Attention Please

Subject : Matters needing attention for maintenance and accessories

1. First welcome you to have used our product and thank you for great coordination in business.
2. In case the equipment is in faults, it should be maintained by our Company or the company appointed by our Company using standard parts.
3. At present, In some markets there have been some forged and fake imported parts and some unauthorized and untrained companies or persons to maintain the products of our company, causing many problems left and seriously affecting the equipment performance and operation life.
4. In view of the above, the customers are requested to pay attention to followings:
   1) The adopting of non-standard parts may not have obvious effects on the equipment in short time, however, it will certainly have a series of harmful effects later. In order to prevent the damage to the equipment or the performance deterioration causing severer loss, never use non-standard parts.
   2) When the customer is purchasing the parts, it is necessary to purchase products from our company or the company authorized by our company for selling the parts, and be careful for the discrimination. Welcome to contact our company if there is doubtful phenomenon.
   3) If the customer requires to maintain the equipment, it is requested to contact our company or the company authorized by our company.
   4) In case of the equipment faults arising from the maintenance with non-standard parts or by the unauthorized company or persons, our Company do not bear the responsibilities for the warranty service, even within the Warranty period.
   5) With the improvement of products, the contents of this manual may be lagging behind. Customers in order to obtain the latest product information, please contact our company or our authorized dealer.
5. Thank you once again for the business cooperation at normal times.

With best regards

Special Explanation

Topic: special explanation of fuel system operation and maintenance for loader

In order to let HYUNDAI loader for you to create greater economic benefits, please read this article seriously.

Fuel quality is the important factors of make the engine to obtain fine performance and prolong service life and realize low emission.

The main function of fuel is provide the required energy for diesel engine work and provide cooling and lubrication for fuel inside the system precision components .The market supply of most of the diesel oil can meet HYUNDAI loader installed diesel engine use requirement, but it has to meet the viscosity, cetane number, sulfur content, cloud point, water and sediment content and performance requirements. Among them, the viscosity, cetane number, cloud point and indicators in selecting the right after the diesel brand generally its performance does not change, but the water and sediment index will because transportation, storage, add and maintain undeserved causes such overweight, exceed the prescribed content requirements (less than 0.05 volume percent). So as to increase the wear and tear of diesel engine fuel system, causing the engine starting difficulty, power loss, smoke when fault.

To this end, we please the HYUNDAI loader users and operators must do the following points:

1) Choose conform to the requirements of the use of diesel, don't use small smelter and other production the inferior diesel oil;
2) In diesel oil transportation, storage, added to take appropriate measures to reduce moisture and impurity interfuse;
3) In strict accordance with "The operation maintenance manual "provisions of the maintenance period of fuel system for drainage, filter replacement and maintenance work, and can shorten appropriately according to working environment drainage and filter cartridge replacement cycle.

Thank you again for you choose the HYUNDAI products!

With best regards

Operation & Maintenance Manual

Our Company has the right to continuously improve the products so as to promote the best products to the market as possible as we can. These improvements can be implemented at any time; however, we will not change the materials for the products being sold at that time. The consumers should particularly be reminded of that they should regularly contact with the Agent to ask for the newest information of the equipment.

These information may include the auxiliary equipment and optional ones, but you equipment does not. If you need other devices, please contact with the Agent.

The pictures use in this Manual is only to visually depict the related sections of the equipment and they may be different from the actually installed equipment.

Contents

Safety

TO THE OPERATOR OF WHEEL LOADAR

DANGER

The irregular operation of the loader can cause serious injure and death. When conducting equipment operation, maintenance, traveling or shipment, if the following safety rules are not obeyed, there may be serious and even fatal injury to the persons or heavy damages to the equipment and periphery.

For your safety and that of others, carefully check the factors that can lead to danger to minimize the pitfalls.

WARNING

Follow national and local road regulations

The wheel loader are not designed and manufactured for driving on the road, mainly used for closed roads and fields work. When wheel loader need to be transferred to other working site, it should be loaded on truck or hanging truck for transferring. Do need to temporarily drive on the road, should get the permission according to the provisions of local laws and regulations.

The wheel loader was manufactured mainly implementing the following safety standards:

1. **Mandatory terms in GB 25684.1-2010 <Earthmoving Equipment Safety Part 1: General Requirement>**
2. **Mandatory terms in GB 25684.3-2010 <Earthmoving Equipment Safety Part 3: Wheel Loader Requirement>**

WARNING

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

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

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

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

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

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

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

SAFETY MESSAGES

Safety messages and safety decals included in this manual and on the machine provide instructions how to operate, service and maintain the machine. Safety messages and safety decals indicate potential hazards and describe safety precautions required to avoid hazards. Operator and maintenance personnel should read and understand these safety messages and decals before beginning operation or maintenance.

SAFETY ALERT SYMBOL

Be prepared-Get to Know All Operating and Safety Instructions. This is the Safety Alert Symbol. Wherever it appears in this manual or on safety signs on the machine you must be alert to the potential for personal injury or accidents.

Always observe safety precautions and follow recommended procedures.

Signal Words

The signal words “DANGER,” “WARNING,” “CAUTION” are used throughout safety messages and safety decals in this manual or on the machine. They indicate an existence of, and the relative seriousness of, a hazard. All three indicate that a safety risk is involved. Observe the precautions indicated whenever a Safety Alert Symbol is present, no matter which signal word appears next to it.

CAUTION

CAUTION - This signal word is used on safety messages and safety labels and indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

WARNING

WARNING - This signal word is used on safety messages and safety labels and indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

DANGER

DANGER - This signal word is used on safety messages and safety labels and indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Other Signal Words

In addition to safety signal words, the following signal words are used to indicate proper and effective use of machine.

IMPORTANT

This signal word identifies procedures which must be followed to avoid damage to machine.

NOTE: *The word "*NOTE*" identifies information for effective use.*

We cannot predict every circumstance that might involve a potential hazard in operation and maintenance.

Therefore the safety messages in this manual and on the machine may not include all possible safety precautions.

If any procedures or actions not specifically recommended or allowed in this manual are used, you must be sure that you and others can do such procedures and actions safely and without damaging the machine.

If you are unsure about the safety of any procedures, contact the Agent.

SAFETY DECALS

Safety decals are attached to the machine to alert the operator or maintenance person about potential hazards, the consequences of potential injury, and instructions and/or actions required to avoid the hazard.

The location of the safety decals and the description of the decals are reviewed in the following section.

Please become familiarized with all safety decals and their messages.

Make sure that all the safety decals are in their correct location and legible.

Clean or replace the safety decals if they are damaged, missing, or the texts and pictorials are not legible.

When you clean the safety decals, use a soft cloth, water, and soap.

Do not use solvent, gasoline, or other harsh chemicals to clean the safety decals because this could loosen the adhesive that secures the decals to the machine. Remember, if a safety decal is attached to a part that is replaced, install a new safety decal on the replacement part.

This machine uses safety decals with and without text.

The type and number of safety decals can vary depending upon geographical regions and machine models.

Safety Decals With Text

Safety decals with text consist of a signal word, pictorial and a text message panel.

In some cases, a pictorial panel may not be part of the safety decal.

Safety Decals Without Text (No-Text)

Safety decals without text consist of a safety sign and safety information panel.

The safety sign panel is located at the top or left side and the safety information panel is located at the bottom or right side of the decal depending on its configuration.

The safety sign panel uses a black triangular band and a pictorial to identify the hazard and the potential of the failure to follow instructions. The safety information panel uses pictorials and/or prohibition signs to identify the actions necessary to avoid the hazard.

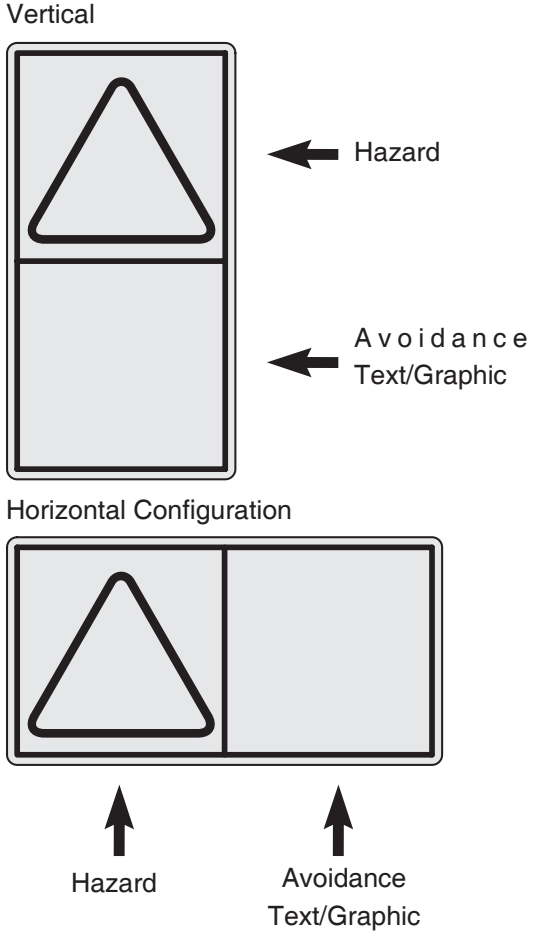


Fig 1

Information and Location for Safty Decals

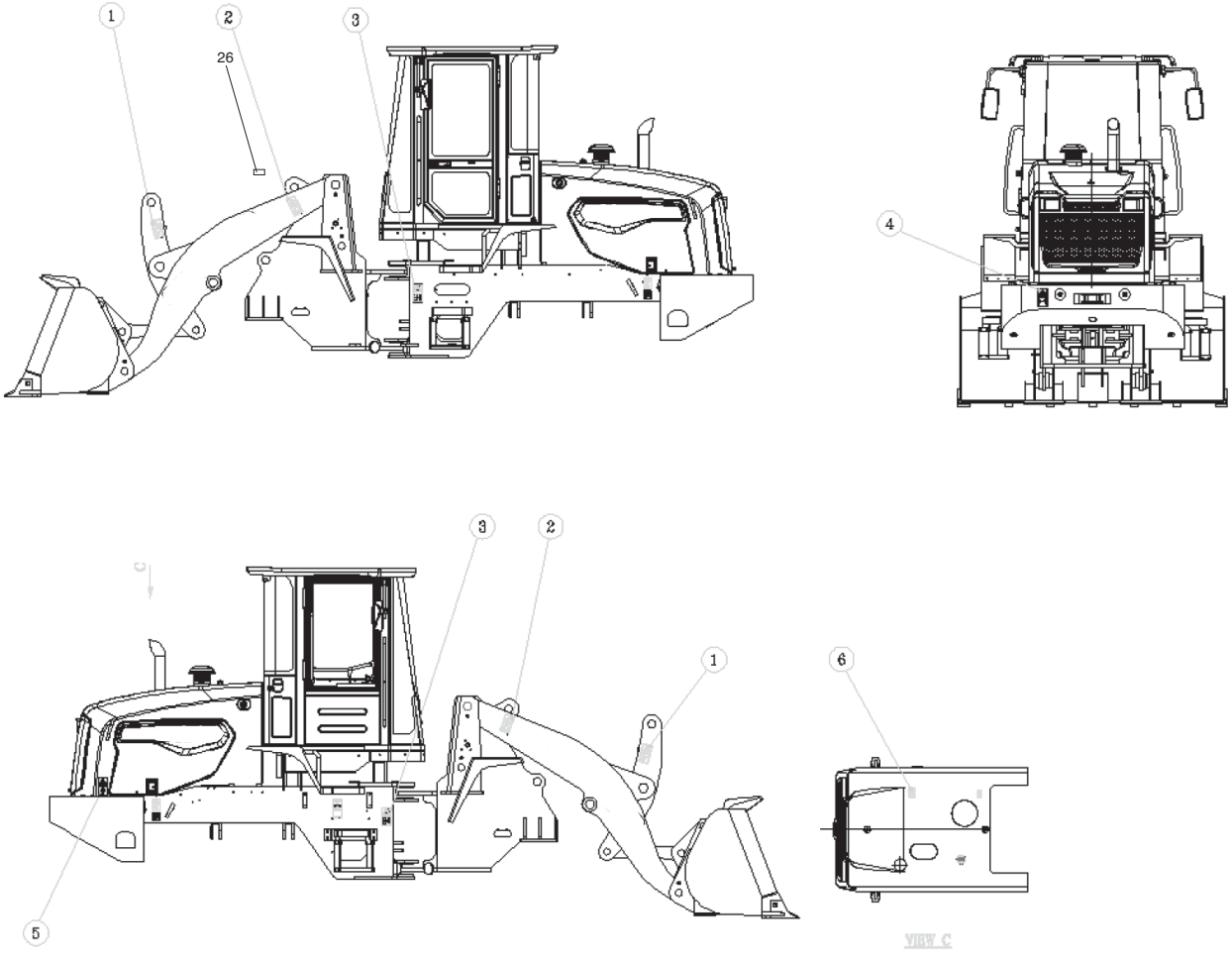


Fig 2

The safety decals are attached to the machine. In this Chapter, the locations and descriptions of these decals will be reviewed in the following section. Please become familiarized with all safety decals and their messages.

Make sure that all the decals are in correct locations and legible. Clean or replace the safety deals if the decals are missing or damaged, or the texts and pictorials are not legible. Use cloth, water and soap to clean the labels. Do not use solvent, gasoline or other harsh chemicals to clean the decals because they may lead the adhesive that secures the labels to the machine, thus causing the labels to come off.

Replace the damaged or lost labels. Remember, if a safety decal is attached to a part that is replaced, install a new safety deal on the replacement part.

1. Never stand under the bucket.

Fig 3

2. Never stand under the moving arm.

   Sudden or accidental movement of boom may cause injury or death.

   Securely brace boom before working or walking under raised boom.

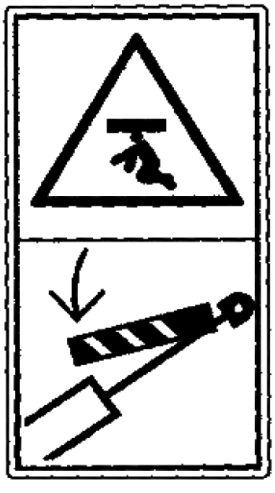


Fig 4

3. Severe injury and death from crushing could occur in articulation position when machine turns.

   Make sure people are clear of machine beforestarting engine or moving steering wheel.

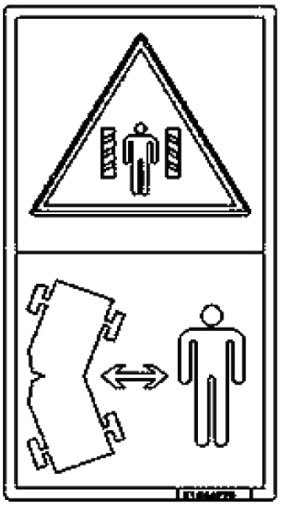


Fig 5

4. Standing here is strictly prohibited while the machine is moving. Otherwise, it will cause serious injury or death accidents.

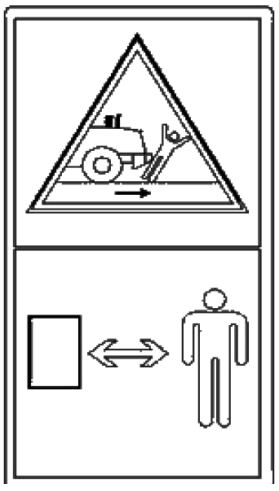


Fig 6

5. Keep your hands away from the fan during operation. Entanglement in the fan can cause serious injury.

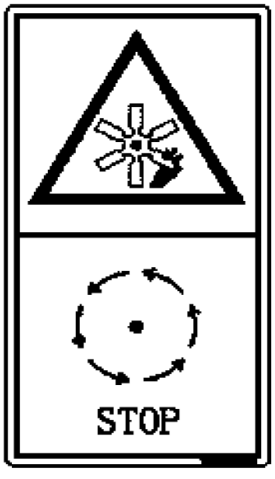


Fig 7

6. High temperature, NO touch.

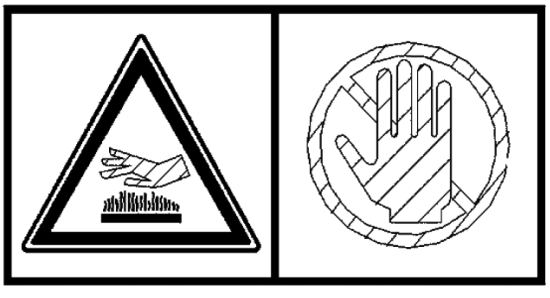


Fig 9

UNAUTHORIZED MODIFICATIONS

In case of the safety accidents arising from any modification without authorization by HYUNDAI, the Owner shall bear the respon-sibilities.

As a safety precaution, all OEM parts must be replaced with the correct authorized or genuine HYUNDAI parts. If the fasteners, bolts or nuts are not regularly replaced with correct spare parts, it may cause these parts to exceed the safety limit of operation.

GENERAL HAZARD INFORMATION

Safety Regulation

Operation and maintenance of the loader should only be carried out by authorized professionals with the requisite training.

Strictly follow all safety regulations, warnings and requirements when performing operation and maintenance.

When feeling ill or tired for taking medication or not adapt to the environment,you should not operate the machine. These prob-lems will interfere with your sense of judgment in emergencies and may cause accidents.

When working together with another operator or with a person on work site traffic duty, it is necessary to ensure that all per-sons know the nature of the work and understand all hands sig-nals that are to be use.

Always observe strictly any other rules related to safety.

Safety Features

Ensure all the guards and covers are installed in proper posi-tion. Repair immediately if damaged.

Be sure that you understand the methods of all safety features such as seat belt, and perform the correct operation.

Never remove the safety features, and keep them in good oper-ating condition.

Incorrect operation of the safety features may also cause seri-ous bodily injury.

Matters needing attention in cabin

When entering the cabin, remove the mud and oil from the soles of your shoes, otherwise, the accident will occur when you step on the accelerator pedal due to the slippage on the sole.

Do not stick suction pads on the window glass, because the suction pads could act as a lens which can cause the fire.

Do not leave lighters laying around the cabin. If the temperature inside the cabin becomes high, there is a danger that the lighter may explode.

Do not use mobile phone when you are operating the loader.

Never bring any dangerous objects such as explosives, inflammable goods into cabin.

To ensure the safety, do not wear earphone when you are operating the machine. Otherwise, the serious accident will occur.

Do not put your head and hands out of the window when you are operating.

Ensure the engine has already been shut off when you are leaving the seat. Otherwise, if you negligently touch the operation lever, the equipment will move and the accident will occur.

Lower the working device down to the Ground and shut off the engine when you leave the equipment. Use the key to lock all places and then pull out the key to carry it with you.

Clothing and personal protective items

Secure long hair, and avoid loose clothe and jewelry. These items have the tendency to catch on controls or into parts and cause serious injury or death.

Do not wear oily clothes, because they are flammable.

Use the goggle, helmet, safety shoes, and gloves in the working area.

Do not use the tools without enough strength when performing the maintenance of the equipment. Otherwise it will cause the injury arising from breakage or slippage, or make the installation unqualified.

Fig 9

Breathing masks & Ear Protection

Do not neglect the factors which do not have direct hazardous impact on the health. The waste gas and noise pollutions are invisible, but they can cause disability or permanent injury.

Mounting and Dismounting

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

Never jump on or off machine. In particular, never get on or off a moving machine. These actions can result in death or serious injury.

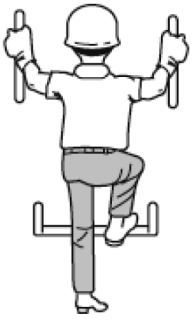
When getting on or off machine, always face machine. Maintain a three-point contact (both feet and one hand or one foot and both hands) with handrails and steps to ensure that you support yourself securely.

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

Securely latch door. If you grip handrail inside door when moving on platform outside of door, and door latch is not securely engaged, door may move and cause you to fall resulting in death or serious injury.

Use points marked by arrows in diagram when getting on or off machine.

Do not carry tools or supplies when you mount or dismount the machine.



HA3O1003

Fig 10

Fire Hazards for Fuel, Oil and Hydraulic Oil

If fuel, oil and anti-freeze fluid are put close to the fire source, it is easy to cause fire. In particular, the fuel may cause extreme danger.

Pay strictly attention to the following conditions:

Make sure the premises are well ventilated when the fuel, oil, anti-freeze-fluid and hydraulic oil are filled in. Switch off the lamp, control lever and the starter switch after the machine is shut off. Shut off the engine. The equipment should be far away from the flame and heating element. The auxiliary heating element or the equipment which may cause sparks must be quenched, switched off and move away from the loader.

Static can produce electric sparks at the oil filler. When it is cold or dry, or in other conditions which easily cause the static, it is necessary to make the oil filler always contact with the oil-filling pipe, so as to guarantee a good grounding.

The covers for fuel tank and other liquid tanks shall be tightened. Strictly prohibit from starting the equipment before tightening.

Fig 11

Precautions When Fluids at High Temperature

When the operation has just been stopped, the temperature of coolant, engine oil and hydraulic oil is very high, and there is still pressure in Radiator and hydraulic tank. In this case, opening the cover to drain the oil or the coolant, or replacing the filtration element will cause burns. It is necessary to wait for the temperature to go down and perform the operation according to the specified procedures.

In order to prevent the splashing of HT coolant and oil, it is necessary to shut off the engine, and wait for cooling of coolant oil, then slowly loosen the cover to release the pressure.

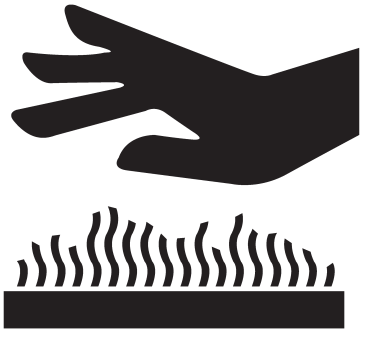


Fig 12

Fig 13

Coolant

- During operation, the temperature of the engine coolant is higher and there is pressure in the engine. All piping lines connected to radiator or to engine have hot water or steam in them. The contact with them will cause severe burns.
- When checking the coolant liquid level, the engine must be shut off, and the water filler cover must be cooled down to the extent that it can be opened by naked hand.
- Slowly loosen the water filler cover for the cooling system to release the pressure.
- The coolant of cooling system contains Alkali, so it is prohibit to make it contact with skin and eyes. It is not appropriate to be drunk. Moreover, cooling down the coolant before drain it out.

Asbestos Dust Hazard Prevention

Inhaling asbestos dust can be hazardous to your health. If the material you work with contain asbestos fiber, please obey the following regulations:

- Use dust-filtration mask.
- Prohibit using compressed air to purge.
- Use water to clean to prevent from kicking up dust.
- Whenever you operating the machine, make the air blow against your back.
- Obey the related laws and regulation on site.

Fig 14

Injury arising from working equipment

Do not put hands, arms, or other body parts between the moving components (e.g., between the working devices and cylinder or between equipment and working devices).

The gaps between equipment and working devices will change during operating the operation lever. In this case, the careless operation will cause serious faults or personal injury.

If it is necessary to enter the places between moving parts, fix securely the working equipment to make it not move.

Fig 15

Fire extinguisher and first-aid kit

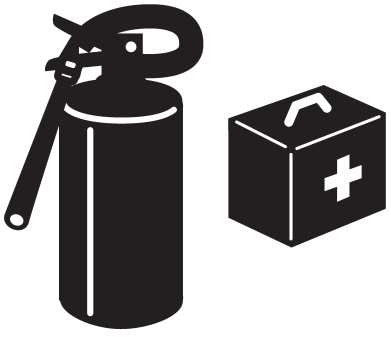


Fig 16

In case of personal injury or fire happened, please operate as follows

- Find the Fire extinguisher and carefully read the operation description on it to ensure that you can use it. It is recommended to use the multi-functional “A/B/C” Fire extinguisher with a weigh of greater than 2.27 kg [5 lb]. Put the fire extinguisher in the cab. Regularly check and maintain the fire extinguisher and conduct the effective training for the field personnel.

Put one first-aid kit inside the reserved box, and put another on the site. Regularly check for the necessary of supplement of first-aid kit.

- Know what to do in case of injury from fire.
- Keep emergency numbers for doctors, ambulance service, hospitals and fire stations and put them by the side of the telephone set.

If the equipment catches fire, it may cause serious personal injury or even death. In case of fire during operation, escape from the machine as follows

- Shut off the starting switch, and stop the engine.
- If there is time, use the fire extinguisher to put out the fire as far as possible.
- Use handrail and steps to escape from the machine.

The above is the basic method to escape from the equipment. However, the method can be changed if necessary according to the actual conditions. Therefore, it is necessary to conduct the escape practice on site.

Prevent from falling objects or flying objects

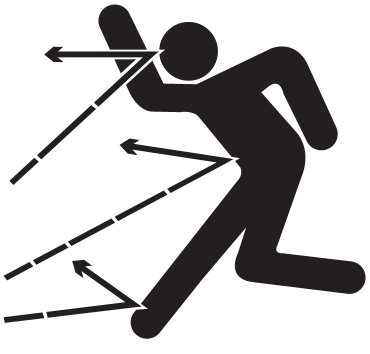


Fig 17

The collision of falling objects or flying objects on site with the cab may cause dangers. Please select the protective devices under appropriate operation conditions to protect the drivers.

Working in mine, tunnel, deep pit or on soft and wet surface, it is possible to have the dangers from the falling stones or flying objects. The protective facility must be installed for the cab, and it should accord with the requirements from FOPS (protective devices for falling objects) or from protective devices for windows.

Prohibit reforming or changing any forms of protection structure by adding reinforcing devices (e.g., drilling hole, welding, re-installing or re-installing fasteners etc.). The re-identification of the whole protective system is needed for the protective system which has suffered severe impact or damage. Re-installation, re-authentication, or replacement of system is needed if necessary.

If there is the danger for the persons to be injured by the object impacting the cab, please contact with the Agent and ask for the effective safety protective devices and related recommendations. Ensure all other field personnel should be away from the loader and not threatened by potential dangers.

Fig 18

When you use crusher in operation, the protective devices should be installed on front windshield glass. Please contact with the branch organization for the recommendations.

When performing the crushing operation, it is needed to install the thin plate on the front glass. We recommend you should contact with Agent.

When performing the cutting and destroying operation, it is needed to install the front and top protective plate, meanwhile, it is needed to install the thin plate on the front glass.

At the places where there is the danger of falling stones such as in mine quarry etc., please install FOPS (protective devices for falling objects), and install thin plate to protect the front glass.

If any glass of the machine is broken, please immediately replace it with a new one.

Protective measures for attachments

The optional attachments shall be provided by agent. If you need unidirectional action and bidirectional action hard pipe, flange and auxiliary control devices, please contact with our Company. Because we can not expect, prove or check all working devices the customers want to install, please contact with our Company to ask for the authentication certificate for the attachments and the compatibility authorization certificate for the equipment and working device.

Battery

- During operation, the battery can produce combustible gases which may cause explosion.
- Do not smoke while checking the level of electrolyte of the battery.
- The electrolyte is an acidic substance, and it will hurt the persons when it touches with skin or eyes.

Aether (if your machine is equipped with Aether cold starter)

- Aether is a toxic and combustible substance.
- Inhaling Aether vapor or frequent touching of skin with Aether will cause personal injury.
- There shall be adequate ventilation in the areas where Aether is used.
- Do not smoke while replacing the Aether tank.
- Pay attention to fire protection when using Aether.
- Do not put the replaced Aether tank in the living area or in the cab.
- Do not put the Aether tank in a place with direct sunlight or with an ambient temperature exceeding 39℃ (120 F).
- Put the discarded Aether tank at a safety place. Do not drill hole in it or heat it up.
- Put the Aether tank far away from the place where the non-working persons are living.

Tire

That the fully inflated Tire may be exploded is due to the heating inside of the Tire. Generally, heating is caused from the welding or heating of rim, the external flames or the too frequency of braking.

The explosion of Tire is much more powerful than air bleeding. It can make Tire, rim, and driving parts fly off over a distance of more than 500 meters. The explosion power and fragments may cause the personal death and property damage.

In order to prevent the excess air charging, the appropriate equipment and personnel are needed. The air leakage or rim damage are due to the incorrect use or misuse of the air charging device.

When charging the air, you should stand on the side of the Tire and use the cock with auto-clamping clamp.

The replacement and maintenance of the Tire may be dangerous. Therefore, the trained persons are needed to perform the maintenance and replacement of Tire, and shall perform the maintenance strictly according to the operation specifications provided by Tire or rim provider or by agent.

Indoor ventilation

The exhaust from the engine may cause fatal injury and death accidents, making people lose consciousness and lose alertness, judgment and control ability, thus inducing severe accidents.

Confirm a good ventilation before starting engine in an enclosed area.

Be careful for the opened doors and windows, because the waste gases may enter or may be blown in through them, thus inducing dangers.

Fig 19

BEFORE STARTING ENGINE

Matters needing attention on site

Before starting, completely check the working area for the abnormal conditions which may cause dangers.

Check the terrain and ground surface on site, and identify the best and the safest operation method.

Before operation, please make the ground hard and smooth as possible as you can. Please sprinkle some water on the ground before operation if there is a lot of dust or sand on site.

If it is needed to work on the street, please arrange one person to ensure the safe operation for the vehicles on the site or erect a fence and stick the labels on site such as “NO ADMISSION” as well as use other methods to prevent the pedestrians from getting near or entering the site. If some body wants to approach the machine in operation, he (she) may be stricken or hooked so that he (she) may be caused serious injury or death.

There may water piping, gas piping, telephone cables or HV cables buried underground. Please contact with Utility Department and identify the positions where you are to avoid cutting any piping or lines.

Before conducting the operation or passing the river in water, please check the riverbed, the depth as well as flow of water. You must not work in the water with a depth greater than the allowed ones.

There is the potential danger for any objects around the moving arm where the accident easily occurs because there is little time for the driver to act. When you are working in the vicinity of bridge, telephone lines, site scaffoldings or other obstacles, the observer or signaler are needed for the assistance.

When the minimum standard or operation restrictions for barrier protection on site is less strict, the insurance responsibilities scope and the operation license or certificates can be issued by the institutions authorized by the Government; it may be needed to follow the restrictions on laws and regulations, policies, standards or equipment required by local authorities; Moreover, you may have to implement the regulations related to the special operations. Please contact with local authorities and related departments if you want to know whether your machine and the site environment comply with the laws and regulations.

Avoid entering the soft ground. Otherwise it is difficult for the machine to leave.

Avoid working on the edge of cliff, on the suspensory or in the deep pit, because the grounds in these areas are easily broken. If the ground surface is collapsed, the machine will fall or tip-over to cause serious injury or death. Please remember that the earth is very soft in this area after raining, explosion operation or earthquake.

The soils piled up on the ground or by side of the channels are very soft which will be collapsed under the vibration of the machine to cause the machine to tip over.

Please install cab protection device at the places where there is the danger of stone falling.

Check before starting engine

Perform the inspection each day before starting the engine. Otherwise, you will have danger of serious injury.

Completely remove all wooden chips, tree leaves, grass, paper scraps and other combustible substances piled up around the engine and the batteries. These substances may cause fires. Remove the dirt from the glass, mirrors, handrails and footsteps.

Do not randomly put the backup tools and components which should be put in the reserved box in the cab. Otherwise, they will fall or will be damaged or will break the control handle or switches due to the vibration when the machine is travelling or operating. Moreover, there is also the possibility for them to be stuck in gap of the handle, making the working device in fault or moving dangerously which can cause the unexpected accidents.

Check the level of coolant, fuel and hydraulic oil, and check air filter for blocking or the cables for damaging.

Adjust the seat to the position at which the operation is easily performed. Check the seat belt and fasteners for the damage or wear.

Check the Instrument position and the mirror angle, and check the operation lever for the normal position.

Please perform the maintenance immediately if the abnormalities are found during aforementioned inspections.

Start the engine

Walk around and check the loader before entering the cab. Check for oil leakage, loose, improper adjustment of components or the possible damage phenomenon of other equipment.

In order to prevent the accidents, all cover plates and protective devices for the equipment shall be complete when operating the machine.

Check the working area for any potential dangers or for any other threatening factors to the safety during operation.

Please follow the warning sign on the control lever, and strictly prohibit starting engine during repair or maintenance.

If the machine has been used recently or if the temperature is too low, it is needed to preheat and perform the maintenance before starting.

Before starting the engine, check the instrument and monitor for the normal conditions, the sound for the normal conditions. When the operation begins, be alert for abnormal souffle and the potential unsafe factors.

When starting the engine, do not make the motor being started short circuited. This will be not only dangerous, but also be a risk of damage to the machine.

When starting the engine, it is necessary for the horn to sound to issue the warning.

Start and operate the machine only while seated.

Before operating loader

If you do not correctly check after the engine is started up, then you may not timely find the abnormalities of the machine so that the personal injury or machine damage could occur.

- Check the machine at a place without any obstacles, and do not let anybody to approach the machine while you are checking.
- Check the operation of the equipment, and the actions of big arm, travelling and rotary system.
- Check the machine for the abnormal noise, vibration and overheat, peculiar smell or the abnormality of Instrument. Check for the air leakage, oil leakage.
- Please perform the maintenance immediately if the abnormalities are found. Otherwise it may cause accidental injury or machine failure.
- Do not let any person to stay near the machine or in the working area.
- Remove all obstacles on the path along which the machine travels. Be aware of the dangers.
- Keep the windows clean. Ensure the doors and windows are at the safety positions: OPEN or CLOSE.
- Adjust the rear-view mirror to have the best view. Ensure that the horns, travel alarm device (if any) and other alarm devices are in good working conditions.
- Fasten the seat belt.
- Warm up the engine and hydraulic oil before operating the machine.

OPERATION OF LOADER

Inspection after starting engine

If you do not correctly check after the engine is started up, then you may not timely find the abnormalities of the machine so that the personal injury or machine damage could occur.

Check the machine at a place without any obstacles, and do not let anybody to approach the machine while you are checking.

Check the operation of instrument and equipment. Check bucket, boom, brake system, transmission system and steering system for the normal working.

Check machine sound, vibration, heat, smell or instrument for any abnormalities: check for leakage of hydraulic oil, lubrication oil, gas or fuel.

Please immediately perform the maintenance if any abnormality is found. If the machine is working under the improper conditions, it will cause serious injury or damage.

efore traveling or starting operation, check the bumper for locking front/rear frame. The bumper shall securely lock onto the “Release” position.

Inspection after starting engine

- Before traveling, re-check the surrounding of the machine to conform that there is nobody and no obstacles there.
- When traveling,it is necessary to sound horn to issue the warning.
- The machine can be operated only by the person sitting on the operator seat.
- Attach the seat belt.
- Nobody shall be allowed in the cab except the operators. Nobody is allowed to sit on the machine body.
- The reverse warning alarm device shall be check for normal work if any.

Matters needing attention on travelling

Never put the key in the starter switch to SWITCH OFF position when the vehicle is traveling. It is dangerous for the engine to be switched off when it is traveling, because the steering becomes very serious.

If the engine is switched off, it is necessary to immediately apply brake to stop the machine.

It is dangerous to glace to the left and to the right while operating .Full attention is required for operation.

It is dangerous to travel fast, or start abruptly, stop suddenly, turn sharply or travel in a zigzag mode.

If any abnormality is found in the machine (noise, vibration, smell, incorrect instrument indications, gas leakage, oil leakage etc), it is necessary to drive the machine to a save place and look up for the causes.

Adjust the working device height down to a place where the boom's lower hinge pin is 500 - 600mm (20 - 24in) over the ground. Then travel on the ground.

Do not operate the pilot control lever of the working device while the machine is traveling. If it is necessary to do so, first stop the machine, and then operate the pilot control lever.-

Do not abruptly operate the steering wheel. If so, the working device will touch the ground surface and the machine will lose its balance, or the machine itself or the structures around the machine will be damaged.

Drive slowly and avoid suddenly turn a direction while traveling on the rugged ground.

Try best to avoid crossing the obstacles while the vehicle is traveling. If the machine must cross an obstacle while traveling, it is necessary to let the working device travel close to the ground at a slow speed.

Keep the distance from this machine to other machines or to the structures while performing operation to prevent from the collision.

If the machine is transported on water, it is not allowed to exceed the permitted water depth.

When the machine passes the bridge or the buildings on private territory, it is necessary to first check whether their strength can support the weight of the machine. When the machine travels on the public road.it is necessary to first accord with the regulations of the related authorities and comply the related regulations.

When the machine travels on the public road.it is necessary to comply with the traffic regulations. The traveling speed of this machine shall be lower than the normal speed of the vehicle. Travel on he side of the road, and pay attention to retain the central portion of the road to other vehicles.

f the machine is driven at a high speed for a long time, the tires will be overheated, and the internal pressure in the tires will change to be extremely high. This will cause explosion of the tires. If the tire is exploded, it will produce extremely powerful destructive force, thus able to cause serious injury or accidents.

If you are prepared to perform the continuous traveling, please consult the distributor specified by HYUNDAI Co., Ltd.

Inspection when the direction changes

In order to prevent the injury or death, it is necessary to comply with following regulations before moving the machine or the working device even the machine is equipped with alarm device and rear-view mirror:

- Sound the horn to warn the personnel on the site.
- Check the vicinity of the machine for nobody being there. Especially watch the rear of the machine, because this is the area which could not be seen clearly by the person sitting on operator seat.
- When working in the conditions at risks or under conditions with bad visibility, please designate one specially-assigned person to direct the traffic.
- The unapproved persons can absolutely not enter the area in the steering direction or in the traveling direction.
- Do not change the travel direction at high traveling speed.

BCO0590S

Fig 20

Operation on slope

Be especially careful for that travelling on the slope will cause the machine to sideslip or tip-over.

