



201705002

CLG856-I WHEEL LOADER

GCIC CHINA II POWER / LIUGONG AXLE / ZF GEARBOX
(英文)

OPERATION AND MAINTENANCE MANUAL

Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair on this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintain and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "WARNING" as shown following.

WARNING

The meaning of this safety alert symbol is as follows:

Attention. Be alert. Your safety is involved.

The message that appears under the warning, explaining the hazard, can be either written or pictorially presented.

Operations that may cause product damage are identified by NOTICE labels on the product and in this publication.

LiuGong cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by LiuGong is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance or require procedures you choose.

The information, specification, and illustrations in this publication are on the basis of information available at the time when it was written. The specification, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service given to the product. Obtain the complete and most current information before starting any job. LiuGong has the most current information available.

CALIFORNIA PROPOSITION 65

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects and other reproductive harm.

Battery post, terminal and related accessories contain lead and lead compounds, Always wash hands after handling.

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Preface

This manual includes important instructions concerning operation, lubrication, checking testing, adjusting the machine and permanent key components.

This manual should always be kept safe, clean and with the machine where it is convenient to find for operators to use. This manual should not be separated from the machine even when reselling or leasing.

Some photographs and illustrations in this manual show details of attachments those may be different from your machine. Guards and covers may have been removed for the purpose of illustration.

Read this manual carefully and follow all instructions for proper operation and maintenance of this machine. Instructions in this manual should help the reader avoid possible personal injury or damage to the machine. The operator should proficiently and correctly operate the machine to ensure safety.

Use this machine only for the purpose described in this manual. Contact your Liugong dealer for approval before making any modifications or adding attachments to the machine. The addition of any unauthorized attachment may cause operation of the machine to become unsafe and reduce the service life of the machine. Guangxi Liugong accepts no liability for any damage resulting from the use of unapproved attachments or working practices.

Only trained or experienced personnel should be allowed to operate or maintain this machine. Correctly record the machine type, serial number, engine serial number and all major component serial numbers for your reference when ordering parts or in the event of theft. Record the correct numbers to both the operator's manual and a secure place outside the machine.

Safety

The safety section lists basic safety precautions. In addition this section identifies the text and locations of warning signs and labels used on the machine.

Read and understand the basic precautions listed in the safety section before operating or performing lubrication, maintenance or repairs on this machine.

Operation

The operation section is a reference for the new operator and a refresher for the experienced operator. Read, understand and reference it whenever necessary. This section includes a description of gauges, machine controls, switches and other controls at the operators' station. It also provides transportation and towing information.

Photographs and illustrations guide the operator through correct procedures of checking, starting, operating and stopping the machine.

Operating techniques outlined in this publication are basic. Skill and techniques develop as the operator gains knowledge of the machine and its capabilities.

Maintenance

The maintenance section is a guide for equipment care. The illustrated, step-by-step instructions are grouped by servicing intervals. Items without specific intervals are listed under the "When Required" service interval. Items in the "Maintenance Intervals" are referenced to detailed instructions that follow.

Maintenance Intervals

Use the service hour meter to determine servicing intervals. Calendar intervals shown (daily, weekly, monthly, etc) can be used instead of service hour meter intervals if they provide more convenient servicing schedules and approximate the indicated service hour meter reading. Recommended service should always be performed at the interval that occurs first.

Under extremely severe, dusty or wet operating conditions, more frequent lubrication than is specified in the "Maintenance Intervals" may be necessary.

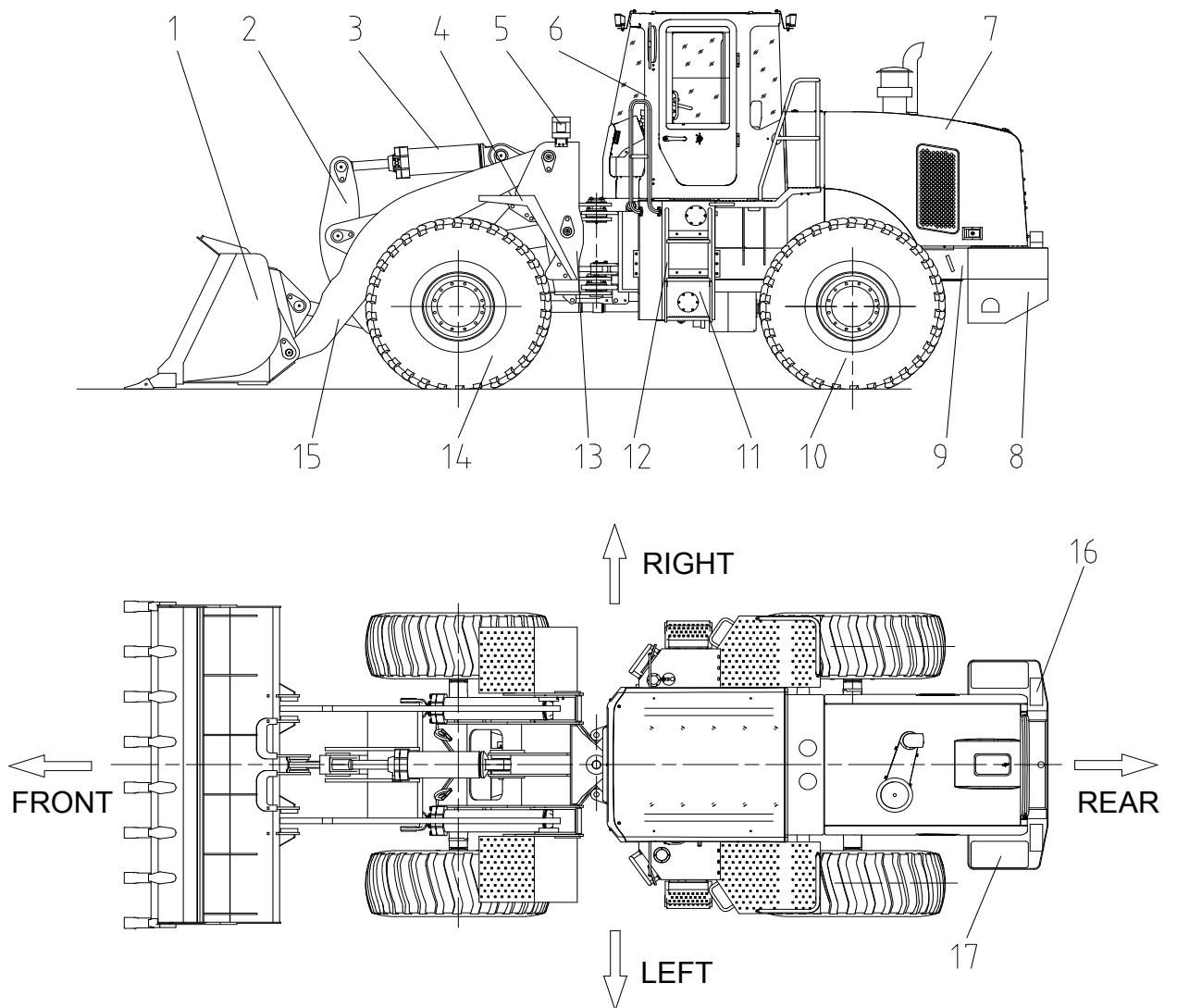
Perform service on items at multiples of the original requirement. For example, at every 500 service hours, also service those items listed under every 250 service hours, 50 service hours and every 10 service hours or daily.

All the information, figures, tables and specifications are the latest product information obtainable at the time of publication. Guangxi Liugong Company will reserve the right to make change without notice.

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Preface

Main Components



- | | | |
|---|------------------------|---|
| 1. Bucket | 7. Engine hood | 13. Front frame |
| 2. Bucket lever | 8. Counterweight | 14. Front wheel |
| 3. Tilting cylinder | 9. Rear frame | 15. Boom |
| 4. Fender | 10. Rear wheel | 16. Rear position light, turn signal light, brake light |
| 5. Front flood light, front position light, turn signal light | 11. Hydraulic oil tank | 17. Battery box |
| 6. Cab | 12. Ladder | |

Type and Serial Number of the Machine and Parts

Manufacturer's Name	Guangxi Liugong Machinery Co., Ltd.
Type of the Machine	
Serial Number of the Machine	
Type of Engine	
Serial Number of Engine	
Type of Transmission	
Serial Number of Transmission	
Type of Front Axle	
Serial Number of Front Axle	
Type of Rear Axle	
Serial Number of Rear Axle	
Type of Hydraulic Pump	
Serial Number of Hydraulic Pump	
Cab Manufacturer	
Serial Number of Cab	

Note: After receiving the machine the user should fill out the above table according to the specific configuration.

Safety Information

Safety Symbol



The symbol for safety alerting appears on machines, safety signs, manuals or for important safety information at other places. When you see this symbol, you should follow the instructions in the safety information, guarding against any possibility of personal injuries or death.

Safety Signs

Definitions of the safety signs with the words "Danger", "Warning" and "Caution" which appear in this manual and on the machine are as follows:

DANGER

- Danger: this word denotes an impending danger, failure to observe instructions could result in death or serious injuries.

WARNING

- Warning: this word denotes potential danger, failure to observe instructions could result in death or serious injuries.

CAUTION

- Caution: this word denotes potential danger, failure to observe instructions could result in minor to medium degree of injury.

"Caution" is also used to indicate safety information relating to unsafe operations which may cause personal injuries. "Danger" represents the most dangerous conditions. The safety signs "Danger" or "Warning" are placed near particular dangerous places. General notice information is placed on the safety sign "Caution."

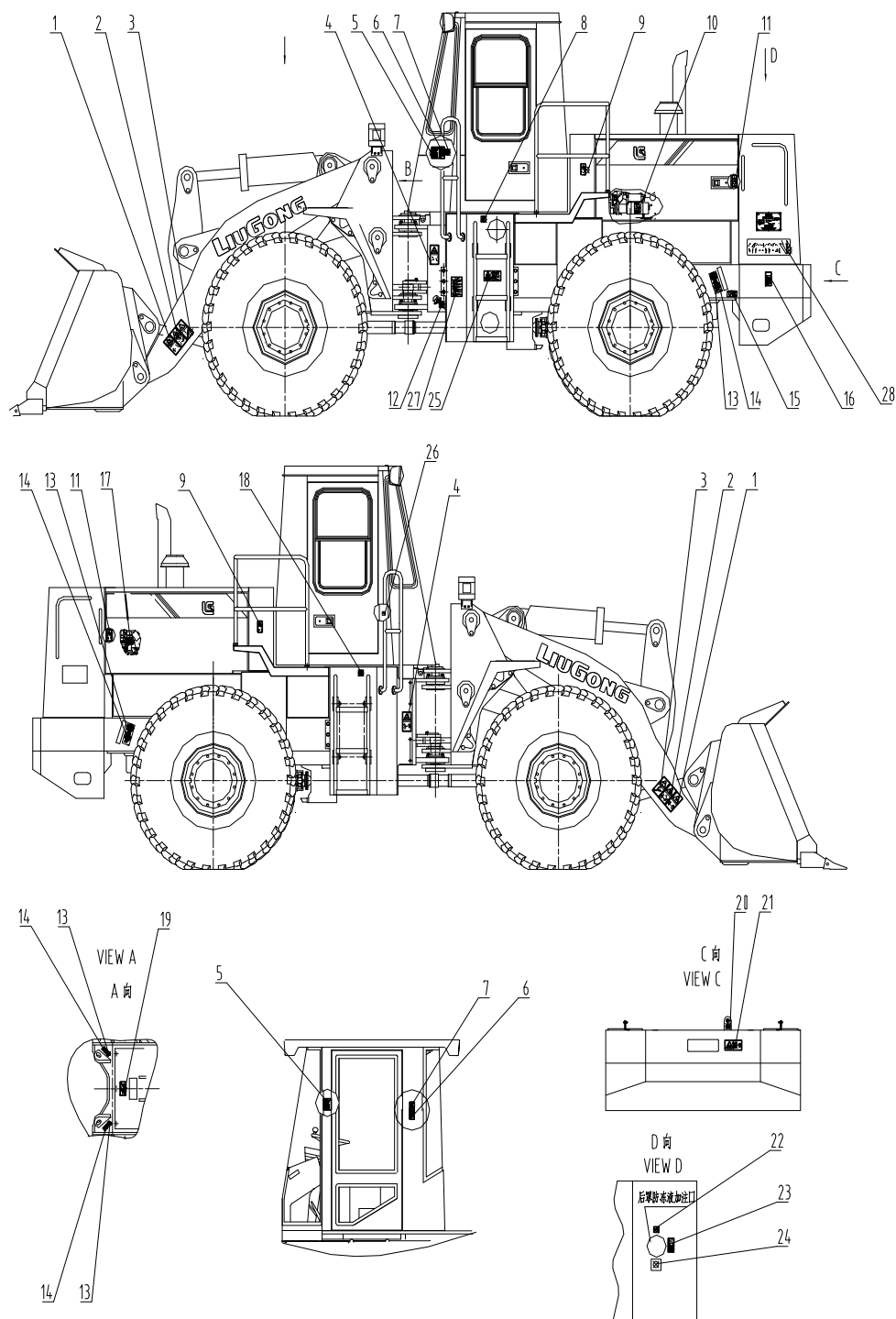
Safety Decals and Decal Locations

There are several specific safety decals on your machine. The exact location of and description of the hazards are reviewed in this section. Take time to read, understand and familiarize yourself with each and every one of these safety decals.

Make sure that you can read all safety decals. Clean or replace if you cannot read the words or see the pictures. When cleaning the decals use a cloth, water and soap. Do not use solvent, gasoline, or other harsh chemicals to clean the safety decals. Solvents, gasoline or harsh chemicals could loosen the adhesive backing of decals causing them to fall off the machine.

You must replace a decal if it is damaged, missing or cannot be read. If a decal is on a part that is replaced, make sure a new decal is installed on the replacement part. Pay attention to the instructional and safety decals located in the cab before starting.

Decal location



1. WARNING DECAL
2. DANGER DECAL
3. DANGER DECAL
4. WARNING DECAL
5. WARNING DECAL

6. NOTICE DECAL
7. NOTICE DECAL
9. CAUTION DECAL
10. WARNING DECAL
11. WARNING DECAL

15. NOTICE DECAL
16. DANGER DECAL
19. DANGER DECAL
20. SYMBOL
21. WARNING DECAL

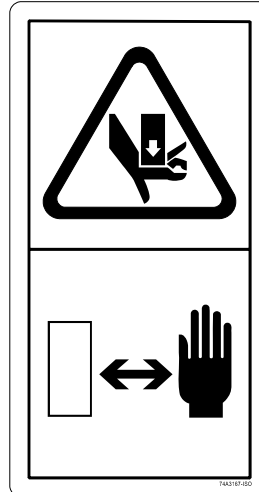
23. WARNING DECAL
24. NOTICE DECAL
25. DECAL
26. DECAL

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Safety Information
Safety Decals and Decal Locations

Decal information

Fig.1 WARNING DECAL
(Located near the crush area)
CRUSH HAZARD. Keep clear.



74A3167

Fig. 2 DANGER DECAL
(Located on the arm)
CRUSH HAZARD. Keep away from raised
loader arm or bucket.



74A3153

Fig. 3 DANGER DECAL
(Located on the arm or arm cylinder)
CRUSH HAZARD. Install arm support before
maintenance or repair with loader arm raised.



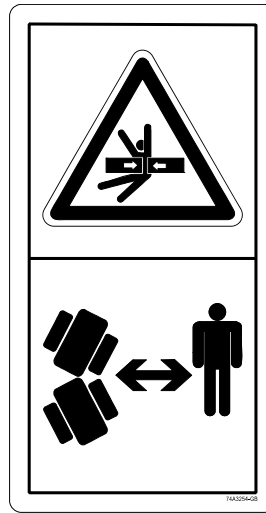
74A3165

Decal information

Fig. 4 WARNING DECAL

(Located at the frame articulation joint)

CRUSH HAZARD. Keep clear.



74A3254

Fig. 5 WARNING DECAL

(Located in the cab)

Read and understand Operation and Maintenance Manual before operating or performing maintenance on this machine, death or serious injury could result. It is your responsibility to be aware of and follow all local laws and regulations. Operate only from operator's seat. Do not carry riders on machine. Before starting machine, make sure hydraulic control lever is in lockout position and all control levers are in neutral. Sound horn to alert people. Ensure bystanders and obstacles are clear of machine before moving machine or its attachment. Before leaving operator's compartment, park on level ground, lower attachments to ground, make sure hydraulic control lever is in lockout position. All control levers are in neutral. Engage parking brake. Never operate machine downhill with stalled engine and gear in neutral. Avoid contacting overhead obstacles when operating or hauling machine.

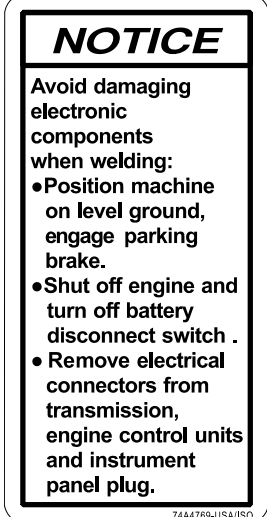
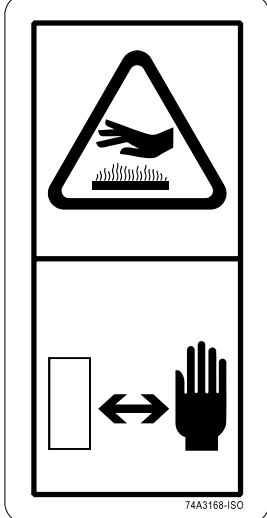


74A4777

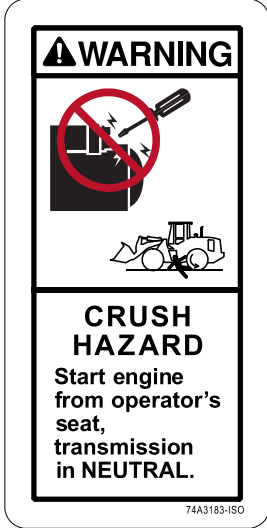
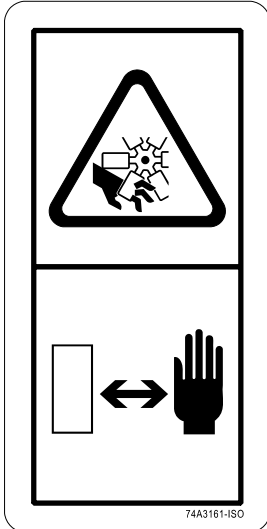
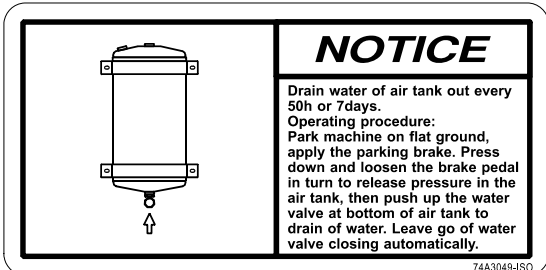
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Safety Information
Safety Decals and Decal Locations

Decal information

Fig. 6 NOTICE DECAL (Located in the cab) Avoid damaging electronic components when welding: Position machine on level ground, engage parking brake. Shut off engine and turn off battery disconnect switch. Remove electrical connectors from transmission, engine control units and instrument panel plug.	 74A4769
Fig. 7 NOTICE DECAL (Located in the cab) Do not clean inside of cab with water under pressure, electrical component damage will result. Prevent loss of electrical power, turn battery disconnect switch to off position when machine not in use or being parked overnight.	 74A4780
Fig. 9 CAUTION DECAL (Located on the hot surface) Hot surface, keep clear.	 74A3168

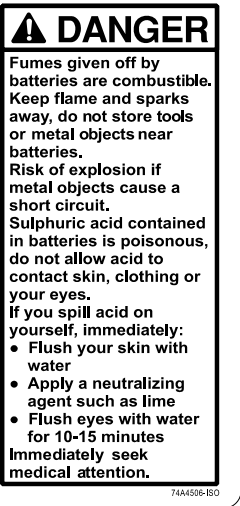
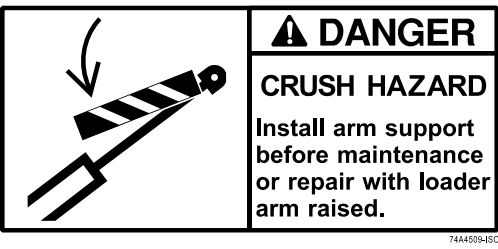
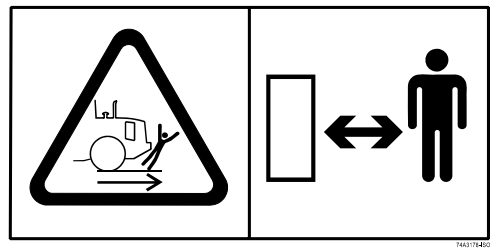
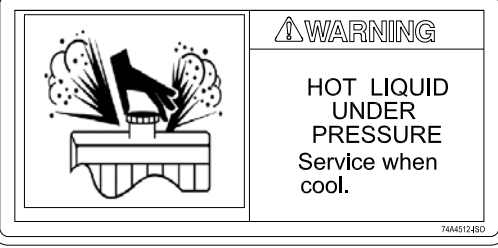
Decal information

Fig. 10 WARNING DECAL (Located on the engine) RUNOVER HAZARD. Start engine from operator's seat, transmission in NEUTRAL.	 74A3183
Fig. 11 WARNING DECAL (Located near the engine fan) CUTTING HAZARD. Keep clear or stop engine before servicing.	 74A3161
Fig. 15 NOTICE DECAL (Located on the front side of the air tank) Drain water of air tank out every 50h or 7days. Operating procedure: Park machine on flat ground, apply the parking brake. Press down and loosen the brake pedal in turn to release pressure in the air tank, then push up the water valve at bottom of air tank to drain of water. Leave go of water valve closing automatically.	 74A3049

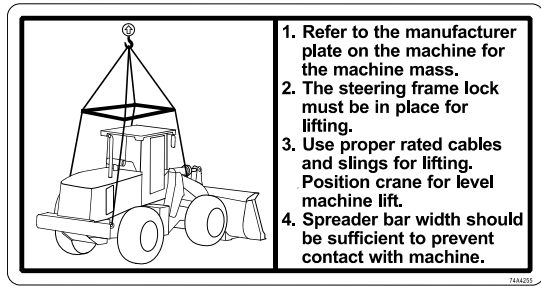
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Safety Information
Safety Decals and Decal Locations

Decal information

Fig.16 DANGER DECAL (Located near the battery) Fumes given off by batteries are combustible. Keep flame and sparks away, do not store tools or metal objects near batteries. Risk of explosion if metal objects cause a short circuit. Sulphuric acid contained in batteries is poisonous, do not allow acid to contact skin, clothing or your eyes. If you spill acid on yourself, immediately: Flush your skin with water. Apply a neutralizing agent such as lime. Flush eyes with water for 10-15 minutes. Immediately seek medical attention.	 74A4506
Fig. 19 DANGER DECAL (Located on arm or arm support) CRUSH HAZARD. Install arm support before maintenance or repair with loader arm raised.	 74A4509
Fig. 21 WARNING DECAL (Located on the tail of machine) RUNOVER HAZARD. Keep clear.	 74A3178
Fig. 23 WARNING DECAL (Located near the coolant filler cap) Hot liquid under pressure, service when cool.	 74A4512

Decal information

Fig. 24 NOTICE DECAL (Located near the coolant filler on engine hood) Engine coolant contains antifreeze protection to -15°C\ -30°C\ -45°C. Change coolant annually.	 74A2868-USA/ISO 74A2868  74A2867-USA/ISO 74A2867  74A2863-USA/ISO 74A2863
Fig. 25 DECAL 1. Refer to the manufacturer plate on the machine for the machine mass. 2. The steering frame lock must be in place for lifting. 3. Use proper rated cables and slings for lifting .position crane for level machine lift. 4. Spreader bar witch should be sufficient to prevent contact with machine.	 74A4255 74A4255
Fig. 26 DECAL (Located in the cab)	 74A2875 74A2875

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Safety Information
Safety Decals and Decal Locations

Decal information

Fig. 27 DECAL

(Located on the hydraulic oil tank)

Hydraulic oil detection instruction:

- Park the machine on flat ground, ensure that the front and rear frames are on a straight line, the oil temperature is between 25-50 °C.
- Start the engine; operate the boom, bucket, and steering cylinders repeatedly to ensure that the system is filled with hydraulic oil.
- Tilt the bucket back, speed up the engine to raise the boom at full speed to the highest position.
- The machine is at idle state, push the boom control lever to lower the boom at constant speed, place the bucket levelly on the ground, stop the engine; operate the control levers repeatedly to release pressure.
- Wait for 3-5 minutes, check the hydraulic oil level, if the oil level is below the green range of the oil level sight glass, add oil in time.

Hydraulic oil detection instruction:

- Park the machine on flat ground, ensure that the front and rear frames are on a straight line, the oil temperature is between 25-50°C.
- Start the engine; operate the boom, bucket, and steering cylinders repeatedly to ensure that the system is filled with hydraulic oil.
- Tilt the bucket back, speed up the engine to raise the boom at full speed to the highest position.
- The machine is at idle state, push the boom control lever to lower the boom at constant speed, place the bucket levelly on the ground, stop the engine; operate the control levers repeatedly to release pressure.
- Wait for 3-5 minutes, check the hydraulic oil level, if the oil level is below the green range of the oil level sight glass, add oil in time.

74A8304

Decal information

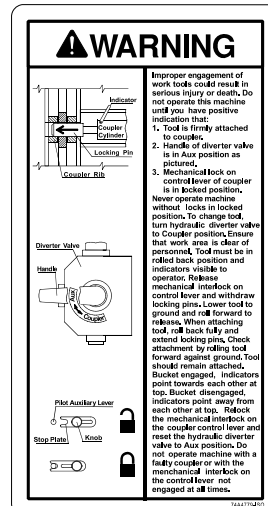
Fig. 29 WARNING DECAL

(Located in the cab)

Improper engagement of worktools could result in serious injury or death. Do not operate this machine until you have positive indication that:

1. Tool is firmly attached to coupler.
2. Handle of diverter valve is in Aux position as pictured.
3. Mechanical lock on control lever of coupler is in locked position.

Never operate machine without locks in locked position. To change tool, turn hydraulic diverter valve to Coupler position. Ensure that work area is clear of personnel. Tool must be in rolled back position and indicators visible to operator. Release mechanical interlock on control lever and withdraw locking pins. Lower tool to ground and roll forward to release. When attaching tool, roll back fully and extend locking pins. Check attachment by rolling tool forward against ground. Tool should remain attached. Bucket engaged, indicators point towards each other at top. Bucket disengaged, indicators point away from each other at top. Relock the mechanical interlock on the coupler control lever and reset the hydraulic diverter valve to Aux position. Do not operate machine with a faulty coupler or with the mechanical interlock on the control lever not engaged at all times.



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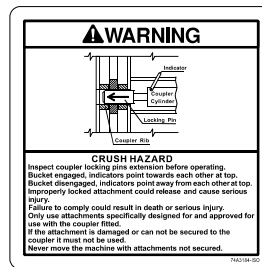
Safety Information
Safety Decals and Decal Locations

Decal information

Fig. 30 WARNING DECAL

(Located near the joint of coupler)

CRUSH HAZARD. Inspect coupler locking pins extension before operating. Bucket engaged, indicators point towards each other at top. Bucket disengaged, indicators point away from each other at top. Improperly locked attachment could release and cause serious injury. Failure to comply could result in death or serious injury. Only use attachments specifically designed for and approved for use with the coupler fitted. If the attachment is damaged or can not be secured to the coupler it must not be used. Never move the machine with attachments not secured.

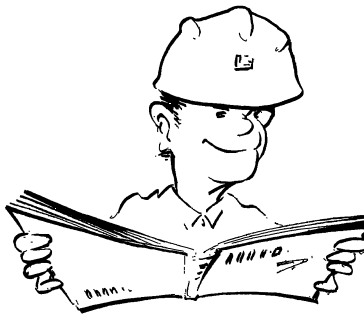


74A3184

General Hazard Information

Be familiar with all safety cautions, failure to observe could result in property damage, serious injury or even death.

Only trained and qualified personnel should be allowed to operate or maintain the machine.

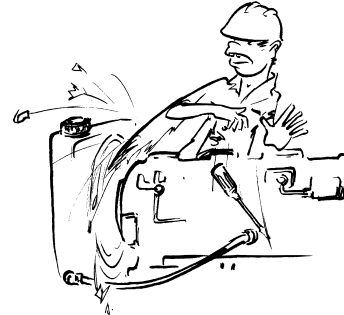


Do not operate the machine if you feel sick, sleepy or after taking some medication. Check with your doctor if unsure. Never operate machinery while under the influence of drugs or alcohol.

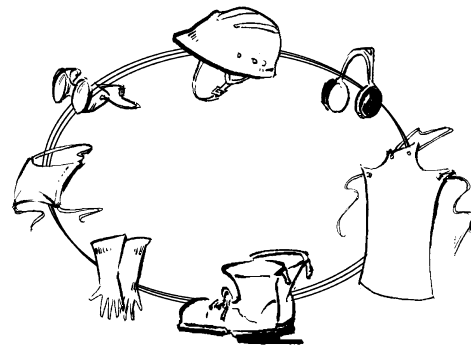
Attach a DO NOT OPERATE or similar warning tag to start switch or control levers before servicing or repairing the machine.



Do not wear loose fitting clothing, dangling jewelry or long hair that can catch on controls or in other moving parts of the machine.



Wear relevant personal protective equipment (PPE) such as a hard hat, ear protection, safety glasses, safety shoes and gloves when operating or servicing the machine.



Using goggles, safety glasses or full face mask can protect your eyes from being injured by high pressure liquids, when maintaining storage batteries, by flying scraps when the engine is in operation or you are using tools. When you remove springs or resilient parts, add acid/electrolyte to batteries, you should wear a full face protective mask. When carrying out welding operations or gas cutting operations with a welding torch, wear specific safety goggles suitable for the task being performed. Consult your welding equipment dealer for more information.

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Safety Information
General Hazard Information



When working under high noise conditions, wear appropriate safety equipment to protect your hearing, such as approved earmuffs or plugs. Avoid the damage caused by exposure to high noise on your hearing.



Make sure all protective guards and covers are secured in place on the machine. Always replace protective guards and covers removed for servicing or maintenance. Repair damaged guards and covers before operation.

Keep the machine, especially the panels, accesses, step and ladders, free of foreign material, such as debris, oil, tools and other items which are not part of the machine.

Secure all loose items such as lunch boxes, tools and others.

Pay attention when opening fluid compartments to prevent foreign materials from entering the system. Always remove loose materials from near caps and plugs.



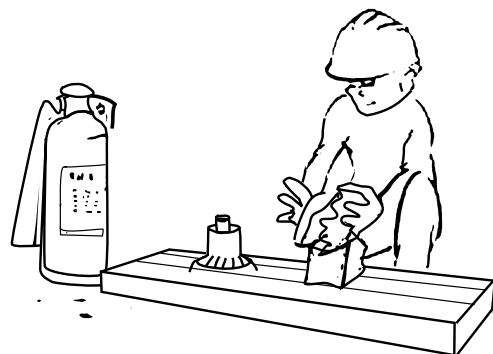
Know the appropriate worksite hand signals and who gives them. Accept signals from one person only.

No smoking and keep open flames away when maintaining air conditioner or if there is refrigerant gas, the flames contact the refrigerant and the cigarette smoke will cause personal injury or death.

Never put maintenance fluids into glass containers.

Observe the relevant laws and regulations when handling harmful articles such as lubricants, fuels, coolants, solvents, filters, batteries and other materials.

Use all cleaning solutions with care. Do not use any flammable material to wash components, for example, diesel oil or gasoline. They may easily catch fire.



Report all required repairs in time.

Do not allow unauthorized personnel on or around the machine.

Guangxi Liugong bears no responsibility for failures caused by modifications to machine structure without Liugong's permission.

Compressed Air

Compressed air can cause personal injury. When using compressed air for cleaning, wear a protective face shield, protective clothing, hearing protection and protective shoes. Never aim compressed air at yourself or others. Compressed air could penetrate your skin and cause serious injury or death. The maximum air pressure used should not exceed 25psi (0.2Mpa).

High-pressure Fluid

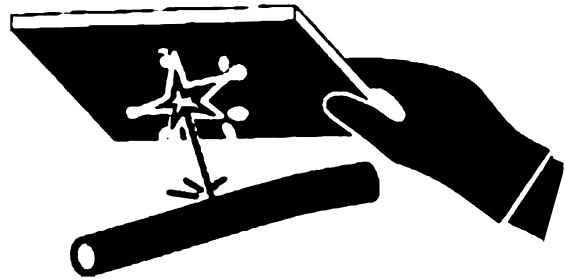
⚠ WARNING

Avoid injury from high-pressure oil. When repairing hydraulic lines, ensure that system pressure is completely released before beginning the repair. Hydraulic oil under pressure contacting the skin could cause serious injury or damage.

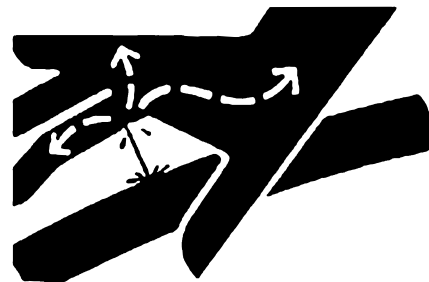
Use caution before disconnecting hydraulic lines or connectors. High pressure oil that is released can cause a hose to whip.

Always support attachments and release residual pressure before attempting to disconnect hydraulic lines. Pressure applied by loads on attachments could cause hydraulic oil to spray when lines are removed.

Wear safety glasses and leather gloves. Never check for high-pressure leaks with your unprotected hand. Use a board or cardboard when checking for leaks.



Even a pin-hole size leak can cause serious injury. If you are hit by spraying high-pressure oil, see a doctor for treatment at once.



Disposal of Waste Fluids

Improper handling of the waste fluid will cause pollution of the environment. Obey all local regulations for disposal of waste fluids.

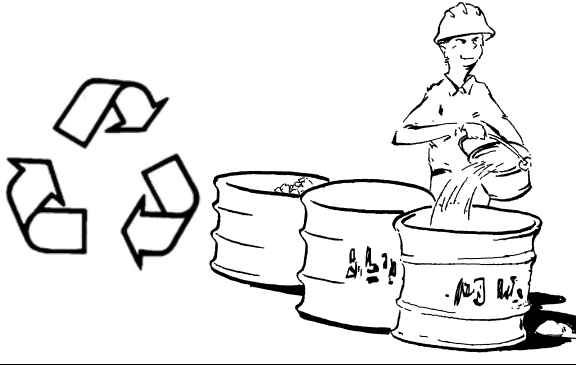
Collect all waste fluids when performing inspections, maintenance, testing, adjusting and repairs to the machine.

Prepare to collect fluids with suitable containers before opening any compartment or disassembling any component that contains fluids.

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Safety Information
General Hazard Information

Use suitable containers to collect waste fluids. Do not use food containers or beverage bottles as they could mislead people to drink the contents.



Cautions about Accumulators

High-pressure nitrogen is contained in the accumulators making them dangerous articles. Read the following requirements and pay attention to the proper use of accumulators.

Check accumulators before charging with nitrogen. Safe use cannot be guaranteed if there is not a nameplate attached to the accumulator. Never charge accumulators that have an incomplete nameplate or that are of an unidentified type.

Accumulators are charged with nitrogen. The use of oxygen, compressed air or other flammable air in the accumulator could cause an explosion and possible injury, death and damage to the machine.

When charging accumulators with nitrogen, care should be taken not to damage the diaphragm.

The accumulator's valve should be installed facing vertically upward. Do not attempt to fix accumulators by welding them.

Do not drill any hole in the accumulator or close a hole by welding.

Do not weld a boss on the accumulator.

Accumulators are high-pressure vessels and should be repaired only by trained specialized personnel.

Always release pressure in the accumulator before disposing of it.

Asbestos Danger

Breathing asbestos dust can be hazardous to your health. Equipment and replacement parts shipped from Liugong have no asbestos in them. Liugong recommends the use of genuine factory spare parts only. Observe the following rules if you are handling any spare parts that contain asbestos or asbestos fibers:

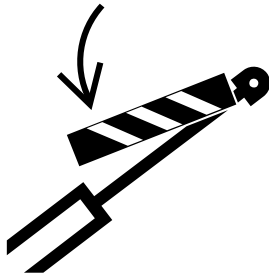
- Never use compressed air to clean up asbestos. Use a wet method in order to clean up asbestos materials. Water the area down to clear asbestos dust.
- A vacuum cleaner that is equipped with a high efficiency particulate air filter (HEPA) can also be used.
- Do not grind materials that contain asbestos.
- Operate the machine on the windward side of the asbestos as far as possible.
- Obey environmental regulations for the disposal of asbestos.
- Shower after contact with asbestos.
- Wear an approved respirator if there is no other way to control the dust.



Crushing and Cutting Prevention

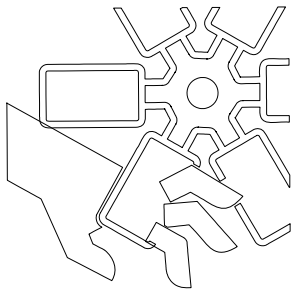
Don't put hands, arms, or any other parts of the body in the way of removable parts.

Support equipment and attachments properly when working beneath them. Do not depend on hydraulic cylinders to hold up the implement/attachment. The implement/attachment can fall if a control lever is accidentally moved, or if a hydraulic line breaks.



For those parts fitted with shields, if it is necessary to remove shields in order to perform maintenance, always install the shields after the maintenance is performed.

Rotating or moving parts have cutting or crush hazard. Keep clear or stop engine before servicing.



Keep hands and objects away from moving fan blades. They can throw or cut any object that contacts the moving blades.

Never attempt adjustments while the machine is moving or the engine is running unless otherwise specified.

If the machine must be repaired with engine running, make sure that a qualified operator is available in the cab to shut down the engine if required.

Do not use a kinked or frayed wire cable. Wear gloves when handling wire cables.

Retainer pins, when struck with force, can fly out and injure nearby persons. Make sure the area is clear of people when driving retainer pins. Wear protective glasses when striking a retainer pin to avoid injury to your eyes.

