OPERATOR'S MANUAL

MOVING YOU FURTHER

WHEEL LOADER

HL660VL
HL665VL

HYUNDAI
CONSTRUCTION EQUIPMENT

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. Thank you once again for the business cooperation at normal times.

With best regards

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

ADVICE FOR OPERATION OF LOADER

 **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 the sake of your safety and the safety of others whose safety is subject to your actions, please seriously check important factors causing hazards.

WARNING!

The incorrect operation and maintenance may bring about hazards and even the personal death.

Before operation and maintenance, the driver and maintainer must fully understand the details in this manual.

If you perform the operation and maintenance without the correct method specified this manual, the accidents may occur.

Before using the equipment, it is necessary to read through the operation procedures and matters to be attended described in this manual.

The sold equipment follows all relative local laws and regulations. If you purchase the machine from other country, it may lack of the safety equipment specified in local laws and regulations. If so, please consult the Agent before operation.

Safety Alert Symbols

Preparation - understand the description of all operations and safety.

This is a Safety Alert Symbol. When working together with other persons, you must ensure that all persons shall be able to understand the sign language being used and warn the people of injury dangers. Please follow the recommended safety measures and safety operation regulations. Memorize the sign languages used in alert symbol.

Signal Words

The “CAUTION”, “WARNING”, “DANGER” used in this manual and on the machine. They indicate the hazardous level for harms and non-safety operations, and they also represent the three degree of safeties. Whenever you see the delta label for safety warning, you should seriously read the content of the warning no matter what warning text is followed.

CAUTION!

CAUTION indicates a potential hazardous situation which, if not avoided, could result in minor or moderate injury. It is also used for reminding operator to prevent the unsafe operation factors during operating.

WARNING!

Warning indicates a potential hazardous situation which, if not avoided, could result in serious injury or death. It is also used for warning operator to prevent the severer unsafe operations.

DANGER!

Danger indicates a direct dangerous situation which, if not avoid, will cause death or extremely severe injury accidents. Meanwhile, it is also used to warn that the equipment will explode or be destroyed if not operated properly.

The safety warning starts from Page 1-4 of Safety Section in this manual.

It is impossible to pre-list all potential hazards in all working environments. Therefore, if you want to perform the operations un-recommended, you must ensure the safety of yourself and others and must ensure the equipment not to be damaged. If you cannot ensure the safety of some operations, please contact with the agent.

SAFETY DECALS

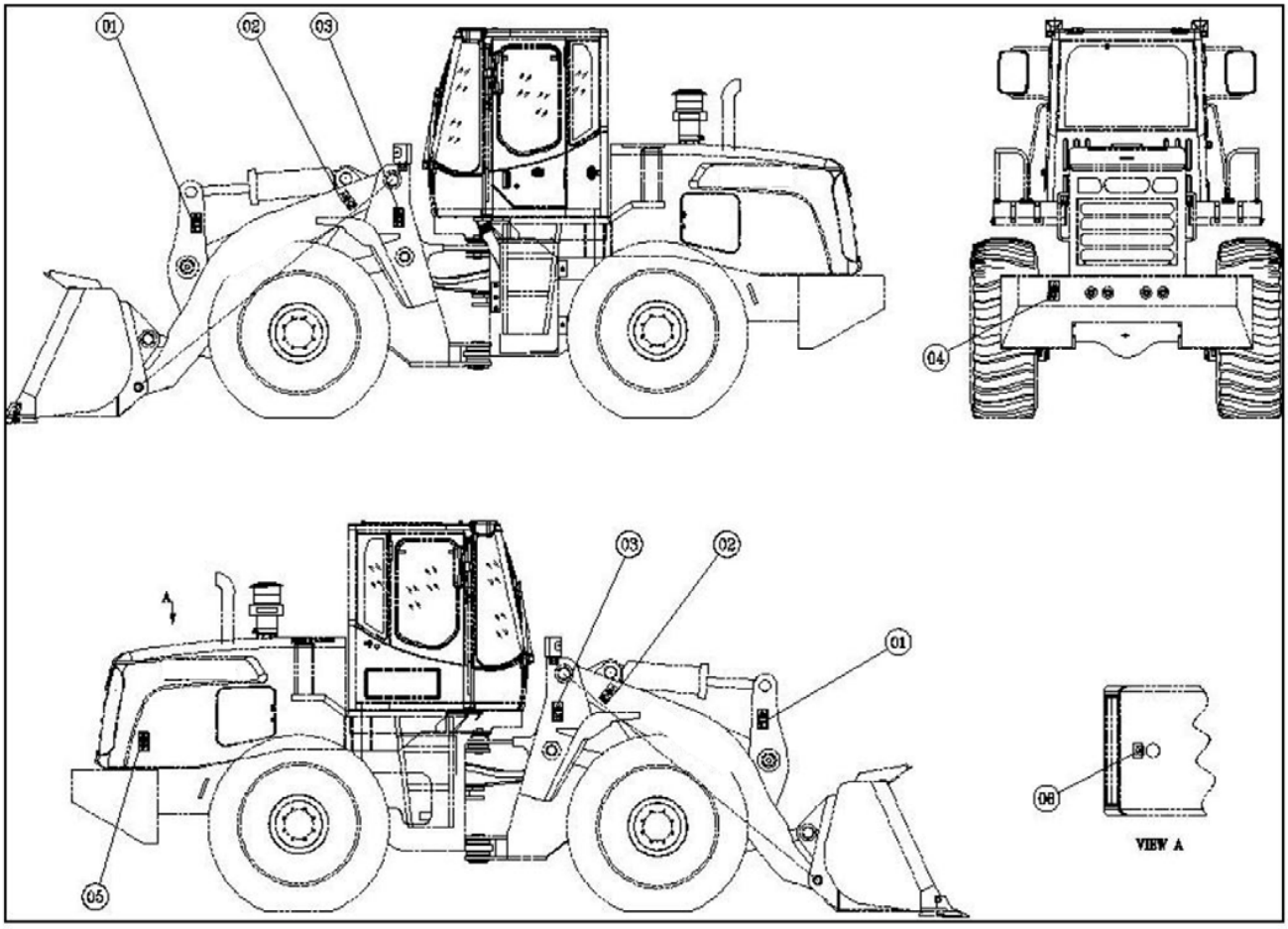

Fig. 1

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. 2

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.

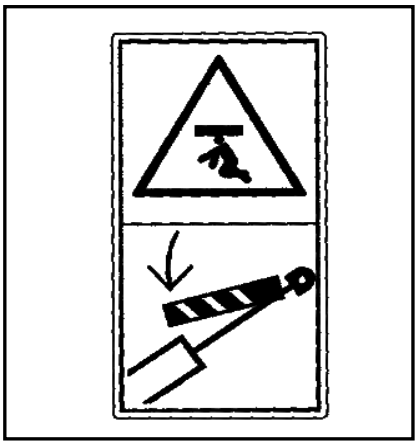

Fig. 3

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

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

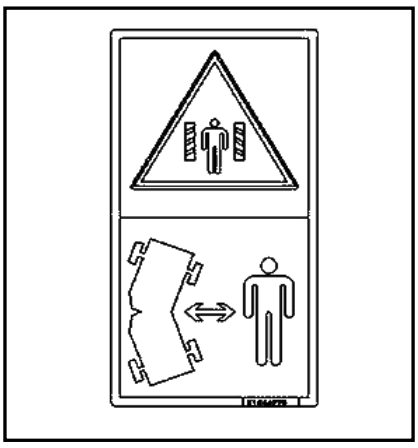

Fig. 4

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

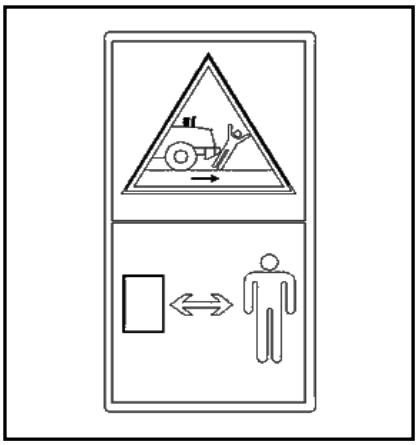

Fig. 5

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

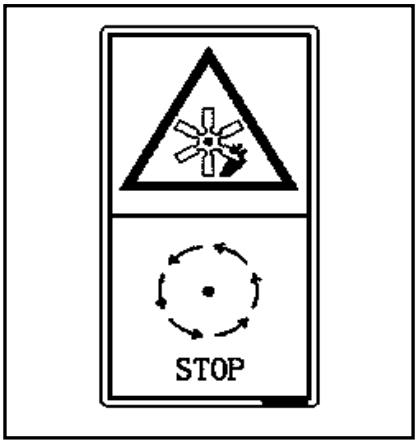

Fig. 6

6. **High temperature, NO touch.**

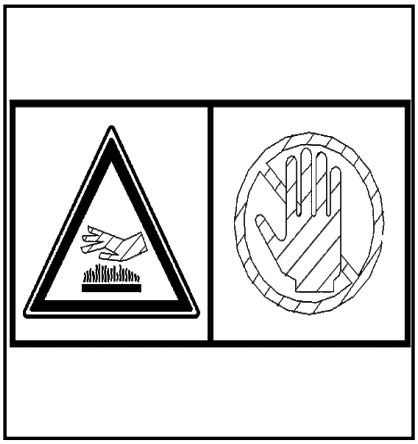

Fig. 7

UNAUTHORIZED MODIFICATIONS

In case of the safety accidents arising from any modification without authorization by Hyundai, the Owner shall bear the responsibilities.

As a safety precaution, all OEM parts must be replaced with the correct authorized or genuine 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 problems 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 persons know the nature of the work and understand all hands signals 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 position. 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 operating condition.

Incorrect operation of the safety features may also cause serious 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. 8

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.

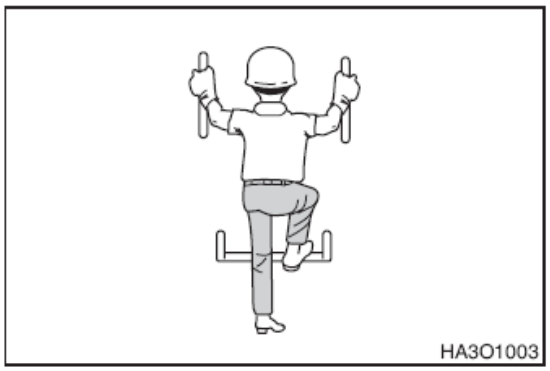

Fig. 9

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. 10

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. 11

Fig. 12

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. 13

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. 14

Fire extinguisher and first-aid kit

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.

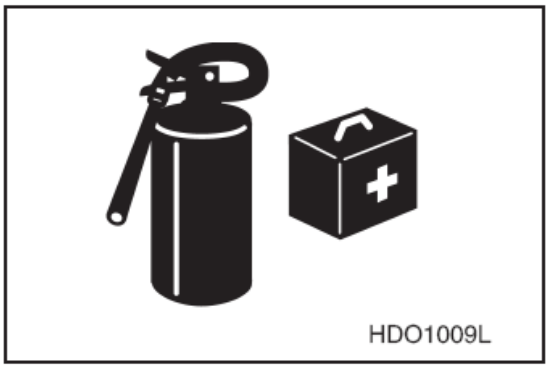

Fig. 15

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

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.

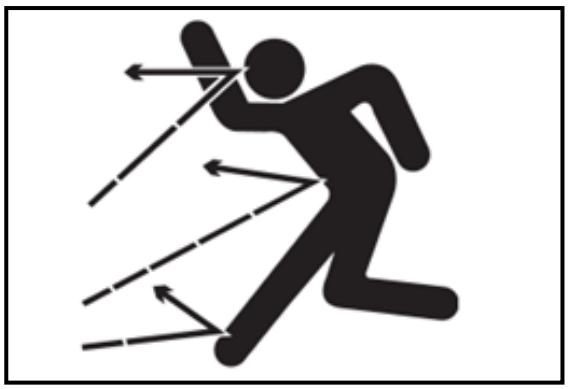
Fig. 16

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.

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

Fig. 17

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.

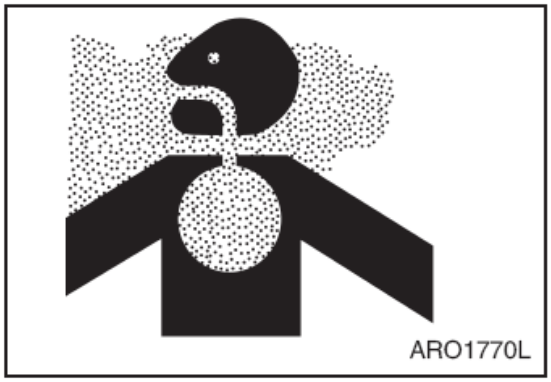

Fig. 18

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.

Starting and operating machine by sitting on the seat.

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

Matters needing attention on travelling

Do not shut off the engine while the machine is travelling. The shutting off engine while the machine is travelling is dangerous. You cannot manipulate the steering wheel effectively.

Do not operate the control handle of the attached device while the machine is travelling.

Do not change the selected travel mode (quick/slow) while the machine is travelling.

Fold the working device, making the outer end of the big arm close to the machine as much as possible, and over 40-50cm (16-20in) above the ground.

Do not travel on the obstacles or on the slope where the tip-over of the machine is easily caused. Please bypass in advance when you meet a slope or obstacle which can make the loader tilt more than 10º from left side to right side and more than 30 º from front side to rear side.

Please not suddenly turn a direction. Otherwise the working device will strike the ground, making the machine lose balance so that the machine or the devices in working area will be damaged.

Drive slowly and avoid suddenly turn a direction while travelling on the coarse ground.

Keep the permissible water level. The permissible water level refers to the central line of the bridge.

Check first whether the bridge or the building can withstand the weight of the machine while the machine is travelling on the bridge or building. Observe the local authorization and follow its instruction while the machine is travelling on the highway.

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

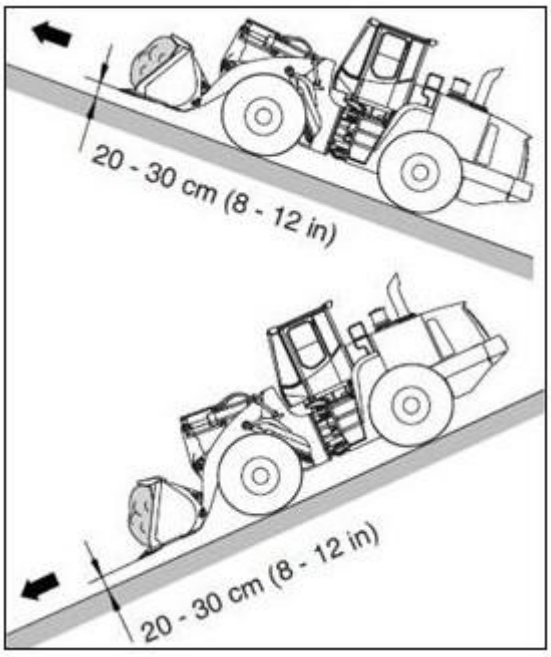

Fig. 19

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.

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.

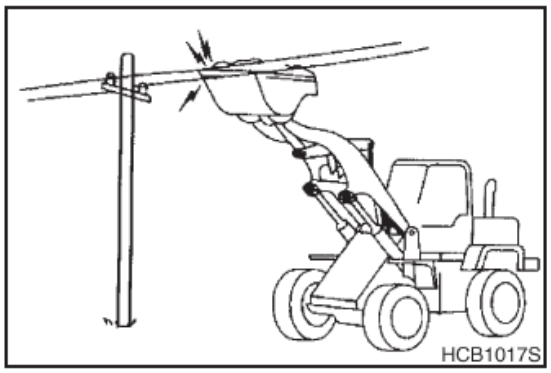

Fig. 20

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.

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.