The shovel must be 200-300mm over the ground while the machine is travelling on the slope. In an emergency, lower the bucket quickly down to the ground to assist the stop of the machine.

Do not make a turn on slope, nor traverse on slope. You should drive the machine down to the flat ground to perform these operations.

When driving down the slope, it is absolutely not to shift gear or put the gearbox onto Neutral Gear. Not using the braking force of the engine is dangerous. Put the gearbox onto low speed gear when the machine begins driving down the slope.

When driving down the slope, it is necessary to use the braking force of the engine, and travel at lower speed. Use also, if necessary, use the brake pedal to control the travelling speed.

Do not travel at a high speed on grasses, tree leaves or wet steel plate. If doing so, even a very small slope also make the machine slip towards one side. Therefore, it is necessary to travel at a low speed.

The machine shall be right up or down the slope while the machine is travelling on the slope.

When the machine is travelling on ground, if the engine is switched off, it is necessary to immediately and completely depress the pedal to apply the braking to lower the bucket down to ground for fixing the machine.

If the machine travels up or down the slope with load, you should let the bucket face the UP slope direction (i.e., face forward when travelling up, and face backward when travelling down). If the machine travels on the slope with load on the bucket, if you let the bucket face the DOWN slope direction, the machine will have the risk of tipover.

Matters needing attention on travelling on slope

Do not jump onto the incontrollable machine to shut it off, otherwise you will have the risk of serious injury.

Travelling on the slope will cause the machine to tip-over or slipping.

Keep the bucket at a position 20-30cm (8-12in) over the ground while the machine is travelling on the hill, on the dyke or on the slope. Please immediately lower the bucket onto ground in an emergency to assist the stop of the machine.

Do not travel on grasses, tree leaves or wet steel plate. Even a small slope can make the machine slip towards one side. Therefore, drive slowly to ensure the machine always travelling right under the slope or right over the slope Avoid changing the travelling direction while the machine is travelling on the slope, otherwise it will cause tip over or sideslip.

Operate the machine under or over the slope as much as possible. Avoid traversing the slope.

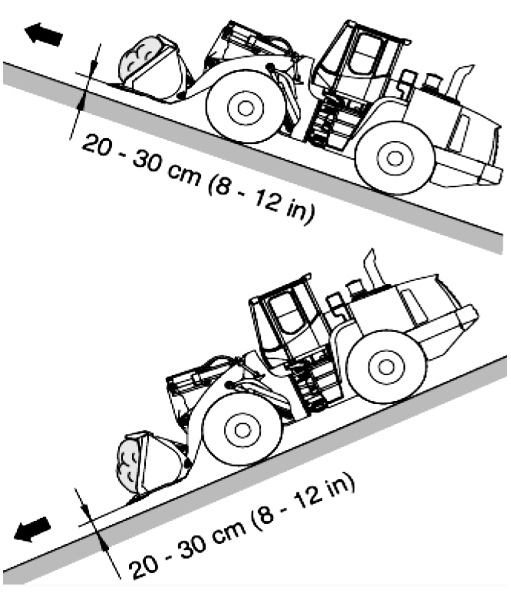


Fig 23

Prohibited operations

Do not shovel the working face under the highland, otherwise it will cause the highland to collapse, making falling objects tramp onto the top of the machine.

Working with heavy load on soft, unsmooth or cracked ground may cause the possibility of dangerous side force and tipover. Travelling without load or with unbalanced load is also dangerous.

Do not use jack or other inappropriate objects as the support while working.

Do not exceed the load ability of the machine (the maximum load and stability depend on the equipment structure) while operating in order to prevent the accidents induced from the equipment damage and tipover for the overload of the machine.

Matters needing attention on operating

Be careful not to approach the edge of the cliff.

If the machine is used for other operation, it will cause the operation to fail.

In order to ensure a good view, please obey the following items:

- Be equipped with work lamp and head lamp while working in a dark place. Install the lighting device on site if necessary.
- Stop working when the light is darker, such as in smoke, raining, snowing. The work could not be restarted until the view is restored to the extent that the operation can be guaranteed to perform without problems.
- In order to avoid the striking the working device, please obey the following items:
- When the machine is working or stored in the tunnel, bridge, under electric cables or in a place where there is the restriction on the height, please particularly pay attention to not touching with the bucket or other parts.
- In order to prevent the collision, please operate the machine at the safety speed in a tight space, in the room, or in a crowded area.
- Do not put the bucket over the head of the worker or over the cab of the dump truck.

Be careful for HV cables

The touching of machinery with or the approaching of machinery to HV cables may cause serious injury or death. Prohibit the approaching of bucket to electric cables.

The driver shall leave far away from the electric cables with assistance of observer and sign language when the driver's sight line is not clear.

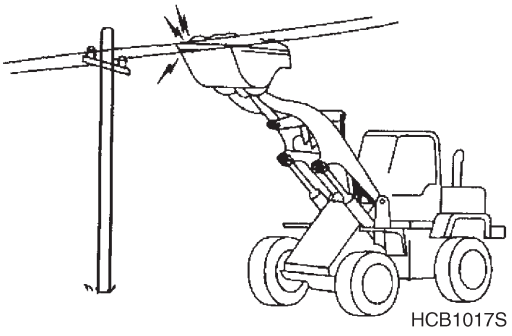


Fig 24

Voltage	Minimum safety distance
6.6KV	3m(9' 10")
33.0KV	4m(13' 1")
66.0KV	5m(16' 5")
154.0KV	8m(26' 3")
275.0KV	10m(32' 10")

The minimum distances listed this table are only for reference. The strong electric shock may still occur even the distance from the big arm or the bucket to the electric cable is 4- 6m (13-20ft) when the voltage and atmosphere condition changes. The safety range will be greatly reduced under HV or raining conditions.

NOTE: *Make contact with Electric Power Company and stipulate a safety plan together with the said company before approaching to the electric cables (cables above or underground) to perform any forms of operations.*

Be careful for operation in ice and snow places and in very cold weather

Avoid travelling suddenly in cold weather, and do not enter the very slippery slopping surface. The equipment may slip suddenly towards one side. The accumulated snow may hide or produce the potential dangers. Take special care for it when you remove the snow by operating or using the equipment.

In order to prevent the slow action and working performance degradation, it is necessary to slightly raise the temperature. The vibration or impact load induced form the large amplitude of actions of big arm and working device may cause violent stress, therefore, it is very necessary to reduce working speed and load.

When the temperature is increased, the frozen road surface will be softened,therefore, the machine will be unstable when it is travelling.

Do not directly touch on the metal surface with hands in cold weather, otherwise, the skin will be stuck on the metal surface.

Parking the machine

After the operation, avoid sudden switching-off or shutting-off. Park the loader on a hard plane, far away from traffic lines and high walls, cliffs, and edges of pools and drainage ditch. If the machine must be parked on the slope, it is necessary to stop up the Tires to prevent from moving, and lower the bucket and other working devices down to ground or on the supporting bases. There should be no possibility of unexpected actions.

When parking on the highway, you should set the guard bars, marks, warning labels to ensure that the passing vehicles can see clearly the machine, and make the machine, flags and guard bars not hinder other vehicles.

All switches and operation levers must be switched off after the parking the vehicles during night.

Close the cab doors

Prohibit other persons sitting on the working device

Do not let anybody ride on the attachments such as bucket, crusher, otherwise it will cause the persons falling off or serious injury.

Fig 25

MAINTENANCE

Warning labels

Warn of that others persons are performing the maintenance, and hang the warning sign on cab control device and other necessary places.

Our company branch organizations provide control warning signs.

ARO1320L

Fig 26

Requirements on personnel

Operation and maintenance of this machine may only be carried out by personnel equipped with corresponding resources. The persons irrelevant with current maintenance and repair work shall keep away from the work area. You can specially designate the persons to watch if necessary.

Be especially careful for performing cutting, welding or using hammers.

One person in charge shall be designated before starting of disassembling or mounting operation in the vicinity.

Do not let any non-working persons to approach the machine or accessories.

Perform the cleaning work before maintenance

Perform the cleaning work before inspection and maintenance to prevent the dust from entering the machine and ensure the maintenance can be securely performed.

If the machine is dirty when it is checked, it is difficult to locate the fault, and there is the risk of dust and mud entering the eyes or of the personal injury. Please obey the following items when you clean the machine:

- Wear the shoes with anti-slippage heels to prevent from slipping at the wet places.
- Wear goggles and work clothes when you clean the machine by using HP water gun.
- Adopt the protective measures to prevent HP water flow from cutting skin or prevent the mud from entering the eyes.
- Do not sprinkle water directly onto the electronic components (sensors, connectors) (1, Fig. 20). If the water enters the electrical system, it will cause the failure or faults.

Pick up any tools in working area, rub up all lubrication oil, oil and other lubrication substances, and clean the working area to facilitate the safety operation. If the working area is not clean or tidy, it will cause tumbling or injury.

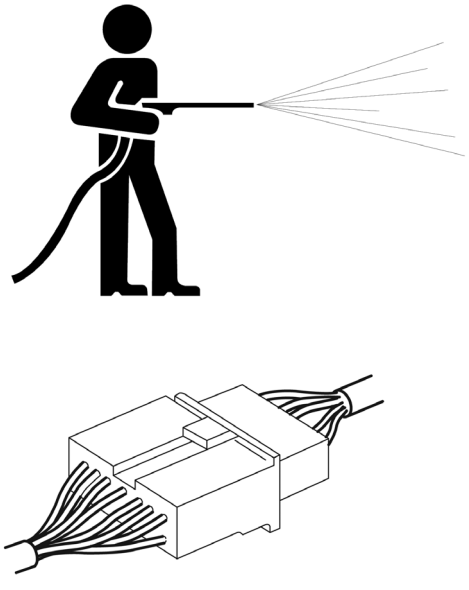


Fig 27

Proper tools

Use tools which are proper for the operation. The use of damaged, low quality, unqualified or temporary tools may cause the personal injury. The scraps from chisel or hammer are very dangerous, and they will cause the persons to be blind.

Fig 28

Operation of lighting devices

The explosion-proof lighting devices should be used for checking fuel, oil, battery electrolyte or detergent. Otherwise, there will be the risk of explosion.

Working in dark without using lighting devices may cause persons to be injured. Therefore, it is necessary to use appropriate lighting devices.

Do not use lighter or flames to replace the lighting devices even it is dark in working area, otherwise, it will cause fire. Tourmaline (gas) lamp also has the risks on fire and of explosion.

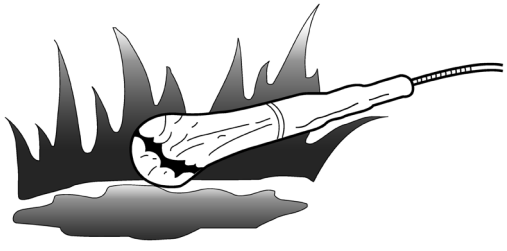


Fig 29

Fire protection and anti-explosion

All fuels, most lubrication oils and some coolant mixture are combustible. If the fuels are leaking or splashing onto the HT surface or on the electronic components, the fire will break out.

Put all fuels and lubrication oils at the specified places and make them far away from the unauthorized persons.

Put the oil foot and the combustible substances in the protective containers.

Prohibit smoking when the machine is oil-filled or is in the oil-filling area.

Prohibit smoking in the Battery Charging Area or in places where there are combustible substances.

Clean and tighten all cable connectors and check the cables for loose or wear every day. Tighten all loose cables and repair all worn cables before operating the machine.

Timely clear the combustible substances accumulated on the machine.

Do not weld the pipes containing the combustible liquids. Do not weld the pipes containing the combustible liquids. Please use anti-combustion solvent to thoroughly rub up the pipes before welding the pipes or cutting the pipes using flames.

Avoid burns

Stop the engine when checking the level of radiator to let the engine and radiator cool down.

Slowly open the cover to release the pressure before opening the cover of the radiator.

If the coolant in the recycling tank approaches the lower limit, add the coolant.

There is Alkali in coolant. First cool down the components of cooling system before draining out the coolant.

Hot components can cause personal injury. Do not let it contact the skin.

Slowly open the vent valve of hydraulic oil tank to release the pressure after engine stops operation, and ensure it is cooled down before screwing up the vent valve of hydraulic oil tank.

Release completely pressure in hydraulic oil system, fuel system or cooling system before disconnecting all pipes, connectors or connected components.

Battery can produce the combustible gases which may cause explosion.

Do not smoke while checking Battery electrolytes.

The electrolytes are acidic which may cause the personal injury. Therefore, do not let it contact the skin and eyes.

Be sure to wear goggles when performing he maintenance of battery.

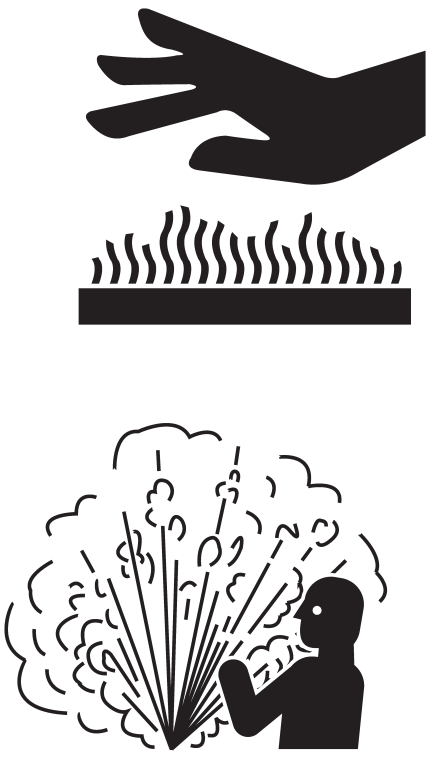


Fig 30

Welding maintenance

The welding operation should be performed at the specified place. The welding operation should be performed by qualified persons. The toxic gases and flames etc will be produced during welding, therefore, do not allow the unqualified persons to perform the welding operation.

The qualified welders must accomplish the following:

- The battery terminals must be removed and the battery must be moved away to prevent the explosion of battery.
- Remove the paints and coatings from electric welding site to prevent the toxic gases from being produced.
- If the hydraulic equipment, pump or actuator is very hot, they may produce the combustible toxic gases or smokes to cause fire. Therefore, do not heat these components.
- Do not weld the pipes containing the combustible liquids. Do not weld the pipes containing the combustible substances. Please use anti-combustion solvent to thoroughly rub up the pipes before welding the pipes or cutting the pipes using flames.
- The direct heating up rubber pipe or pressured pipe may cause sudden breakage. Therefore, please use fire-protection cover to keep the fire out.
- Please wear protective work clothes.
- Make sure the premises are well ventilated where the work is per-formed.
- Remove all combustible substances, and prepare the Fire extinguisher.

WARNING

Warning to customers: remove the counterweights from the machine. The front devices or other accessories may affect the balance of the machine, thus causing the accidental movement and serious injury or death. Our company bears no legal responsibilities for the faults induced from misusing the equipment.

Matters needing attention for attachment moving, installation and storage

Select the leader for the operation before starting removal and installation.

Do not let any unauthorized persons to approach the machine or attachments. Put the attachments removed from the machine at the safety places to prevent from falling. The guard bars are set around the attachments and corresponding measures should be adopted to prevent unauthorized persons from entering.

Fig 31

Maintenance and protection measures on the machine

When performing maintenance of the machine, please keep the area around your feet clean so as to prevent from slipping, and accomplish the following:

- Do not spill over the oil or lubrication oil.
- Do not leave your tools all over.
- Mind the Step when walking.

Do not jump on or off the machine. In order to ensure the safety, use the guard bars and step board when you get on/off the loader, and at least have three points contact (i.e., two foot and one hand, or one feet and two hands).

Fig 32

Please wear protective work clothes if necessary.

When you are working on the engine hood, you can only use the inspection passage with corollary anti-slipping pad. Do not use other components

Avoid being crushed or cut

When performing maintenance,if you must operating the engine, ensure at least two persons must work together. One person is sitting on the driver seat to operate the control device and shut off the engine.

Unless otherwise instructed by others, Do not adjust the machine when the machine or the engine is running.

Be far away from the running or moving parts.

Keep objects far away from the fan blades which may throw off or cut the objects.

Do not use bent or peeled cables. When handling the cables, please wear the gloves.

The dowels will fly off when you knock them. The flied dowel may cause the personal injury. Ensure that there is nobody around when you knock the dowels. Wear the protective goggles when you are knocking to prevent the eyes from being hurt.

Equipment supports and stops

Do not let any load and equipment hang in the air. Please lower all objects down to ground before you leave the cab. Do not use hollow, cracked, unstable or rocking objects to support. Never work under the equipment supported only by a jack.

Fig 33

Regulations you should comply when filling fuel or lubrication oil

Fuel, lubrication oil, hydraulic oil, anti-freeze fluid, braking fluid, windshield detergent can be on fire by flame. Please obey the following regulations:

Switch off the engine when you fill fuel or lubrication oil.

No smoking.

Immediately wipe up the overflowed fuel, lubrication oil, hydraulic oil, anti-freeze fluid, braking fluid, windshield detergent.

Tighten securely the top cover of all containers for fuel, l ubrication oil, hydraulic oil, anti-freeze fluid, braking fluid, windshield detergent.

Keep a good ventilation on the place where you will fill fuel, lubrication oil, hydraulic oil, anti-freeze fluid, braking fluid, windshield detergent.

Precautions for maintenance under HT or HV conditions

When the operation has just been stopped, the temperature of coolant for various components and fuel of the engine are still under HT and HV conditions. At this moment, the opening of the engine hood, or draining of oil or water, or replacing filter will cause burn or other injury. Wait for the decrease of the temperature and perform the maintenance and repair according to the procedures specified in this Manual.

Measures which should be taken when you find the abnormalities during inspection

Please perform the maintenance if any abnormality is found during inspection. Especially, it the machine with brake or operating system in fault is further being used, it will cause the severe injury or damage.

Contact with maintenance station, if necessary, based on the fault types.

Matters needing attention for HP pipes and hoses as well as LP hoses

Confirm whether the pressure is released from the circuit when you check or replace HP pipes or hoses. If the pressure is not thoroughly released, it will cause serious injury or damage. Please obey the following items:

- Please wear protective goggles and leather gloves.
- The leaking of hydraulic oil is difficult to be found, but the hydraulic oil ahs enough force to penetrate the skin to cause serious injury. Please use wood chip or card to check whether the hydraulic oil is leaking. Do not use your fingers to check.
- Do not bend or knock HP pipe. Do not install the bent or damaged HP pipe, hose or LP hose.
- Ensure all clamps, protective plates and insulations are correctly installed to prevent from vibrating, wearing other components or overheating.
    - Please replace the components if you find following conditions:
    - Damage or leakage at the end of the hose.
    - Worn or cut in outer layer, or the metal layer exposed externally.
    - Local upheaval in outer layer.
    - Partial bend or deformation of hose.
    - Foreign matters embedded into hose protective layer.
    - Deformation at the end of hose.

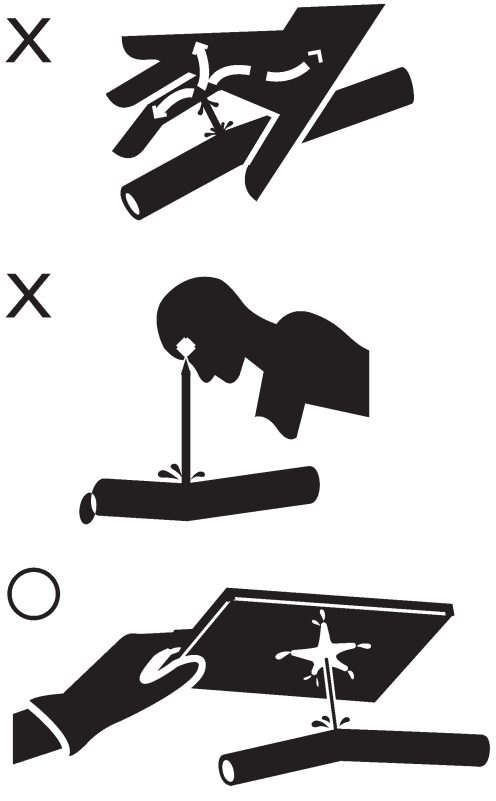


Fig 34

Scraps

Contacting with used engine oil may cause threats to the health.

Immediately rub off the engine oil from your hands, and wash away the remaining oil foot.

The used engine oil is a pollutant to the environment, and it can be only disposed by using the approved recycling equipment. Please accomplish the follows in order to prevent the environment pollution:

- Do not drain the waste oils into sewages or rivers.
- Collect the engine oil drained from the machine into the containers. Do not drain it directly onto the ground surface.
- Follow the corresponding laws and regulation when you dispose engine oil, fuel, solvent, filter or battery.

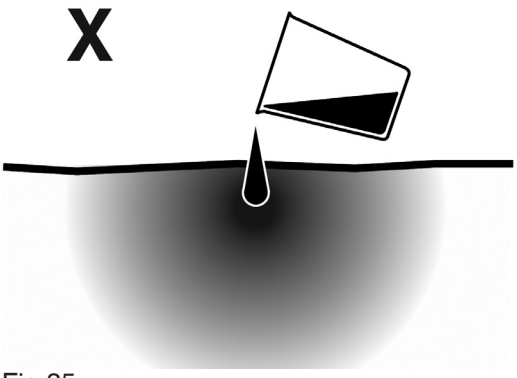


Fig 35

BATTERY

Prevention of battery risks

The battery electrolytes contain sulphur acid, and battery can produce Hydrogen. Hydrogen is highly explosive. If disposing incorrectly, it will cause serious injury or fire. In order to prevent theses problems, please accomplish following items:

- Prohibit smoking or flame approaching the battery.
- Please wear protective goggles and rubber gloves when you performing inspection, maintenance or charging of battery.
- Rinse immediately with water if the battery electrolytes spills over your body on your clothes.
- Rinse with plenty of water and see the doctor immediately if the battery electrolytes enters your eyes.
- Drink plenty of water or milk, and eat raw eggs or vegetable oils if you carelessly drink the battery electrolytes. And immediately go to a doctor or a poisoning prevention center.
- Please use clean wet cloth to scrub the upper surface of the battery. Do not use gasoline, diluent, other organic solution or detergent.
- Tighten the cover of battery box.
- If the battery electrolyte is frozen, do not charge the battery or use other power supply to start the motor, otherwise it will cause the risk of explosion.
- If you want to charge the battery or use other power supply to start the motor, you should let the battery electrolytes molten and check for the leakage before operation.
- Remove the battery from the machine before charging.

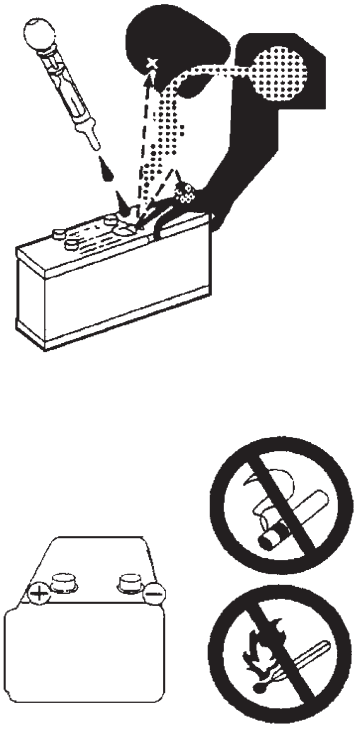


Fig 36

Auxiliary starting or charging the engine battery

The incorrect connection of battery cables may cause explosion or fire. Please obey the following items:

- Switch off all electrical equipments before connecting to battery, including the electric switch for battery charger and auxiliary starting device.
- When using other machine to perform the auxiliary starting, Do not let two machines contact each other. Wear protective goggles when connecting battery.
- 24 V battery combination consists of two 12 V batteries in serial. One wire connects to the Positive pole of one battery and the negative pole of the other battery. Connect the two positive poles of two batteries not in serial connection, and connect the negative pole of the booster battery and the metal support for the charged equipment. Refer to the methods and description of in “Start Engine by Using Booster Battery” on Page 3-8.
- When connecting wires, first connect the positive pole wires; when disconnecting wires, first disconnect the negative pole wires. Finally connect the negative pole of the booster battery and the metal support for the charged equipment. The connection shall be as far away from the battery as possible.

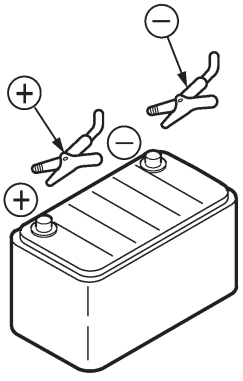


Fig 37

TOWING

Matters needing attention on towing

If fault occurs during the selection or inspection of the traction string or during performance of traction, it will cause serious injury. Please obey the following items:

- Use the methods introduced in Operation and Maintenance Manual.
- Please wear the leather gloves for disposing string and ropes.
- When there are two or more persons to do the preparation, unify the signals and use them correctly.
- If there is fault in the machine or in the brake system, or the engine could not be started, please contact with the agent.
- When performing the traction operation, do not walk between the tractor and the towed machine.
- It is dangerous to perform the traction on slope, therefore, you should select a gentle slope. If there is no gentle slope, please reduce the slope angle before performing traction operation.
- Please use the string and ropes with enough traction force to tow the fault machine.
- Do not use the worn, kinked rope or the rope with too small cross-section.

SHIPPING AND TRANSPORTATION

Investigate the height, width and the allowed carrying capacity in the passage of transportation line. The total height, total width and total weight should not exceed the related regulations. Please consult HYUNDAI or other agents for the solutions.

In order to prevent the safety accidents from being occurred during the shipment of the machine, clear the ice and snow as well as other slippery materials on the dock and wagon.

Perform the shipping according to the procedures shown below:

1. Use wedges to stop the wheels of trailer or truck before shipping.
2. Do not allow the steering operation on the way for the machine being driven on to the trailer or the truck. You should back the vehicle to the flat ground, and then perform the steering operation
3. After the machine is fixed, use frame-fixed bumper to fix the front and rear frames.
4. Lay the bucket down to the transportation vehicle, put the shifting manipulating handle on “Neutral Gear” position, and put the neutral gear locking plate on “Locking” position.
5. Pull up the button of parking brake to apply parking braking.
6. The engine is switched off, and all switches are put to Middle position or “OFF position. Pull out the starter key.
7. Close and lock all doors, then take away the cab key.
8. When you use truck or trailer to transport the machine, you must use wedges to stop the wheels and use steel cables to fix the machine, so as to prevent the machine from moving during transportation.

Lifting of loader

1. It is necessary to let the professionals with lifting knowledge be responsible for the command and operation.
2. 2. You should calculate the crane's maximum lifting weight and the sling's bearing capacity to ensure the lifting safety. Meanwhile, the 4 hooks on the sling shall bear load evenly.
3. Accomplish the following preparation before lifting:
    - Put the shifting manipulating handle on "Neutral Gear" position, and put the neutral gear locking plate on "Locking" position.
    - Put the arm and bucket to the lowest position.
    - Pull up the button of parking brake to apply parking braking.
    - Switch off the engine and pull out the starter key.
    - Close and lock all doors.
    - Use frame-fixed bumper to fasten the front and rear frames, making the machine unable to rotate.
4. The sling should be securely fixed to the lifting eyes of the machine on which the lifting marks are indicated.

WARNING

Incorrect lifting may cause the offset of the machine, thus inducing personal injury or death as well as property loss.

Tow the fault machine

This machine cannot be towed unless in the emergency. Towing is only used for towing this machine to a place where the overhaul can be performed, instead of transporting over a long distance. The towing distance for this machine should not exceed 10km, and the towing speed should not exceed 10km/h, otherwise the gearbox will be damaged for short supply of oil. If you must move this machine, you should use special trailer.

WARNING

Incorrect towing of inoperable machine may cause the personal injury or death.
Towing the fault vehicle on bad road surface may cause the fault vehicle to be further damaged severely.
If the brake system is in fault, the brake shall not be applied. In this case, you should be quite careful during towing.

Matters needing attention for towing

1. Be sure to release the parking braking.

   NOTE: *You should use wedges to stop the wheels of the machine to prevent the machine from moving. If the machine wheel is not properly stopped by wedges, the machine will move. The wedges shall be removed after towing begins.*

2. Nobody shall be allowed to sit on the towed machine unless the driver can control the direction and brakes.

3. Ensure, before towing, the towing rope and the tow bar are in good working conditions and have adequate strength to pull the machine. The strength of the available towing rope and tow bar shall be at least 1.5 times of the gross weight of the towed machine, so as to pull up the machine from the mud or beneath the slope.

4. Keep the minimum angle of the supporting rope, and the angle between the tow rope and the right ahead should not exceed 30º

5. The too quick movement of the machine may cause the breakage of tow rope or tow bar. It is better to slowly and stably move the machine.

6. When towing the machine, all persons shall be far away from both sides off the rope to prevent the tow rope from injuring persons due to the breakage.

7. Under normal conditions, the trailer shall be of a size as the machine. It is necessary to ensure the trailer shall have adequate braking capacity, weight and power to control the slope ascending of two machines and the travel distance etc.

8. When the towed machine is descending the slope, in order to have adequate controlling and braking capacity, it is necessary to connect a bigger trailer or other machine to the back of the machine so as to prevent from out-of-control and rolling.

9. If the travel direction of the towed machine is controlled by the driver, the driver shall make the turn along the direction of tow rope.

Operation Controls

Description of each component position and each control switch, instrument and valve through drawings or photos.

The meters on the dashboard are attached with indicators through which the operator monitors the operation of the machine and with which the faults are displayed.

WARNING

AVOID DEATH OR SERIOUS INJURY

Warning lamp: If any warning lamp or several lamps on the console are lit up, immediately stop the operation and shut off the working unit. The operation could not continue until the troubleshooting is accomplished.

COMPONENT LOCATIONS

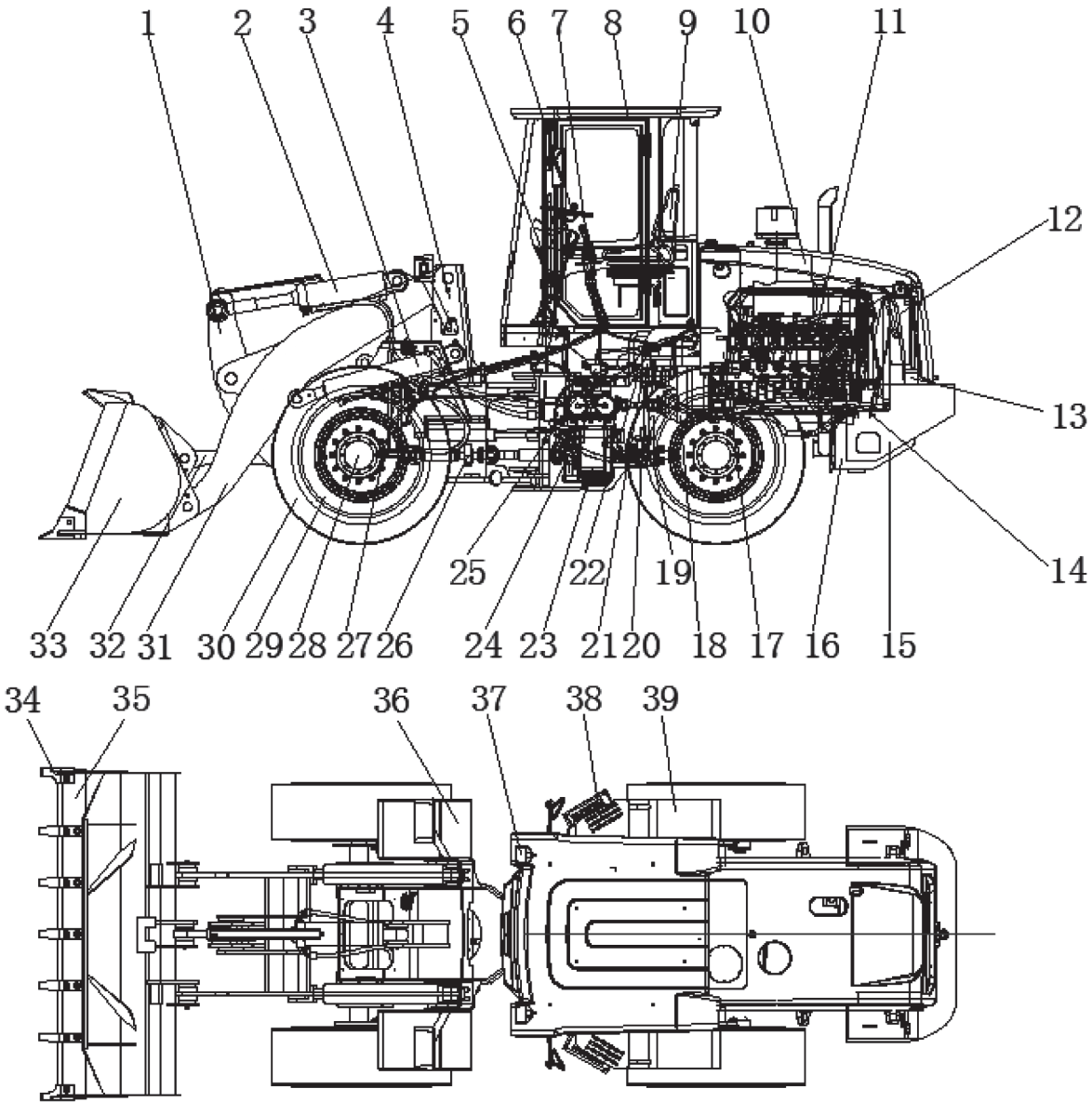


Fig 1

Reference Number	Description
1	Lever
2	Bucket Cylinder
3	Boom Cylinder
4	Frame
5	Electric Part-Fuse Box
6	Electric Part-cab
7	Joystick
8	Cabin
9	Seat
10	Engine Cover
11	Engine
12	Cooler Piping
13	Lighting Lamp-Rear frame
14	Electric Part-Engine
15	Counter Weight
16	Fuel Tank
17	Oil Tank
18	Torque Converter
19	Priority Valve
20	Pilot Filter

Reference Number	Description
21	Pilot Pump
22	Main Pump
23	Transmission
24	Break Piping
25	Sequence Valve
26	Shaft
27	Main Pump
28	Axle
29	Rim
30	Tire
31	Lift Arm
32	Link
33	Bucket
34	Bucket Tooth
35	Bucket Cutting Board
36	Fender
37	Lighting Lamp-Front frame
38	Ladder
39	Platform

OPERATOR`S AREA(STAND)

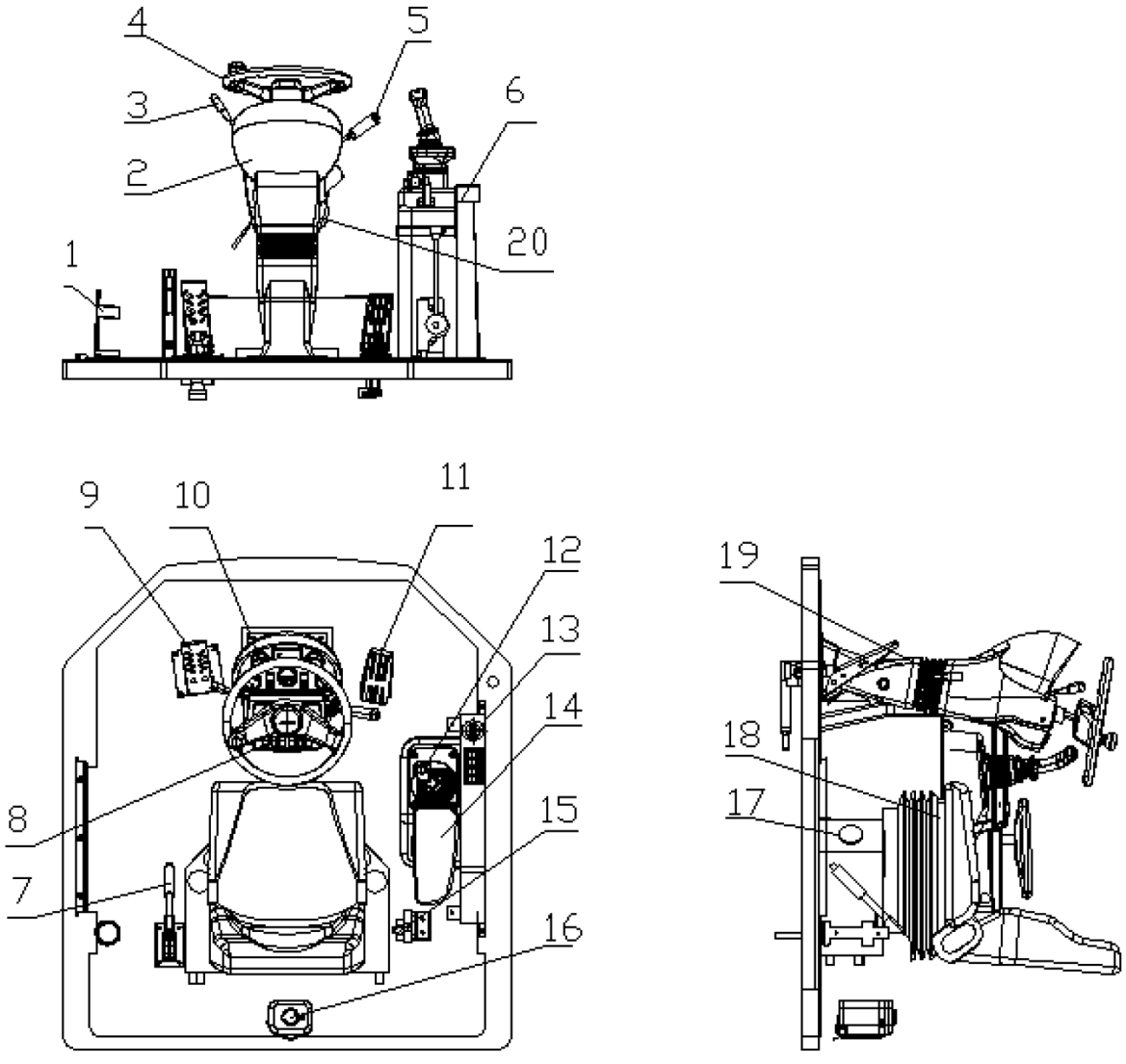


Fig 2

Reference Number	Description
1	Fire Extinguisher Bracket
2	Console
3	Combo switch handle
4	Steering wheel
5	Gearshift Handle
6	Operation Box
7	Hand Brake Lever
8	Control switch such as OFF
9	Brake Piping
10	Dashboard Assembly

Reference Number	Description
11	Accelerator Pedal
12	Pilot Control Handle
13	Pilot Control Box
14	Engine Flameout Lever
15	High-Low Speed Control Lever
16	Washing Pot
17	A\C assembly
18	Seat
19	Steering Wheel Adjustment Handle
20	Fuse Box

FRONT INSTRUMENT PANEL

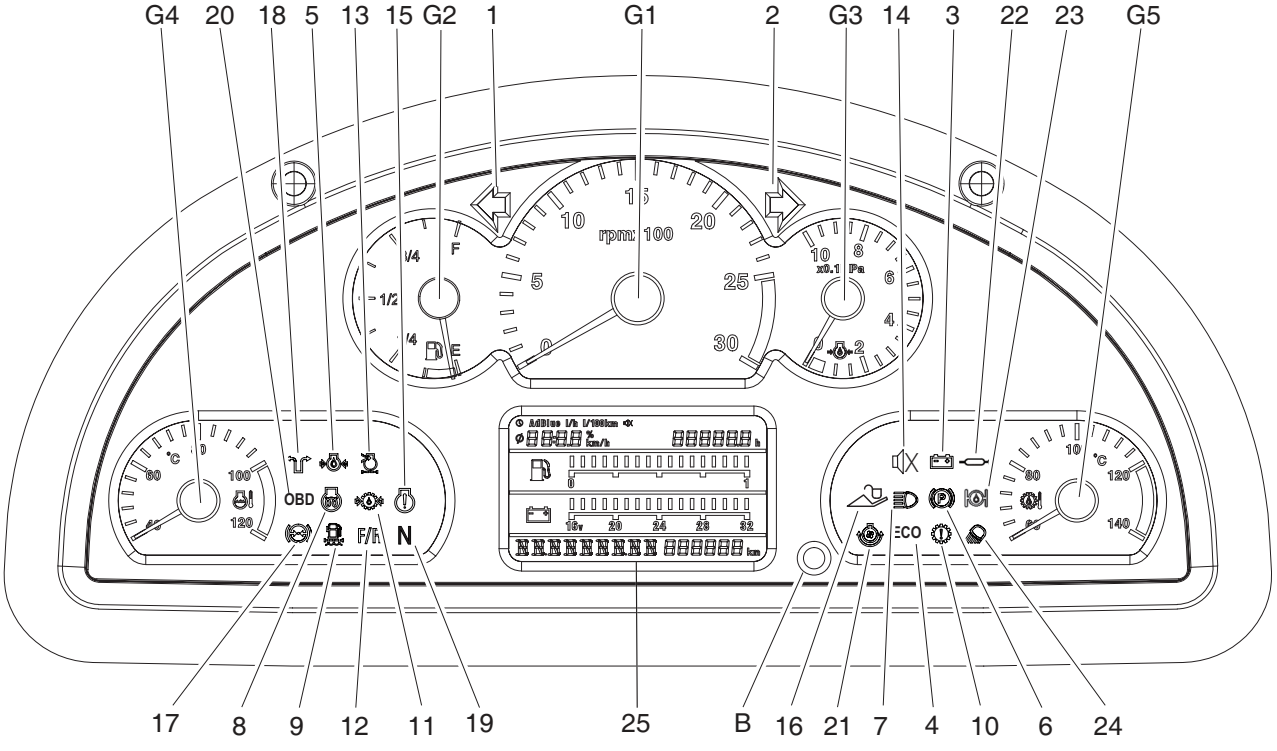


Fig 3

Gauges

Reference Number	Description
G1	Tachometer
G2	Fuel Gauge
G3	Engine oil pressure Gauge

Reference Number	Description
G4	Engine coolant temperature Gauge
G5	TM oil temperature Gauge
B	Buzzer shielding and function switching button

Waring and Indicator Lights

Reference Number	Description
01	Left Turn and Hazard Warning Light
02	Right Turn and Hazard Warning Light
03	Battery Waring Light
04	ECO Indicator
05	Engine Oil Pressure Warning Light
06	Parking Brake Indicator Light
07	High Beam Indicator light
08	Preheat Indicator Light
09	Water in Fuel Warning Light
10	TM Fault Warning Light
11	TM Oil Pressure Warning Light
12	F/R (Forward/Reverse) Selector Indicator Light
13	Air Cleaner Clogged Warning Light

Reference Number	Description
14	Buzzer Shield Indicator
15	Engine Warning Light
16	Pilot Unlock Indicator
17	Brake Fluid Pressure Warning Light
18	Emergency Steering Indicator Light (Optional)
19	Neutral Indicator
20	OBD Warning Light (Optional)
21	Reverse Fan Indicator Light
22	Centralized Lubrication Indicator(Optional)
23	Axle waring Indicator Light(Optional)
24	Work Light Indicator Light
25	LED Display

IMPORTANT

All of gauge and warning lights (except for the turn lights, high beam light, work light and transmission cutoff light) turn "ON" for two seconds with a warning buzzer sound when the starter switch is turned to "I" (ON) position.