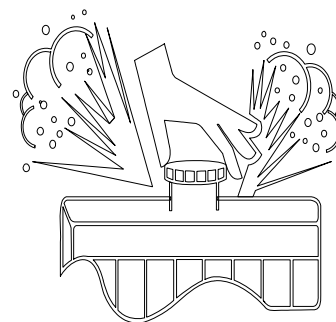
Chips or other debris can fly off objects when struck. Make sure no one can be injured by flying debris before striking any object.

Burn Prevention

Some parts of the machine become hot during normal operation. Use caution when maintaining the engine and hydraulics. Allow the machine to cool after it has been operating for a long period of time.

Coolant

At operating temperature, the engine coolant is hot and under pressure. The radiator and all lines to heaters and the engine contain hot water or steam. Any contact can cause severe burns.



Check the coolant level only after the engine has been stopped and the coolant filler cap is cool enough to remove with your bare hand.

Remove the cooling system filler cap slowly to relieve pressure.

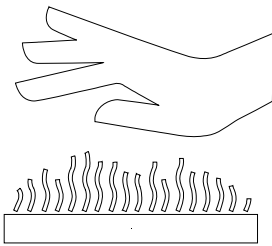
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Safety Information
Fire & Explosion Prevention

Coolant contains alkali that can cause personal injury. Avoid contact with the skin, eyes and mouth.

Oil

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



At operating temperature the hydraulic oil tank is hot and can be under pressure.

Remove the hydraulic oil tank cap only after the engine has been stopped and the cap is cool enough to remove with your bare hand.

Remove the hydraulic oil tank oil filling cap slowly to relieve pressure.

Relieve all residual pressure in air, oil, fuel or cooling systems before any lines, connectors or related items are disconnected or removed.

Batteries

Batteries give off flammable fumes which can explode.

Batteries and battery terminals may contain lead; do not touch batteries with your bare hands. Always wash your hands right after maintaining a battery.

Do not smoke when observing the battery electrolyte levels.

Electrolyte is an acid and causes personal injury if it contacts skin or eyes. If contact occurs flush with water and seek medical attention right away.

Always wear protective glasses and gloves when checking batteries.

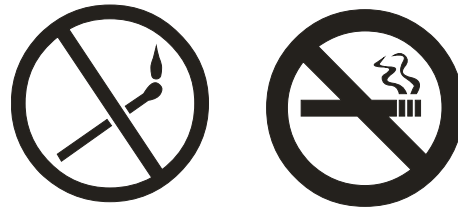


Fire & Explosion Prevention

All fuels, most lubrication and some coolant mixtures are flammable.

Fuel leaked or spilt onto hot surfaces or electrical components can cause a fire.

Do not smoke while refueling or in a refueling area, or where flammable materials are stored.



Clean and tighten all electrical connections. Check daily for loose or frayed electrical wires. Have all loose or frayed electrical wires tightened, repaired or replaced before operating the machine.

Check the electric circuit periodically to avoid fire caused by overload or short circuit.

Keep all fuels and lubrications stored in properly marked containers and away from all unauthorized persons.

Store all oily rags or other flammable materials in a protective container away from naked flames or other sources of ignition.

Do not weld or flame cut pipes that contain flammable fluids. Clean the flammable fluids before welding or flame cutting on them.

Remove all flammable materials such as fuel, lubrication and other debris before they accumulate on the machine.

Do not operate the machine near an open flame.

Keep all open flames or sparks away from the battery. Do not smoke in battery charging areas.

Do not charge a frozen battery. This may cause an explosion.

Ether

Starting the machine by use of ether could result in serious damage to the engine or personal injury or death.



Cautions Concerning Lines, Tubes and Hoses

Do not bend or strike high-pressure lines. Do not install bent or damaged tubes or hoses.

Tighten any loose fuel or oil pipes, hydraulic system tubes or hoses. Repair any damaged fuel or oil lines, tubes or hoses. Leaks can cause fires. Contact Liugong or your Liugong Dealer for factory authorized replacement parts.

If you see evidence of any of the following situations, replace the part before using:

- Connectors damaged or leaking.
- Outer covering frayed or cut and reinforcing wire exposed.
- Outer covering ballooning.
- Evidence of kinking or crushing.
- Reinforcing steel wire of the hose embedded in the outer covers.
- Connectors incorrectly fitted or tensioned.

Make sure that all clamps, guards and heat shields are properly installed. During operation this will prevent vibration, abrasion, friction with other parts and guard from excessive heat.

Before removing or servicing any lines of the air conditioning system, always ensure there is not an open fire nearby; any escaping gas coming into contact with fire could result in poisonous fumes. Never smoke when servicing or repairing the air conditioning system, any escaping gas that burns and inhaled can cause bodily harm or death.

Fire Extinguishers and First-aid Kit

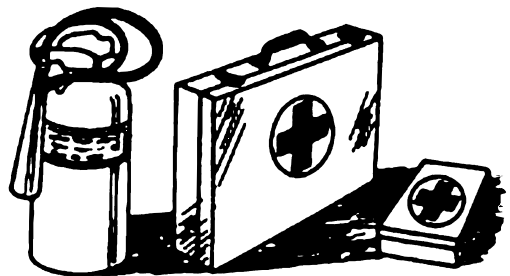
A fire extinguisher that meets with all local fire extinguisher laws and regulations should be available on the machine.

Maintain the fire extinguisher in accordance with all local laws and regulations. Contact your local fire department for further information.

Know how to use the fire extinguisher and first-aid kit.

A first-aid kit should be available at the work site. Periodically check the contents of the kit and replace used medical supplies as necessary.

Keep telephone numbers of doctors, first-aid centers or fire stations etc with you so you can contact them in case of an emergency. Post the contact telephone numbers in regulated places. Ensure that all persons know where the telephone numbers are located and know the correct contact method.



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Electrical Storm Injury Prevention

Inspect and service the fire extinguisher regularly. Obey the recommendations on the instruction plate and all local laws and regulations relating to fire extinguishers.

Electrical Storm Injury Prevention

When lightning is striking in the vicinity of the machine, the operator should never attempt to mount and dismount the machine.

If you are in the cab during an electrical storm, stay in the cab. If you are on the ground during an electrical storm, stay away from the machine.



Tire Explosion Prevention

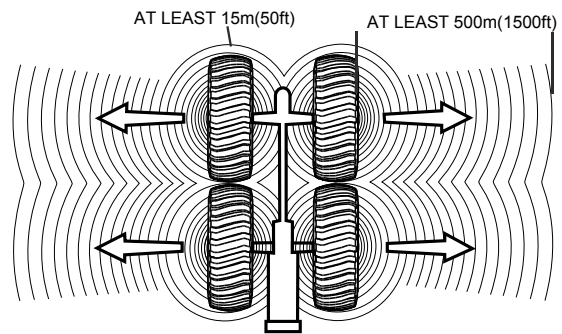
Maintenance, removal, repair and installation of the tires and wheel rims must be performed with special equipment and a trained repairer. Therefore, it is better to repair and maintain the tires in a tire service shop.



Explosions of tires have resulted from gas heat-induced and combustion inside the tires. Explosions can be caused by heat that is generated by welding, by heating rim components, by external fire, or by excessive use of brakes.

A tire explosion is much more violent than a blowout. The explosion can propel the tire, the rim components, and the drive train components as far as 500 m (1500 ft) or more from the machine. Both the force of the explosion and the flying debris can cause property damage, personal injury, or death.

Do not approach a warm tire. Maintain a minimum distance, as shown. Stay outside the shadow area.



Dry nitrogen is recommended for inflation of tires. If the tires were originally inflated with air, nitrogen is still preferred for adjusting the pressure. Nitrogen mixes properly with air. Nitrogen inflated tires reduce the potential of a tire explosion because nitrogen does not aid combustion. Nitrogen helps to prevent oxidation of the rubber, deterioration of rubber, and corrosion of rim components.

Avoid over inflation. Use proper inflation equipment, and training for using the equipment is necessary. Improper equipment or using will result in tire break or rim damage.

Improper tire and rim maintenance may cause tire explosion, and such explosion can lead to serious personal injury or death. Only trained personnel with proper tools and correct procedure can maintain the tires and wheel rims.

ROPS/FOPS

ROPS/FOPS of Guangxi LiuGong Machinery Co., Ltd are located above the operator's compartment and secured to the machine.

The strength of the structure will be reduced if it is damaged due to a rollover. ROPS are certified structures and cannot be repaired. Any damage to the ROPS structure will require replacement of the structure to retain the certification.

Always fasten your seat belt when you operate the machine.

It is forbidden to drill holes or weld inside or outside or change anything of the cab. This will damage the integrity of the ROPS structure.

If the cab is to be modified in any way, contact your local LiuGong dealer to avoid damaging the ROPS structure.



Operator Station

This machine is equipped with a cab that meets with industry standard: ISO 3411.

Any modifications or additional equipment added to the inside of the operator station should not project into the operator space. The addition of a radio, fire extinguisher and other equipment must be installed so that the defined operator space is maintained. Any item that is brought into the cab should not project into the defined operator space. A lunch box or other loose items must be secured. Objects must not pose an impact hazard during travel over rough terrain or in the event of the machine tipping.

Steering Frame Lock

Connect steering frame lock when the machine is being lifted and shipped. Also connect the steering frame lock when performing repairs near the articulation joint.

Disassemble the steering frame lock before operating the machine.

More information refers to Steering Frame Lock in Operation Manual.

Attachment Cautions

Attachments should only be installed by authorized people who have been trained to operate and maintain the attachment according to the operator's manual.

Refer to the instructions in the operation manual and any other related information when installing and using attachments.

Incorrect installation of attachments or optional parts not only will result in safety problems, but also will negatively influence the operation and service life of the machine and the attachments.

It is forbidden to modify the machine or any attachments without permission from your LiuGong dealer.

LiuGong bears no responsibility for injuries, accidents or machine damage resulting from the use of unauthorized attachments.

Cautions about Machine Operations

Mounting and Dismounting

Before mounting or dismounting the machine, check the condition of handrails, ladders and steps. Clean them of grease, lubricants and dirt before use. Repair any damaged parts and tighten loose bolts.

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Safety Information
Cautions about Machine Operations

Mount and dismount the machine only where there are handrails, steps or ladders.

Face the machine when getting on or off, grab the handrails with both hands and step onto the steps or ladders. Touch three points simultaneously (two feet and one hand or two hands and one foot) to ensure stability of the body.



Never jump off the machine.

Never get on or off a moving machine.

Be careful not to touch any control levers when getting on or off the machine.

Do not try to climb on or off the machine when carrying tools or supplies. Use a rope to pull equipment up onto the platform or have an assistant pass them to you.

Understand Your Machine

Be able to operate all the equipment on your machine.

Understand the purpose of all control systems, instruments and indicators.

Understand the rated load, speed range, the characteristics of braking and steering, turning radius and the space clearance for operation.

Remember that rain, snow, ice, gravel and soft earth may change the performance of the machine.

Understand the safety signs on the machine (Danger, Warning, Caution) and any other signs.

Understand Your Working Area

Before starting, inspect the area where you will be working. You should check: adequate ventilation, the position of any slopes, visible ditches, falling or hanging objects, conditions of soils (soft or hard), accumulated water and swamp areas, rocks or stumps, hidden groundwork, posts or the outer limits of walls, the outer limits of the areas where garbage is buried or that are filled in with earth, holes or openings, obstacles, mud or ice, traffic, heavy dust, heavy smoke, heavy fog, the exact locations of cables or pipes for power supply, gas supply, phone service, water supply, sewage disposal and other utilities that are hidden or hung. If necessary before starting work you should ask the utility companies to mark out, close or move out these utilities.

Before Starting the Engine

Inspect the machine carefully before starting the engine, ensure all systems are in good operational condition. Make sure nobody is on or around the machine before starting the engine.

Keep the steps and handrail clean. Clear any dirt and sand from your shoes before mounting the machine.

Check all structural members, covers and fenders for deformation or damage.

Check the condition of safety items such as doors, guards and covers. Repair any damage as necessary.

Check the hydraulic system for oil leakage. Check the condition of hoses and pipes.

Check all fasteners for security.

Check the condition of the electrical wiring harness and fuses, replace or repair as necessary. Also check the connectors for good connection.

Check the fuel level and fuel system for normal condition, drain any water or sediment in the water/fuel separator. Dispose of fluids in accordance with local regulations.

Replace all damaged or lost parts and carry out lubrication according to the maintenance interval schedule.

Remove all loose objects from the cab. Loose objects may affect the operation and cause accidents.

Make sure that all the windows, if fitted, are clean and the screenwiper works normally.

Adjust the operators seat to a position that is most comfortable and provides for easiest operation of the machine. Check the seat belt and the condition of mounting hardware. Repair or replace any items that are damaged. Replace the seat belt after three years of use or any time the belt shows signs of wear or damage.

Adjust the seat to ensure that you can depress the pedals fully when your back is against the seat.

Check all the illumination equipment before operation in low light, and ensure that the illumination system is in good condition.

Check to make sure the steering frame lock is in the RELEASED position.

Engine Starting

Do not start the engine if there is a DO NOT OPERATE or similar tag attached to the start switch or control levers.

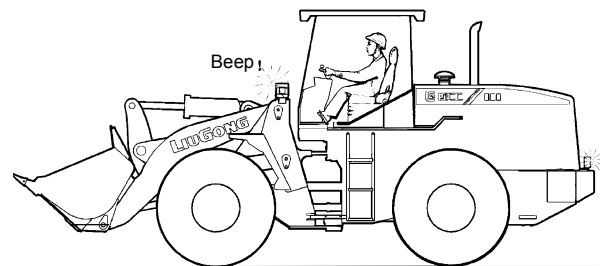


Do not start the engine until seated in the operators seat and the seat belt is firmly fastened.



Ensure the hydraulic control levers are all in the NEUTRAL position and the shift control lever is in the NEUTRAL position before starting the engine.

Sound the horn to alert personnel before starting the engine.



Only start the engine from the operators seat in the cab. The transmission should be in NEUTRAL position before engine starting. Never start the engine by short-circuiting the starter motor terminals. Starting the engine by short-circuiting could result in damage of the electrical system, personal injury or death.

After the engine is started, you should observe, instruments and warning lights, and make sure that they work and every reading is within working range.

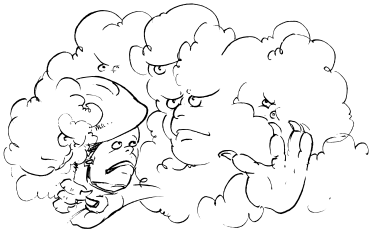
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Safety Information
Cautions about Machine Operations

Observe machine movements and listen carefully for unusual noises. If there is any fault or abnormality, you should stop the engine immediately. Locate the source of the problem and repair before further operation.



Never run the engine in a closed or poorly ventilated environment. If working inside a building, open the doors and windows to ensure enough ventilation and try to prevent exhaust gas poisoning. Use a power exhaust system when working in an enclosed area.



Before Operating the Machine

Make sure the machine is clear of personnel and fasten the seat belt before operation.

Keep all the windows, lightshades and rearview mirrors clean. Secure doors and windows in either the open or close position.

Adjust the rearview mirrors for best vision, especially close to the machine.

Clear all obstacles from where the machine will be working. Be aware of hazards such as high voltage wires, ditches, etc.

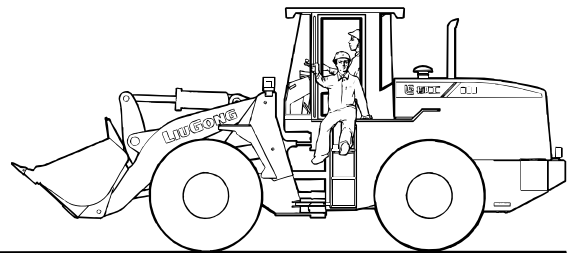
Make sure the horn, backup alarm (if equipped) and all other alert devices are working properly.

Machine Operation

Before operating the machine on roads, check whether the machine meets the requirements of the local laws and regulations for road operation. Make sure that you get the road operating permission from relevant road administration offices. Observe the local traffic regulations when driving the machine on roads.

Before driving the machine, you should carefully observe the surroundings, and find out the relations between the direction that you want to go in and the pedal/operating lever.

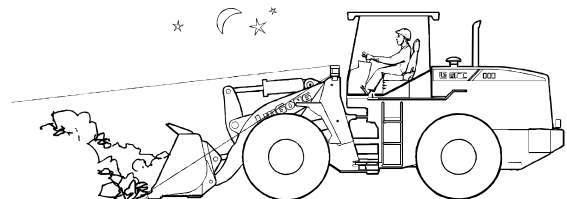
Do not allow another person to sit on the machine unless equipped with an additional seat, seat belt and Rollover Protective Structure (ROPS).



Before working the machine, you should operate the machine slowly to an open area, check for proper operation of all control levers and all protective devices.

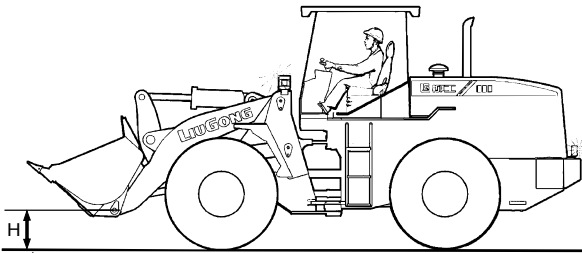
Note any needed repairs during machine operation such as an abnormal noise, vibration, smell, wrong reading of gauges, gas or oil leakage, etc., stop what you are doing and report any needed repairs.

Dust, heavy rain, and heavy fog will blur your vision. You should keep windows, mirrors and lights clean and in good condition. When the visibility decreases, you should decrease the speed and apply the proper lights.



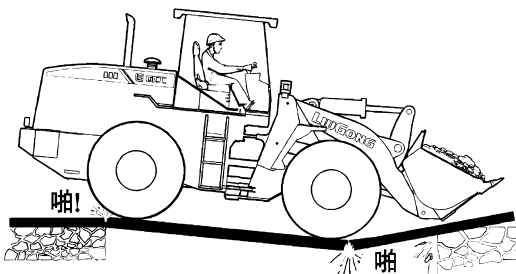
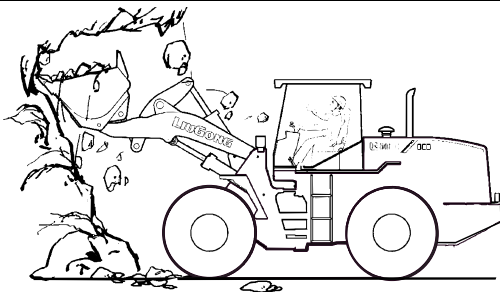
If driving or operating the machine with a bad view or in a crowded area, you should work with a signalman, keep the signalman within the field of your vision, and coordinate your hand signal.

When traveling with a load in the bucket, set the load height at 17" ~20" (450~500mm) from the ground level to below the boom articulation joint.

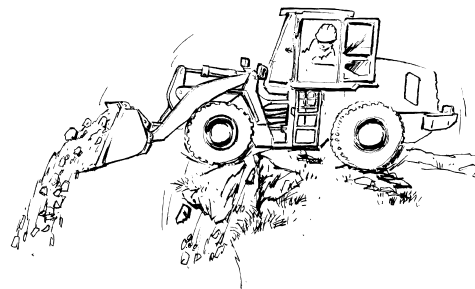


Avoid bumping the obstacles on top of the machine when operating it.

Never undercut a high bank. The bank edges could collapse causing severe injury or death. Avoid working at the base of a bank or under overhanging structures. Overhanging ground and structures could collapse. Extreme caution should be used when working in such areas. Stay away from overhanging banks and structures.



Consider filled or unstable ground. Be certain the condition of the work site is stable and capable of supporting the machine during operation. Do not operate the machine close to an unstable drop off. Operation of the machine on shoulders, drop off's, or filled areas could cause the machine to become unstable, presenting a work hazard.



When driving the machine on a slope, make it straight up and down and neither make turn on the slope nor drive it transversely on the slope to prevent tipping. The distance between bucket and ground should be 200-300mm (7-12in).

If the engine stops accidentally when operating the machine across the slope, depress the service brake pedal immediately and lower the bucket to the ground, then pull up the parking brake button (or parking brake handle) to stop the machine from moving.

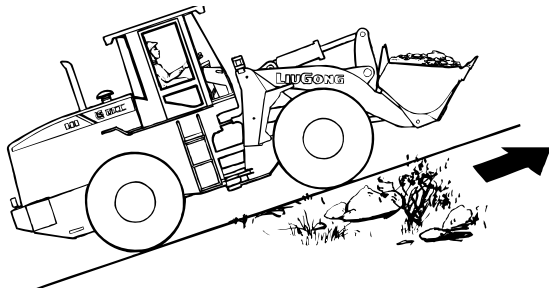
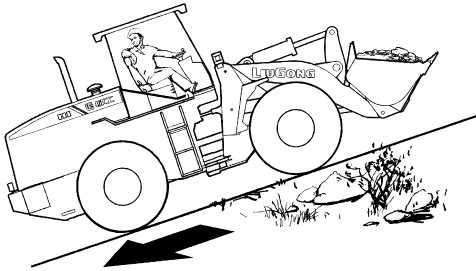
If the machine begins to sideslip on a slope, immediately remove the load and turn the machine downhill.

When going down a slope, use the brake power of the engine and drive in low speed. At the same time, use the service brake to control the travel speed if necessary. Do not shut down the engine or push the lever to NEUTRAL position when machine goes down the slope, so as to prevent serious accident or personal injury.

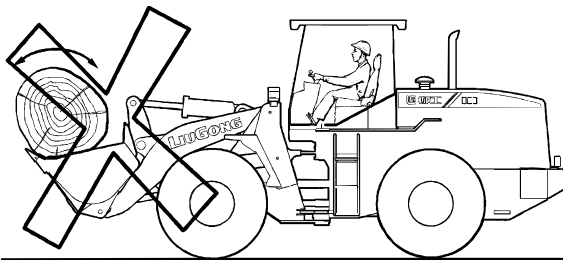
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Cautions about Machine Operations

Avoid operating the machine across the slope. If possible, drive the machine in reverse when going down the slope with a load, and drive forward when going up the slope. The machine may turn over if do not drive the machine in reverse when going down the slope with a load.



To prevent the machine from tipping over or damaging the attachment due to overloading, never exceed the machines rated capacity.



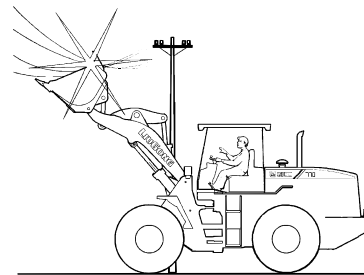
Do not use the bucket or boom for lifting. The machine can only be used within its capability. Any operation beyond its capability will bring damage to the machine. Refer to the Applications and Specifications section for the specific capacities.

Never hoist heavy articles by directly hanging slings on the bucket teeth.

Never use the loader to lift people. Do not use the bucket as a work platform for people. Never allow people to ride in the bucket.

Be careful when working beside high voltage wire. If it is possible to contact the electrical wire while working, consult the Electricity Company before working.

The contact with electrical wire may cause accidents, such as injury or death, do not allow any part of the machine to come close to or contact an electrical wire. Check the area above the machine, and learn about the exact distance between electrical wire, machine and ground. If possible, you'd better cut off the power supply. If it is impossible to cut off the power supply, you should ask a signalman to guide you.



If the machine has contacted the high voltage wire:

- Alert all personnel to keep away from the machine.
- If you can, drive the machine away to disconnect the contact point and separate the high voltage wire from the machine and leave.
- If you can not disconnect the contact point, stay inside the cab until the Electricity Company cuts off the power and you are informed to go out.
- If a fire occurs, hold your feet as close as possible and jump off the machine without touching ground with your hands. Try to jump into a safe place.

Transportation

When transporting, make sure that the hooks and the towing devices are adequate. Connect tie down equipment to a drawbar or hook only. Never straddle a wire rope cable or similar device, nor allow others to do so.

Before transporting, ensure that no personnel stays between the machine and tie down equipment. The towing bracket or drawbar pin of the tie down equipment should be centering connected with the drawbar or hook of the machine.

Parking the Machine

When possible choose flat level ground to park the machine, apply the parking brake, always lower any attachment to the ground and ensure the machine will not move, possibly causing damage or injury.

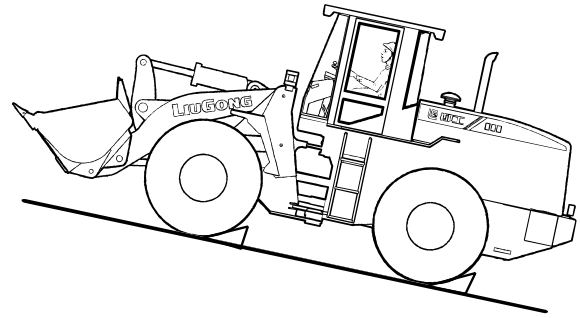
Consider any overhead hazards such as the possibility of falling rocks, any powerlines or any other overhead hazards that may exist.

Consider the ground conditions. Do not park the machine near the edge of a cliff, close to an open excavation or pit.

Consider environmental conditions such as the possibility of flooding, heavy snow fall, electrical storms and exposure to wind and cold. Any of these conditions may cause damage to the machine.

Do not cause an obstruction, consider the site access and other emergency conditions the machine may obstruct.

If it is necessary to park the machine on a slope or incline, lower the implement to the ground, engage the parking brake and shut off the engine. Place chocks under the wheels at the downhill side on both sides to prevent the machine from moving.



Understand and obey all regulations relating to public roads, if the machine is parked on a public road. Additional signal or flasher may be required.

Always lower attachments or other equipment before leaving the machine, apply the parking brake.

If the machine is equipped with a pilot cut-off lever, turn it to OFF position. If the machine is equipped with a hydraulic lock switch, press it to LOCK position. Put the work implement control levers and shift control lever to the NEUTRAL position.

Engage the parking brake.

Keep the engine running at idle speed for five minutes to let the engine cool down gradually.

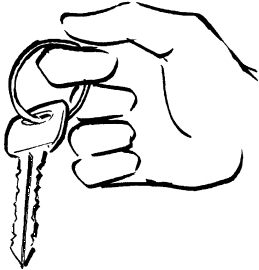
Stop the engine, and take out the key from the switch.

Turn the battery disconnect switch to OFF position to avoid battery discharge.

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Safety Information
Cautions about Machine Maintenance

When leaving the machine lock all equipment covers and doors with the key. Remove the key and keep it with you.



Lowering the Attachment/ Implement with Engine Stopped

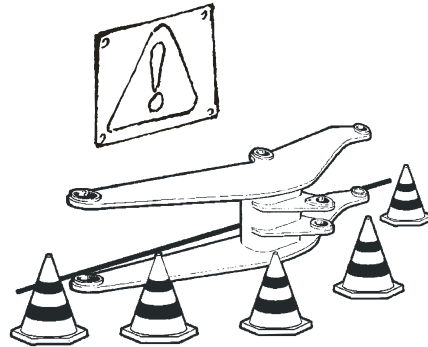
⚠ CAUTION

For a machine controlled by electro-hydraulically control lever, in order to lower the implement, the engine start switch must be on ON position. Turn the engine start switch to OFF position after lowering the implement.

In order to lower the implement to the ground or trailer, move all control levers to DOWN position. When release them, they will return to HOLD position.

Store Accessories Safely

Store accessories and tools safely so as to prevent them from falling and causing serious injury or death. Keep playful children and bystanders away from the storage area or any area accessories are being stored while in use.



Cautions about Machine Maintenance

Prepare the Working Area

Please choose a clean and flat area with adequate space, enough light, and good ventilation to carry out any repair work. Clean the ground surface, wipe up fuel, lubricating oil and water, and spread sand or other absorptive materials on the slippery ground. Keep the work area clean and dry.

Support the Machine Correctly

Lower to the ground or support any attachments with stands or other methods. Ensure that any attachment can not move during maintenance or repair work, use wheel chocks or other devices to prevent machine movement.

Do not work under any part of the machine or attachment that is not adequately supported. Do not rely on hydraulic systems as support. Use stands or other measures that are secure and can support the weight being applied to them.

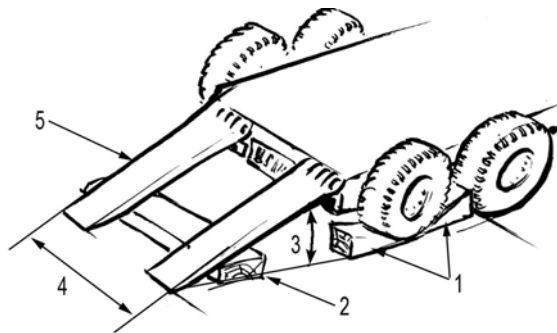
Transportation Information

Obey the appropriate laws that govern the parameters of the load (weight, length, width, and height).

Understand the correct procedures for loading and unloading.

Carry out the loading and unloading operations on flat ground.

Chock the wheel of the trailer to make it unable to move.



1. Wedge
2. Block
3. Angle (Max. angle is 15°)
4. Distance between the ramps
5. Ramp

Use loading ramps appropriate for the machine being moved. Consider: size, strength, departure angle and proper height. Make sure that the loading ramp is anti-slip and free of mud and snow.

Use chains and blocks to secure the machine to the trailer.

Keep the bystanders away.

Place all the working equipment in the transportation position, secure all the equipment and attachments or additional equipment with chains or other secure methods to prevent accidental movement.

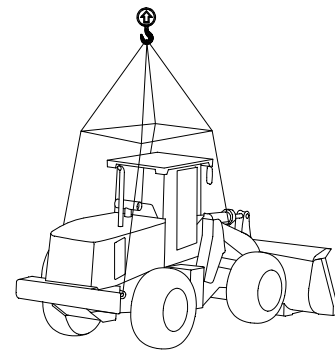
Lifting the Machine

Refer to the machine nameplate for the machine mass.

Before lifting, secure the front and rear frame with the steering frame lock so that the machine can not move.

Use proper rated cables and lifting device, keep levelling in lifting.

Lifting device should be big enough to prevent the machine from being damaged in lifting.



Welding Operation

Any personnel engaging in welding operations must have occupational certificates and carry out the operation at a place with appropriate devices equipped. When carrying out the welding operation, the personnel must follow the instructions below:

Before carrying out the welding operation, turn off the battery isolator switch, disconnect the battery, disconnect the controllers, GPS and other electrical parts.

Remove all paint from the place to be welded, so as to prevent harmful gas from being produced.

Do not inhale smoke produced by burning paint.

Never weld pipes, close to rubber hose and electrical wires.

Always remove residual pressure from the machine. Never weld pipes that are fitted to the machine.

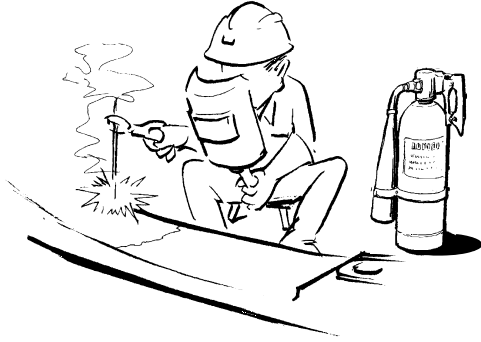
Always wear correct PPE for welding, protect bystanders by using screens and signs advising of the operation being performed.

Ensure good ventilation.

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Sound and Vibration

Remove all the flammable materials, supply the work area with a fire extinguisher.



Clean the Equipment Periodically

To avoid possible injury or damage to the machine, all the oil and scraps accumulated should be removed. The engine, radiator, storage battery, hydraulic hose, fuel tank and cab should be kept clean.

When carrying out the cleaning operation, wear suitable PPE. Consider exposure to: chemicals, slippery surfaces, high pressure water spray and material splash.



Do not spray the water directly onto sensors, connectors or instruments of the electrical system. If water enters the electrical system malfunction may occur.

Sound and Vibration

Sound

The sound performance offered for this machine is the standard in European Union countries and in countries that adopt the EU Directives.

A Weighted emission sound pressure level measured according to work cycle procedures specified in "ISO 6396" is 85dB(A), for the cab offered by LiuGong.

Vibration Level

NOTICE

Whole body vibrations generated by construction machines, are to a high degree, influenced by different factors, e.g. working methods, ground conditions and traveling speed selected by the operator.

This machine is equipped with an operator's seat, which meets the criterion in standard ISO 7096. This seat is tested with the input spectral class EM6 and has a Seat Amplitude Transmissibility factor SEAT=0.95.

The hands and arms are exposed to a weighted root mean square acceleration that is less than 2.5 m/s^2 .

The whole body is exposed to a weighted root mean square acceleration that is less than 0.5 m/s^2 .

Mesurements are obtained on a representative machine using the procedures in the following standards:

"ISO 2631-1"

"ISO 5349-1"

"ISO 5349-2"

Key Spare Parts to be Periodically Changed

No.	Key spare parts to be periodically changed	Q'ty	Changing intervals
1	Hydraulic oil tank filter element	2	Every year or every 2000h(To see which one comes earlier)
2	Fuel hose(fuel tank—Fuel pre-filter)	1	Every 2 years or every 4000h(To see which one comes earlier)
3	Fuel hose(fuel pre-filter—fuel lift pump)	1	
4	Fuel hose(fuel lift pump—fuel filter)	1	
5	Fuel hose(fuel filter—high pressure pump)	1	
6	Fuel hose(fuel return hose)	1	
7	Turbo-charger return oil hose	1	
8	Hose assembly(pump—flow amplifying valve)	1	
9	Hose assembly(flow amplifying valve—steering cylinder)	2	
10	Steering cylinder seals	2	
11	Hose assembly (air compressor—air reservoir)	1	
12	Hose assembly (air reservoir—connector)	1	
13	Hose assembly (connector—service brake valve)	1	
14	Hose assembly (connector—front and rear assistor)	2	
15	Assistor seals	2sets	
16	Hose assembly (assistor—axle)	1	
17	Hose assembly (connector—service brake valve)	2	
18	Hose assembly (service brake valve—parking brake actuator)	1	
19	Air reservoir	1	Every 3 years or every 6000h(To see which one comes earlier)

1. To ensure the safety of the wheel loader during usage, the user must adhere to replace the parts listed in the above table regularly due to the importance of these parts in the security and fire prevention.
2. The materials of these parts will degenerate along with the passage of time, or more easy to wear, corrosion. Moreover, it is very difficult to determine the state of these parts simply according to the regular maintenance. Therefore, no matter what usage state they are, it is necessary to change these parts regularly in order to ensure their performance.
3. If the parts not work properly even less than the time for replacement, they should be repaired or replaced immediately.
4. If the pipe folder of the fixed hose has any damage, such as distortion or cracks, it should be replaced together with the hose.
5. Replace the O-ring, seals and other parts like these at the same time when replace the hose.
6. Contact the designated dealer of LiuGong Machinery Co., Ltd. to replace the safety key parts.

Application and Specification

Applications

This loader is a kind of engineering machinery mainly used for loading & unloading loose materials. It is mainly used for loading, unloading, bulldozing and traction operation etc. at mine areas, ports and docks, capital construction, road repair and steel & iron enterprises etc. It is a kind of multi-purpose and high efficiency engineering machinery.

This loader is a kind of general-purpose engineering machinery and is not suitable for the flammable, explosive, dusty and air poisonous environments.

Requirements of Work Environments

- 1) Altitude: $\leq 3000\text{m}$
- 2) Environmental temperature: $-15^{\circ}\text{C} \sim 40^{\circ}\text{C}$ (The cold starting Aid device is not available)
- 3) Water Depth: $\leq 630\text{mm}$

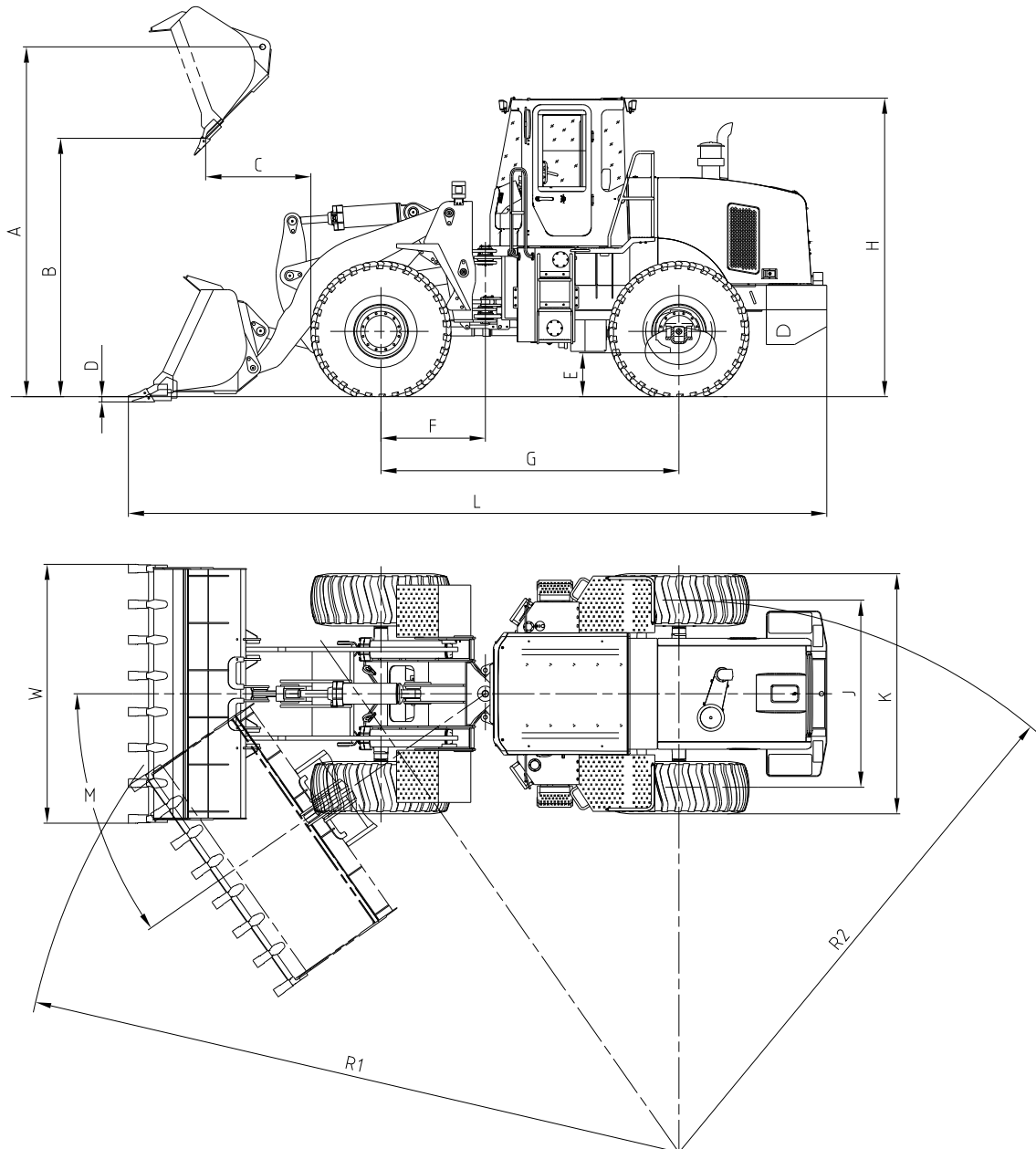
CAUTION

Preventive measures for operation, maintenance and safety rules outlined on this manual are only suitable for the stipulated applications of the machine. Do not use the machine beyond the stipulated application scope, Guangxi LiuGong Machinery Co., Ltd will not bear any safety liability, and these safety liabilities will be born by users. Under any cases, do not use the forbidden operation outlined in this manual.