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. 23

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

Fig. 24

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. 25). If the water enters the electrical system, it will cause the failure or faults

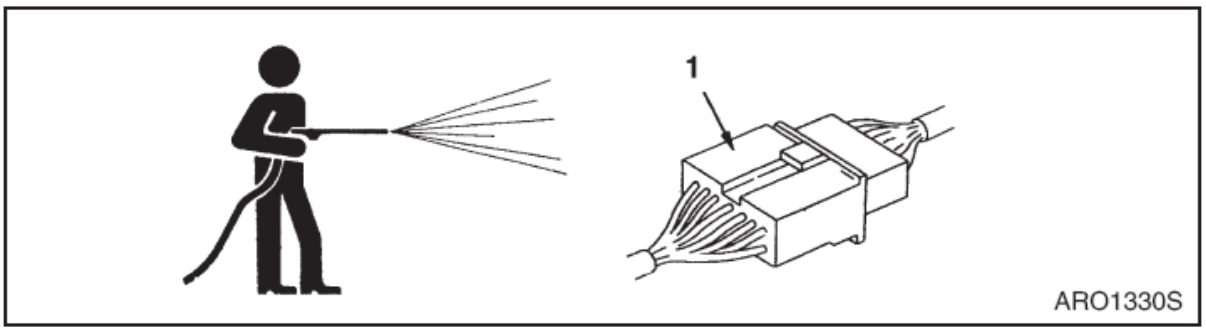

Fig. 25

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.

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.

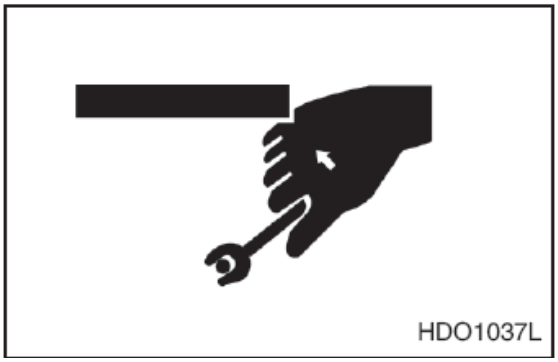

Fig. 26

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.

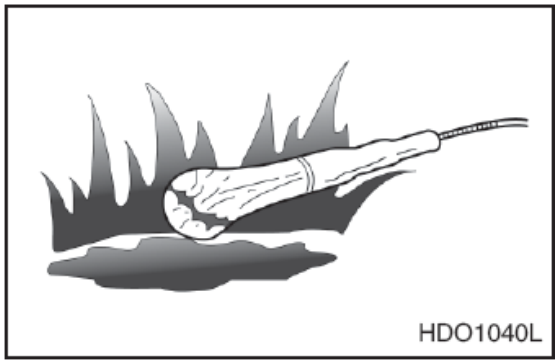

Fig. 27

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.

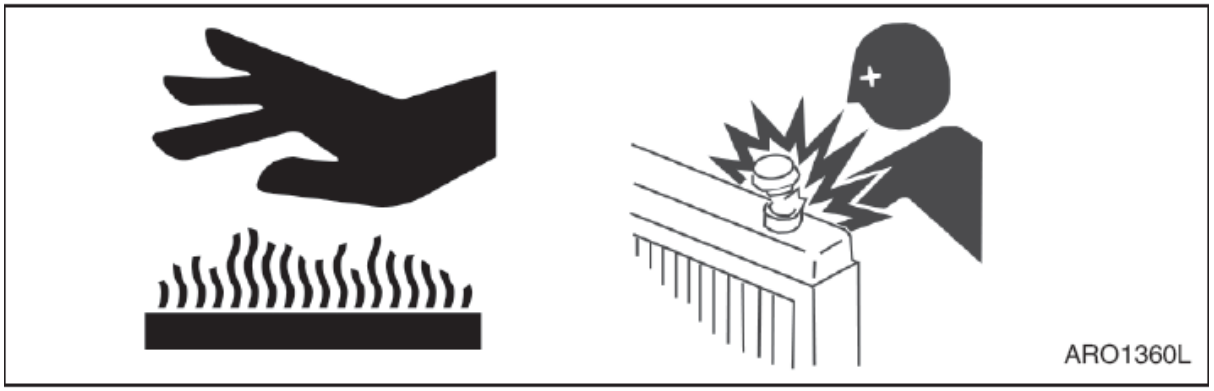

Fig. 28

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.

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. 29

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).

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

Fig. 30

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. 31

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.

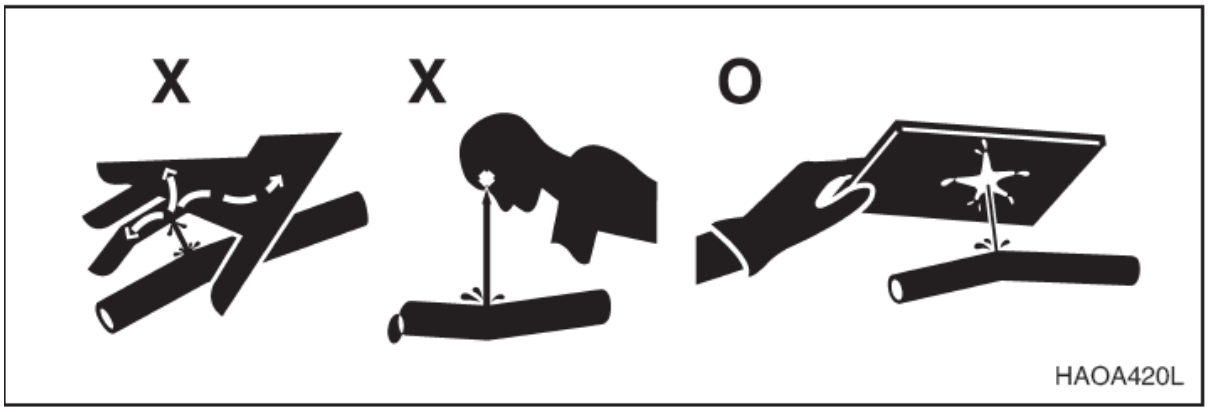

Fig. 32

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.

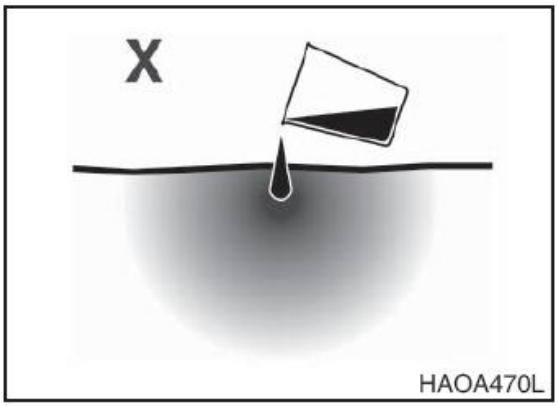

Fig. 33

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.

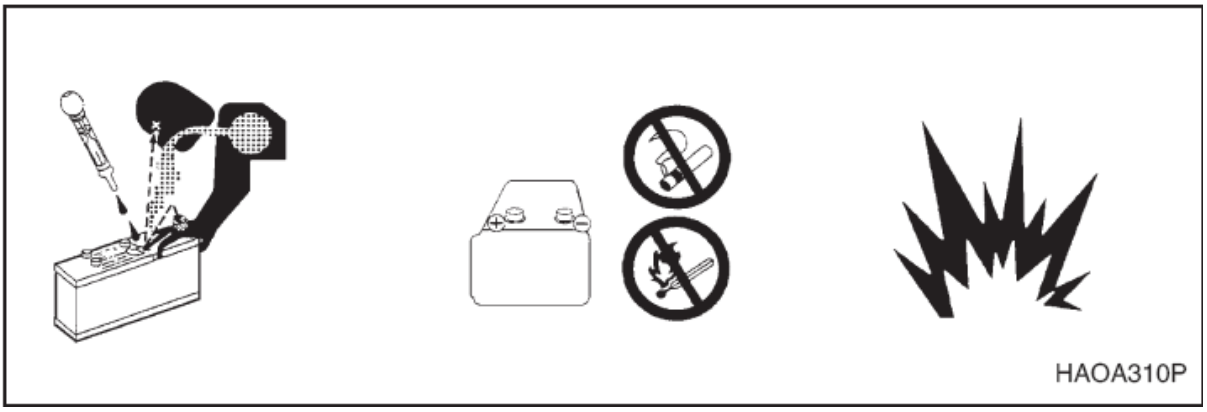

Fig. 34

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.

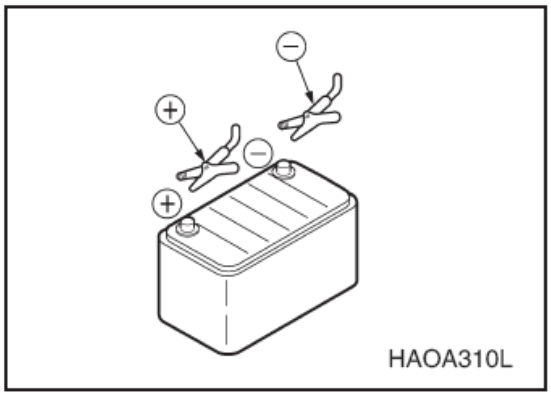

Fig. 35

- 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.

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.

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

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. 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!
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

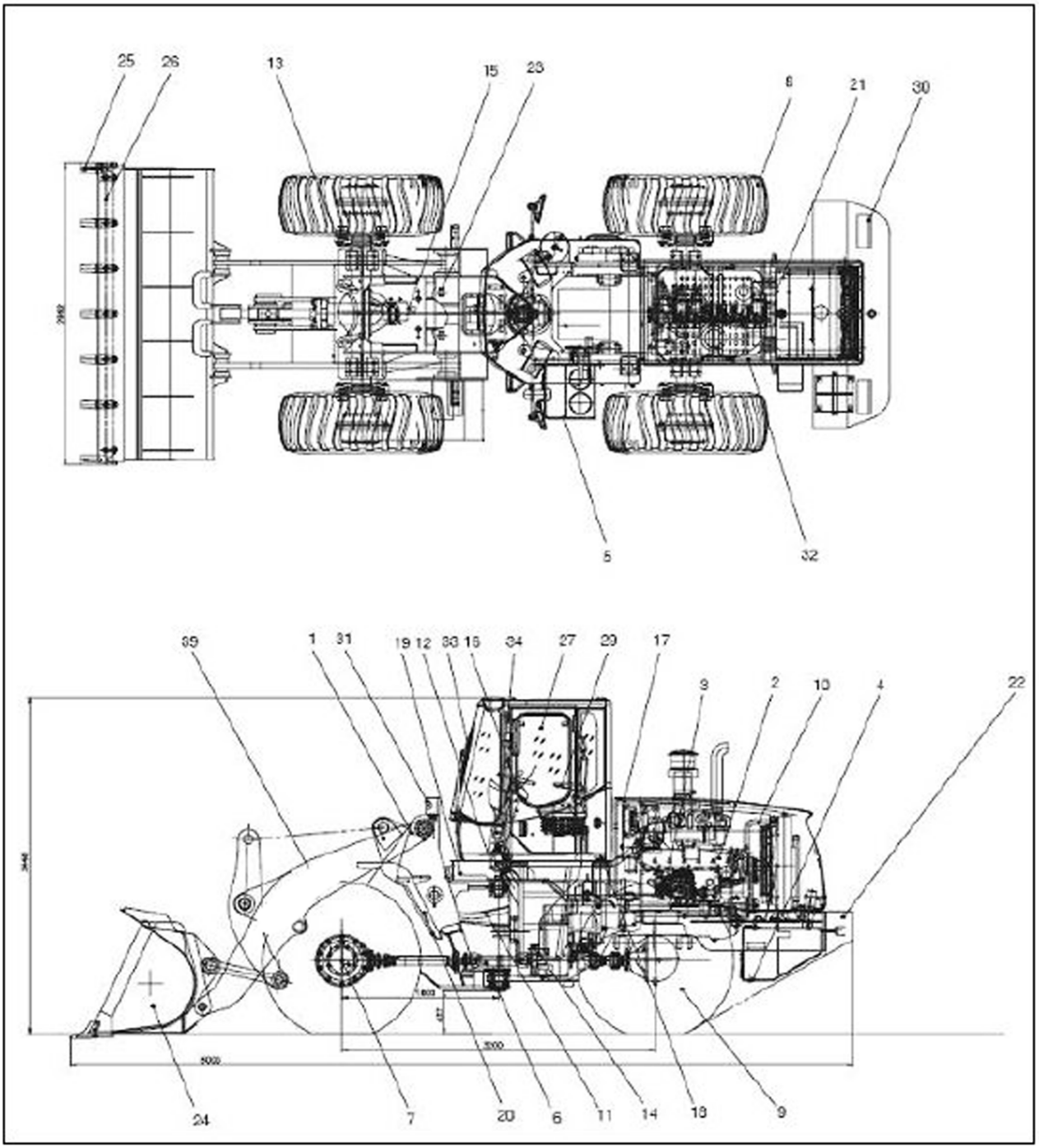

Fig.1

Reference Number	Description
1.	Main frame
2.	Engine and gearbox
3.	Engine controls
4.	Fuel tank
5.	Hydraulic oil tank
6.	Driving shaft
7.	Axle
8.	Tire
9.	Tire hub
10.	Cooling pipeline
11.	Main pipeline
12.	Steering oil piping
13.	Brake pipeline
14.	The Brakes
15.	Control valve pipeline
16.	Handrail
17.	Cover

Reference Number	Description
18.	Cab seat
19.	Trims in cab
20.	Pedal
21.	Stop
22.	Counterweight
23.	Front additional device
24.	Bucket module
25.	Bucket lip
26.	Bucket knifing edge
27.	Cab
29.	Seat
30.	Lighting lamp-rear
31.	Lighting lamp-front
32.	Electrical part - engine
33.	Electrical part - cab
34.	Electrical part - electrical box
39.	Nameplate

OPERATOR`S AREA

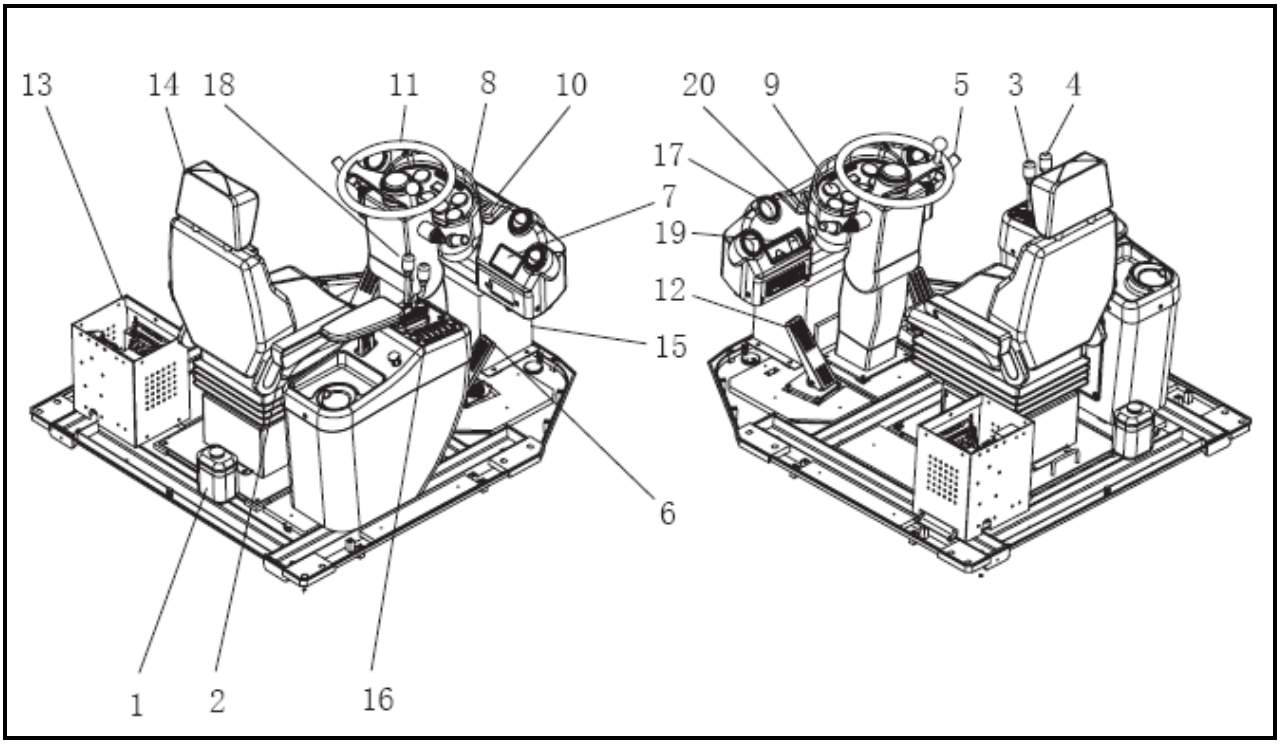

Fig. 2

Reference Number	Description
1	Washing pot
2	Adjusting handle for seat (Forwards, backwards, leftwards, rightwards)
3	Bucket manipulating handle
4	Arm manipulating handle
5	Combo switch handle (Low/high beam, Horn, Steering lamp)
6	Throttle pedal
7	A\C Panel
8	Dashboard base
9	Dashboard assembly
10	Panel

Reference Number	Description
11	Steering wheel
12	Brake pedal
13	Electrical element box
14	Seat
15	A\C evaporator assembly
16	Control switch such as OFF
17	Air outlet
18	Steering wheel adjustment handle
19	Lamp switch assembly
20	Gearshift handle

Shifting lever

The shifting lever is located under the steering wheel.