If any light fails to turn "ON" at this time, check the cause and replace.

G1. Tachometer

This meter displays engine speed in revolutions per minute.

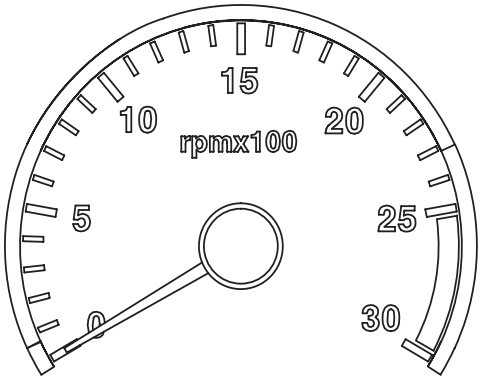


Fig 4

G2. Fuel Gauge

This gauge displays amount of fuel in tank. “F” means the tank is “full”; “E” means the tank is “empty”. If the pointer comes close to “E” (red zone), add fuel as soon as possible. When the pointer comes close to “E” (red zone), approximately 40l of fuel remains,and 20l is effective.

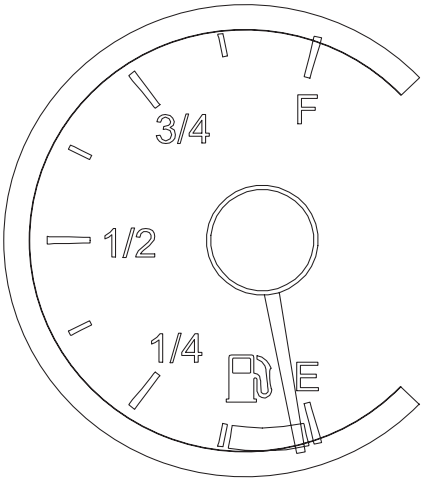


Fig 5

G3. Engine oil pressure Gauge

The meter displays the engine oil pressure.

CAUTION

when the engine running, the pointer comes close to red zone means the engine oil pressure lower,and need to be checked

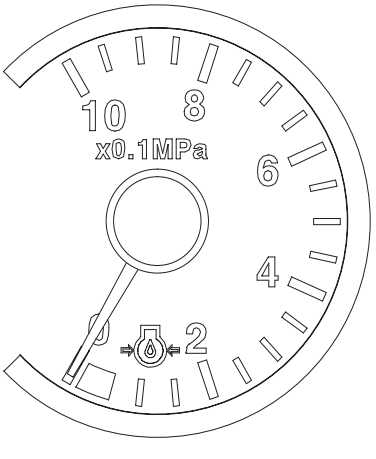


Fig 6

G4. Engine Coolant Temperature Gauge

This gauge displays temperature of engine coolant.

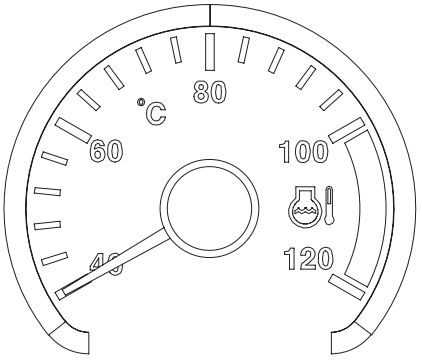


Fig 7

CAUTION

AVOID INJURY

When the pointer indicates red zone, it means the engine is overheated. Stop the operation, let the engine run at low rpm and wait for it to cool down.

Do not stop engine. If engine is shut down heat surge can occur.

G5. Transmission Oil Temperature Gauge

This gauge displays temperature of oil in transmission converter and transmission circuit.

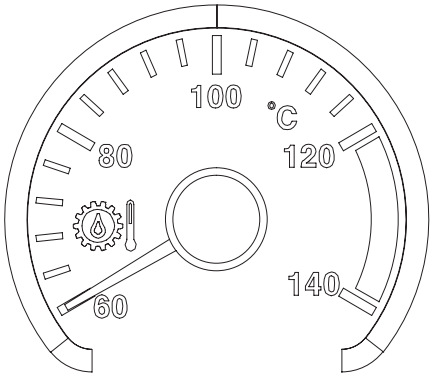


Fig 8

CAUTION

AVOID INJURY

When the pointer indicates red zone, it means the transmission is overheated. Stop the operation, let the engine run at low rpm and wait for transmission to cool down.

B. Button

the button in on the right side of the LCD. It can make the buzzer stop warning (pressing more than 3s) and it can change the display of speed and fuel consumption (pressing less than 3S).

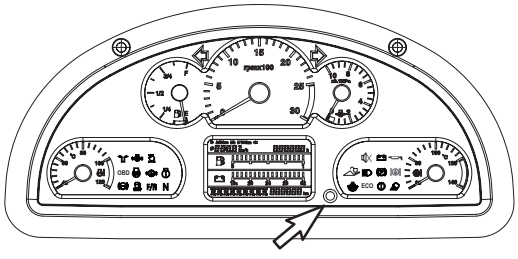


Fig 9

1. Left Turn and Hazard Warning Light

This light blinks when left turn signal is turned “ON”. Both lights blink when warning lights are turned “ON”.

NOTE: *If left and right turn indicators blink together, or if they blink faster than normal, a light bulb is not operating or Flasher solenoid is damaged.*

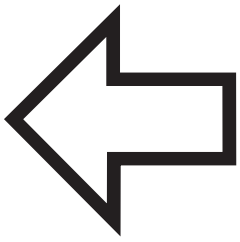


Fig 10

2. Right Turn and Hazard Warning Light

This light blinks when right turn signal is turned “ON”. Both lights blink when warning lights are turned “ON”.

NOTE: *If left and right turn indicators blink together, or if they blink faster than normal, a light bulb is not operating or Flasher solenoid is damaged.*

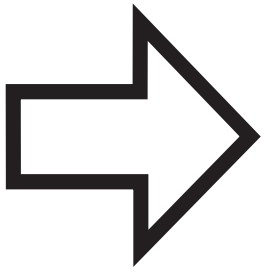


Fig 11

3. Battery Warning Light

When starter switch is first turned to “ON” position, this red warning light should turn “ON”. When engine is running this red light should turn “OFF”. If light remains “ON” when engine is running, alternator is defective.

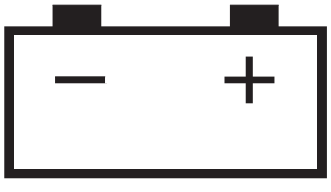


Fig 12

4. ECO Indicator

When the engine is operating under economic conditions, this light will turns “ON”

Fig 13

5. Engine Oil Pressure Warning

This indicator Light will turn “ON” when the engine starter switch is turned “ON”, and should go “OFF” after the engine starts. For example, if the engine oil pressure becomes too low, the light will turn “ON”. If this happens, shut the engine down immediately and determine the cause of the problem. If you continue to work when this light is “ON”, it will result in serious engine damage.

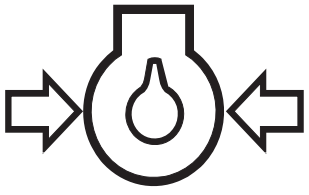


Fig 14

IMPORTANT

If work is continued when this light is “ON”, it will result in serious engine damage.

6. Parking Brake Indicator Light

This indicator light will turn “ON”, when the parking brake is “APPLIED”.

Fig 15

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

If vehicle is moved while this light is turned “ON”, it could cause premature wear or damage the brake.

Always “RELEASE” parking brake and make sure this light is “OFF” before traveling machine.

7. High Beam Indicator Light

This indicator light will turn “ON”, when the headlights are turned to “HIGH BEAM”.

Fig 16

8. Preheat Indicator Light

This indicator light will turn “ON”, when the engine preheat function is operating. Do not start engine as long as this light is “ON”.

Fig 17

9. Water In Fuel Warning Symbol

This symbol indicates when the water is full in the fuel pre-filter.

When this symbol appears drain the water from the fuel prefilter as soon as possible.

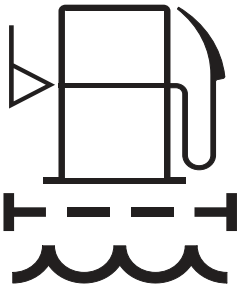


Fig 18

10. Transmission Warning light

This light will turn “ON” when a nonfatal system error occurs with the Transmission.

CAUTION

AVOID INJURY

If this light turns “ON”, check the Transmission and repair the cause of the fault to prevent Transmission from having fatal errors.

Fig 19

11. TM Oil Pressure Warning Light

When the engine running, if the transmission oil pressure is lower than normal value,the waring indicator lights.

Fig 20

12. F/R (Forward/Reverse) Selector Indicator Light (Optional) This indicator light will turn “ON”, when the 2nd gear function is selected.

Fig 21

13. Air Cleaner Clogged Warning Light(Option)

This warning light will turn “ON”, when dirt has built up in the air filter and is beginning to restrict flow of air. Clean or replace air filter before continuing to operate machine. To turn indicator light “OFF”, turn starter switch “OFF” and then back “ON”.

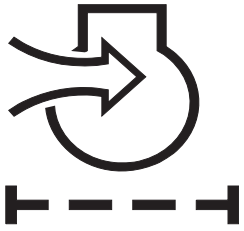


Fig 22

14. Buzzer Alarm Shield Indicator

When the buzzer of the instrument is shielded, this light will turn “ON” and the buzzer sound will be eliminated.

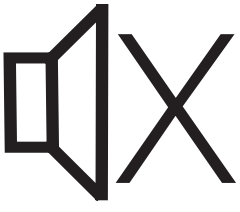


Fig 23

15. Engine Warning Light

This light will turn “ON” when a nonfatal system error occurs with the engine or its peripherals. If this light turns “ON”, check the engine as described under the engine diagnostic switch and repair the cause of the fault to prevent engine from having fatal errors.

Fig 24

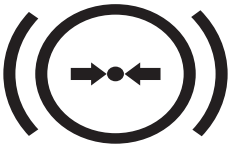
16. Pilot Unlock Indicator Light

When the vehicle is equipped with a pilot system and the pilot locking is cancelled,this light turn “ON” and the working device can act;When the light goes out, the working device will not operate.

Fig 25

17. Brake Pressure Warning Light

This warning light will turn “ON”, when pressure drops in brake fluid circuit. When light turns “ON”, an alarm also sounds.



WARNING

AVOID DEATH OR SERIOUS INJURY

Never operate or travel machine when this light is “ON” or when alarm is sounding. Always investigate cause of the drop in brake fluid pressure, and repair problem before operating or traveling machine.

Fig 26

18. Emergency Steering Indicator Light (Optional)

This indicator light will turn “ON”, when the emergency steering system is activated because of a hydraulic failure. Immediately stop any operation, stop machine, “APPLY” parking brake, and stop engine.

DANGER

AVOID DEATH

Emergency steering indicator light. If this light turns “ON” while operating machine, discontinue operation immediately. This light indicates that there is a serve problem with the unit.

Fig 27

NOTE: *The light will also turn “ON” when the system is being tested.*

19. Neutral Position Indicator Light

When the gear of the operating handle is placed in the neutral position, this indicator light turn”ON”.

Fig 28

20. OBD Indicator Light(Optional)

NOT USED

Fig 29

21. Reverse Fan Indicator Light(Optional)

This indicator light will turn “ON”, when the cooling fan rotates in the reverse direction.

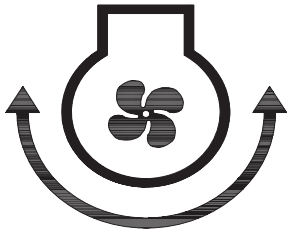


Fig 30

22. Centralization Lubrication Indicator Light(Optional)

This light will turn”ON”when the vehicle is equipped with centralization lubrication function and the function is activated.

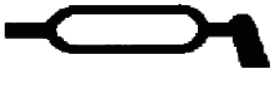


Fig 31

23. Axle Warning Light(Optional)

This light will turn”ON” when the driving axle fails

Fig 32

24. Work Light Indicator Light

This indicator light will turn “ON”, when the front and/or rear work lights are activated.

Fig 33

25. Display

LCD display the engine fuel consumption, vehicle speed, hour meter, Amount of fuel remaining, vehicle voltage, engine error code, overall fuel consumption and mileage.

NOTE: *Engine error code refer to the attached part.*

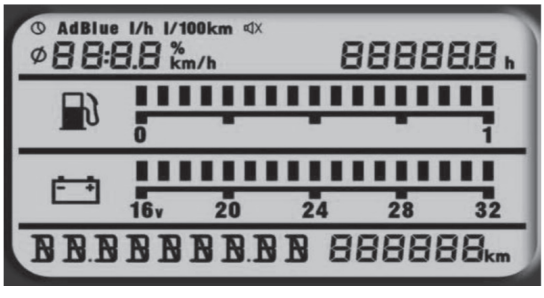


Fig 34

FRONT AND RIGHT SIDE SWITCH PANEL

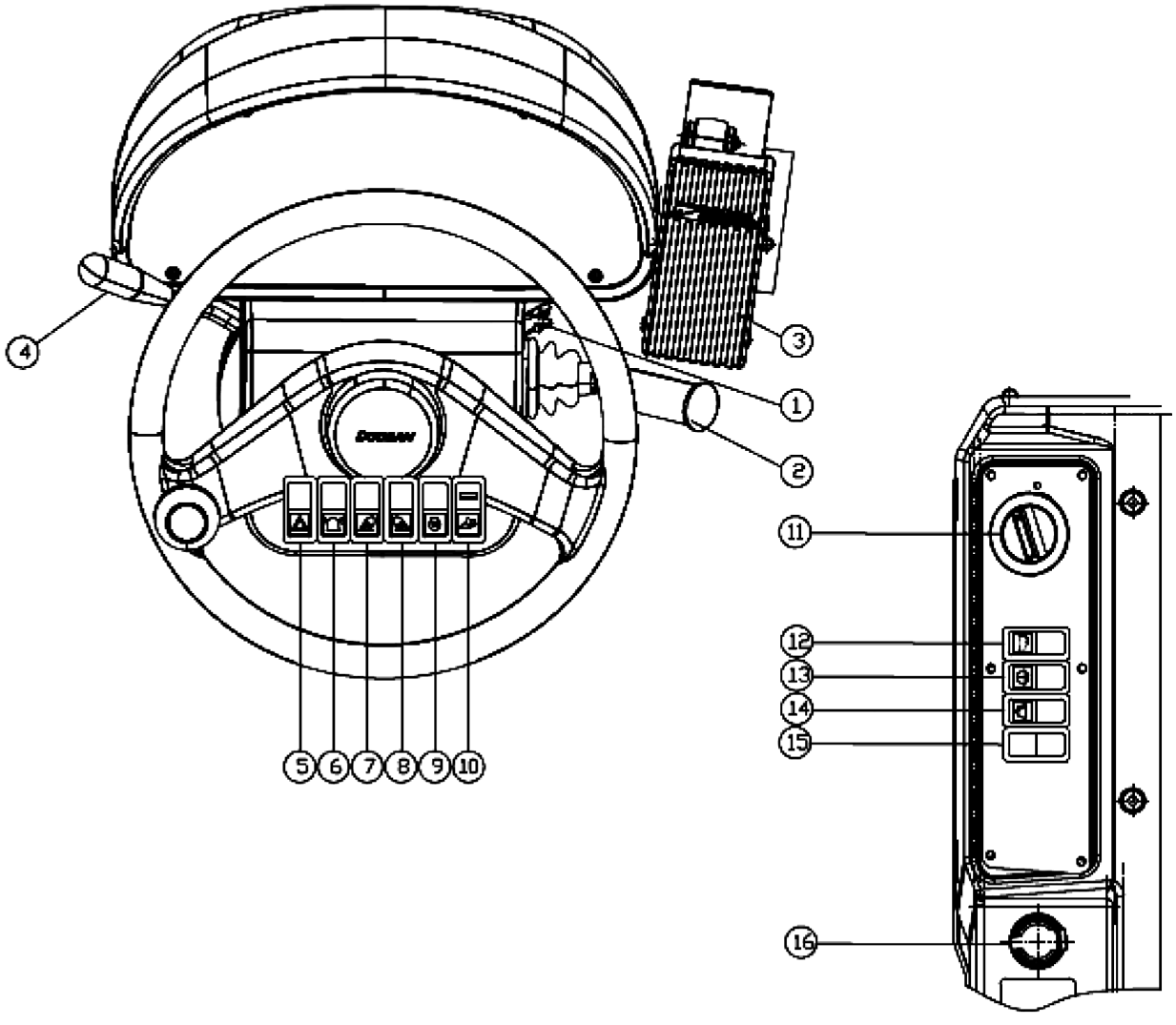


Fig 35

Reference Number	Description
01	Starter switch
02	Combine switch
03	Accelerate switch
04	Shift lever
05	Hazard Warning lamp switch
06	Rotating lamp switch
07	Front working lamp switch
08	Rear working lamp switch

Reference Number	Description
09	Fuel pumping switch
10	Pilot cutoff switch
11	Engine mode switch
12	Diagnostic switch
13	Wiper and washer switch
14	Wiper switch
15	spare
16	Power socket

1. Starter Switch

A three-position starter switch is used to start or shut down engine for equipment operation.

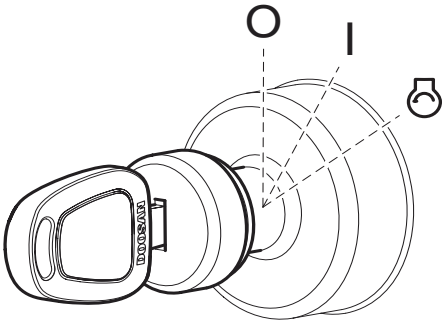


Fig 36

O. Turning switch to this position turns the engine “OFF” with its electrical system. In this position the engine is “OFF” but interior cabin light and fuel tank transfer pump (if equipped) are functional

I. Turning switch to this position turns engine electrical system “ON”. When switch is first turned “ON” six indicator/warning lights across top of instrument panel, will light for approximately two seconds. The battery warning light and engine oil pressure warning light should remain “ON” after the other four have turned “OFF”.

NOTE: *Preheat Indicator Light - The operation of the preheat cycle depends on coolant temperature. When the engine coolant is cold enough, the preheat indicator light will remain “ON” until engine preheat cycle is completed. When preheat cycle completes, the indicator light will turn “OFF”. When the light turns “OFF”, engage the starter.*

Moving switch to this position will crank engine. Whenengine starts, release key and allow it to return to the “I” (ON) position. Do not operate the starter switch for more than fifteen seconds at a time. This will help prevent damage to starter.

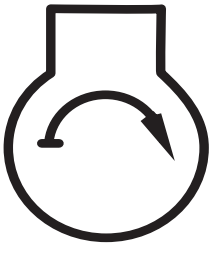


Fig 37

WARNING

AVOID DEATH OR SERIOUS INJURY

DO NOT USE STARTING FLUIDS. The preheat system could cause the starting Fluid to explode. Starting fluids should never be used.

2. Combination switch

A. Left Side Directional Switch - Pushing lever forward, activates left outside directional lights and directional indicator light on instrument panel.

B. Right Side Directional Switch - Pulling lever back, activates right outside directional lights and directional indicator light on instrument panel.

NOTE: *Turn signals will function with starter switch in "OFF" position.*

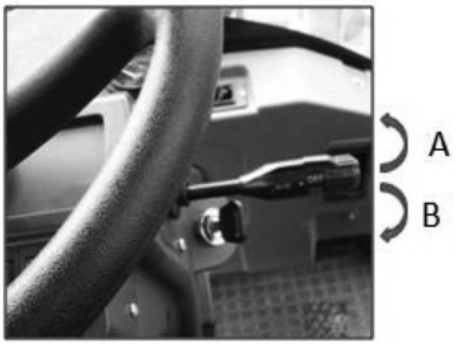


Figure 38

N. Neutral Position - Normal low beams.

C. Pull up 1st step - Momentarily turns "ON" both the low beams and high beams. (It returns to "NEUTRAL" position when released.)

D. Pull up 2nd step - The high beams turn "ON".

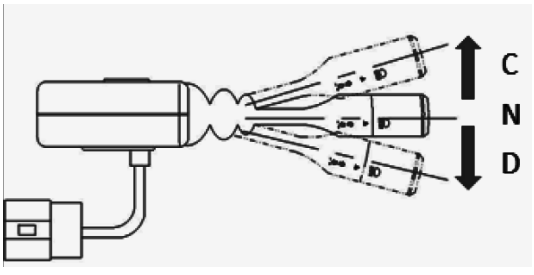


Figure 39

3. Accelerator pedal

Controls the travel speed of loader and working speed of load handling system.

WARNING

The further the pedal is pressed, the more engine speed increases. However, do not press the pedal more than necessary; otherwise it will increase fuel consumption, cause short life on the engine, and in the worst case lead to a serious accident.


Figure 40

4. Shift lever

Shift lever is located under the steering wheel.

Move the handle back and front, may operate gears "Forward I", "Forward II", "Reverse" and "Neutral" respectively.

NOTE: *Before starting the engine, please confirm the negative pole switch is in "ON" state and the shifting manipulating handle is at "Neutral" position.*


Figure 41

5. Hazard Warning Light Switch

This warning light is used when the equipment is stopped due to a malfunction or when an emergency occurs. When this switch is pressed the directional indicator lights in front and back of the machine light up and flash, warning others in the area. At the same time the directional indicator lights on the instrument panel will turn “ON” to warn the operator. The hazard warning lights operate independent of the starter switch.

O. In this position, this switch turns “OFF” hazard warning lights.

I. In this position, this switch turns “ON” all turn signals and they flash simultaneously.

NOTE: *Hazard warning lights will function with starter switch in “OFF” position.*

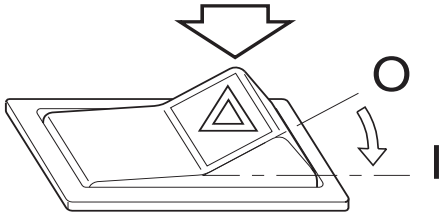


Fig 42

6. Rotating Beacon Light Switch (Optional)

O. In this position, this switch turns “OFF” rotating beacon light.

I. In this position, this switch turns “ON” rotating beacon light.

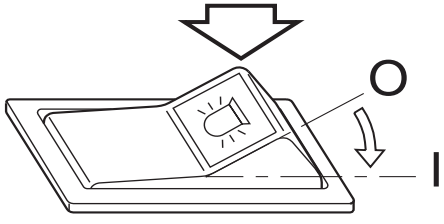


Fig 43

7. Front Work Light Switch

O. In this position, this switch turns “OFF” work lights mounted on the front top of cabin.

I. In this position, this switch turns “ON” work lights mounted on the front top of cabin.

CAUTION

Do not turn “ON” the work light when traveling on public roads.

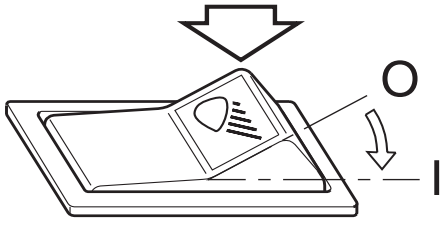


Fig 44

8. Rear Work Light Switch

O. In this position, this switch turns “OFF” work lights mounted on the rear top of cabin and the sides of radiator.

I. In this position, this switch turns “ON” work lights mounted on the rear top of cabin and the sides of radiator.

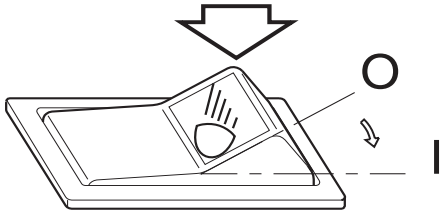


Fig 45

CAUTION

Do not turn “ON” the work light when traveling on public roads.

9. Fuel pumping switch

This switch is self return type

When pressing the switch,the fuel pump will work and suck fuel from tank;

It can help the engine starting successfully more easily;

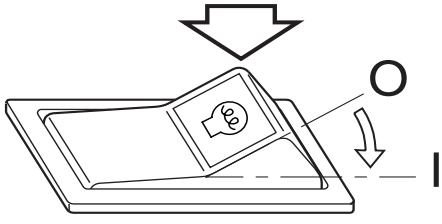


Fig 46

10. Pilot Cutoff Switch

O. In this position the operator cannot operate the pilot control valve lever (joystick).

I. In this position the operator can fully control the movement of the pilot control valve lever (joystick).

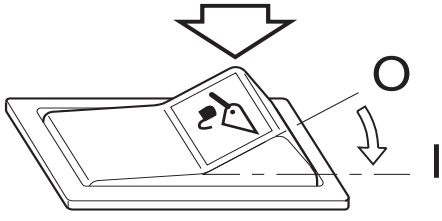


Fig 47

CAUTION

When driving or parking, the pilot cutoff switch must be changed to “O” (OFF) position.

11. Engine mode switch

This switch have three-position:ECO,Normal and Power

According to different load conditions of the vehicle, the output torque curve of the engine is reasonably selected to achieve the purpose of fuel saving. When the switch harness is disconnected, the engine runs under heavy load conditions by default.

Fig 48

12. Diagnostic switch(Optional)

This switch is self return type

It can clear the history of the fault error code of ECU when press one time;

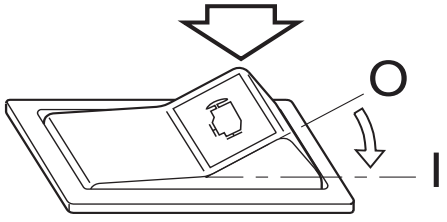


Fig 49

13. Wiper and Washer Switch

O. In this position, this switch turns “OFF” windshield washer

I. In this position, windshield washer Fluid sprays onto the rear windshield while running the rear wiper. When released, the switch returns to the “O” (OFF) position.

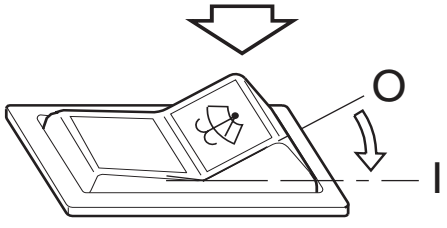


Fig 50

14. Wiper Switch

O. In this position, this switch turns “OFF” windshield wiper mounted on windshield of operator’s cabin.

I. In this position, wiper work at slow-speed.

II. In this position, wiper work at high-speed.

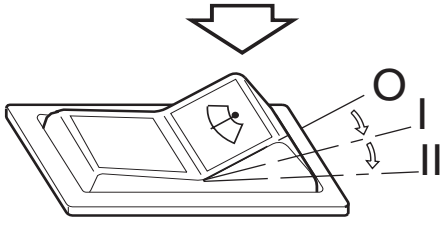


Fig 51

15. Optionnal

16. Power socket

This is a power socket for only 24V DC devices.

This socket can be used for charging a cellular phone or powering a small 24V DC electrical device.

Open the cap when using it.

NOTE: *This socket is designed for small electrical capacity devices. Do not use this socket for large electrical capacity devices. Thus, damage can be avoided.*

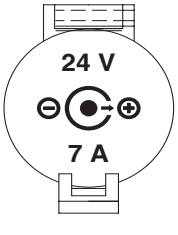


Fig 52

PREHEATING SYSTEM

Preheating system can make the engine start successfully more easily.it can increase the temperature of engine air intake.

1. In the following conditions,preheating will work:
   - The coolant temperature is lower than 5℃.
   - The voltage is higher than 10V.

Fig 53

2. Turn the start switch to“ON”,preheating system begin to work if engine is not be started, the work time is like the curve.if the battery voltage is lower,preheating system stop working; the temperature is lower, the preheating time is longer,but not more than 1 min.

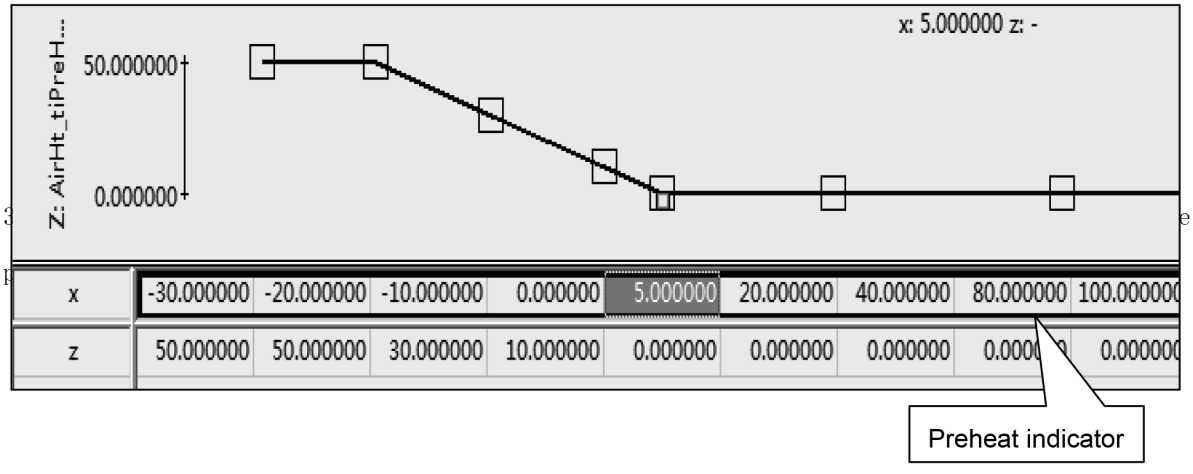
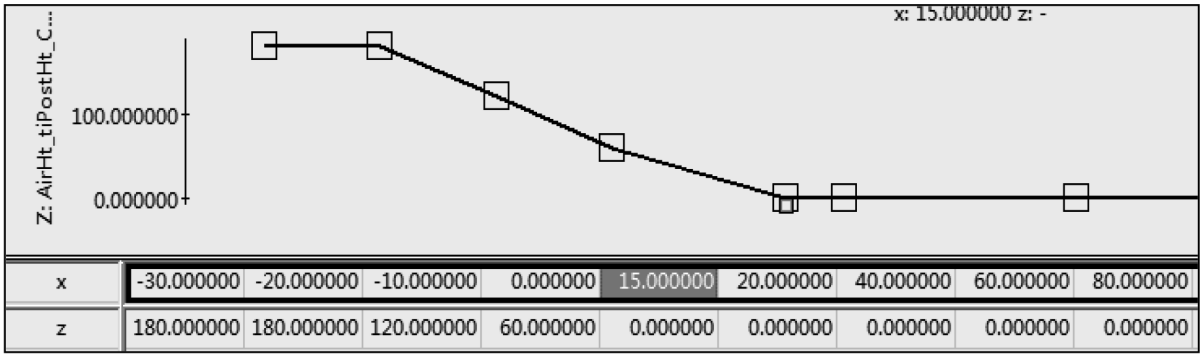


Fig 54

3. When the preheating system is working, the indicator will turn on; after the indicator flash, the preheating is end, and the operator can start the engine.

Fig 55

4. When the engine started, preheating will work on heating later period. the preheating time is like below curve; if the battery voltage is lower,preheating system stop working;



x	-30.000000	-20.000000	-10.000000	0.000000	15.000000	20.000000	40.000000	60.000000	80.000000
z	180.000000	180.000000	120.000000	60.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Fig 56

5. The preheating indicator is not light when it on the later period.

Fig 57

MANIPULATING FACILITY

Steering Wheel

1. The steering wheel rotation angle is not equal to the machine's rotation angle. Continuously rotate the steering wheel to increase the rotation angle until to the required position.
2. The quicker the steering wheel rotates, the quicker the machine rotates.
3. The steering wheel cannot restore to original position after rotation, and the machine rotation angle is kept unchanged. Therefore, after the machine finishes the steering, you should reversely rotate the steering wheel to make the machine drive along the straight direction.
4. The intermediate round button of the Steering Wheel is horn switch. (this switch can be automatically reset)

Fig 58

Parking brake Lever

The parking brake lever is on the left side of the seat (Fig.59.) Put upward the lever to lock the parking brake. Press down the lever to release the parking brake. When you press down the lever, you need to press and hold the button at the top of the lever.

Fig 59

Service braking pedal

Service braking pedal (foot brake) is located in front left of the cab floor. (Fig. 60) .

Depress the service braking pedal; the braking applies onto front and rear driving axles. Meanwhile, the braking lamp switch is energized, and the braking lamp is lit up. Release the Service braking pedal to release the service brake.