Main Specifications

All rated lift capacities specification are collected from the machine operation on a hard and flat ground. When the machine is operated in conditions that deviate from the above-mentioned condition (e. g. on soft or uneven ground, on a slope), these conditions shall be taken into account by the operator.

Exterior drawing



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Application and Specification
Main Specifications

Machine specification

Rated Bucket Capacity		m ³	3
Rated Load		kg	5000
Boom Lifting Time (Under Full Load)		s	≤6.5
Total Time		s	≤11.5
Max. Traveling Speeds	Forward 4th Speed	km/h	40
	Forward 3rd Speed	km/h	25
	Forward 2nd Speed	km/h	13
	Forward 1st Speed	km/h	7
	Reverse 1st Speed	km/h	7
	Reverse 2nd Speed	km/h	13
	Reverse 3rd Speed	km/h	25
Max. Traction Force		kN	160±5
Max. Breakout Force (Bucket Tilting)		kN	167±5
Max. Gradeability		°	30
Overall Dimensions	A: Height to hinge pin, fully raised	mm	4020±25
	B: Dumping height	mm	2970±25
	C: Reach, fully raised (Dumping distance)	mm	1200±25
	D: Digging depth	mm	60
	E: Ground clearance	mm	485±20
	F: Distance from swing pivot axis to front wheel center	mm	1200±50
	G: Wheel base	mm	3427±30
	H: Overall height (Top of cab)	mm	3470±50
	J: Thread width	mm	2150±10
	K: Overall width (Outside of wheel)	mm	2750±50
	L: Overall length (with bucket)	mm	8030±50
	M: Max. turning angle	°	35±1
	W: Bucket width	mm	2976±30
	R1: Turning radius with bucket in carrying position	mm	7598±50
	R2: Min. turning radius (tire center)	mm	6347±50
Operating Mass (with cab)		kg	16500 ± 300
Work Implement	Single bucket lever reversal Z-bar Mechanism		
Driver's Seat	Above Steering Articulation Frame		

Appendix 1: Special Specification

Specification		Standard bucket	Optional bucket	Optional bucket	Optional bucket	Optional bucket	Side dump bucket	V-type rock bucket
Rated bucket Capacity	m ³	3.0	3.3	3.6	4.0	4.5	2.5	3
Max. breakout force (Bucket tilting)	KN	167	153	144	138	130	147	150
B: Dumping height	mm	2970±50	2916±50	2850±50	2808±50	2745±50	2863±50 (front dump) 3825±50 (side dump)	2836±50
C: Reach, fully raised (Dumping distance)	mm	1200±50	1254±50	1320±50	1363±50	1425±50	1307±50 (front dump) 95±50 (side dump)	1335±50
L: Overall length (with bucket)	mm	8030±100	8104±100	8204±100	7974±100	8062±100	8185±100	8224±100
R1: Turning radius with bucket in carrying position	mm	7598±50	7811±50	7836±50	7756±50	7800±50	7778±50	7720±50
W: Bucket width	mm	2976±30	3066±30	3066±30	2956±30	3140±30	2950±30	2976±30
Operating Mass	kg	16500±300	16500±300	16500±300	16500±300	16500±300	17750±300	16500±300

Appendix 1: Special Specification (Continuation)

Specification		Special bucket	Special bucket (BOCE)	Long arm (Standard bucket)	Long arm (Optional bucket)	Long arm (Optional bucket)	Long arm (Optional bucket)
Rated Bucket Capacity	m ³	1.8	2.5	3.0	3.3	3.6	4.0
Max. Breakout Force (Bucket Tilting)	KN	195	175	165	150	141	135
B: Dumping height	mm	3085±50	3008±50	3365±50	3310±50	3245±50	3203±50
C: Reach, fully raised (Dumping distance)	mm	1075±50	1160±50	1225±50	1280±50	1345±50	1387±50
L: Overall length(with bucket)	mm	7602±100	7890±100	8387±100	8457±100	8557±100	8327±100
R1: Turning radius with bucket in carrying position	mm	7628±30	7647±30	7890±30	7950±30	7970±30	7865±30
W: Bucket Width	mm	2800±30	2830±30	2976±30	3066±30	3066±30	2956±30
Operating Mass	kg	16500±300	16500±300	17100±300	17100±300	17100±300	17100±300

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Application and Specification
Main Specifications

Main components specification

Power system	Engine	Model		GCIC 6LTAA9.3 engine
		Rated fuel consumption	g/kWh	215
		No. of cylinder and arrangement		Straight-six cylinder
		Cylinder bore X stroke	mm	116.5×114.5
		Total displacement	L	9.3
		Compression ratio		18.2
		Ignition sequence		1-5-3-6-2-4
		Intake type		Turbocharged & air cooled
		Rated power	KW	162
		Rated speed	r/min	2200
		Maximum speed(without load)	r/min	2400
		Minimum speed(without load)	r/min	750
		Maximum torque	N.m	890
		Speed at maximum torque	r/min	1400
		Rated voltage of start motor		24V-7.5 KW
		Rated current of alternator		24V- 70A
Power train system	Torque converter	Model		Single turbine, three members
		Cooling type		Air cooled, forced circulation type
	Transmission	Model		Fixed Shaft type, power shift
		Speed		Four forward speed, three reverse speed
		Shift pump(gear pump) work pressure	MPa	1.6~1.8
	Drive axle	Main drive type		Spiral bevel gear single reduction
		Final decelerate type		Spur gear planetary reduction
		Reduction rate		22.5
	Wheel	Model		Four wheel drive
		Tire		23.5-25PR16

Main components specification

Hydraulic system	Steering hydraulic system	Model		Articulation frame, full hydraulic power flow amplifying valve steering system
		Steering cylinders--bore×stroke	mm	2-φ100×342
		Steering pump displacement	ml/r	63/16
		Rated speed of steering pump	r/min	1680
		System flow	L/min	125
		System work pressure	MPa	12
		Steering angle		35°±1° each
	Work hydraulic system	Model		Tandem pump diverter hydraulic system
		Boom cylinder--bore×stroke	mm	2-φ165×757
		Tilting cylinder--bore×stroke	mm	1-φ200×540
		Control valve		Pilot tandem (three) valve spool
		Work pump displacement	ml/r	160
		Rated speed of work pump	r/min	2200
		System flow	L/min	327
		System work pressure	MPa	17
		Pilot pressure	MPa	3.5
Brake system	Service brake	Model		Single line, air over hydraulic, four-wheel disc type brake
		System air pressure	MPa	0.71~0.784MPa
		System oil pressure	MPa	12.3MPa
	Parking brake	Model		Automatic and manual activated type
Air conditioning system	Air conditioner	Heating capacity	W	5800
		Warm air flow	m ³ /h	490
		Cooling capacity	W	4600
		Cool air flow	m ³ /h	490
		Refrigerant		R134a
		Filling capacity of refrigerant	Kg	1
		Total power	W	250
		Compressor power consumption	KW	3
		voltage	V	24
Electrical system	System voltage		V	24
	Battery		V	24

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Before Operation

Operation Manual

Before Operation

Mounting and Dismounting

Before mounting or dismounting the machine, check the condition of handrails, ladders and steps. Clean them of grease, lubricants and dirt before use. Repair any damaged parts and tighten loose bolts.

Mount and dismount the machine only where there are handrails, steps or ladders.

Face the machine when getting on or off, grab the handrails with both hands and step onto the steps or ladders. Touch three points simultaneously (two feet and one hand or two hands and one foot) to ensure stability of the body.



Never jump off the machine.

Never get on or off a moving machine.

Be careful not to touch any control levers when getting on or off the machine.

Do not try to climb on or off the machine when carrying tools or supplies. Use a rope to pull equipment up onto the platform or have an assistant pass them to you.

Disconnect switch--ON

Turn the battery disconnect switch key clockwise to I position before you start the engine. In this position, the battery disconnect switch key will

Daily Inspection

For a maximum service life of the machine, complete a through walk-around inspection before you mount the machine and before you start the engine.

Inspect the area around the machine and under the machine. Look for loose bolts, trash buildup, hydraulic oil, coolant leakage, broken parts, or worn parts.

Inspect the condition of the implement and the hydraulic components.

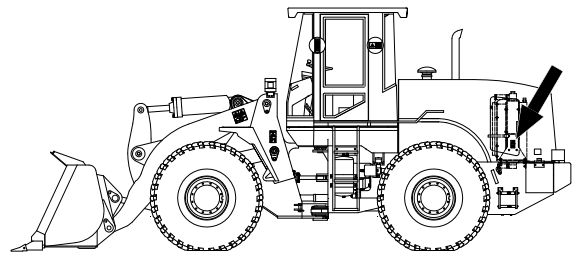
Check all of the oil levels, the coolant level and the fuel level.

For additional information, refer to section "Maintenance Interval Schedule".

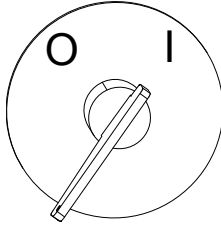
Operator Controls and Instrument Panels

Battery Disconnect Switch

The battery disconnect switch is located on the left rear side of the rear frame, near the left access door of the engine hood.

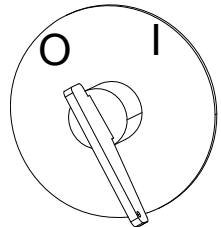


point to the I position.



Disconnect switch--OFF

To shut down the electrical system, turn the battery disconnect switch key counterclockwise to O position. In this position, the battery disconnect switch key will point to the O position.



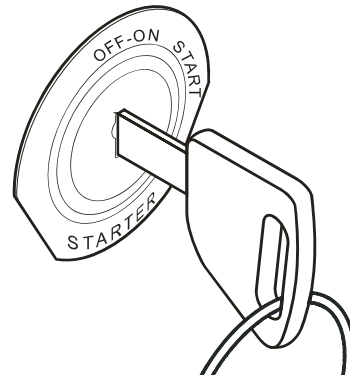
The battery disconnect switch and the engine start switch perform different functions. To disable the entire electrical system, turn the battery disconnect switch to the OFF position. The battery remains connected to the electrical system when you just turn off the engine start switch key.

! WARNING

Do not turn off the battery disconnect switch while the engine is running, otherwise it may damage the electrical system.

Engine Start Switch

The start switch (also called ignition switch) is located inside the cab and it has four positions in clockwise direction.



AUX—The first position when insert the start switch and turn it counterclockwise. The start switch key will reset to OFF position automatically after being released. This position is not available at present.

OFF—The oil passage of the engine is cut off at this position. The power of the machine is turned off. All of the other electrical appliances can not be turned on except the engine hood lift switch (If equipped) and sound system.

! CAUTION

The start switch key can only be inserted or taken out in OFF position.

ON—The first position when insert the start switch key and turn it clockwise. The electrical system of the machine can turn on and work normally.

START—The second position when insert the start switch key and turn it clockwise. The engine will be turned on and work. Release the start switch key after starting the engine. This position can not hold on automatically and the key will reset to the ON position automatically after being released.

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⚠ CAUTION

The battery disconnect switch must be at I position and the shift control lever must be in NEUTRAL before starting the engine.

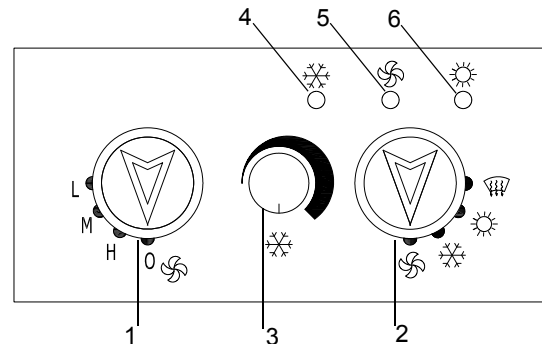
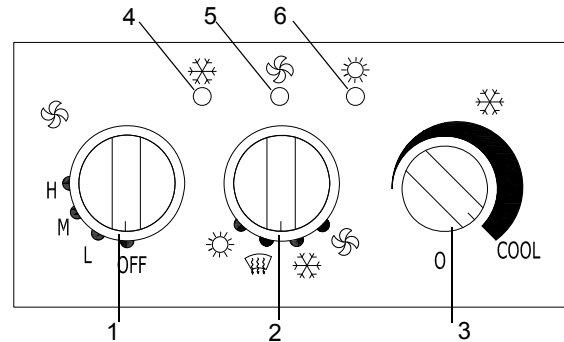
⚠ WARNING

If the engine fails to start, turn the start switch to the OFF position before restart or the start switch could be damaged.

Do not engage the start switch for more than 15 seconds at one time. Wait at least 30 seconds before restarting. Do not exceed three consecutive attempts before allowing the starter motor and choke solenoid to cool down. Failure to comply could result in a reduction of the service life of the battery as well as damage to the starter motor and choke solenoid.

A/C Panel

Two types of A/C panels are available.



1. Fan speed switch
2. Selector switch
3. Temperature control switch
4. Cool air indicator
5. Fan indicator
6. Warm air indicator

Fan speed switch

Three positions are available: high(H), medium(M), low(L). Turning the switch to O or OFF position will turn off the fan.

Fan speed switch is also the power switch of the air conditioner. Turn this switch to either H, M or L with engine starting to turn on the air conditioner.

Turn the fan speed switch to O or OFF position to turn off the air conditioner.

Selector switch

There are four positions available for the selector switch: warm air, defrost, cool air and natural air.



Warm air

Select this position, warm air indicator 6 will turn on. The air conditioning system is heating.



Defrosting

Select this position, cool air indicator 4 and warm air indicator 6 will turn on. The air conditioning system is

defrosting (not available on this machine)



Cool air

Select this position, cool air indicator 4 will turn on. The air conditioning system is cooling.



Fan

Select this position, fan indicator 5 will turn on. Only the fan blower works. Natural air will come out.

Temperature control switch

Turn the temperature control switch clockwise for cool air. Turn it counterclockwise for warm air.

Starting explanation of air conditioner

After the engine is started, turn the fan speed switch to either H, M or L with engine starting to turn on the air conditioner.

Turn the fan speed switch to O or OFF position to turn off the air conditioner.

NOTICE

During winter, turn on the air conditioner for 20 minutes to run the compressor to avoid leakage of coolant. This keeps the compressor in best condition.

Cooling

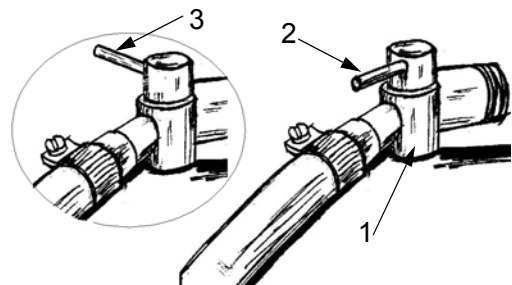
1. After starting the air conditioning, adjust the fan speed switch to the desired position.
2. Turn the selector switch clockwise to cool air position (the cool air indicator is on), the cooling system is starting to work and the cooling air comes out from the air vent.
3. Adjust the temperature control switch to adjust the cool air temperature.

NOTICE

It is recommended not to set temperature control switch to COOL position and fan speed switch to Low position at the same time, otherwise the evaporator will frost and cooling effect could be affected.

Heating

1. Before starting the engine, set the warm water valve at the engine coolant inlet and outlet to ON position (warm water valve direction is the same with the hoses).



1. Warm water valve
 2. Warm water valve ON (OPEN)
 3. Warm water valve OFF (CLOSED)
2. After the engine is started, turn the fan speed switch to the desired position.

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Operator Controls and Instrument Panels

3. Turn the selector switch counterclockwise to warm air position, the warm air indicator will turn on. The air conditioning system starts working, and the warm air comes out from the air vent continuously.

NOTICE

At the beginning when the engine is started, the air temperature is low due to the low coolant temperature, but the air temperature will raise after coolant temperature is getting high.

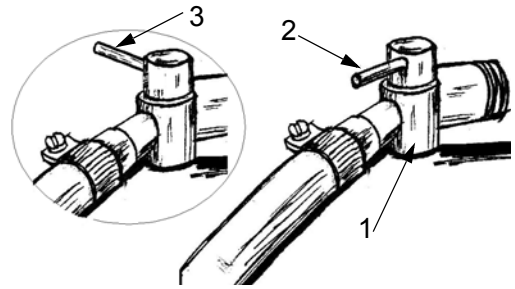
Fan

1. Adjust the fan speed switch to desired position after the engine is started.
2. Turn the selector switch to fan position, then the fan indicator will turn on and natural air will come out.
3. Turn the fan speed switch to adjust the fan speed.

Warm water valve

The heating function of the air conditioning system can be realized by the coolant flows through the evaporator of the air conditioning system to release heat.

A manual warm water valve is provided respectively for the water inlet and water outlet of the engine. (Note: some machine only has one for the water inlet of the engine). A water solenoid is fitted between the water intake and the evaporator and is controlled by the selector switch.



1. Warm water valve
2. Warm water valve ON
3. Warm water valve CLOSE

During heating operation, the manual warm water valve should be at ON position (the warm water valve direction is the same with the hoses).

NOTICE

If it is necessary to repair the air conditioning system due to fault, first close the manual warm water valve (the warm water valve direction is vertical to hoses) to prevent coolant loss.

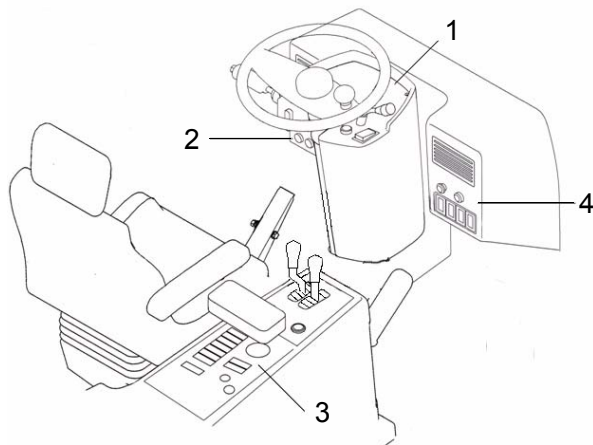
When replacing the engine coolant, open the warm water valve and set the selector switch to warm air position to replace the coolant inside the evaporator together. Make sure the engine coolant level is correct.

⚠ WARNING

The water radiator should be emptied or filled with antifreeze and the selector switch should be set to warm air position when the ambient temperature is below 0°C and the engine stop running, otherwise the radiator lines will be damaged by being frozen.

Instrument Panel

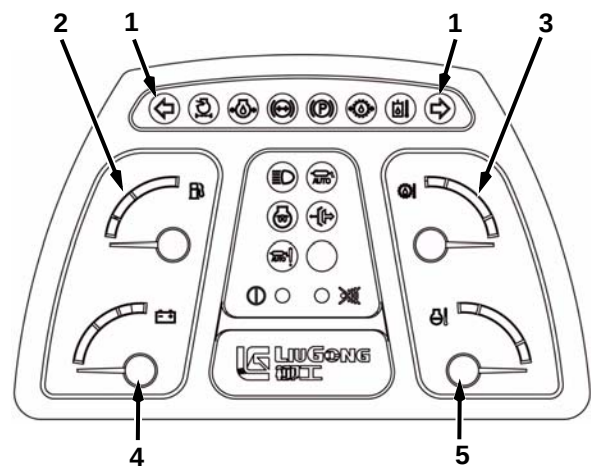
Most of the gauges, alarms and steering indicators are integrated in the instrument panel under the steering wheel. The service hour meter is installed on the right control box cover. Transmission oil temperature, coolant temperature, transmission oil pressure, engine oil pressure, voltage, parking brake low pressure alert, service brake low pressure alert, service hours and left and right turn indicators are displayed on the instrument.



1. Central instrument panel
2. Front left instrument panel
3. Front right instrument panel
4. Right instrument panel

Central Instrument Panel

Central instrument panel consists of four pointer gauges, status indicators and warning indicators, etc.



1. Turn indicators
2. Fuel level gauge
3. Torque converter oil temperature gauge
4. Voltmeter
5. Engine coolant temperature gauge

Turn indicators



The left indicator flashes when the machine turns left, the front & rear left turn signal light will also flash simultaneously.



The right indicator flashes when the machine turns right, the front & rear right turn signal light will also flash simultaneously.



Fuel level gauge

This gauge indicates the fuel level of the machine. "1" indicates the high fuel level. "0" indicates the low fuel level. Add fuel in time when the fuel level is lower than "0.2".

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Torque converter oil temperature gauge

This gauge is used to indicate the oil temperature of the torque converter. The green zone shows normal work temperature; the yellow zone shows low temperature and the red zone shows high temperature.

CAUTION

When the pointer of the torque converter oil temperature gauge points to the red zone, park the machine on a safe and convenient place for repair. Check the transmission and transmission oil level. Never go on working or operate the machine before eliminating the problem.



Voltmeter

This gauge indicates the power voltage of the machine. Appropriate power voltage is about 24V~28V.



Engine coolant temperature gauge

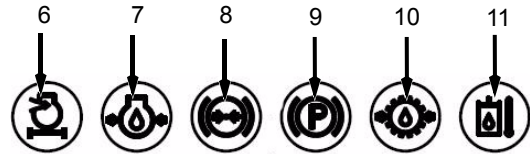
This gauge shows the coolant temperature of the engine. The green zone shows normal work temperature; the yellow zone shows low temperature and the red zone shows high temperature.

CAUTION

Stop the engine and park the machine on a convenient place to check when the gauge points to red zone. Check the engine fan, belts and the radiator coolant level. Never go on working until the trouble is eliminated.

WARNING

When checking the engine fan, belt and water tank level, be extremely careful to avoid injury. Keep away from the moving parts to avoid being injured and keep away from hot parts to avoid being burnt.



6. Engine intake air filter alert indicator
7. Engine oil pressure alert indicator
8. Service brake low pressure alert indicator
9. Parking brake low pressure alert indicator
10. Transmission oil pressure alert indicator
11. Hydraulic oil temperature alert indicator

The instrument monitoring system is divided into two warning categories according to the relative importance of the project:

Warning categories I: the indicator flashes. Including drive axle oil pressure alarm, transmission oil pressure alarm, and hydraulic oil temperature alarm.

Warning categories II: the indicator flashes, and buzzer sounds at the same time. Including engine oil pressure alarm, service brake low pressure alarm and parking brake low pressure alarm.



Engine intake air filter alert indicator

When the air filter is blocked, this indicator will light. Stop the engine and maintain the air filter.



Engine oil pressure alert indicator

Engine oil pressure alert indicator will flash to alert when the engine oil pressure is too low, and the buzzer will sound at the same time (the buzzer alerts only when the engine is running). Stop the engine to check.



Service brake low pressure alert indicator

When the service braking oil pressure is too low, the red indicator turns on. Stop the machine to check unless the fault is eliminated.



Parking brake low pressure alert indicator

The illumination of this red alert indicator indicates the hydraulic oil pressure of the parking brake is too low. Stop the machine to check.



Transmission oil pressure alert indicator

The red indicator will flash when transmission oil pressure is too low. Stop the engine to check.

CAUTION

Park the machine on a safe and convenient place for repair when the transmission oil pressure alert indicator is flashing. Check the transmission and transmission oil level. Never go on working or driving the machine before correcting the fault.



Hydraulic oil temperature alert indicator

The red indicator will light to alert when the hydraulic oil temperature is too high. Stop the engine to check.



Front floodlight high beam indicator

The blue indicator indicates the front floodlight is at high beam.



Centralized lubrication indicator

The green indicator illuminates when the centralized lubrication system is working.



Preheat indicator

This indicator shows that the fuel preheater is working when it turns on.



Clutch cut-off indicator

The machine is at clutch cut-off state when the yellow indicator lights. The machine is out of clutch cut-off state when the indicator goes out.



Centralized lubrication fault indicator

When the red indicator flashes, it indicates fault of the centralized lubrication system.

Power supply indicator

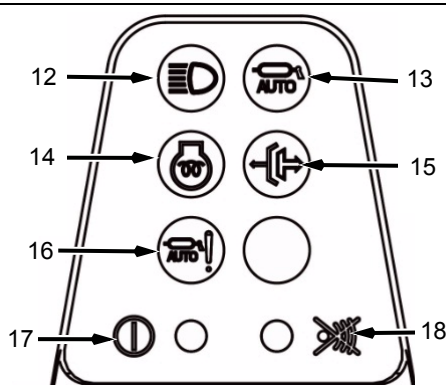
This red indicator will light when the instrument is powered up.



Buzzer alert mute indicator

Press the buzzer alert mute switch, the alert mute indicator lights, which indicates that the machine is at alert mute condition; press the mute switch again, the alert mute indicator goes out, which indicates that the alert mute function has been cancelled.

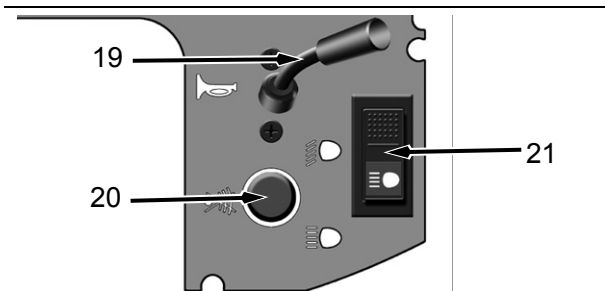
Please keep the buzzer alert mute indicator at close condition when the machine is travelling.



12. Front floodlight high beam indicator
13. Centralized lubrication indicator
14. Start state indicator
15. Clutch cut-off indicator
16. Centralized lubrication fault indicator
17. Power supply indicator
18. Buzzer alert mute indicator

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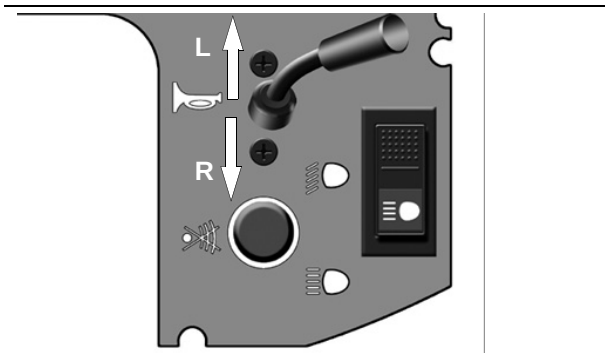
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19. Turn signal light switch
20. Buzzer mute switch
21. Front floodlight switch

Turn signal light switch

When pushing the signal light switch forward, the front & rear left turn signal lights flash, and the left turn indicator on the central instrument panel flashes simultaneously.



L: Left turn
R: Right turn

When pulling the signal light switch backwards, the front & rear right turn signal lights flash, and the right turn indicator on the central instrument panel flashes simultaneously.



Buzzer mute switch

Press the buzzer mute switch, the buzzer stops beeping, and the alert mute indicator lights at the same time; press the buzzer mute switch again, the buzzer beeps and the alert mute indicator goes out.

When any one of the steering system fault indicator, engine oil pressure alert indicator, parking brake low pressure alert indicator or service brake low pressure alert indicator on the central instrument panel turns on, the buzzer will beep to alert. Stop the machine to repair until the fault is eliminated.

⚠ CAUTION

Do not turn on the buzzer mute switch when the machine is working or travelling, otherwise there will be potential safety hazard.



Front floodlight switch

The front floodlight switch controls the on and off of the left and right front floodlights simultaneously. This switch has three positions: high beam, OFF, low beam.

Turn the front floodlight switch to low beam, the front floodlight low beam illuminates; turn the switch to high beam, the front floodlight high beam illuminates.

Front Left Instrument Panel



1. Air vent
2. A/C panel

1. Air vent

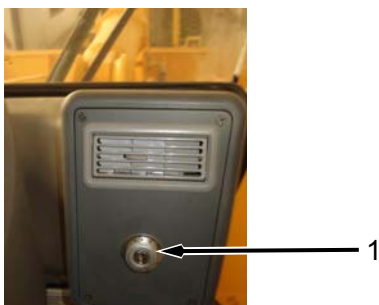
After starting the air conditioning system, cool air, hot air or natural air will come out from the air vent. Adjust the air flow direction as needed.

2. A/C panel

For more information about air conditioner panel, refer to "A/C Panel" on page 43.

Front Right Instrument Panel

Front right instrument panel is located at the right side of the platform.

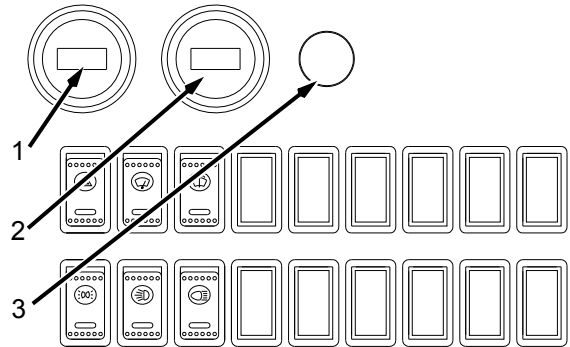


1. Start switch

For more information about start switch, refer to "Engine Start Switch" on page 42.

Right Instrument Panel

Right instrument panel is installed on the right console.



1. Service brake air pressure gauge
2. Service hour meter
3. Lighter



Service brake air pressure gauge

This gauge indicates the pressure value of the compressed air in the brake system. The range of the normal work pressure is 4~8Bar. The service brake low pressure alert indicator on the instrument panel flashes when the air pressure is lower than 4Bar or higher than 8Bar, and the buzzer alerts at the same time.

⚠ CAUTION

The lower or higher brake pressure will cause brake failure, and threaten the operation safety of the operator. Therefore, park the machine on a safe and convenient place for repair when the brake air pressure is lower than 4Bar or higher than 8Bar. Check whether there is leakage or block in the lines of brake system, and the pressure in the air reservoir is normal or not. Never go on working until the trouble is eliminated.

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Service hour meter

Service hour meter indicates the total work hours of the machine, unit in hour. The time range of the hour meter is 0 to 9999.99 hours. When turning on the start switch, the power of the panel is turned on and the service hour meter starts to time. The LCD display shows the accumulated work hours of the machine. The recording value by the service hour meter can be used to determine the machine maintenance intervals.



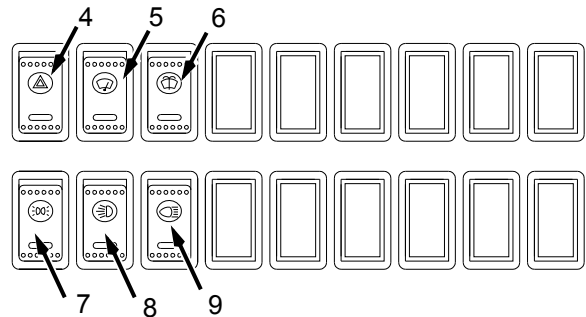
Lighter

Push down the lighter, the lighter will be turned on and begins to heat. The lighter will spring out when it is hot enough. Pull out the lighter for smoking. Return the lighter to socket after use.

CAUTION

The lighter will automatically spring out in 10-18 seconds. If the lighter does not spring out in this time, the lighter will heat continuously and the lighter wiring terminal or jacket may be burnt; Immediately drawout the lighter if it does not automatically spring out exceed 25 seconds.

The socket of the lighter can be used as a power supply interface of 24 volts DC, the maximum power supply current is 10 Amp.



4. Hazard flasher switch
5. Front windshield wiper switch
6. Front washer switch
7. Position light switch
8. Work light switch
9. Rear floodlight switch



Hazard flasher switch

After turning on the hazard flasher switch, all the turn signal lights (four lights) will flash simultaneously. They function as warning lights when the machine stops in case of danger and emergency.

CAUTION

The left and right turn lights switch will not work after turning on the hazard flasher switch. Therefore, turn off the hazard flasher switch before starting the machine.



Front windshield wiper switch

There are three positions of the front windshield wiper: OFF, LOW and HIGH. The wiper can reset automatically at OFF position.



Front washer switch

The washer will work and spray water from the reservoir to the windshield by pressing the switch. The washer will stop spraying when the switch resets automatically after being released.

The washer reservoir is located on the rear right side of the seat.



⚠ WARNING

Frequently check the washer reservoir to find whether the water has been used up, otherwise the normal viewing may be affected.

The washer reservoir should be emptied or filled with antifreeze when the ambient temperature is below 0°C, otherwise the washer will not work or even be damaged by being frozen.

As the washer with additive may be harmful to human body, dispose of it according to the local laws and regulations.



Position light switch

This switch controls the on and off of the position light. The four position lights of the machine will turn on.



Work light switch

The work light switch controls on or off of the work lights on the top of the cab simultaneously.

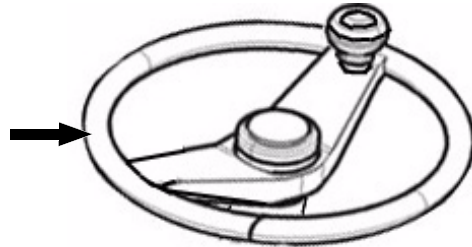


Rear floodlight switch

The rear floodlight switch controls the on and off of the left and right rear floodlight simultaneously.

Control Devices

Steering Wheel



Articulate full-hydraulic power steering is provided on this machine, the steering wheel is in the cab and it is connected to the full-hydraulic metering pump. In normal operation, turn the steering wheel clockwise, the machine will turn right; turn the steering wheel counterclockwise, the machine will turn left.

The characteristics of the full-hydraulic power steering are as follows:

1. The steering angle of the steering wheel is not the same with the turning angle of the machine, turn the steering wheel continuously to increase the turning angle of the machine until the desired position is obtained.
2. The faster the steering wheel turns, the faster the machine turns.
3. The steering wheel can not reset automatically after being released, and the machine steering angle will not change. Therefore, turn the steering wheel counterclockwise to let the machine travel in straight direction after finishing turning.

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Horn Switch

There are two horn switches, one is located in the center of the steering wheel, the other one is located at the end of the combination switch. The functions of these two switches are the same, the horn will sound when pressing any one of the switches. The operators can use the switches according to their operation habits.



Shift Control Lever

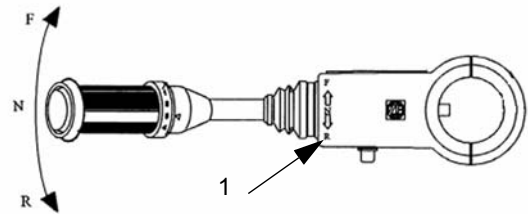
The shift control lever is semi-automatic type. It is located on the left side of the steering column, which is used to choose travel direction and travel speed.



⚠ WARNING

When the shift control system has a fault, never remove the transmission system without authorization. Consult Liugong dealer or Service Company if the fault can not be eliminated.

Direction selection



F: Forward
R: Reverse
N: Neutral

1. Shift control lever

Forward: push the shift control lever to FORWARD position, the machine will move forward.

Neutral: push the shift control lever to NEUTRAL position, the machine should not move. Only when the shift control lever is in NEUTRAL position can the engine start.

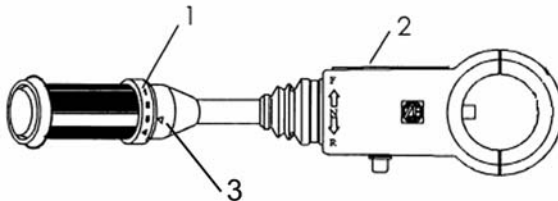
Reverse: push the shift control lever to REVERSE position, the machine will move backward.

Speed selection

Rotate the shift control lever. The number in the arrow direction as illustrated in the picture is the speed position. This machine has four forward speeds and three reverse speeds. When the shift control lever is in the R4, actually it is in R3.



1. "1" for first speed
2. "2" for second speed
3. "3" for third speed
4. "4" for fourth speed

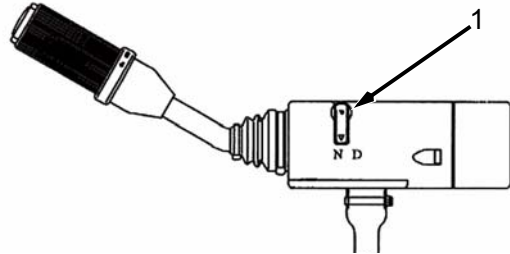


1. Gear
2. Shift control lever
3. Gear indication

Except for the direction and speed change function, the shift control system also has other special functions.

Special functions of the shift control system:

1. Neutral locking protection function



1. Neutral lock switch

Push the shift control lever to NEUTRAL, and push the lock switch (1) to position (N), the shift control lever will be locked at NEUTRAL position.

Push the lock switch (1) to position (D), the shift control lever will be unlocked, and the machine can be operated normally.

Generally, when the machine is in maintenance or in parking condition, in order to prevent the misoperation, push the lock switch (1) to position (N) to lock the shift control lever at NEUTRAL position.

Use this switch to prevent misoperation.

⚠ WARNING

When the shift control lever is locked at NEUTRAL position, it is forbidden to shift forward or reverse without releasing the neutral lock switch, otherwise the shift control lever will be damaged!

2. Neutral/start interlock protection functions

The electrical system of the machine has neutral/start interlock protection function, start the engine only after the shift control lever is at NEUTRAL position so as to prevent unexpected accidents due to sudden actions.