Operate the shifting lever frontward or backward to get forward gear 1, forward gear 2, back gear, neutral position.

Fig. 3

MANIPULATING FACILITY AND MONITORING SYSTEM

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

Fig. 4

WARNING!

Do not switch off the negative pole switch of the battery while the engine is still running, otherwise it will damage the whole electrical system！！！

Starting switch

Starting switch (also called as electric lock) is located on the right side panel of the steering wheel.

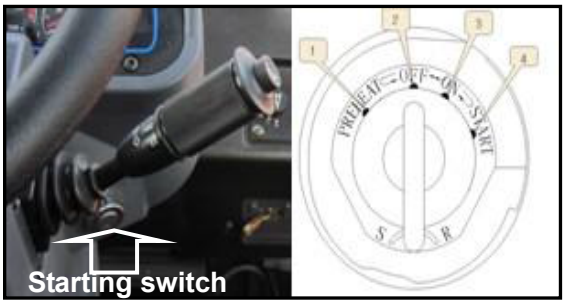

Fig. 5

1. Auxiliary – the first position you meet when you insert the starter key and rotate it counterclockwise, and this gear position can be auto reset (i.e., the button will return to “OFF” position when you release your hand). This gear position is not available at present.
2. OFF – at this gear position, the power supply control circuit for the whole machine is cut off, but at this time the machine is still powered by the generator. When you want to stop the machine, first use the switch off handle to stop the engine, and then rotate the starting switch to “OFF” position.

   Note: *Only at this position, is it possible to insert or pull out the starter key!*
3. ON – the first gear position you meet when you insert the starter key and rotate it clockwise. At this position, the electrical system of the whole vehicle can be powered to operate normally.
4. START – the second gear position you meet when you insert the starter key and rotate it clockwise. At this position, the starter motor can be powered to operate and start the engine. After the engine is successfully started, you should immediately release the starter button. This gear position can not be held by itself. As soon as you release the starter button, it will auto return to “ON” position of the starter switch.

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

Fig. 6

Fig. 7

WARNING!

If the engine starting operation fails, it is necessary to turn the switch to “OFF” position then you can restart. Otherwise it will damage the starter switch!

The time for each start should not exceed 15 s; the interval between two starts shall be at least 30s and the times to continuously start should not exceed 3 times; if it exceeds 3 times, you should wait for the starter motor to be fully cooled down, then you can start again. Otherwise, it will reduce the operation life of the battery; meanwhile it may damage the starter motor.

Operation of pre-heater system

The pre-heater system can be used in some regions and states where the cold weather may affect the starting ability of the engine. Please read the following specification carefully before operation.

1. Turn the starter switch to the position 'ON'

   Starter Switch ('ON')

Fig. 8

When the resistivity of the engine coolant sensor is less than 2700±300Ω (which means that the engine coolant temperature is above 0 ℃), the controller won't go to pre-heat status and the pre-heat indicator will be on for 2s before goes out.

Pre-heat indicator

Fig. 9

2. When the resistivity of the engine coolant sensor is more then 2700±300Ω （which means that the engine coolant temperature is below 0℃） ,the controller will go to pre-heat status and the pre-heating time is associated with the voltage (please refer to the following table).

Voltage (V)	18	20	22	24
Time （S）	55±5	41±4	30±3	26±2

3. When the pre-heat time is up, the pre-heat indicator (DL) goes out (If the start switch is turned off during the pre-heat time, the controller will stop) and the pre-heat system then wait to start the engine for 30s.

   - During the waiting time (the pre-heat plug is in ON position),if you switch on the start switch (K2),the fuel supply valve is open and the pre-heat indicator will be lighted on again with the pre-heat plug energized .

Starter switch ('start')

   - During the waiting time, if you don't switch on the start switch (K2) , the voltage of 24V will not be input to 50 port which means that the engine is not started .The controller will stop working.

4. If the generator don't send D+ signal to the controller after the reset of the start switch, which means that the engine fail to be started, the control will stop working after 6s;if the generator send D+ signal to the control (which means that the engine is started),it begin to heat and the heat time is presented as a function of the resistance of the engine coolant sensor whose range is between 60s and 120s.
5. If the circuit of the engine coolant sensor is open, the pre-heat system works. The pre-heat indicator twinkle for 15s to give a warning after all start procedure is over, and it is the longest heating time.
6. When the voltage is less than 15V, the pre-heat system doesn't work and the pre-heat indicator (DL) twinkle for 15s to give a warning.
7. No matter the controller stop working at what stage, only turning off the pre-heat switch K1, which means cancel the voltage of 15V, firstly and then turning it on can regain the pre-heat function.

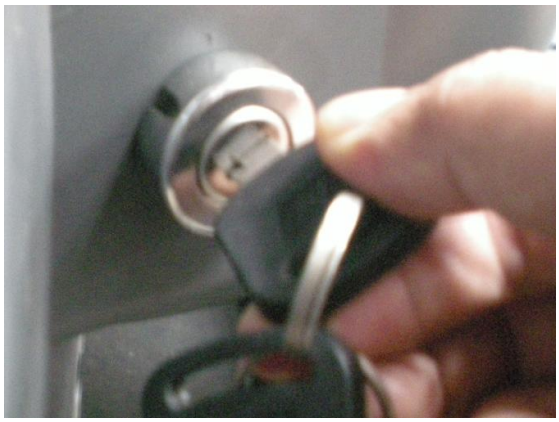

Fig. 10

Schematic

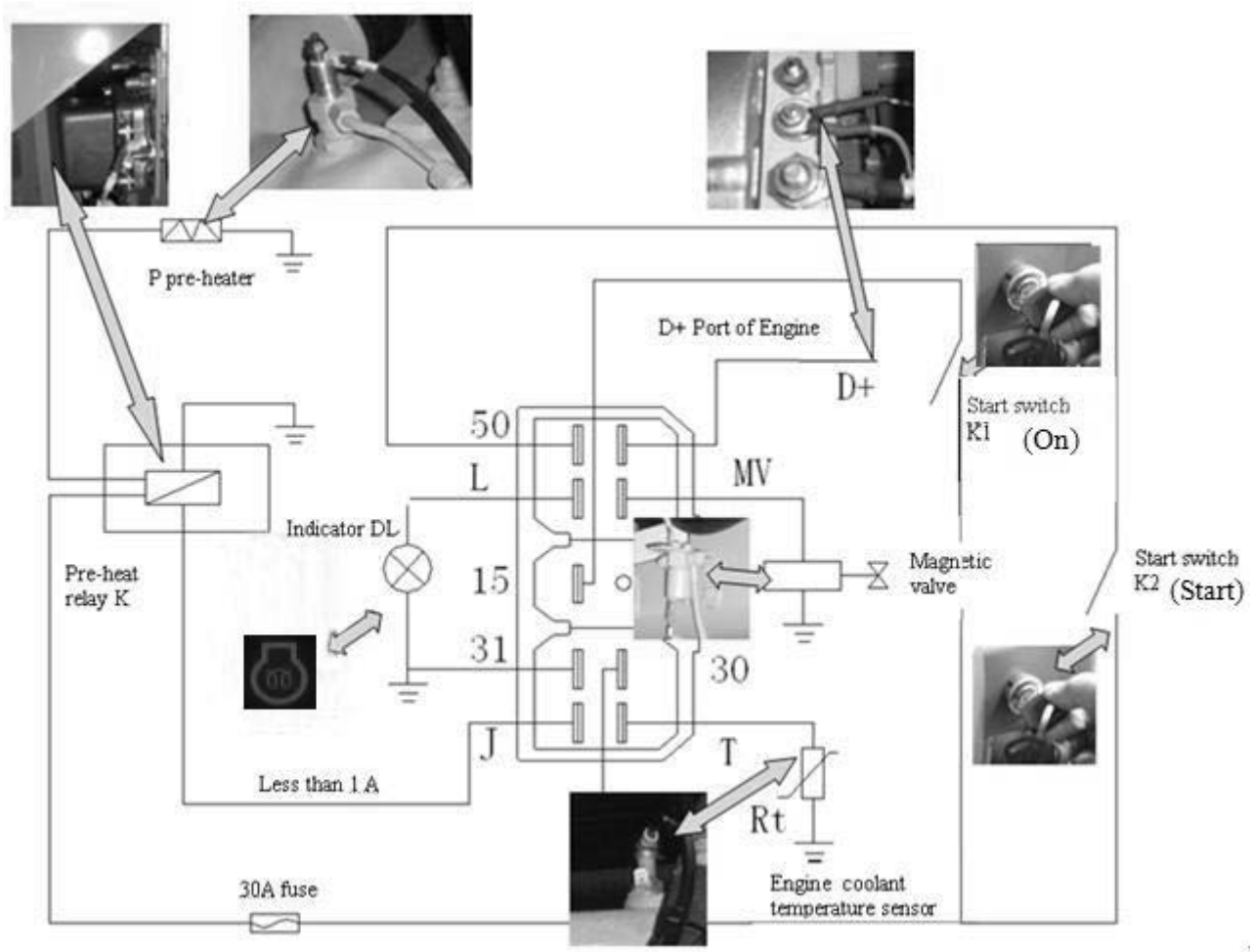

Fig. 11

Parking braking

Parking braking switch (Hand brake) is located on the console on the right side of the cab. When it is pulled up, the braking applies. It cannot be depressed to release the braking until the braking air pressure is up to 0.4MPa. The emergency braking is realized by auto upspring of the braking switch when the air pressure is under 0.3MPa. (Fig. 12)

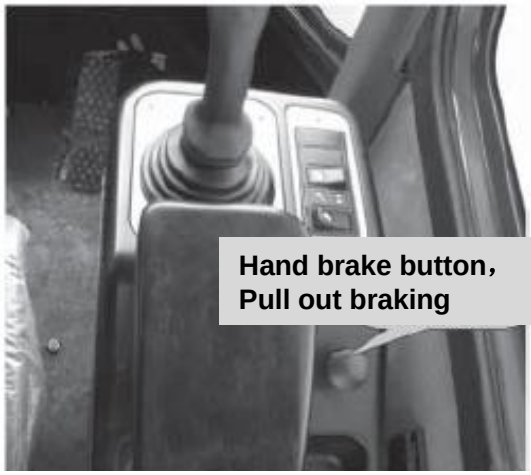

Fig. 12

Service braking pedal

Service braking pedal (foot brake) is located in front left of the cab floor. (Fig. 13)

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. 13

Throttle pedal

The throttle pedal is located in front right of the cab floor. When it is at the position shown in Fig.11, the engine is in the idle state. Depress the throttle pedal, the amount of fuel supply will be increased to increase the power output of the diesel engine. (Fig. 14)

Fig. 14

The engine cutoff of this machine is controlled by electrical module.

If you put the starter switch to the “OFF” position the engine will be stopped.

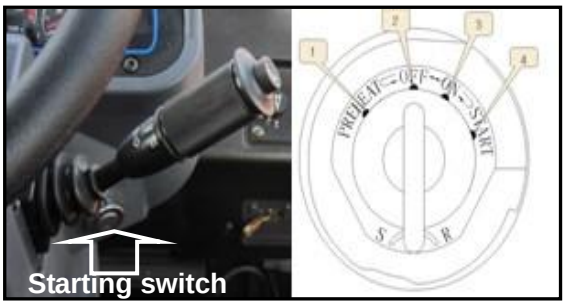

Fig. 15

Immediate direction-changing function

There is no direction-changing interlocking function for shifting manipulating handle of this machine. The driver can, based on the vehicle speed, immediately change the direction of the vehicle (it is required that the vehicle speed shall be less than 10Km/h when the direction is changed)：

- For forward 1 and 2 positions, you can engage them to reverse position at any time. However, because this machine has only Reverse 1 Position, therefore, if you toggle the lever to the Reverse position, it is always the Reverse 1 Position

NOTE!

Do not selfishly change the shifting manipulating system when the shifting manipulating system of the vehicle is in fault!!!

If the fault cannot be removed, please contact with authorized maintenance station and after sales service company of Hyundai for the maintenance.

Pilot manipulating handle (Standard configuration)

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 inner side bucket manipulating handle is used to control the bucket's movement and the outer side arm manipulating handle is used to control the arm's movement. Both handles are at the "holding" position under natural state, i.e., at the middle position.

When the engine is running, if you push the bucket manipulating handle forward, the bucket will tilt forward; if you pull the bucket manipulating handle backward, 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 these two handles forwards or backwards, 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.

Besides, the pilot manipulating handle also has the following special functions:

1) Arm lifting limit:

If the arm manipulating handle is pulled backwards to the extreme rear position, the arm manipulating handle will be stuck by arm rise holding magnet (the arm 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 arm 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 arm manipulating handle is pushed forward to the extreme front position, the arm manipulating handle will be stuck by arm floating 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 arm manipulating handle back to the middle position.

When you manipulate the arm to lower down, you can push the arm manipulating handle to the floating position and the will then descend under the action of gravity. At this time, the driver can use his right hand to perform other operations (e.g., lay down the bucket), thus improving the working efficiency.

When you performing scraping or shoveling & loading, push the arm 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 rear 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 attractive force, and the bucket 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 rear position, the bucket 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 bucket 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 bucket

manipulating handle is again pulled backwards to the extreme rear position, the bucket manipulating handle will be held at the Extreme Rear Position.

The bucket manipulating handle does not have holding function when it is at the front position. When the bucket tilts forwards from the maximum bucket receive angle to the unloading angle, you need, at all time, push the bucket manipulating handle in ahead(bucket 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, thus improving the comfort of operation.

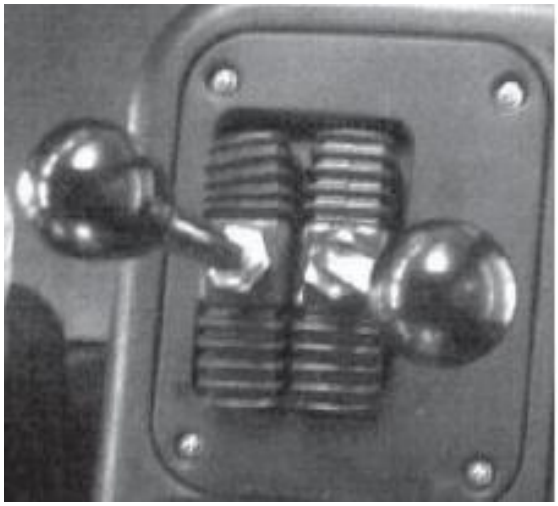

Fig. 16

Pilot manipulating handle (Optional)

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 these two handles 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.