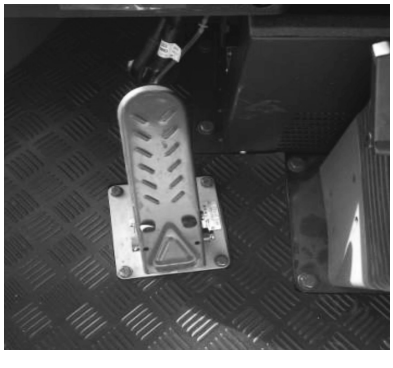


Fig 60

High-low speed switch handle

This handle is located on the right of the seat. Please refer to the right picture. When the handle is pushed to the middle position, the car is in neutral. Push forward into low speed gear; And pull back to high speed gear.

When parking switch for high or low speed: Put the shifting manipulating handle on “Neutral Gear” position, then feather the accelerator pedal meanwhile switch handle into the high or low speed position.

When moving switch for high or low speed: Should be the first to slam on the brake pedal, in the moment of parking, switch the handle into the high or low speed position immediately.

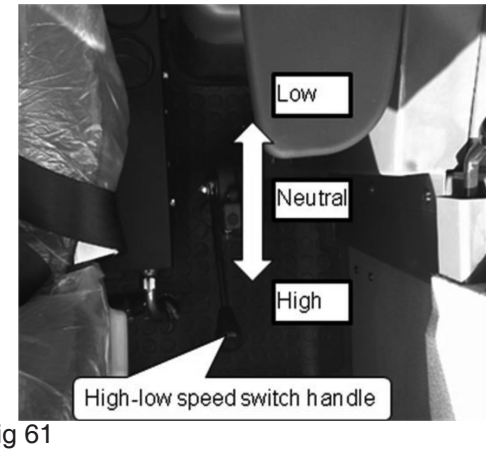


Fig 61

Adjustment of steering gear

The inclination of steering gear of this machine may be adjusted within a certain range to adapt to driver’s operation customs.

There is a spanner at the middle of steering gear (Fig.62). The method of adjusting the inclination angle of the steering gear is as follows.

Use angle adjustment handle to raise the spanner to adjust the steering gear to a proper position, and then release the spanner.

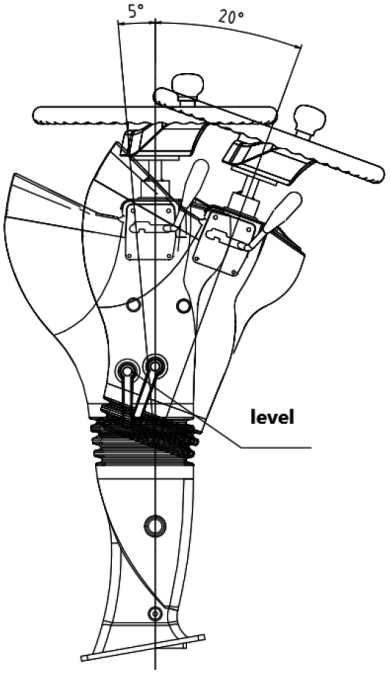


Fig 62

Pilot manipulating handle (stand)

Fig 63

Pilot manipulating handle is installed on the handle manipulating box on the right side of the driver seat. It is used for controlling the working device to perform the operation. The bucket manipulating handle with leftward and rightward manipulation is used to control the bucket's movement and the arm manipulating handle with forward and backward manipulation is used to control the arm's movement. This handle is at the "holding" position under natural state, i.e., at the middle position.

When the engine is running, if you push the manipulating handle rightward, the bucket will tilt forward; if you pull the manipulating handle leftward, the bucket will tilt backward.

If you push the arm manipulating handle forwards, the arm will lower; if you pull the arm manipulating handle backwards, the arm will rise.

If you slightly move the handle forwards or backwards, or leftwards or rightwards, you can control the openness of the main valve, which, together with the throttle openness, can control the movement position and speed of the working device in a comparatively accurate mode.

Pilot control valve lever (joystick) operating pattern and description of operation(fig 64).

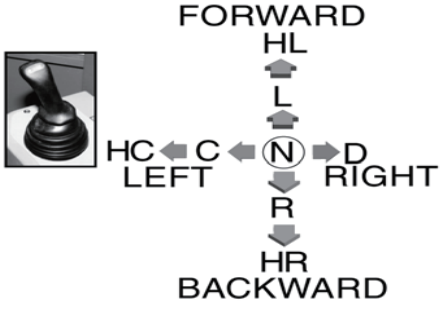


Fig 64

HL. Hold lever in Lower Mode

L. Lower

HC. Hold lever in Bucket Crowd **C.** Bucket Crowd **N.** Neutral **D.** Bucket Dump

R. Raise

HR. Hold lever in Raise Mode

Besides, the pilot lever(joystick) also has the following special functions:

1) Arm lifting limit:

If the manipulating handle is pulled backwards to the extreme rear position, the manipulating handle will be stuck by arm rise holding magnet (the manipulating handle will not return back to the middle position even you release your hand), and the arm will be rising all the time; when the arm reaches the limit position, the arm limit switch is actuated, the arm rise holding magnet is de-energized and loses the suction force, and the manipulating handle will automatically rerun to the middle position under the force of spring and the arm will no longer be lifted.

2) Arm floating device:

If the manipulating handle is pulled backwards to the extreme rear position, the manipulating handle will be stuck by arm float holding magnet (in this case, the driver can release his hand, and the arm manipulating handle will not return back to the middle position), and at this time, the arm is in floating state. If you want to remove the floating state, you only need to pull the manipulating handle back to the middle position.

When you manipulate the arm to lower down, you can push the manipulating handle to the floating position, and the will then descend under the action of gravity.

When you performing scraping or shoveling &loading, push the manipulating handle to the floating position, and the bucket will fluctuate as the fluctuation of the ground surface, thus avoiding the damaging of the road surface.

3) **Bucket leveling limit device**

When the bucket is in the unloading state, if the bucket manipulating handle is pulled backwards to the extreme left position, the bucket manipulating handle will be stuck by Bucket Receive holding magnet and will be held at the extreme rear position (the bucket manipulating handle will not return back to the middle position even you release your hand), and the bucket will be rotated backwards all the time; when the bucket reaches the limit position, the bucket leveling limit switch is actuated, the Bucket Receive holding magnet is de-energized and loses the suction force, and the manipulating handle will automatically rerun to the middle position under the force of spring and the bucket will no longer rotate. In this case, lower the arm. When the bucket contacts with the ground surface, the bucket bottom is flush with ground surface.

When the bucket manipulating handle is again pulled backwards to the extreme left position, the manipulating handle will not be stuck by Bucket Receive holding magnet (it will return back to the middle position under the force of spring when you release your hand) because the Bucket Receive holding magnet is de-energized all the time due to the Limiting and Holding function of the bucket leveling limit switch. Only when you push manipulating handle forwards and the tilting of bucket (unloading) exceeds the bucket leveling position, can the bucket leveling limit switch be reset and the bucket auto leveling function be restored. At this time, if the manipulating handle is again pulled backwards to the extreme left position, the manipulating handle will be held at the Extreme Left Position.

The manipulating handle does not have holding function when it is at the front position. When the bucket tilts outwards from the maximum bucket receive angle to the unloading angle, you need, at all time, push the manipulating handle in excess rightwards(the manipulating handle will return back to the middle position under the force of spring when you release your hand), which will not stop even when the bucket passes the leveling position. When shoveling and loading, you should fully use arm lifting limit, arm floating device and bucket leveling limit device, which will effectively reduce the labor intensity of to operate the manipulating device, thus improving the comfort of operation. The engine cutoff of this machine is controlled by electrical module.

AUDIO SYSTEM

Audio system is located in the cab, including multimedia, speaker, and antenna.

Host Panel (Fig 65)

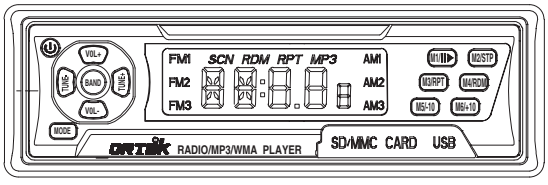


Fig 65

Speaker(Fig 66)

Fig 66

The multimedia speaker has many functions such as digital radio, USB/SD/MMC, MP3/WMA, clock, adjustable volume.

1. System Configuration

   Digital radio, USB / SD / MMC, MP3 Player

2. Radio

   Support FM FM/AM medium wave.

   Support six FM1, six FM2, six FM3, six AM1, six AM2, six AM3, Channel storage, at the same time memory these radio station in case of outages. .

3. MP3

   USB / SD / MMC played automatically.

4. Auto save channels function.

   When the power is off, the channels can be saved automatically.

5. Others

   A. Support the clock display type for 24-hours.

   B. The mobile phone can be charged through USB port (cable is needed)

Host Panel

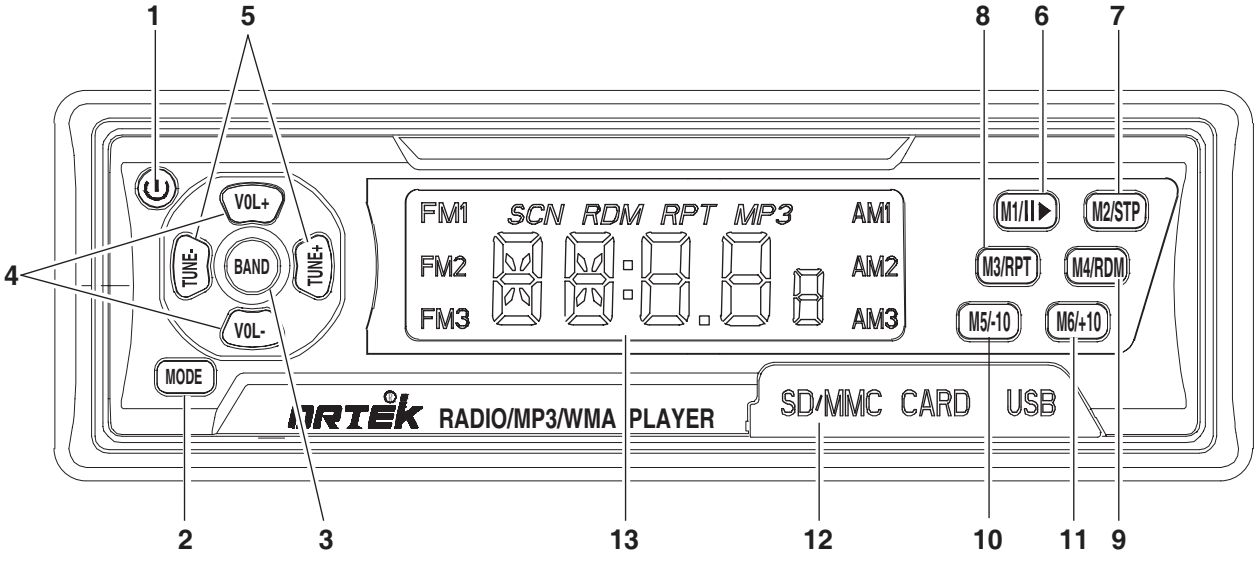


Fig 67

Reference Number	Description
1	POWER
2	Select Mode/Set time
3	Select Band/Save Auto Searched Channel
4	VOL+/VOL-
5	Auto Select Channel Last/Next song, Time set.
6	Store Channel/Pause
7	Store Channel/STOP

Reference Number	Description
8	Store Channel/REPEAT
9	Store Channel/RANDOM
10	Channel/Next 10 Songs
11	Channel/Last 10 Songs
12	SD/MMC/USB
13	LCD

Operation specification

1. Operation

   A. M1, M2, M3, M4, M5, M6 are used to memorize the date of M1, FM2, FM3, AM1, AM2, AM3 respectively.

      Push the button for shorter than 2s, you can pick up the corresponding pre-saved channels.

      Push the button until more than 2s, you can store the current channel in corresponding internal storage.

   B. BAND is used to switch band between FM1, FM2, FM3, AM1, AM2, AM3

      When you push the button for shorter than 2s, the radio band will circulate as FM1→FM2→FM3→AM1→AM2→AM3…

      If you push the button until more than 2s and it was FM before you push it, it will search upward automatically from 87.5M of FM1 and store them automatically. When the search for FM1~FM3 is finished (18 channels totally) which means the search from 87.5M to 108M is finished, the first channel of FM1 is picked up automatically and the previous stored channels are replaced.

      When it was in AM before you push the button, it will search automatically upward from 522K of AM1. When the search for AM1~AM3 is finished (18 channels totally) which means that the search from 522K to 1620K is finished, the first channel of FM1 then is picked up automatically and the previous stored channels are replaced.

   C. TUNE+/TUNE- is used to search automatically or step by step manually.

      If you push the button shorter than 2s,it will search forward or backward automatically and pick up one when it is found.

      If you push the button until more than 2s, and push it step by step again to search forward or backward automatically and it won't switch to automatic model until one channel is found.

2. Operation for USB/SD/MMC

A. M1/ II▶ : Pause MP3

B. M2/STP : Stop playing

Push M1/ II▶ to play from the beginning.

C. M3/RPT

Repeat play the current songs.

D. M4/RDM

Play the current songs randomly.

E. E. M5/-10

Move 10 songs down

F. F. M6/+10

Move 10 songs up

G. TUNE-/TUNE+

Next song/last song,adjust time

3. Specification for other functions

MODE change and time set.

Push the button shorter than 2s,it will switch among FM→USB→SD.

Push the MODE button until more than 2s for the first time, time appears.

Push the MODE button longer than 2s when time appears to reset the time. Push TUNE+ to adjust hour upward and TUNE- downward when it is twinkling. Push MODE again to switch to Minute adjust model after you have adjusted the hour and the operation is the same with that of the hour.

NOTE: *Time can be adjusted even the switch of the radio is off.*

A/C SYSTEM

1. Refrigeration

A. Close the heater water valve; (Fig. 69)

B. After the engine working normal, turn the blowing rate switch to the proper position;

C. Rotate the temperature control switch to the proper position (Green indicator lit up), and the refrigeration system starts working and the cooled air begins to be sent out from the air outlet;

D. You may adjust the temperature of the cooled air by adjusting temperature control switch.

Fig 68

2. Heating

A. After the engine working for a moment, turn the blowing rate switch to the proper position;

B. Rotate the temperature control switch counterclockwise to the leftmost position, and the heating system starts working and the hot air begins to be sent out from the air outlet


Fig 69

3. Hot water valve

The heating function of A\C system is realized by emitting heat through circulation of the coolant from engine to radiator. There are two hand hot water valves installed on water inlet and water return port connected to engine and radiator.

In normal operation, these two hand valves shall be at the OPEN position (i.e., the direction of handle of the valve is in line with the run of the pipeline). In case of repair due to the fault in A\C system, you should first close the two hot water valves (i.e., the direction of handle of the valve is perpendicular to the run of the pipeline) to prevent the engine coolant from being lost. When changing engine coolant, you should open the hot water valve and solenoid valve to change the coolant in the radiator also, and guarantee the correct liquid level of the engine coolant.

⚠ WARNING

When the ambient temperature is lower than 0 º and the engine is not working, If there is no anti-freeze fluid filled into the engine coolant, you should empty the engine water tank, and, at the same time, open the hot water valve and solenoid valve to drain out the coolant in the radiator, otherwise the radiator will be frost cracked due to too low temperature of the radiator pipeline!!!

ADJUSTMENT OF DRIVE SEAT

The driver seat equipped for this machine can be adjusted in aspects of soft and hard extent (i.e., height, front and rear direction, backrest angle and headrest height) to adapt requirements from different drivers and different work situations.

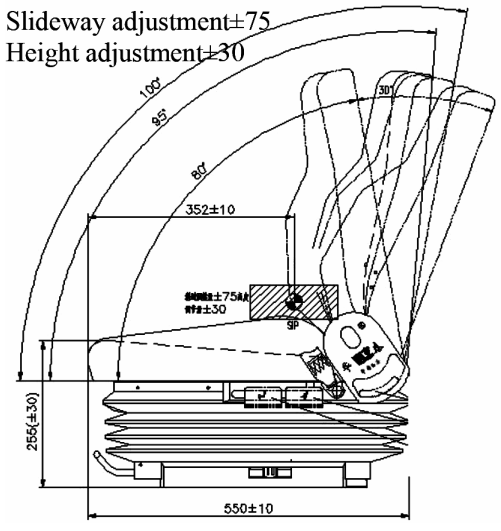


Fig 70

1. Adjustment of front and rear positions

   There is a handle in front sections of low left side of the driver seat. If you toggle this handle towards the outside of the driver seat, the seat may move back and fro. During the movement, you will feel the obvious clamping positions at some places. Move the seat to the clamping position, release your hand and the seat will be fixed to the clamping position. This machine seat can be moved back and fro within the scope of 75mm, and the seat can only be fixed at the clamping position.

2. Adjustment of height

   This machine seat has 3 positions able to be adjusted and you will obviously feel that there are 3 clamping positions. The driver seat is adjusted to the middle position when the machine was delivered from the factory. The driver can adjust the height as required. When adjusting, you should hold the base beneath the seat with your hands, and pull up smoothly. There are several clamping positions to be met during the moving up of the seat, where you can release your hands, and then the driver seat will be fixed at this position

3. Adjustment of backrest angle

   There is a handle in the middle on the right side of the driver. First you toggle the handle clockwise, then toggle the backrest forward or backward to a comfort position and release your hands. The backrest will be fixed at this position. The backrest of the driver seat for this machine can be folded forward, and adjusted backward within 110°.

4. Adjustment of seat headrest height

   The height of seat headrest can be adjusted by using hands holding seat headrest and forcibly pull it up or push it down

SEAT BELT

WARNING

Seat belt is for operator's safety and should always be worn. Before driving machine, adjust seat to desired position for maximum comfort and machine control, then fasten seat belt. Seat belts must be worn across pelvic region and adjusted snugly to lessen chance and severity of injury in event of an accident. Never fasten a seat belt across abdomen.

Under no circumstances should operator be standing in cabin when operating wheel loader.

Do not adjust seat position while vehicle is moving because a loss of control may result. Stop machine, apply parking brake, and then adjust seat.

Always, check condition of seat belt and belt bracket before fastening it. Do not use it with twists in it. Replace belt or bracket if damaged or worn.

Seat Belt Locking and Unlocking

Insert belt end (1, Fig 71) into buckle (2). Pull belt to check that belt end is locked into buckle.

Adjust belt length so that it comfortably tight against operator's pelvic region (hipbone).

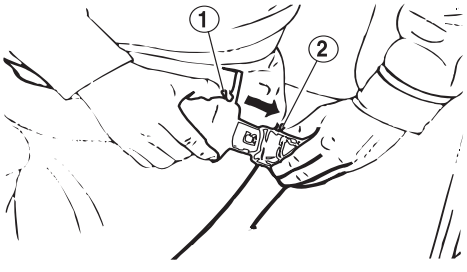


Fig 71

Press button (3, Fig 72) in center of buckle (2) and pull out belt (1) to unlock.

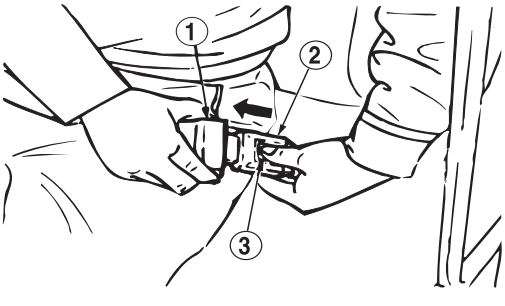


Fig 72

ADJUSTMENT OF REAR-VIEW MIRROR

There is one rear-view mirror each above, on the left and right side of the cab of this machine. Before operating this machine, you must adjust the field of view to ensure the driver has a good field of rear view.

Untighten the bolt connecting rear-view mirror support and cab and rotate the support to adjust the position of the rear-view mirror relative to the cab; Untighten the bolt connecting rear-view mirror and support and rotate the rear-view mirror to adjust the elevation angle of the rear-view mirror. After the above adjustment, it is necessary to tighten the bolt.

Fig 73

Operation

ADVICE FOR OPERATION OF NEW LOADER

All loaders were checked and adjusted before delivery from the factory. However, during the initial running-in process, you should still obey the following procedures, otherwise the equipment could be damaged or its performance degraded.

If perform the operation with full load before running-in period, it will produce adverse effect on the operation life and safety running, and cause accidents finally.

NOTE:

1) *Check coolant, fuel, oil and hydraulic oil for leakage each day.*
2) *Check lubrication oil every day and replace it if necessary.*
3) *Frequently watch the displays on dashboard and various instruments during operation.*
4) *Avoid the overload of engine.*
5) *Keep a load of 80% before engine and other components reaching their operating temperatures.*
6) *Pay attention during operation whether the working device is working normally*
7) *Check for the component loose or damage due to transportation.*
8) *Check the electric wires or terminals for not loose, the instrument for normal operation, and electrolytes for sufficiency.*
9) *Check Tire air pressure for normality.*

Lubrication oil and filter element

1. Change oil and renew filter element after working for first 50 hours.
2. Change transmission oil after working for first 100 hours.
3. Change the filter element in hydraulic oil line and renew filter element after working for first 250 hours.
4. Change axle gear oil after working for first 100 hours.

NOTE: *Refer to "Inspection, Maintenance And Adjustment" on Page 4-1 of this manual for replacement of lubrication oil or grease.*

Running-in of the new vehicle

Running-in of the new vehicle plays an important role in extending the operation life, eliminating fault and hidden troubles, as well as avoiding major faults. After buying this machine, the user must perform the machine operation and maintenance according to the regulations on the running-in of new vehicles specified in this manual, and then you can normally use this machine.

Requirements on running-in of the new vehicle

1. The period for running-in of the new vehicle is 100 hours.
2. Start the engine and run at idle for 5 minutes.
3. During the running-in period, you should evenly arrange the running-in test for each gear of Forward I II III and IV Reverse I II and III Gears.
4. Run the vehicle in a sequence at low speed (small power) first, and then at a high speed gradually. Except in emergency, you should avoid sudden start, acceleration, steering and abrupt braking.
5. It is appropriate to operate the vehicle with a load of loose materials during the running-in period, without too abrupt or too urgent actions. During the running-in period, the loaded weight should not exceed 70 % rated load, and the travel speed should not exceed 70% rated maximum speed.
6. Pay attention to the lubrication of the machine, change the lubrication oil and lubrication grease as per the specified interval.
7. You must pay attention to the temperatures of gearbox, torque converter, front/rear axles, hubs, parking brake, immediate supporting shaft, and hydraulic oil, cooling fluid, engine oil. Perform the troubleshooting if the overheat phenomenon is found.
8. Check bolt and nut of each component for the tightening.

Perform the following operations after 8 hours of running-in period:

1. Completely check bolt and nut of each component for the tightening. Especially you should check the following components one time: diesel engine cylinder head bolt, exhaust pipe bolt, and front/rear axle fixing bolts, rim nuts, propeller shaft connecting bolt, diesel engine fixing bolt, gearbox fixing bolt, front/rear frame hinged-type bolt.
2. Check fan belt, generator belt, A\C compressor belt for the degree of tightness.
3. Check gearbox oil level, driving axle and diesel engine oil levels.
4. Check the hydraulic system and braking system for the leakage tightness.
5. Check the connecting and fixing of each manipulating pull rod and throttle pull rod.
6. Check the temperature and connections of each component in electrical system, the status of generator power supplying and the working conditions of lamps and lighting as well as steering signal lamps.

Perform the following operations after expiry of running-in period:

1. Completely check bolt and nut of each component for the tightening. Especially you should check the following components one time: diesel engine cylinder head bolt, and front/rear axle fixing bolts, rim nuts, propeller shaft connecting bolt, diesel engine fixing bolt, gearbox fixing bolt, front/rear frame hinged-type bolt.
2. Check fan belt, generator belt, A\C compressor belt for the degree of tightness.
3. Check the hydraulic system and braking system for the leakage tightness.
4. Change the transmission oil in gearbox, and lubrication oil for driving axle.
5. Replace gearbox oil filter, diesel engine oil filter, filter element of diesel oil filter.
6. Wash return oil filter element in hydraulic oil tank .

NOTE: *Before changing gearbox transmission oil, driving axle lubrication oil and diesel engine oil, it is necessary to perform according to the related operation regulations.*

OPERATING MACHINE

Before starting engine, check follows:

1. Check the engine coolant level.
2. Check the engine oil level.
3. Check hydraulic oil level.
4. Check the leakage tightness for each oil pipe, water pipe and each component.
5. Check battery connecting wires. If the connecting wires between battery and cables are found loosened, tighten them timely.
6. Check Tire air pressure for normality.

Start engine

1. Remove the obstacles along the driving direction; pay attention whether there is still repair man under the vehicle; except the driver can operate in the cab, nobody is allowed to stand at any position of the machine or sit in the cab.
2. Switch on the negative pole switch.
3. Get on or off the staircase according to the related regulations.

   The correct attitudes to get on/off the staircase (see Fig.1).
4. Adjust the rear-view mirror to have a good rear sight line, and approach the equipment as much as possible.
5. Close the cab left and right doors.
6. Check seat belt for abnormality, and tie the seat belt securely.
7. Check whether the shifting manipulating handle is at "Neutral" position; if not, please toggle it to "Neutral" position.
8. Check whether the manipulating handle is at the middle position. If not, please toggle it to the middle position.

NOTE: *The instrument noted in the picture can pump oil automatically when it is necessary, and this course can last for up to 5mins. Please wait for several minutes after you switch on the start switch when the vehicle has been parked for a long time.*

Fig 1

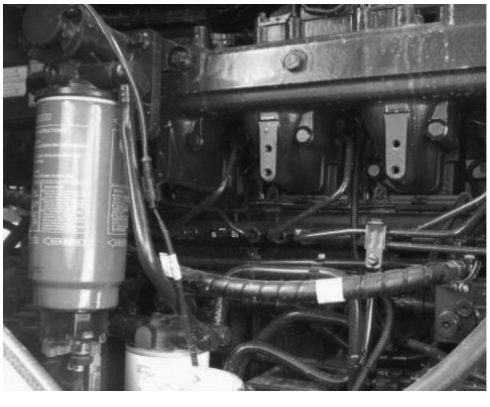


Fig 2

9. Check whether the air flow switch for A/C system is at “O” position and the transfer switch at “O” position. If not, please toggle it to corresponding position.

10. Insert the key into electric lock and rotate clockwise one increment. Switch on power supply and hoot the horn to warn that this machine is to be started and that other persons are not allowed to approach this machine.

11. Check fuel quantity.

12. Slightly depress the throttle pedal, and rotate clockwise for another one increment to switch on diesel engine starter motor. The engine will be started to work within 10s. Now it is necessary to immediately release your hand to let the starting electric lock reset.

    NOTE: *The time for one start should not exceed 15s (the continuous working time for the starter motor should not exceed 15s). If the engine cannot be started now, it is necessary to immediately release the starter switch and wait a little time (over 30s) and then re start the engine again. This is jointly determined by the characteristics of starter motor and the battery. If it cannot be started for 3 times continuously, it is necessary to search for the causes. The engine cannot be re-started until the faults are removed and three minutes later.*

13. The engine, after starting up, shall be warming up at the idle speed (600—750r/min). The full load operation cannot be started until the cooling water temperature of the engine is 55℃ and the hydraulic oil temperature is 45℃.

14. Listen to the engine at the low speed operation. Check the gearbox for abnormal sound and normal operation.

15. Check the instrument for normal operation and each lighting device, indicator, horn, wiper, braking lamp for normal operation.

    NOTE : *Pay special attention to the indicated position for the engine oil pressure, which should not be less than 0.07MPa (at idle speed). If it is less than this value, it is necessary to stop the machine to check the engine for the faults.*

16. If it is in cold weather, you should heat the hydraulic oil. Toggle the bucket manipulating handle backwards and hold it for 4-5 minutes. Meanwhile, increase the throttle actuation to make the bucket limit stop against the arm and make the overflow of hydraulic oil, thus increasing the oil temperature in a quicker way.
17. Check service braking and Parking braking systems for the normality.
18. If there is no obstacle around the machine, it is necessary to slowly rotate the steering wheel and observe whether the machine has the actions for leftwards or rightwards rotation.

Operation of driving loader

1. Operate the manipulating handle and transfer the bucket backwards to the limit position; then raise the arm to the transportation position, i.e., the distance from the hinged point below the arm to the ground is about 500mm.
2. Depress service brake pedal and meanwhile pull down the parking brake handle to release the parking braking. Slowly release service brake pedal and observe whether the equipment is moving.

WARNING

If the machine moves on the flat ground, please immediately depress brake pedal and pull up the parking brake pedal handle to apply the braking. Check the shifting control system of this machine for the faults. If it is on the slope, please first use the wedge to stop the wheel to prevent the vehicle from moving, then check the machine again.

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3. Check whether the Neutral locking switch of the shifting manipulating handle is at “D”. If not, please toggle it to the position “D”;
4. Drive the machine to the flat ground. If the steering inspection is not performed due to narrow space during the operation in previous stage, now it is necessary to rotate the steering wheel. Check whether the machine can make a turning leftwards or rightwards.

5. Check service braking performance of the vehicle. Drive the machine at gear Forward I or II on the flat ground. First release the throttle pedal and smoothly depress the service brake pedal, then the machine can obviously slow down and stop.

   NOTE : *If you depress the service brake pedal, but feel that the machine cannot obviously slow down, please immediately pull up parking brake handle to apply the braking. Meanwhile, operate the manipulating handle to lower down the arm to the lowest position, and tilt the bucket forward to make the bucket lip or knife edge insert in or go against the ground to force the machine to stop, thus ensure the security.*

6. Check the engagement statues of each gear. Drive the machine to the flat ground. Check the gear shifting of the machine respectively with combination of each gear.

7. Steering operation of the machine:

   When the machine needs to turn due to the bend ahead in the driving direction, please perform the operation following the local traffic laws and regulation. At time when you are about to make a turn, you should first put the control handle of the steering lamp to the corresponding direction. When the combo switch handle is toggled forward, it is to turn leftwards, and when it is toggled backward, it is to turn rightwards. At this time, the steering lamps on corresponding side in front of or at the rear of the machine and the corresponding steering indicators on the panel will flash, indicating to the adjacent vehicles and pedestrians around that this machine will implement the steering operation. Then, rotate the steering wheel towards the side you want to make a turn, and the steering immediately begins.

   This machine adopts hinged-type full-hydraulic coaxial flow amplifying power steering. The steering wheel rotation angle is not equal to the machine's rotation angle. Continuously rotate the steering wheel to increase the rotation angle until to the required position. The quick the steering wheel rotates, the quick the machine rotates.

The steering wheel cannot restore to original position after rotation, and the machine rotation angle is kept unchanged. Therefore, after the machine finishes the steering, you should reversely rotate the steering wheel to eliminate the relative angle between front and rear frames of the machine and make the machine drive along the straight direction. After completion of the steering operation, you should toggle the steering lamp to the middle position, and the steering lamp and the steering indicator will go off immediately.

When performing the steering at higher speed, you must release the throttle pedal and, if necessary, use service braking to decrease the machine speed and then conduct the steering operation so as to ensure the driving safety.

WARNING

Strictly prohibit conduct the steering operation on the slope. You should drive the machine down to the flat ground to perform these operations.

8. Braking operation of machine

When the braking is needed for the machine, it is necessary to first release the throttle pedal and then smoothly depresses the service brake pedal. At this time, the braking can be applied.

WARNING

When the machine is driving at high speed, you cannot abruptly depress the throttle pedal to the bottom to prevent from the safety accidents or machine damage due to braking too suddenly unless in the emergency.

Parking of machine

1. Drive the machine to a flat field. Confirm that there is no risk of falling stones, landslip or flood.
2. Apply service braking to stop the machine.
3. Toggle the shifting manipulating handle to Neutral position.
4. Push parking brake button to apply parking braking.
5. Operate the manipulating handle of working device to lower down the arm, and lay down bucket on the ground, then slightly press down the bucket.
6. Let the engine operate at idle speed for 5 minutes to dissipate the heat from each component.
7. After using ENGINE STOP button and making engine shut off, rotate electric lock key counterclockwise to “OFF” and cut off the power supply for the vehicle, then pull out the key.
8. Toggle each switch to middle position or “OFF”.
9. Close left and right doors, and get off the staircase according to the related regulations.
10. If you want to park the vehicle for a long time (e.g., for a night), it is necessary to open the battery box cover to toggle the power supply negative pole switch to SWITCH OFF.
11. If the machine is not added with anti-freeze solution when it is delivered from the factory, you should timely open all water valves after parking the vehicle in winter to drain out all cooling fluid in radiator of cooling system to prevent from frost crack. If the machine is added with anti-freeze solution when it is delivered from the factory, you should operate with reference to the description on the Anti-Freeze Fluid Label at the tail of the vehicle.
12. Lock up all equipments and take away the key with you.

NOTE: *Park the machine on the flat ground. If it is necessary to park the vehicle on the slope, please use the wedge to stop the wheel to prevent the vehicle from* moving.

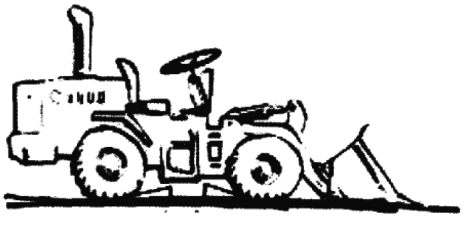

Fig 3

If the machine needs to be stored for a long time, operate according to the following requirements:

A. Before storage

- Wash each part of the vehicle, dry and store in a dry warehouse. If the machine is only allowed to be stored in the open, it is necessary to park the machine on the concrete road surface where the drain is easy, and use the canvas to cover.
- Before storage, the fuel tank must be filled with fuel, and fill lubrication grease to each movable axis pin, propeller shaft, and replace hydraulic oil.
- Put the shifting manipulating handle on “Neutral Gear” position, and put the shifting manipulating Neutral Gear locking plate on “Locking” position.
- Pull up the handle of parking brake to apply parking braking.
- Put the bucket on a flat ground, and toggle the working device handle to the middle position.
- Toggle each switch to middle position or “OFF”, and lock all doors.
- Coat a thin layer of grease on the open part of the piston rod of the hydraulic cylinder.
- Remove battery from the vehicle, and store it separately.
- Air temperature decreases to below 0℃, add anti-freeze fluid into cooling water for engine, and make anti-freeze fluid able to access engine body and A\C system radiator. Or you can drain out the water in the cooling system. Pay attention that you should also drain out the water in the radiator of A\C system.
- After the machine is fixed, use frame-fixed bumper to fix the front and rear frames.

B. In the process of storage

- Start the vehicle once a month to operation each system, and fill lubrication grease to each movable axis pin, propeller shaft, thus lubricating each movable part. Meanwhile, charge the battery also.
- Wipe off the grease on the piston rod of hydraulic cylinder before starting vehicle.
- Coat the anti-rust agent on the easily corrosive part.

NOTE: *If the anti-rust agent is used in the room, it is necessary to open the door and window to remove toxic gases.*

C. After storage

When the machine is stored for long time, you must operate as follows:

- Replace the lubrication oil and hydraulic oil as well anti-freeze fluid in engine, gearbox, driving axle.
- Fill lubrication grease to each movable axis pin, propeller shaft.
- Wipe off the grease on the piston rod of hydraulic cylinder before starting vehicle.

OPERATION OF LOADER

1. Preparation before operation

   Before operation, first use this machine to level the working site, remove the protrusions, fill and level up the pits, shovel the surface of wet ground, clear large and sharp stones on the site to prevent from scratching Tires.

   If you want to use this machine to load the materials onto or unload them from the truck or hopper, you should adjust the limit height of the arm limiting device to make the bucket of the loader able to safely access the truck or hopper, and to prevent the truck or hopper from being damaged due to the impact by materials because the unloading height is too high.

2. General technologies

   - Common shoveling and loading method

     Common shoveling and loading method is suitable for shoveling and loading of loose materials.

     The loader travels at a speed of Gear 2 to approach the materials, and align the bucket middle portion to the materials. The driver holds the steering wheel with left hand and operate, with right hand, arm control lever to lower down the arm to a height 500 mm above the ground.

     When the machine is 1 meter away from the stock pile, then lower the arm to make it contact with the ground and change machine's Gear Forward II into Gear Forward I.

     NOTE: *When the bucket touches the ground, you should prevent the bucket from producing excessive force on the ground and inducing unnecessary resistance for the advance. Meanwhile, the front and rear frames of the loader should be laid straight, and there shall be no included angle between front and rear frames.*

Depress the throttle pedal to make the bucket fully insert into the stock pile. When the machine could not advance further, the driver toggle backwards the bucket manipulating handle to move the bucket backwards and then push the bucket manipulating handle back to the middle position. At this time, the machine will continuously insert into the stock pile and repeat such insertion and retraction of the bucket until the bucket is full with materials.

- United shoveling and loading method

  United shoveling and loading method is suitable for shoveling and loading of hard or stickier materials. The operation before the bucket is inserted into the stock pile is the same with that of common shoveling and loading method. When the bucket is inserted into the stock pile and the machine could not advance further, the driver toggle backwards the bucket manipulating handle with right hand, and then toggle back to the middle position to move the bucket upwards and the bucket thus insert forward a distance. And then the driver toggle rightwards the bucket manipulating handle, and then toggle back to the middle position to rotate the bucket rightwards and the bucket thus could continuously insert forward. Repeat such insertion, lifting, re-insertion and retraction of the bucket until the bucket is full with materials.

- Exit from stock pile

  After the bucket is full with materials, the driver should operate the bucket manipulating handle to rotate the bucket backwards until the bucket's stop dog touches backing plate, and then toggle the manipulating handle back to the middle position. You can thus get the maximum bucket retraction angle.