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3. Direct forward/reverse change function

The shift control lever of the machine has no turning interlock function, the driver can directly change directions according to the driving speed:

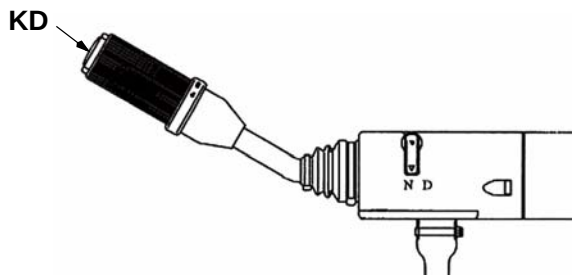
At F1 or F2 gear, directly engage the corresponding reverse (F1 $\Leftrightarrow$ R1 and F2 $\Leftrightarrow$ R2) any time.

At F3 and F4, The driver should operate the shift control lever according to the driving speed as the following rules:

When the machine exceeds the preset speed (normally 2nd gear is set as the maximum driving speed), the system first automatically reduces to 2nd position at the present driving direction and engages the 2nd position after a while, and finally changes speed to the preset position.

4. Forced down shift function (Kick down key)

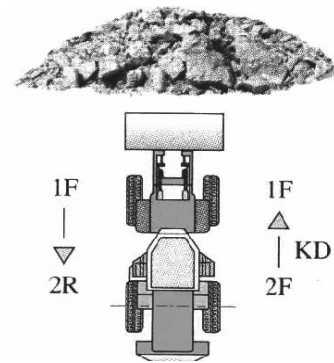
There is a KD key at the end of the shift control lever. It is sliding type.



See above picture shows, the arrow direction is the operation direction of the KD key.

When the F2 or R2 is selected, press KD key on the shift control lever, the transmission can automatically shift to F1 or R1.

The KD key function and the direct forward/reverse change function have supplied a convenience for gear shifting when loading materials. For example, when the machine moves close to the material stack at F2, push down the KD key, the gear can shift into F1 automatically; after loading, press down the key $\downarrow$, the gear will shift to R2 automatically. The machine will leave the material stack at R2 speed, so a high working efficiency can be achieved.



The KD key function will stop automatically when other position is selected, cancel the KD key function through the following ways:

- Pressing KD key again.
- Reversing.
- Operate the shift control lever to change the driving speed.
- The lever is at NEUTRAL position.

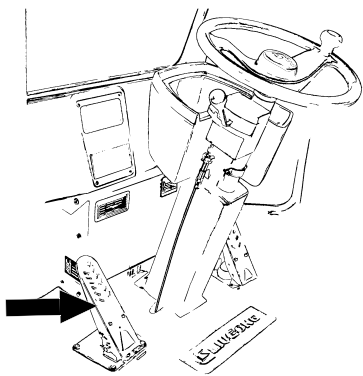
5. Start speed limit function

To ensure the driving safety, the position is limited at F1, F2 or R1, R2 by the electronic control box when the machine starts. Only after the speed exceeds the setting value can F3, F4 be shifted. If the speed doesn't reach this value, the machine only can move in F2 (the road condition determines the running speed) even shift the gear to F3, F4. Therefore, after the machine starts, it can move at high speed only after the driving speed exceeds the setting value.

6. System self-protection function

When abnormal information occurs (such as disconnected wiring, ground short-circuit of the electronic control box and odd signal) or power supply exceeds the specified limit or there is an open circuit, the electronic control box changes to NEUTRAL to lock all output signals so that misoperation can be greatly prevented to ensure the driving safety.

Service Brake Pedal



The service brake pedal is located at the front left side of the driver's seat.

The service brake system has single brake pedal and double circuits. The other circuit will not be affected if one of the circuits has fault so as to let the machine keep enough brake capability to ensure the operation security. Repair the brake system in time if it has fault to ensure the machine has enough brake power.

Depress the service brake pedal, the front and rear axle will brake and the brake light will turn on. Release the brake pedal to disengage the serviced brake.

Accelerator Pedal

The accelerator pedal is located at the front right side of the driver's seat. The engine runs in idle speed when the accelerator pedal is at neutral position. The oil supply and the power output of the diesel engine will increase by depressing the pedal.

Stop the engine through the start switch "OFF" position. When the engine is running, turn the start switch key to "OFF" position, the engine stops.



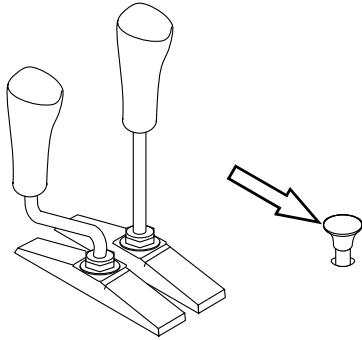
1. Accelerator Pedal

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Parking Brake Button

The parking brake button is near the work implement control lever. Pull it up to engage the parking brake, press it down to disengage the parking brake.



The parking brake is also used as an emergency brake. When the machine works under an emergency condition, pull up the parking brake button to engage the emergency brake.

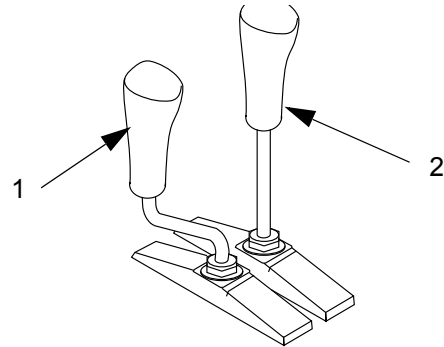
When the service brake system has faults, and the air pressure of the service brake circuit is below 0.28 Mpa, the parking brake system will engage automatically to ensure safety.

⚠ CAUTION

Unless the service brake pedal can not work, do not use this parking brake button while driving. Using the parking brake button as the service brake pedal will damage the brake system seriously.

Work Implement Control Lever

The work implement control levers are installed on the right side of the seat. They are used to control the boom and bucket. The two levers are naturally at the NEUTRAL position when the engine stops.



1. Bucket control lever
2. Boom control lever

Boom control

Lower



Push the boom control lever forward, the boom will lower. The control lever will reset to NEUTRAL position after being released.

Float



Push the boom control lever forward until it reaches the limit position, then the boom is at FLOAT state.

When scraping or loading, push the boom control lever to the FLOAT position, then the bucket will raise or lower along with the ground to avoid damaging the ground.

When lowering the boom, push the boom control lever to FLOAT position, and then the boom will lower slowly due to its weight. The driver can perform other operation with his right hand in order to improve efficiency.

Push the boom control lever to NEUTRAL position to cancel FLOAT state.

⚠ CAUTION

Do not use FLOAT when lowering the bucket with a load. The quick lowering speed of the bucket will damage the machine.



Hold

This is the NEUTRAL position.

Whenever pushing the boom control lever forward or pulling it backward, the boom control lever will return back to the NEUTRAL position by releasing it and the boom will hold at the position that is selected.



Raise

When pulling the boom control lever backward, the boom will raise.

Boom lift kickout: pull the control lever backward till it reaches to the limit position, then the control lever will stay at this position (it will not reset after released); when the boom reaches to its maximum height, the boom lift kickout switch works and the control lever will return to the NEUTRAL position, the boom will not raise any more.

Bucket control



Dump

Push the bucket control lever forward, the bucket will dump forward.



Hold

This is the NEUTRAL position, the bucket will hold at this position after releasing the bucket control lever.



Tilt back

Pull the bucket control lever backward, and then the bucket will tilt back.

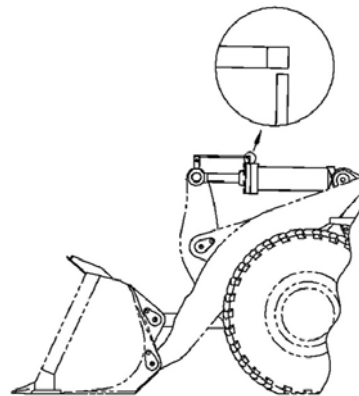
⚠ WARNING

Make sure that the machine is clear of personnel before operating the boom and bucket, otherwise serious damage to the machine or personal injury could result.

Bucket Positioning (indicating rod type)

If the bucket is at DUMP position, turn the control lever backward and check the pointer on the indicating rod at the same time. After the pointer reaches the desired position, turn the control lever to NEUTRAL.

Then lower the boom, after the bucket contacts with the ground, the bucket bottom will align with the ground.

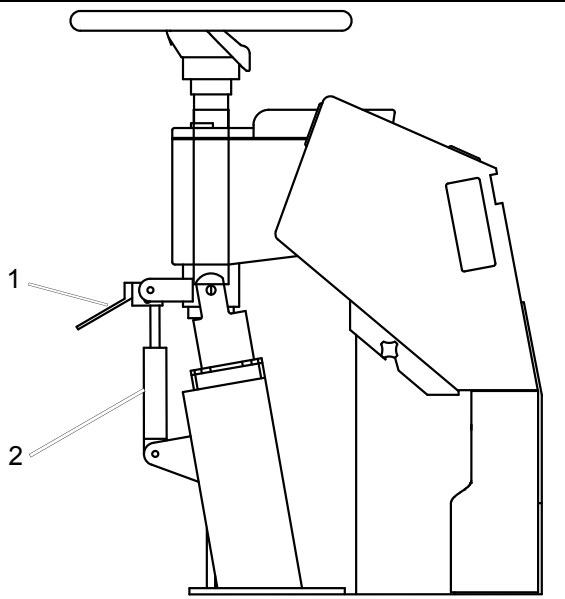


Other Devices

Steering Column

The steering column of the machine can be adjusted up/down/forwards/backward within certain scope to meet different drivers' operation habit.

The adjusting handle is located in the middle of the steering column. It is connected with an air spring.



1. Adjusting handle
2. Air spring

Adjust the steering column as follows:

1. Raise the handle so that the handle ejects the check valve.
2. Hold the handle still, adjust the steering column up and down to proper position.
3. Release the handle, then the check valve will close automatically. The steering column adjustment is finished.

Seat

The seat provided for this machine can be adjusted in the aspects of rigidity, height, fore and aft direction, backrest angle and headrest height to meet the needs of different drivers in various working conditions.

1. Fore-and-aft adjustment

There is a knob on the front lower left side of the driver's seat. Adjust the knob, the seat can be moved forward or backward. Adjust the seat to the proper position then tighten the knob.



2. Height adjustment

There are different locking positions in accordance with the position heights available in the seat.

The operator can adjust it as required. When adjusting, release the knob, both hands held on the base below the cushion, pull it upward smoothly with hands, the seat moves upward and contacts with the locking position, release the hands at this time, then the seat will be locked, finally tighten the knob.



3. Seat rigidity adjustment

The knob for seat rigidity adjustment is located behind the seat, which can be used to adjust the rigidity of the seat in order to meet the different weight of the drivers. As shown below, rotate the knob clockwise or counterclockwise for several turns. The seat rigidity can be adjusted between 50kg~30kg, the preset value is 70 kg before leaving the factory.



Seat Belt (Optional)

A seat belt is equipped according to the customer's requirement.

Fasten the seat belt before operating the machine.

Before using the seat belt, check the seat belt for wear and security, replace if necessary. Contact your Liugong dealer for seat belt replacement.

Adjust length of the seat belt before using in order to ensure safety and comfortability. Length of the seat belt can be adjusted by moving the position of catch on the safety belt.

The buckle of the seat belt is located at the rear right side of the seat. Insert catch of the safety belt into the buckle to latch it.

A red button is provided by side of the buckle. Press the button down, the catch will spring up from the buckle.

Before using the seat belt, check whether the buckle of the seat belt can lock and release normally.

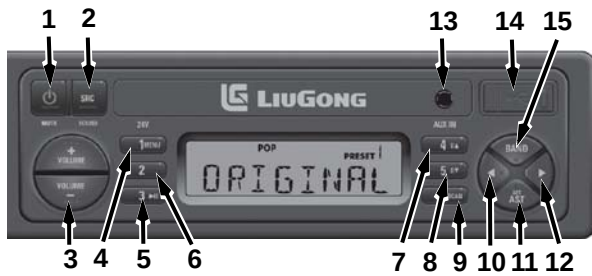


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Sound System

The sound system is located inside the cab and consists of the main unit, loudspeaker and antenna.



1. Source/mute key
2. SRC/SOUND
3. Volume key
4. Menu key
5. Preset key 2
6. Preset key3
7. Preset key4/last menu
8. Preset key 5/next menu
9. SCAN key
10. Search station forward/last song/hour
11. Auto store station/exit
12. Search station backward/next song/minute
13. Audible signal input
14. USB
15. Waveband key

⚠ WARNING

Connect the battery negative terminal only when the sound system has been installed to avoid a short circuit.

Make sure you can still hear traffic (horns, sirens and so on) when adjusting the volume.



Source/mute key

Press to switch on the power. Press this key for more than 2 seconds to switch off the power. Press this key shortly to mute or cancel the mute (silence) .



Time set key

- Press SET key for 2 seconds to enter or escape SETUP menu.
- Press SET key shortly to enter hour or minutes selection of TIME.
- Select ◀ or ▶ to adjust hour or minute and the digital will flash. The new time setting will be memorized.
- Press SET key at least 2 seconds to escape SETUP menu.

Sound adjustment



Volume Key

Press the VOLUME+/- key to adjust the volume up or down.

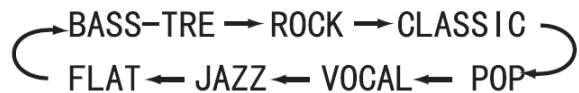


Sound

1. Press SRC/SOUND key for 2 seconds to enter BASS-TRE.



2. Press VOLUME+/- key shortly to select your own sound style.



- BASS-TRE—Your own settings of bass and treble.
- FLAT—Original
- JAZZ—Jazz music
- VOCAL—Speech
- POP—Pop music
- CLASSIC—Classical music

- ROCK-Rock music mode
- The LED display will show the sound type that has been selected.

NOTICE

No sound mode will be shown on the display if no sound mode is selected.

Volume balance adjustment

- Press the SOUND key continuously to select the balance modes:

BASS—TREBLE—BAL—FADER—LOUD

BASS--low volume control, -7, +7.

TREBLE--high volume control, -7, +7

BAL--left and right balance control. -7-- -0- --7

FADER--horn control, -7- -0- 7

LOUD--undertone volume control. Four choices are available: OFF LOW MID HI.

- Press VOLUME+/- shortly to adjust the selection mode.



If no other sound mode is selected, BASS/TREBLE will show on the display.

NOTICE

The sound system will escape from the sound mode and memorize the last setting if no further changes within 5 seconds.

Radio



Waveband

Press BAND to select the desired band.



Automatic search

- Press "◀" to tune to a station of a lower frequency or "▶" to a higher frequency. To search for another station, press the key again.

Manual search

- Press "◀" or "▶" for two seconds to change to manual search.
- Press "◀" to turn to a station of a lower frequency or "▶" to a higher frequency or a desired frequency.
- The radio will search the station automatically when you release "◀" or "▶" for five seconds.



Store stations

Press any keys from 1 to 6 to store desired stations.

- Manual store

Press the desired preset key (1 to 6) for more than 2 seconds to store the current tuned station.

- Automatic store (AUTO STORE)

You can automatically store the 6 strongest FM stations on the FM AST band or 6 strongest MW (AM) stations on the MW(AM) AST band. When you use Auto Store, the new stations replace any stations previously stored in the FM AST band or the MW (AM) AST band.

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Press  "AST" key to activate auto-store.

USB

USB interface is provided on this machine.

Features:

- Support MP3 format only.
- Support 32Mbyte~4G memory disc.
- Support MPEG Audio 1, 2 and 2.5.
- Support Layer 3.
- Support FAT16 and FAT 32 partition memorizing.
- Sampling frequency range: 8k, 16k, 32k, 11.025k, 22.05k, 44.1k, 1k, 12k, 24k and 48kHz.
- Bit rate: 8k ~ 320kbps and VBR(MP3 PRO).

Do as follows:

1. Insert the memory disc, USB PLUG will show on the display.



NOTICE

Initialization is needed when inserting the memory disc. It will last for a few seconds by different memories. Do not take out the memory disc within the initialization process.

2. Press SRC key shortly under radio state to change to USB mode, then the following interface will be shown:



3. The display will show the album number before playing the songs.
4. When playing, the display will show the song's name and playing time. After finishing, it will continue to play the next one.
5. Press ◀ or ▶ to select the last song or the next song to play.
6. Press SCAN key during playing, each song in the same album will play for 10 seconds in sequence, press SCAN key again to make it return to normal playing state.
7. During playing, press MENU key to show the the song sequence in the album, after 2 seconds, it will return to normal playing state.
8. In playing state, press 3 ▶ ||, playing will pause, press this key again to continue playing.

⚠ CAUTION

Do not take out the memory disc when playing, otherwise the file could be damaged. It is better to take out the memory disc after turning off the sound system.

NOTICE

It is recommended not to extend the USB cable because USB connection has a high requirement on the length, resistance and signal delaying of the cable, other cables may not meet the requirement, which could result in a reading failure of the memory disc.



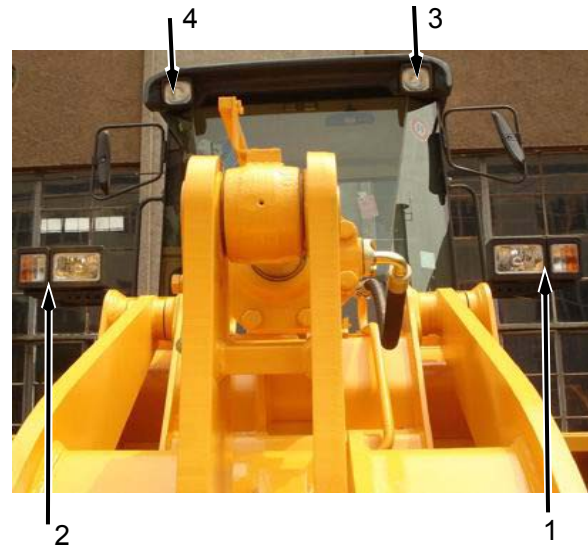
Audible signal input

A 3.5 mm audible signal input interface is provided on the sound system, which can be used to connect other music players. Press SRC key and select AUX IN mode. The volume can be adjusted under AUX IN mode.



Lights

Lights of the machine consist of the front combination lights (left & right each), rear combination lights (left & right each), dome light, work light (left & right each) and rear floodlight (left & right each).



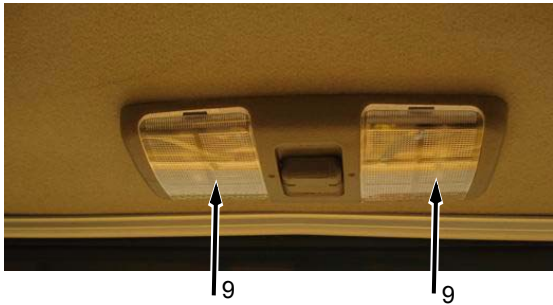
1. Front left combination light
2. Front right combination light
3. Left work light
4. Right work light



5. Left rear floodlight
6. Right rear floodlight
7. Rear left combination light
8. Rear right combination light

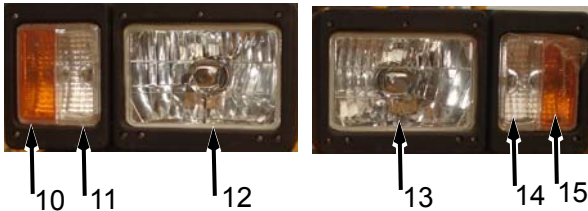
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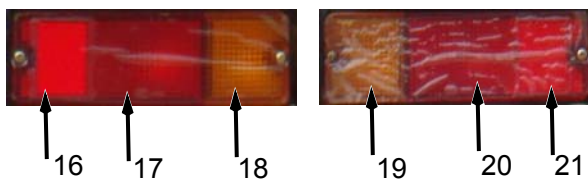
9. Dome light

The front combination lights consist of front floodlight; front position light, front turn signal light.



- 10. Front right turn signal light
- 11. Front right position light
- 12. Front right floodlight
- 13. Front left floodlight
- 14. Front left position light
- 15. Front left turn signal light

The rear combination lights consist of the rear position light, rear turn signal light, and brake light.



- 16. Rear left turn signal light
- 17. Rear left position light / brake light
- 18. Rear left reflector
- 19. Rear right reflector
- 20. Rear right position light /brake light
- 21. Rear right turn signal light

Door Lock

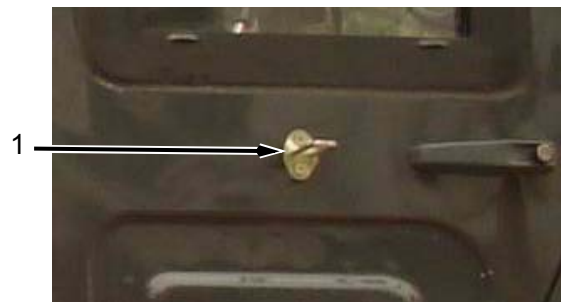
The key for the right and left door of the cab is the same. Insert the key and rotate it clockwise for 180 degrees then take it out. Push the lock with your thumb, then open the door by pulling the door out.



Before locking the door, first close it. Insert the key and rotate counterclockwise for 180 degrees, then take it out. After the door is locked, the lock can't be pressed.

Latch

When opening the right and left doors to 180 degrees, the latch on the door is locked by the buckle behind it. Then the door is locked in this position.



1. Buckle

The latch handle is located in the middle of door frame. Pull the handle to unlock the latch to close the door.



⚠ WARNING

Before operating the machine, always close the doors first to ensure safety.

Rear View Mirrors

Left and right rear view mirrors are separately located at the top of the machine cab. Before operating the machine, adjust the rear view mirrors and make sure the driver has a good rear view when sitting on the seat.

Adjustment of rearview mirrors

1. Loosen the connection bolts between the rear view mirror brackets and the cab, turn the brackets to adjust the rear view mirrors to the proper position.
2. Loosen the connection bolts between rear view mirrors and the brackets, turn the rear view mirrors to adjust the elevation.

3. After completing the above mentioned adjustment, tighten the bolts.



Engine Hood

The machine is equipped with side open type engine hood. The key for the right and left doors of the engine hood is the same.

When it's necessary to repair the machine with the engine hood open, insert the key to the door of the engine hood and rotate it clockwise for 180 degrees then take it out. Push the lock with your thumb, then open the door by pulling the door out.



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After maintenance, pull the draw ring downwards to close the door of engine hood. Insert the key to the door and rotate it counterclockwise for 180 degrees then take it out. The lock couldn't be pushed down if the door is in locking state.



Steering Frame Lock

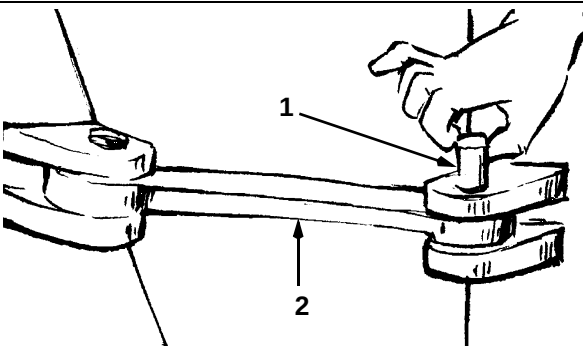
⚠ WARNING

No clearance for person in this area when machine turns. Injury or death from crushing could result.

⚠ CAUTION

To connect the steering frame lock, the machine must be in the straight ahead direction.

The steering frame lock is located at the left or right side of the machine.



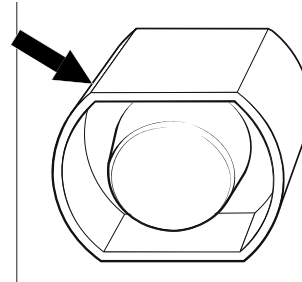
1. Pin
2. Steering frame lock

Connect the steering frame lock when the machine is being lifted and transported. Also connect the steering frame lock if you are performing service work near the articulation joint.

Separate the steering frame lock before operating the machine. Move the steering frame lock to the rear frame and install the pin.

Backup Alarm System (Optional)

The backup alarm is located at the back of the machine. When the machine is reversing with shift control lever turned to REVERSE position, the backup alarm will sound automatically.



Engine Starting

Check Before Starting the Engine

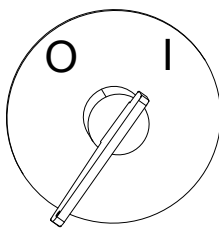
- Check the engine coolant level.
- Check the engine oil level.
- Check the hydraulic oil level.
- Check each oil pipe, water pipe and fuel pipe for airtight condition.
- Make sure air pressure of the tires is normal.
- Check batteries for damaged wiring and/or loose connectors.

⚠CAUTION

Before starting the engine, clear personnel from around the machine. Clear away any obstacles. Make sure the machine is under control of the operator.

Engine Starting Operation

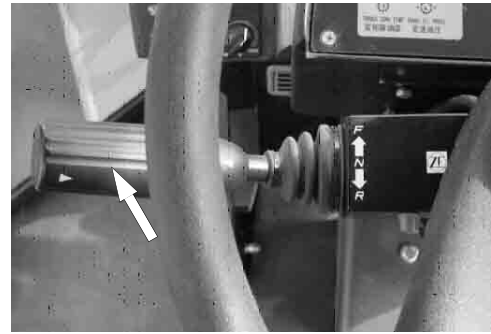
1. Turn on the battery disconnect switch. After the battery disconnect switch is turned on, the key will point to "I" position.



2. Mount and dismount the machine according to the safety regulations.



3. Close the door of the cab. Check the seat belt for normal condition and fasten it.
4. Make sure the pilot control lever and the shift control lever are at NEUTRAL position, if not, push them to NEUTRAL position.



⚠CAUTION

The engine can start only when the shift control lever is at NEUTRAL position. This can avoid the accident that is produced when the machine is started suddenly.

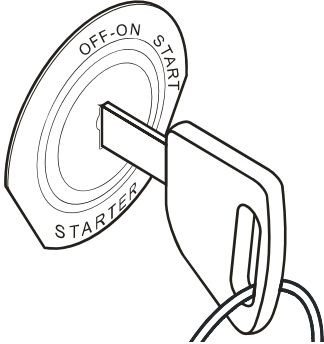
5. Make sure the fan speed switch of the air conditioning system is at OFF position and the selector switch is at NATURAL AIR position, if not, turn them to the corresponding positions.



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6. Insert the start switch key and turn clockwise to ON position to turn on the power. Sound the horn to warn that the machine is going to run.



7. Slightly depress the accelerator pedal, turn the key clockwise to START position to start the machine. In normal cases, the engine will start within 10 seconds. Release the start switch at once to let it reset.

⚠ CAUTION

Start motor operation should not exceed 15 seconds. If the engine doesn't start after 15 seconds, release the start switch at once. Wait 30 seconds before trying to start again. If the engine can not be started after three times, wait for at least three minutes before trying again to prevent damage to the start motor.

8. Warm up the engine at an idle speed of 650~750 r/min after the engine is started. Check the coolant temperature gauge. Run the engine with full speed only after the coolant temperature of the engine reaches the green zone.
9. Check the readings of all the gauges to make sure they are in the normal range. Check that all the lights, indicators, horn, windshield wiper and brake lights work normally.

10. During severely cold weather, preheat the hydraulic oil. Pull the bucket control lever backward and hold for about 4-5 minutes, depress the accelerator pedal and let the bucket positioner stop on the boom to make the hydraulic oil flow out, which can increase the hydraulic oil temperature rapidly.
11. Check the service brake, parking brake system for normal conditions.
12. If there are no obstacles around the machine, slowly turn the steering wheel and observe for left and right turning.

Operation Techniques

Operation Information

Follow these basic instructions when you are operating the machine.

1. To prevent injury, make sure that no one works on the machine or near the machine. Always keep control of the machine.
2. Raise the bucket or the implement high enough to go over any obstacle.
3. Before disengaging the parking brake, depress the service brake pedal in order to prevent the machine from moving.
4. Drive the machine forward for best visibility and the best stability.
5. Reduce the engine speed when turning and go over a hill.

⚠ WARNING

Personal injury or death can result from falling material. Remove any suspensions and watch out sliding material.

⚠ CAUTION

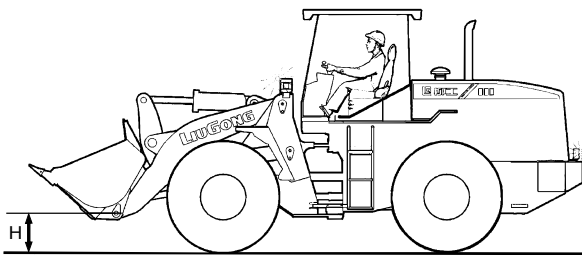
Never allow the bucket in the float position to avoid bucket damage.

Travelling Operation of the Machine

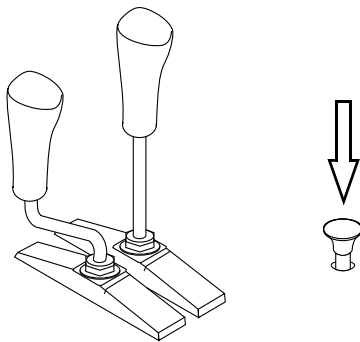
⚠CAUTION

Before driving the machine on roads, check whether the machine meets the requirements of the local laws and regulations for road driving and make sure that you get driving permission from the relevant administration offices. Observe the local traffic regulations when driving the machine on roads.

1. Operate the work implement control lever, tilt the bucket backward to limit position. Raise the boom to the transportation position. Keep a clearance of approximately 500~600mm between the lower articulation point of the boom and the ground.



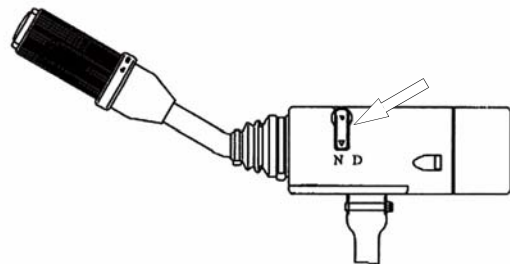
2. Depress the service brake pedal and press down the parking brake button to disengage the parking brake. Slowly release the service brake pedal and observe the machine for movement.



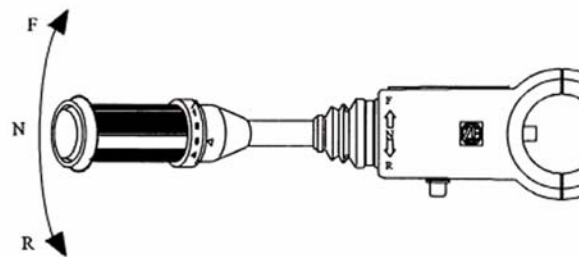
⚠WARNING

If the machine moves, depress the service brake pedal immediately, and pull up the parking brake button to engage the parking brake. Then check whether the shift control system of the machine has fault. If the machine is on a slope, chock the wheel with a wedge first to prevent the movement of the machine, and then check the machine.

3. Check the neutral lock switch of shift control lever is at "D" position or not, if not, push it to "D" position.



4. Push the shift control lever to get the 1st forward or reverse gear, and depress the accelerator pedal properly at the same time, the machine can run forward or backward.



- F. Forward
- N. Neutral
- R. Reverse

⚠CAUTION

The machine can start only when the F1, F2 or R1, R2 is selected.

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5. Drive the machine to open and flat ground; turn the steering wheel to check whether the machine has spot right and left turn ability.
6. Check the brake performance of the machine. The machine drives at 1st or 2nd forward, release the accelerator pedal, smoothly depress the service brake pedal, the machine should obviously reduce speed and stop.

⚠CAUTION

After depressing the service brake pedal, if you can not feel the machine obviously reduce speed, to ensure safety, turn on the parking brake button at once to engage emergency brake to force the machine to stop.

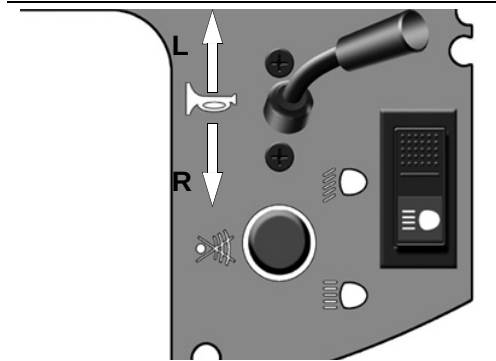
7. Check engagement of all the gears.

⚠CAUTION

Before shifting the gear, to protect the clutch, first release the accelerator pedal, then operate the shift control lever to protect the clutch.

Steering Operation

1. Release the accelerator pedal to slow down the engine running speed.
2. Depress the service brake pedal to slow down the driving speed.
3. Push the combination switch forward when turning left; Pull the combination switch backward when turning right. (see the following picture) The front and rear turn signal lights of the machine and the turn indicators on the instrument panel will light to warn the neighboring vehicles and passerby that the machine is going to turn.



4. Turn the steering wheel for turning. Turn the steering wheel oppositely for straight driving after the turning operation is finished.
5. After the turning is finished, turn the combination switch to NEUTRAL position. The turn signal lights and the indicators will go out.
6. Depress the accelerator pedal to get a desired running speed of the engine.

⚠WARNING

Never turn the machine on a slope. Park the machine on flat ground then turn it.

Shift Operation

It is no need to stop the machine or depress the service brake pedal when you shift the travel speed from F1 to F2 during driving. When shifting from low speed to high speed, decrease the accelerator and operate the shift control lever at the same time, then increase the accelerator. When shifting from high speed to low speed, increase the accelerator before slowing down to make the rotating speed of the transmission output shaft the same with the drive shaft.

Stop the machine before changing the driving direction.

Brake Operation

When braking, first release the accelerator pedal, then smoothly depress the brake pedal to perform service brake operation.

The machine will cut off the oil circuit of the shift control valve automatically at the same time when using the service brake, therefore, it is unnecessary to turn the shift control lever to NEUTRAL position before braking. After releasing the brake, the machine will return to the gear automatically that was used before braking.

WARNING

When the machine drives at high speed, do not rapidly depress the brake pedal unless an emergency occurs so as to avoid accidents and damage to the machine.

Downhill Operation

Select a proper speed before going down a hill. Do not change gears during the downhill process. Most of time, the speed for downhill operation is the same.

Maintain a proper speed that is slow enough for the conditions. Use the service brake to control the travel speed. Using service brake when the machine runs at a high speed may result an overheating of the brakes and driving axle oil. These will bring serious abrasion or damage to the brakes.

Drive the machine reversely when going down a hill with a load. Drive forward when going up the hill.

Operation during Cold Weather

CAUTION

If the ambient temperature is too low, the engine can't be started easily, and the radiator will be frozen.

1. Use fuel, hydraulic oil and lubrication with low viscosity. Refer to section "Oil Specifications" for particular oil brands.
2. Add anti-freeze to coolant.

WARNING

Keep antifreeze away from an open fire. Do not smoke when adding antifreeze.

3. In severe cold areas, use anti-cold batteries. As the ambient temperature drops, the electrolyte may be frozen. In order to prevent battery capacity loss, cover the battery or move it to a warm place and install it the next day, then the engine can be started easily at the next day.

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4. Thoroughly clear sludge, water or frozen snow from the machine to avoid them entering into the seams and damaging sealing performance.
5. Park the machine on dry and hard ground. If impossible, park the machine on wooden boards. The wooden boards can prevent the machine from being frozen.
6. After the weather turns warm, change fuel, hydraulic oil and lubricant with half viscosity. Refer to section "Oil Specifications" for particular oil brands.

Machine Operation

Preparation before Operation

Before operation, first level the work site with this machine. Remove ballooning, fill-in the pits and shovel away the wet and slide ground surface. Clear the area of large, sharp rocks to avoid damaging the machine's tyres or the machine itself.

If this machine is used to load or unload a truck or hopper, adjust the limit height of the boom lift kickout according to the height of the truck or the hopper to allow the bucket to go in and out of the truck or hopper safely.

For information about how to use the work implement control lever, refer to section "Work Implement Control Lever".

Shoveling

1. Common Shoveling

Common shoveling is suitable for loading loose materials.

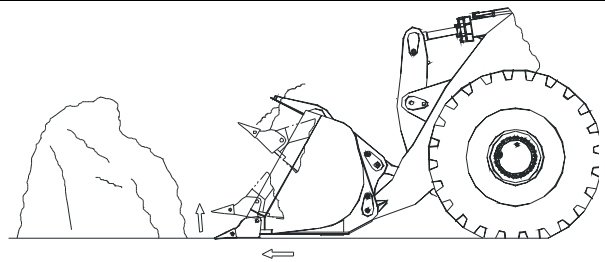
1. Drive the machine at F2 speed to approach materials. Align the bucket middle with the materials, lower the boom to transportation position (about 500mm/1'8" above the ground).

2. At the distance of about 3' (one meter) from the material, lower the boom, let the bucket contact the ground and keep the bucket bottom parallel with the ground. At the same time, press lightly the KD key on the end of shift control lever (or the KD key on the work implement control lever). Operate the machine to change the speed of the machine from F2 speed to F1 speed.

! CAUTION

When the bucket touches the ground, too much pressure to the ground should be avoided, so as to avoid the unnecessary resistance to go forward. Moreover, the front and rear frames of the machine should be aligned, and no included angle between them.

3. Depress the accelerator pedal to force the bucket to cut into the material with full power. When the machine can't advance any more, tilt the bucket backward, then release the work implement control lever back to the NEUTRAL position. The machine will advance and continuously cut in the material. Repeat cut in material and tilting the bucket until the bucket is completely filled.

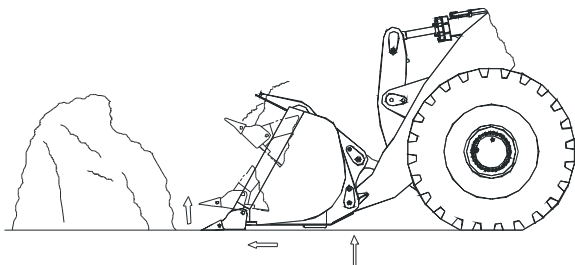


2. Combination Shoveling

Combination shoveling is mainly used for hard and viscous materials.

1. The operation of the cutting in the material pile is the same as the common shoveling.

2. When the bucket can't advance after cutting in the material, tilt the bucket upward, then the bucket cuts in forward for some distances. Then tilt the bucket backward so as the bucket can continue to cut in the material.
3. Repeat cutting in material and tilting the bucket until the bucket is completely filled.