Besides, the pilot manipulating handle 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.

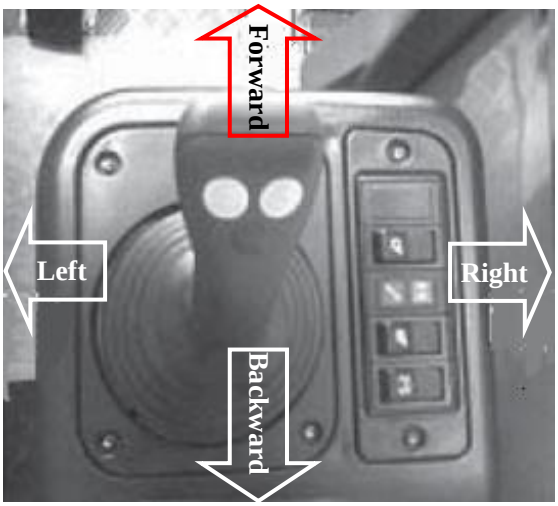

Fig. 17

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.

ROCKER SWITCH

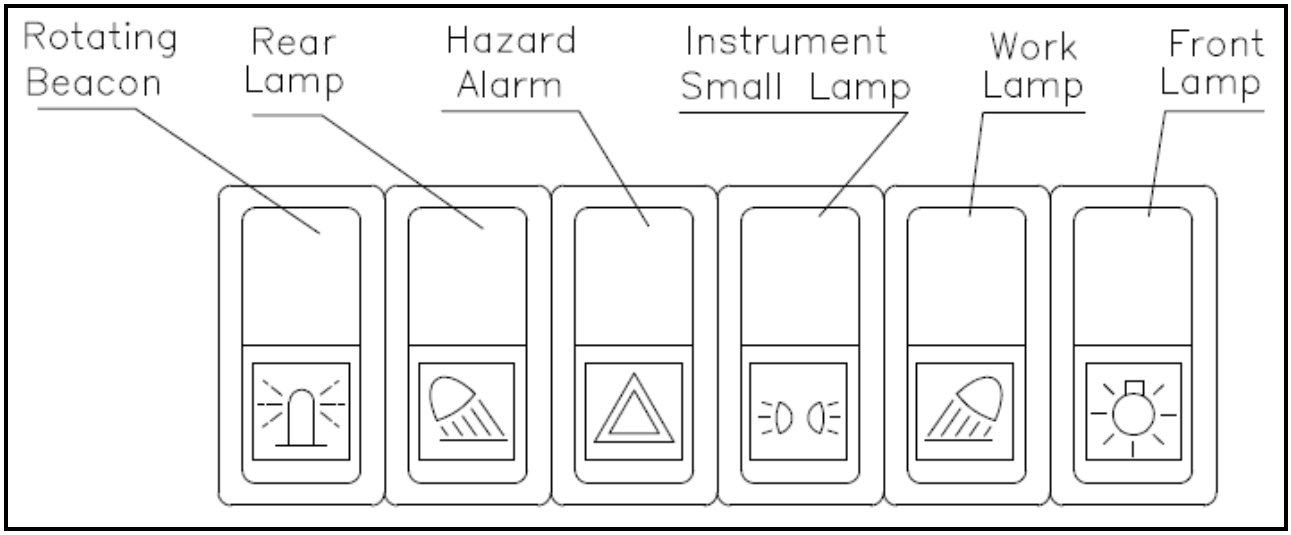

Fig. 18

Combo rocker switch

1. Rotating Beacon Light Switch (Optional)

If unit is equipped with a rotating beacon warning light, push this switch to activate it.

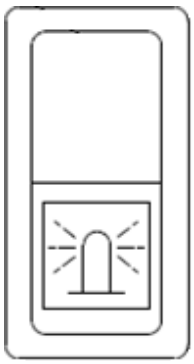

Fig. 19

2. Rear Work Light Switch

Rear lamp switch controls left and right lamps are turned “ON” or “OFF” simultaneously

Note: *Do not turn "ON" the work lights when traveling on public roads.*

Fig. 20

3. Hazard Warning Light Switch

The hazard warning light is used when machine is stopped because of a malfunction or when an emergency occurs. When this switch is pressed, all directional indicator lights on front and back of machine will turn "ON" and "FLASH," warning others in the area. At the same time the directional indicator lights on instrument panel will turn "ON" to warn the operator.

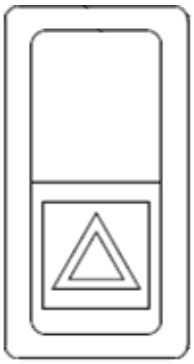

Fig. 21

4. Instrument small lamps

The small lamp switch can control the four small lamps in front and rear to be lit up or off simultaneously. In addition, it can also control the indicators for all rocker switches and instrument lighting.

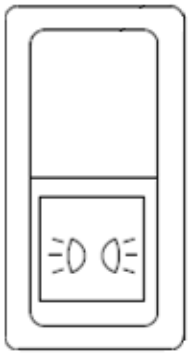

Fig. 22

5. Front Work lamp switch

Work lamp switch control the two work lamps in the ceiling of the cab to be lit up or off simultaneously.

Note: *Do not turn "ON" the work lights when traveling on public roads.*

Fig. 23

6. Front lamp switch

This switch is the Main Switch to control front lamp to be lit up or off.

The “ON” and “OFF” conditions of the front lamp including low beam and high beam are control by

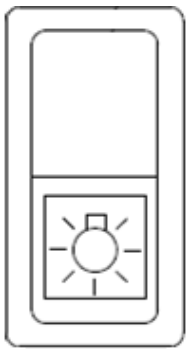

Fig. 24

this front lamp switch, and when you turn off this switch the front lamp including low beam and high beam is not available.

The state of the front lamp switch in the picture is “OFF”, and both low beam and high beam are not available.

Fig. 25

Only when you turn on the front lamp switch can you get the state you want——low beam high beam by operating the level noted in Fig 26.

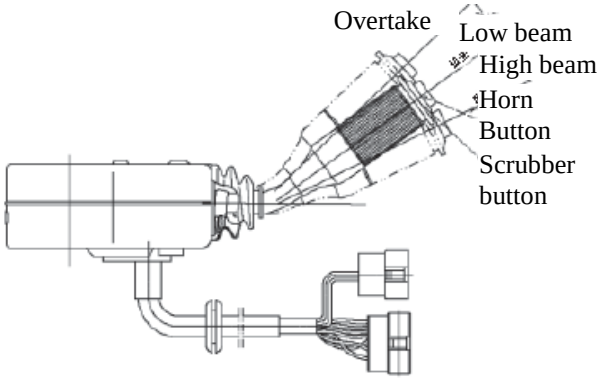

Fig. 26

NOTE!

Before driving, check all braking lamps, steering lamps, small lamps for damage or fault. If any, please repair and then begin driving.

* Monitoring instrument and horn switch

Most of monitoring instrument and meters and indicators are integrated in the instrument ass`y below the steering wheel. The Instrument include: totaling to 8 meters for cooling water temperature, gearbox oil level, timer, braking air pressure, engine oil pressure, torque converter oil temperature, power supply voltage; the indicators include: steering indicator, charging fault indicator, high beam indicator, stopping (parking) braking indicator etc.. In addition, there is LP alarm device in the empty paper box on the left side of the seat.

MONITORING SYSTEM

Most of monitoring instrument and meters and indicators are integrated in the Instrument Assy below the steering wheel. The Instrument include: totaling to 10 meters for tachometer, cooling water temperature, gearbox oil level, timer, braking air pressure, engine oil pressure, torque converter oil temperature, power supply voltage, speedometer, odometer; the indicators include: steering indicator, charging fault indicator, high beam indicator, stopping (parking) braking indicator, the warning indicator for Brake low pressure, the warning indicator for transmission oil pressure, Buzzer voice conversion button etc..

Instrument Panel

Fig. 27

1. Monitoring Instrument

When the pointers of various monitoring instrument(except timepiece)are within green zones, this means that this monitoring item is now in the normal range, and the loader can normally work;; on the contrary, if the indicated positions are not within the green zones, you must confirm the states for this monitoring item and adopt corresponding measures to correct. You can not enter the normal working conditions until the indication is normal.

2. Indicating lamp

When the left steering lamp or right steering lamp is switched on, the corresponding left steering or right steering indicators shall be lit up;

When the high beam lamp is switched on, the corresponding high beam indicators shall be lit up;

When the loader is in stopping (parking) braking state, the parking braking indicators shall be lit up;

When the ignition switch is rotated to “ON”, the charging fault indicator is lit up before the starting of engine; the charging fault indicator is OFF after the starting of engine.

3. Detailed descriptions for Monitoring instrument and Indicating lamp

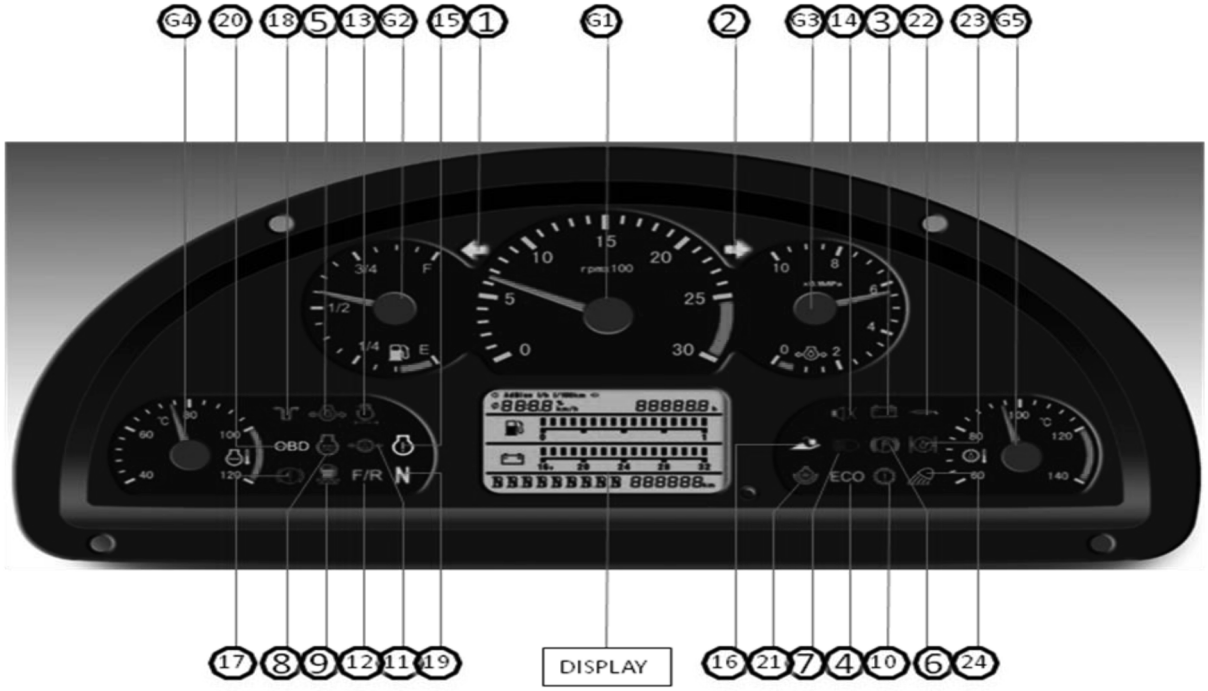

Fig. 28

Gauges, Warning and Indicator Lights

Reference Number	Description
G1	Tachometer
G2	Fuel Gauge
G3	Engine oil pressure Gauge
G4	Engine coolant temperature Gauge
G5	TM oil temperature Gauge
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 separator light

Reference Number	Description
10	TM warning light
11	TM oil pressure warning light
12	F/R selector indicator light
13	Air cleaner clogger warning light
14	Sound alarm block light
15	Engine warning light
16	Pilot unlock indicator
17	Brake air pressure warning light
18	Emergency steering indicator
19	N indicator
20	OBD warning light
21	Reverse fan indicator light
22	Centralization lubrication indicator light
23	Axle warning light
24	Working lamp light

G1. Tachometer

This meter displays engine speed in revolutions per minute.

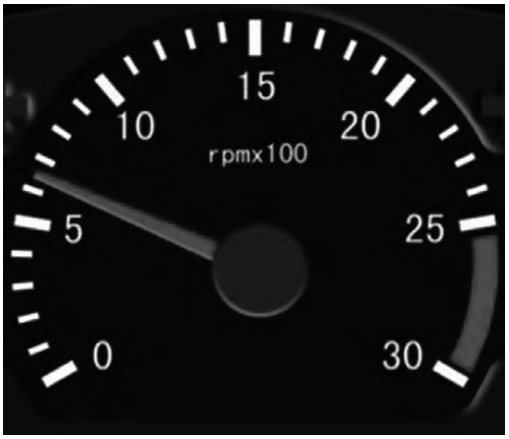

Fig 29

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 30

G3.Engine oil pressure Gauge

The meter displays the engine oil pressure.

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

Fig 31

G4. Engine Coolant Temperature Gauge

This gauge displays temperature of engine coolant.

Note: *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.

Fig 32

G5. Transmission Oil Temperature Gauge

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

Note: *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.*

Fig 33

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.*

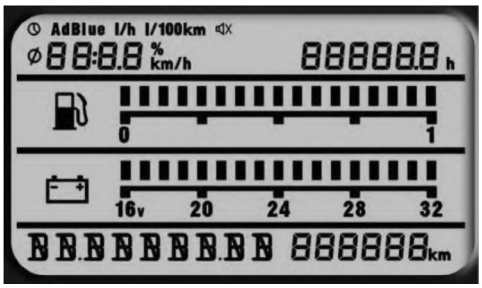

Fig 34

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 35

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”.

Fig 36

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”.

Fig 37

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.

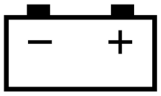

Fig 38

4. ECO indicator

no used

Fig 39

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.

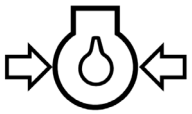

Fig 40

6. Parking Brake Indicator Light

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

Note: *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.

Fig 41

7. High Beam Indicator Light

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

Fig 42

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 43

9. Water Separator Light

This symbol indicates when the water is full in the fuel prefilter.
When this symbol appears drain the water from the fuel prefilter as soon as possible.
NOT USED

Fig 44

10. TM warning light

NOT USED

Fig 45

11. TM oil pressure warning light

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

Fig 46

12. F/R indicator light

NOT USED

Fig 47

13. Air Cleaner Clogged Warning Light

NOT USED

Fig 48

14. Sound alarm block light

when the buzzer is blocked,the indicator lights.

Fig 49

15. Engine Warning Light

If a defect is present in the engine system, and it is recognized by the ECU and cause a malfunction in operation, it can be displayed with the engine warning light to indicate a warning to the operator.
NOT USED

Fig 50

16. Pilot unlock indicator light

when the pilot lock is released,the indicator turn on.

Fig 51

17. Brake air pressure warning light

when the air pressure lower than normal value,the warning light turn on.

Note: *Never operate or travel machine when this light is "ON" or when alarm is sounding. Always investigate cause of the drop in brake air pressure, and repair problem before operating or traveling machine.*

Fig 52

18. Emergency Steering Indicator Light

Fig 53

19. N position indicator light

when the shift lever is on N position, the indicator light turns on.

NOT USED

Fig 54

20. OBD indicator light

NOT USED

Fig 55

21. Reverse fan indicator light

NOT USED

Fig 56

22. Centralization lubrication indicator light

NOT USED

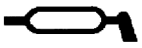

Fig 57

23. Axle warning light

NOT USED

Fig 58

24. Working lamp indicator light

NOT USED

Fig 59

INSTUMENT PANEL

1. Timepiece

It is used to indicate the working time of the machine, in hours. The working scope of the timepiece is: 0 - 9999.99 hours. When the engine is started, the timing begins.

