

Operation & Maintenance Manual

**SWE150F/SWE210F
HYDRAULIC EXCAVATOR**

Sunward Intelligent Equipment Co., Ltd

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Foreword

It is particularly important that the operator should read these instructions carefully in order to operate and maintain the excavator safely and correctly. Otherwise accidents or damage may occur.

The manual supplies safety rules and labels which have been fixed on the machine so as to provide the instructions of potential danger and the ways to avoid it.

SUNWARD cannot predict any kind of potential danger may occur in the process of operation and maintenance. Therefore, the related instructions in this manual and on the machine only concern the basic safety rules. It is the operator's duty to take necessary measures to protect safety if there is no corresponding method recommended in this manual.

The forbidden usages or operations that mentioned in this manual can not be engaged in any circumstances.

The excavator is designed according to the metric system, all the data presented are metric and only metric parts and apparatus can be used.

The manual should be regarded as the permanent part of excavator and kept at the easy reading place for consultation at any time. If it is damaged or lost, please contact SUNWARD or agents for ordering. The manual should be attached when the excavator is transferred or sold.

Use only trained, qualified and experienced operator to operate , check and maintain the machine.

The equipment covered by this manual meets the applicable technical specifications effective as of its date of issue. The manufacturer SUNWARD reserves the rights to make any modification from time to time and without prior notice to any excavator components.

Please contact SUNWARD or agents for the updated information or the information problem concerned in this manual.

Sunward Intelligent Equipment Co.,Ltd

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1 Safety rules



Warning

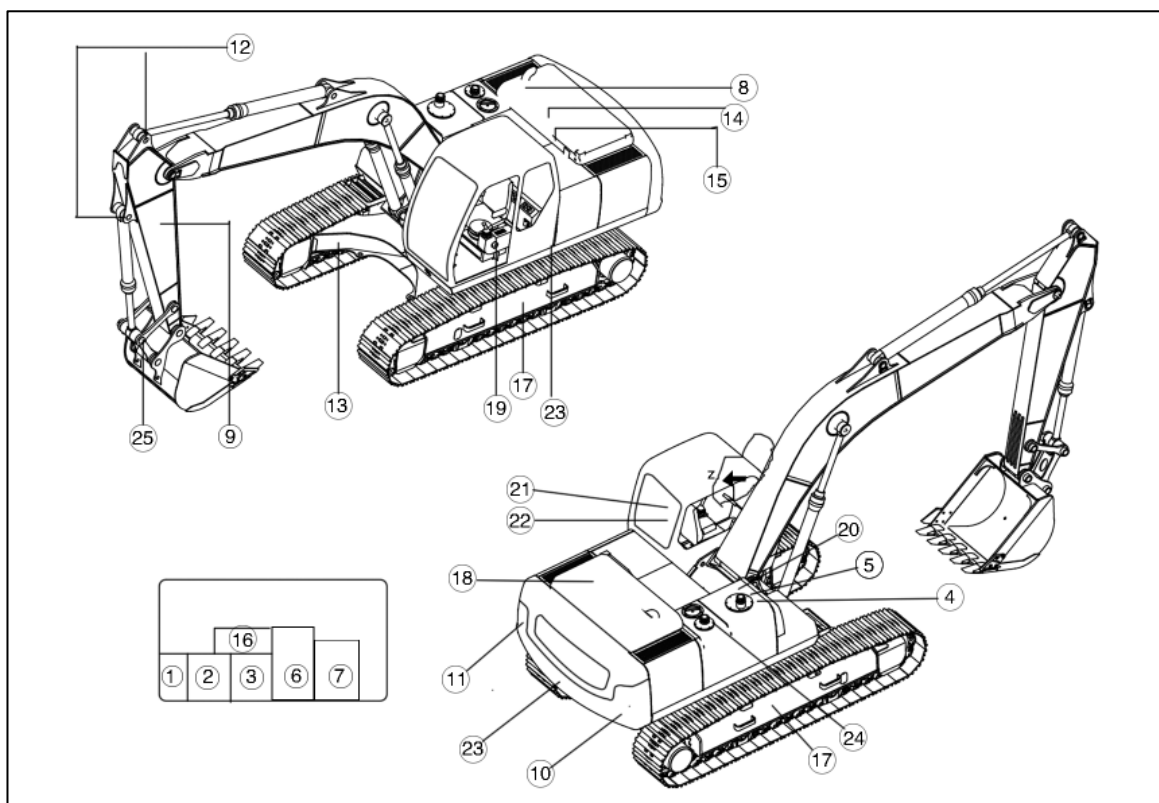
Please thoroughly read and completely understand all precautions described in this manual or safety labels. Follow all instructions when operating or servicing this machine.

§1 SAFETY RULES

1.1 Safety labels

1.1.1 Location of safety labels

- Fully understand the correct position and contents of safety labels in this machine.
- To ensure that the content of labels can be read properly, be sure that they are in right place and always keep them clean. When cleaning them, do not use solvents or gasoline. It may cause labels to peel off.
- There are also other labels in addition to warning labels. Handle these labels in the same way.
- In case the labels are damaged, lost or not legible, replace them with new ones. For details of the part number, refer to parts manual or actual label, and place an order with SUNWARD or our authorized distributors.