3. Retreating from the material

1. After the bucket is filled fully, tilt the bucket backward until the bucket block contacts the boom.
2. Raise the boom to a certain height to keep the machine away from the material when reversing. Then operate the machine backward.
3. After the machine retreats from the material, lower the boom to the transportation position.

Transportation of Materials

The machine can be used for transporting material under the following conditions:

- When the ground is too soft or the ground is not leveled, a truck can not be used.
- When transporting distance is less than 500 meters, using trucks for transportation is not economical.

When transporting, make sure that the lower articulated joint of the boom is at transporting position (about 500mm/1'8" above the ground). Tilt the bucket back to its limit position (the bucket block contacts the boom) in order to ensure safety and stability when transporting.

⚠ WARNING

Never raise the bucket to a higher position for transporting, otherwise the machine could tip over.

Dumping Operation

1. Dumping materials into a truck or hopper

1. Release the accelerator pedal to let the machine approach the truck or hopper at a low speed when the machine is at a distance of 15 meters(49'3") from the truck or hopper with a full load.
2. Let the boom raise to its limit position, the boom will not raise up any more once it reaches its limitation.
3. When the bucket is on the top of the truck or hopper, depress the brake pedal to stop the machine. Then tilt the bucket forward and dump the materials.
4. If the body length of the truck is over two times than the bucket width, dump the materials from the front part to the rear part.



⚠ CAUTION

When dumping, it is advisable not to bump the bucket block with the boom repeatedly so as to avoid damaging the machine.

⚠ WARNING

Do not lower the boom when the bucket is at high dumping position with full load, otherwise the machine may tip over.

5. After dumping, tilt the bucket backward until it reaches the positioning position.
6. Then push the shift control lever to the REVERSE position so that the machine can leave the truck or hopper reversely.
7. After the machine leaves the truck or hopper, the driver could drive the machine with lowering the boom for next operation.

2. Dumping at low position

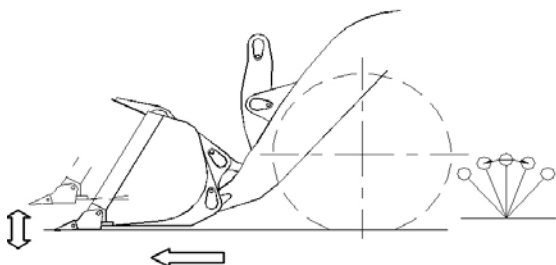
When carrying materials among the work sites, sometimes you may need to dump at a lower position, that is, the machine dumps materials near the ground. After dumping, first tilt the bucket to the level position, then lift the boom.

Shoving Operation

Place the bucket on the ground, push the shift control lever to the F1 or F2 and depress the accelerator pedal to drive the machine forward.

During the shoving operation, slightly lift the boom and continue the shoving operation if the machine meets an obstacle.

To ensure shoving safety, operate the work implement control lever slowly and smoothly when lifting or lowering the boom.

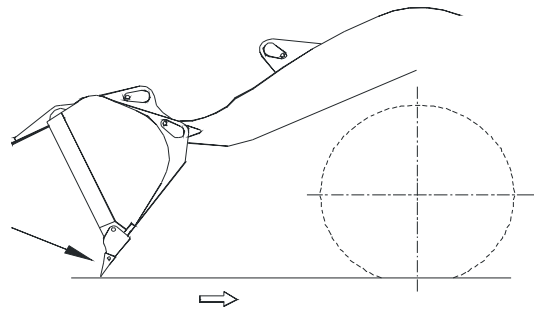


Scraping Operation

Lift the boom, tilt the bucket forward until the blade contacts the ground. The angle between the blade and ground should be kept at about 60°.

The work implement control lever should be set to the float position for hard road surface, and it should be pushed to the NEUTRAL position for soft surfaces.

Pull the shift control lever to REVERSE speed and depress the accelerator pedal to operate the machine backward. Scrape the ground evenly by the bucket blade.



Towing Operation

The machine can be towed by a 20T trailer. Operate as follows:

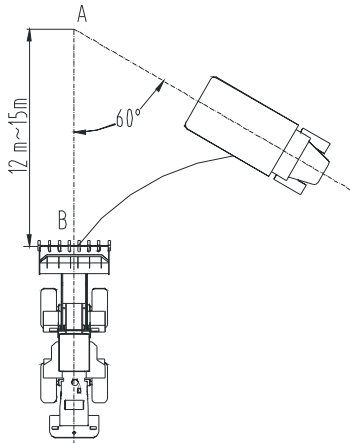
1. Secure the trailer firmly to the traction pin of the towed machine.
2. The trailer should be equipped with a brake system of strong brake ability.
3. Set the bucket to transportation position.
4. Start and stop the towed machine slowly. Engage brake before going down a hill.

NOTICE

When braking, engage the brake of the trailer first, then the towed machine.

Operation Method

1. V Type operation method

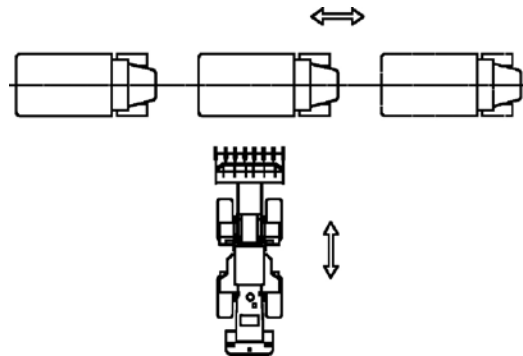


1. As shown in the above figure, maintain 60° angle between the machine and the truck. Stop the machine at 12~15m(39'4"-49'3") away from the truck.
2. After the machine is loaded fully, drive the machine to 12~15m(39'4"-49'3") from the material, then run the machine towards to the truck with bucket lifted while it is turning. After dumping, return the machine to the original position for next loading.

2. Shuttle operation method

The shuttle operation is mainly used for the combination operation of the machine with a truck team.

1. As shown below, after loading, the machine returns to a distance of 2~3 times the truck width. Then the truck runs to the front of the machine from one side and stops. The machine moves forwards and lifts the boom. After dumping, the machine returns to the original position.



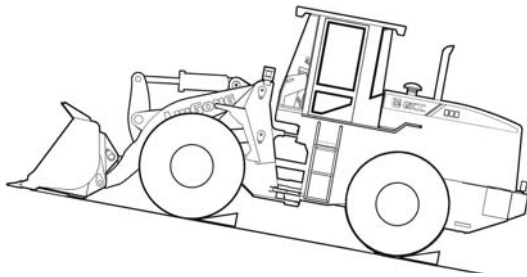
2. If the truck is not completely filled with materials, drive the truck forward for one position. After the machine performs the second loading, it will return to the original position. Then the truck returns to the front of the machine for dumping.
3. Repeat the operation until the truck is filled with material. The machine then goes on loading the next truck.

This operation requires skillful cooperation between the machine and the truck drivers. They communicate with each other by using the horn, lights, or hand signals.

Parking

Stopping the Machine

1. Park the machine on a flat ground. If it needs to park the machine on a slope, place a wedge under the wheels to stop it from moving.



2. Use the service brake to stop the machine.
3. Turn the shift control lever to NEUTRAL position.
4. Pull up the parking brake button.
5. Lowering all the implements to the ground and press the bucket downwards slightly.

Turning off the Engine

⚠CAUTION

Do not turn off the engine when the machine is working with a load. Otherwise, the engine parts will be worn quickly due to the overheating.

1. Let the engine run at idle speed for 5 minutes to let the parts cool down.
2. Turn the start switch of the engine to OFF position and take out the key.
3. Turn the all the switches to NEUTRAL or OFF position.

Lowering the Work Implement with Engine Stopped

Make sure that no personnel are around the machine before lowering the implement.

⚠CAUTION

For a machine controlled by a electro-hydraulic control lever, in order to lower the implement, the engine start switch must be at ON position. Turn the engine start switch to OFF position after lowering the work implement.

Push the work implement control lever to LOWER position to lower the implement. This lever can return to NEUTRAL position automatically after being released.

Leaving the Machine

1. Close the doors of the cab.
2. Use the ladder and the handrail when you get off the machine. Face the machine and use both hands. Make sure that the steps are clear of debris before you dismount.
3. Inspect the engine compartment for debris. Clean out any debris and paper in order to avoid a fire.
4. Remove all flammable debris in order to reduce a fire hazard. Dispose of all debris properly.
5. Turn the battery disconnect switch to OFF position.
6. If the machine is not filled with anti-freeze before leaving the factory, after the machine parks in winter, open all water drain valves of the engine, discharge all coolant in the cooling system and air conditioner system so as to prevent the machine from being cracked by frost. If the machine has been filled with anti-freeze, refer to the instructions of the anti-freeze labels.
7. Install all covers, lock all equipment and remove the key.

Storage

Before Storage

1. Clean and dry every part of the machine and store it in a dry warehouse. If the machine has to be stored in the open air, park the machine on concrete ground and cover with canvas.
2. Before storage, refill the oil tank, lubricate every moving pin & shaft and change hydraulic oil.
3. Paint a thin layer of grease on the exposed parts of the hydraulic oil cylinder piston rod.
4. Remove batteries from the machine and store in a separate place.
5. If the air temperature is below 0°C, add anti-freeze in cooling water of the engine until it reaches the engine body and evaporator of the air conditioner. Drain out water in the cooling system, also drain out water in the evaporator of the air conditioner.

During Storage

1. Start the machine once every month and run every system, and lubricate every parts of the moving pins and shafts. Meanwhile, charge the batteries.
2. Before starting the machine, wipe off grease from the hydraulic oil cylinder piston rod. After operation, paint a layer of grease on it.
3. Paint antirust additive on rusted parts.

⚠ WARNING

To avoid personal injury or death, when working with anti-freeze inside the room, open the windows for ventilation.

Before Reuse

1. Change lubricant of the engine, transmission, axles lubrication and hydraulic oil, brake oil and anti-freeze of the engine.

2. Lubricate all moving pins and shafts.
3. Before starting the machine, wipe off grease from the hydraulic oil cylinder piston rod.

⚠ CAUTION

If the machine is not coated with antirust additive per month during storage, consult your LiuGong dealer.

Transportation Information

Transportation of the Machine

⚠ CAUTION

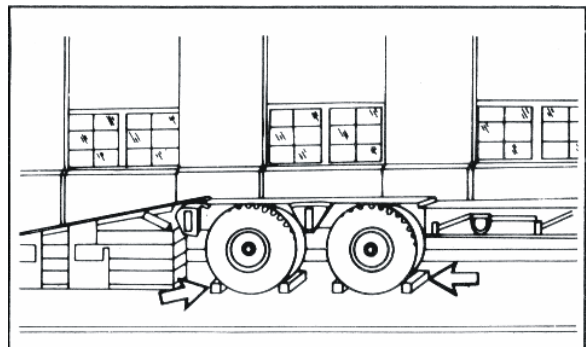
Obey the correlative laws that govern characteristics of the load (weight, width, and length).

Investigate the travel route for overpass clearances, Make sure that there will be adequate clearance for the machine.

Clean ice, snow, or other slippery material from the loading dock and from the truck bed before you load the machine onto the transport machine. This will prevent the machine from slipping in transit.

Perform loading according to the following steps:

1. Chock the trailer wheels or the truck wheels before you load the machine.



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2. When the machine is loading on the trailer or truck, it is forbidden to turn.
3. After the machine is parked, use the steering frame lock to lock the front frame and the rear frame.
4. Lower the bucket to the floor of the trailer. Turn the shift control lever to the NEUTRAL position.
5. Pull up the parking brake solenoid valve switch.
6. Stop the engine, turn every switch to NEUTRAL or OFF position and remove the key.
7. Lock the door and remove the key.
8. Turn the battery disconnect switch to OFF position.
9. Chock the wheels of the machine and fasten it with steel wires to avoid movement during transportation.



10. Cover the exhaust outlet to prevent the turbocharger from rotating during transportation. Damage to the turbocharger can result.

Driving the Machine

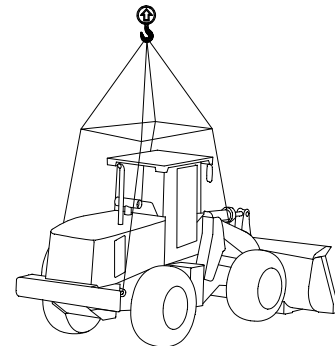
1. Before you run the machine, consult your tire dealer for recommended tire pressure and speed limitations.
2. Stop for 30 minutes after every 40km or after every hour when running the machine for a long distance in order to cool down the tire.
3. Inflate the tire to the correct pressure. Refer to "Tire Inflation Information" on page 91 for more information.
4. Travel at a moderate speed. Observe all speed limitations when you run the machine.

Lifting the Machine

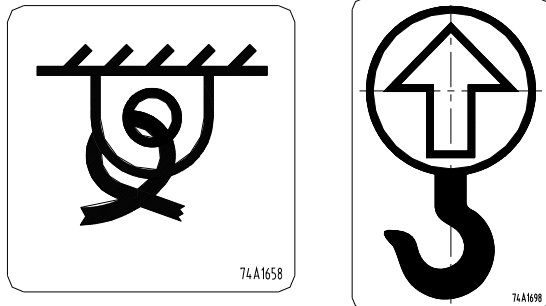
!WARNING

Improper lifting or securing could cause the machine to move and cause injury or damage. Install the steering frame lock before lifting.

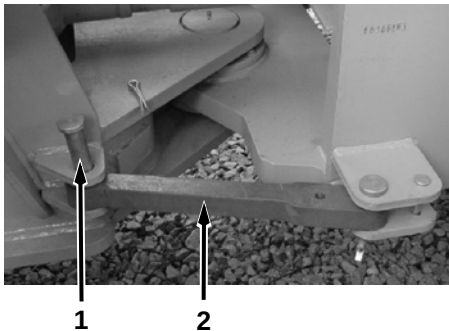
1. Calculate the maximum lift weight of the crane and loading capacity of the lifting device to ensure lift safety.
2. The length of the four ropes on the lifting device must be the same to ensure the four lifting eyes share the same pressure.



3. The lifting decal can be seen on the front and rear frame of the machine.



4. Before lifting, secure the front and rear frame with the steering frame lock so that the machine can not move.



1. Pin
2. Steering frame lock

5. The lifting device should be fixed on the lift eyes with lift decals on the machine.

!WARNING

Improper lifting could cause the machine to move accidentally and cause machine damage, personnel injury or death.

Towing Information

Towing the Machine

!WARNING

Personal injury or death could result when towing a disabled machine incorrectly. Chock the wheels before disengaging the brake to prevent the machine from moving.

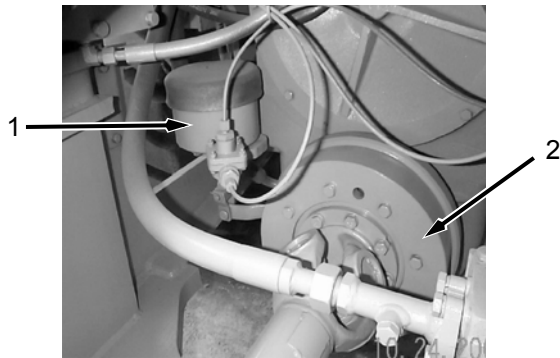
Do not tow the machine unless the machine has a severe trouble. The machine can only be towed for a short distance for repair. Never tow the machine for a long distance. The towing distance should not exceed 10Km and towing speed should not exceed 10km/h; otherwise, the gear box will be damaged due to insufficient lubrication. If the machine needs to be transported for a long distance, a truck and trailer should be used.

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Operation Manual
Transportation Information

Do the following steps:

1. If the machine doesn't move due to machine brakes caused by an engine fault or a brake system fault. Remove the connecting shaft between the parking brake chamber and the parking brake rod to disengage the parking brake by force.



1. Parking brake chamber
2. Parking brake

⚠ CAUTION

Before releasing the parking brake, chock the wheel to prevent movement. Remove the wedge before starting the machine.

2. The towing machine should be equipped with a protective guard to protect the towing operator if the towing ropes or towing bar cracks accidentally.
3. Do not allow riders on the machine that is being towed unless the operator can control the steering wheel or the brake.
4. Before you tow the machine, make sure that the towing ropes or the towing bar are strong enough for towing the machine. The towing ropes or towing bar must have a strength that is 1.5 times of the gross weight of the machine that is being towed.
5. Use a rope cable or steel wire with rings as the towing tools. Order a person as observer in a safe position. Stop towing if the ropes begin to crack or loosen. Stop towing if the towing machine can move but the towed machine can not move.
6. The minimum angle between the towing ropes and straight direction should not exceed 30°.
7. Quick machine movement could cause the towing ropes or a towing bar overload. This could cause the towing ropes or the towing bar to break. A smooth machine movement helps towing operation.
8. Normally, the towing machine should be as large as the disabled machine. The towing machine must have enough brake capacity, enough weight, and enough power for the grade and for the distance that is involved.
9. During towing, all personnel should keep from both sides of the towing ropes so as to avoid injury caused by a break.
10. It may be necessary to connect a large machine or additional machine to the disabled machine in order to provide sufficient control and sufficient brake. This will prevent the disabled machine from rolling away on a downgrade.
11. When towing the disabled machine downhill, to get enough control and brake ability, it is necessary to connect a larger truck or additional machine on the back to avoid a rolling accident.

It is impossible to list all the requirements for all different situations. Refer to your Liugong dealer for more information about towing a disabled machine.

Towing a Machine with Running Engine

If the engine is running, the machine can be towed for a short distance under certain conditions. The power train and the steering system must be operable. Tow the machine for a short distance only. For example, pull the machine out of mud or to the side of the road.

The operator on the towed machine must turn the machine in the direction of the towing ropes.

If service brake system and parking brake system work well, release the parking brake button before towing; if service brake system has fault but parking brake system works well, connect the forcible releasing receptacle of the parking brake to release the parking brake forcibly. If the parking brake system has been damaged, towing after service brake system and parking brake system have been repaired, or towing by using the following method in the next section "Towing a Machine with closed Engine".

Maintenance Manual

⚠ CAUTION

Perform the maintenance procedures at the intervals according to this manual. Proper maintenance will extend the service life of the machine and provide safer operation.

Maintenance Guidance

Correct Maintenance Procedures

Learn how to maintain your machine correctly. Follow the instructions of this manual, if your machine has troubles, you must maintain or contact your dealer before operating.

Daily Checks

1. Check the gauges.
2. Check the coolant, fuel and oil level.
3. Check hoses and tubes for leakage, wear conditions and damage.
4. Perform a walk-around inspection of the machine.
5. Check for loose or missing parts.

Check Service Hour Meter

1. The service hour meter determines when your machine needs to be maintained. The time in the maintenance table is basically given for normal operation. If the machine is operated in severe conditions, you must maintain the machine more frequently.

Maintain Machine on Schedule

Follow the maintenance methods listed in this maintenance manual.

Maintenance Suggestions

1. Use only recommended fuels and lubricants.
2. Don't adjust the engine speed setting and/or the hydraulic safety valve.
3. Protect electronic units from water and vapor.
4. Do not disassemble electronic units such as sensors etc.
5. Use only recommended Liugong parts.

Cleanser of Windshield

Clean the windshield with special windshield cleanser and ensure no foreign matter mixes with cleanser.

Clean Engine Oil

Use clean engine oil and keep the engine oil clean. Ensure no foreign matter mixes with the engine oil.

Check Discharged Oil or Used Filter Element

After replacing the oil or filter element, check the discharged oil or filter element for iron particles and foreign matter. If any iron particles or foreign matter is found, report this immediately and take preventive measures.

Welding Cautions

1. Turn off the engine.
2. Do not keep using voltage above 200V.
3. Keep the welding area and earth cables within 1m(3'3"). If the earth cable is close to gauges or connectors, failure could result.
4. Protect the seals and bearings located between the welding area and earth cables.
5. Never use the surrounding area of the work implement pin or cylinder as an earthing point.

Prevent Dropping Things into Machine Interior

1. When checking through an open window or tank filler, be careful not to drop nuts, bolts or tools into the machine interior. If anything is dropped carelessly, take them out at once.
2. It is suggested not to take unnecessary items with you in your pockets, take necessary tools only.

Dusty Environment

Pay attention to the following instructions when working in dusty environments:

1. Check the air filter indicator regularly to see whether it is blocked. Service the air filter prior to the normal schedule.
2. Wash the radiator core frequently. Clean and replace the fuel filter periodically.
3. Clean the electrical units, especially the starter motor and alternator, to remove accumulated dust.

Avoid Mixing Oil

Do not use oils of different brands. If it is really needed, change the old oil prior to using the new oil of another brand.

Lock the covers

If it is needed to service the machine with the covers opened, lock the covers with the lock lever.

Purge Hydraulic System

Purge the air from the hydraulic lines if the hydraulic lines or components have been repaired, replaced or removed.

Install Hydraulic Hoses

1. If components equipped with O-rings or gaskets need to be removed, clean the mounting surfaces. Do not forget to install new O-rings and gaskets.

2. When installing hoses, do not twist or bend them. This will damage and shorten the service life of the hoses.

Proper Fuel and Lubricant

Use proper fuel and lubricant that adapts to the ambient temperature.

Check Electrical Wiring

⚠ WARNING

If a fuse is burnt out frequently or short-circuited, find out the reason and repair or contact your Liugong dealer for assistance.

Keep the battery surface clean.

1. Check the fuse for damage. Check the circuit for broken or shorted wires. Check the terminals for loose connections and tighten any loose parts.
2. Check the circuits of the battery, starter motor and alternator.
3. Contact your Liugong dealer for more information about the solutions.

Check Air Conditioner

Check the fan speed switch of the air conditioning system to see if it is at NEUTRAL position and the work mode switch is at the OFF position. If not, turn them to the correct position.

Check Gauges

Check the gauges, lighting, indicators, horn and wipers for good condition. Contact your Liugong dealer if any problem is found.

⚠ CAUTION

Before starting the engine, make sure nobody is on or near the machine. Keep the machine controlled by the operator.

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Maintenance Manual
Run-in

Preparation before Maintenance

Park the machine as follows before maintenance:

1. Park the machine on flat ground.
2. Lower the bucket to the ground.
3. Set the engine speed to idling speed and run it for 5 minutes.
4. Turn the start switch to OFF position and take out the key (If the machine needs to be maintained with the engine running, make sure the machine is under control of the operator).
5. Push the pilot control lever to LOCK position.
6. Attach a "DO NOT OPERATE" tag to right hand control lever if the machine is not operated.



Run-in

The run-in of new machine is an important procedure for prolonging the service life of the machine, eliminating fault and avoiding accidents. The user must read these guidelines for run-in of a new machine and how to operate and maintain the machine after purchase.

Run-in-Requirements for a New Machine

1. Run-in of a new machine is 100 hours.
2. Run the engine at idle speed for five minutes after starting the engine. Start the machine at low speed. Slowly increase speed.
3. Run-in should be done averagely in each forward or reverse gear.

4. Start the machine at low speed. Slowly increase speed. Always avoid starting, speeding up, turning and braking suddenly except for emergency cases.
5. It is better to load with loose material during run-in period. Do not operate rushly and exceed its rating load capacity and travel speed by 70%.
6. Check the lubricant periodically. Replace or add lubricant according to the recommended period.
7. Always pay attention to the temperature of the transmission, torque converter, front and rear axles, wheel hub, parking brake, middle shafts, hydraulic oil, engine coolant and engine oil, if there is overheating, find out the reason and eliminate it.
8. Check the tightness of all the bolts and nuts.

The following must be done after the first 8 hours of operation during the run-in period.

1. Check the tightness of all the bolts and nuts especially the bolts of the engine cylinder cover, exhaust pipe, front and rear axles, drive shaft, diesel engine, transmission, front and rear frames joint, and wheel rim nuts etc.
2. Check the tightness of the fan belt, engine belt and air conditioner compressor belt.
3. Check the oil level of the transmission, drive axle and diesel engine.
4. Check the hydraulic system and brake system for oil leakage.
5. Check the connections of all control levers, throttle linkage (if equipped) and flexible shaft.
6. Check temperatures and connections of the electrical system, power supply of the alternator, lights and the turn signal lights.

CAUTION

Check oil level according to the relevant operation regulations.

Work should be done after the finish of run-in

1. Check the tightness of all the bolts and nuts especially the bolts of the cylinder head, exhaust pipe, front and rear axles, drive shaft, diesel engine, transmission, front and rear frames joint, and wheel rim nuts etc..
2. Check the tightness of the fan belt, engine belt and air conditioner compressor belt.
3. Check the hydraulic system and brake system for oil leakage.
4. Replace the transmission oil and axle lubricant.
5. Replace the secondary filter and clean the primary filter of the transmission.
6. Clean the return oil filter element of the hydraulic oil tank.

⚠CAUTION

Replace transmission oil, axle lubricant and secondary filter of the transmission according to operation instructions.

Maintenance Interval Schedule

⚠CAUTION

Read and understand all the safety instructions, warnings and indications before any operations or maintenance.

The maintenance intervals stated in this manual are determined according to the service hour meter or calendar intervals shown (daily, weekly, monthly, etc). LiuGong recommends that maintenance should be performed according to whichever of the above-mentioned intervals occurs first.

Under extremely severe, dusty or wet operating conditions, more frequent lubrication than is specified in the "Maintenance Intervals" chart may be necessary.

Perform service on items at multiples of the original requirement. For example, at every 500 service hours or 3 months, also service those items listed under every 250 service hours or monthly, every 50 service hours or weekly and every 10 service hours or daily.

Every 10 Service Hours or Every Day

1. Check engine oil level.
2. Check coolant level.
3. Check hydraulic oil level.
4. Check fuel level.
5. Drain any water and impurity from the fuel pre-filter and filter of the engine.
6. Daily inspection.
7. Check the engine fan and belt.
8. Check working condition of lights and gauges.
9. Check tire inflation pressure and look for tire damage.
10. Check the working condition of the backup alarm (if equipped).
11. Lubricate every articulation point according to the instructions of the machine lubrication diagram on the machine.
12. Pull the draw ring of the manual water outlet valve at the bottom of the air reservoir outward to drain water of the air reservoir. If there is too much water, which indicates that the desiccant of the air dryer mounted in front of the fuel tank lost efficacy, replace the drying cylinder promptly (suitable for the machine with air dryer).
13. Pull the draw ring of the manual water outlet valve at the bottom of the air reservoir outward to drain water of the air reservoir (suitable for the machine with combination valve).

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Maintenance Manual
Maintenance Interval Schedule

Every 50 Service Hours or Every Week

In addition to all previous service checks:

1. Check the transmission oil level.
2. At the first 50 service hours, check the clearance between the parking brake shoe and brake drum, adjust it if necessary; check the wear condition of the friction disc, replace it if it has been worn away, and exhaust air in the clamp (suitable for the machine with clamp). Check once every 250 service hours later on.
3. For the machine equipped with air conditioner, clean the dust and sundries from the cab recirculating air strainer and fresh air strainer. Wash them if it is necessary. Check the compressor belt for tightness and check the condenser for grease, dirt and sundries.
4. Check the lubrication condition of the lubricating points and lubricate every lubricating point according to lubrication diagram on the machine. If the machine is equipped with central lubrication system, for those manual lubricating points, pump grease by hand according to the lubrication diagram on the machine.
5. Replace the engine oil and engine oil filter at the first 50 service hours. Use higher grade engine oil can prolong the service hour of engine oil, contact LiuGong or engine manufacturer for details.
6. Check the oil level of the booster cup (suitable for the machine with air reservoir).
7. Check nitrogen precharge pressure of the accumulators at the first 50 service hours (suitable for the machine with accumulators).

Every 100 Service Hours or Two Weeks

In addition to all previous service checks:

1. Tighten all connecting bolts on drive shafts at the first 100 service hours, tighten them every 2000 service hours later on.

2. Replace transmission oil, the inner strainer and seal ring of transmission oil filter (replace filter element and seal ring for ZF transmission), and clean the primary filter in the transmission oil sump at the first 100 service hours, and doing once every 1000 service hours later on. If the operating hours are less than 1000 hours a year, replace the transmission oil at least once every year.
3. For the machine with LiuGong wet axle, replace gear oil of the axles after the first 100 service hours, replace once every 1000 service hours later on. If the operating hours are less than 1000 hours a year, replace the gear oil of the axles at least once every year.
4. Clean the engine cylinder head.
5. Clean the radiator groups.
6. Clean the filter strainer of the fuel tank.
7. Check the oil level of the front and rear axles.
8. Check nitrogen precharge pressure of the accumulators at the first 100 service hours (suitable for the machine with accumulators).

Every 250 Service Hours or Every Month

In addition to all previous service checks:

1. Check battery voltage.
2. Check the tightening torque of the rim set bolts.
3. Check the tightening torque of the engine mounting bolts.
4. Check the work implement, and each stress weld and mounting bolt of the front & rear frames for cracks and looseness.
5. Check the engine air intake system, air filter service indicator or air filter alert indicator (if equipped). If the yellow piston of the service indicator rises to red area or the alert indicator blinks, clean or replace the air filter element.
6. Replace the fuel /water separator, and the fuel pre-filter and fuel filter on the engine.

7. Replace the engine oil and engine oil filter every 250 service hours. Use higher grade engine oil can prolong the service hour of engine oil, contact LiuGong or engine manufacturer for details.
8. Replace the coolant filter.
9. Check tension and wear conditions of the engine belt and air conditioner compressor belts.
10. For the machine equipped with air conditioner, check the refrigerant level in the refrigerant receiver.
11. For the machine equipped with air conditioner, clean the recirculating air strainer and fresh air strainer of the cab.
12. Check the service brake ability and parking brake ability.
13. Check the clearance between the parking brake shoe and brake drum, adjust it if necessary; check the wear condition of the friction disc, replace it if it has been worn away, and exhaust air in the clamp (suitable for the machine with clamp).
14. Check nitrogen precharge pressure of the accumulators at the first 250 service hours (suitable for the machine with accumulators).

Every 500 Service Hours or Three Months

In addition to all previous service checks:

1. Check the density of anti-freeze and coolant additives.
2. Tighten connecting bolts of the front & rear axles and front & rear frames.
3. Check bolts on the articulation joint of the frame for loose condition.
4. Check nitrogen precharge pressure of the accumulators at the first 500 service hours (suitable for the machine with accumulators).
5. Replace the return oil filter element of the hydraulic system at the first 500 service hours. Replace the return oil filter element of the hydraulic system once every 1500 service hours later on.

6. Replace the pilot oil filter element of the hydraulic system at the first 500 service hours. Replace the pilot oil filter element of the hydraulic system once every 1500 service hours later on (suitable for the machine with pilot oil filter).
7. Replace the oil suction filter element of the hydraulic system at the first 500 service hours. Replace the oil suction filter element of the hydraulic system once every 1500 service hours later on (suitable for the machine with oil suction filter).
8. For the machine with LiuGong axle or ZF axle, replace gear oil of the axles after the first 500 service hours, replace once every 1000 service hours later on. If the operating hours are less than 1000 hours a year, replace the gear oil of the axles at least once every year.

Every 1000 Service Hours or Six Months

In addition to all previous service checks:

1. Adjust the engine valve lash.
2. Check the engine tensioner bearing and fan shaft housing.
3. Replace transmission oil, the inner strainer and seal ring of transmission oil filter (replace filter element and seal ring for ZF transmission), and clean the primary filter in the transmission oil sump.
4. Change gear oil of the drive axles.
5. Clean the fuel tank.
6. Tighten all mounting bolts of the battery and clean the battery surface.
7. Check nitrogen precharge pressure of the accumulators at the first 1000 service hours (suitable for the machine with accumulators).
8. For the machine equipped with air conditioner, replace the fresh air strainer of the cab.

Every 1500 Service Hours or Nine Months

In addition to all previous service checks:

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Maintenance Interval Schedule

1. Replace the return oil filter element of the hydraulic system.
2. Replace the pilot oil filter element of the hydraulic system (suitable for the machine with pilot oil filter).
3. Replace the oil suction filter element of the hydraulic system (suitable for the machine with oil suction filter).

Every 2000 Service Hours or Every Year

In addition to all previous service checks:

1. Replace coolant, coolant filter and clean the cooling system. If the operating hours are less than specified, replace the coolant at least every two years.
2. Replace hydraulic oil, clean the hydraulic oil tank and check the oil suction hose.
3. Check the service brake system and parking brake system. Remove and check the friction disc for wear condition and replace if necessary.
4. Check airtight condition of the control valve and work cylinder by measuring natural sediment of the cylinder.
5. For the machine equipped with air conditioner, check the refrigerant pipe and water hose of the air conditioner for cracks, wear or foaming by oil. Check the connectors and clamps for loose condition.
6. For the machine equipped with air conditioner, replace the recirculating air strainer of the cab.
7. Check flexibility of the steering system.
8. Tighten all connecting bolts on drive shafts.
9. Check the tightening torque of the transmission mounting bolts.
10. Check nitrogen precharge pressure of the accumulators at the first 2000 service hours, check the pressure every 2000 hours later on (suitable for the machine with accumulators).

General Torque Specifications

Tighten the bolts used in the machine according to the torque requirements shown in the following table unless otherwise specified:

Standard Torque for Metric Threads

Thread Size	Standard Torque lb.ft (N·m)	
	8.8 Grade Strength	10.9 Grade Strength
M6	10.5±1.5	
M8	26±4	
M10	52±7	72±6
M12	90±12	120±10
M14	145±20	195±15
M16	225±35	305±25
M18	310±45	415±35
M20	410±50	600±50
M22	600±80	800±70
M24	760±100	1020±100
M27	1100±150	1500±100
M30	1500±200	1850±150
M33	2050±300	2900±400
M36	2650±350	3100±250

Standard Torque for British System Threads

Thread Size	Standard Torque lb.ft (N·m)
1/4	12±4
5/16	25±7
3/8	45±7
7/16	70±15
1/2	100±15
9/16	150±20
5/8	200±25
3/4	360±50
7/8	570±80
1	875±100

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Maintenance Manual
Tire Inflation Information

Tire Inflation Information

LiuGong recommends the use of dry nitrogen for tire inflation and tire pressure adjustments. It includes all machines with rubber tires. Nitrogen is an inert gas that will not aid combustion inside the tire.

The use of nitrogen for tire inflation can not only reduce the risk of explosion, but also help to prevent oxidation, aging of the rubber, and corrosion of the wheel rim parts.

WARNING

Training for using the equipment is necessary to avoid over inflation. A tire blowout or a rim failure can cause personal injury. Do not set the tire inflation equipment regulator higher than 140 kPa (20 psi) over the recommended tire pressure.

Check and adjust the tire inflation pressure after the tire cools down completely. Ask all other persons to leave the danger area (around the rim).

The inflation pressure for nitrogen and air are the same when charging the tires. Consult your tire dealer for operating pressures.

See the following table for the tire inflation pressure under normal temperatures.

Tire size	Ply rating or strength index	Front wheel inflation pressure MPa	Rear wheel inflation pressure MPa
17.5-25	PR12	0.32-0.35 (46.4-50.75psi)	0.29-0.32 (42.05-46.4psi)
17.5-25	PR16	0.44-0.47 (63.8-68.15psi)	0.41-0.44 (59.45-63.8psi)
17.5R25	★	0.42-0.45 (60.9-65.25psi)	0.39-0.42 (56.55-60.9psi)
20.5-25	PR16	0.32-0.35 (46.4-50.75psi)	0.29-0.32 (42.05-46.4psi)
20.5-25	PR20	0.32-0.35 (46.4-50.75psi)	0.29-0.32 (42.05-46.4psi)
20.5R25	★	0.42-0.45 (56.55-65.25psi)	0.39-0.42 (56.55-60.9psi)
23.5-25	PR16	0.30-0.32 (43.5-46.4psi)	0.28-0.30 (40.6-43.5 psi)

23.5-25	PR20	0.34-0.37 (49.3- 53.65psi)	0.31-0.34 (44.95- 49.3psi)
23.5-25	PR24	0.44-0.47 (59.45-63.8psi)	0.41-0.44 (59.45-63.8psi)
23.5R25	★	0.42-0.45 (56.55-65.25psi)	0.39-0.42 (56.55-60.9psi)
26.5R25	PR26	0.42-0.45 (56.55-65.25psi)	0.39-0.42 (56.55-60.9psi)
26.5R25	★	0.42-0.45 (56.55-65.25psi)	0.39-0.42 (56.55-60.9psi)
29.5R25	PR28	0.42-0.45 (56.55-65.25psi)	0.39-0.42 (56.55-60.9psi)
29.5R25	★ ★	0.42-0.45 (56.55-65.25psi)	0.39-0.42 (56.55-60.9psi)
35/65-33	PR30	0.44-0.47 (63.8-68.15psi)	0.41-0.44 (59.45-63.8psi)

The tire pressure will significantly change when you drive the machine into freezing temperature from a normal environment with a temperature of 18°C to 21°C (65 °F to 70 °F). If you inflate the tire to the correct pressure under normal temperature, the tire will be under inflated in freezing temperature. Low pressure will shorten the service life of the tires. Consult your LiuGong dealer when you are not sure about the tire inflation pressure.

NOTICE

If the machine travels for a long distance at high speed, stop the machine for 30 minutes each time when it has travelled for 45km so as to let the tires cool down.

Lubrication Specifications

Oil Change Interval and Refill Capacities

⚠ CAUTION

Care must be taken in order to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the equipment. Collect the fluid with suitable containers before opening any compartment or disassembling any component. Obey all local regulation for the disposal of liquids.

Item	Approximative quantity (L)
Transmission oil	45
Hydraulic oil	300
Front axle oil	32
Rear axle oil	32
Engine oil	20
Cooling system	50
Brake fluid	3.5×2
Fuel	300

Oil Specifications

For Flatland Area

Type of oil		Name of oil		Position of use
		In Summer	In Winter	
Engine oil		★ SAE 15W/40 CH-4	SAE 5W/40 CH-4	For diesel engine
Engine fuel	South	No.0 light diesel oil	No.0 light diesel oil	For diesel engine
	North	★ No.0 light diesel oil	★ -No. 35 light diesel oil	For diesel engine
Hydraulic oil		★ 46# anti-wear hydraulic oil	46# low temperature anti-wear hydraulic oil	For implement hydraulic system & steering hydraulic system.
Grease		★ 2# MOS ₂ lithium based grease		For roller bearings, bushings, pins, frame pins, swing frame of rear axle, drive shaft spline, universal joint and water pump shaft etc.
Transmission oil		★ SAE 15W-40 Mobil 1300		For torque converter and transmission
Gear oil		★ SAE85W-90 (API GL-5LS) heavy load gear oil		For bevel gear and final drive.
Brake oil		★ Mobil DOT3		For brake system assistor

Note: " ★ " used by the manufacturer after the machine is newly produced.