2. Horn switch

There are two horn switches in this machine: “A” at the center of steering wheel and “B” at the end of combo handle; the functions of both switches are the same. Switching on any horn switch of them will blare.

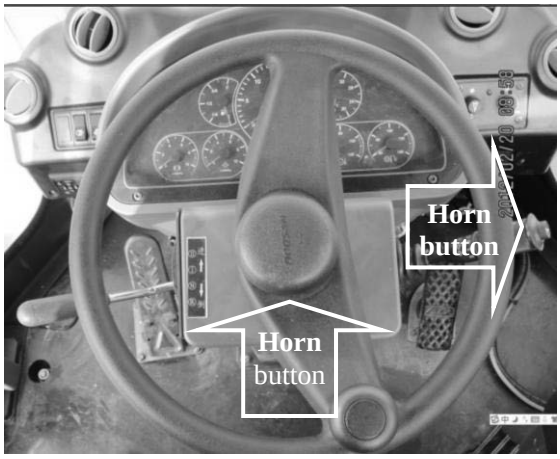

Fig. 60

There are three horn switches equipped for the single pilot handle in this machine. “C” on left side of the single pilot lever; the functions of these three switches are the same. The driver can decide to use which switch based on his operation customs.

Fig. 61

A/C system switch

1. Refrigeration

   A. Close the heater water valve;

   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

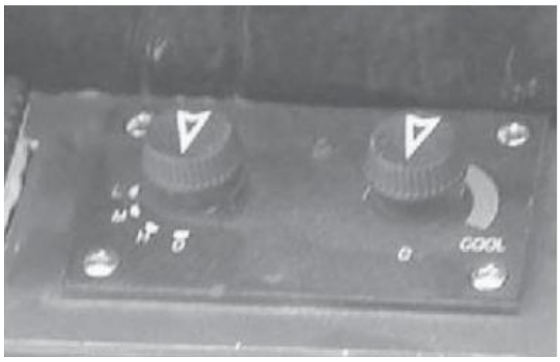

Fig. 62

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

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

Fig. 63

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!!!

Audio system

Audio system (optional): Audio system is located in the cab, including multimedia, speaker, and antenna. The multimedia speaker has many functions such as digital radio, USB / SD / MMC, MP3 / WMA, clock, adjustable volume.

Fig. 64

1. Configuration

   Digital radio, USB / SD / MMC, MP3 Player

2. Radio

   The radio has both FM and AM.

   6channels can be stored respectively for FM1, FM2, FM3, AM1, AM2 and AM3, and they can be memorized after power off.

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

   24-hour clock. The mobile phone can be charged through USB port (cable is needed)

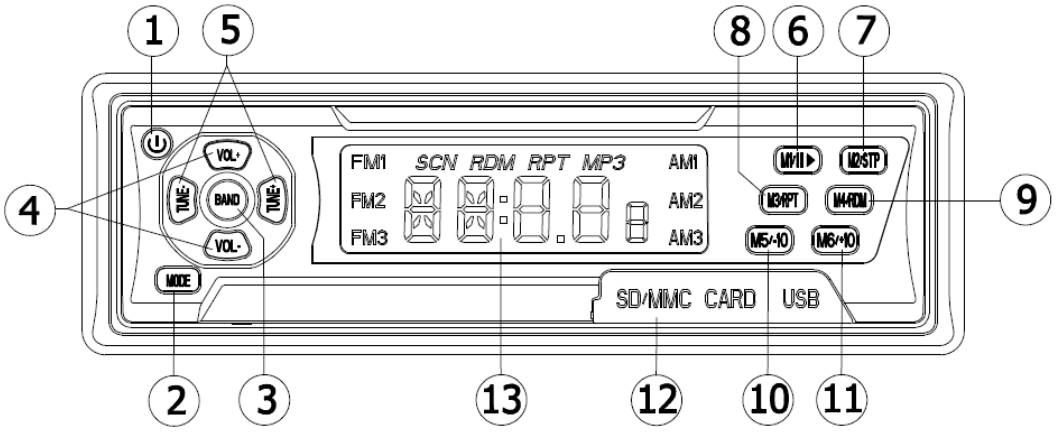

Fig. 65

Reference Number	Description
1	POWER
2	MODE Select Mode/Set time
3	BAND Select Band/Save Auto Searched Channel
4	VOL+/VOL-
5	TUNE+/TUNE- Auto Select Channel Last/Next song, Time set.
6	M1/ ⏯ Store Channel/Pause
7	M2/STP Store Channel/STOP

Reference Number	Description
8	M3/RPT Store Channel/REPEAT
9	M4/RDM Store Channel/RANDOM
10	M5/-10 Store Channel/Next 10 Songs
11	M6/+10 Store 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/⏯ : Pause MP3

   B. M2/STP : Stop playing

      Push M1/⏯ 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.*

Wiper and scrubber

This machine is equipped with wiper for front window. The control switch is located handle-type combo-switch below the steering wheel.

1. Front wiper switch

   Front window wiper switch has three positions: STOP, LOW SPEED and HIGH SPEED. The wiper can automatically reset when the wiper in STOP state.

2. Scrubber switch

   Push scrubber switch, the scrubber will begin operation to sprinkle the cleaning solution onto window glass. The scrubber switch will automatically reset and the scrubber will stop sprinkling after you release your hand. The scrubber pot is located at the rear of driver seat

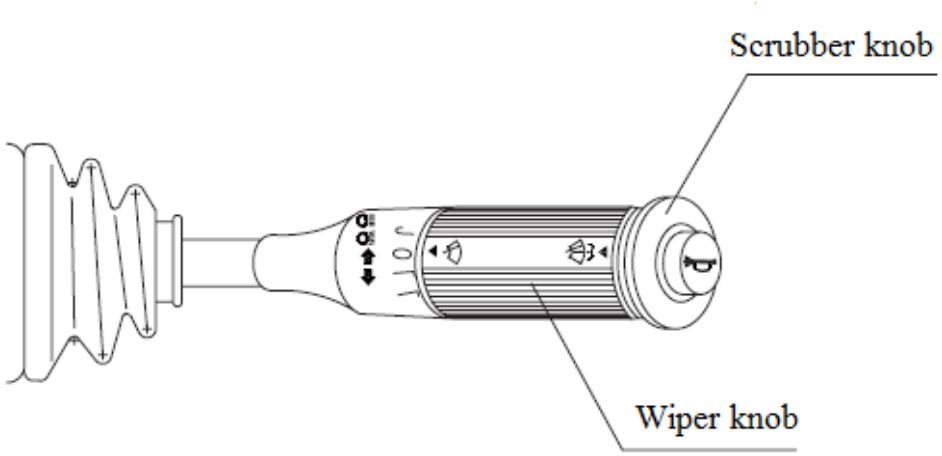

Fig. 66

WARNING!

Frequently check whether the cleaning solution in the sprinkler pot is exhausted to prevent the sight line being obstructed due to the window which could not be cleaned by the scrubber.

When the ambient temperature is lower than 0 ℃, it is necessary to use anti-freeze cleaning solution, otherwise the sprinkler will be iced or even be frozen and which will result in its failure

.

Reversing auto alarm system

Reversing alarm device is located by side of the lift cylinder of the engine cover (Fig.67). When you operate the gearshift handle to back the vehicle, the reversing alarm device will automatically hoot. Lifting device for engine hood

The rising and dropping of the integrated engine hood of this machine is controlled by hand-operated cylinder and cylinder mechanism which is installed in the right battery box of the machine. The action of the lifting device is realized by using the attached handle, and the rising and dropping of the engine hood through the switching of the reversing valve on the hand-operated pump

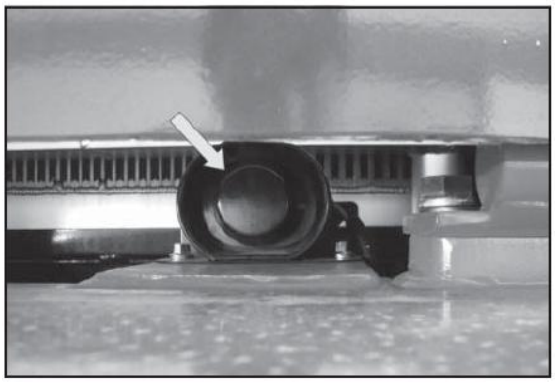

Fig. 67

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.68). 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.

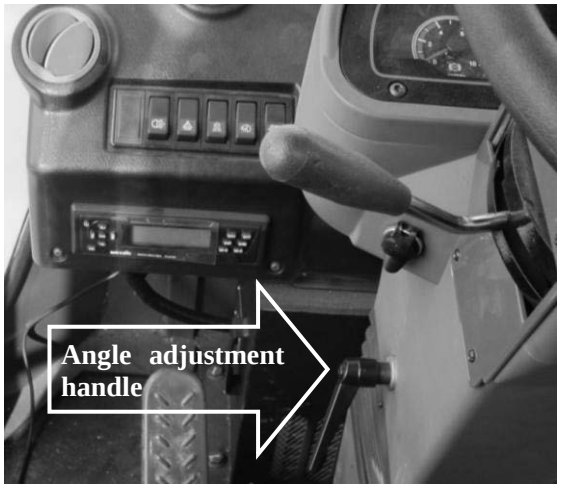

Fig. 68

Adjustment of driver 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.

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

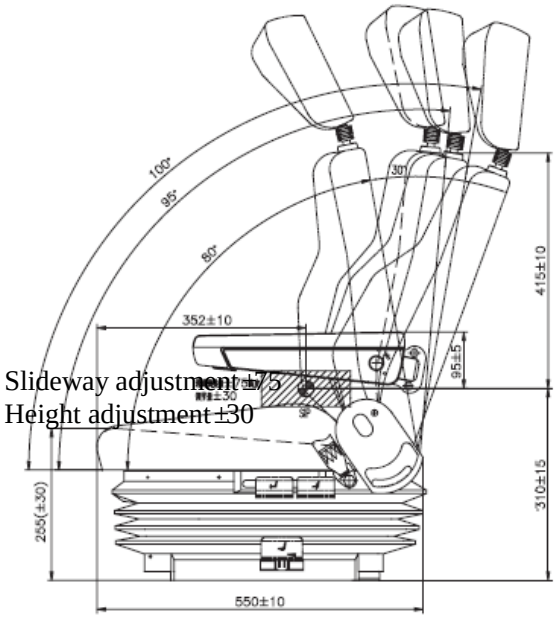

Fig. 69

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 º.

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

Usage of seat belt

The driver seat of this machine is equipped with seat belt. The driver shall tie the seat belt when operating the machine. Check the wear and security of the seat belt before using it. Replace it if necessary.

Adjust the length of the seat belt before using to ensure the seat belt can play the role of safety guarantee and have certain flexibility. You can adjust the length of the seat belt by changing the spring bolt position on the seat belt. The locking device of the seat belt is located at rear right side of the seat. Insert the spring bolt into the opening of the locking device, the locking device will clamp the spring bolt. There are two Red buttons by side of the opening of the locking device. Push this red button, and the spring bolt will spring out from the locking device. Before using seat belt, please check whether the locking device of the seat belt can normally be locked or opened.

Power socket

The output voltage of the power supply socket (Fig.68) is 24V, which can supply power for the mobile phone, car MP3 and other electrical parts

Fig. 70

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. 71

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 rotary reducer gear 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 driving speed reducer 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 and Ⅱ Reverse 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.*

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.

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.

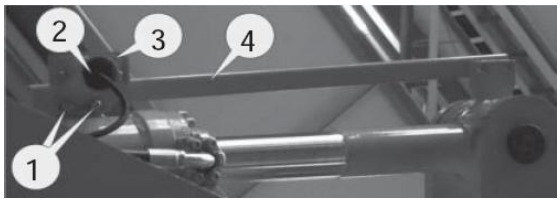

Fig. 1

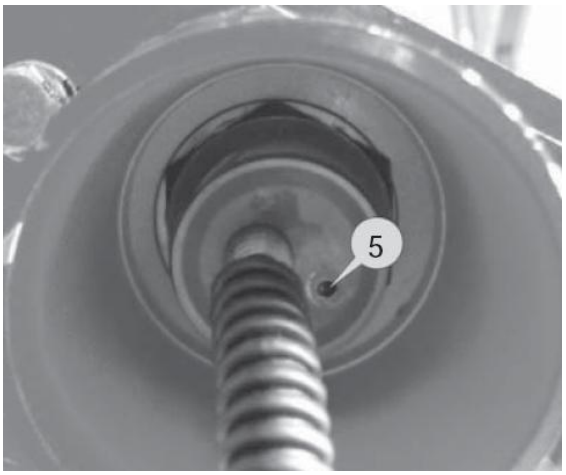

Fig. 2

Adjust the lifting limit device for the arm

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.

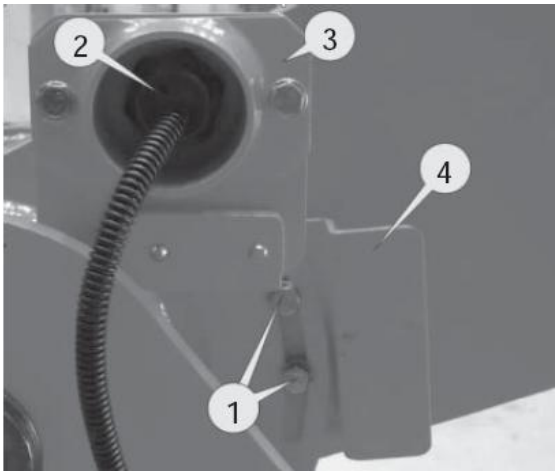

Fig. 3

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.4).
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.*

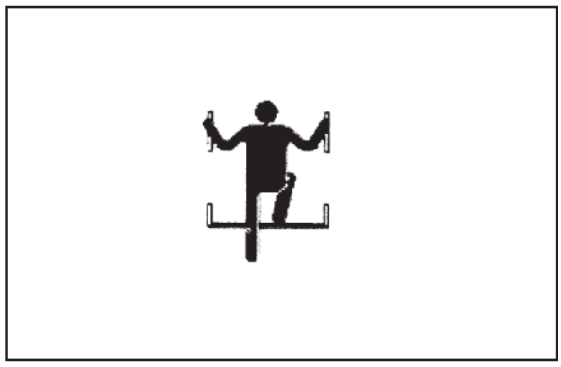

Fig. 4

Fig. 5

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.

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.*

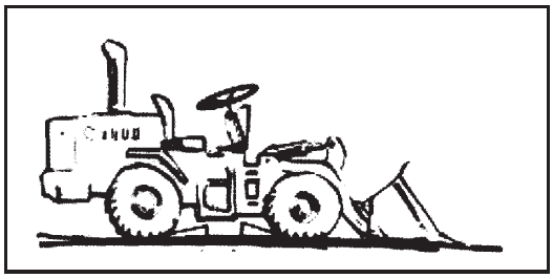

Fig. 6

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.