Actual position of safety labels in the machine

1.1.2 Safety labels instruction

(1) Precaution for operation

- Please carefully read all safety precautions written in labels and all information concerning safety, prior to operate machine.
- Maintenance frequently and replace safety label if required. In case that safety labels or manual are damaged or lost, you can place an order with our distributors. The procedure of ordering them is identical with that of the other parts and components. You must specify model of the machine when ordering.
- Use only trained and qualified personnel to operate this machine. Follow all safety precautions and instructions in this manual to keep your machine in good condition.
- Do not alter or modify machine rashly, this may impair function and effect service life or jeopardize personal safety.
- Caution: all safety information described in this manual covers only basic safety information of this machine. It's not possible to predict every circumstance which might involves potential hazards. So it's necessary to ask for instruction from your superior before attempting any operation or maintenance procedure.



(2) Precaution for operating engine

Diesel engine inspection

- Stop machine on level ground, inspect engine oil level (stop engine for longer than 15 minutes to allow engine oil to go back to the bottom), inspect dipstick to make sure oil level must be between the lines of “MIN” and “MAX”. For engine maintenance procedures, please refer to the “diesel engine maintenance manual” enclosed with the other literature of the machine.

Pre-start inspection

- Keep control lever of pilot valve in LOCK position, pilot handle and travel pull link are in normal position (neutral position), operator sit over seat.
- While switching the key to ON position, except engine hour meter and LCD module, all indicators of test system must light up. Buzzer must sound as well. Self-test is finished in 2 seconds to indicate test system is or is not properly functioning.

Start the engine

- Keep control lever of pilot valve at LOCK position.
- Switch key to ON position.
- Sound horn to alert the persons around.
- Turn the key to the right; hold it in START position until engine runs. Then release the key, switch will automatically. Return to ON position.



Caution

- ◆ Do not operate motor for longer than 5 seconds ever time to avoid damage to machine. In case of failure to start engine, switch the key back to OFF position, wait 2 minutes before a new attempt. Incorrect start may damage to starter.

Engine daily inspection

1. Before starting engine, please check engine oil gauge, the oil level between H and L is correct.
2. Before starting engine, please check coolant level, and fill up if necessary. The coolant must be clean.
For -32° C or higher, choose the compound of 50% vinyl glycol and 50% water as coolant.
For -32~-51° C, choose the compound of 60% vinyl glycol and 40% water as coolant.
3. Please choose diesel oil as follows:
0# diesel oil for 4° C or higher
-10# diesel oil for -5° C or higher.
-20# diesel oil for -15° C or higher.
The diesel oil should be clean. Never use impure fuel.
4. If any air bubble in fuel system, please exhaust it before starting engine.
5. Without fuel, engine will stop running. After filling up fuel, please exhaust air by hand oil pump. (If no hand oil pump, use starter motor to exhaust air automatically.)

Engine start and stop

Start

1. Ensure the handle is in the neutral position.
2. Pull the accelerograph handle to a position a little higher than that of “lowest idle speed”.
3. When it is around 0° C or even lower, preheat the engine before startup, turn the ignition key widdershins to “preheat” position and keep it there for 10 to 15 seconds, then turn it right to “start” position, engine is now started. After that, release the key, which will automatically return to “ON” position. Don't run the starter motor for more than 5 consecutive seconds. If the engine fails to be started, wait for 30 seconds and then try again to start the engine. If engine fails to work after being started for three times, check the oil supply system.
4. After starting engine, pull the accelerograph handle from low speed to middle speed position, warm up the engine for 5 minutes.

Engine in operation

1. Only thermometer pointer is in green range, the engine can run.
2. Check that the warning lamps are off.
3. If warning lamp is lit or warning sound is made, stop engine immediately and check concerned position as per light lamp.

Stop

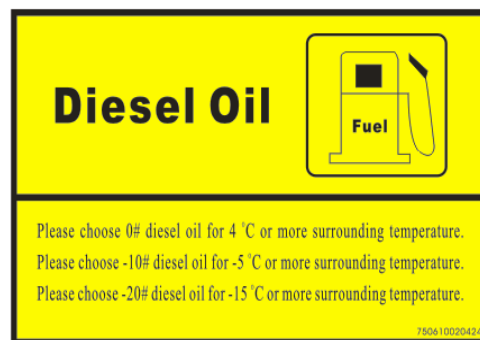
1. Run the engine at low rev for about 5 minutes to gradually let it cool.
2. Turn the key to the “OFF” position to stop the engine.

(3) Diesel label



Caution

- ◆ Refilling fuel with extra care. Stop engine before refilling fuel. Do not smoke while refilling to fuel tank or operating around fuel system.
 - ◆ Select proper fuel according to different ambient temperature.
-
- Refer to “stop engine” section for properly parking machine and stopping engine.
 - Inspect fuel gauge on monitor, top up is required.
 - Prevent dirt, dust, water and other foreign matter from entry into oil tank and fuel system.
 - While refilling at the end of daily work-shift, do not spill, drip any fuel to machine or ground to avoid fuel clotting.
 - After refilling fuel, fasten cap securely.