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Maintenance Manual
Lubrication Specifications

For Plateau Areas

Type of oil	Name of oil		Position of use
	In Summer	In Winter	
Grease	2# MOS ₂ lithium based grease		For roller bearings, bushings, pins, frame pins, swing frame of rear axle, drive shaft spline, universal joint and water pump shaft etc.
Transmission oil	SAE 15W-40 Mobil 1300		For torque converter and transmission
Hydraulic oil	46# low temperature anti-wear hydraulic oil		For implement hydraulic system & steering hydraulic system.
Engine oil	SAE 5W/40 CH-4		For diesel engine
Fuel	-No. 35 diesel oil		For diesel engine
Gear oil	SAE80W-90 (API GL-5/LS) heavy load gear oil		For bevel gear and final drives
Brake oil	Mobil DOT3		For brake system assistor

⚠ CAUTION

Do not mix oils of different brands even if they have the same specifications. Clean the system before refilling with different oil.

If the machine is used at low temperature in severe cold areas for a long time, HV-46 low temperature anti-wear hydraulic oil should be used, and ATF220 or DEXRON-III or Donax TC transmission oil should be used.

Replace the lubricant periodically even though the lubricant is very clean because the lubricant might break down after long use.

Choose the oil according to the lowest air temperature in the local area where the machine is used.

Important Maintenance Procedures

Daily Inspection

⚠ CAUTION

Watch carefully for leakage. If you find leakage, service it. If you suspect leakage or observe leakage, check the fluid level more frequently.

Check the engine compartment and clean the accumulated sundries from it and the radiator.

Check the engine for damaged parts.

Check the axles, differential, wheel rim brakes and transmission for leakage. Repair the leakage point.

NOTICE

It is a normal phenomenon if there is a little oil stain around the breather of the transmission during machine operation.

Check the hydraulic oil tank, all of the tubes and hoses, plugs, seals, connectors and grease fittings for leakage. Repair the leakage and replace the hose if necessary.

Check all of the implements and linkage for cracks and damage.

Ensure that all doors, covers and shields are securely attached. Check them for damage.

Check the ladder, walkway and handrail. Clear away all the trash and repair or replace any damaged part.

Check the air inlet and outlet of the evaporator in the air conditioner. Clear away the cotton, paper, plastic and film that can block the air inlet.

Check the ROPS for visible damage. Consult your Liugong dealer for repair information if there is damage.

Check all the lighting equipment and replace cracked bulbs and glass if necessary.

Check the cab and keep the cab tidy.

Check the instrument panels and indicators for damage. Replace damaged parts if necessary.

Check the seat belt, buckle and tighten the bolts. Replace the worn or damaged parts if necessary.

Adjust the rearview mirrors and check the window to ensure good vision for the driver. Clean the windows if necessary.

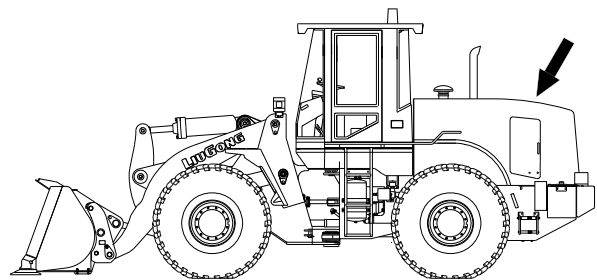
Engine System

Coolant Level--Check

⚠ WARNING

Hot coolant can cause serious burns. To open the cap, stop engine until the radiator cools down. Then loosen cap slowly to release the pressure.

The coolant is in the radiator located at the rear of the machine.

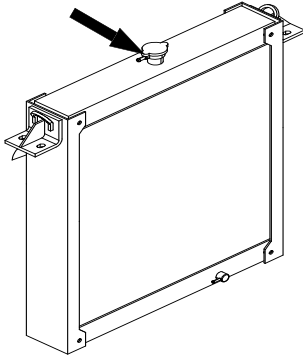


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Maintenance Manual
Important Maintenance Procedures

Checking method for coolant level:

1. After the engine coolant temperature drops down below 50°C, slowly screw out the radiator coolant filler cap to release pressure in order to avoid being scalded by high temperature vapor or splashing coolant.



2. Check if the coolant level is within 1 cm below the water filler, add coolant if necessary.
3. Check the seals of the coolant filler cap, replace if damaged.
4. Screw in the coolant filler cap.

⚠ CAUTION

Check the cooling system of the engine for leakage if it needs to add coolant everyday. If leakage is found, eliminate the leakage and add coolant until it reaches the proper level.

Anti-freeze density and coolant additive density-check

NOTICE

Anti-freeze has been added into the machine before leaving the factory which can resist to - 30°C.

If the temperature is forecasted to drop below 0 °C (32° F), add anti-freeze suited to local climatic conditions into coolant. If only anti-freeze concentrate is available, it is needed to mix it with soft water in a certain proportion. Refer to the proportioning instruction for the mixing proportion of anti-freeze concentrate.

Before adding anti-freeze, use refractometer to measure the freezing point of the well mixed anti-freeze accurately to ensure that the anti-freeze adapt to the local lowest temperature. The mixed anti-freeze by experience is just a general range, the anti-freeze measured by refractometer is accurate, which can effectively avoid frost cracking and damage to the radiator and engine.

When replacing anti-freeze, use high quality anti-freeze and follow the instructions for filling.

⚠ CAUTION

When adding anti-freeze, use the anti-freeze of the same brand.

Coolant must contain additive (SCA) to prevent the engine parts which contact with coolant from rusting, scaling, pitting, and corrosion. Additive (SCA) of low density doesn't have effect, additive (SCA) of high density will have a negative impact on engine, it may result in water pump leakage and corrosion of cooling system solder and aluminum parts.

The density of coolant additive should be maintained at about 3%. Anti-freeze already contains additive, but the additive will be consumed up during running the engine. Therefore, check the coolant density every 500 work hours or six months. Add additive by changing the coolant filter periodically.

Refer to the Operation and Maintenance Manual of Diesel Engine provided with the machine for the additive density inspection method and detailed instructions.

Coolant--Add

⚠ WARNING

Hot coolant can cause serious burn. To open cap, stop engine until radiator cools down. Then loosen cap slowly to release the pressure.

⚠ CAUTION

Anti-freeze is flammable. Never expose anti-freeze to an open fire. Never use water as the coolant otherwise it will cause corrosion damage to the cooling system.

Water used in coolant must be soft water or distilled water, because ordinary fresh water and tap water contains a lot of calcium and magnesium materials, which will cause scaling of the cooling system radiator, engine and piping, while excessive chlorine compounds and sulfate will corrode the cooling system and engine waterways. If there isn't soft water or distilled water, the quality of water used in coolant must meet all of the requirements listed in the following table, and the density level of each element shall not exceed the permitted maximum value in the following table.

Min. water quality requirement

Item	Permitted max. content value
Calcium and magnesium content (hardness)	Max. content in (CaCO ₃ + MgCO ₃) is 170ppm
Chlorine	Max. content in (Cl) is 40ppm
Sulfur	Max. content in (SO ₄) is 100ppm

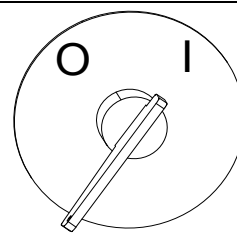
If the temperature is forecasted to drop below 0 °C (32° F), add anti-freeze suited to local climatic conditions into coolant. If only anti-freeze concentrate is available, it is needed to mix it with soft water in a certain proportion. Refer to the proportioning instruction for the mixing proportion of anti-freeze concentrate.

Since the heat absorption capacity of anti-freeze to the engine isn't as good as water, add anti-freeze into the engine before thoroughly mixed with water will cause overheat of the engine.

Before adding anti-freeze, use refractometer to measure the freezing point of the well mixed anti-freeze accurately to ensure that the anti-freeze adapt to the local lowest temperature. The mixed anti-freeze by experience is just a general range, the anti-freeze measured by refractometer is accurate, which can effectively avoid frost cracking and damage to the radiator and engine.

Add coolant as follows:

1. Mix the water and coolant completely according to desired density level of the coolant. As the endothermic performance of the anti-freeze is worse than water, adding antifreeze into the engine before completely mixed with water will cause overheat of the engine.
2. Turn on the battery disconnect switch.

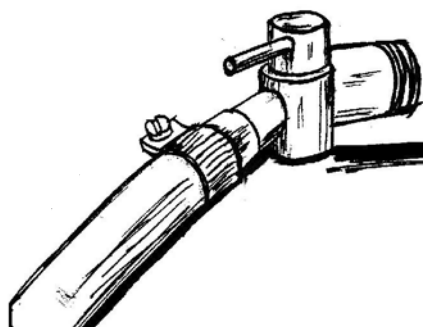


3. Insert the key into the start switch and turn clockwise to the ON position to turn on the power of the machine.
4. Turn the selector switch of the air conditioner to WARM position.

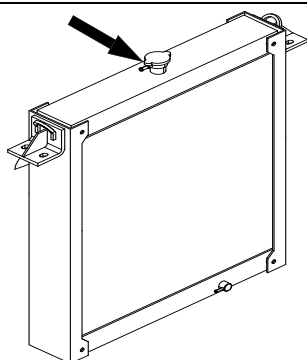
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5. Turn the manual valve on the water inlet hose of the engine to ON position. (The valve is at ON as shown)



6. Open the radiator filler cap, slowly add coolant until the level reaches 1 cm below the water filler of the radiator and keeps stable for 10~15 minutes.



⚠ CAUTION

When adding coolant, exhaust air from the cooling system lines of the engine.

7. Keep the radiator filler cap open, start the engine and run at idle speed for 5~10 minutes, and at high speed for 5~10 minutes.
8. Run the engine at idle speed and check the coolant level again. Add coolant if necessary.

⚠ CAUTION

Close the radiator filler cap before stopping the engine, or coolant will spray out from the filler.

⚠ WARNING

Do not add coolant when the engine temperature is high, otherwise this could cause damage to the engine. Add coolant only after the coolant temperature is below 50°C.

Coolant--Replace**⚠ WARNING**

Hot coolant can cause serious burn. To open cap, stop engine until radiator cools down. Then loosen cap slowly to release the pressure.

Anti-freeze might hurt the skin, when replacing it, wear goggles and protective clothing to avoid personal injury.

⚠ CAUTION

Care must be taken in order to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the equipment. Prepare to collect the fluid with suitable containers before disassembling any hydraulic oil lines. Obey all local regulation for the disposal of liquids.

If the cooling system failed to be cleaned thoroughly, the new coolant may be polluted during adding, and result in the cooling system and engine failure.

Do not mixed use multiple brands of coolant, otherwise the consequent cooling system and engine failures are not covered by warranty.

Completely replace the coolant every 2000 service hours or one year (which ever comes first) and clean the cooling system. Clean the cooling system before that interval if the coolant is polluted, the engine is running excessively hot or bubbles appear in the radiator.

When coolant is polluted, engine overheated or bubbles appeared in radiator, test the freezing point of the additive and anti-freeze in the cooling system to determine whether the coolant must be replaced, replace the coolant if it exceeds any permitted limit value in the coolant replacement limit table.

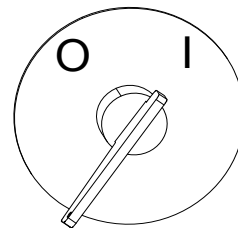
Coolant replacement limit table

Pollutants	Permitted limit value
Sulfate (SO ₄)	Max. 1500ppm
Chloride (Cl) fluoride, bromide	Max. 200ppm
Engine oil or fuel pollution	Coolant shall not contain engine oil or fuel
pH value	Min. 6.5 (see Note ★)
Grease, solder , silicone, corrosion or scaling	Coolant shall not contain these pollutants.

Note ★ : The replacement limit of the min. pH value may change with the product changes. Consult the product manufacturer for the pH value limit. The pH value less than 6.5 is unacceptable generally.

Steps for cleaning the cooling system

1. Turn on the disconnect switch.

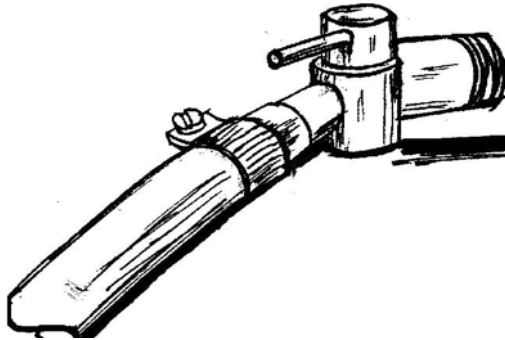


2. Insert the start switch key and turn clockwise to the ON position to turn on the power of the machine.
3. Turn the selector switch of the air conditioner to WARM AIR position.

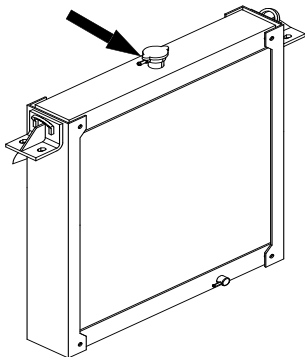
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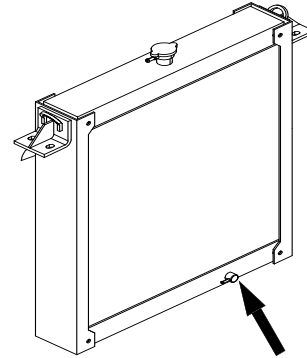
4. Turn the manual valve on the water inlet hose of the engine to ON position. (The valve is at ON as shown).



5. Start and run the engine at idle speed for 5~10 minutes, then stop the engine. Turn the start switch to the first position to turn on power of the machine. Open the water solenoid valve of the air conditioner.
6. Slowly screw out the water radiator filler cap to release pressure after the coolant temperature is below 50°C.



7. Open the water drain plug at the bottom of the radiator, drain out the coolant of the engine and collect with a container.



8. After draining out the coolant, close the water drain plug.
9. Check all water lines and clamps of the cooling system for damage, replace if necessary. Check water radiator for leakage, damage and piled-up trash, clean and repair if necessary.
10. Add cleanser mixed with water and sodium carbonate into the cooling system of the engine, its proportion is 0.5 kilograms of sodium carbonate against 23 liters of water. The level should reach normal level of the engine and keep stable within 10~15 minutes.

⚠ CAUTION

When adding cleanser into the cooling system, exhaust air from cooling system lines of the engine. During cleaning of the cooling system, never cover the water radiator filler cap while running the engine.

11. Keep the water radiator filler cap open, start the engine, when the coolant temperature reaches over 80°C, run the engine for 5~10 minutes again.

⚠ CAUTION

If the coolant temperature can not reach 80°C, use a hardboard to cover the water radiator filler cap.

12. Stop the engine, drain out cleanser.
13. Add clean water into cooling system of the engine until it reaches normal level and keeps stable within 10~15 minutes. keep the water radiator filler cap open, start the engine, when the coolant temperature reaches over 80°C, run the engine for 5~10 minutes again.
14. Stop the engine, drain out water in the cooling system. If the drained water is still dirty, clean the system again until the drained water gets clean.
15. Replace with a new coolant filter, close all drain plugs, then add new coolant according to the operation rules previously described in section "Coolant--Add".

⚠ WARNING

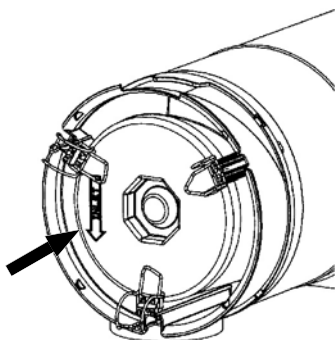
The coolant of the engine is poisonous and im potable. Dispose of it according to the local laws and regulations.

Main Filter Element of the Air Filter --Clean/ Replace

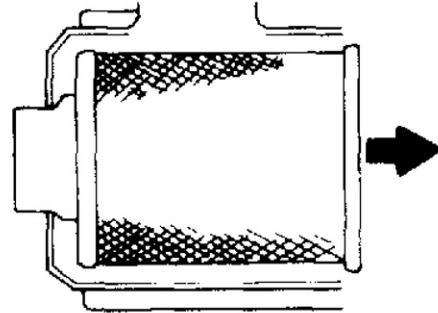
⚠ CAUTION

If the engine air filter alert indicator on the instrument panel is on, then maintain the engine air filter.

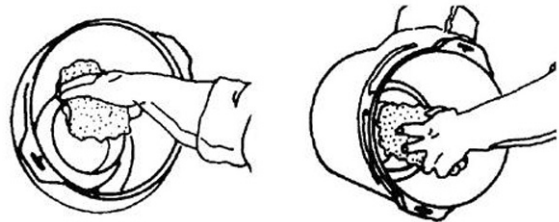
1. Stop the engine and open the engine hood.
2. Remove outer cover of the air filter.



3. Take out the main filter element along with the housing direction.



4. Check the main filter element.
 - (a) Replace the main filter element if any damage is found to pleats and gaskets.
 - (b) Clean the main filter element if it is not damaged.
5. Clean the inner wall of the air filter housing.



6. Clean the main filter element with compressed air (below 300kPa/ 3.1kgf/cm³) from inside to outside.

⚠ WARNING

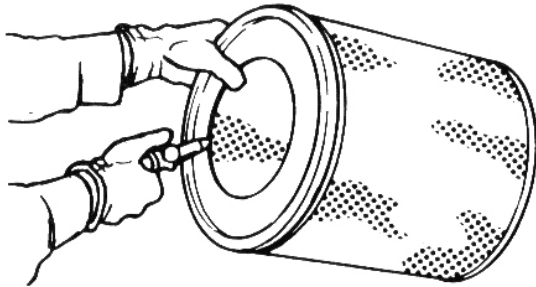
It is not allowed to clean the main element from outside to inside with compressed air. Do not use oil or water to clean the main element.

⚠ CAUTION

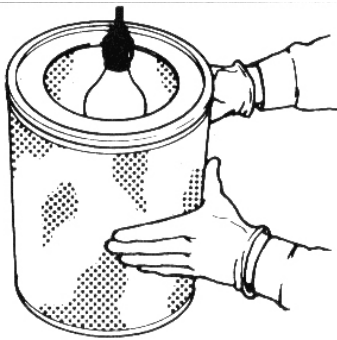
Do not hit the main element when cleaning it. Otherwise the engine could be damaged.

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7. After cleaning the main filter element, check with a bulb, if small holes and particles as well as damage of the washer and seal are found, replace with a new main filter element.



8. Install a clean main filter element into the air filter and ensure an even contact with the housing.
9. Clean and install the cap of the air filter, make sure that the inner cap gasket in the air filter contacts evenly with the air filter housing.

NOTICE

The main element should be replaced after being cleaned for 4-5 times. It is forbidden to remove the safety element when servicing the main element.

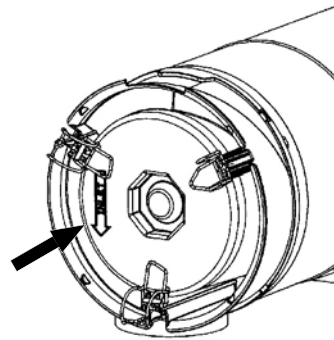
10. Close the engine hood.

Air Filter Safety Element--Replace

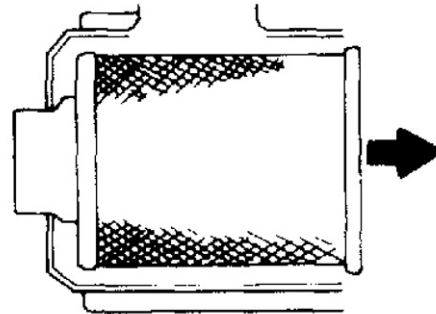
⚠ CAUTION

Replace the main element and safety element at the same time. Always replace the safety filter element with a new filter element. Never use again after cleaning.

1. Stop the engine and open the engine hood.
2. Remove the outer cap of the air filter.

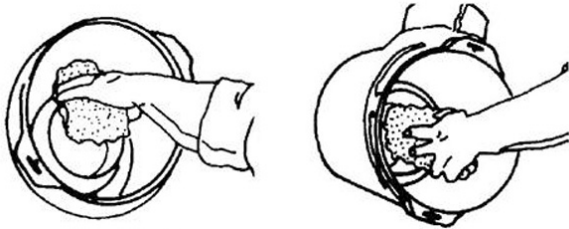


3. Remove the main filter element along with the housing direction.



4. Remove the safety filter element.

5. Cover the air inlet. Clean the inside wall of the air filter.



6. Check the gasket between the air inlet tube and the air filter housing. Replace with a new one if it is damaged.
7. Open the air inlet. Install a new safety filter element, make sure the seal ring on the top of the safety filter element contacts evenly.
8. Install a new main filter element and install the outer cap of the air filter. Tighten the clip to secure the cap of the air filter housing.
9. Close the engine hood.

Fuel Level--Check

The fuel level gauge is on the cab instrument panel. It has two zones. "1" indicates the high fuel level. "0" indicates the low fuel level. Add fuel in time when the fuel level is lower than "0.2".

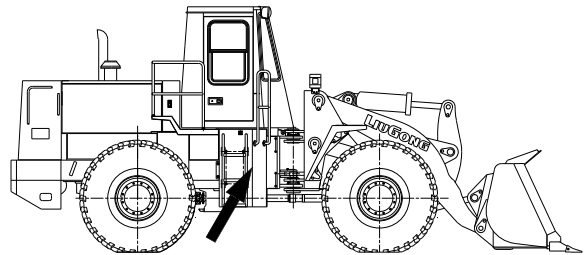
If the fuel level is lower than 0.2, ensure enough time for the operator to add fuel.

Fuel--Add

⚠ WARNING

It is forbidden to smoke when adding fuel. Keep any flames or sparks away.

The fuel tank of the machine is located on the right lower side of the cab. .



1. Stop the engine.
2. Open the fuel filler of the fule tank on the right of the cab.
3. Add fuel.



⚠ CAUTION

Do not take out the strainer of the fuel filler when adding fuel.

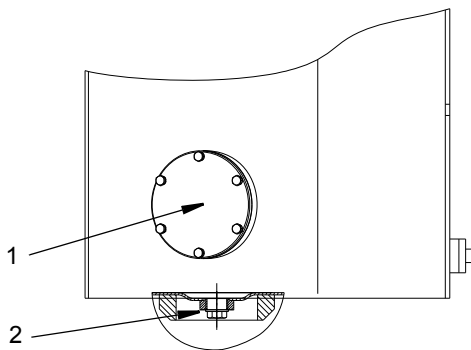
Fuel Tank--Clean

⚠ CAUTION

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before disassembling any component containing fluids. Dispose of all fluids according to local regulations.

No smoking and keep away from the flames or spark area when cleaning the fuel tank.

1. Stop the engine.
2. Remove the flange cover in front of the fuel tank. Wash the inner surface of the tank with clean fuel.



1. Flange cover
2. Drain plug
3. Remove the drain plug to drain out the residual fuel.
4. Repeat washing until the drained fuel is clean.

Fuel Strainer--Clean

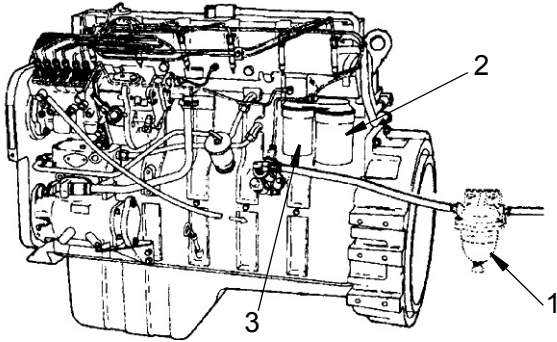
1. Stop the engine.
2. Remove the fuel filler cap of the fuel tank. Check the gaskets for damage. Replace the gaskets if damaged.
3. Take out and check the fuel strainer. Replace if damaged.
4. Wash the fuel filler and fuel strainer with clean and nonflammable detergent. Dry them in the air or by compressed air.
5. Install the fuel filler cap and strainer.

Water and Impurity--Remove

The fuel pump and fuel injection nozzle are precision devices, if fuel is mixed with water or impurity, the fuel pump and fuel injection nozzle can't work properly and quickly worn. Measures should be taken to remove water and impurity in fuel.

1. If the condition is permitted, fuel should be deposited for 24 hours before it is filled to the tank.
2. Before filling, screw out the drain plug at the bottom of the fuel tank to drain out water and impurity deposited in the tank once every week.
3. After completing daily work, add fuel and remove the humid air in the fuel tank.
4. After replenishing the fuel tank every time, wait for 5 ~ 10 minutes before starting the engine so that water and impurity have sunk to the bottom of the tank.

5. After completing daily work, loosen the water drain plugs of fuel water separator, fuel pre-filter and fuel filter to drain out water and impurity.



1. Fuel water separator
2. Fuel pre-filter
3. Fuel filter

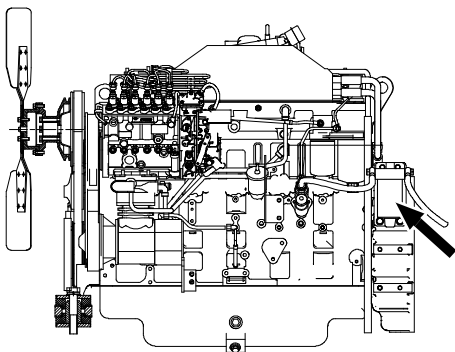
⚠ CAUTION

Add the fuel in time. Any residual fuel at the bottom of the fuel tank that contains water and impurity will affect the normal running of the engine. Drain and clean fuel tank before adding.

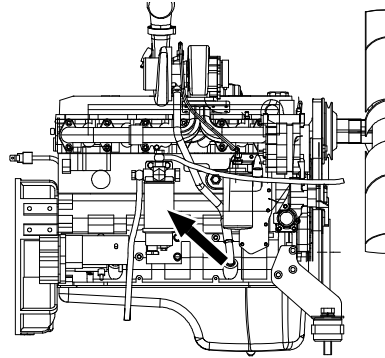
Fuel Pre-filter--Replace

The fuel pre-filter is located on the left or right side of the engine.

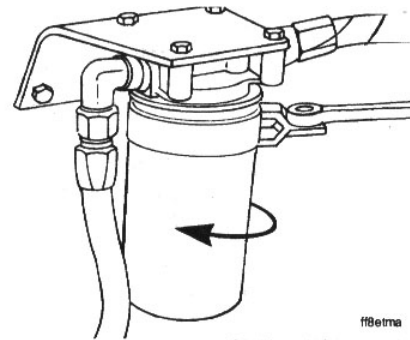
Fuel pre-filter is on the right side of the engine



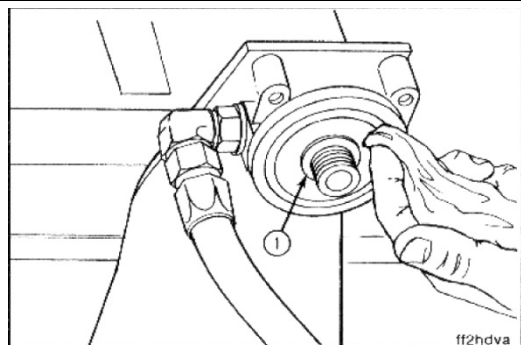
Fuel pre-filter is on the left side of the engine



1. First clean the fuel pre-filter surroundings and the support.
2. Remove the fuel pre-filter from the support with a wrench.



3. Remove the gasket on the thread connector of the support. Clean the seal surface of the support with a non-fibrous cloth.



1. Gasket
4. Check the gasket, replace if damaged.

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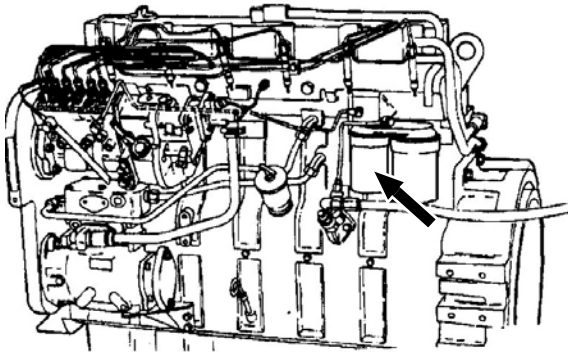
5. Install a new fuel pre-filter to the support.

⚠ CAUTION

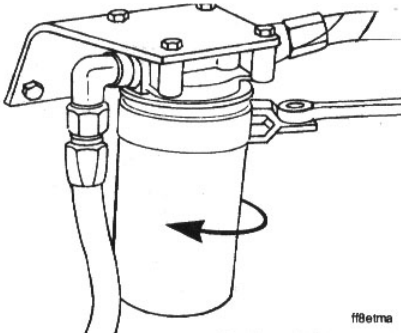
Do not fill with fuel before the fuel pre-filter is installed. Fuel contamination will quicken damage of the fuel system parts.

Fuel Filter--Replace

The fuel filter is located on the right side of the engine.

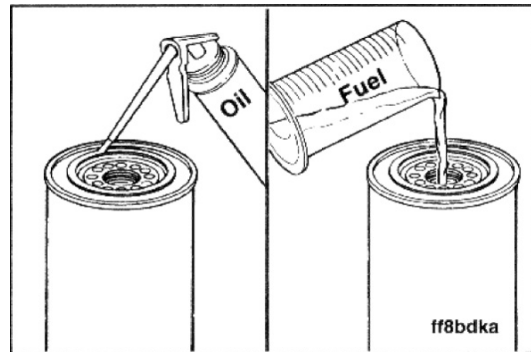


1. First clean the fuel filter surroundings and the support.
2. Remove the fuel filter from the support with a wrench.

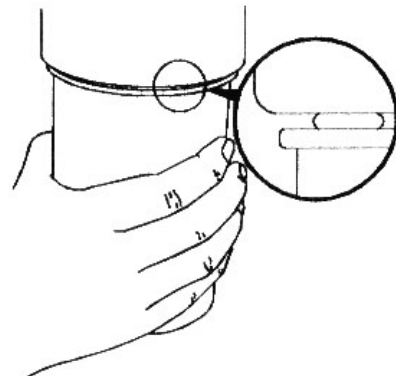


3. Clean the fuel filter surroundings and the support. Make sure that all old gaskets are removed.

4. Install a new gasket on the thread connector of the support of the fuel filter. Apply a coat of engine oil on the seal surface of the filter. Fill the fuel filter with clean fuel.



5. Install the filter to the support by hand. After the gasket of the filter contacts with the support, continue to tighten 1/2 ~ 3/4 turns. Do not over tighten the filter with the wrench to avoid damaging the filter.



⚠ CAUTION

Do not fill with fuel before the fuel filter is installed. Fuel contamination will quicken damage of the fuel system parts.

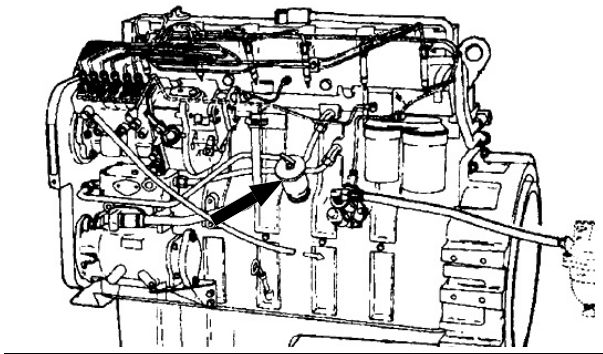
Engine Oil Level--Check

⚠ CAUTION

Too much or too little engine oil can result in damage to the engine.

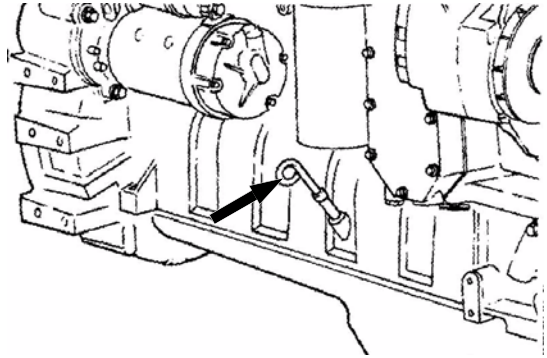
1. Drive the machine to flat ground, stop the engine and engage the parking brake.
2. After stopping the engine, wait for 10 minutes to let the engine oil in the crankcase return to the engine oil pan.
3. Open the engine hood, the engine oil filler is located on the right side of the engine while the engine oil dipstick is located on the left side.

Engine oil filler



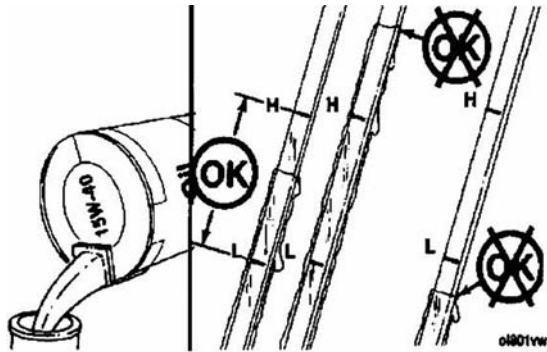
4. Take out the dipstick. Wipe it with a clean cloth and completely reinsert the dipstick into the end of the oil level of the engine. Take the dipstick out again and check the oil level. The oil level on the dipstick should be between the low (L) and high (H) graduation marks.

Engine oil dipstick



5. If the oil level is below L, add oil. If the oil level is above the H, screw out the oil drain plug at the bottom of the engine oil pan to release some oil.

Oil level range



6. Reinsert the the oil dipstick and close the engine hood.

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Engine Oil--Replace

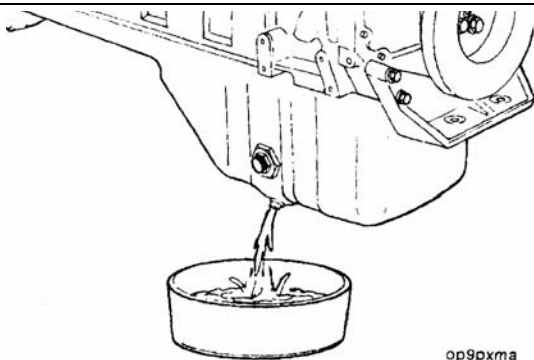
⚠ CAUTION

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before disassembling any component containing fluids or dismounting any hydraulic lines. Dispose of all fluids according to local regulations.

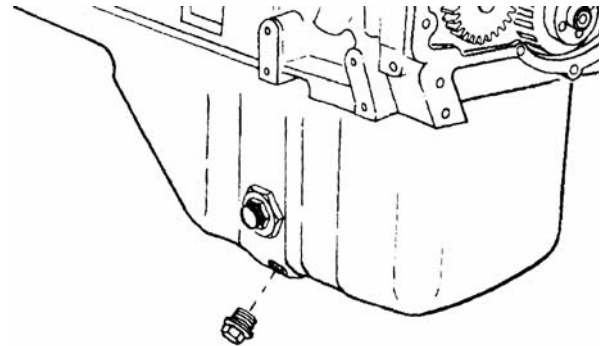
⚠ WARNING

High-temperature lubricant can cause personal injury. Replace the lubricant only when the lubricant is warm and the impurity is floating.

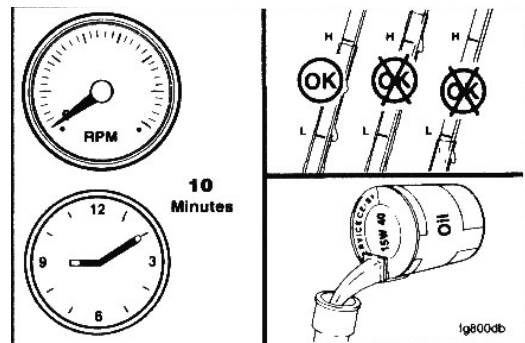
1. Park the machine on flat ground, start the engine and run until the water temperature reaches 60°C.
2. Stop the engine and engage the parking brake.
3. Loosen the engine oil drain plug at the bottom of the oil pan to drain the oil into a suitable container.



4. Tighten the oil drain plug.



5. Add clean engine oil to the oil filler of the engine until the engine oil is at H on the oil dipstick. Run the engine at idle speed to check the engine oil filter and oil drain plug for leakage.
6. Stop the engine and wait for about 10 minutes, let the engine oil fully return to the oil pan, check the engine oil level again, if insufficient, add engine oil to the H on the dipstick.



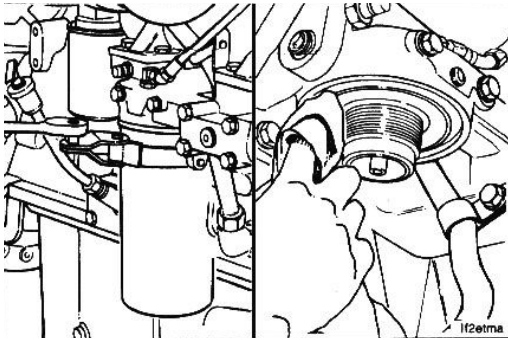
⚠ CAUTION

Within 15 seconds after the engine has been started, check the reading of engine oil pressure gauge. If no reading is found, shut down the engine immediately to protect the engine. Check to see if the engine oil level is correct.

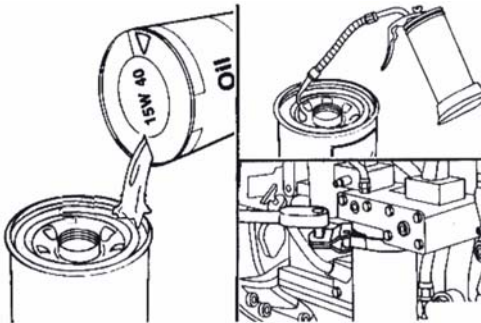
Engine Oil Filter--Replace

Replace the engine oil filter after the first 50 service hours, replace it every 250 service hours later on.

1. Open the engine hood.
2. Clean the area around the support of the engine oil filter.
3. Remove the engine oil filter with a belt spanner and check it.
4. Clean the surface of the gasket of the support with a clean cloth. If old O-ring adheres to the support, remove it.