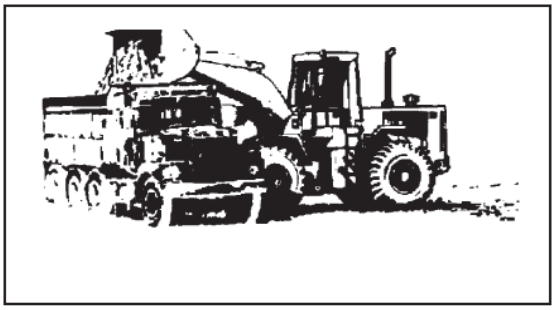

Fig. 7

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

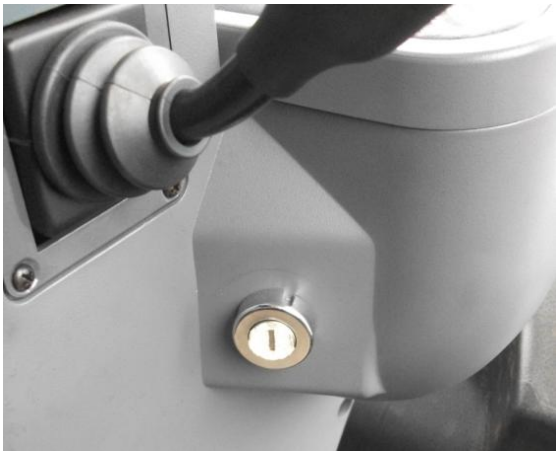

Fig. 8

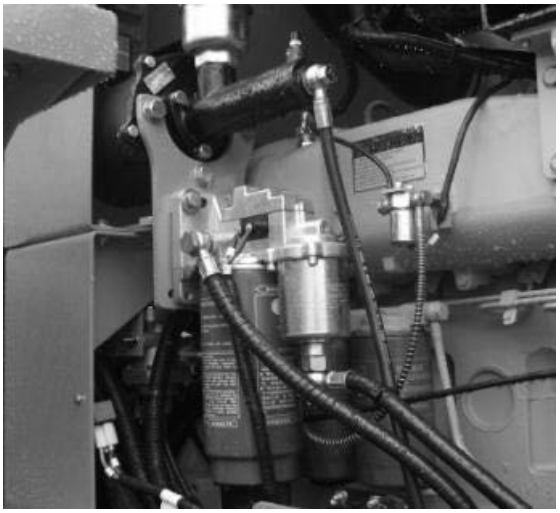

Fig. 9

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

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.

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.

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:

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)*

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.

Note that these numbers and their positions are very important to the maintenance at any times during Warranty period.

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. 2

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.

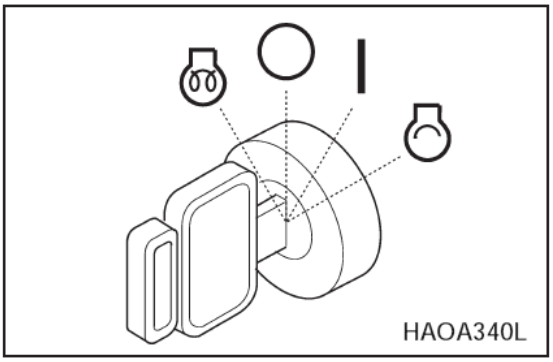

Fig. 3

3. Switch off the engine and pull off the key
4. Put the control lever at middle position

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
Torque converter oil	Engine Oil: 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

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)	19 liters
	Cooling system	42 liters
Fuel tank		300 liters
Hydraulic oil	Oil level	187 liters
	System	245 liters
Gear box		49 liters
Driving axle	Front driving mechanism:	17 liters
	Front housing reduction gear	5 liters(single side)
	Rear differential mechanism:	17 liters
	Rear hub reduction gear	5 liters(single side)

LUBRICATION OIL AND MAINTENANCE CHART

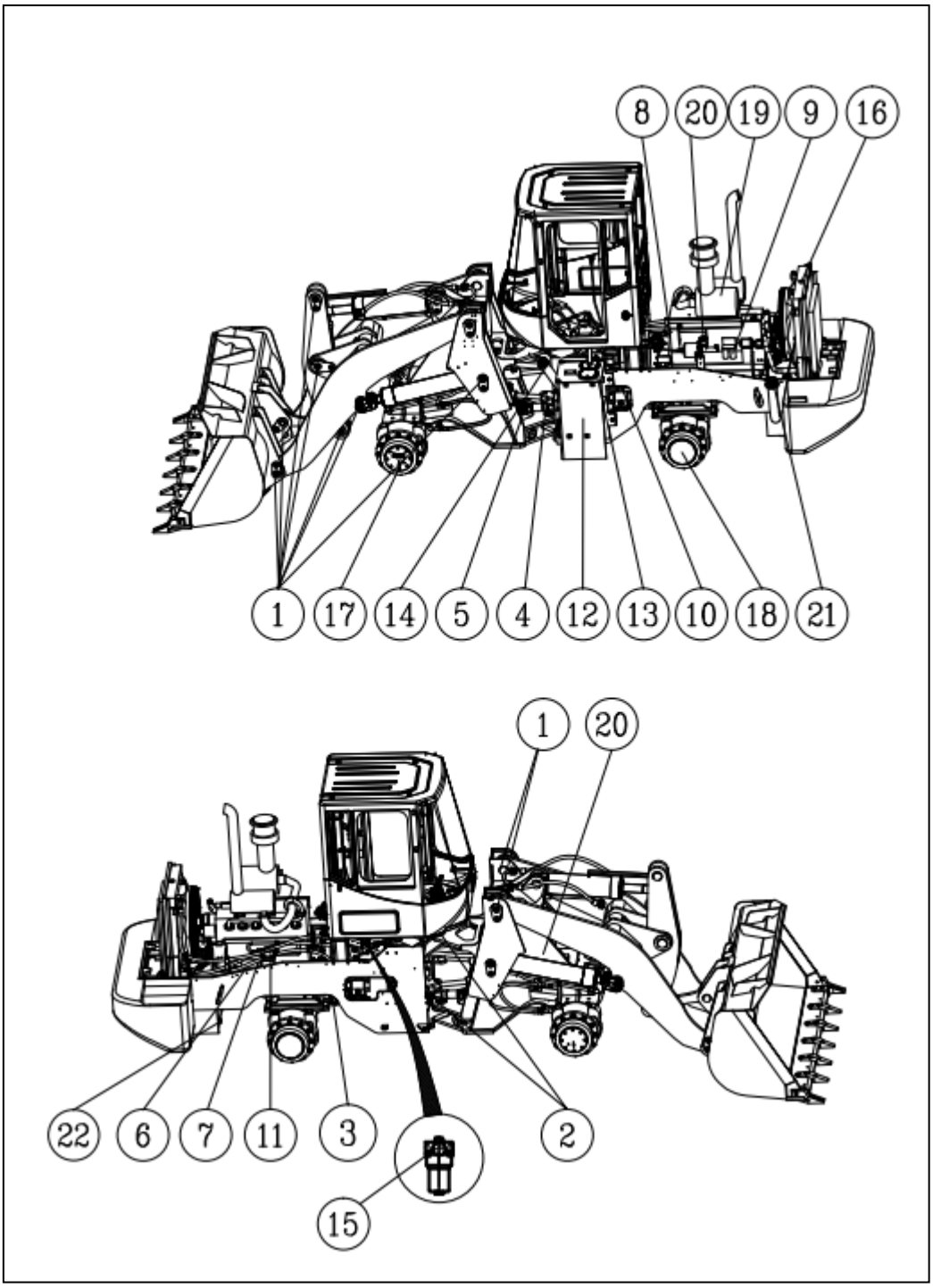

Fig. 4

No.	Items To Check	Service	Qty.	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	10	V						
6	Engine Oil	Engine Oil (SAE15W40)	19L	V	F		●			
7	Engine Oil Filter	Cartridge	2		F		●			
8	Fuel Pre-Filter	Cartridge	1					●		
9	Fuel Filter	Cartridge	2					●		
10	Transmission	Engine Oil (SAE15W40)	49L	V		F		●		
11	Transmission Filter	Strainer(inner)	1					C		
		Element(outer)	1			F		●		
12	Hydraulic Oil Tank	Hyd. Oil ISO#46	245L	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	42L	V						●
17	Front Axle	Gear Oil	27L	V		F			●	
18	Rear Axle	Gear Oil	27L	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	Engine Oil, SAE15W40
●: 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.	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 oil and transmission oil level.
- Check hydraulic oil level.
- Lighting and instrument
- Check tire for damage and wear patterns.
- Gunning grease into drive shaft.
- Drain water from air reservoir each day.
- Gunning grease into front/rear frame articulated point, rear axle swinging rack, intermediate bearing and other bearings.

50 hours / weekly maintenance

- Tighten the connecting bolt for front/rear drive shaft.
- Check oil level in brake pump.
- Clean the outer element of the air cleaner.
- On first 50th hours working day, change engine oil and the filter of engine oil. From then on, repeat this operation every 250 hours.

100 hours / half-monthly maintenance

- Clean engine cylinder head and torque converter cooling device.
- Check battery liquid level, and coat a thin layer of vase line.
- On first 100th hours working day, change gearbox oil filter and oil as well as torque converter oil, radiator oil. From then on, repeat this operation every 500 hours.
- 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 engine fan belt, compressor belt and generator belt for loose or damage.
- Check and adjust service braking and emergency braking.
- On the first 250th hours working day, change the oil return filter and the pilot filter. From then on, repeat this operation every 1,000 hours.

500 hours / quarterly maintenance

- Tighten the connecting bolt between front/rear axle and frame.
- Replace engine diesel oil filters
- Check the engine valve clearance.
- Clean the oil filling and oil sucking oil filtration screen of fuel tank.
- Check and clean the seal components of the brake pump and replace the brake oil.

  *When replace the brake oil, the air must be exhausted from the brake system.

Every 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 pilot filter element of the hydraulic oil tank.

Every 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.
- Clean and check seal and spring of brake pump, replace brake oil and check the braking flexibility.
- Check the tightness of distribution valve and working cylinder by measuring the natural sediment.
- Check flexibility of the steering system.

ELECTICAL SYSTEM

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

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.

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.5)

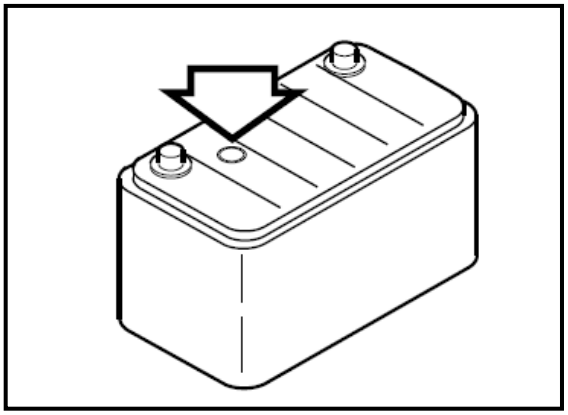

Fig. 5

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.(Figure 6)

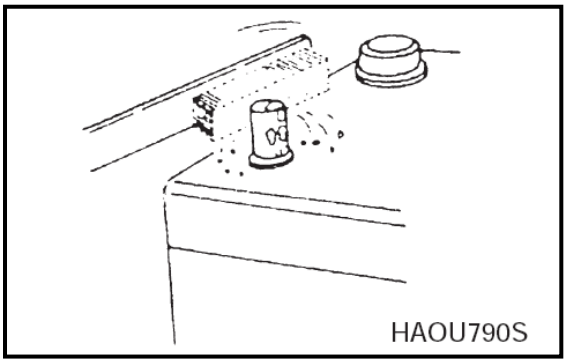

Fig. 6

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

BUCKET

Replace O-ring seal for the bucket

WARNING!
Wear safety helmet, gloves and goggles when you replace pins because metal objects may fly off.

1. Check the O-ring seal for the bucket, and replace it if it is worn or damaged

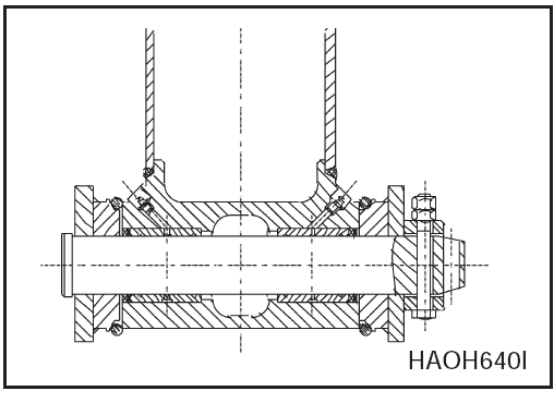

Fig. 7

2. Move O-ring seal (1, Fig.8) onto bushing (2) , then , remove the bucket pin (3) and extract the bucket connecting rod(4) .

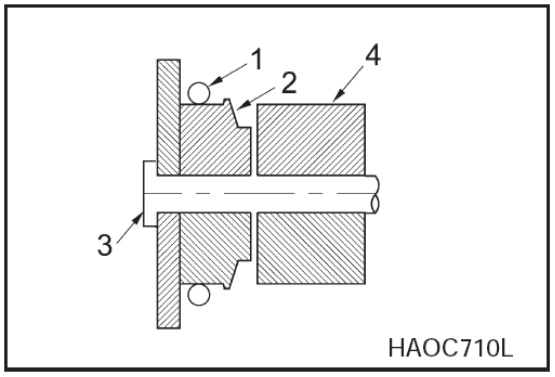

Fig.8

3. Remove old O-ring seal and install new O-ring seal (1, Fig. 10) onto bushing (2). Confirm that the O-ring seal on connecting rod cover (4) and bucket bushing has been thoroughly cleared.
4. Align the bucket connecting rod cover and the bucket link pin hole, and install bucket pin (3, Fig. 8).
5. Install new O-ring seal 1(1, Fig. 9) into O-ring seal.

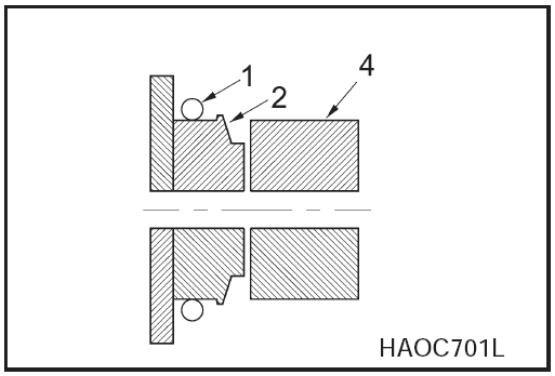

Fig.9

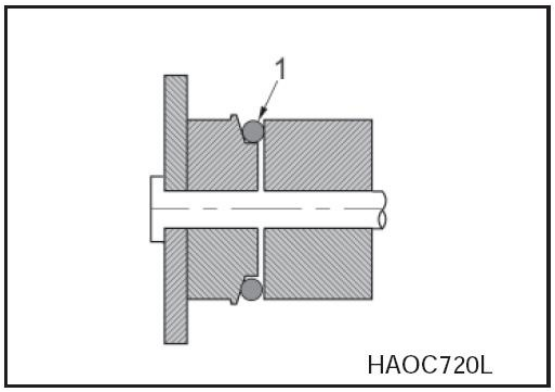

Fig.10

ADD SHIM TO BUCKET

Install a new bucket

1. If you want to install new bucket, you should measure the dimension of between internal lugs of the bucket and the dimension of bucket link width.
2. Subtract one dimension from the other, and you will get the dimension of the shim you want to add on both sides. Add the sheet before assembling.

WARNING!

When you check the gap at bucket connection, the bucket is in free status. Otherwise, you should lower down the bucket to the ground and use supporting block to fix the bucket. Stop the engine, lock the safety lever, hang the warning sign and prevent the bucket from moving.

The method with which the shim is added when the bucket is installed

1. When the bucket is being connected, the bucket will be retracted and the bucket link will extend outwards to lower arm to make the bucket teeth several centimeters away from the ground. At such position, it is easy to measure the dimension.
2. After the O-ring seal is installed, you should push the bucket to one side to check the gap between the other side of the bucket and bucket link. The total gap between the bucket internal lug and the bush end face (Y, Fig.11) shall be 1MM. If the fit is too tight (less than 1 MM), it will aggravate the wear, and if the fit is too loose, it will generate too much noise and the action will be slack.
3. Push the bucket to other side to check the above gap again.
4. When it is needed to adjust, you should remove the back cap(1，Fig.11) and bolt (2) from the pin (3) , remove or add shim (4) . The same quantity of shims shall be used on both sides. Install bolt (2) and nut (1). A gap of 1-2MM shall be retained between the nut and the bush at the point “X”.