  Lift the arm to a certain height so that when the machine retreats, the bucket can avoid the stock pile. The driver holds the steering wheel with right hand and toggle, with left hand, the manipulating handle back to the Gear Reverse position to operate the machine to retreat.

  After the machine retreats from the stock pile, the driver operate the arm control lever to lower down the arm to a height of 500 mm above the ground.

- Transportation of materials

  Transport materials with the loader in following conditions:

  ① The heavy-duty truck cannot be used for transportation due to the road surface is too soft or the site is not leveled.

  ② The heavy-duty truck is not economical for transportation over such a short distance (The handling distance is within 500 m).

  During handling, the arm lower hinged point should be kept at the transportation position (500 mm above the ground), and the bucket should be rotated backwards to the limit position (the limit stop on the bucket touches the arm), thus ensuring a smooth and safe handling, not easily scattering the materials.

  The vehicle speed for handling is determined according to the handling distances and road surface conditions. When the machine is crossing the pits or juts, you should release throttle pedal. You can use service braking to conduct "snub" if necessary, to reduce the machine speed to slowly go across the obstacles, thus reducing the impact on the machine and material scattering.

⚠ WARNING

Prohibit lifting the bucket to a higher position to conduct the transportation operation; otherwise it will cause the tip-over of the machine.

- Dumping

  ① Dumping the materials to truck or hopper

  When the loader with full materials is 15m away from the truck or hopper, you should release throttle pedal. You can use service braking to conduct “snub” if necessary, to reduce the machine speed to slowly approach the truck or hopper. Meanwhile, the driver shall toggle the arm manipulating handle backwards to the limit position. At this time, the driver can release hand and the handle will not return back to the middle position under the force of magnet. During this process, the driver shall be careful for driving the machine and closely watching the approaching of the bucket to the truck or hopper, not causing the collision of the bucket and the truck or hopper.

  When the bucket is located right above the truck or hopper, the driver shall depress the brake pedal to make the machine stop. Then, push the bucket manipulating handle forward to make the bucket tip-over forward to dump the materials into the truck or hopper. Here, the driver shall closely watch the movement of the bucket, not causing the collision of the bucket and the truck or hopper edge. If the material is stickier, it is necessary to repeatedly push the bucket manipulating handle back and fro, to make the bucket limit stop repeatedly impact the arm, making the materials attached onto the bucket fall off.

  If the length of the vehicle body is two times as width of the bucket, the unloading operation shall begin from the front portion of the vehicle body.

During dumping, the impacting force of bucket limit stop and the arm shall not be too large, and the impacting times shall not be too many to avoid the damage to the machine.

After completion of unloading, the driver shall toggle the bucket manipulating handle backwards to the limit rear position. The driver release hand and the bucket will automatically return back to the middle position. Then, the driver shall toggle the shifting manipulating handle to the retreat position, and then release the brake pedal to make the machine leave the truck or hopper. When the machine is leaving the truck or hopper, the driver shall be careful for driving the machine and closely watching the approaching of the bucket to the truck or hopper, not causing the collision of the bucket and the truck or hopper. After the bucket fully leaves the truck or hopper, the driver can lower the bucket while driving to prepare the next operation cycle.

Fig 4

② Dumping at lower position

When performing the materials handling between sites, the unloading at lower position is needed some time, i.e., the bucket unloads the materials at a place with lower height from the ground.

Here, after completion of unloading, it is necessary to rotate the bucket backwards to horizontal position, and then conduct the operation of lifting the arm. Otherwise, it is possible unable to lift the arm because of the interference from the link internal mechanism of the working device.

- Handling by pushing

  With bucket flatly close to the ground, put the shifting manipulating handle at Gear Forward I and depress the throttle pedal to push forward. During the pushing process, if some obstacles are found to hinder the advance of the vehicle, it is possible to slightly lift the arm to advance continuously. The operation of lifting or dropping of the arm shall be performed between the lifting and dropping the control lever (not to toggle to either lifting or dropping position) to ensure the pushing handling operation can be accomplished smoothly.

- Scraping

  Lift the arm and make bucket tip-over until the knife plate touches the ground. The included angle between the knife plate and the ground shall be kept to be about 60 º. For the hard road surface, the arm control lever shall be put at the Float position; while for the soft road surface, it should be put to the middle position. Toggle the shifting manipulating handle to the Retreat gear, depress the throttle pedal to make the machine retreat, and use knife plate to scrape the ground surface.

- Traction

  It is possible to equip 20 ton trailer to perform traction transportation. The method is as follows:

  ① Connect securely the trailer to the traction pin of this machine.

  ② Trailer should equipped with good braking system

  ③ Put bucket at “Transportation” position.

  ④ Smoothly execute the starting and stopping operation of the vehicle, and pay attention to apply the braking before going down the slope.

  NOTE: *When executing the braking, it is necessary to first apply braking for the trailer, and then for this machine.*

3. Operation method

- V-type operation method

  Loader is dead against stock pile, and the included angle between truck and loader driving direction is 60 º, and it stops at a place 12-15m away from the stock pile. When the loader is fully loaded, it will retreat directly back to the place 12-15m away from the stock pile. It can make turn while driving, and lifting the bucket simultaneously. After unloading, it will retreat to the original place to perform the next shoveling and loading operation.

- Shuttling operation method

  The Shuttling operation method is mainly used for the united operation between loader and fleet. When the loader is fully loaded, it will retreat back to the place with a distance of 2-3 times of the truck width. Then, one truck travels from one side of the loader to be in front of the loader and stops, and then the loader travels further forward and lifts the arm. After unloading, the loader retreats back to the original place. If the truck is not fully loaded, the truck will travel forward another truck space. After the loader accomplishes the next shoveling and loading operation, it will retreats to the original place, and the truck which has not been fully loaded then retreats to be in front of the loader, and the loader will perform the unloading. In this way, repeat the operations until the truck is fully loaded, then start the loading and unloading for the next truck. This operation method requires the loader driver and the truck driver to cooperate skillfully. They can use horns, lights or gesture to communicate if necessary.

Operation in cold weather

Matters needing attention in cold weather:

If the ambient temperature is too low, the engine will be started difficultly and the radiator may be frozen. Therefore, you should obey the following instructions:

1. When the environmental temperature is below 6℃, you should wait for about 8 or 10 minutes after you turn on the starting switch, and then start the engine.
2. Use low-sticky fuel, hydraulic oil and lubrication oil, and add the anti-freeze fluid into the cooling water.
3. Matters needing attention for anti-freeze fluid
   - Do not use anti-freeze fluid containing methanol, ethanol, propanol.
   - Absolutely no use of any leakage proof water aqua, no matter whether it is used separately or together with anti-freeze fluid.
   - Do not mixedly use anti-freeze fluids with different brands.
   - When changing anti-freeze fluid, please refer to the description on the Anti-Freeze Fluid Label at the tail of the vehicle.

   NOTE: *Keep the anti-freeze fluid away from flame, and do not smoke when filling anti-freeze fluid.*
4. Matters needing attention for battery:
   - When the ambient temperature is decreased, the battery capacity will also decrease. If the charge rate of the battery is low, the electrolytes may be frozen. Therefore, it is necessary to keep the rate as close to 100% as possible and perform the heat preservation as possible so that the engine can easily be started up the next day.
   - Use chill-proof battery in severe cold district.

Fig 5

In order to prevent the vehicle from being not started next day due to the congelation of sludge, water or snow stuck on the machine, the following work must be done after completion of the operation each day:

1. Thoroughly remove sludge, water or snow stuck on the machine to prevent from them entering the seals to impair the seal performance.
2. Park the vehicle on the dry hard ground. If not possible, park it on the plank. Using plank may prevent the vehicle from being frozen onto the ground. This is convenient for the start of the vehicle next day.
3. In low temperature conditions, the battery capacity will decrease as the storage time of the vehicle increases. So it is necessary to cover the battery or remove it to a warm place and reinstall it before operation the next day.

After the cold weather and when it is warmer, you should perform as follows:

1. Replace with proper-sticky fuel, hydraulic oil and lubrication oil for all components.
2. If the permanent anti-freeze fluid was not used, it is necessary to fully drain out the water in the radiator, clean the radiator, and replace the cooling water.

OPERATION UNDER SPECIAL CONDITIONS

Operation under extreme cold conditions

If the machine is working in extremely cold weather, it is necessary to adopt protective measures to guarantee the normal operation. The following detailed inspection can ensure the machine to work normally in cold temperature.

1. Check whether the cooling system has used proper anti-freeze fluid under extreme low temperature. Carefully check cooling system and record the leakage situations.
2. Keep the battery fully charged to prevent from freezing. If you add water into the battery, run the engine for at least one hour to make it mixed with electrolytes.
3. Keep the engine in the optimal conditions to realize the easy start and operation in unfavorable weather.
4. Select proper engine oil according to the temperature. For more information see “Lubrication and specifications” in Engine Manual.
5. Ensure the fuel tank is fully filled with fuel at any time. Drain out the condensates in the fuel tank before operation. Check fuel tank the filter element, drain out the condensates in it (e.g., wax-like substance), and ensure the freezing point of the used oil is lower than the lowest ambient temperature.
6. Perform the full lubrication for the machine according to the instructions in Section 4 of “Maintenance Period Chart” and to the lubrication diagram attached on the machine.
7. Start the engine to make it reach the normal temperature before working with load.
    A. When the machine is in idle state, if the mud and ice are attached on the running components, please heat to melt the frozen substances.
    B. Be careful to operate the hydraulic components until they reach the temperature at which they can normally work.
    C. Check all machine control device and/or functions to ensure the normal operation.

8. Put a backup external air filter in the cab to replace the frozen components in case.

9. Perform auxiliary startup in cold weather, see Section “Start in Cold Weather” in this Manual.

10. In order to prevent from icing, remove all mud, snow and ice. If possible, use canvas to cover the machine, and prevent the canvas edges from being frozen onto the ground.

Operation under high temperature conditions

Operating the machine continuously under high temperature may cause overheat of the machine. Monitor the engine and gearbox temperature if necessary, and stop the machine to cool it down.

1. Frequently check and maintain the fans and radiator. Check the coolant level for the radiator. Check whether the radiator fins are accumulated with dust, sands or insects etc which blocks the cooling pipeline.

    A. Under high temperature, the dirt is generated more quickly in the cooling system. Change the anti-freeze fluid each year to keep the preservative function.

    B. Regularly flush the cooling system, if necessary, to keep the cleanness of the pipeline. Avoid using the water containing high Alkali, otherwise, the dirt will be generated more easily.

2. Check electrolytes level every day. Keep proper electrolytes level to prevent from damaging the battery. In high temperature environment, use weaker electrolytes. Dilute the electrolytes with a specific weight of 1.280 into one with a specific weight of 1.200-1.240, and fully charge it. Whenever the specific weight of 1.160 reaches, it is necessary to re-charge the battery. If stored under high temperature for a long time, the battery will self discharge quickly. If the machine stops for several days, please put it in a cool place.

WARNING

Do not store acidic batteries near tires, because the acidic gases will be harmful to rubber.

3. Check fluid level before oil filling. High temperature and cooling will cause the concentration varying of the fluid in the reservoir.

4. Perform the full lubrication for the machine according to the instructions in Section 4 of “Maintenance Period Chart” and to the lubrication diagram attached on this machine.

5. Do not store the machine in the sun for a long time. Put the machine under the covering to prevent sun, dirt or dust.

A. If there is no appropriate covering, please use canvas to cover the machine. Prevent dust from entering engine, gearbox, and hydraulic system.

B. Under the high temperature and wet weather, all parts of the machine will be corroded, and they will be more easily corroded in rainy season. The metal surface will be rusted and paint blistered, and other surfaces will have speckles.

C. Coat the anti-corrosive lubrication oil onto unpainted or naked surface. Use insulation mixture to protective wires and terminals. Use paint or proper anti-rust materials on the damaged surfaces to prevent from being rusted or corroded.

Operation in the dusty or sandy area

Dust will be produced in most places during operating machines. However, you must adopt the preventive measures in severely dusty or sandy places.

1. Keep the cooling system and cooling area clean. You can use compressed air to purge them for cleaning, and shall adopt this measure as much as possible.

⚠ WARNING

Wear protective goggles when using compressed air.

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2. When maintaining the fuel system, you must be careful to prevent dust and sand from entering the oil way.

3. Frequently maintain air filter, check air control indicator everyday, and keep dust cover and dust screen clean. Prevent dust and sand from entering engine parts and components as much as possible.

4. Perform lubrication and maintenance according to the lubrication diagram attached on the machine and to the instructions in Section 4 of “maintenance Period Chart”. Clean all lubrication oil connectors. The mixing of sand and lubrication oil will cause the wear and expedite the wear of parts.

5. Keep the equipment clean as much as possible. Put the loader under the shed to prevent the machine from being impaired by sand or dust.

Operation under rainy weather

Advice for operation under rainy weather is the similar to the under high temperature conditions.

1. Coat lubrication oil onto all naked surfaces. Be especially careful, as early as possible, for the damaged or unpainted surfaces. Coat lubrication oil on the damaged paint surfaces to prevent from being corroded.

Operation in brine

The brine and sea wave are highly corrosive. When the equipment is working in brine, pay attention to follow items:

1. When the equipment is corroded by brine, immediately use clean water to wash and dry it completely.
2. Spread lubrication oil on the surface which contacts to brine. Pay especially attention to the damaged paint surface.
3. Timely refit the damaged paint surface.
4. Perform lubrication according to the lubrication diagram attached on the current machine and to the instructions in Section 4 of “maintenance Period Chart”. The equipment working in brine environment should shorten lubrication interval.

Operation at high altitude area

Normally, the operation at high altitude area is the same with that under low temperature conditions. Before operating at high altitude area, you must perform the necessary adjustment on the engine according to the related engine manual.

1. Measure the working temperature of the engine and check the engine for overheat. The radiator must be strictly sealed to prevent the coolant pressure from being released.

ADJUSTMENT OF BUCKET POSITION SWITCH

Adjustment of bucket limiting device

This machine is equipped with bucket positioning system, and it has auto leveling and lifting limit function at any position. You can effectively improve the working efficiency by rationally using these functions.

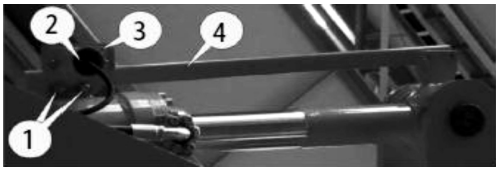


Fig 6

Adjustment of bucket auto leveling device

1. Place the machine on a flat ground and the shifting manipulating handle at the Neutral position. Operate the pilot manipulating handle and put the bucket on a flat ground, then pull up parking braking valve button, shut off the engine. Install the frame-fixed bumper
2. Untighten the bolt “1” as shown in the diagram, move the approach switch assy “2” forward to make the approach switch “2” completely coincide with limiting plate “4”.
3. Switch the starter key to ON position and connect the power supply for the vehicle. Toggle the pilot valve bucket manipulating handle backwards to the extreme rear position and stuck by the magnetic force.
4. Move the approach switch assy backward to make the approach switch “2” in line with the rear end (left end) of the limiting plate “4”. At this time, the magnetic force on pilot valve just disappeared(the approach switch indicator “5” is just OFF), and the bucket control lever auto returns to the middle position; and tighten bolt “1”. The distance between the approach switch “2” and the limiting plate “4” shall be kept within 4~6mm
5. After completion of the above operations, remove frame-fixed bumper, start the engine and check whether the adjustment is appropriate.

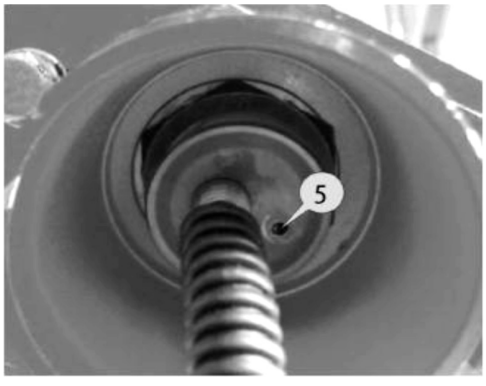


Fig 7

ADJUSTMENT OF BOOM POSITION SWITCH

WARNING

Be careful for the personal safety when performing the adjustment of arm lifting height limit. Non-working persons shall not approach the machine, and nobody shall stand in the area near arm.

1. Place the machine on a flat ground and the shifting manipulating handle at the Neutral position. Pull up parking braking valve button, operate the pilot valve control lever to raise the arm to the required unloading height, shut off the engine and install frame-fixed bumper.
2. Switch the starter key to ON position and connect the power supply for the vehicle. Toggle the pilot valve arm manipulating handle backwards to the extreme rear position and stuck by the magnetic force.
3. Untighten Bolt “1” shown in diagram and rotate the limiting plate “4” towards approach switch “2”, making the approach switch “2” in line with the rear end (left end) of the limiting plate “4”. At this time, the magnetic force on pilot valve just disappeared(the approach switch “2” indicator is just OFF), and the pilot valve control lever auto returns to the middle position; and tighten bolt “1”.
4. The distance between the approach switch “2” and the limiting plate “4” shall be kept within 4~6mm. When rotating the limiting plate “4”, rotating it counterclockwise will decrease the limiting height, and rotating it clockwise will increase the limiting height.
5. After completion of the above operations, remove frame-fixed bumper, start the engine and check whether the accomplished adjustment is appropriate.

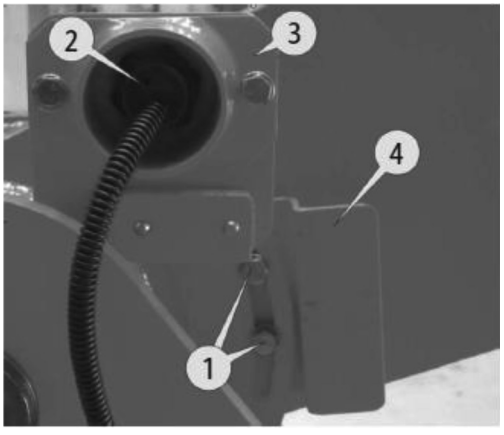


Fig 8

Inspection, Maintenance and Adjustment

The maintenance and inspection of the equipment are necessary in order to keep the equipment working in normal conditions. The time interval, each system and components position and inspection method are listed as follows:

Fig 1

NOTE: *The following items list the content and time interval for the maintenance and inspection. The maintenance period may be shorten depending on actual conditions. The extreme heat or dirty environment is needed to be maintained more frequently. For maintenance period, refer to the engine working time shown on the cluster display of the console in cabin. (Fig.1)*

Series No.

There two Series NO plate attached on the body of the loader. The main Series NO. plate is positioned in the front of the front frame. The engine Series No is stuck to the left of the engine body and above the oil sump. Other descriptions related the engines are positioned on a label on the cylinder head.

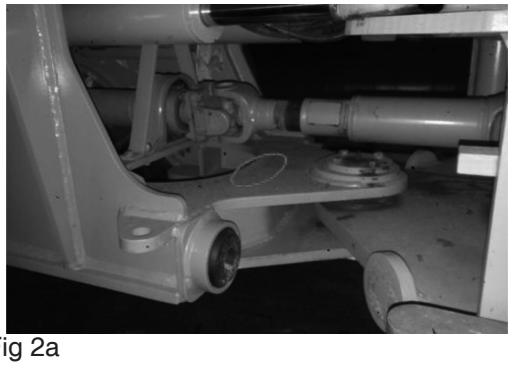


Fig 2a

NOTE: *These numbers and their positions are very important to the maintenance at any times during Warranty period.*


Fig 2b

Safety instructions

1. In order to prevent some accidental operation during maintenance, you must first identify the hydraulic system control level be positioned in the middle and hang the Warning mark (warning sign).

2. Confirm that the overflowed liquids are thoroughly cleared, especially those liquids around the engine.

3. Check all fuel pipeline for the tightening of joint, pipeline, fuel filter, and O-ring seal.

4. If it is needed to start engine for check or experiment, ensure that all irrelevant personnel have left and that the operation shall be performed according to the standard.

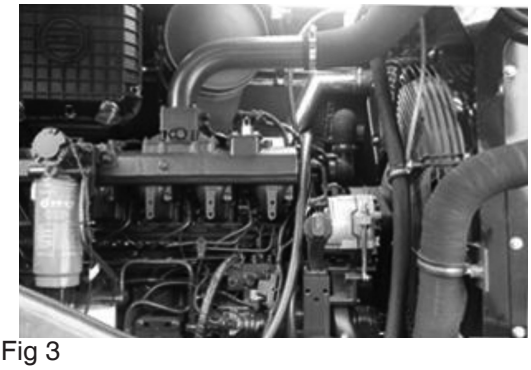


Fig 3

PREPARATION AND SETTING OF THE EQUIPMENT BEFORE MAINTENANCE

Park the vehicle as the following requirements before performance of maintenance according to the regulations in this manual.

NOTE: *Some special maintenance requires the machinery has different parking mode. However, after completion of maintenance, the machine must be reset to the following positions.*

1. Park on the hard plane.
2. Put the Bucket on the ground.
3. Switch off the engine and pull off the key
4. Put the control lever at middle position

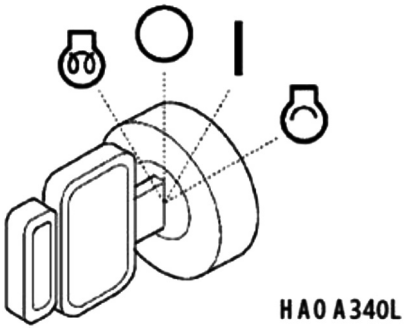


Fig 4

⚠ WARNING

Especially be careful for running the engine during the maintenance. When the engine is running, let one person always stand in the cab without leaving.

5. Before starting work, hang a warning sign “Do Not Touch When Performing Inspection Or Maintenance” on the cab door or on the working pole.

RECOMMENDED LUBRICANTS TABLE

Do not use un-recommended lubrication oil. Do not use unapproved products.

NOTE: *Refer to maintenance time interval table to make lubrication for the specified positions.*

Matters needing attention on lubrication

- The oil must be cleaned and the diesel oil must be sedimented for 72 hours; hydraulic system cleanness must meet the requirements from 18/15(GB/T14039-93) or NAS10 (American Standard), otherwise, the failure of the hydraulic system or pump excess wear will be caused.
- The oil filling device and oil position must be clean.
- The machine must be kept to be horizontal during inspection of oil flow.
- For oil filling of front and rear axles, you should fill the oil into the oil filler on the left hub and the right hub, the oil filling quantity is subject to the overflow at the oil level plug of the axle.
- Oil filling for the gearbox: fill oil into oil filling into oil filling pipe of the gearbox. Open the oil level switch, oil filling pipe of t/m, when the oil level switch overflow, the t/m is full-load. If filling t/m fist start the vehicle run for 5 minutes then check the oil level again.
- Filling of hydraulic oil tank: Open the cover of hydraulic oil tank, and fill oil into the tank. When the oil level reaches 10-15 on the tank scale label, this indicates the oil in the tank is to be about full; if this is the first time to fill oil into hydraulic oil tank, you should start the engine to run for 5 minutes, then check the oil level again.
- Do not mix using, replacing of various kinds of oils, otherwise it will cause aging and ineffectiveness of rubber parts and the premature wear of the parts.

See following table for oil varieties and brands

Classification	Name		Application location
Lubrication grease	#3 molybdenum disulfide Lithium-based grease		Various rolling bearing, working device axis pin for rolling bearing, frame pin for steering cylinder axis pin, propeller shaft spline of sub-frame pin, and water pump
Transmission oil	API :CD/CE/CF/SF/SG SAE15W40 *Do not mix with any other oils *It is filled with engine oil when delivery.		Torque converter, power shift gearbox
Hydraulic oil	HM46(Summer)	HV46(Winter)	Working device hydraulic system and steering hydraulic system
Engine oil	CF 15W/40(Summer)	CF 5W/40 (Winter)	Diesel engine
Engine fuel	#35 light diesel oil		Diesel engine
Gear oil	GL-5 85W/90 heavy load vehicle gear oil		Main transmission and hub reduction inside the axle
Brake fluid	Mobil DOT3		Brake system

IMPORTANT

Do not mix different brands of oil varieties from different companies. Our company disapproves to use other brands of oil varieties. If you must select other brands of oil varieties, the oil specification shall meet or exceed the standards we specified.

We use the oils from the specified excellent factories when the equipment is delivered.

But for the hydraulic oil temperature fluctuations every day and every week, or when it is operated below 0 ℃ air temperature, please select the lubrication oil with a lighter specific weight. The best recommendation is to select lubrication oil according to the air temperature conditions

FLUID CAPACITY

Component		Capacity
Engine.	Oil pan (incl. filter)	14 L
	Cooling system	28 L
Fuel tank		155 L
Hydraulic oil Tank Capacity		123 L
Gear box		42 L
Driving axle	Front Axle housing	10 L
	Front Hub wheel	4.5 L(single side)
	Rear Axle housing	17 L
	Rear Hub wheel	4.5 L(single side)

LUBRICATION OIL & MAINTENANCE CHART

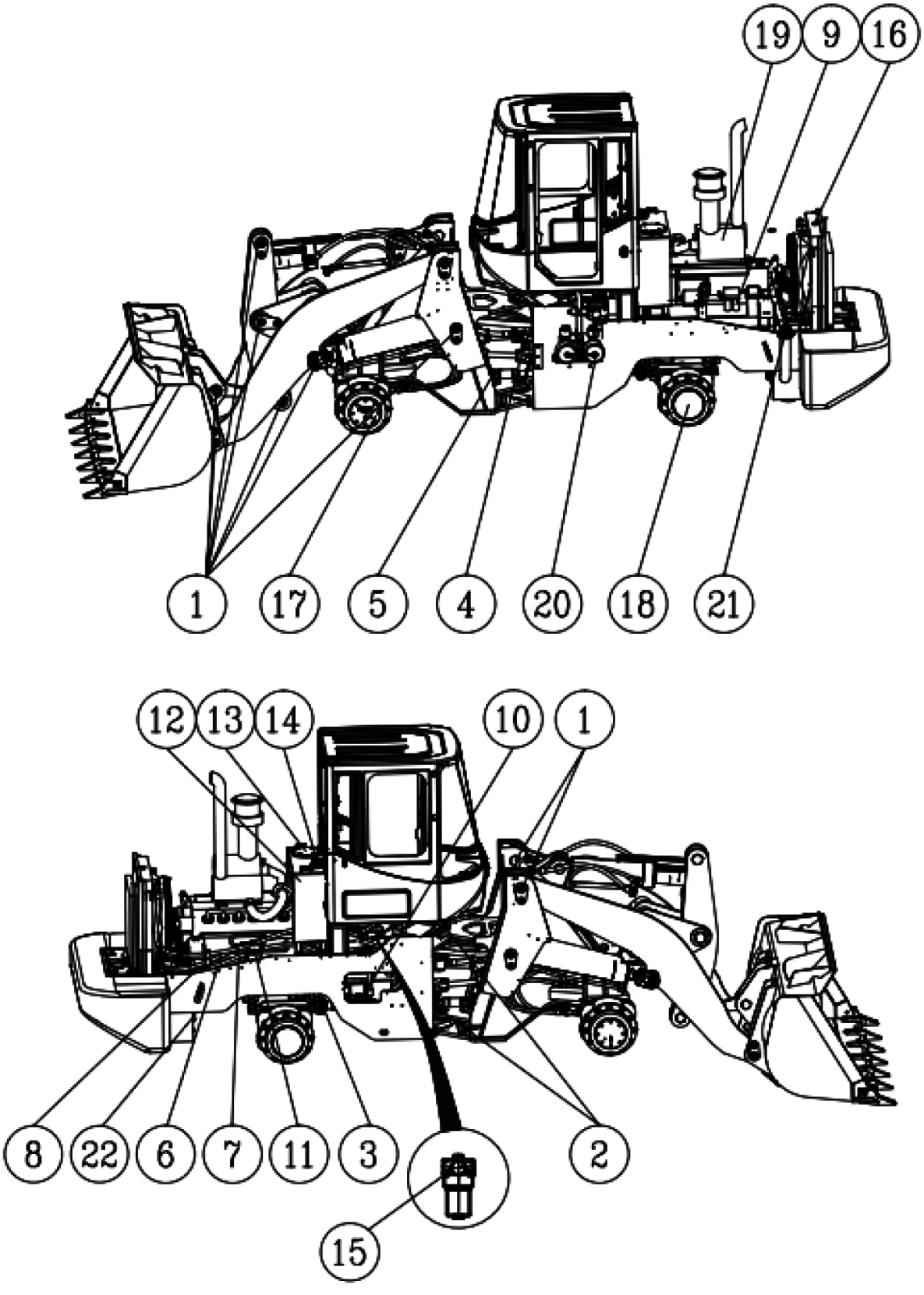


Fig 5

Service Data										
No.	Items To Check	Service	Qty	HL635AL						
				Service Interval（h）						
				10	50	100	250	500	1000	2000
1	Front Joint Pin	Grease	13	V						
2	Articulation Pin	Grease	2	V						
3	Stabilizer pin	Grease	2	V						
4	Steer Cylinder	Grease	4	V						
5	Shaft Bearing	Grease	13	V						
6	Engine Oil	Engine Oil	14L	V	F			●		
7	Engine Oil Filter	Cartridge	1		F			●		
8	Fuel Pre-Filter	Cartridge	1					●		
9	Fuel Filter	Cartridge	2					●		
10	Transmission	Engine Oil	42L	V		F		●		
11	Transmission Filter	Element(Primary)	1					C		
		Element(fine)	1			F		●		
12	Hydraulic oil Tank Capacity	Hydraulic Oil ISO #46	123L	V						●
13	Oil Tank Return Filter	Element	1				F		●	
14	Oil Tank Breather Filter	Element	1						C	
15	Pilot Filter	Cartridge	1				F		●	
16	Radiator	Coolant	28L	V						●
17	Front Axle	Gear Oil	19L	V		F			●	
18	Rear Axle	Gear Oil	19L	V		F			●	
19	Air Filter	Element (Outer)	1		C			●		
		Element (Inner)	1					●		
20	Brake Pump	Brake Oil	2.8L	V				●		
21	Fuel Cap Filter	Element	1				C			
22	Fuel Suction Filter	Element	1				C			

V: Maintenance and Fill	Grease	NLGI-3 or NLGI-2
C: Cleaning	Engine Oil	API: CF-4, SAE: 15W40
F: First Time Exchange Only	Transmission Oil	#8 T/M OIL
●:Replacement On Every Interval	Gear Oil	API: GL-5, SAE: 85W/90
NOTE: For additional service items see list of" Maintenance Intervals" on page 4-9,4-10.	Hydraulic Oil	ISO: VG46, HV46
	Coolant	50% Water + 50% $(HOCH_2)_2$
	Brake Fluid	DOT 3

MAINTENANCE INTERVALS

10 hours/routine maintenance

- Visually check around the machine for informalities or oil leakage.
- Check the engine and transmission oil level.
- Check hydraulic oil level.
- Lighting and instrument.
- Check tyre for damage and wear patterns.
- Gunning grease into drive shaft,Gunning grease into front/rear frame articulated point, rear axle swinging rack, intermediate bearing and other bearings.
- Drain water from air reservoir each day.
- Check the brake pipe and make sure no air and fluid leak.
- Check oil level of the brake pump (from 1/2 to 2/3 of the full capacity of recommended) and the quality of the brake fluid (turbid or pollutional).

50 hours/weekly maintenance

- Tighten the connecting bolt for front/rear drive shaft.
- Clean the outer element of the air cleaner.
- On first 50th hours working day, change engine oil and the filter of the engine oil. From then on, repeat this operation every 500 hours.
- Check and adjust the parking brake system if necessary.

100hours/half-monthly maintenance

- Clean engine cylinder head and torque converter cooling device.
- Check battery liquid level, and coat a thin layer of vaseline.
- On first 100th hours working day, change transmission oil and the element of the fine filtration. From then on, repeat this operation every 500 hours. Every time to replace the transmission oil, clean thepri mary filter element; If the element cannot be cleaned up, please replace it.
- On first 100th hours working day, change front/ rear axle gear oil. From then on, repeat this operation every 1000 hours. .

250 hours/monthly maintenance

- Check tightening torque of fixing bolt of rim.
- Check oil level of front/rear axle.
- Check load-carrying welds and fixing bolts of working device and front/rear frame for cracks and looses..
- Check compressor belt and generator belt for loose and damage.
- Check and adjust service brake and parking brake system.

500 hours / quarterly maintenance

- Tighten the connecting bolt between front/ rear axle and frame..
- Replace engine diesel oil filters.
- Clean the oil filling and oil sucking filtration screen of fuel tank.
- Replace the outer and inner element of the air filer.
- Check and wash the seal components of the booster pump and replace the brake fluid of the whole loader.(When replace the brake oil, the air must be exhausted from the brake system).
- Check the wear conditions of the friction plate of the service brake and that of the brake drum and brake shoe of the parking brake.

1000 hours/half-yearly maintenance

- Inspect various temperature gauges and pressure gauges.
- Check the tightening of engine exhaust pipe.
- Check engine operation.
- Replace the oil return filter element, breather and the pilot filter element of the hydraulic oil tank.

2000 hours/yearly maintenance

- Replace hydraulic oil, clean oil tank and oil sucking filter screen, and check oil sucking pipe.
- Check service braking and parking braking operations. Disassemble and check the wear of friction lining if necessary.
- Check the tightness of distribution valve and working cylinder by measuring the natural sedimen
- Check flexibility of the steering system.
- Replace the Coolant of the radiator and cooler piping.

WORKING HYDRAULIC SYSTEM (Pilot Control)

Working hydraulic system is used to control the actions of working devices such as arm and bucket in loader. The whole working hydraulic system is mainly composed of: hydraulic oil tank (with oil return filter), gear pump, main control valve, boom cylinder, bucket cylinder, control lever and leveling system.

Operation principle of working hydraulic system

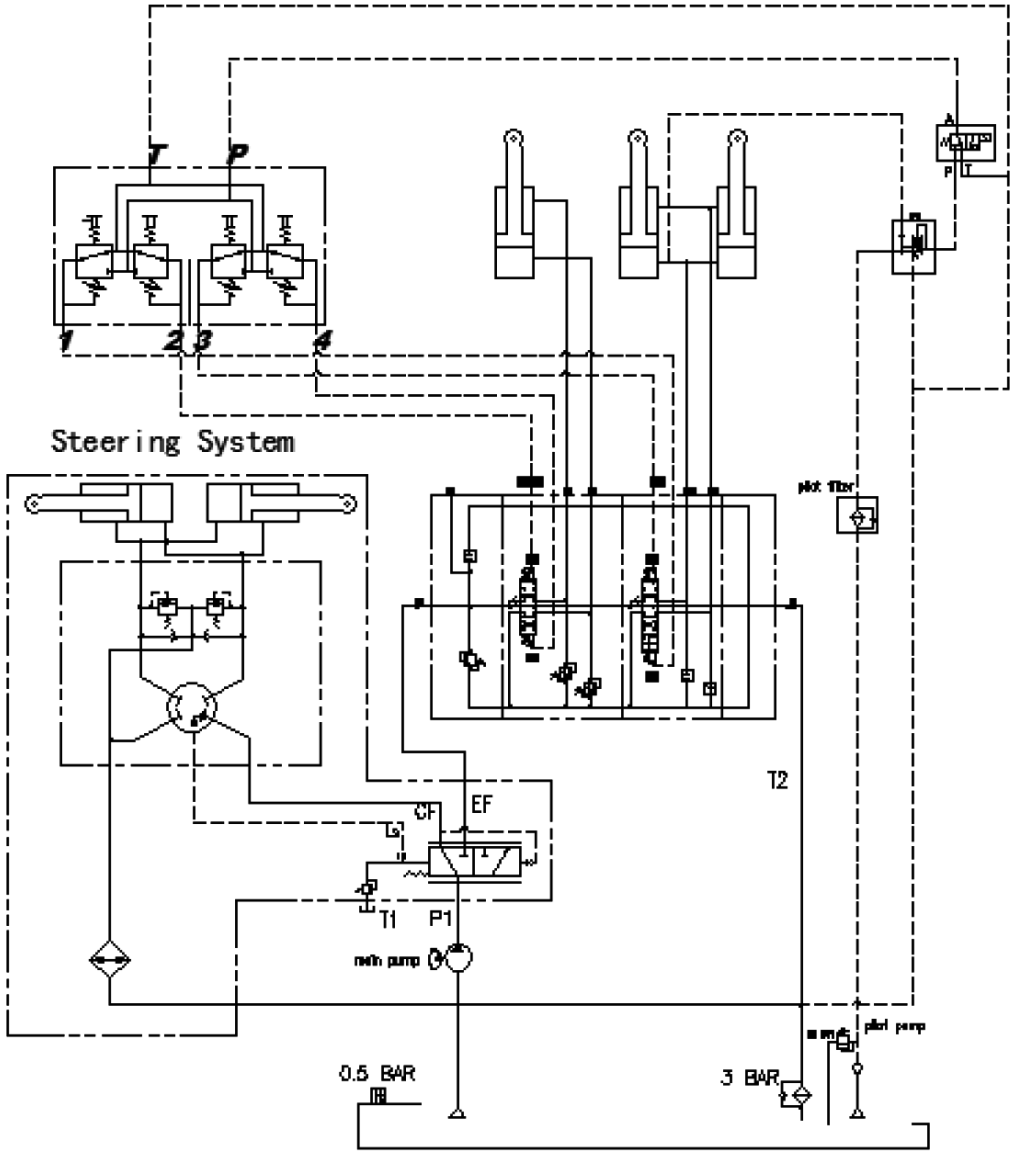


Fig 6 HL635AL HYDRAULIC CIRCUIT(Pilot Control System)

- When working device does not work, the oil from priority valve will pass through middle portion of the main control valve and return from the return port of main control valve to the oil tank.
- When the working device needs to actuate, Operate the control lever of the bucket, and the oil from priority valve will pass through the working oil port of the main control valve and, depending on the position of the bucket spool, enter the big chamber or small chamber of the bucket cylinder, able to realize the tilting of bucket. Operate the control lever of the arm, and the oil from priority valve will enter the working oil port of the main control valve and, after passing through bucket spool, and depending on the position of the boom spool, enter the big chamber or small chamber of the arm cylinder, able to realize the lifting or dropping of arm.
- When the external load exceeds the working capacity of the system, or when the working device moves to each limiting positions and the system pressure rises up to the set pressure of the system, the relief valve of the main control valve will open and the high pressure oil will return to tank through relief valve. At this time, the hydraulic system will heat and energy consumption is greater.