5. Install a new O-ring, replenish the oil filter with clean engine oil, and apply a coat of clean engine oil on the gasket surface.



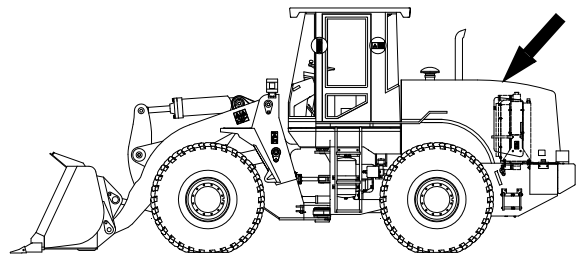
⚠ CAUTION

Fill the filter with clean engine oil before the engine oil filter is installed. If an empty engine oil filter is installed, the engine could be damaged due to a lack of lubricant.

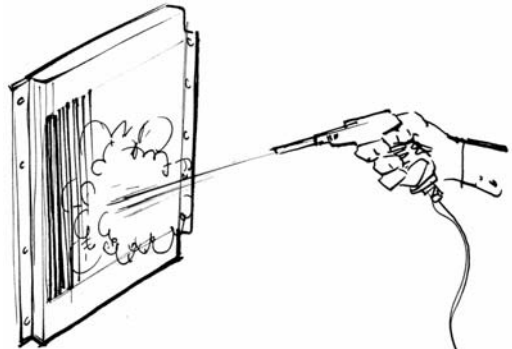
6. Secure the engine oil filter on the support and tighten the gasket of the engine oil filter until it contacts with the support. Tighten engine oil filter according to the specified requirements with the spanner.
7. Close the engine hood.

Radiator Group--Clean

1. Open the engine hood to get access to the radiator group.



2. Remove the dust and debris on the radiator group by compressed air.



⚠ CAUTION

Reduce the compressed air pressure when cleaning. Keep any bystander away and use protective devices to avoid being hurt.

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Engine Valve Lash--Adjust

⚠ WARNING

Adjustment of the engine valve lash must be performed by trained personnel with special tools.

For more information about the adjusting procedure of the engine valve lash, refer to the Operation and Maintenance Manual of the Engine.

Engine Air Intake System--Check

Check the air intake system for cracked hoses, loose clamps or holes. Tighten or replace the parts to ensure the sealability of the air intake system.

Engine Tensioner Bearing and Fan Hub --Check

Check the tensioner to ensure it can turn freely.

Check the fan hub, it should rotate without any wobble or excessive clearance.

Engine Belt--Check

Check the belt of the engine by sight for cracked surfaces.

If the belt cracks lengthways or if flaking material falls off, replace it with a new belt. For more information about the replacing procedure, refer to the Operation and Maintenance Manual of the Engine.

Fan Belt Tension--Check/Adjust

For more information on fan belt adjustment procedures, refer to the Operator and Maintenance Manual of the Engine.

⚠ CAUTION

Loose fan belt could cause improper battery charging, engine heating and rapid abnormal belt wear problems. But an over tightened fan belt will cause damage to both bearings and the belt .

Power Train System

Transmission Oil Level--Check

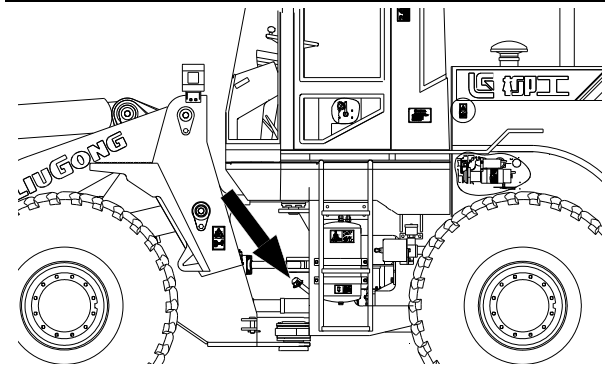
⚠ CAUTION

Stop the machine on flat ground when checking the oil level. Turn the shift control lever to NEUTRAL position, engage the parking brake and install the steering frame lock to avoid movement of the machine.

Check the transmission oil level every 50 service hours or once a week to ensure enough oil.

The transmission oil filler is located near the articulation joint. The transmission oil dipstick is located inside the oil filling pipe.

Transmission oil filler



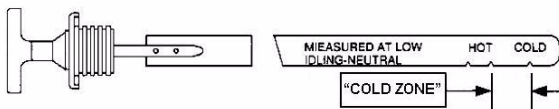
⚠ CAUTION

When checking the transmission oil level, always separately check cold oil level and hot oil level. Too high or too low oil level of the transmission could result in damage to the transmission, make sure the oil level of the transmission is at proper level.

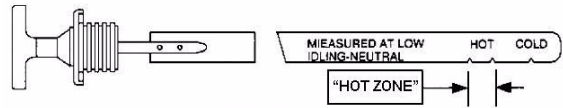
Check transmission oil level:

Before starting the engine, check the cold oil level to ensure the transmission oil is at proper level after the machine is started. It is quite important for machines stored for a long time.

1. Park the machine on flat ground.
2. Turn the shift control lever to NEUTRAL position. Engage the parking brake and install the steering frame lock to avoid movement of the machine.
3. Check the transmission cold oil level when the engine runs at idle speed and the transmission oil is below 40°C. Turn the dipstick counterclockwise and take it out. Wipe off the oil with a clean cloth. Insert the dipstick into the end of the oil filling pipe and then take it out again. The oil level of the transmission should reach the COLD zone of the dipstick.



4. When the transmission oil temperature reaches 80~90°C, take the dipstick out of the oil filling pipe and wipe off the oil with a clean cloth. Insert the dipstick into the end of the oil filling pipe and take it out again. The oil level should be above the HOT graduation of the dipstick. If the oil level is below HOT graduation of the dipstick, add transmission oil. If the oil level is above the HOT graduation of the dipstick, loosen the drain plug at the bottom of the transmission to release excessive oil.



5. After inspection, insert the dipstick into the oil filling pipe of the transmission. Rotate it clockwise to tighten it.

⚠ CAUTION

Pay close attention to cleanliness when checking the transmission oil level and replacing transmission oil and filter. Do not let impurity enter the transmission system to avoid damage to the transmission.

The operating method to raise the transmission oil temperature quickly when checking the transmission hot oil level:

1. Park the machine on flat ground.
2. Turn the shift control lever to NEUTRAL, press the parking brake button to disengage parking brake.
3. Depress the service brake pedal completely.
4. Turn the shift control lever to F4, then the torque converter is under stall condition, the transmission oil temperature will raise fast.
5. After the transmission oil temperature reaches 80°C, turn the shift control lever to NEUTRAL again, engage the parking brake. Then check the hot oil level of the transmission.

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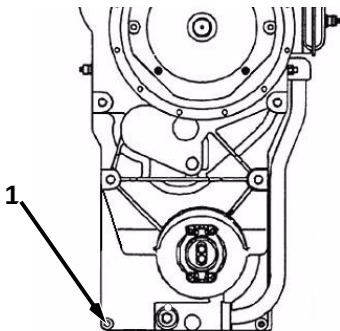
Transmission Oil--Replace

⚠ CAUTION

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting the product. Be prepared to collect the fluid with suitable containers before disassembling any hydraulic lines or component containing fluids. And dispose all fluids according to local regulations.

Replace the transmission oil at the first 100 hours. Replace the transmission oil every 1000 service hours or at least once a year later on.

1. Park the machine on flat ground and turn the shift control lever to NEUTRAL. Engage the parking brake and attach the steering frame lock to the front and rear frames to avoid movement of the machine.
2. Start the engine and run at idle speed. When the transmission oil temperature reaches 80~90°C, stop the engine.
3. Loosen the oil drain plug at the bottom of the transmission to drain oil. Collect oil with an appropriate container.

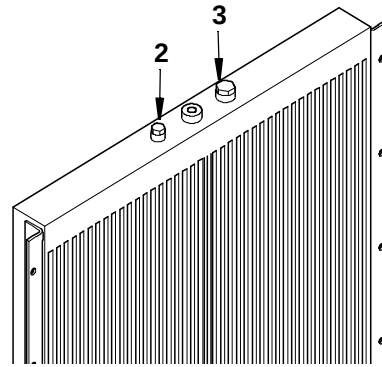


1. Oil drain plug

⚠ WARNING

Because the transmission oil temperature is still high when draining, wear protective clothing and be careful to prevent injury.

4. Loosen the oil drain plug under the torque converter oil radiator and collect with a container. Loosen the air release plug of the torque converter oil radiator to quicken oil release speed.



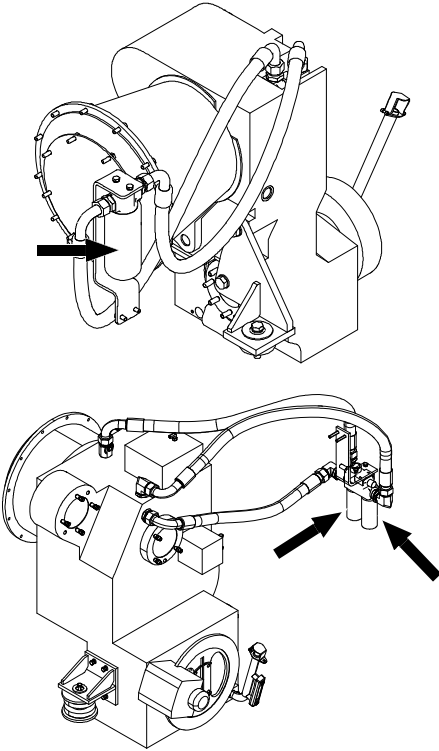
2. Air outlet
3. Oil filler

⚠ CAUTION

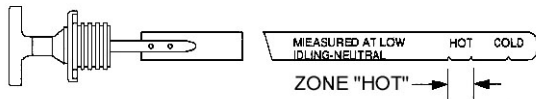
Drain out the oil in transmission, torque converter and radiator simultaneously.

5. Replace the transmission oil filter and seal ring. Refer to section "Transmission Oil Filter-Replace".

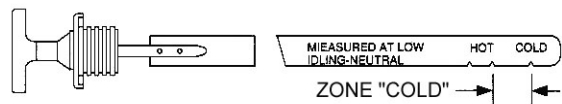
Secondary filter



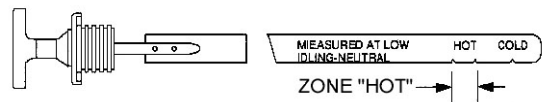
6. Loosen the oil filling plug above the torque converter oil radiator. Add clean transmission oil from the oil filler of the torque converter oil radiator. After the radiator is fully filled with transmission oil, tighten the air release plug and oil filling plug.
7. Take out the dipstick of the transmission. Add clean transmission oil until the level is above HOT mark.



8. Start the engine and let it run at idle speed. Check the transmission oil level again and add the transmission oil until the oil level is above COLD. The transmission could produce a slightly abnormal noise due to transmission oil insufficiency. The abnormal noise will disappear after the transmission oil reaches the specified level.



9. When the transmission oil reaches 80~90°C, check the oil level again. The level should be at the HOT graduation of the dipstick. If the oil is insufficient, add oil. If the oil is excessive, drain some excessive oil.



10. Insert the dipstick and tighten it clockwise.

⚠ CAUTION

Before replacing transmission oil, cover the parking brake by cloth to prevent the friction disc from touching with oil to ensure the parking brake performance.

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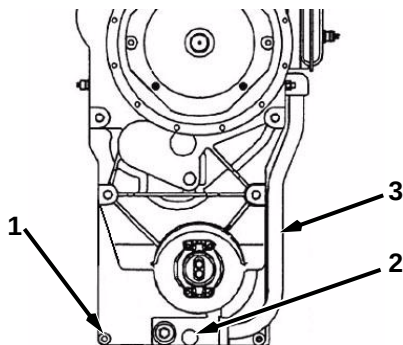
Transmission Oil Filter--Replace

⚠ CAUTION

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting the product. Be prepared to collect the fluid with suitable containers before disassembling any hydraulic lines or component containing fluids. And dispose all fluids according to local regulations.

Replace the primary filter as follows:

1. Remove the oil suction pipe on the rear right side of the transmission. Take the primary filter out. Clean it with compressed air or fuel. Install the primary filter after it is dried in the sun.

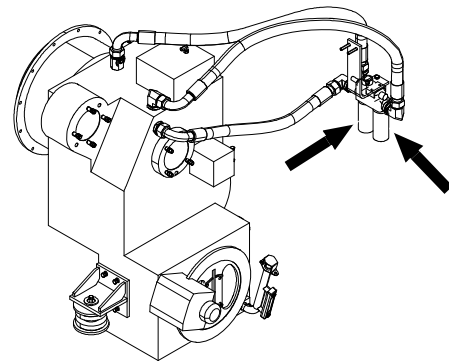
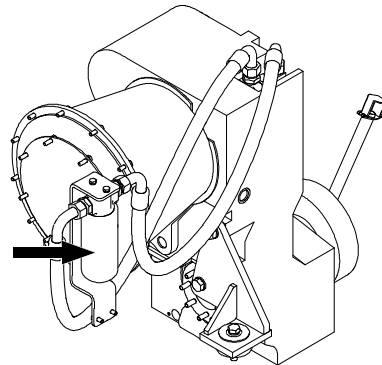


1. Oil drain plug
 2. Transmission primary filter
 3. Oil suction pipe
2. Clean any iron filings attached on the drain plug by the magnet. Insert the magnet into the transmission oil pan from the primary filter mounting port. Clean the iron filings on the inner wall of the primary filter.
 3. Secure the primary filter, oil suction pipe, drain plug and oil drain plug of the torque converter oil radiator and seals.

Replace the secondary filter as follows:

The secondary filter of the transmission is located at the upper right side of the transmission. See the following pictures.

Secondary filter



1. Clean the surface around the transmission secondary filter.
2. Remove the secondary filter from the support with a wrench.
3. Clean the seal surface of the support with a clean cloth.
4. Coat the gasket of the new secondary filter with transmission oil.

5. Install the secondary filter on the support until the gasket contacts with the seal surface of the support and then manually further tighten it by 1/3 or 1/2 turn.

⚠CAUTION

Dispose of the transmission oil that drained from the transmission oil sump properly to avoid polluting the environment.

Axle Oil Level--Check (LiuGong Axle)

Check the axle oil level at every 250 hours or once a month in order to ensure enough oil.

⚠CAUTION

Be careful of the splashing hot oil when adding, draining, or loosening the plug.

As the drain plug on the wheel end of the front and rear axles could not be at the level position at the same time, so check the oil level of the front and rear axles separately.

1. Park the machine on level ground, slowly drive the machine to keep the oil level auxiliary line on one wheel end of one axle at level position, and the oil drain plug should be above the oil level auxiliary line at the same time.



1. Oil drain plug
2. Oil level auxiliary line

2. Turn the shift control lever to NEUTRAL position, engage the parking brake to prevent movement of the machine and stop the engine.
3. Clean the surface around the oil drain plug before checking the axle oil level.
4. Loosen the oil drain plug on this wheel end of the axle to check the oil level, the axle oil should flow over the axle. If it isn't, remove the oil drain plug, and add clean axle oil. Observe for about 5 minutes after refilling until the oil keeps stable.
5. Tighten the oil drain plug.
6. Check the oil level of another axle according to the previous operation steps.

Axle Oil--Replace (LiuGong Axle)

Replace the axle oil after the first 500 service hours. Replace the axle oil every 1000 service hours at least once a year later on.

⚠CAUTION

Care must be taken to ensure that fluids are contained during the performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before disassembling any hydraulic line or component containing fluids. Dispose of all fluids according to local regulations. Drain oil after the machine runs for a period of time to let the impurities deposited in the oil suspend.

Because the oil drain plugs on both wheel ends of the front and rear axles could not be at the lowest position at the same time, therefore, replace oil of the front and rear axles separately.

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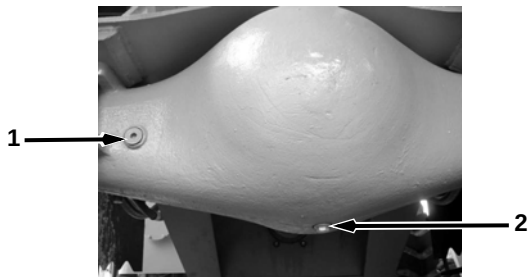
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1. Drive the machine for a while to let the settling impurities in the axle suspend fully. Park the machine on level ground. Slowly operate the machine to locate the oil drain plug on one wheel end of the front axle at the lowest position. Because the oil drain plugs on both wheel ends could not be at the lowest position at the same time, so drain oil of the axle separately.

Oil drain plug



2. Turn the shift control lever to NEUTRAL position, engage the parking brake to prevent movement of the machine and stop the engine.
3. Loosen the oil drain plug on the wheel end of the front axle and the oil drain plug in the middle of the axle to drain oil, and collect with a container.



1. Oil filler
2. Oil drain outlet

⚠ WARNING

Because the axle oil temperature is still hot when draining, wear protective clothing and be careful to prevent injury.

4. Tighten the oil drain plug on the wheel end of front axle and the oil drain plug in the middle of the axle.
5. Start the engine, disengage the parking brake. Turn the shift control lever to the first gear, and slowly operate the machine to locate the oil drain plug on the other wheel end of the front axle at the lowest position. Then turn the shift control lever to NEUTRAL position, engage the parking brake and stop the engine.
6. Loosen the oil drain plug on the wheel end of the front axle and the oil drain plug in the middle of the axle to drain oil, and collect with a container.
7. Tighten the oil drain plug on the wheel end of front axle and the oil drain plug in the middle of the axle.
8. Add clean axle oil from the oil filler in the middle of the axle until the oil flows over the oil filler. Observe for about 5 minutes after adding, the oil level should keep stable, and then tighten the oil drain plug of the oil filler.
9. Start the engine, disengage the parking brake. Turn the shift control lever to the first gear, and slowly drive the machine to keep the oil level auxiliary line on one wheel end of the front axle at level position, and the oil drain plug should be above the oil level auxiliary line at the same time. Then turn the shift control lever to NEUTRAL position, engage the parking brake and stop the engine.

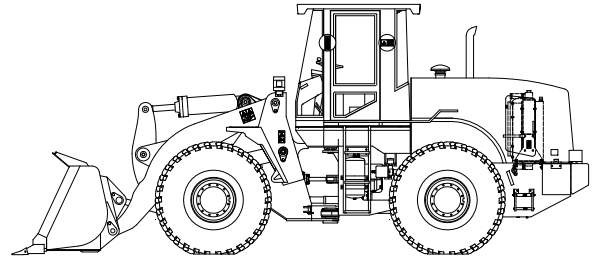


10. Add clean axle oil to the oil drain outlet on this wheel end of the axle until the oil flows over the oil filler. Observe for about 5 minutes after refilling, the oil level should keep stable.
11. Tighten the oil drain plug on this wheel end of the axle.
12. Add axle oil to the oil drain outlet on the other wheel end of the front axle according to the above operation steps.
13. Refer to the section "Lubrication Specifications" for axle oil refill capacity. But in the actual operation, add axle oil until the oil flows over the oil filler as mentioned in above operation steps.
14. Replace the rear drive axle oil according to the previous operation steps.

Hydraulic System

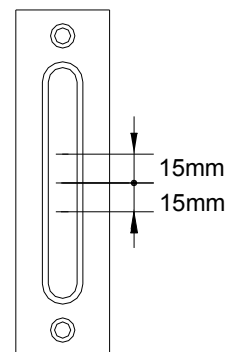
Hydraulic Oil Level--Check

1. Ensure that the hydraulic oil tank, hydraulic lines, radiator and other hydraulic parts are full of hydraulic oil before checking the hydraulic oil level.
2. Park the machine on level ground. The front and rear frames must be aligned in a straight line.
3. Tilt the bucket backward to limit position, raise the boom to the highest position by full engine speed.
4. Let the engine run at idle speed, push the pilot control lever to lower the boom to the lowest position at constant speed, and lower the bucket onto ground. Stop the engine and take off the start switch key, push the pilot control lever forward and backward, left and right to release pressure.



5. Check the sight glass of the hydraulic oil tank when there aren't bubbles. The hydraulic oil level should be within 15 mm above or below the middle position of the sight glass.

Sight glass



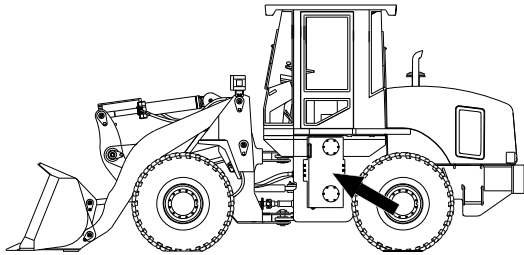
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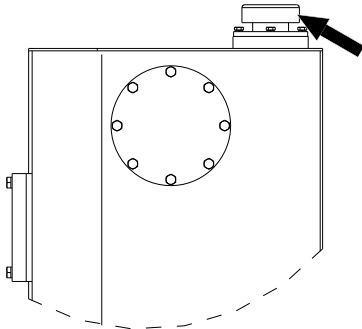
6. Add hydraulic oil if the oil level is too low. And check the hydraulic oil level again according to the above method.

Hydraulic Oil--Add

Hydraulic oil tank



1. Unscrew the breather filter cap of the hydraulic oil tank to release the pressure. Take off the breather filter cap.



2. Refill the hydraulic oil tank and check the sight glass. The hydraulic oil level should be within 15mm above or below the middle position of the sight glass.
3. Install the breather filter cap.

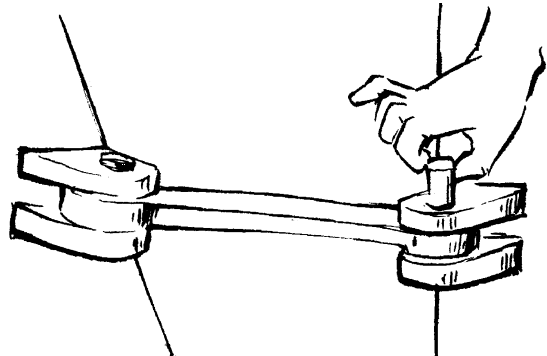
Hydraulic Oil--Replace

⚠CAUTION

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before disassembling any hydraulic line or component containing fluids. Dispose of all fluids according to local regulations.

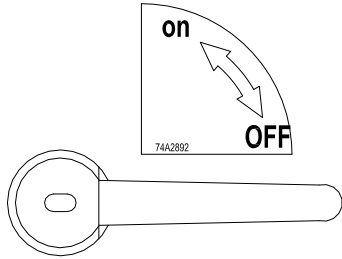
Pay close attention to the cleanliness when replacing the hydraulic oil, do not allow dirt enter the hydraulic system.

1. Park the machine on flat ground, push the shift control lever to NEUTRAL position, pull up the parking brake button (parking brake handle) and install the steering frame lock.



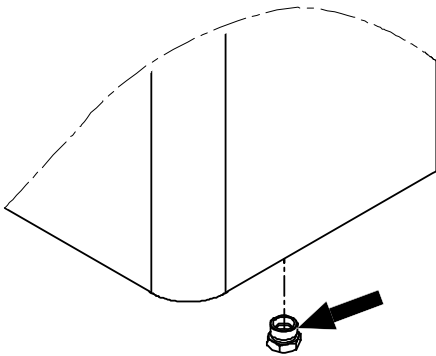
2. Start and run the engine at idle speed for 10 minutes. Operate the boom and tilt the bucket repeatedly to raise the hydraulic oil temperature.
3. Raise the boom to the highest position, tilt the bucket backward to the limit position, and stop the engine.
4. Push the bucket control lever forward to let the bucket tilt forward by its deadweight, and discharge the hydraulic oil in the tilting cylinder. After the bucket tilts to the limit position, push the boom control lever forward to let the boom lower by its deadweight, and discharge the hydraulic oil in the boom cylinder.

5. Turn the pilot shutoff lever (If equipped) to OFF position.



6. Clean the oil drain outlet below the hydraulic oil tank, loosen the oil drain plug to drain out the hydraulic oil and collect with a container.

Oil drain plug



7. Meanwhile, open the breather filter cap (oil filler cap) of the hydraulic oil tank to quicken the oil discharging speed.

⚠ WARNING

Because the hydraulic oil temperature is still high when draining, wear protective clothing and be careful to prevent injury.

8. Remove the oil inlet hose of the hydraulic oil cooler and drain residual hydraulic oil from the cooler.
9. Remove the end cap of the return oil filter from the hydraulic oil tank, take out the return oil filter element and replace with a new one.
10. If the hydraulic oil tank is equipped with a suction oil filter element, remove the element and replace with a new one.

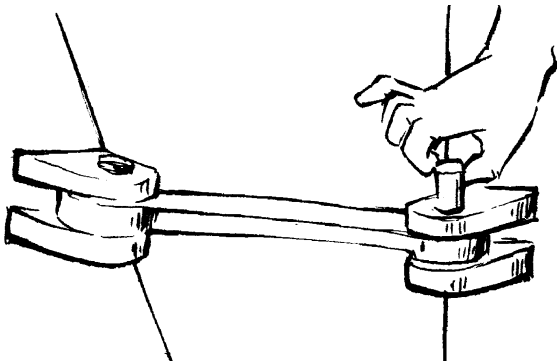
11. Open the breather filter cap (oil filler cap), take out the strainer.
12. Wash the breather filter cap (oil filler cap), strainer and oil drain plug with nonflammable detergent. Dry them in the air or with compressed air.
13. Install the oil drain plug, return oil filter, strainer, breather filter cap (oil filler cap), and oil inlet pipe of the hydraulic oil cooler.
14. Remove the return oil pipe of the hydraulic oil cooler. Refill the hydraulic oil cooler with clean hydraulic oil from the return oil port. Install the return oil pipe after finishing.
15. Refill the hydraulic oil tank from the hydraulic oil filler until the oil level reaches the upper graduation of the sight glass. Tighten the breather filter cap(oil filler cap) after finishing.
16. Remove the steering frame lock and start the engine. Operate the work implement control lever to raise and lower the boom for 2~3 times. Tilt the bucket forward and backward and turn from left to right to the maximum angle to fill cylinders with hydraulic oil. Then run the engine at idle speed for five minutes to drain air in the system.
17. Stop the engine. Open the hydraulic oil filler cap, refill the hydraulic oil tank.

Serious Polluted Hydraulic Oil--Replace**⚠ CAUTION**

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before disassembling any component containing fluids or dismounting any hydraulic line. Dispose of all fluids according to local regulations.

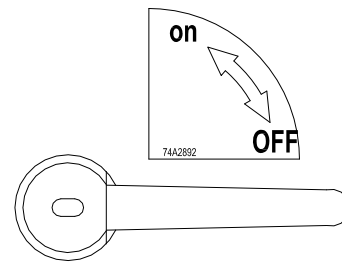
Pay close attention to the cleanliness when replacing the hydraulic oil, do not allow dirt enter the hydraulic system.

1. Park the machine on flat ground, push the shift control lever to NEUTRAL position, pull up the parking brake button (parking brake handle) and install the steering frame lock.



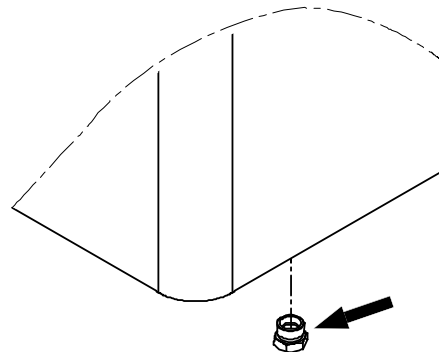
2. Start and run the engine at idle speed for 10 minutes. Operate the boom and tilt the bucket repeatedly to raise the hydraulic oil temperature.
3. Raise the boom to the highest position, tilt the bucket backward to the limit position, and stop the engine.

4. Push the bucket control lever forward to let the bucket tilt forward by its deadweight, and discharge the hydraulic oil in the tilting cylinder. After the bucket tilts to the limit position, push the boom control lever forward to let the boom lower by its deadweight, and discharge the hydraulic oil in the boom cylinder.
5. Turn the pilot shutoff lever (If equipped) to OFF position.



6. Loosen the oil drain plug to drain out hydraulic oil and collect with a container.

Hydraulic oil drain plug



7. Meanwhile, open the breather filter cap (oil filler cap) of the hydraulic oil tank to quicken the oil discharging speed.

⚠ WARNING

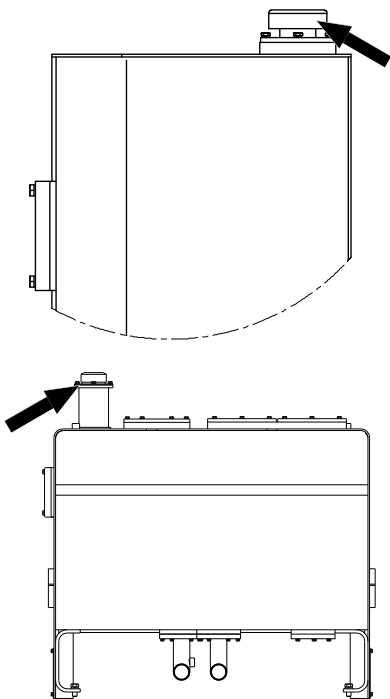
Because the hydraulic oil temperature is still high when draining, wear protective clothing and be careful to prevent injury.

8. Disconnect one end of the oil inlet pipe to drain the residual hydraulic oil from the steering cylinder, oil cooler and other pipes.

9. After finish draining, install the oil drain plug and all the disconnected pipes.
10. Open the breather filter cap (oil filler cap) of the hydraulic oil tank and fill with clean oil to proper level.
11. Replace the polluted hydraulic oil according to the procedures described in section "Hydraulic Oil--Replace". Replace the return oil filter element, suction oil filter element (if equipped), and wash the breather filter cap (oil filler cap) and hydraulic oil tank.

Breather Filter of Hydraulic Oil Tank --Clean

The breather filter is located in the oil filler of the hydraulic oil tank.



1. Pull up the lock plate of the breather filter cap. Rotate the cap counterclockwise to next position and move the cap outward to take off the cap. Unscrew the mounting bolt then take out the filter element.

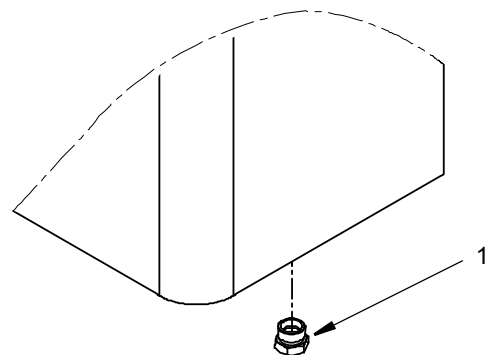


2. Wash the breather filter with clean and nonflammable detergent. Dry it in the air or with compressed air.
3. Install the breather filter element and the cap.

Oil Suction Filter Element of Hydraulic Oil Tank--Replace

Replace the hydraulic oil suction filter element after the first 500 service hours, replace it every 1500 service hours later on.

1. Unscrew the oil drain plug at the bottom of the hydraulic oil tank to drain hydraulic oil. Collect with a suitable container.

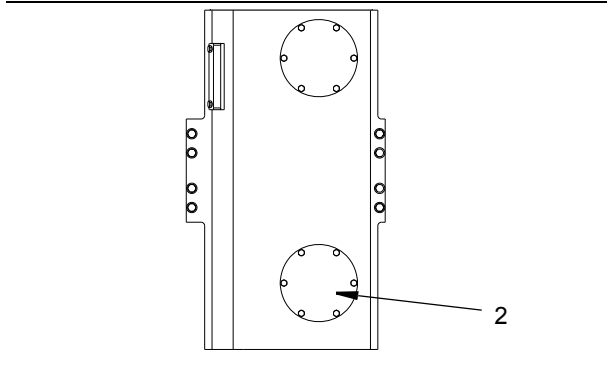


1. Oil drain plug

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2. Remove oil suction filter flange and O-ring, take out the oil suction filter element.



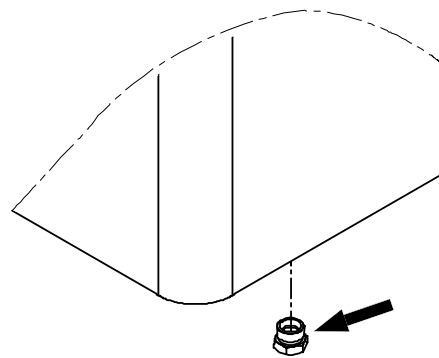
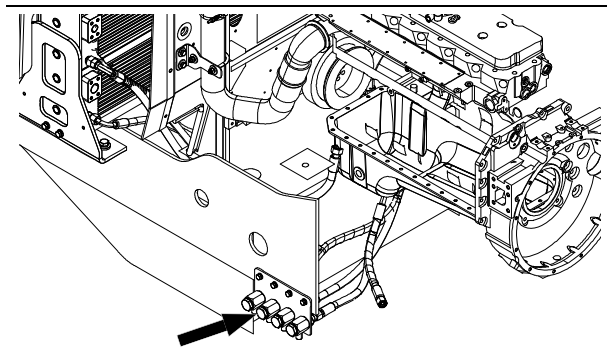
2. Oil suction filter flange
3. Replace with a new oil suction filter element and O-ring. Install the oil suction filter flange and oil drain plug.

Return Oil Filter Element of Hydraulic Oil Tank--Replace

Replace the return oil filter element at first 500 service hours, replace it every 1500 service hours later on. Replace the return oil filter element in advance if the working condition is very bad.

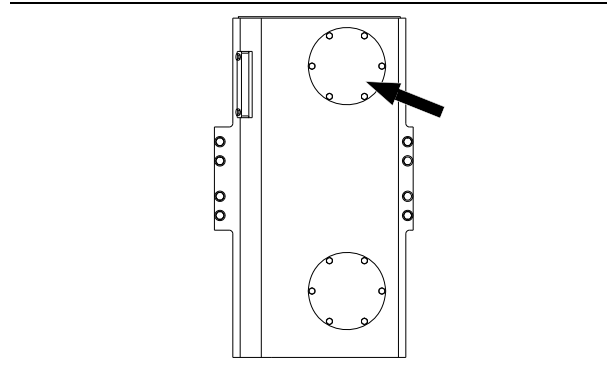
1. Loosen the oil drain plug to drain out hydraulic oil and collect with a container. Meanwhile, open the breather filter cap (oil filler cap) of the hydraulic oil tank to quicken the oil discharging speed.

Hydraulic oil drain plug



2. Remove return oil filter flange and O-ring, take out the element.

Return oil filter flange



3. Replace with a new return oil filter element and O-ring. Install the return oil filter flange and oil drain plug.

Hydraulic Oil Tank--Clean

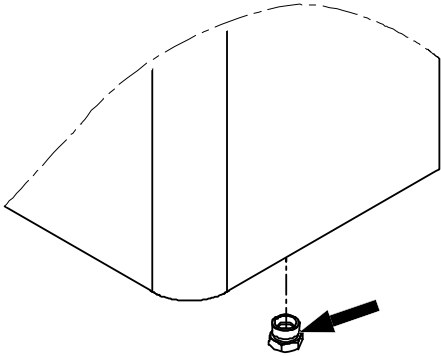
⚠ CAUTION

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before disassembling any component containing fluids or dismounting any hydraulic line. Dispose of all fluids according to local regulations.

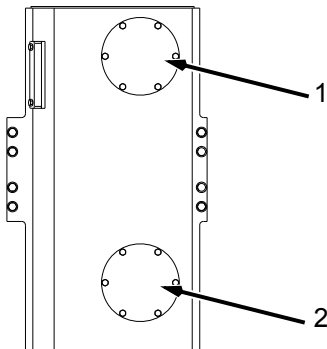
1. Stop the engine.

2. Unscrew the oil drain plug at the bottom of the hydraulic oil tank to drain hydraulic oil. Collect with a container.

Oil drain plug



3. Remove the return oil filter cap, take out the oil filter element and O-ring.

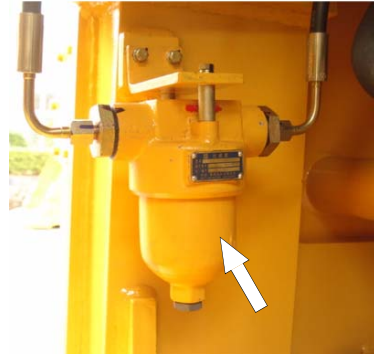


1. Return oil filter cap
2. Oil suction filter cap

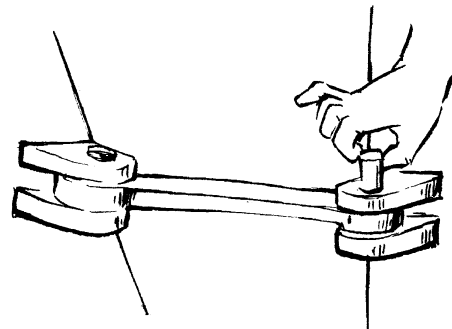
4. Remove the oil suction filter cap, take out the oil filter element and O-ring. Deal with them properly.
5. Wash the bottom and four walls of the hydraulic oil tank with fuel through the return oil filter and dry with a clean cloth.
6. Wash the bottom and four walls of the hydraulic oil tank with hydraulic oil again.
7. Remove the oil suction filter cap and O-ring, install a new oil filter element, a new O-ring and oil suction filter cap.
8. Install the oil drain plug, a new return oil filter element, a new O-ring and return oil filter cap.

Pilot Filter Element--Replace

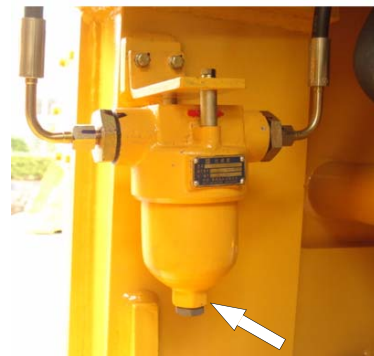
The pilot filter is located on the right side of the frame, under the articulation joint.



1. Park the machine on flat ground and lower the bucket to the ground. Engage the parking brake and stop the engine.
2. Install the steering frame lock.



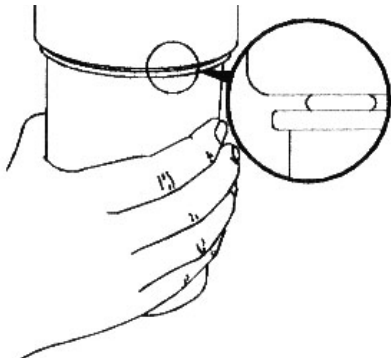
3. Remove the hexagonal plug at the bottom of the pilot filter and collect hydraulic oil with a suitable container.