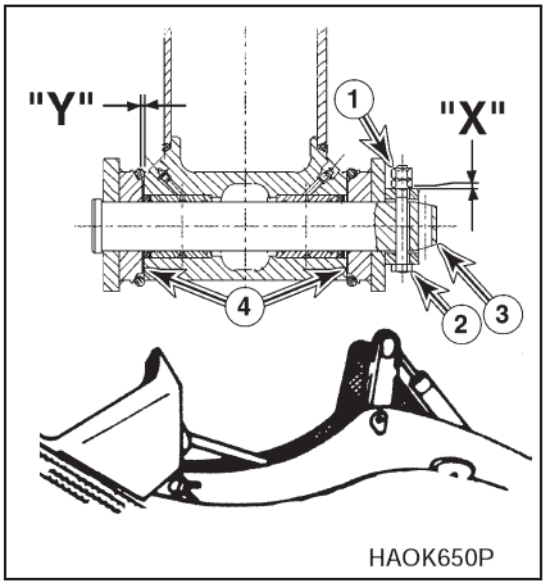

Fig.11

TIRES

The proper charging of the tire (2. Fig 12) is the important factor to determine tire life and performance. If tire is inadequately charged (1. Fig 12), it will not support the equipment, and will be worn quickly; if tire is excessively charged (3. Fig 12), the friction is less and it is easily to be pierced. Use pressure gauge to measure the Tire pressure before operation of the equipment, refer to following table:

Determine the pressure of front/rear Tires when the machine is running. Check the Tire for damage and for the insertion of any objects.

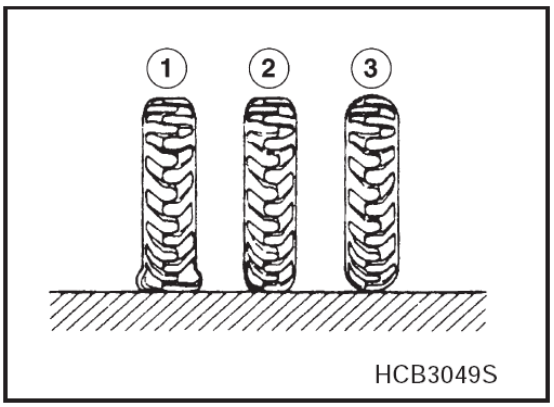

Fig.12

Recommended Air Pressure

Tire	Operating pressure		Remarks
	Front Tires	Rear Tires	
Bias Ply Tire (Tube Tire)	3.8kg/cm2(3.8bar(54psi))	3.4kg/cm2(3.4bar(48psi))	Standard
Radial Ply Tire (Tubeless Tire)	4.3kg/cm2(4.3bar(62psi))	3.1kg/cm2(3.1bar(44psi))	

Check Tires for damage

WARNING!

Improper maintenance or replacement of Tires may cause explosion to cause serious injury or death.

The maintenance and replacement of Tires may only be carried out by trained person who is properly equipped.

For maintenance of Tires, please contact with the nearest Tires agent or Tires manufacturer.

WARNING!

The overheating of the Tire will cause explosion and serious injury or death.

Overheated tires may explode causing death or serious injury.

If an overheated tire is suspected, keep away at least 15m (50 ft).

Stay away until tire and rim cools down.

In case of following situation, you should replace with new Tires for the sake of safety, and contact with the nearest Tire agent or manufacturer.

- Tire bead metal wires are broken, damaged or bent, or the Tire is deformed.
- The wheel carrier is excessively worn, with an exposure of more than 1/4.
- The wear of the Tire carrier of the tread exceeds 1/3.
- The inner tube is separated.
- When the radius is worn to the wheel carrier.
- The Tire is deformed or damaged.

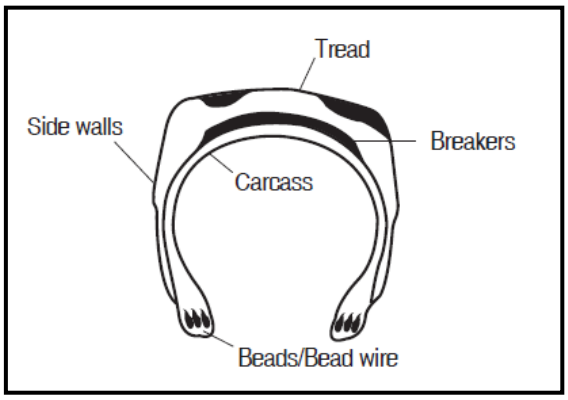

Fig.13

Replacement of tire

WARNING

If a wheel and tire must be removed from machine and replaced, or if a tire must be replaced on wheel, use only experienced and trained service personnel. A tire rim could be propelled off wheel and cause death or serious injury. See Figure 14.

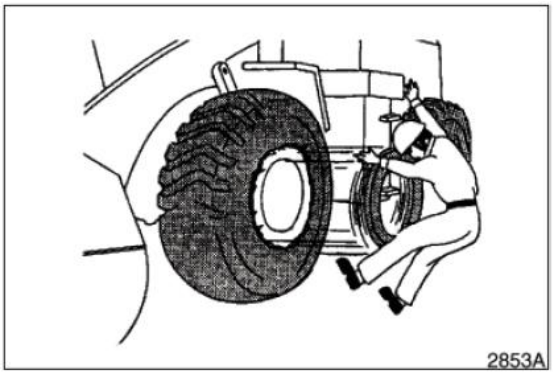

Fig.14

Note!

1. **Before replacement of Tire, pull up and lock the hand brake, hang the warning label on the control lever to prevent others to operate the equipment.**
2. **Lower the external support (if any) down to ground to fix the machine.**
3. **When you use wheel wedges, ensure that there is no other Tire is being replaced.**

When you install the Tires, pay attention to the rotation direction marked on the Tire. If there is no such marks, check the threads to make it orient towards the front of the machine.

Note: *Please use standard Tires. Using uncommissioned Tires may cause accidental wear to increase the load for the end drive.*

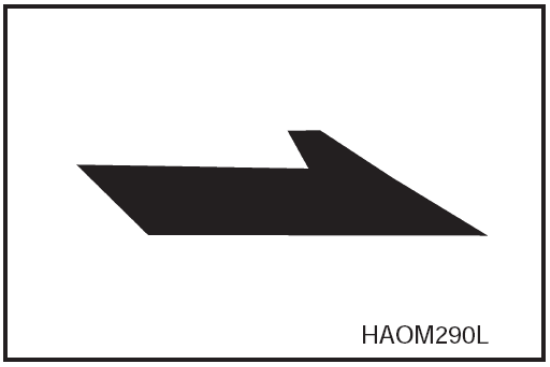

Fig.15

1. Park the equipment on the flat ground.
2. Use a jack which can support the weight of the equipment to jack-up the equipment, making an adequate clearance between the Tires and the ground, and put proper strut under the support to sustain the equipment.
3. Lower the bucket down to the ground

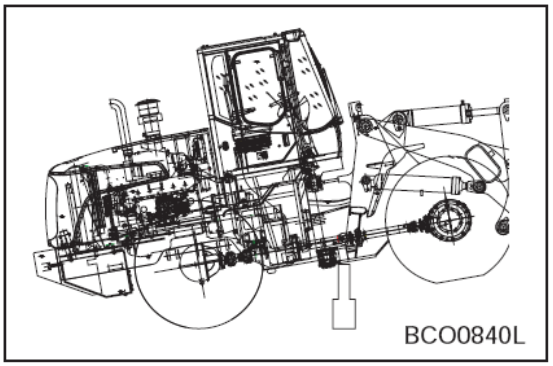

Fig.16

4. Remove the wheel nuts and tire assy from the hub (refer to Fig 17). Check the wearness of nut and replace the nut if necessary.
5. Check all components for excessive wear, and replace them if necessary.

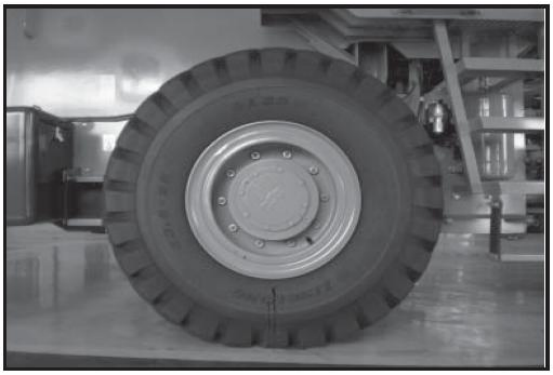

Fig.17

6. When you tighten the wheel nuts, refer to the pattern shown in Fig.18. Tighten the nuts to the specified torque (tightening torque: 600-680N.m and coat tightening glue on the mounting bolts)

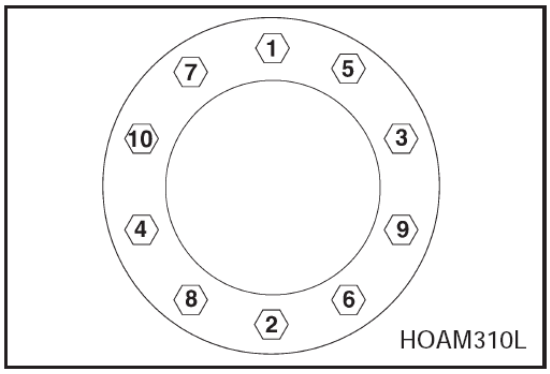

Fig.18

7. Rotate the wheels forward and backward, drive the machine to ensure the correct installation of the Tires. Re-tighten the Tire nuts with the required torque

Fig.19

INSPECTION OF BOLT AND NUT

Check all fasteners after working for 50 hours for the first time and every 250 hours from then on. If loose or loss is found, it is necessary to re-tighten or add new products. You must use torque wrench.

Clear the fasteners before tightening.

If the counter weight of the bolt is loose, please consult the agent to solve the problems.

No.	Check points		Bolt dia.	Qty.	Bolt head dimension	Torque	
						kg·m	Nm
1	The connecting bolts and nuts between engine mounting support and engines		M12	4		12	118
2	The connecting bolts and nuts between engine mounting support and main frame		M20	2		46±4.6	451±45
3	Mounting bolts for radiator		M12	4	40mm	12	118
4	Tighten the mounting bolts for hydraulic oil tank		M16	5	24mm	20~26	193~257
5	Tighten the mounting bolts for fuel tank		M20	4	30mm	55~66	540~650
6	Tighten the mounting bolts for oil pump		M12	4	35mm	8~10	78~104
7	Tighten the mounting bolts for control valve		M12	4	115mm	8~10	78~104
8	The bolts between cab mounting rubber and main rack		M16	4	64mm	20	196
9	The bolts between cab mounting rubber and cab		M10	16	30mm	6~67	59~657
10	Tighten front/rear axles		M30	8	260mm	150	1470
11	Connecting bolt and nuts for propeller shaft	Bolt	M12	16	65mm	11	107
		Nut	M12	8		11	107
12	Tire nut		M20	40		61~69	600~680
13	The connecting bolt between gearbox and main frame		M20×2 ×65	2		70±4.6	686±45

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.

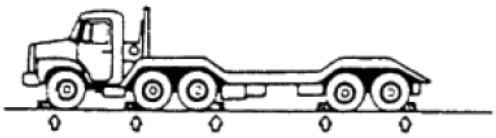

Fig.1

TRANSPORTING MACHINE

NOTE!

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

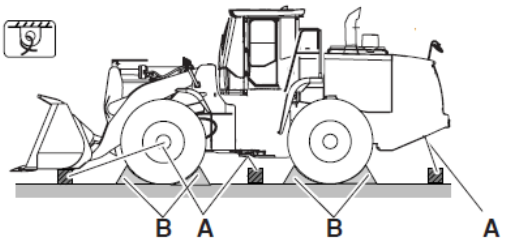

Fig.2

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.

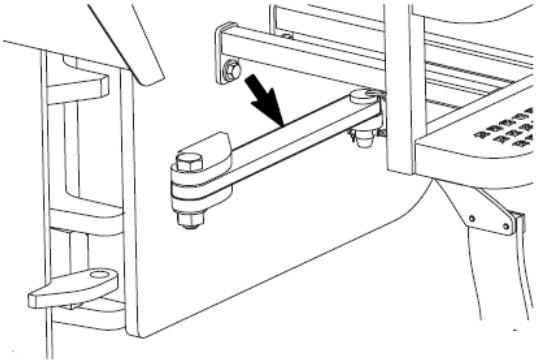

Fig.3

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.**

Tie Down (Securing)

- Block tires (B, Figure 2).
- Tie (lash) the wheel loader down using attaching points (A, Figure 2) intended for this purpose, so it cannot tip or begin to roll.

Lifting

- Lift wheel loader using intended lifting eyes (see Figure 4) and "LOCK" articulated frame lock bar.

Fig.4

Across Ramp

- First check that ramp is wide enough and has the required strength and that it will not move during loading operation

Transportation dimension

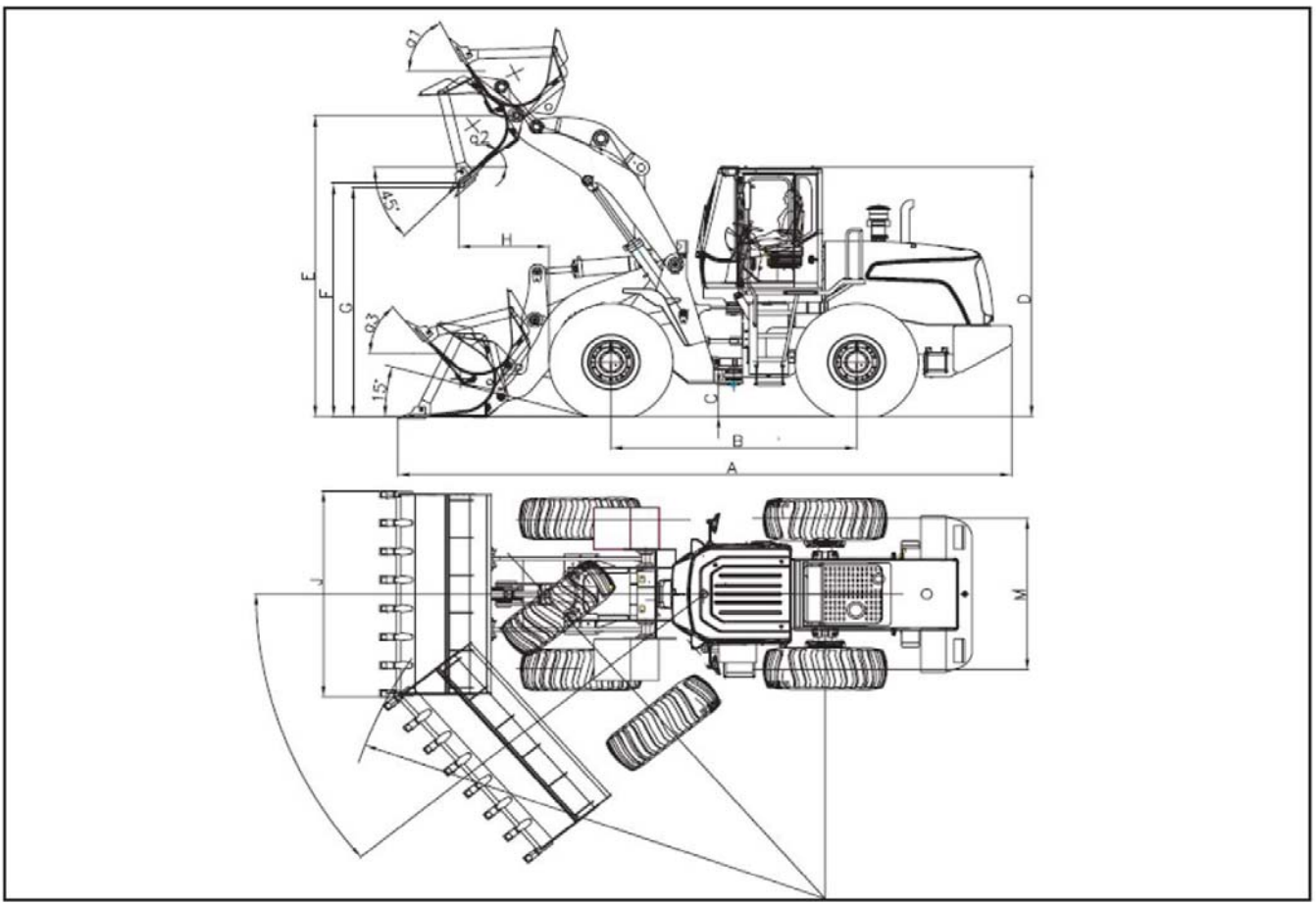

Fig.5

Basic dimension		
Sign	Description	Dimensions
A	Transportation length	8080mm
J	Transportation width	3020mm
D	Cab height	3470mm
C	Ground clearance	450mm
B	Space between front and rear Tires	3200mm

Troubles Shooting

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	Priority valve acts not sensitively	Maintain or replace priority 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.