Introduction to main elements of working hydraulic system:

Main Control Valve

Model …….. DVS20

Pressure setting of relief valve……17.5MPa

Overload valve pressure of
bucket small chamber…… 19.5MPa

Overload valve pressure of
bucket big chamber……..19.5MPa

The main control valve is a pilot operated, integrated, serial-parallel, duplicated valve, and is mainly consisted of valve body, boom slide valve, bucket slide valve, main relief valve, bucket small chamber overload valve, and all kinds of check valves. The oil inlet passage for boom slide valve and bucket slide valve is a serial structure, with the bucket slide valve having the priority. When the bucket slide valve is working, the boom slide valve cannot work at the same time. However, the oil return passage for boom slide valve and bucket slide valve is a parallel structure, i.e., both slide valves can realize the oil return at the same time. The bucket slide valve is a 3-p-6-w slide valve, including bucket unloading, neutral and bucket retracting positions (totaling to 3 positions). The boom slide valve is a 4-p-6-w slide valve, including boom lifting, neutral dropping, and

float dropping positions (totaling to 4 positions). Moreover, the bucket slide valve also has bucket big chamber overload valve and bucket small chamber overload valve.

When bucket slide valve of the main control valve is at Middle position, the overload valve connected to the bucket oil cylinder big/small chamber will limit the maximum pressure inside the bucket oil cylinder. When external force exerts on the bucket oil cylinder, and if the pressure inside the cylinder is higher than the pressure setting of the overload valve, the overload valve will open to connect the pressured chamber to oil tank to realize the oil return, and the piston of bucket oil cylinder will move immediately to prevent the system elements from being damaged from high oil pressure.

The interior of bucket valve and boom valve is installed with check valve to prevent the “Nodding” phenomenon during operation. The bucket slide valve can automatically reset, but the boom slide valve needs manual reset due to the internal steel ball locating.

WARNING

Hydraulic system may be under high oil pressure even if the engine is switched off or the pump has stopped. If you make any operation on this system without releasing these pressures, it is possible to cause serious injury or damage. In order to avoid the occurrence of injury or damage, you should carefully read this Section and release the pressure in hydraulic system before performing any operation on the hydraulic system.

When commissioning or adjusting the system, you should put the machine on the flat ground, and keep it far away from the working crowd and machinery. The machine can only be separately operated by one person, and other persons must be away from the machine by certain distance to prevent the accidents.

You must understand the correct flow and pressure in this hydraulic system during the inspection and operation of this hydraulic system. The output flow of the pump is related to the engine speed. The higher the speed of the engine is, the more the pump output will be, and vise versa. The pressure value of the hydraulic system is related with the load of hydraulic system.

The maximum pressure of each subsystem is calibrated through each relief valve. The too low calibrated value may cause boom to powerlessly lift or dig. However, the too high calibrated value may cause the damage to elements or seals.

The leakage in boom and bucket operation system is related with oil cylinder oil glands, the gap and seals inside of each valve, and the fit between cone valve and taper seat.

Observation and inspection

After the fault occurs, the first step for troubleshooting is to perform the observation of the steering system and its elements. Switch off the engine before performing observation, lay boom and bucket down to the ground.

- Check the hydraulic tank oil level is normal.
- Observe the oil bubbles in the hydraulic oil tank: take a sample from the oil tank using a clean bottle after the machine is just stopped, and observe the bubbles in the oil sample.
- Remove the oil filter and observe the precipitation of oil. The magnet can be used to separate the irony grains from non-irony grains.
- Check all pipelines and joints for the leakage and damage.

Release of hydraulic system pressure

- Put the machine on the flat ground, and keep it far away from the working crowd and machinery. The machine can only be separately operated by one person, and other persons must be away from the machine by certain distance to prevent the accidents.
- Push the parking braking button, and the engine should be switched off.

WORKING DEVICE

The working device is consisted of four main parts: bucket, lift arm, lever and link, as shown in Fig. 6. The lift arm is a single plate structure, whose rear end is supported on the front frame, and the front end is connected to the bucket, and the middle portion is connected to lift arm oil cylinder. When the lift arm oil cylinder stretches or retracts, the lift arm will rotate around its rear end pin to realize the lifting and dropping of bucket.

The lever is a single rocker arm structure. When the bucket oil cylinder stretches or retracts, the lever will rotate around its central bearing point and the bucket will tilt up or tip down trough the link connection.

The bucket is flat bucket with teeth, as shown in Fig. 6. The tooth sleeve is welded to the main cutting plate. The tooth body is fixed using flat pin. After worn, the tooth body can be replaced by tapping out the flat pin. The wearable plate is welded onto the bottom of bucket to extend the service life of bucket.

The type of connection between tooth body and the tooth sleeve is shown in Fig. A-A.

The structure of pins for each movable parts of the working device is shown in Fig. B-B. The bush adopts composite materials with self-lubricating capacity to extend the service life of pin and bush; each pin shall be filled with lubrication oil every 50 hours during operation to ensure its normal operation.

After the whole machine works for 2000h, it is necessary to check the gap between each axis pin and bush. If the actual gap exceeds the permissible maximum value in the following table, you should replace the pin and bush.

Pin position	Check item	Nominal dimension (mm)	Fit clearance (mm)	Permissible gap after being worn(mm)	Measures to be adopted after the permissible value is exceeded(replace pin or bush)
Link and lever hing pin	Gap	φ60	0.220-0.394	0.90	(as above)
Link and bucket hing pin	Gap	φ60	0.220-0.394	0.90	(as above)
Lift arm and bucket hing pin	Gap	φ60	0.190-0.338	0.80	(as above)
Lift arm and lever hing pin	Gap	φ85	0.240-0.414	1.00	(as above)
Bucket oil cylinder and lever hinge pin	Gap	φ60	0.220-0.394	0.90	(as above)
Lift arm oil cylinder and lift arm hinge pin	Gap	φ50	0.220-0.348	0.85	(as above)
Lift arm and frame hinge pin	Gap	φ60	0.220-0.394	0.90	(as above)

Check working device regularly for crack, bend and deformation of each component weld,and repair them timely if necessary.

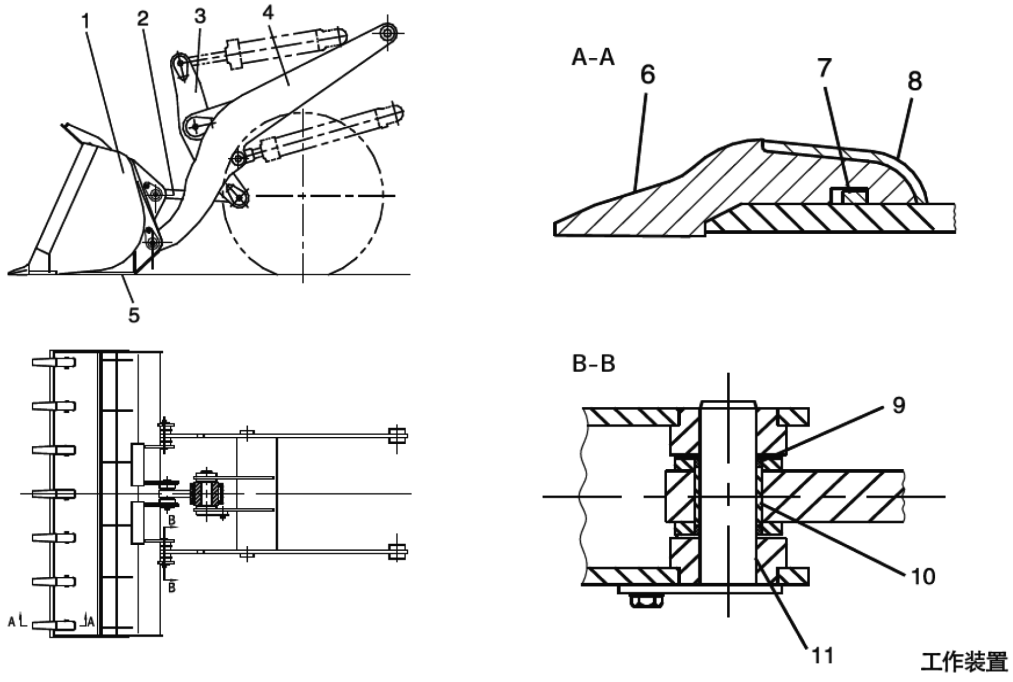


Fig 7

Reference Number	Description
1	Bucker
2	Link
3	Lever
4	Lift Arm
5	Wearable Plate
6	Tooth Body

Reference Number	Description
7	Flat Pin
8	Tooth Plate
9	O-Ring Seal
10	Bush
11	Pin

ELECTICAL SYSTEM

NOTE: *Strictly prohibit disassemble electric circuit and components. You should consult the agent to solve such problems.*

HL635AL electrical system includes: battery, alternator, starter motor, gauge panel, switch, lamp system, control elements, A\C circuit and other electric equipment etc.

The machine's voltage is DC 24V, with negative pole grounded, and single wire system (See "Electrical System" of Parts Catalogue for more information)

Battery

This machine uses two batteries in series. The negative pole of the first battery is grounded, and the positive pole of the secondary battery is connected to relay contact of the power supply. When the power supply relay is closed, this battery bank can supply power to electric equipment. The battery models 100AH free-maintenance battery.

⚠ WARNING

The electrolyte is the diluted Sulfuric acid which can quickly burn the skin and pierce in the clothes. Rinse immediately with water if the battery electrolyte spills over your body on your clothes for your careless operation.

If the battery electrolytes enter eyes, immediately use plenty of water to clean and call a doctor as much as possible. Otherwise, it will cause the person to be blind.

Drink plenty of water or milk, and eat raw eggs or vegetable oils if you carelessly drink the battery electrolytes. And immediately go to a doctor or a poisoning prevention center.

Wear protective goggles when assembling battery.

The battery can generate Hydrogen. The battery has risk of explosion, especially the one without charged. Do not smoke near the battery, or perform anything which may cause sparks.

Before the maintenance of the battery it is necessary to confirm the engine has stop running and the Start switch is at OFF position.

Prevent the accidental short circuit due to the contact between battery terminals with metal objects such as tools.

When disassembling the battery, you should check Positive (+) terminal and Negative (-) terminal of the battery.

When disassembling the battery, you should first disassemble Negative (-) terminal. When assembling the battery, you should first assemble Positive (+) terminal.

If the terminal is loose, the bad contact will cause electric sparks or arcs, as a result of that the explosion will occur. When assembling the battery, you should assemble it securely.

Pay attention to the follows during operation of battery:

1. Keep battery clean.

2. Tighten the battery after the battery is installed in battery case to prevent the machine from being damaged due to bumping and collision during traveling. The wire terminal and battery terminal must kept close contact. If loosen, you should tighten the nut at the joint, and coat lubrication oil at the joint to prevent the corrosion from acid fog.

3. The plastic plug on filling hole must be tightened to prevent the electrolytes from overflowing due to the vibration during traveling of vehicle. Meanwhile, keep the vent hole in the plug unblocked.

4. Do not put any conductive parts on the battery to avoid short-circuit. Strictly prohibit using short-circuit sparking method to check the battery for the capacity to prevent the over current in moment, thus causing battery capacity to be dramatically lost, and battery terminal to be burnt.

5. When handling battery, do not tow it on the ground.

6. If the specific weight of electrolytes level of the battery drops to be less than 1.18kg/L, you should immediately charge the battery to prevent the acidulation of the pole plate. After first charging of the newly used battery, it is better to discharge the battery at a rate of 10 hours discharge rate, then continue the charge to make the battery fully play its role and output adequate capacity. So far as 2506-1104 battery used in this machine, you should judge the status of the battery regularly according to the gravimeter color, as shown in Fig.8:

Battery in cold weather

The battery will consume a lot when performing starting and pre-heating operation in cold weather. Meanwhile, when the temperature decreases, the performance of the battery will also decrease.

In extremely cold weather, it is possible to remove the battery and put it in a warmer place, thus helping the improvement of battery performance.

Check fluid level of battery

The battery installed in this machined is the one without needing maintenance, and you need not add electrolyte into the battery. When the charge indicator is transparent, it indicates that the electrolyte is less, and the possible reason is leakage or the faults in charging system. Immediately perform the troubleshooting and replace the fault battery. (Fig.8)

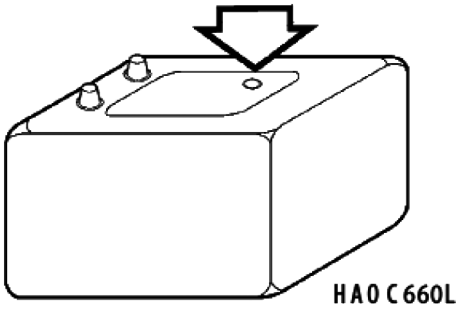


Fig 8

Check the charge state

Check the charge state by observing the indicator color set inside.

- Green: Normal
- Black: Charge is inadequate. Check the generator.
- Transparent: Electrolyte is inadequate. Replace with a new battery.

Check terminals of battery

Ensure the battery is fixed securely. Clean the battery terminals and battery wire connectors. The soda and water can neutralize the electrolyte on battery surface, terminals and wire connectors. Coat Vaseline or grease on the connector to prevent the corrosion.(Fig 9)

Fig 9

Replace battery

When the charge indicator is transparent, it is necessary to replace the battery. The batteries shall be replaced in pairs.

The mixed-use of new and old battery will shorten the service life of the new battery

Power supply relay

Power supply relay is used to control the ON and OFF between power supply and the machine circuit system. When the coil of power supply relay controlled by Main switch is energized and closed, its main contact is closed to make battery bank supply power to vehicle circuit system.

Power supply relay model is DK238D,with a coil current of 0.55A,contact of 600A(allowing 1000A current to be passed in a moment.)

Silicon rectification alternator

The silicon rectification alternator used in this machine is a corollary product for diesel engine.

Silicon rectification alternator is an integrated AC alternator, with a voltage of 28V,an output current of 55A. Its principle is shown in Fig.10

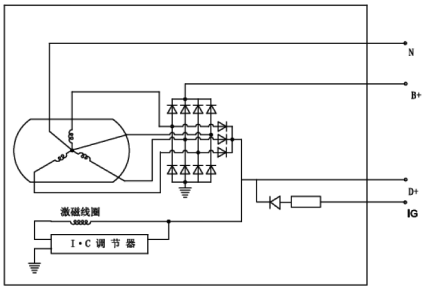


Fig 10

This alternator has four output terminals, they are respectively:

B+: Power supply output terminal of the alternator.

D+: Charge indication terminal.

N: Midpoint output,with an output voltage equal to half that at alternator “+”, in DC voltage

IG: Not available for this machine

Under normal conditions, the alternator can either supply power to electric equipment or to the battery. This can be obviously observed on Voltmeter installed on dashboard. After running of engine, if the voltage indicated on voltmeter is greater than that before operation, this indicates the alternator is charging the battery and supplying power to electric equipment. After running of engine, if the voltage indicated on voltmeter is equal to or less than that before operation, the alternator does not generate electricity, and the battery supplies power to electric equipment.

Reasonably operate and frequently maintain the alternator because it has a severe application environment. Please pay attention to the following items during operation and maintenance:

WARNING

This machine strictly prohibits the alternator to separately supply power to electric equipment without battery.

1. This alternator requires negative pole to be grounded. Never connect reversely; otherwise the silicon rectifying diode will be burnt.
2. Do not short circuit the alternator “+” output terminal to magnetic field terminal “-” during running of alternator to check the situation of the alternator to prevent from burning silicon diode and impacting electronic regulator.
3. Do not use Megohmmeter or 220V AC power supply to check the insulation of alternator. It is only possible to use high resistance position of Millimeter to check.
4. Perform maintenance for the alternator every 1200 hours or so of operation:
5. Use air compressor to purge dust on each part of the alternator, and use gasoline to wipe up slide ring and each part of dirt.
6. Clean bearing and replace with new lubrication oil. Check for any loose. Replace if any, and fill lubrication oil. It is advisable to fill lubrication oil until the oil occupies 2/3 space of the bearing.
7. Check the welding heads on coils, rotor, and silicon diode for disordering.
8. Use multimeter high-resistance position to check silicon diode one-by-one. If the great difference between Positive direction and Negative direction resistances, this indicates the silicon diode is damaged, and must be replaced. The new silicon diode shall be installed on end cover or element plate with good contact condition. If too loose, use copper strip with a thickness of 0.1mm to tightly stuff. If too tight, it is possible to slightly enlarge the hole. The power of electric soldering iron shall not exceed 75W, and the welding shall be quickly performed.
9. Check electric brush for the wear. Replace it if it is worn too much.
10. Check the insulation between electric brush bracket / outgoing wire screw and the shall for the normality.

The above battery and silicon rectification power form the power supply in the electrical system. When the main switch is ON, the power supply relay is energized to be closed and its contact is ON. At this time, both battery bank and alternator can supply power to electric equipment.

WARNING

This machine strictly prohibits starting the vehicle with silicon rectification power supply instead of iocon rectification power

Starter motor

The Starter motor used in this machine is a corollary product for diesel engine. The starter circuit is shown in Fig.11

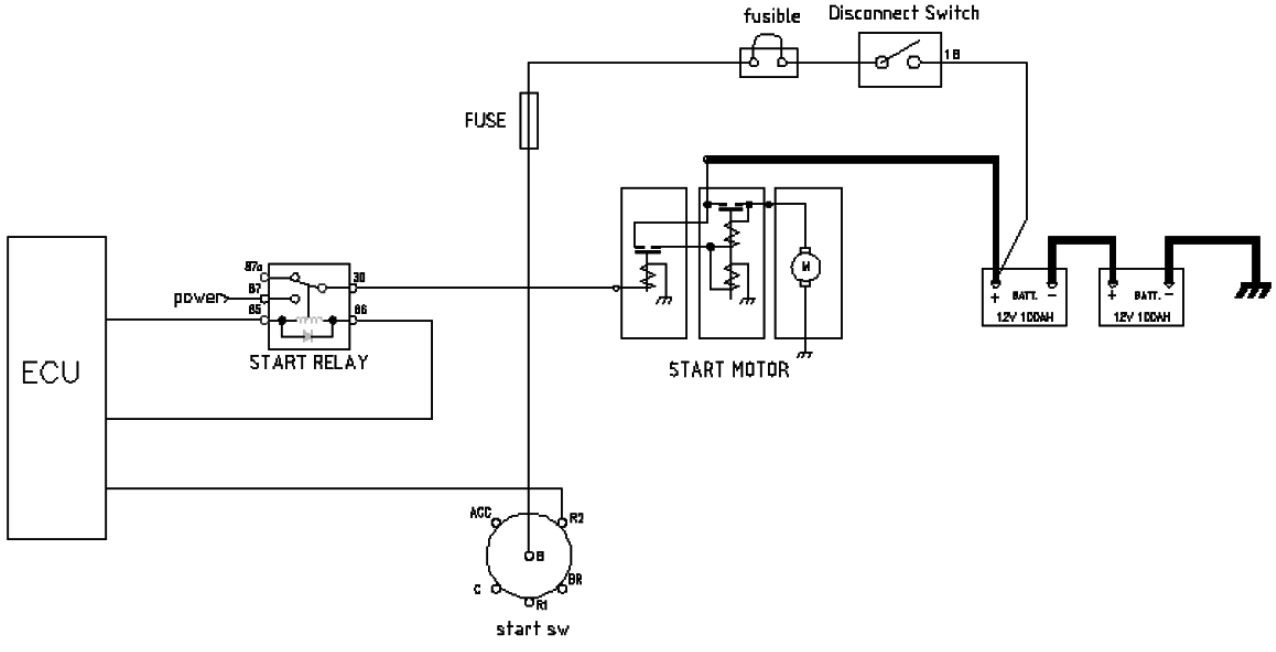


Fig 11

NOTE: *There is also one fork device inside the starter motor which is used to engage the starter rotor and the outer gear ring of diesel engine flywheel (not shown in this diagram)*

Please pay attention to the following items during operation of the starter:

- Frequently check the wiring bolt of the starter for loose (tighten it if any), and the wires for good conditions.
- Keep the starter clean during operation. Do not let water or oil leaking into the starter to prevent the faults induced from the degradation of insulation level.
- Keep lubrication of gear fork device to prevent it from being blocked, causing the contact of EM coil of starter motor unable to be closed or to damage the starter motor.
- Disassemble the starter motor during maintenance to check its collector ring and use gasoline to wipe up. If tiny spot or indentions are found on the surface, use #0 sand paper to polish, and use gasoline wipe up. The pressure of brush shall be adjusted to be within 800~ - 1000g or so.

Lamp System

In order to facilitate to replace the damaged bulb, the specifications for the bulbs in this machine are listed in following table.

NO.	NAME	Qty.	Specification of Bulb	
1	Head Lamp	2	24V	75/70W
2	Rear Lamp	2	24V	70W
3	Work Lamp	2	24V	70W
4	Front Signal Lamp and Front Steering Lamp	4	24V	10/21W
5	Rear signal Lamp and Rear Steering Lamp	6	24V	10/21/21W
6	Rotating Beacon	1	24V	21W

A/C System

See Fig.12 for the principle of the circuit of A\C system

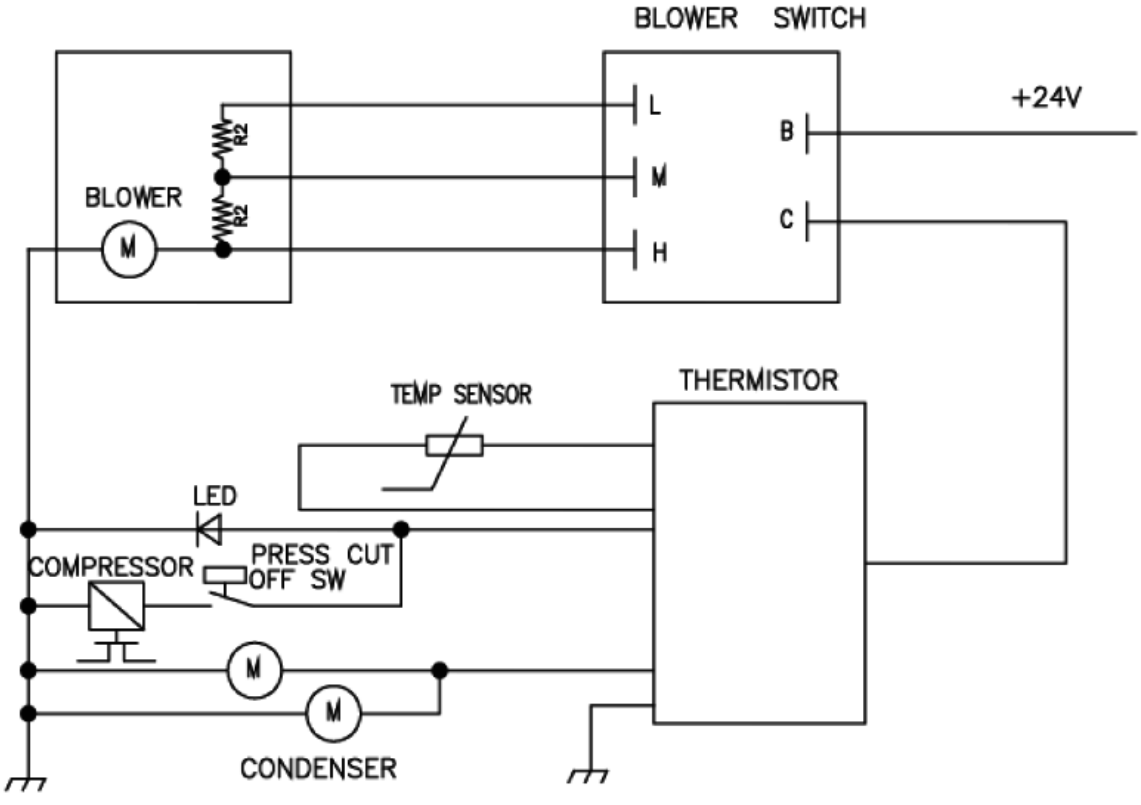


Fig 12

Main technical parameters of A/C System:

Voltage	24V DC
Heat-Release Capacity	5 KW
Refrigerating Capacity	4 KW

Main technical parameters of A/C System:

The air-conditioner system for this machine has three function of: refrigerating, heating and dehumidifying. See “A\C system ” for details of operation.

Starter switch (electric lock)

The model of this machine is JK406 which integrates ignition and start functions. It has 4 positions; rotate counterclockwise to PREHEAT position. This position can be automatically reset (this position function is not used temporarily, it can be used to heat the preheater), and the follow-on three positions (in clockwise order) : SHUTOFF,IGNITION, STARTING. Rotate the key from RESET position to IGNITION position, the vehicle circuit is switch on. Continuously rotate Starter Switch button to STARTING position, then it is possible to start the engine. After your release your hand, the key will automatically reset to IGNITION position.

NOTE: *Each start time cannot exceed 15 s, and it better to have 30s interval between two continuous starts. And the times to continuously start should not exceed 3. Or else, you should wait for the starter motor and ICO(ignition cut off) electromagnet to be fully cooled down, and then you can start again, thus preventing the accumulated high temperature from burning starter motor and ICO electromagnet, and severely damaging the capacity and service life of battery.*

MAINTENANCE UNDER SPECIAL CONDITIONS

Conditions	Maintenance requirements
Working in mud, water or rain	1. Walk around and check for the loose connector, obvious damage or leakage. 2. After working, clear the mud, rocks and sand on the machine. Check the welded parts for the cracks and components for the loose. Accomplish lubrication and maintenance everyday. 3. If the equipment is working in acid rain or in the corrosive materials, you should use water to clean the affected parts.
Working in a particularly dusty or in a very hot environment	1. Clean the air filter element more frequently. 2. Clean radiator to remove the inserted dust and dirt . 3. Clean the fuel sucking filter and fuel filter more frequently. 4. If necessary, check and clear the starter and engine. 5. Replace more frequently the filter element, breather and pilot the filter element of the hydraulic oil tank.
Working in rock environment	1. Check the chassis and wheel assy for damage or excessive wear. 2. Check connector and bolt for loose or damage. 3. Check hubs and Tires for damage. 4. Check more frequently the bucket or crusher for damage or excessive wear. 5. If necessary, install a top frame and front frame to avoid the damaging from falling objects.
Working in extremely cold area	1. Use the proper fuel which is adapted to the ambient temperature. 2. Use gravimeter to check anti-freeze fluid to ensure having corresponding anti-freeze performance. 3. Confirm the ambient temperature of the battery. In extremely cold weather, it is necessary to remove the battery during night and put it in a warmer place. 4. Timely remove the slime on the machine body to prevent the equipment from being damaged due to the freezing.

STORAGE FOR A LONG TIME

Store the machine as shown in the following table if it will stop for more than one month

Conditions	Maintenance requirements
1. Cleaning	1. Flush the chassis and wheel drive assy using HP water gun. Check for the damage or the loose components.
2. Lubrication	1. Execute all routine lubrication operations. 2. Coat a layer of oil on the surface of the exposed metal parts, such as hydraulic oil cylinder lever. 3. Coat oil on all control connecting components and at the control oil cylinder (control valve plug etc) .
3. Battery	1. Fully charge the battery, remove battery or battery wires, and keep them in reserve.
4. Cooling system	1. Check whether the anti-freeze fluid level in cooling fluid reservoir is correct. 2. Check every 90 days or 750 hours the anti-freezing conditions of anti-freeze fluid or coolant using gravimeter. Refer to the required level for filling anti-freeze fluid.
5. Hydraulic system	1. Start the engine once every month by referring to “Temperature Increase Method for Hydraulic System” specified in this manual.

Transportation

Check federal, state and local laws and regulations regarding weight, width, and length of machine and load before making preparations for transporting on public roads or highways.

The hauling vehicle, trailer, and load must comply with all applicable laws and regulations.

Check the intended route for road width, overhead clearances, weight restrictions, and traffic control regulations. Special approval or permits may be required.

TRANSPORTING MACHINE

CAUTION

During shipping, please follow the laws and regulations about the shipment height, width, length and weight issued by State and local authorities.

On Another Vehicle

- If the wheel loader is lifted onto another vehicle, the frame lock bar must be in the "LOCKED" position.
- "APPLY" parking brake and set the frame lock bar in the "LOCKED" position.
- Tie down (securing) the wheel loader – Use intended attaching points for lifting. – Lock the articulated frame joint.

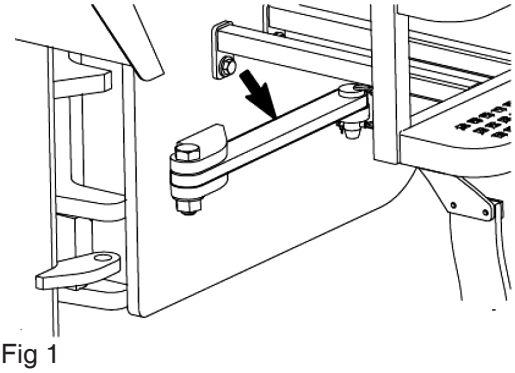
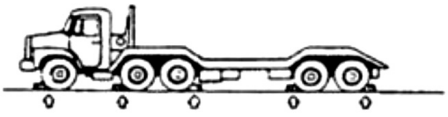


Fig 1

- Use wedges to stop the wheels of trailer or truck before shipping.
- Do not allow the steering operation on the way for the machine being driven on to the trailer or the truck. You should back the vehicle to the flat ground, and then perform the steering operation.
- After the machine is fixed, use frame-fixed bumper to fix the front and rear frames.
- Lay the bucket down to the transportation vehicle, put the shifting manipulating handle on “Neutral Gear” position.
- Pull up the handle of parking brake to apply parking braking.
- The engine is switched off, and all switches are put to Middle position or “OFF position. Pull out the electric lock key.
- Close and lock all doors, then take away the buttons.
- Toggle the power supply Negative switch to “OFF” position.
- When you use truck or trailer to transport the machine, you must use wedges to stop the wheels and use steel cables to fix the machine, so as to prevent the machine from moving during transportation.



2880A

Fig 2

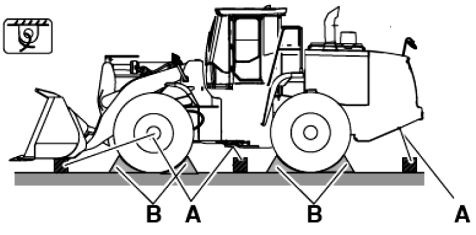


Fig 3

DANGER

Warning to customers: Removing from the machine the counterweights, the front devices or other accessories may affect the stability of the machine, thus causing the accidental movement and serious injury or death. Our company bears no legal responsibilities for the faults induced from misusing the equipment. The machine the counterweights or the front devices can be removed only when the upper structure and the bottom structure arrangement are consistent in direction.

⚠ WARNING

1. **Loading and unloading machine is dangerous. Be especially careful for running engine at low speed and driving at low speed.**
2. **The inclined plate must withstand the weight of the machine. If necessary, you can add the cushion block to increase the support force.**
3. **Ensure there is no grease, mud etc on the inclined plate to prevent the slippery of the machine.**
4. **When you load or unload the machine, the trailer shall park on the solid flat ground.**
5. **When the machine is running on the trailer, you must keep the lowest engine speed and drives at the lowest speed.**
6. **Fix securely the machine onto the trailer according to the local laws and regulations.**

Lifting of loader

It is necessary to let the professionals with lifting knowledge be responsible for the command and operation.

You should calculate the crane's maximum lifting weight and the sling's bearing capacity to ensure the lifting safety. Meanwhile, the 4 hooks on the sling shall bear load evenly.

Accomplish the following preparation before lifting:

- Put the shifting manipulating handle on "Neutral Gear" position.
- Put the boom and bucket to the lowest position.
- Pull up the handle of parking brake to apply parking braking.
- Switch off the engine and pull out the electric button.
- Close and lock all doors.
- Toggle the power supply Negative switch to "OFF" position.
- Use frame to fix the bumper and fasten the front and rear frames, making the machine unable to rotate.

The sling should be securely fixed to the lifting eyes of the machine on which the lifting marks are indicated.

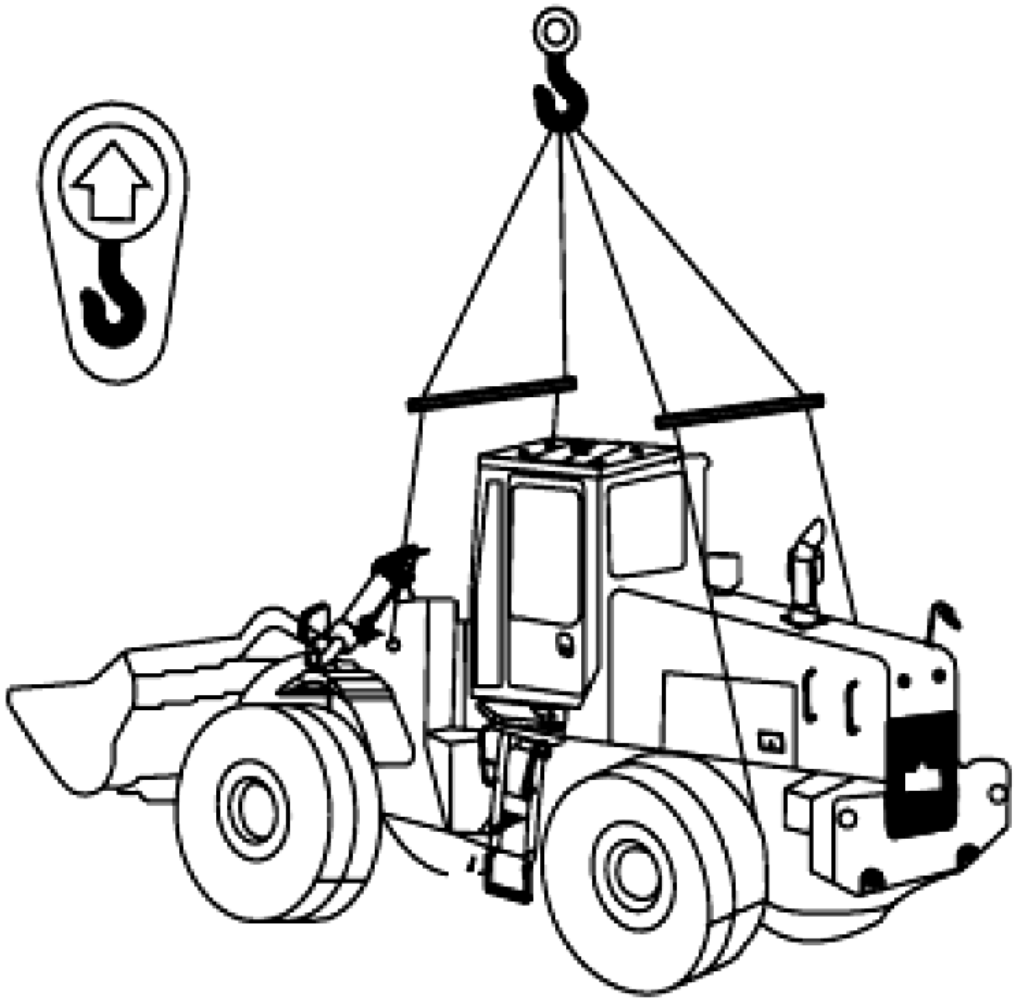


Fig 4

⚠ WARNING

Incorrect lifting may cause the offset of the machine, thus inducing personal injury or death as well as property loss.

Towing of the fault machine

This machine cannot be towed unless in the emergency. Towing is only used for towing this machine to a place where the overhaul can be performed, instead of transporting over a long distance. The towing distance for this machine should not exceed 10km, and the towing speed should not exceed 10km/h, otherwise the gearbox will be damaged for short supply of oil. If you must move this machine, you should use special trailer.

⚠ WARNING

Incorrect towing of inoperable machine may cause the personal injury or death. Towing the fault vehicle on bad road surface may cause the fault vehicle to be further damaged severely.

If the brake system is in fault, the brake shall not be applied. In this case, you should be quite careful during towing.

Matters needing attention for towing

Be sure to release parking break

1. You should use wedges to stop the wheels of the machine to prevent the machine from moving. If the machine wheel is not properly stopped by wedges, the machine will move. The wedges shall be removed after towing begins.
2. Nobody shall be allowed to sit on the towed machine unless the driver can control the direction and brakes.
3. Ensure, before towing, the towing rope and the tow bar are in good working conditions and have adequate strength to pull the machine. The strength of the available towing rope and tow bar shall be at least 1.5 times of the gross weight of the towed machine, so as to pull up the machine from the mud or beneath the slope.
4. Keep the minimum angle of the supporting rope, and the angle between the tow rope and the right ahead should not exceed 30 º
5. The too quick movement of the machine may cause the breakage of tow rope or tow bar. It is better to slowly and stably move the machine.