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4. Remove the pilot filter from the mounting support with a spanner and take out the element from the pilot filter body. Dispose of the pilot filter element properly.
5. Clean the mounting support of the pilot filter. Remove the old O-ring if it sticks to the mounting support.
6. Install the hexagonal plug and its combination gaskets at the bottom of the pilot filter.
7. Replace with a new filter element and fill the pilot filter with clean hydraulic oil.
8. Screw the pilot filter on the mounting support with hand. Tighten $1/2 \sim 3/4$ turn when the O-ring of the pilot filter contacts the mounting support. Do not over tighten it to avoid damage to the pilot filter.



!CAUTION

Keep the element clean during replacement to protect the pilot filter from being contaminated.

Brake System

Service Brake Performance--Inspect

!CAUTION

Before checking the service brake ability, make sure the machine's parking brake system works normally in case of any emergency.

Check the service brake performance of the machine on hard, dry and flat road surface. Make sure no personnel or obstacles are around when checking. Fasten the seat belt before checking.

1. Start and drive the machine at 32km/h (20mph). Depress the service brake pedal to fully brake the machine. After the machine stops, turn the shift control lever to NEUTRAL, engage the parking brake then release the service brake pedal. The brake distance should not exceed 15m.
2. Start and drive the machine at 32km/h (20mph). Perform spot braking, the machine should stop immediately without deflection.

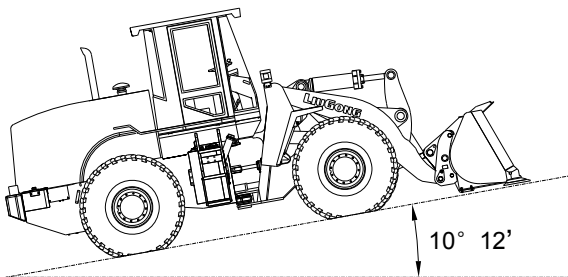
If the brake distance exceeds 15m(49'3"), consult your LiuGong dealer for brake system checking. Eliminate the problems before going on working.

Parking Brake Performance--Inspect

⚠ CAUTION

Check the parking brake performance frequently to ensure the machine can safely stop and ensure its emergency braking capability.

1. Adjust the air pressure of the machine tires to the specified value, lay the bucket flatly with a distance about 300mm above the ground. Make sure the service brake is performing normally.
2. Start the engine and drive the machine to a slope with a gradient of 18% (the angle is about 10° 12'). The slope surface should be smooth and dry.



3. Depress the service brake pedal to stop the machine. Turn the shift control lever to NEUTRAL position, and do not stop the engine.
4. Engage the parking brake and slowly release the service brake pedal. Check to see if the machine has moved from its original location.

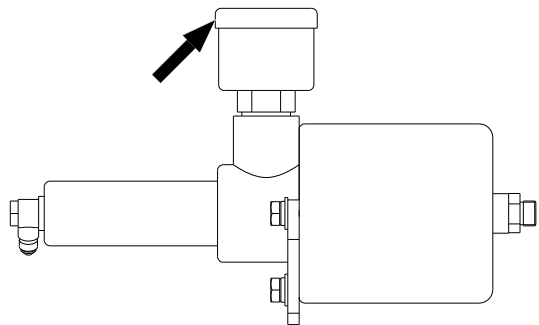
If the machine moves while checking, consult your LiuGong dealer for brake system checking. Eliminate the problems before going on working.

⚠ WARNING

Personal injury can result if the machine moves while checking.

Booster Oil Level--Check

1. Park the machine on flat ground.
2. Shut down the engine, engage the parking brake to avoid machine movement.
3. Unscrew the booster cap to check the oil level of the oil cup. If the booster oil is below the inner screen, add synthetic brake fluid (SHELL DOT4 or DOT 3) until the oil surface keeps the same level with the screen.



NOTICE

Keep the brake fluid filler clean before adding brake fluid to prevent the booster oil cup from being contaminated.

Parking Brake Clearance--Check/Adjust

⚠ CAUTION

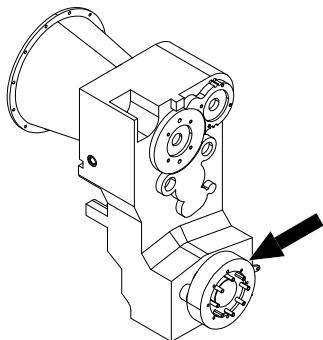
Check and adjust the parking brake clearance after the brake cools down.

Check the parking brake clearance at the first 50 hours, then check it every 250 hours later on to ensure good braking ability.

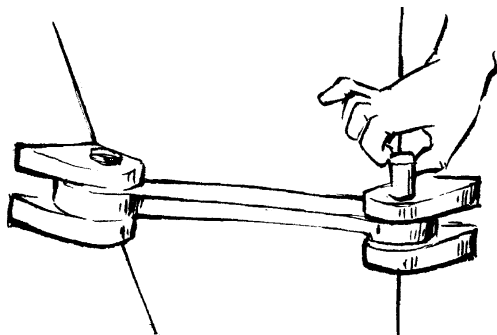
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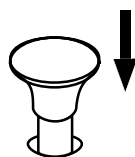
The parking brake is located at the front side of the output shaft of the transmission.



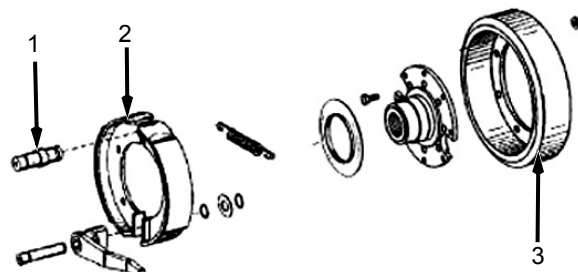
1. Park the machine on flat ground, stop the engine and install the steering frame lock.



2. Press the parking brake button to disengage the parking brake.



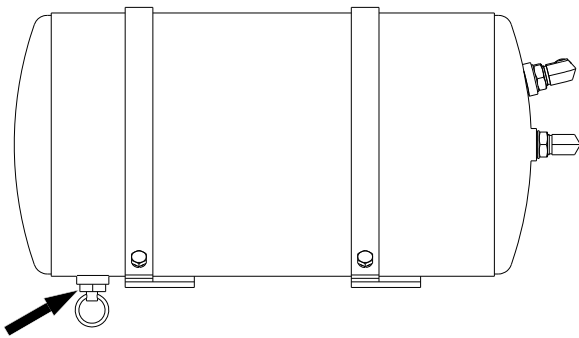
3. Use a clearance gauge to measure the clearance between the brake shoe and brake drum. The clearance should be within the range of 0.15~0.22 mm.



1. Adjusting rod
2. Brake shoe
3. Brake drum
4. If the clearance is beyond 0.15~0.22 mm, rotate the adjusting rod to adjust the clearance between the brake shoe and brake drum.
5. If the clearance still can not meet the requirement after adjusting by the rod, replace the friction plates of the brake shoe.
6. Operate the parking brake button repeatedly to check the parking brake ability by stopping the machine on a slope.

Air Reservoir Water Drain Valve--Check

1. Park the machine on flat ground and engage the parking brake. Continuously depress and release the service brake pedal to release the air pressure in the air accumulator.
2. Push the water drain valve upwards to drain water in the air reservoir. If loosen the water drain valve, it will close automatically. If water flows out linearly, replace the air dryer body immediately.



⚠ CAUTION

Check the water drain valve every two weeks if the machine works in greasy and dusty environment.

Electrical System

⚠ WARNING

Never let burning cigarettes or open fire close to the batteries.

Wear safety glasses and rubber gloves when touching batteries during work. Also wear protective clothes as the acid in the battery can result in blindness or burns.

See a doctor at once if you touch the acid carelessly.

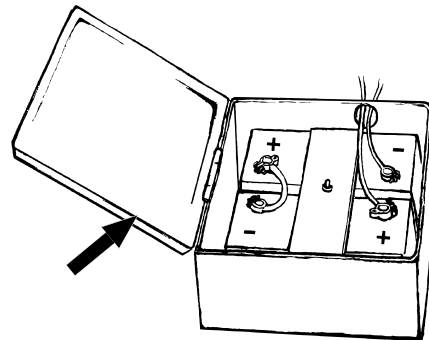
Stop the engine before working with batteries.

Battery--Check

⚠ WARNING

Stop the engine before working with batteries.

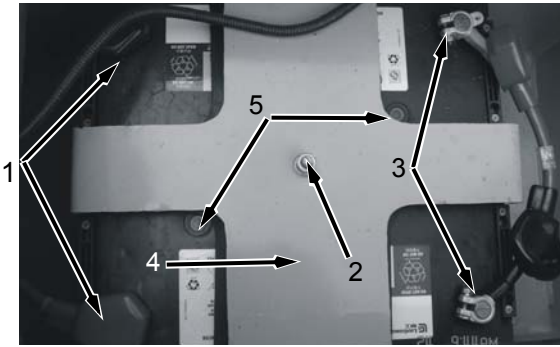
1. Open the battery box cover to get access to the battery.



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2. Check whether the clamp nut, battery terminal and cable lead are loose. Tighten them if they are loose.



1. Battery terminal
 2. Nut
 3. Battery terminal(without jacket)
 4. Clamp plate
 5. Hydrometer
3. Check the battery hydrometer color. Green indicates a full battery and the machine can be started normally. Black indicates a low battery which need charging at once. White indicates a discarded battery which needs to replace.
 4. Close the battery box cover.

⚠ WARNING

The battery clamp plate, battery terminals and cable leads will become loose due to the machine vibration after operating the machine for a period of time. Check the tightness of the nut located in the middle of the clamp plate. Tighten it if it is loose.

Battery--Install

Before installing the battery to the machine, make sure that the battery hydrometer is green.

⚠ CAUTION

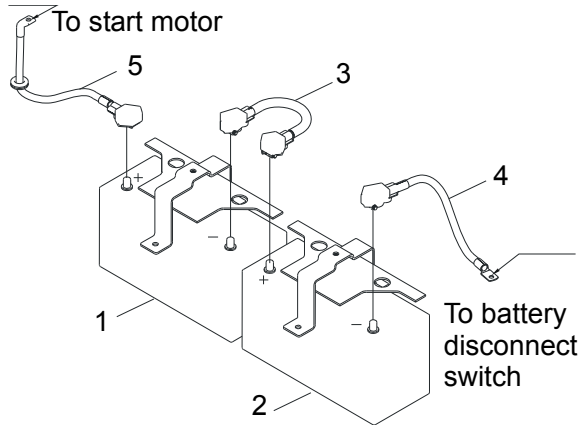
The battery should not be inclined over 40°. Do not place the battery reversely or by any side of it.

Make sure the hydrometer is green before installing the battery. It is not allowed to install the battery with a black hydrometer onto the machine.

Do not install a leaked battery onto the machine.

1. Turn the start switch (also called ignition switch) to OFF position then remove the key. Turn disconnect switch to OFF position.
2. Clean the battery terminals and surface with a clean cloth. Do not use petrol or other organic impregnant or cleanser.
3. When connecting:
 - a) Connect the positive post of one battery to the negative terminal of the other battery with the cable.
 - b) Connect one end of the battery positive lead terminal to the battery positive post, the other end to start motor.
 - c) Connect one end of the battery negative lead terminal to the battery negative post, the other end to the battery disconnect switch.

d) Connect the battery disconnect switch to ground cable.



1. Battery
 2. Battery
 3. Cable
 4. Battery negative lead
 5. Battery positive lead
4. Tighten the nut.
 5. Turn on the battery disconnect switch. Insert the key and start the engine.

⚠ WARNING

A wrong installation of the negative and positive terminal will result in a serious damage to the battery. Distinguish the positive (+) and negative terminal (-) correctly.

Battery--Charge

A maintenance-free battery is used in this machine. Obey the following instructions when dealing with the battery.

A long-time use of the electric appliances without starting the engine or a long-time stop, electricity leakage, or the alternator can not charge; all these reasons could lead to an abnormal battery charge and result in an electricity insufficiency or even can not start the machine. Recharge the battery if this happens.

NOTICE

Charge the battery to let it work normally if the above-mentioned phenomenon happens.

Check the outlook of the battery before charging:

1. Do not charge the battery if the battery housing cracks or there is an acid leakage. Check the reason and replace with a new one.
2. Do not charge the battery if the battery terminal cracks. Check the reason and replace with a new one.
3. Do not charge the battery if the hydrometer is clear. Replace with a new one.
4. Do not charge the battery if it is distensible by over-charging or over-discharging. Replace with a new one.

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Battery charging

WARNING

Wear safety goggles when charging.

Keep ventilated when charging. Charge the battery under normal temperature.

Do not smoke when charging the battery, keep any kindling away.

The battery could have an explosion danger if it is deposited improperly when charging.

1. Turn the start switch to OFF position and take out the key, and then turn the disconnect switch to OFF position.
2. Clean the battery terminals and surface with a clean cloth, remove the oxidation surface.
3. Remove the battery from the machine. When removing, first disconnecting the negative terminal of the battery.
4. Connect the cables after finishing charging. Connect the positive cable first.

CAUTION

When connecting the battery, first connect its positive terminal; when disconnecting the battery, first disconnect its negative terminal.

5. Connect the positive clamp of the charger to the positive terminal of the battery, the negative clamp to the negative terminal under room temperature.
6. It is recommended to use a charger with a constant voltage of 16VDC (the maximum voltage cannot exceed 16 ± 0.1 V, maximum current can not exceed 25A) to charge the battery. Green hydrometer indicates the battery charging is finished.
7. Charge the battery according to the following specification if the above-mentioned requirement can not meet:
 - 1/10 of rated current to charge.

- Table of charge time and battery voltage for reference (lower current means a longer charging time).

Battery Voltage	Charge Time
12.55-12.45VDC	2h
12.45-12.35VDC	3h
12.35-12.20VDC	4h
12.20-12.05VDC	5h
12.05-11.95VDC	6h
11.95-11.80VDC	7h
11.80-11.65VDC	8h
11.65-11.50VDC	9h
11.50-11.30VDC	10h
11.30-11.00VDC	12h
Below 11.00VDC	14h

- Check the hydrometer color after finishing charging. Green hydrometer indicates that the battery is fully charged.
- If the hydrometer is black, check the cable connection and connecting points. Charge the battery again according to the above table until the hydrometer is green.
- If the hydrometer lost color, bubbles might exist in the hydrometer. Shake the battery slightly to remove the bubbles. If the hydrometer still lost color, then electrolyte is lost seriously, discard the battery and replace with a new one.

8. As for the battery with a voltage under 11.0VDC, it may not be able to be charged at the beginning. Due to the serious insufficiency of electricity, the proportion of vitriol is close to water, therefore, the battery resistance is higher. The vitriol proportion increases during recharge and the circuit can get right gradually.

WARNING

Fix the two terminals tightly. Do not charge the battery of 24VDC voltage in serial connection.

Stop charging immediately to check the reason if the battery discharge hole spurts acid during the charging process.

9. Stop charging if the battery temperature exceeds 45°C during the charging process. Halve the circuit before recharging after the battery temperature drops to the ambient temperature.
10. Check the battery voltage every hour during the charging process. The battery is fully charged if the hydrometer is green.

CAUTION

If the hydrometer is black, check for loose cable and clean connecting terminal. Check whether the voltage has come to 16VDC. If the hydrometer is clear, it is likely that air bubble exist in it. If the hydrometer is still clear after slight shaking (indicates that the electrolyte loss), replace with a new battery.

11. It is recommended applying vaseline on the battery terminals to avoid electric corrosion after charge is completed.

Charge the battery according to the following method when the battery voltage is low, but the machine still can be started and alternator works normally.

1. Start the engine, and ensure that the battery charging system is in normal (observe the battery voltage through gauge), keep the engine speed at second gear to charge the battery until the hydrometer turns green.
2. Turn off the A/C, radio, lights (except night) and other high-power electric equipment during battery charging.
3. Avoid starting the machine frequently as far as possible during battery charging. If restart is necessary, it is recommended to restart the machine after finishing charging the battery.

Battery--Store/ Service

1. Turn off the battery disconnect switch when storing the batteries being installed on a machine, and check the battery voltage state at least every other month.
2. Disconnect the negative terminal of the battery if the machine is stored over 15 days. Check the electricity state of the battery every 3 months (with cable disconnected).
- Green hydrometer means the battery is in normal condition. Black hydrometer means the battery needs charging.
- Replace the battery if its electrolyte was lost seriously and hydrometer lost color.
- Check the battery voltage every 3 months during machine storage. Recharge if the battery lacks for electricity. Recharge according to special procedures.
3. Recharge if the battery lacks for electricity. Recharge according to special procedures
4. As for the machine which has not disconnected the battery terminals, check the battery voltage state every month. If the voltage is under 12.4V, recharge it according to special procedures.
5. As for the machine which is stored over 1 year, replace with a new battery and dispose the old one if the above- mentioned requirements can not be followed.

Battery, Cable, Battery Disconnect Switch--Replace

1. Turn the engine start switch key to OFF position. Turn all of the switches to OFF position. Take out the switch key.
2. Turn the battery disconnect switch to OFF position.
3. Disconnect the negative battery cable from the battery disconnect switch.
4. Sequences for disconnecting the battery cables:
 - Disconnect the negative battery cable from the battery.
 - Disconnect the positive battery cable from the battery.

⚠CAUTION

Do not let the disconnected negative battery cable contact with the battery disconnect switch.

5. Inspect the battery terminals for corrosion. Inspect the battery cables for wear or damage.
6. Make any necessary repairs. If necessary, replace the battery cables or the battery.
7. Sequences for connecting the battery cables:
 - Connect the positive battery cable to the battery.
 - Connect the negative battery cable to the battery.
8. Connect the battery cable with the battery disconnect switch.
9. Install the switch key and turn the battery disconnect switch to ON position.

Battery--Recycle

When discarding a battery, its inner material such as lead, acid and plastic shell can pollute the environment due to its outer frayed structure or other reasons. Therefore, do not throw away the old battery randomly, deal with it by collecting for a battery disposal station or put it into a recycle can set by the manufacturer (if there is any) in a local place.

Alternator--Maintain

⚠WARNING

It is forbidden to check the alternator by short-circuiting the negative and positive terminals of the alternator, otherwise the diode will be burnt and the voltage regulator could be affected.

Keep any metallic conductor away from positive terminals of the alternator.

The alternator is a supporting component of the diesel engine. Its working voltage is 24V DC (refer to specification section or the alternator's nameplate for the current value). It has a built-in electronic voltage regulator. Check the connections of the alternator terminals frequently. Connection looseness at either terminal "B+" or "ground" will result in trouble of the electrical system, even cause serious failure.

Turn off the start switch before checking the two terminals for good connection.

⚠CAUTION

The cable of the terminals can not be incorrectly connected, otherwise the diode could be burnt and result in serious failure.

Method of judging whether the alternator works normally and the handling measures:

1. Turn on the start switch and observe the reading of the voltmeter, and then start the diesel engine and observe reading of the voltmeter again. The latter reading should be higher than the former one.
2. You can also use the 200V DC voltage position of a multimeter to check. Turn on the start switch, measure terminal voltage of the alternator (red meter pen connects D+ of the alternator while black meter pen connects the ground), and then write down the reading of the multimeter (in fact, this reading is just the terminal voltage of the battery and generally the value is under 24V DC).
3. Start the engine and increase the engine speed to rated speed. Check the voltage of the alternator again and write down the reading of the multimeter (This reading should be under 24V DC if the alternator works normally). The latter reading should be higher than the former one.
4. In case the alternator does not work:
 - a) Check the drive belt of the alternator for looseness.
 - b) Turn off the start switch, and then use a wrench to check the connections of the alternator terminals.
 - c) Check to see whether the alternator connects correctly to the ground.

Starter Motor--Maintain

The starter motor is a supporting component of the diesel engine. It mainly consists of a solenoid, DC motor, shifting fork and driving gear. The starter motor converts electrical energy of the battery into mechanical energy through the DC motor. Then the driving gear will drive the flywheel of the engine to start the engine.

After the engine starts, the starter motor should immediately stop. Otherwise, the driving gear may be damaged, the DC motor may be burnt, the chock electromagnet may be damaged, and capacity and service life of the battery may also be greatly affected.

It is prohibited to allow any metallic conductor to approach any naked terminal freely. Especially ensure that the other metallic articles around the starter motor will not contact or rub the naked terminal after a long and severe shock or operation of the machine. Otherwise, fire may occur to the machine.

Fuse--Check/ Replace

The fuses protect the electrical system from being damaged due to circuit overload. If the fuse is broken, replace with a new one. Check the circuit if the new fuse is broken again. Repair the circuit, if necessary.

⚠ CAUTION

Replacing fuses with the same type and size from different brands is allowed. Do not use copper wire, otherwise the circuit could be damaged.

It is recommended to use fuse supplied by LiuGong if it needs to replace the fuse when repairing. Do not buy the fuse randomly in the market as fuse of poor quality will bring bad effect to the machine, even could cause a fire.

NOTICE

If it is necessary to replace fuses frequently, an electrical problem may occur. Contact your LiuGong dealer.

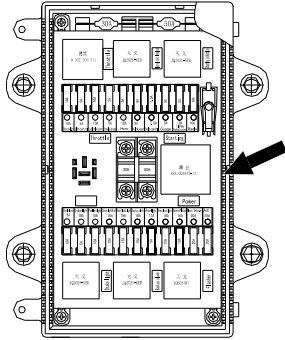
The fuse box is located in the cab on the rear left side of the driver's seat, open the cover to maintain the fuses, as show below:



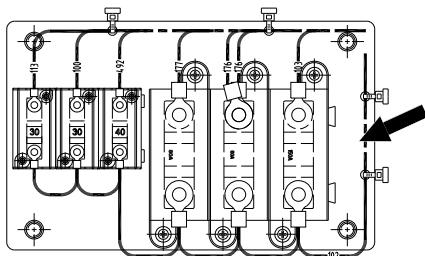
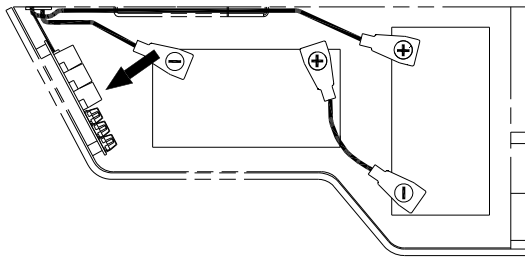
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See the picture inside the fuse box for the fuse distribution.



Other fuses are in the battery box.



Check and replace the fuse as follows:

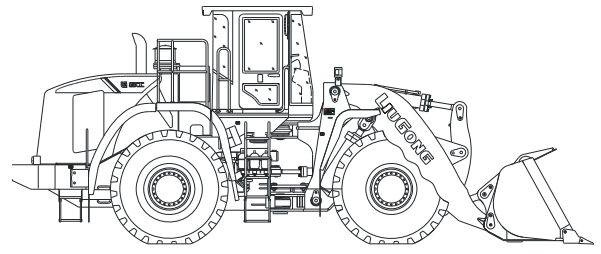
1. Turn the start switch to OFF position.
2. Open the fuse box cover. Take off the broken fuse with a clamp.
3. Replace the broken fuse with a new one with same specification.
4. Install the fuse box cover.

The slice type fuse and flat type fuse that used in this machine should meet the regulation in standard of QC/T420 Fuse-Links for Motor Vehicles.

See the following table for the fuse color:

Model	Color
BK/ATC-5A	Orange
BK/ATC-7.5A	Brown
BK/ATCC-10A	Red
BK/ATC-15A	Blue
BK/ATC-20A	Yellow
BK/ATC-30A	Green

Windows--Clean



Use commercially available window cleaning solutions in order to clean the windows. Clean the outside windows from ground unless handholds are available.

Window Washer Reservoir--Fill

Add washer through the water filler of the washer reservoir.

Washer reservoir location



⚠ WARNING

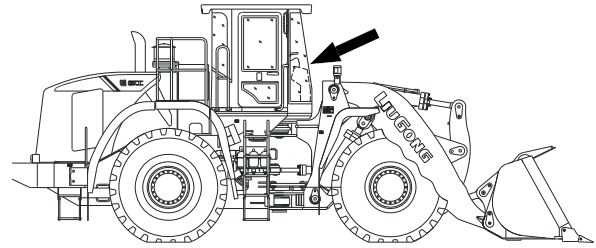
Check the washer reservoir frequently to ensure enough water in it, otherwise dirty windshield may impact the visibility of the operator.

Do not use wiper to wipe windshield when the washer reservoir is out of water, otherwise the wiper motor may be burnt out.

The washer reservoir should be emptied or filled with antifreeze when the ambient temperature is below 0°C, otherwise the washer will not work or even be damaged by being frozen.

As the washer with additive may be harmful to human body, dispose of it according to local laws and regulations.

Window Wiper--Inspect / Replace



Inspect wiper blades. Replace the wiper blade if it is worn or damaged or if streaking occurs.

Backup Alarm--Test

Turn the engine start switch to I or ON position to turn on the power of the machine.

Pull the parking brake button (parking brake handle) up to engage the parking brake.

Turn the engine start switch to II or START position to start the diesel engine.

Turn the shift control lever to REVERSE position, the backup alarm should sound immediately.

The backup alarm will sound continuously until the shift control lever is turned to NEUTRAL or FORWARD position.

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Air Conditioner System

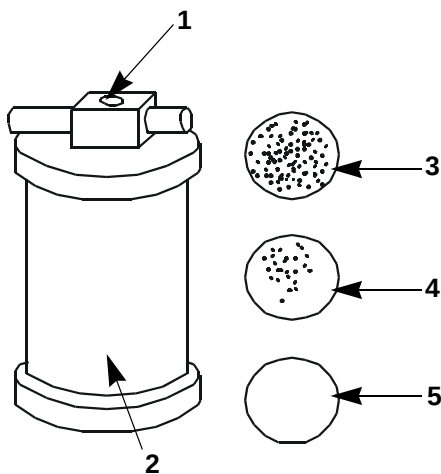
Refrigerant Level--Check

⚠ WARNING

Personnel injury or death could result due to the inhaled refrigerant gas or frog through lighting the cigarette or other smoking ways. Never smoke when maintaining the air conditioner or in the place where refrigerant gas may exist.

After turning on the air conditioner, check the refrigerant in the refrigerant receiver for bubbles through the sight glass to judge if the refrigerant is sufficient or not. Many bubbles indicate refrigerant is insufficient while few bubbles or no bubbles indicate the refrigerant is sufficient.

See the following picture for the refrigerant level:



1. Sight glass
2. Refrigerant receiver
3. Few refrigerant
4. Insufficient refrigerant
5. Enough refrigerant

⚠ CAUTION

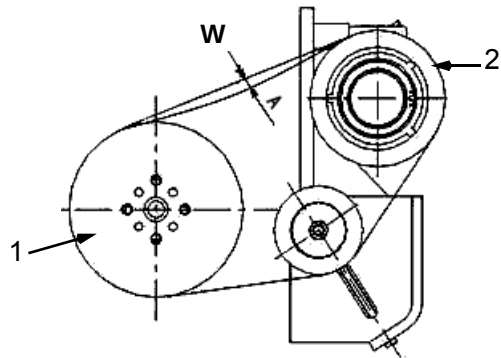
R134a refrigerant is used in this air conditioning system. Do not use other refrigerant or refrigerant with low quality to avoid damaging the compressor.

Do not add excess refrigerant when adding refrigerant to avoid compressor liquid impact damage caused by insufficient space for refrigerant vaporization in the air conditioning system.

If refrigerant leakage is found, check all the joints that connect to the hoses for loose conditions.

Compressor Belt Tension--Check/ Adjust/ Replace

The compressor belt tension: apply($W=15N$) force in the center span of the pulleys (compressor pulley and engine pulley). The deflection of the belt center distance should be $4 \pm 1mm$. See the following picture:



1. Engine pulley
2. Compressor pulley

1. Shut down the engine, open the engine hood to access the air conditioner compressor.
2. Check the air conditioner belt. Replace with a new belt if the belt is not tense. That is, the deflection of the belt center distance is more than $4 \pm 1mm$ when applying ($W=15N$) force in the center span of the pulleys (compressor pulley and engine pulley).

3. Replace the belt if the belt has cracks or splits.
4. Check the air conditioner belt tension with a gauge.
 - a) The used air conditioner belt tension should be $400 \pm 44\text{N}$ when it has run for more than 30 minutes at the rated speed.
 - b) The new air conditioner belt tension should be $534 \pm 22\text{N}$ when it has run in 30 minutes at the rated speed.

Adjusting the air conditioner belt tension as follows:

1. Unscrew the mounting bolt of the compressor bracket and adjust it.
2. Insert a pawl with a square bar into the mounting bracket hole. Rotate the compressor outwards with this mechanism being the lever. Rotate the compressor until obtain a proper belt tension.
3. Tighten the mounting bolt of the compressor bracket and adjust it.
4. Recheck the belt tension. Repeat the above adjusting procedure if the belt tension is improper.

Cab Air Strainer--Clean and Replace

The cab air strainers consist of the fresh air strainer and recirculating air strainer. The blockage condition of the strainers is entirely depending on the working environment of the machine.

! WARNING

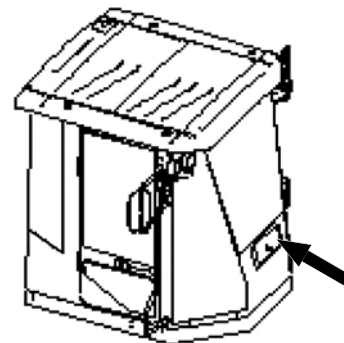
The cab strainers are only intended to separate particles (dust and sundries) from the air. Do not use it for poisonous gas.

The air flow rate will reduce if the recirculating air strainer is blocked, and the effect of cooling and heating will be weakened. The fresh air will reduce if the fresh air strainer is be blocked.

It may be dangerous when using compressed air or high-pressured water to clean dust or dirty materials. Wear protective glasses, shields or other protective devices.

Clean /replace the fresh air strainer

1. Remove the strainer cover fixed bolts on the front downside of the cab, then remove the strainer cover plate and the fresh air strainer.



2. Clean the strainer with compressed air. If the strainer is too dirty or too oily, wash it with neutral detergent. Dry the strainer completely before reuse.

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⚠ CAUTION

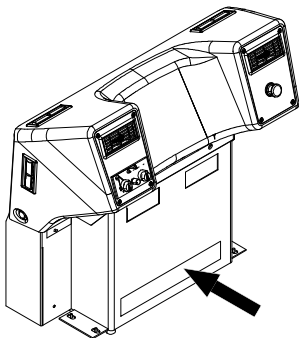
If the fresh air strainer is still blocked or damaged after being cleaned by compressed air or water, replace it with a new one.

3. Install the cleaned fresh air strainer in the groove of the strainer cover, and then install it together with the strainer cover to the original position, screw the bolts at last.

Clean /replace the recirculating air strainer

1. Remove the cover plate bolts underneath the front console of the cab, then remove the cover plate. Remove the recirculating air strainer from the air conditioning evaporator.

Cover plate



2. Clean the strainer with compressed air. If the strainer is too dirty or too oily, wash it with neutral detergent. Dry the strainer completely before reuse.

⚠ CAUTION

If the recirculating air strainer is still blocked or damaged after being cleaned by compressed air or water, replace it with a new one.

3. Install the recirculating air strainer after cleaning it. Install the access door cover plate.

4. Replace the recirculating air strainer every 2000 hours. Choose an air strainer which meets the standard of ISO10263-2.

Compressor--Maintain

NOTICE

R134a refrigerant is used in this air conditioning system.

1. When the air conditioner isn't used in cool weather, such as spring, autumn or winter, it must be started running for about 5 minutes every other week, in order to prevent the system internal moving parts from producing dry friction due to long-term disuse, thus damage the internal parts of the compressor.
2. If the compressor doesn't run for a long time, do not wet the compressor.
3. Do not let oil, water etc. enter into the clutch, otherwise the compressor cannot work normally.
4. Although the bearing being used has waterproof and dustproof protection, in order to prevent function failure, do not wash them if unneeded.
5. Air conditioner system only can be used after the engine is started. After stopping the engine, turn off the power / fan speed switch. (it's better not to start the air conditioner suddenly during high engine speed).
6. Normally, turn the temperature control switch to the High position to decrease the temperature, and turn it to Medium or Low position to keep the temperature.
7. Do not turn the temperature control switch to High position with fan speed switch at low position, otherwise the evaporator could be frosted.
8. In moist weather, air is wet due to humidity. Turn the temperature control switch to Medium cooling position and fan speed switch to Low position to dehumidify.

9. R12 and R134a refrigerant can not interchanged in the air conditioning system. The repairing tools and spare parts for them are also non-interchangeable.
10. R134a is immiscible with the mineral lubricant which is used in the system with R12. Therefore, PAG polyolefin glycol lubricant and synthetic PAG lubricant that contains various additives should be used for a system adopts R134a.
11. Since R134a can dissolve rubber hoses and seals that used in the system with R12, therefore, rubber materials that can adapt to the R134a refrigerant, such as polyethylene-propylene rubber, EPDM. etc should be used.
12. R134a can not use the desiccant which is used in the system with R12, it must use a new type of desiccant, such as XH-7, zeolite.
13. When the air conditioner compressor is stocked for one year, turn the compressor with hands first before installation to ensure that it works well. If the compressor is stocked for more than two years, replace the refrigeration oil and refill nitrogen before installation. (Turn the compressor with hands to drain the old oil as far as possible when changing refrigeration oil).

Other Maintenance

Bucket Teeth--Replace

Check the bucket teeth for wear and for damage. Use the following procedure to service the bucket teeth:

⚠ WARNING

Personal injury or death can result from bucket falling. Chock the bucket before replacing bucket cutting edges.

1. Raise the bucket and chock the bucket.
2. Lay the bucket flatly on the block. Do not place the bucket higher than required height when replace the bucket teeth. Stop the engine.
3. Remove the pin from the retainer of the teeth then take off the tooth sleeve and the retainer.



4. Clean the tooth, pin and retainer. Install the retainer on the lateral slot of the teeth.



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5. Install new tip on the tooth. Drive the pin into the snap ring, tooth, and tip from the side of the snap ring.



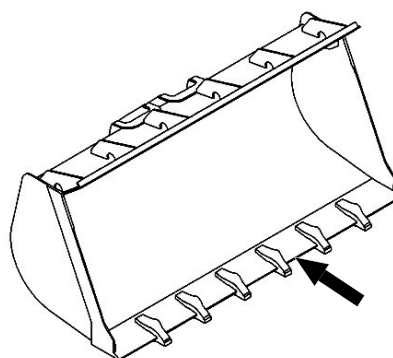
6. Start the engine.
7. Raise the bucket, take out the wedge, and lower the bucket to the ground.

Bucket Cutting Edges--Check/Replace

⚠ WARNING

Personal injury or death can result from bucket falling. Chock the bucket before replacing bucket cutting edges.

Cutting edge



Check the cutting edges and the end bits for wear and for damage. Use the following procedure to service the cutting edges and the end bits:

1. Raise the bucket and chock the bucket.
2. Lower the bucket onto the wedge. Stop the engine.
3. Remove bolts, cutting edge and the end bits.
4. Clean all contact surfaces.
5. If the opposite side of the cutting edge is not worn, use the opposite side of the cutting edge. The end bits are not overturned. If both sides are worn, replace a new cutting edge.
6. Screw the bolts to the specified torque.
7. Start the engine. Raise the bucket and remove the wedge. Lower the bucket to the ground.
8. After a few hours of operation, check the bolts for proper torque.

Seat Belt--Inspect

The driver should check the seat belt for its condition and security before use. Replace it, if necessary.

Adjust the length of the seat belt to ensure its restraint and comfort ability before use. Adjust it by moving its buckle position on the belt.

Replace the seat belt every 3 years even though it is in good condition. A valid date is provided on every seat belt, confirm the use deadline of the seat belt according to it.

For further information of the seat belt replacement, refer to your LiuGong dealer.

Welding Operation

To avoid possible damage to the machine, read and understand the following cautions before welding and always observe the welding operation procedures as follows:

1. Park the machine on flat ground.
2. Engage the parking brake.
3. Turn the pilot shutoff lever to OFF position (if equipped) or turn the hydraulic lock switch to LOCK position (if equipped).
4. Turn off the start switch to stop the engine.
5. Turn off the battery disconnect switch to disconnect the battery and frame.
6. If the machine is equipped with ZF control unit, to avoid damage of it, always remove all connectors of the instruments connected to the machine harness and ZF transmission control unit before welding.
7. If your machine is equipped with other electronic components such as loudspeakers, remove all connectors of the electronic components connected to the machine harness before welding to avoid possible loss.
8. Clear away paint from those parts to be welded to prevent harmful air from production.

9. Clamp the earth cables of the welder with the parts to be welded, keep the earth position close to the welded place. Check and confirm the circuits from the earth cables to the welded parts don't get across any of the following parts:

- Bearings
- Hydraulic cylinders
- Controllers
- Internal circuit of other electronic parts

Any damage to the following parts could be avoided by doing so:

- Bearings
- Hydraulic parts
- Electronic parts
- Other possible parts on the machine

10. Keep any inflammable and explosive materials away from the welding site, protect any cable, do not allow sparks and solders produced in welding to splash onto the cables, thus cause a fire and resulting in loss and injury.
11. Use proper safety welding operation procedures for welding.

Cautions for Welding Operation

- Never use the earth position of the electrical parts on the machine as that of the welder.
- When performing welding near the earth position of an electrical part, always disconnect the earth position of this electrical part, and perform welding operation after ensuring that the welding circuit of the welder doesn't get across this electrical part. Otherwise it will result in damage to this electrical part or even result in a fire.
- Do not keep using voltage above 200V. Keep the welding area and earth cables within 1m (3'3").
- Avoid seals and bearings located between the welding area and earth cables.

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- Never weld any pipe or container with fuel, engine oil or hydraulic oil.
- Never weld any sealed container or container which is poorly ventilated.
- Do not allow sparks and solders produced in welding to splash onto the cables, rubber hoses and other inflammable materials, thus cause a fire and resulting in loss and injury.

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