Characteristics of faults	Cause:	Remedy
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
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

Specification

SPECIFICATION

Item			Size
Performance	Bucket capacity		2.7m^3
	Rated load		5000kg
	Lifting time of arm		≤5.9s
	Sum of three items		≤11.3s
	Highest speed at each gear	Forward Ⅱ	38km/h
		Forward I	13km/h
		Reverse I	17km/h
	Traction force		149±5kN
	Maximum digging up force		160±5kN
	Maximum gradeability		30°
	Min. bend radius	Center of Tire	5,700±50mm
		Outside of bucket	6,710±50mm
	Geometry dimension	Vehicle length(with bucket laid down the ground)	8,080±100mm
		Vehicle width(outside of wheel)	2,800±20mm
		Bucket width	2,990±10mm
		Vehicle height(top of cab)	3,450±50mm
		Axle base	3,200±20mm
		Wheel base	2,150±10mm
		Min. Distance above Ground (at articulated point)	450±10mm
		Maximum unloading height	3,180±20mm
		Maximum unloading distance	1,110±20mm
	Machine weight		16,800±200kg
	Driver seat		Over the articulation position

Item			Size
Engine.	Type		WD10G220E23 Diesel engine
	Rated rotation speed		2,000r/min
	Maximum torque		900N.m/(1,300-1,500)r/min
	Fuel consumption at rated working conditions(rig-test)		215g/kw.h
	Fuel oil		#40light diesel oil
	Fan diameter (exhaust)		
Transmission system	Hydraulic torque converter	Type	Dual turbines
		Torque ratio	4.368
		Cooling mode	Air cooling pressure circulation mode
	Gear box	Type	Planetary hydraulic gear shifting
		Shifting gear	2 gears for Forward, 1 gear for reverse
		Variable -speed oil pump (gear pump)	
		Operating pressure	1.6~1.8MPa
	Main transmission and hub reduction	Main transmission type	1st stage reduction spiral bevel gear
		Hub reduction type	Planetary reduction straight spur gear
		Reduction ratio	22.848
		Main transmission reduction ratio	4.625
		Hub reduction ratio	4.875
	Driving axle and wheel	Type	4- wheel driven
		Tire	23.5-25
		Tire air pressure	0.34～0.38Mpa
Brake system	Service braking		Single pipeline, air-poppet oil 4-wheel caliper disc brake
		Brake diameter	Φ450mm
		Braking slave cylinder	Φ70mm
		friction lining dimensions (L×W× H)	182×72×15mm
	Parking and emergency braking		Auto, manual, hand-operated pneumatic type
		Brake drum diameter	Φ305mm
		Brake band dimensions (L × W × H)	325×76×6.5mm

Item			Size
Steering system	Type		Articulation frame, full hydraulic steering system
	Steering cylinders — I.D. × stroke		2-φ90×485mm
	Steering pump		80ml/r
	System operating pressure		14MPa
	Steering angle		40º each on left and right
Working device	Arm cylinders — I.D. × stroke		2—φ165×823mm
	Bucket cylinders — I.D. × stroke		1—φ190×576mm
	Main Control valve		Pilot hydraulic manipulation type
	Main Pump		100ml/r
	System operating pressure		17MPa
	Working device		Single rocker, reversal, 6-connecting rod mechanism
	Pressure of pilot SSM		3.5MPa
Electrical system	System voltage		24V
	Battery		Two 12V120AH, in series
	Light bulb voltage		24V
	Diesel engine starting		24V, electric startup
Oil filling capacity	Fuel oil		300L
	Hydraulic oil		245L
	Crankcase		19L
	Gearbox system		49L
	Axle (differential and planetary system)	Front axle	27L
		Rear axle	27L
	Front/rear brake pump		2.8L
A/C system (Optional)	Hot air	Working medium	Diesel engine cooling water
		Heating capacity	5,000W
	Cold air	Working medium	R134a
		Refrigerating capacity	4000W
	System voltage		24V

WORKING RANGE AND DIMENSIONS

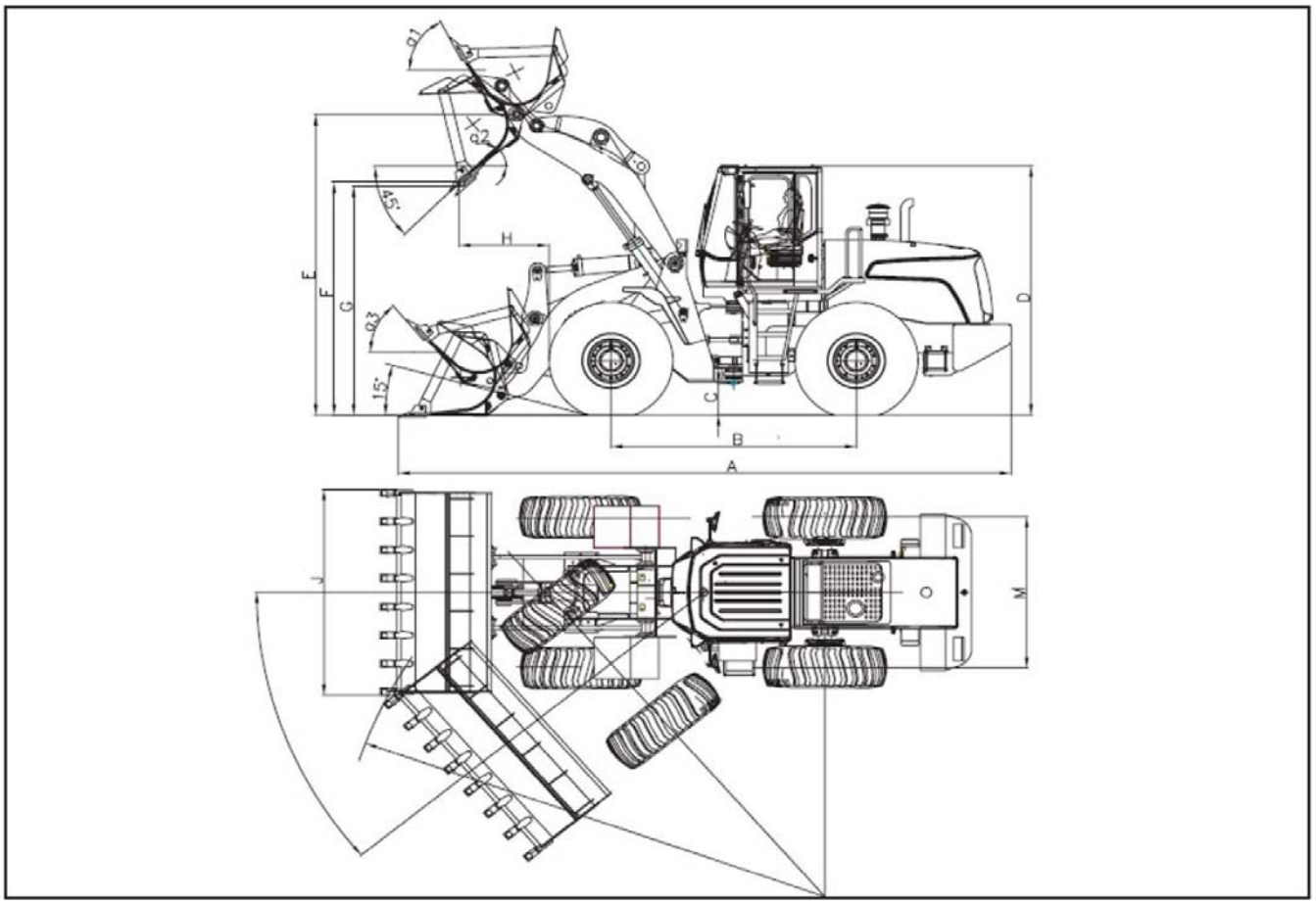

Fig.1

Integral dimension		
Sign	Description	Dimensions
A	Transportation length	8,080mm
J	Transportation width	3,020mm
D	Cab height	3,470mm
C	Ground clearance	450mm
B	Space between front and rear Tires	3,200mm

WORKING CAPACITIES

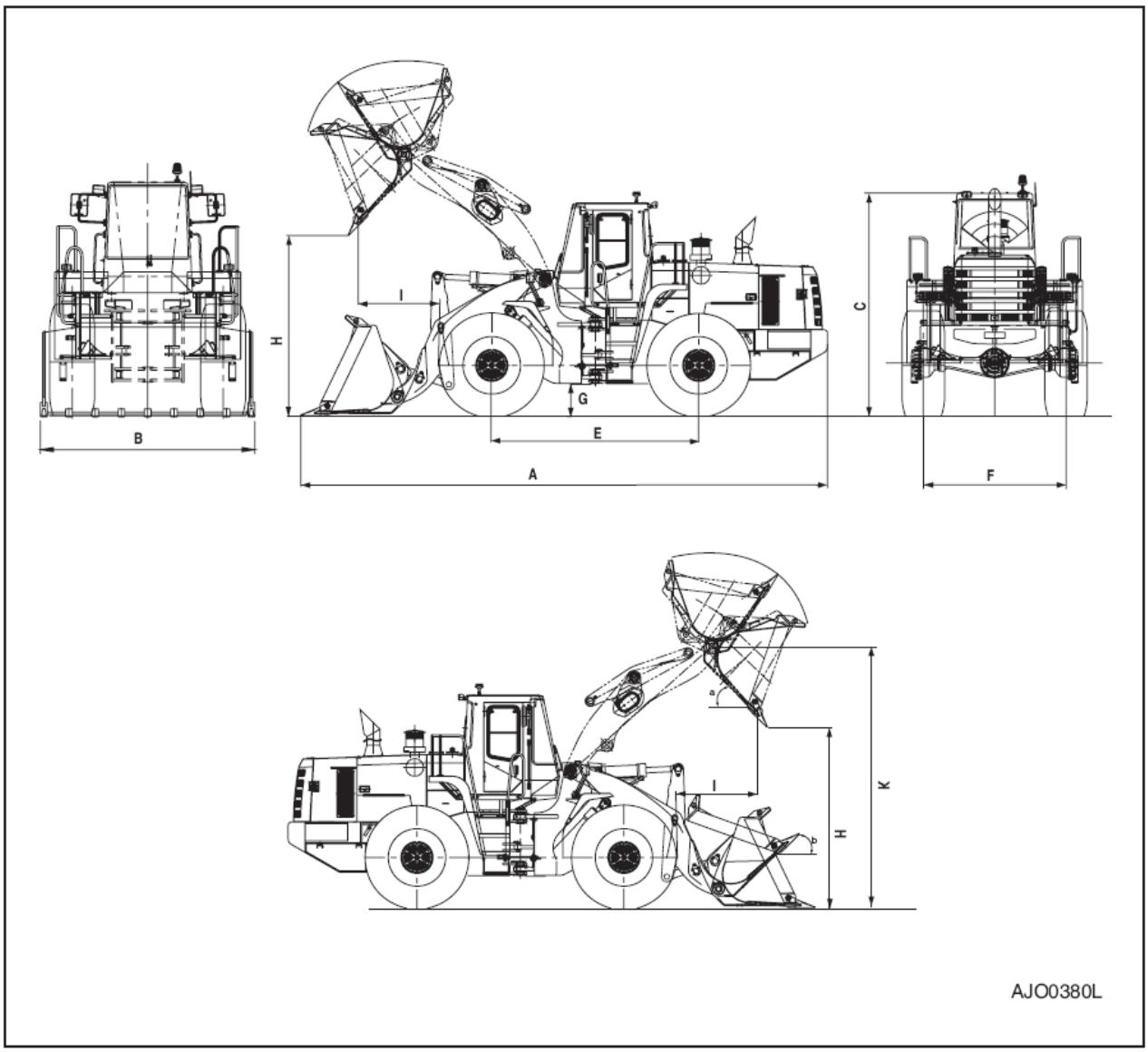

Fig.2

Integral dimension		
NO.	Description	Dimensions
A	Machine length	8,080mm
B	Machine width	3,020mm
C	Machine height	3,470mm
E	Axle base	3,200mm
F	Wheel Base	2,240mm
G	Min. Distance above Ground	450mm
H	Unloading angle(Bucket teeth)	≥2,900mm
I	Unloading distance(Main knife plate)	≥1,050mm
K	Hinged pin height at maximum lifting position	4,160mm
a	Maximum unloading angle	45°
b	Maximum tilting angle(transportation position)	50°

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	401 kg/m^3 (695 lb/yd^3)	----------	----------
Coke, blast furnace size	433 kg/m^3 (729 lb/yd^3)	----------	----------
Coke, foundry size	449 kg/m^3 (756 lb/yd^3)	----------	----------
Coal, bituminous slack, piled	801 kg/m^3 (1,350 lb/yd^3)	----------	----------
Coal, bituminous r. of m., piled	881 kg/m^3 (1,485 lb/yd^3)	----------	----------
Coal, anthracite	897 kg/m^3 (1,512 lb/yd^3)	----------	----------
Clay, DRY, in broken lumps	1,009 kg/m^3 (1,701 lb/yd^3)	----------	----------
Clay, DAMP, natural bed	----------	1,746 kg/m^3 (2,943 lb/yd^3)	----------
Cement, Portland, DRY granular	----------	1,506 kg/m^3 (2,583 lb/yd^3)	----------
Cement, Portland, DRY clinkers	----------	1,362 kg/m^3 (2,295 lb/yd^3)	----------
Dolomite chips	----------	1,522 kg/m^3 (2,565lb/yd^3)	----------
Earth, loamy, DRY, loose	----------	1,202 kg/m^3 (2,025 lb/yd^3)	----------
Earth, DRY, packed	----------	1,522 kg/m^3 (2,565 lb/yd^3)	----------
Earth, WET, muddy	----------	----------	1,762 kg/m^3 (2,970 lb/yd^3)
Gypsum, calcined, (heated, powder)	961 kg/m^3 (1,620 lb/yd^3)	----------	----------
Gypsum, crushed to 3 inch size	----------	1,522 kg/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
Gravel, DRY, packed fragments	----------	----------	1,810 kg/m^3 (3,051 lb/yd^3)
Gravel, WET, packed fragments	----------	----------	1,922 kg/m^3 (3,240 lb/yd^3)
Limestone, graded above 2	----------	1,282 kg/m^3 (2,160 lb/yd^3)	----------
Limestone, graded 1-1/2 or 2	----------	1,362 kg/m^3 (2,295 lb/yd^3)	----------
Limestone, crushed	----------	1,522 kg/m^3 (2,565 lb/yd^3)	----------
Limestone, fine	----------	----------	1,602 kg/m^3 (2,705 lb/yd^3)
Phosphate, rock	----------	1,282 kg/m^3 (2,160 lb/yd^3)	----------
Salt	929 kg/m^3 (1,566 lb/yd^3)	----------	----------
Snow, light density	529 kg/m^3 (891 lb/yd^3)	----------	----------
Sand, DRY, loose	----------	1,522 kg/m3 (2,565 lb/yd3)	----------
Sand, WET, packed	----------	----------	1,922 kg/m^3 (3,240 lb/yd^3)
Shale, broken	----------	1,362 kg/m^3 (2,295 lb/yd^3)	----------
Sulfur, broken	529 kg/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.