6. When towing the machine, all persons shall be far away from both sides off the rope to prevent the tow rope from injuring persons due to the breakage.
7. Under normal conditions, the trailer shall be of a size as the machine. It is necessary to ensure the trailer shall have adequate braking capacity, weight and power to control the slope ascending of two machines and the travel distance etc..
8. When the towed machine is descending the slope, in order to have adequate controlling and braking capacity, it is necessary to connect a bigger trailer or other machine to the back of the machine so as to prevent from out-of-control and rolling.
9. If the travel direction of the towed machine is controlled by the driver, the driver shall make the turn along the direction of tow rope. Check the regulations on the width, height, and load-restriction and traffic restriction for the roads you want to go through. It is possible to need special application or permit.

TRANSPORTATION DIMENSION

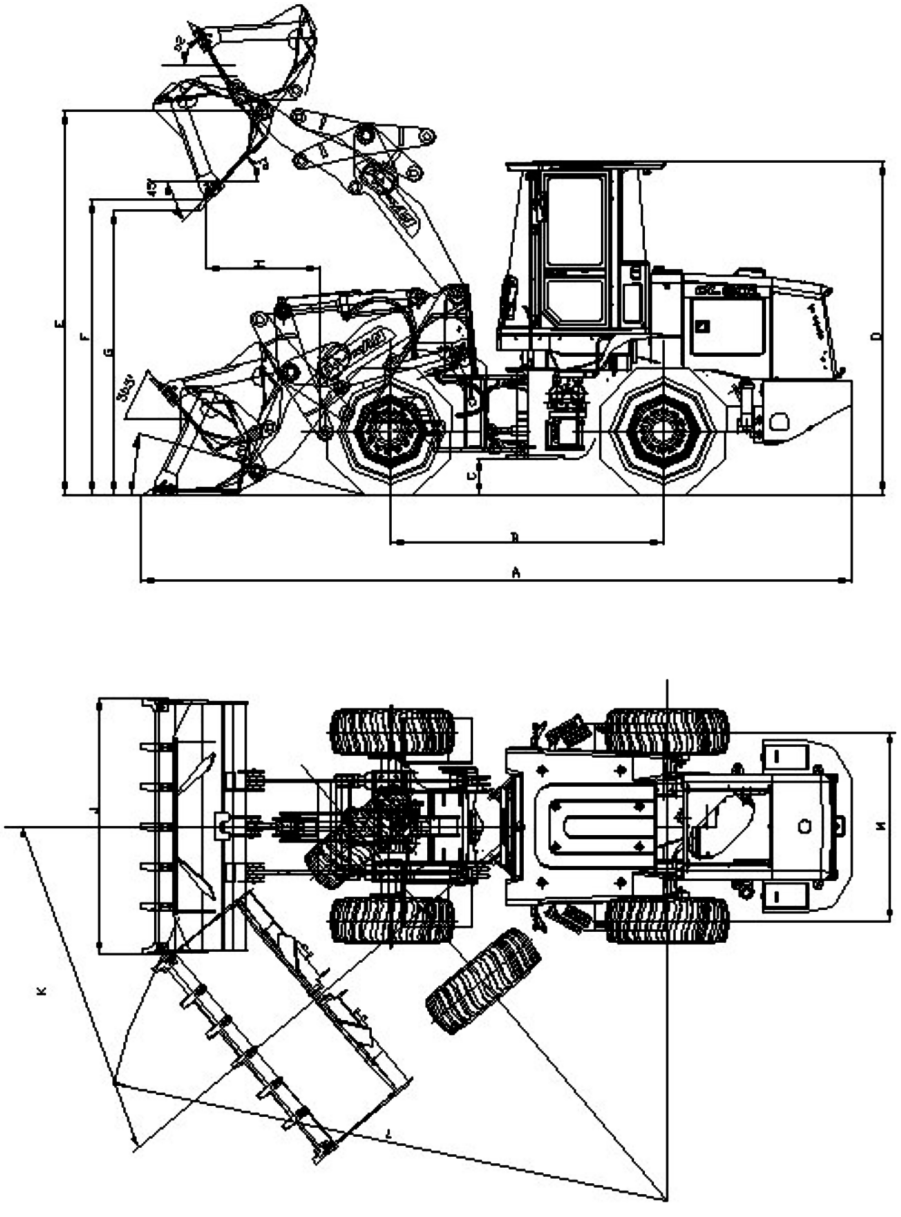


Fig 5

Basic Dimension		
Sign	**Description**	**Dimensions**
A	Transportation Length	6,990mm
J	Transportation Width	2,510mm
D	Cab Height	3,250mm
C	Ground Clearance	300mm
B	Space between Front and Rear Tires	2,670mm

Troubles Shooting

TRANSMISSION

Characteristics of faults	Cause	Remedy
Shifting pressure low for each position	Oil level too low in gearbox oil pool	Add oil to the specified oil level
	Leakage in main oil way	Check main oil way
	Gearbox oil filter blocked	Clean or replace variant pump
	Variant pump ineffective	Replace working pump
	Pressure regulation spring of shifting manipulation valve improper	Re-adjust according to the regulations
	Pressure regulation spring of shifting manipulation valve ineffective	Replace spring of regulation valve
	Shifting manipulation valve, Pressure regulation valve or accumulator piston blocked.	Dismantle and eliminate the blocking phenomenon
Shifting pressure at some position is low	Seal ring for piston of this position damaged	Replace seal ring
	Seal ring in oil way of this position damaged	Replace seal ring
	Leakage in oil way of this position	Locate the leakage point and repair
Torque converter oil temperature Over high	Oil level too low in gearbox oil pool	Add oil to the specified oil level
	Oil level too high in gearbox oil pool	Add oil to the specified oil level
	Shifting pressure low, and clutch slippage	See I, II
	Torque converter radiator blocked	Clean or replace torque converter
	Torque converter works with high load for too long time	Stop working for cooling properly
Engine speed high, Engine is running, but the vehicle could not be driven	The valve stem of shutoff valve for shifting manipulating valve not return	Remove shutoff valve, find the cause of unable returning, and perform trouble shooting
	Gear not engaged	Re-push to the proper position, or re-adjust the control lever system
	Pressure regulation spring of shifting manipulation valve broken	Replace spring of regulation valve
	See items 1,2,3,4 in (I)	See items 1,2,3,4 in (I)

Characteristics of faults	Cause:	Remedy
Driving force not adequate	Shifting pressure low	See I, II
	Torque converter oil temperature too high	See III
	Impeller of torque converter damaged	Disassemble torque converter and replace impeller
	Big overrunning clutch damaged	Disassemble big overrunning clutch and replace damaged parts.
	Poor engine output power	Repair the engine
Gearbox oil level increase	Steering pump shaft end mixing oil	Replace oil gland at steering pump shaft end
	Working pump of working hydraulic system mixing oil	Replace oil gland at working pump shaft end

BRAKING SYSTEM

Characteristics of faults	Cause	Remedy
Foot braking force not adequate	Air in braking hydraulic pipeline	Exhaust air from the pipeline
	Oil leakage in clamp	Replace seals on the clamp
	Brake air pressure low	Check tightness of air compressor, combo valve, air reservoir and pipeline
	Seals for brake pump worn	Replace seals
	The hub is leaking, and the oil is leaked onto the brake pad	Check or replace hub oil seal
	Brake pad worn to the limit	Replace brake pad
Gear not engaged	Brake valve fault	Check brake valve
Brake can`t opened normally	Brake valve fault	Check brake valve
	Brake pump not act normally	Check brake pump
	Slave pump piston can not return	Check or replace rectangular coil
Pressure in air reservoir quickly decreases (drops more than 0.1MPa in 3 minutes)	Intake valve of the brake valve blocked by dirt or damaged	Perform several times of braking to blow off the dirt or replace brake valve
	Pipe joint loose or pipeline ruptured	Tighten joint or replace pipe
Pressure indicated by barometer rises slowly	pipe joint loose	Tighten joint
	Air compressor works abnormally	Check working conditions of air compressor
	Intake valve of the brake valve or drum membrane not sealed	Check or replace brake valve
Emergency or parking braking force inadequate	Clearance between brake drum and brake pad too large	RE-adjust according to the operation requirements or replace brake pad
	Oil on the brake pad	Clean brake pad

HYDRAULIC SYSTEM FOR WORKING DEVICE

Characteristics of faults	Cause	Remedy
Arm lifting force or bucket digging up force inadequate	Wear or damage of cylinder oil seal	Replace oil seal
	Distribution valve excessively worn. Fit clearance between valve stem and valve body exceeds the specified value	Disassemble, check and repair to make the clearance meet requirements on specified value , or replace distribution valve
	Oil leakage in pipeline system	Locate the leakage point and repair
	Severe internal leaking of working pump	Replace working pump
	Improper adjustment of safety valve, and system pressure too low	Adjust the system pressure to the specified value
	Oil suction pipe and oil filter blocked	Clean oil filter and change oil
Bucket or arm rises slowly even at high speed of engine	See above	See above
	Dual action safety valve blocked	Disassemble the dual action safety valve to check

STEERING HYDRAULIC SYSTEM

Characteristics of faults	Cause	Remedy
Hard to make steering	Oil temperature too low	Increase the oil temperature , then start working
	Load sensing oil way blocked	Clean it
	Pressure of steering pump low	Adjust overflow valve block pressure according to the regulations
	Partial bolts for metering motor of full hydraulic steering gear tightened too tightly	Loosen the bolts
Vehicle steering not stable	Flow amplifying valve action is not sensitive	Repair or replace the flow amplifying valve
Both leftward and rightward steering slowly	Regulation valve leaking	Repair or replace priority valve
	Steering pump flow inadequate	Repair or replace steering pump
Steering normally when steering resistance is small; Steering slowly when steering resistance is large	Steering overflow valve seat leaking severely	Repair vale seat or replace seal ring
	Steering cylinder leaking severely	Repair or replace steering cylinder seal ring
Vehicle not steering while steering wheel is rotated	Steering gear fault	Repair or replace steering gear
	Steering overflow valve fault	Repair steering overflow valve
	Steering column fault	Repair steering column
Steering wheel auto rotates while driver nor operating	Full hydraulic steering gear valve housing blocked	Remove impurities in valve
	Full hydraulic steering gear spring plate broken	Replace spring plate
Steering pump noisy and steering cylinder acts slowly	Air in steering oil way	Start vehicle, make several times of leftward/rightward steering
	Steering pump worn, and flow inadequate	Replace steering pump
	Oil viscosity inadequate	Change oil as per correct brands
	Hydraulic oil inadequate	Fill enough hydraulic oil
	Internal leaking in steering cylinder	Repair cylinder or replace seal

ELECTICAL SYSTEM

Characteristics of faults	Cause	Remedy
Generator not working, or output low voltage	Commutator oil stained or worn	Wipe using clean cloth dipping with gasoline, or grind using #00 emery cloth
	Remanence coil open circuit	Check external magnetic field , and check exciting circuit using light bulb
	Remanence disappeared	Perform magnetizing or replace with new generator
Generator overheat	Bearing worn or lubrication oil inadequate	Replace and add lubrication oil
	Commutator or armature coil short-circuited internally	Disassemble generator and check commutator and armature coil , and eliminate the short-circuit faults
Battery not charged or charged at low flow	Generator magnetic field coil short-circuited or open circuited	Generator magnetic field connected well, and resistance of magnetic field coil is about 20Ω
	The positive pole connecting wire dropped off	Turn on the electric lock but do not start, there should be 24V on the generator “+” pole
	Battery connecting wire too loose or dropped off	Visual check and tighten the wire
	Generator transmission belt too loose	Visual check and tighten the wire
Battery charge time too long	1. Battery feed supply severely 2. One or two cells in the battery short-circuited or damaged 3. Generator negative pole connecting wire dropped off	Start the generator and use multimeter to check charge current or battery voltage. If the charge current is too large and battery voltage is below 25V, the battery is in fault. If the generator “+” pole voltage is greater than 30V, check generator “-” pole grounding for the normality. Connect voltmeter “-” pole to ground and “+” pole to generator “-” pole. If there is voltage indication on voltmeter, the Grounding wire is open circuited.. Otherwise, the problem is in the generator.
No indication on electric sensing instrument	Instrument damaged	Replace instrument
	Sensor damaged	Replace sensor
	Generator or battery is in fault	Check whether the terminal voltage of generator or battery is normal
	Sensor drops off	Re-tighten it

Characteristics of faults	Cause	Remedy
Engine could not start or start difficultly	Battery damaged or its capacity inadequate	Replace with new battery or charge the old battery
	Electric lock damaged	Replace electric lock
	Electric circuit contact badly or short-circuited	Check and repair
	Starter motor electromagnetic switch or fork damaged	Check the coil for perfection , the contact for smooth, the fork for moving freely, the spring for broken and for tooth picking. Repair if necessary
	Rotor of starter motor burnt	Replace starter motor
	Main power supply relay, starter relay or gear position/start interlocking relay damaged	Replace relay
Lamps not lit up	Lines fault	Check switch, fuse, light bulb, and lines. Replace or repair if necessary
Maximum range indicated by instrument	Instrument connecting wires loose	Re-tighten or connect the grounding wire

ENGINE FAULT ERROR CODE

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
001	The voltage value of the accelerator pedal 1 exceeds the upper threshold	91	3	Limp home	The accelerator pedal or its harness connector is damaged	1. Whether the voltage of pedal 1 pin (X1-07) is higher than 4599mV and whether it is short circuited with 5V power supply; 2. Whether the voltage of pedal 1 changes when pedal 1 is pressed. If not, replace pedal 1
002	The voltage value of the accelerator pedal 1 is lower than the lower threshold	91	4	Limp home	The accelerator pedal or its harness connector is damaged	1. Whether the voltage of pedal 1 pin (X1-07) is higher than 260mV and whether it is short circuited with the ground 2. Whether the voltage of pedal 1 changes when pedal 1 is pressed. If not, inspect whether pedal 1 is connected properly or replace pedal 1
003	The double signal relationship between accelerator pedal 1 and accelerator pedal 2 is unreliable	520252	2	When the engine rotates at a constant speed of 1,000rpm, the accelerator pedal fails	When using a single modulus accelerator, the deviation of accelerator pedal voltage signal is too large at low idle	1. Inspect whether the accelerator pedal is normal and replace the accelerator pedal 2. Inspect relevant circuits and connectors of accelerator pedal for short circuit and open circuit 3. Inspect whether the accelerator circuit is disturbed by other circuits
004	The voltage value of the accelerator pedal 2 exceeds the upper threshold	29	3	Limp home	The accelerator pedal or its harness connector is damaged	1. Whether the voltage of pedal 2 pin (X1-08) is higher than 3621mV and whether it is short circuited with 5V power supply; 2. Whether the voltage of pedal 2 changes when pedal 2 is pressed. If not, replace pedal 2
005	The voltage value of the accelerator pedal 2 is lower than the lower threshold	29	4	Limp home	The accelerator pedal or its harness connector is damaged	Whether the voltage of pedal 2 pin (X1-08) is higher than 68mV and whether it is short circuited with the ground; whether the voltage of pedal 2 changes when pedal 2 is pressed. If not, inspect whether pedal 2 is connected properly or replace pedal 2;

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
006	The voltage of the atmospheric pressure sensor exceeds the upper threshold	108	3	Insufficient power and black smoke at high altitude	The atmospheric pressure sensor inside ECU is damaged	Replace ECU
007	The voltage of the atmospheric pressure sensor is lower than the lower threshold	108	4	Insufficient power and black smoke at high altitude	The atmospheric pressure sensor inside ECU is damaged	Replace ECU
008	The atmospheric pressure sensor signal is unreliable	102	2	Storage of fault code, and insufficient power	When stopping, the intake pressure is 200hPa higher than the atmospheric pressure or less than 200hPa	1. Check whether the atmospheric pressure value is consistent with the local atmospheric pressure. If the difference is too large, replace the ECU; 2. Check whether the intake pressure value is consistent with the local atmospheric pressure. If the difference is too large, replace the sensor;
009	The accelerator and brake signals are unreliable	91	7	Occasionally insufficient engine power	The accelerator pedal and brake pedal are pressed at the same time	Clear the fault code and tell the driver not to press the accelerator pedal and brake pedal at the same time
010	Normally open fault of intake heating	2898	7	Intake heating does not work / harness burned out	Intake heating relay is not connected Intake heating relay has a short circuit	1. Connect the intake heating relay 2. Inspect the heating relay circuit for open circuit or short circuit
011	The intake heater is short circuited to power	2898	3	Intake heating failure	Intake heating relay wiring fault	1. Inspect whether the control terminal X1-37 of intake heating relay is short circuited to power
012	The intake heater is short circuited to ground	2898	4	Intake heating failure	Intake heating relay wiring fault	1. Inspect whether the control terminal X1-37 of intake heating relay is short circuited to ground
013	Open circuit of intake heater	2898	5	Intake heating failure	Disconnection or open circuit of intake heating relay	1. Inspect whether the wiring of intake heating relay is in good condition and whether it is connected with ECU (X1-37); 2. Inspect whether the intake heating relay is damaged.

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
014	The voltage of the intake pressure sensor exceeds the upper threshold	102	3	Limp home	The sensor or its harness connector is damaged	1. X2-68 pin and sensor are not connected properly 2. X2-68 pin is short circuited to the power line higher than 5V
015	The voltage of the intake pressure sensor is lower than the lower threshold	102	4	Limp home	The sensor or its harness connector is damaged	X2-68 pin is short circuited to ground wire
016	The original value of battery voltage exceeds the upper threshold	168	3	Engine starting failure	The storage battery voltage is too high	1. Power off and check the storage battery voltage. If the storage battery voltage is 23-28V, it indicates that it is normal; 2. Power off, unplug the ECU connector and storage battery power line, and inspect whether the line is on or off. If the resistance value is 0Q, it indicates that it is normal; 3. Power on and check the positive voltage of ECU to ground. If the voltage is S~24V, it indicates that it is normal.
017	The original value of battery voltage is lower than the lower threshold	168	4	ECU fails to work normally and the engine stops working	The storage battery voltage is too low	1. Power off and check the storage battery voltage. If the storage battery voltage is 23-28V, it indicates that it is normal; 2. Power off, unplug the ECU connector and storage battery power line, and inspect whether the line is on or off. If the resistance value is 0Q, it indicates that it is normal; 3. Power on and check the positive voltage of ECU to ground. If the voltage is S~24V, it indicates that it is normal.
018	The brake signal is unreliable	597	2	Unable to judge braking Unable to cruise Brake priority function failure	Main and auxiliary brake switch harness fault Main and auxiliary brake signals are not synchronized	Inspect the main and auxiliary brakes (when the main brake is pressed, X1-61 terminal is 24V, when the auxiliary brake is pressed, X1-62 terminal is 0V, and inspect whether they are synchronized) and relevant harness (inspect whether the connector is connected to X1-61 and X1-62)

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
019	The cold start indicator is short circuited to power	626	3	There is no action of air intake heating lamp	Intake heating lamp wiring fault	Inspect whether the intake heating lamp signal terminal X1-40 is short circuited to power
020	The cold start indicator is short circuited to ground	626	4	There is no action of air intake heating lamp	Intake heating lamp wiring fault	Inspect whether the intake heating lamp signal terminal X1-40 is short circuited to ground
021	Open circuit of cold start indicator	626	5	There is no action of air intake heating lamp	Disconnection or open circuit of intake heating lamp	1. Inspect whether the intake heating lamp is connected or damaged; 2. Inspect whether the line is connected to ECU (X1- 40)
022	The voltage of the cooling water temperature sensor exceeds the upper threshold	110	3	Engine torque limit	The sensor or its harness connector is damaged	1. X2-27 pin and sensor are not connected properly 2. X2-27 pin is short circuited to the power line higher than 5V
023	The voltage of the cooling water temperature sensor is lower than the upper threshold	110	4	Engine torque limit	The sensor or its harness connector is damaged	X2-27 pin is short circuited to ground wire
024	Cooling water temperature and engine oil temperature signals are unreliable	110	2	Storage of fault code	Sensor or harness fault	Inspect the sensor or harness
025	The cooling water temperature does not reach the minimum value within a certain period	110	17	Engine torque limit	Water temperature sensor error	Inspect the engine temperature sensor harness or replace the water temperature sensor
026	The cooling water temperature does not rise to the minimum within a certain period	110	18	Engine torque limit	Water temperature sensor error	Inspect the engine temperature sensor harness or replace the water temperature sensor
027	The clutch state signal is unreliable	598	2	Pressing the clutch cannot exit the cruise after three driving cruises	Poor contact of clutch switch	Inspect clutch switch, ECU pin (X1-53) and circuit

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
028	The voltage of ECU temperature sensor exceeds the upper threshold	1136	3	ECU internal temperature takes the last normal value or default value	The voltage signal of ECU temperature sensor is higher than 4,930mv	Replace ECU
029	The voltage of the ECU temperature sensor is lower than the lower threshold	1136	4	ECU internal temperature takes the last normal value or default value	The voltage signal of ECU temperature sensor is lower than 440mV	Replace ECU
030	The off-vehicle start / stop button is stuck	520203	5	The off-vehicle start function does not work	The off-vehicle stop switch is pressed for too long	Inspect whether the switch is stuck, inspect the circuit and whether there is a short circuit
031	There is only camshaft signal, it enters limp home state	4203	13	Difficult to start, insufficient engine power	1. Crankshaft and camshaft assembly fault; 2. Damage of crankshaft speed sensor; 3. Incorrect installation of crankshaft speed sensor; 4. Open circuit in harness; 5. Flywheel machining problem	1. Replace the crankshaft speed sensor; 2. Replace the harness; 3. Adjust the phase of crankshaft and camshaft; 4. Inspect the installation harness of crankshaft speed sensor and the machining quality of flywheel ring gear
032	Camshaft cycle error	4201	2	Difficult to start, insufficient power	1. Damage of camshaft speed sensor; 2. Line short	1. Replace the camshaft speed sensor; 2. Replace the harness;
033	Camshaft synchronization error	4201	11	Difficult to start, insufficient power	1. Damage of camshaft speed sensor; 2. Line short	1. Replace the camshaft speed sensor; 2. Replace the harness;
034	Camshaft signal loss	4201	12	Difficult to start, insufficient power	Damage of camshaft speed sensor; Line short	1. Replace the camshaft speed sensor; 2. Replace the harness;
035	Camshaft and crankshaft synchronization error	4201	13	Difficult to start, insufficient power	Damage of camshaft speed sensor; Line short	1. Replace the camshaft speed sensor; Replace the harness

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
036	Crankshaft signal loss	4203	12	Difficult to start, insufficient engine power	1. Crankshaft and camshaft assembly fault; 2. Damage of crankshaft speed sensor; 3. Incorrect installation of crankshaft speed sensor; 4. Open circuit in harness; 5. Flywheel machining problem	1. Replace the crankshaft speed sensor; 2. Replace the harness; 3. Adjust the phase of crankshaft and camshaft; 4. Inspect the installation harness of crankshaft speed sensor and the machining quality of flywheel ring gear
037	Wrong number of crankshaft teeth	4203	4	Difficult to start, insufficient engine power	1. Crankshaft and camshaft assembly fault; 3. Damage of crankshaft speed sensor; 4. Incorrect installation of crankshaft speed sensor; 5. Open circuit in harness; 6. Flywheel machining problem	1. Replace the crankshaft speed sensor; 2. Replace the harness; 3. Adjust the phase of crankshaft and camshaft; 4. Inspect the installation harness of crankshaft speed sensor and the machining quality of flywheel ring gear
038	Crankshaft synchronization error	4203	3	Difficult to start, insufficient engine power	1. Crankshaft and camshaft assembly fault; 2. Damage of crankshaft speed sensor; 3. Incorrect installation of crankshaft speed sensor; 4. Open circuit in harness; 5. Flywheel machining problem	1. Replace the crankshaft speed sensor; 2. Replace the harness; 3. Adjust the phase of crankshaft and camshaft; 4. Inspect the installation harness of crankshaft speed sensor and the machining quality of flywheel ring gear

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
039	Crankshaft tooth cycle error	4203	2	Difficult to start, insufficient engine power	1. Crankshaft and camshaft assembly fault; 2. Damage of crankshaft speed sensor; 3. Incorrect installation of crankshaft speed sensor; 4. Open circuit in harness; 5. Flywheel machining problem	1. Replace the crankshaft speed sensor; 2. Replace the harness; 3. Adjust the phase of crankshaft and camshaft; 4. Inspect the installation harness of crankshaft speed sensor and the machining quality of flywheel ring gear
040	The deviation of crankshaft and camshaft signal exceeds threshold	4201	14	Difficult to start, insufficient engine power	1. Crankshaft and camshaft assembly fault; 2. Damage of crankshaft speed sensor; 3. Incorrect installation of crankshaft speed sensor; 4. Open circuit in harness; 5. Flywheel machining problem	1. Replace the crankshaft speed sensor; 2. Replace the harness; 3. Adjust the phase of crankshaft and camshaft; 4. Inspect the installation harness of crankshaft speed sensor and the machining quality of flywheel ring gear
041	The engine speed exceeds the limit	1769	11	Limp home of engine	The engine speed exceeds the maximum allowable value	Power off and restart
042	The engine speed output is short circuited to power	1623	3	The engine speed signal cannot be obtained through this pin	Engine speed output pin wiring fault	1. Inspect whether the engine speed output control terminal X1-19 is short circuited to power
043	The engine speed output is short circuited to ground	1623	4	The engine speed signal cannot be obtained through this pin	Engine speed output pin wiring fault	1. Inspect whether the engine speed output control terminal X1-19 is short circuited to power
044	Open circuit of engine speed signal	1623	5	The engine speed signal cannot be obtained through this pin	Disconnection or open circuit of engine speed output pin	1. Inspect whether the wiring of engine speed output is in good condition and whether it is connected with ECU (X1-19); 2. Inspect whether the engine speed output is damaged.

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
045	The exhaust brake butterfly valve is short circuited to power	520208	3	Exhaust brake does not work	The exhaust brake line is short circuited to power	1. Inspect whether the exhaust brake valve control terminal X1-20 is short circuited to power
046	The exhaust brake butterfly valve is short circuited to ground	520208	4	The exhaust brake valve is always working	The exhaust brake line is short circuited to ground	1. Inspect whether the exhaust brake valve control terminal X1-20 is short circuited to ground
047	Open circuit of exhaust brake butterfly valve	520208	5	Exhaust brake does not work	Exhaust brake solenoid valve is not connected properly	1. Inspect whether the exhaust brake valve is well wired and connected with ECU (X1- 20); 2. Inspect whether the exhaust brake valve is damaged.
048	Fan actuator (PWM wave) is short circuited to power	4815	9	The electro-magnetic fan does not work	The electromag-netic fan relay 1 is short circuited to power	1. Inspect whether it is an elec-tromagnetic fan; 2. Inspect whether the fan con-trol terminal X2-76 is short circuited to the power; 3. Inspect whether the electro-magnetic fan is damaged.
049	Fan actuator (PWM wave) is short circuited to ground	4815	10	The electro-magnetic fan is always working	The electromag-netic fan relay 1 is short circuited to ground	Inspect whether the fan control terminal X2-76 is short circuit-ed to ground
050	Open circuit of fan actuator (PWM wave)	4815	7	The electro-magnetic fan does not work	The electromag-netic fan relay 1 is not connected properly	1. Inspect whether the electro-magnetic fan is well wired and connected with ECU (X2- 76); 2. Inspect whether the electro-magnetic fan is damaged.
051	The fan ac-tuator (digital signal) is short circuited to power	4815	3	The electro-magnetic fan does not work	The electromag-netic fan relay 2 is short circuited to power	1. Inspect whether it is an elec-tromagnetic fan; 2. Inspect whether the fan con-trol terminal X2-40 is short circuited to the power; 3. Inspect whether the electro-magnetic fan is damaged.
052	The fan ac-tuator (digital signal) is short circuited to ground	4815	4	The electro-magnetic fan is always working	The electromag-netic fan relay 2 is short circuited to ground	Inspect whether the fan control terminal X2-40 is short circuit-ed to ground
053	Open circuit of fan actuator (digital signal)	4815	5	The electro-magnetic fan does not work	The electromag-netic fan relay 2 is not connected properly	1. Inspect whether the electro-magnetic fan is well wired and connected with ECU (X2- 40); 2. Inspect whether the electro-magnetic fan is damaged.

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
054	The cooling fan speed exceeds the upper threshold	1639	3	Incorrect fan speed	Sensor fault or data mismatch	1. Inspect whether the speed sensor of electric control silicone oil fan is damaged; 2. Inspect whether the transmission ratio between fan and crankshaft is too large; 3. Inspect data.
055	The cooling fan speed is lower than the lower threshold	1639	4	Incorrect fan speed	Sensor fault or data mismatch	1. Inspect whether the speed sensor of electric control silicone oil fan is damaged; Inspect whether the transmission ratio between fan and crankshaft is too small; 3. Inspect data.
065	Water in oil sensor detects water in oil	520264	11	The diesel entering the engine has a high moisture content	High water level of water collecting cup of coarse filter	Drain the water collecting cup of the fuel prefilter
066	1 Cylinder injector fault	1413	11	Engine cylinder shortage	Unknown fault type	1. Inspect whether the high-end or low-end of the injector is short circuited to the ground and power; 2. Inspect whether the high-end and low-end of the injector are short circuited 3. Replace the connector or injector
067	1 The cylinder injector is short circuited to power	1413	3	Reserved	Reserved	Reserved
068	1 Cylinder injector is short circuited to ground	1413	7	Engine cylinder shortage	The high-end or low-end of the injector is short circuited to ground	1. Inspect whether the high-end of the injector is short circuited to ground; 2. Inspect whether the low-end of the injector is short circuited to ground 3. Replace the injector
069	2 Cylinder injector fault	1414	11	Engine cylinder shortage	Unknown fault type	1. Inspect whether the high-end or low-end of the injector is short circuited to the ground and power; 2. Inspect whether the high-end and low-end of the injector are short circuited 3. Replace the connector or injector

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
070	2 The cylinder injector is short circuited to power	1414	3	Reserved	Reserved	Reserved
071	2 Cylinder injector is short circuited to ground	1414	7	Engine cylinder shortage	The high-end or low-end of the injector is short circuited to ground	1. Inspect whether the high-end of the injector is short circuited to ground; 2. Inspect whether the low-end of the injector is short circuited to ground 3. Replace the injector
072	3 Cylinder injector fault	1415	11	Engine cylinder shortage	Unknown fault type	1. Inspect whether the high-end or low-end of the injector is short circuited to the ground and power; 2. Inspect whether the high-end and low-end of the injector are short circuited 3. Replace the connector or injector
073	3 The cylinder injector is short circuited to power	1415	3	Reserved	Reserved	Reserved
074	3 Cylinder injector is short circuited to ground	1415	7	Engine cylinder shortage	The high-end or low-end of the injector is short circuited to ground	1. Inspect whether the high-end of the injector is short circuited to ground; 2. Inspect whether the low-end of the injector is short circuited to ground 3. Replace the injector
075	4 Cylinder injector fault	1416	11	Engine cylinder shortage	Unknown fault type	1. Inspect whether the high-end or low-end of the injector is short circuited to the ground and power; 2. Inspect whether the high-end and low-end of the injector are short circuited 3. Replace the connector or injector
076	4 The cylinder injector is short circuited to power	1416	3	Reserved	Reserved	Reserved

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
077	4 Cylinder injector is short circuited to ground	1416	7	Engine cylinder shortage	The high-end or low-end of the injector is short circuited to ground	1. Inspect whether the high-end of the injector is short circuited to ground; 2. Inspect whether the low-end of the injector is short circuited to ground 3. Replace the injector
078	5 Cylinder injector fault	1417	11	Engine cylinder shortage	Unknown fault type	1. Inspect whether the high-end or low-end of the injector is short circuited to the ground and power; 2. Inspect whether the high-end and low-end of the injector are short circuited 3. Replace the connector or injector
079	5 The cylinder injector is short circuited to power	1417	3	Reserved	Reserved	Reserved
080	5 Cylinder injector is short circuited to ground	1417	7	Engine cylinder shortage	The high-end or low-end of the injector is short circuited to ground	1. Inspect whether the high-end of the injector is short circuited to ground; 2. Inspect whether the low-end of the injector is short circuited to ground 3. Replace the injector
081	6 Cylinder injector fault	1418	11	Engine cylinder shortage	Unknown fault type	1. Inspect whether the high-end or low-end of the injector is short circuited to the ground and power; 2. Inspect whether the high-end and low-end of the injector are short circuited 3. Replace the connector or injector
082	6 The cylinder injector is short circuited to power	1418	3	Reserved	Reserved	Reserved
083	6 Cylinder injector is short circuited to ground	1418	7	Engine cylinder shortage	The high-end or low-end of the injector is short circuited to ground	1. Inspect whether the high-end of the injector is short circuited to ground; 2. Inspect whether the low-end of the injector is short circuited to ground 3. Replace the injector
084	ETC1 message receiving timeout	522022	19	ETC1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
085	ETC1 message Data length error	522022	14	ETC1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
086	RxCCVS message receiving timeout	522030	19	RxCCVS message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
087	RxCCVS message data length error	522030	14	RxCCVS message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
088	DEC1 message receiving timeout	522062	19	DEC1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
089	ETC7 message receiving timeout	522063	19	ETC7 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
090	Bus received throttle signal overrun	522064	19	The throttle signal adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
091	Bus received remote throttle signal overrun	522065	19	The remote throttle signal adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
092	CAN received frame TSC1PE data size error	522039	14	TSC1PE message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
093	CAN received frame TSC1PE communication error	522039	19	TSC1PE message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
094	CAN received frame TSC1TE data size error	522040	14	TSC1TE message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
095	CAN-received frame TSC1TE time-out error	522040	19	TSC1TE message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
096	CAN received frame TSC-1TR data size error	522041	14	TSC1TR message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
097	CAN received frame TSC-1TR time-out error	522041	19	TSC1TR message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
098	CAN received frame TSC1VE data size error	522042	14	TSC1VE message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
099	CAN received frame TSC1VE time-out error	522042	19	TSC1VE message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
100	CAN received frame TSC1VR data size error	522043	14	TSC1VR message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
101	CAN received frame TSC1VR time-out error	522043	19	TSC1VR message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
102	CAN received frame Time-Date data size error	522034	14	TimeDate message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
103	CAN received frame Time-Date time-out error	522034	19	TimeDate message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
104	Gear lifting clearance time	520221	2	None	Loose gear lever	Inspect the gear lever and ECU pin (X1-54)
105	(Water in oil lamp) indicator light 1 is short circuited to power	624	3	(Water in oil lamp) indicator light cannot be lighted up	The indicator light is short circuited to power	1. Inspect whether the indicator light X1-23 is short circuited to power
106	(Water in oil lamp) indicator light 1 is short circuited to ground	624	4	(Water in oil lamp) indicator light is always on	The indicator light is short circuited to ground	1. Inspect whether the indicator light X1-23 is short circuited to ground
107	Open circuit of (water in oil lamp) indicator light 1	624	12	(Water in oil lamp) indicator light cannot be lighted up	The indicator light is not disconnected properly	1. Inspect whether the indicator light is in good condition and connected with ECU (X1-23); 2. Inspect whether the indicator light is damaged.
108	EEPROM read error	2802	14	ECU failure Storage of fault code	Internal error in ECU	Power off and restart, replace ECU
109	EEPROM write error	2802	12	Read data error, adopt substitute value and store fault code	Internal error in ECU	Power off and restart, replace ECU
110	The voltage of intake temperature sensor exceeds the upper threshold	105	3	Affect engine combustion, even generate black smoke or cause insufficient power	Damage of harness or joint; Damage of intake temperature sensor	1. Inspect whether the intake temperature sensor is normal; 2. Use a multimeter to measure the voltage (higher than 4,978mV) at the pin of intercooled intake temperature sensor to judge whether it is short circuited to external power; 3. Inspect whether the relevant harness and connector are damaged, resulting in short circuit or open circuit
111	The voltage of the intake temperature sensor is lower than the lower threshold	105	4	Affect engine combustion, even generate black smoke or cause insufficient power	Damage of harness or joint; Damage of intake temperature sensor	1. Inspect whether the intercooled intake temperature sensor is normal 2. Use a multimeter to measure the voltage (lower than 137mV) at the pin of intercooled intake temperature sensor to judge whether it is short circuited to ground 3. Inspect whether the relevant harness and connector are damaged, resulting in short circuit or open circuit

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
112	CAN received frame EBC1 time-out error	522013	19	EBC1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
113	CAN received frame EBC1 data length error	522013	14	EBC1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
114	The low-end and high-end of the injector 1 are short circuited to power	1413	16	Engine cylinder shortage	Inspect whether the low-end of the injector is short circuited to power	1. Inspect whether the low-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
115	The low-end of the injector 1 is short circuited to ground	1413	18	Reserved	Reserved	Reserved
116	The high-end of the injector 1 is short circuited to power	1413	15	Engine cylinder shortage	Inspect whether the high-end of the injector is short circuited to power	1. Inspect whether the high-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
117	The high-end of the injector 1 is short circuited to ground	1413	17	Reserved	Reserved	Reserved
118	Short circuit of high and low ends of the injector 1	1413	4	Engine cylinder shortage	Short circuit of high and low ends of the injector	1. Inspect whether the high-end and low-end of the injector are short circuited; 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
119	Open circuit of injector 1	1413	5	Engine cylinder shortage	The high-end or low-end of the injector is not connected properly	1. Inspect whether the injector terminal is firmly connected; 2. Inspect whether the harness plug and ECU pin are well connected
120	The low-end of the injector 2 is short circuited to power	1414	16	Engine cylinder shortage	Inspect whether the low-end of the injector is short circuited to power	1. Inspect whether the low-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
121	The low-end of the injector 2 is short circuited to ground	1414	18	Reserved	Reserved	Reserved

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
122	The high-end of the injector 2 is short circuited to power	1414	15	Engine cylinder shortage	Inspect whether the high-end of the injector is short circuited to power	1. Inspect whether the high-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
123	The high-end of the injector 2 is short circuited to ground	1414	17	Reserved	Reserved	Reserved
124	Short circuit of high and low ends of the injector 2	1414	4	Engine cylinder shortage	Short circuit of high and low ends of the injector	1. Inspect whether the high-end and low-end of the injector are short circuited; 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
125	Open circuit of injector 2	1414	5	Engine cylinder shortage	The high-end or low-end of the injector is not connected properly	1. Inspect whether the injector terminal is firmly connected; 2. Inspect whether the harness plug and ECU pin are well connected
126	The low-end of the injector 3 is short circuited to power	1415	16	Engine cylinder shortage	Inspect whether the low-end of the injector is short circuited to power	1. Inspect whether the low-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
127	The low-end of the injector 3 is short circuited to ground	1415	18	Reserved	Reserved	Reserved
128	The high-end of the injector 3 is short circuited to power	1415	15	Engine cylinder shortage	Inspect whether the high-end of the injector is short circuited to power	1. Inspect whether the high-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
129	The high-end of the injector 3 is short circuited to ground	1415	17	Reserved	Reserved	Reserved
130	Short circuit of high and low ends of the injector 3	1415	4	Engine cylinder shortage	Short circuit of high and low ends of the injector	1. Inspect whether the high-end and low-end of the injector are short circuited; 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
131	Open circuit of injector 3	1415	5	Engine cylinder shortage	The high-end or low-end of the injector is not connected properly	1. Inspect whether the injector terminal is firmly connected; 2. Inspect whether the harness plug and ECU pin are well connected

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
132	The low-end of the injector 4 is short circuited to power	1416	16	Engine cylinder shortage	Inspect whether the low-end of the injector is short circuited to power	1. Inspect whether the low-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
133	The low-end of the injector 4 is short circuited to ground	1416	18	Reserved	Reserved	Reserved
134	The high-end of the injector 4 is short circuited to power	1416	15	Engine cylinder shortage	Inspect whether the high-end of the injector is short circuited to power	1. Inspect whether the high-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
135	The high-end of the injector 4 is short circuited to ground	1416	17	Reserved	Reserved	Reserved
136	Short circuit of high and low ends of the injector 4	1416	4	Engine cylinder shortage	Short circuit of high and low ends of the injector	1. Inspect whether the high-end and low-end of the injector are short circuited; 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
137	Open circuit of injector 4	1416	5	Engine cylinder shortage	The high-end or low-end of the injector is not connected properly	1. Inspect whether the injector terminal is firmly connected; 2. Inspect whether the harness plug and ECU pin are well connected
138	The low-end of the injector 5 is short circuited to power	1417	16	Engine cylinder shortage	Inspect whether the low-end of the injector is short circuited to power	1. Inspect whether the low-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
139	The low-end of the injector 5 is short circuited to ground	1417	18	Reserved	Reserved	Reserved
140	The high-end of the injector 5 is short circuited to power	1417	15	Engine cylinder shortage	Inspect whether the high-end of the injector is short circuited to power	1. Inspect whether the high-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
141	The high-end of the injector 5 is short circuited to ground	1417	17	Reserved	Reserved	Reserved

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
142	Short circuit of high and low ends of the injector 5	1417	4	Engine cylinder shortage	Short circuit of high and low ends of the injector	1. Inspect whether the high-end and low-end of the injector are short circuited; 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
143	Open circuit of injector 5	1417	5	Engine cylinder shortage	The high-end or low-end of the injector is not connected properly	1. Inspect whether the injector terminal is firmly connected; 2. Inspect whether the harness plug and ECU pin are well connected
144	The low-end of the injector 6 is short circuited to power	1418	16	Engine cylinder shortage	Inspect whether the low-end of the injector is short circuited to power	1. Inspect whether the low-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
145	The low-end of the injector 6 is short circuited to ground	1418	18	Reserved	Reserved	Reserved
146	The high-end of the injector 6 is short circuited to power	1418	15	Engine cylinder shortage	Inspect whether the high-end of the injector is short circuited to power	1. Inspect whether the high-end of the injector is short circuited to power 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
147	The high-end of the injector 6 is short circuited to ground	1418	17	Reserved	Reserved	Reserved
148	Short circuit of high and low ends of the injector 6	1418	4	Engine cylinder shortage	Short circuit of high and low ends of the injector	1. Inspect whether the high-end and low-end of the injector are short circuited; 2. Inspect whether the injector or connector is damaged; 3. Replace the injector
149	Open circuit of injector 6	1418	5	Engine cylinder shortage	The high-end or low-end of the injector is not connected properly	1. Inspect whether the injector terminal is firmly connected; 2. Inspect whether the harness plug and ECU pin are well connected
150	INJ driver IC initialization version number error	507	9	Rading data error; ECU cannot run	Internal fault of ECU	Power off and restart, or replace ECU
151	INJ driver IC initialization error after power on	507	10	Rading data error; ECU cannot run	Internal fault of ECU	Power off and restart, or replace ECU

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
152	INJ driver IC initialization error after power on again	507	11	Rading data error; ECU cannot run	Internal fault of ECU	Power off and restart, or replace ECU
153	Unreliable cruise signal (invalid switch combination)	596	2	Cruise function failure	Press a switch for a long time; press more than two switches at the same time;	Inspect the line or switch (off: X1- 63; Reset: X1-64; Plus: X1-68; Minus: X1-51;)
154	OBD lamp is short circuited to power	520219	3	MIL lamp does not light up	MIL lamp is short circuited to power	1. Inspect whether MIL lamp control terminal X1-39 is short circuited to power
155	OBD lamp is short circuited to ground	520219	4	MIL lamp is always on	MIL lamp is short circuited to ground	1. Inspect whether MIL lamp control terminal X1-39 is short circuited to ground
156	Open circuit of OBD lamp	520219	5	MIL lamp does not light up	MIL lamp is not connected properly	1. Inspect whether the wiring of MIL lamp is in good condition and whether it is connected with ECU (X1- 39); 2. Inspect whether MIL lamp is damaged.
157	The multi-state switch voltage exceeds the upper limit	976	3	Fuel saving switch does not work	The fuel saving switch is not properly connected or damaged	1. Remove the fuel saving switch and inspect that the voltage of X1-13 at ECU terminal should be 5V; 2. Inspect the connection between X1-13, X1-31 and fuel saving switch pin;
158	The multi-state switch voltage exceeds the lower limit	976	4	Fuel saving switch does not work	Damage of connector or switch	1. Inspect that the voltage of X1-13 at ECU terminal should be 5V; 2. Inspect whether the resistor switching is normal
159	The multi-state switch signal is unreliable	976	19	Fuel saving switch does not work	Fuel saving switch aging or resistance mismatch	Replace the fuel saving switch with a new one
160	CAN communication error	522000	12	CAN bus communication does not work properly	CAN module in ECU is damaged and nitrogen-oxygen sensor is not connected properly	1. Inspect CAN bus 0(X1-42\ X1-43) and all relevant nodes for short circuit to ground and open circuit (X1-42 to ground 2.7V, X1-43 to ground 2.5V)
161	The voltage of the engine oil pressure sensor exceeds the upper limit	100	16	Insufficient power	The sensor is not connected or short circuited to 5V power	1. X2-67 pin and sensor are not connected properly 2. X2-67 pin is short circuited to power line higher than 5V; 3. Inspect the connector or sensor

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
162	The voltage of the engine oil pressure sensor is lower than the lower limit	100	18	Insufficient power	The sensor is short circuited to ground	1. X2-67 pin is short circuited to ground; 2. Inspect the connector or sensor
163	The engine oil pressure is too high or the engine oil temperature signal is unreliable	100	15	Insufficient power	Sensor or harness fault	1. Power off, measure whether ECU sensor connector and engine oil pressure sensor connector are connected; 2. Power off, unplug the connector of the engine oil pressure sensor, measure the low voltage of the connector. If the voltage is S~0V, it indicates that it is normal;
164	Engine oil pressure is too low	100	17	Insufficient power	Engine oil pressure is too low	1. Start the engine and use the diagnostic instrument to check whether the engine oil pressure is lower than the allowable value of 1,600hPa; 2. Replace the engine oil pressure sensor; 3. Inspect whether the engine oil pump and oil passage pressure relief valve are damaged;
165	The voltage of engine oil temperature sensor exceeds the upper threshold	175	3	Insufficient power	The sensor is not connected or short circuited to 5V power	1. X2-25 pin and sensor are not connected properly 2. X2-25 pin is short circuited to power line higher than 5V; 3. Inspect the connector or sensor
166	The voltage of the engine oil temperature sensor is lower than the lower threshold	175	4	Insufficient power	The sensor is short circuited to ground	1. X2-25 pin is short circuited to ground; 2. Inspect the connector or sensor
167	The engine oil temperature sensor signal is unreliable	175	15	Store flash code	The engine oil temperature exceeds the allowable value of 125t	1. Inspect whether the actual engine oil temperature is too high 2. Replace the engine oil temperature sensor
168	The voltage of the sensor power supply 1 exceeds the upper threshold	3509	3	Abnormal output of sensor power supply 1	Insufficient engine power and black smoke	1. Inspect whether the harness or joint is damaged; 2. Replace ECU

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
169	The voltage of the sensor power supply 1 is lower than the lower threshold	3509	4	Abnormal output of sensor power supply 1	Insufficient engine power and black smoke	1. Inspect whether the harness or joint is damaged; 2. Replace ECU
170	The voltage of the sensor power supply 2 exceeds the upper threshold	3510	3	Abnormal output of sensor power supply 2	Insufficient engine power and black smoke	1. Inspect whether the harness or joint is damaged; 2. Replace ECU
171	The voltage of the sensor power supply 2 is lower than the lower threshold	3510	4	Abnormal output of sensor power supply 2	Insufficient engine power and black smoke	1. Inspect whether the harness or joint is damaged; 2. Replace ECU
172	The voltage of the sensor power supply 3 exceeds the upper threshold	3511	3	Abnormal output of sensor power supply 3	Insufficient engine power and black smoke	1. Inspect whether the harness or joint is damaged; 2. Replace ECU
173	The voltage of the sensor power supply 3 is lower than the lower threshold	3511	4	Abnormal output of sensor power supply 3	Insufficient engine power and black smoke	1. Inspect whether the harness or joint is damaged; 2. Replace ECU
174	T50 switch-on time exceeds the limit	520253	11	Unable to start the engine	T50 switch-off time exceeds 20s	1. Inspect whether T50 switch can be disconnected normally; 2. Inspect whether T50 pin (X1-58) and harness are short circuited to external power
175	Vehicle speed 1 exceeds the maximum threshold	84	0	ECU vehicle speed takes the default value of 0 and stores the flash code	The vehicle speed exceeds 170 km/h	1. Verify whether the vehicle speed does exceed 170 km/h; if not; 2. Inspect whether the vehicle speed sensor is installed correctly; 3. Whether the vehicle speed sensor is disturbed by other harnesses and parts (such as instruments), which affects the stability of vehicle speed signal and leads to vehicle speed error

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
176	Vehicle speed 1, fuel injection quantity and engine speed are unreliable	84	2	ECU vehicle speed takes the default value of 0 and stores the flash code	The maximum linear voltage of vehicle speed signal is less than 4.7V, or the minimum linear voltage of vehicle speed signal is greater than 4.36V	1. Inspect whether the vehicle speed sensor is installed correctly, resulting in low maximum voltage or high minimum voltage 2. Inspect whether the vehicle speed sensor is disturbed by other harnesses and parts (such as instruments), resulting in low maximum voltage or high minimum voltage;
177	The warning lamp is short circuited to power	520250	3	Unable to light up	The warning lamp control terminal is short circuited to power	1. Inspect whether warning lamp control terminal X1-35 is short circuited to power
178	The warning lamp is short circuited to ground	520250	4	Always on	The warning lamp control terminal is short circuited to ground	1. Inspect whether the warning lamp control terminal X1-35 is short circuited to ground
179	Open circuit of warning lamp	520250	5	Unable to light up	The warning lamp is not connected properly	1. Inspect whether the warning lamp wiring is in good condition and connected with ECU (X1-35); 2. Inspect whether the warning lamp is damaged.
180	High-voltage test error	520223	20	Reserved	High-pressure oil pump or high-pressure oil rail failure	Replace the high-pressure oil pump or high-pressure oil rail
181	Open circuit of fuel gauge	1442	7	Limp home of engine	The fuel gauge is not connected properly	1. Plug in the connector of the fuel gauge; 2. Inspect whether the harness is under open circuit (X2- 06);
182	The fuel gauge is short circuited to power	1442	9	Limp home of engine	X2-06 terminal is short circuited to power	1. Unplug the connector of fuel gauge and measure X2-06 voltage, which should be 3.5V;
183	The fuel gauge is short circuited to ground	1442	10	Limp home of engine	X2-06 terminal is short circuited to ground	1. Unplug the connector of fuel gauge and measure X2-06 voltage, which should be 3.5V;
184	Opening of common rail pressure relief valve	520241	14	Limited engine performance	The pressure in the common rail pipe exceeds the allowable value	Inspect whether the oil return line is bent or blocked, whether the flow metering unit is normally open, and inspect the rail pressure sensor

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
185	The opening time of the pressure limiting valve exceeds the limit	520241	0	Limited engine performance	High and low pressure oil passage fault; Rail pressure sensor fault; Fuel gauge fault	1. Check the high and low pressure oil passage; 2. Confirm whether the rail pressure sensor is normal; 3. Confirm whether the fuel gauge is normal;
186	Common rail pressure relief valve does not open during pressure fluctuation	523470	21	Limited engine performance	High and low pressure oil passage fault; Rail pressure sensor fault; Fuel gauge fault	1. Check the high and low pressure oil passage; 2. Confirm whether the rail pressure sensor is normal; 3. Confirm whether the fuel gauge is normal;
187	The opening times of common rail pressure relief valve exceed the maximum times of technical requirements	520241	11	Limp home of engine	High and low pressure oil passage fault; Rail pressure sensor fault; Fuel gauge fault	1. Check the high and low pressure oil passage; 2. Confirm whether the rail pressure sensor is normal; 3. Confirm whether the fuel gauge is normal;
188	The voltage of the rail pressure sensor exceeds the upper threshold	157	3	Limp home	The rail pressure sensor or its harness is damaged or wrongly connected	X2-66 pin and sensor are not connected properly X2-66 pin is short circuited to power line higher than 5V
189	The voltage of the rail pressure sensor is lower than the lower threshold	157	4	Limp home	The rail pressure sensor or its harness is damaged or wrongly connected	X2-66 pin is short circuited to ground wire
190	The voltage of the rail pressure sensor exceeds the maximum deviation	157	15	Limp home	Sensor or line fault	Inspect the sensor or line fault
191	The voltage of the rail pressure sensor is lower than the minimum deviation	157	17	Limp home	Sensor or line fault	Inspect the sensor or line fault
192	The rail pressure deviation exceeds the upper threshold	520243	16	Limited engine performance	High and low pressure oil passage and related parts	1. Inspect the high and low pressure oil passage; 2. Inspect the rail pressure sensor 3. Inspect the fuel gauge; 4. Inspect the injector

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
193	The rail pressure deviation exceeds the upper threshold and the fuel injection quantity exceeds the limit	520243	0	Limited engine performance	High and low pressure oil passage and related parts	1. Inspect the high and low pressure oil passage; 2. Inspect the rail pressure sensor 3. Inspect the fuel gauge; 4. Inspect the injector
194	The rail pressure deviation is lower than the lower threshold and the fuel injection quantity is lower than the limit	520243	1	Limited engine performance	High and low pressure oil passage and related parts	1. Inspect the high and low pressure oil passage; 2. Inspect the rail pressure sensor 3. Inspect the fuel gauge; 4. Inspect the injector
195	The rail pressure peak is lower than the lower threshold	520243	20	Limited engine performance	High and low pressure oil passage and related parts	1. Inspect the high and low pressure oil passage; 2. Inspect the rail pressure sensor 3. Inspect the fuel gauge; 4. Inspect the injector
196	The rail pressure peak exceeds the upper threshold	520243	21	Limited engine performance	High and low pressure oil passage and related parts	1. Inspect the high and low pressure oil passage; 2. Inspect the rail pressure sensor 3. Inspect the fuel gauge; 4. Inspect the injector
197	The rail pressure drops too fast	520243	18	Limited engine performance	High and low pressure oil passage and related parts	1. Inspect the high and low pressure oil passage; 2. Inspect the rail pressure sensor 3. Inspect the fuel gauge; 4. Inspect the injector
198	The fuel gauge setting in overspeed mode is unreliable	520243	23	Limited engine performance	High and low pressure oil passage and related parts	1. Inspect the high and low pressure oil passage; 2. Inspect the rail pressure sensor 3. Inspect the fuel gauge; 4. Inspect the injector
199	Fuel gauge monitor error at low idle	520243	24	Limited engine performance	High and low pressure oil passage and related parts	1. Inspect the high and low pressure oil passage; 2. Inspect the rail pressure sensor 3. Inspect the fuel gauge; 4. Inspect the injector

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
200	The amount of fuel in the fuel gauge exceeds the threshold	520243	7	Limited engine performance	High and low pressure oil passage and related parts	1. Inspect the high and low pressure oil passage; 2. Inspect the rail pressure sensor 3. Inspect the fuel gauge; 4. Inspect the injector
201	The rail pressure deviation exceeds the threshold and the oil volume exceeds the threshold	520243	5	Limited engine performance	High and low pressure oil passage and related parts	1. Inspect the high and low pressure oil passage; 2. Inspect the rail pressure sensor 3. Inspect the fuel gauge; 4. Inspect the injector
202	The low-end of starter motor relay is short circuited to power	1675	3	The engine fails to be started	The starting relay harness is damaged or wrongly connected	1. Inspect whether the control terminal X1-22 of starting relay is short circuited to power
203	The low-end of starter motor relay is short circuited to ground	1675	4	The engine fails to be started	The starting relay harness is damaged or wrongly connected	1. Inspect whether the starting relay control terminal X1-22 is short circuited to ground
204	Open circuit of starter motor relay	1675	5	The engine fails to be started	The starting relay harness is open circuited or wrongly connected, or the starting relay is damaged	1. Inspect whether the wiring of the starting relay is in good condition and whether it is connected with ECU (X1- 22); 2. Inspect whether the relay is damaged.
205	The water temperature sensor works normally, but the water temperature exceeds the threshold	110	15	Storage of fault code	Sensor wiring or parts	Inspect the sensor wiring or parts
206	Cruise control error before the brake pedal is pressed	597	7	Storage of fault code	Brake pedal or connector	Brake pedal or connector
207	The identification error of cruise control requirements makes the fault light always on	597	11	Storage of fault code	Brake pedal or connector	Brake pedal or connector

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
208	The output voltage value of the remote accelerator pedal 1 exceeds the upper limit	520277	3	Limp home	The remote accelerator pedal or its harness connector is damaged	Inspect the harness connector or replace the remote accelerator pedal
209	The output voltage value of the remote accelerator pedal 1 is lower than the lower limit	520277	4	Limp home	The remote accelerator pedal or its harness connector is damaged	Inspect the harness connector or replace the remote accelerator pedal
210	The output voltage value of the remote accelerator pedal 2 exceeds the upper limit	520278	3	Limp home	The remote accelerator pedal or its harness connector is damaged	Inspect the harness connector or replace the remote accelerator pedal
211	The output voltage value of the remote accelerator pedal 2 is lower than the lower limit	520278	4	Limp home	The remote accelerator pedal or its harness connector is damaged	Inspect the harness connector or replace the remote accelerator pedal
212	The double relationship of the remote accelerator is unreliable	520253	2	When the engine rotates at a constant speed of 1,000rpm, the remote accelerator pedal fails	When using a single modulus remote accelerator, the deviation of remote accelerator pedal voltage signal is too large at low idle	1. Inspect whether the remote accelerator pedal is normal and replace the accelerator pedal 2. Inspect the relevant circuits and connectors of the remote accelerator pedal for short circuit and open circuit 3. Inspect whether the remote accelerator circuit is disturbed by other circuits
213	Remote accelerator and brake credibility verification	520277	7	Occasionally insufficient engine power	The remote accelerator pedal and brake pedal are pressed at the same time	Clear the fault code and tell the driver not to press the remote accelerator pedal and brake pedal at the same time
214	The original value of voltage of the water in oil sensor exceeds the upper threshold	520264	3	Water in oil monitoring does not work	The sensor is damaged or its harness is damaged or wrongly connected	1. X1-12 pin and sensor are not connected properly 2. X1-12 pin is short circuited to the power line higher than 5V

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
215	The original value of voltage of the water in oil sensor is lower than the lower threshold	520264	4	Water in oil monitoring does not work	The sensor is damaged or its harness is damaged or wrongly connected	X2-12 pin is short circuited to ground wire
216	OBD torque limit activation error	520198	11	OBD torque limiter works	Emission related failure occurs	1. Check whether the post-processing related parts work normally
217	Data length error	522015	14	EBC2 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
218	time-out error	522015	19	EBC2 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
219	Accident fire of cylinder 1	1323	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
220	Accident fire of cylinder 2	1324	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
221	Accident fire of cylinder 3	1325	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
222	Accident fire of cylinder 4	1326	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
223	Accident fire of cylinder 5	1327	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
224	Accident fire of cylinder 6	1328	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
225	Accident fire of cylinder 7	1329	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
226	Accident fire of cylinder 8	1330	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
227	Accident fire of cylinder 9	1331	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
228	Accident fire of cylinder 10	1332	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
229	Accident fire of cylinder 11	1333	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
230	Accident fire of cylinder 12	1334	3	Engine cylinder shortage	Injector orifice blockage or wiring problem	Inspect whether the injector is blocked or the harness is shorted circuited
231	The total number of cylinders with accident fire exceeds the limit	1322	3	Engine cylinder shortage	Accident fire of many cylinders	Eliminate other specific cylinder misfire faults
232	Lock the vehicle and execute lock mode 1	522014	1	Unable to start the engine or limp home	Failure to pay the loan on time; CAN bus error	Pay the loan on time; Restart CAN bus
233	Lock the vehicle and execute lock mode 2	522014	2	Unable to start the engine or limp home	1. Failure to pay the loan on time; 2. CAN bus error	1. Pay the loan on time; 2. Restart CAN bus
260	CAN received frame TSC-1DR data size error	522038	14	TSC1DR message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
261	CAN received frame TSC-1DR time-out error	522038	19	TSC1DR message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	Disconnect and reconnect; Inspect whether the harness CAN is disconnected
262	CAN received frame TS-C1AR data size error	522036	14	TSC1AR message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
263	CAN received frame TS-C1AR time-out error	522036	19	TSC1AR message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
264	CAN received frame TTSC-1DE data size error	522037	14	TSC1DE message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
265	CAN received frame TSC-1DE time-out error	522037	19	TSC1DE message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
266	CAN received frame TSC1AE data size error	522035	14	TSC1AE message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
267	CAN received frame TSC1AE time-out error	522035	19	TSC1AE message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
268	CAN received frame EngTemp2 data size error	522020	14	EngTemp2 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
269	CAN received frame EngTemp2 time-out error	522020	19	EngTemp2 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
270	CAN received frame ETC2 data size error	522023	14	ETC2 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
271	CAN received frame ETC2 time-out error	522023	19	ETC2 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
272	CAN received frame ERC1DR data size error	522021	14	ERC1DR message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
273	CAN received frame ERC1DR time-out error	522021	19	ERC1DR message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
274	CAN received frame AT1OGC2 data size error	522011	14	AT1OGC2 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
275	CAN received frame AT1OGC2 time-out error	522011	19	AT1OGC2 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
276	CAN received frame AT1OGC1 data size error	522010	14	AT1OGC1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
277	CAN received frame AT1OGC1 time-out error	522010	19	AT1OGC1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
278	CAN received frame AT1IGC2 data size error	522008	14	AT1IGC2 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
279	CAN received frame AT1IGC2 time-out error	522008	19	AT1IGC2 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
280	CAN received frame AT1IGC1 data size error	522007	14	AT1IGC1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
281	CAN received frame AT1IGC1 time-out error	522007	19	AT1IGC1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
282	CAN received frame AT1IG1 data size error	522006	14	AT1IG1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
283	CAN received frame AT1IG1 time-out error	522006	19	AT1IG1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
284	CAN received frame AT1OG1 data size error	522009	14	Affect NOx measurement accuracy	Signal interference or NOx sensor failure; CAN bus off; there is a problem with the received data length of the message	1. Inspect the NOx line, PIN1 positive +24V, PIN2 negative 0V. Low PIN3 of CAN is about 2.3V, and high PIN4 of CAN is about 2.8V. If the line is abnormal, solve the line fault; If it is determined that the circuit is normal, replace the NOx sensor. 2. Inspect the communication between AT1OG1 and CAN, disconnect and reconnect
289	CAN received frame ETC7 data size error	522063	14	ETC7 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
290	CAN received frame DEC1 data size error	522062	14	DEC1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
291	CAN received frame AMCON data size error	522050	14	AMCON message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
292	CAN received frame AMCON time-out error	522050	19	AMCON message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
293	CAN received frame HRVD data size error	522051	14	HRVD message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
294	CAN received frame HRVD time-out error	522051	19	HRVD message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
295	CAN received frame DashDspl data size error	522052	14	DashDspl message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
296	CAN received frame DashDspl time-out error	522052	19	DashDspl message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
297	CAN received frame EGF1 data size error	522053	14	EGF1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
298	CAN received frame EGF1 time-out error	522053	19	EGF1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
299	CAN received frame DM13 data size error	522054	14	DM13 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
300	CAN received frame DM13 time-out error	522054	19	DM13 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
301	CAN received frame TRF1 data size error	520217	14	TRF1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
302	CAN received frame TRF1 time-out error	520217	19	TRF1 message receiving information adopts the alternative value Unable to start the engine or limp home	Bus error; controller disconnection, etc. failure to pay the loan on time;	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected; 3. Pay the loan on time
303	CAN received frame CM1 data size error	522056	14	CM1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
304	CAN received frame CM1 time-out error	522056	19	CM1 message receiving information adopts the alternative value	Bus error; controller disconnection, etc.	1. Disconnect and reconnect; 2. Inspect whether the harness CAN is disconnected
313	Cylinder 1 and other cylinders in the same Bank are open circuited or short circuited to weak power supply	1413	6	Engine cylinder shortage; the warning lamp is on	The injector harness is damaged or not connected properly; injector fault	1. Inspect whether the injector is short circuited to power; 2. Inspect whether there is an open circuit between the injector and other cylinders 3. Replace the injector 4, and inspect the harness and connectors
314	Cylinder 2 and other cylinders in the same Bank are open circuited or short circuited to weak power supply	1414	6	Engine cylinder shortage; the warning lamp is on	The injector harness is damaged or not connected properly; injector fault	1. Inspect whether the injector is short circuited to power; 2. Inspect whether there is an open circuit between the injector and other cylinders 3. Replace the injector 4, and inspect the harness and connectors
315	Cylinder 3 and other cylinders in the same Bank are open circuited or short circuited to weak power supply	1415	6	Engine cylinder shortage; the warning lamp is on	The injector harness is damaged or not connected properly; injector fault	1. Inspect whether the injector is short circuited to power; 2. Inspect whether there is an open circuit between the injector and other cylinders 3. Replace the injector 4, and inspect the harness and connectors
316	Cylinder 4 and other cylinders in the same Bank are open circuited or short circuited to weak power supply	1416	6	Engine cylinder shortage; the warning lamp is on	The injector harness is damaged or not connected properly; injector fault	1. Inspect whether the injector is short circuited to power; 2. Inspect whether there is an open circuit between the injector and other cylinders 3. Replace the injector 4, and inspect the harness and connectors
317	Cylinder 5 and other cylinders in the same Bank are open circuited or short circuited to weak power supply	1417	6	Engine cylinder shortage; the warning lamp is on	The injector harness is damaged or not connected properly; injector fault	1. Inspect whether the injector is short circuited to power; 2. Inspect whether there is an open circuit between the injector and other cylinders 3. Replace the injector 4, and inspect the harness and connectors

Pre Index	Description	SPN	FM I	Problems caused	Reasons	Solutions
318	Cylinder 6 and other cylinders in the same Bank are open circuited or short circuited to weak power supply	1418	6	Engine cylinder shortage; the warning lamp is on	The injector harness is damaged or not connected properly; injector fault	Inspect whether the injector is short circuited to power; 1. Inspect whether there is an open circuit between the injector and other cylinders 2. Replace the injector 4, and inspect the harness and connectors
325	The acquisition mode is interrupted, and the voltage of the rail pressure sensor exceeds the upper threshold	157	3	Limp home	The rail pressure sensor or its harness is damaged or wrongly connected	1. X2-66 pin and sensor are not connected properly 2. X2-66 pin is short circuited to power line higher than 5V
326	The acquisition mode is interrupted, and the voltage of the rail pressure sensor is lower than the lower threshold	157	4	Limp home	The rail pressure sensor or its harness is damaged or wrongly connected	X2-66 pin is short circuited to ground wire
340	key message fault	520218	14	Lock the vehicle	The Key calculated by GPS is different from the key calculated by ECU	Check whether the communication of CAN line is normal and whether GPS is original GPS
341	key message time-out	520218	19	Key comparison fails, resulting in vehicle locking	Time-out of key message sent by GPS to ECU	Check whether CAN line communicates normally and whether the GPS module works normally
342	Engine speed is 0, and the time exceeds threshold	0	0	The engine simulates entering the next driving cycle, and locking responds to the locking command of the previous driving cycle	The engine speed is 0 for too long when the T15 switch is not powered off	When T15 is powered on after power off, avoid too long time that the engine speed keeps at 0 after ECU is powered on, for example, it should not exceed 1h
343	DEC1 message T50 signal receiving error	14161	31	T50 signal from CAN received by ECU is 0	The controller sending T50 signal through DEC1 message is not set to send T50 signal	Check the controller sending DEC1 message

Specification

SPECIFICATION

Item			Size
Performance	Bucket Capacity		1.7m^3
	Rated Load		3000kg
	Lifting time of Arm (Full load)		≤5.4s
	cycle Time		≤9.3s
	Highest speed at each gear	Forward I	8 km/h
		Forward II	13 km/h
		Forward III	24 km/h
		Forward IV	36 km/h
		Reversd I	9 km/h
		Reversd II	27 km/h
	Maxmum Traction Force		98±5kN
	Maximum Digging up Force		107±5kN
	Maximum gradability		30°
	Min. bend radius	Outside of bucket	5,540±100mm
	Geometry Dimension	Vehicle Length(with bucket laid down the ground)	6,990±100mm
		Vehicle Width(outside of wheel)	2,300±10mm
		Bucket Width	2510±10mm
		Vehicle Height(top of cab)	3,250±100mm
		Axle base	2,830±10mm
		Wheel base	1,850±10mm
		Min. Distance above Ground (at articulated point)	330±10mm
		Maximum Unloading Height (with tooth)	2,840±50mm
		Maximum Unloading Distance (with tooth)	1,240±50mm
	Machine Weight		10,200±200kg
	Driver seat		Over the articulation position

ENGINE

Item	Size
Rated Power	92KW
Rated rotation speed	2000r/min
Maximum torque	540N.m/(1,300-1,500)r/min
Fuel consumption at rated working conditions(rig-test)	≤215g/kw.h
Fuel oil	#0 light diesel oil in Winter,-10# in Summer
Fan diameter (exhaust)	600mm

TRANSMISSION SYSTEM

Item	Size
Hydraulic torque converter	
Type	Single turbine
Torque Ratio	3.25
Cooling mode	Air cooling
Gear Box	
Type	Fixed shaft type hydraulic gear shifting
Shifting gear	4 gears for Forward, 2 gears forreverse
Variable - Speed oil pump(gear pump)	
Operating Pressure	1.1~1.5MPa
Main transmission and hub reduction	
Main transmission type	1st stage reduction spiral bevel gear
Hub reduction type	Planetary reduction straight spur gear
Driving axle and wheel	
Type	4- Wheel Driven
Tire	17.5-25
Tire air pressure	0.28~0.32MPa

BREAKING SYSTEM

Item	Size
Service braking (foot braking):	Single pipeline, air-poppet oil 4-wheel caliper disc brake
Brake Disc Diameter	Φ460mm
Parking Braking	Flexible Shaft Control
System Air Pressure	0.71~0.784 MPa

STEERING SYSTEM

Item	Size
Type	Articulation Frame, Full hydraulic system
Steering Cylinders — I.D. × stroke	2-Φ80×Φ45×393mm
Steering Pump(Shared with Working System)	JHP2100
System Pressure	14MPa
Discharge	100ml/r
Steering angle	36º each on Left and Right

HYDRAULIC SYSTEM FOR WORKING DEVICE

Item	Size
Boom Cylinders — I.D. × strok	2-Φ125×Φ70×710mm
Bucket Cylinders — I.D. × stroke	1-Φ140×Φ80×540mm
Main Control Valve	Duplicate, Section Type
Main Pump	HP2100
Discharge	100r/min
System Pressure	17.5MPa
Working device	Single Rocker, Reversal, 6-connecting Rod Mechanism
Pressure of Pilot System	3.5MPa

ELECTRICAL SYSTEM

Item	Size
System Voltage	24V
Battery	Two 12V120AH, In Series
Light Bulb Voltage	24V
Diesel Engine Starting	24V, Electric Startup

OIL FILLING CAPACITY

Item		Size
Fuel Tank		155L
Hydraulic Oil Tank Capacity		127L
Crankcase		14L
Gearbox System		42L
Axle (Differential and Planetary system)	Front Axle	19L
	Rear Axle	19L
Front/Rear Brake Pump		4L

A/C SYSTEM

Item		Size
Hot air	Working Medium	Diesel Engine Cooling Water
	Heating Capacity	5,000W
Refrigeration	Working Medium	R134a
	Refrigerating Capacity	4000W
System Voltage		24V

APPROXIMATE WEIGHT OF WORKLOAD MATERIALS

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

Material	LOW WEIGHT OR DENSITY 1,100 kg/m^3 (1,850 lb/yd^3), OR LESS	MEDIUM WEIGHT OR DENSITY 1,600 kg/m^3 (2,700 lb/yd^3), OR LESS	HIGH WEIGHT OR DENSITY 2,000 kg/m^3 (3,370 lb/yd^3), OR LESS
Charcoal	401kg/m^3 (695 lb/yd^3)	-------	-------
Coke, blast furnace size	433kg/m^3 (729 lb/yd^3)	-------	-------
Coke, foundry size	499kg/m^3 (756 lb/yd^3)	-------	-------
Coal, bituminous slack, piled	801kg/m^3 (1,350 lb/yd^3)	-------	-------
Coal, bituminous r. of m., piled	881kg/m^3 (1,485 lb/yd^3)	-------	-------
Coal, anthracite	897kg/m^3 (1,512 lb/yd^3)	-------	-------
Clay, DRY, in broken lumps	1,009kg/m^3 (1,701 lb/yd^3)	-------	-------
Clay, DAMP, natural bed	-------	1,746kg/m^3 (2,943 lb/yd^3)	-------
Cement, Portland, DRY granular	-------	1,506kg/m^3 (2,583 lb/yd^3)	-------
Cement, Portland, DRY clinkers	-------	1,362kg/m^3 (2,295 lb/yd^3)	-------
Dolomite chips	-------	1,522kg/m^3 (2,565 lb/yd^3)	-------
Earth, loamy, DRY, loose	-------	1,202kg/m^3 (2,025 lb/yd^3)	-------
Earth, DRY, packed	-------	1,522kg/m^3 (2,565 lb/yd^3)	-------

Material	LOW WEIGHT OR DENSITY 1,100 kg/m^3 (1,850 lb/yd^3), OR LESS	MEDIUM WEIGHT OR DENSITY 1,600 kg/m^3 (2,700 lb/yd^3), OR LESS	HIGH WEIGHT OR DENSITY 2,000 kg/m^3 (3,370 lb/yd^3), OR LESS
Earth, WET, muddy	-------	-------	1,762kg/m^3 (2,970 lb/yd^3)
Gypsum, calcined, (heated, powder)	961kg/m^3 (1,620 lb/yd^3)	-------	-------
Gypsum, crushed to 3 inch size	-------	1,522kg/m^3 (2,565 lb/yd^3)	-------
Gravel, DRY, packed fragments	-------	-------	1,810kg/m^3 (3,051 lb/yd^3)
Gravel, WET, packed fragments	-------	-------	1,922kg/m^3 (3,240 lb/yd^3)
Limestone, graded above 2	-------	1,282kg/m^3 (2,160 lb/yd^3)	-------
Limestone, graded 1-1/2 or 2	-------	1,362kg/m^3 (2,295 lb/yd^3)	-------
Limestone, crushed	-------	1,522kg/m^3 (2,565 lb/yd^3)	-------
Limestone, fine	-------	-------	1,602kg/m^3 (2,705 lb/yd^3)
Phosphate, rock	-------	1,282kg/m^3 (2,160 lb/yd^3)	-------
Salt	929kg/m^3 (1.566lb/yd^3)	-------	-------
Snow, light density	529kg/m^3 (891 lb/yd^3)	-------	-------
Sand, DRY, loose	-------	1,522 kg/m^3 (2,565 lb/yd^3)	-------
Sand, WET, packed	-------	-------	1,922kg/m^3 (3,240 lb/yd^3)
Shale, broken	-------	1,362kg/m^3 (2,295 lb/yd^3)	-------
Sulfur, broken	529kg/m^3 (91,620 lb/yd^3)	-------	-------

Environment protection

When you perform the maintenance of the equipment and the disassembling of any pipeline, connector or other associated parts, you should use the special containers to collect coolants, oil liquids, fuel, electrolytes or other materials which may cause environment pollution. Meanwhile, you should dispose the related pollution materials at the specified authorized places or containers, and should comply with the requirements from local laws and regulation when you perform the disposals.