(4) Machine posture symbol

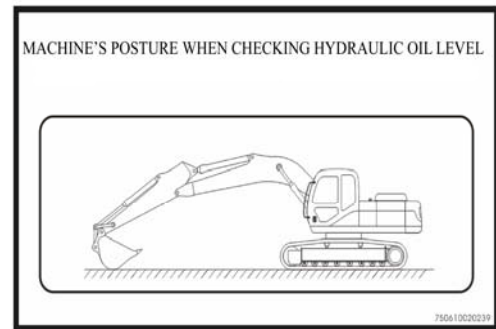


Caution

- ◆ Do not start engine when hydraulic oil tank runs out of oil.

Inspect hydraulic oil level.....daily

- Park machine on level ground.
- Completely retract arm cylinder and extend bucket cylinder to full length.
- Lower bucket down to the ground.
- Run engine at low speed for 5 minutes.
- Shut down engine, remove the key.
- Place pilot control lever to LOCK (up) position.
- Open right side door to check oil level gauge. Located on hydraulic oil tank, oil level must be within level marks. Pump oil if level is higher than MAX mark, refill if level is below MIN mark.
- add oil:
- Remove upper breather screw cap by rotating anticlockwise.
- Refill oil through strainer. Recheck oil level gauge.
- Fasten cap securely.



(5) Service and lubrication symbol.

Proper procedure of maintenance and inspection

Learn about how to properly service machine. Perform proper maintenance and inspection procedure in accordance with this manual. Inspect machine before starting machine.

- Check monitor.
- Check individual liquate level.
- Check hose and piping for leakage, twist, wear out or damage.
- Check surrounding the machine for any signs of noise, heat etc.
- Check parts for looseness and lost.



Caution

- ◆ If any problems are detected, repair prior to operation, or contact our authorized distributor.
- Use recommended fuel, hydraulic oil and lubricant.
- Use only genuine SUNWARD components.
- The warranty is not applicable for any damages arising from failure to use SUNWARD recommended fuel, lubricant, hydraulic oil and genuine SUNWARD components.
- Do not adjust speed limiting governor of engine or safety valve of hydraulic system.
- Do not allow water or vapor to reach electrical equipment.
- Do not disassemble components such as engine pump controller, sensor etc.

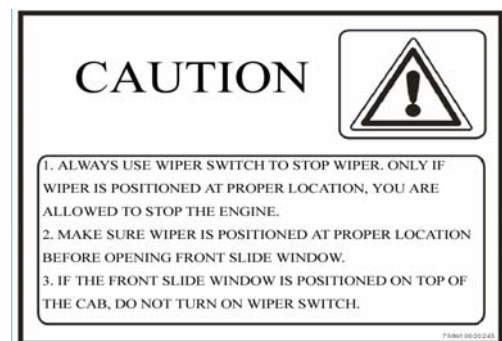
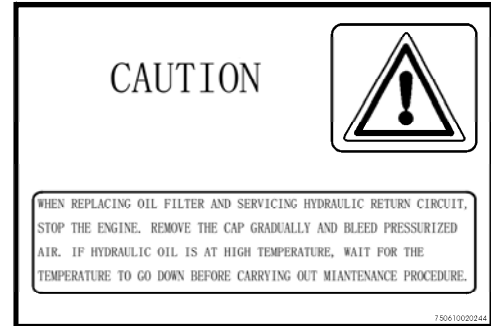
(6) Wiper label

Properly use wiper.

(7) Filter core safety label

Replace pilot oil filter every 400 hours

- Stop machine on a firm and level ground.
- Lower bucket to the ground.
- Run engine at low-speed for 5 minutes.
- Shut down engine, remove the key.
- Relieve internal pressure which builds up in hydraulic system by means of left/right pilot joystick.
- Set pilot control lever in LOCK (UP) position.
- Use wrench for filter to remove filter housing off the filter head cover by rotating counterclockwise.
- Remove filter core and used O-ring.
- Clean the area in contact by head cover and O-ring.
- Apply a new layer of fresh hydraulic oil, and place it in position.
- Lubricate new filter core with a thin layer of clean hydraulic oil on the ring section. Push filter core upward while moving it forward and backward alternately to install it.
- Clean filter housing.
- Rotate clockwise to tighten filter shell to head cover. Tighten at torque: 19.5—29.5Nm (2-3 kgfm).

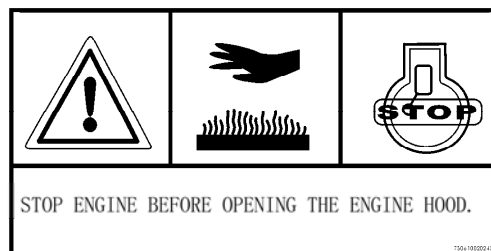


(8) Engine hood label



Warning

- ◆ Shut down engine before opening engine hood.
- ◆ Be cautious of scalding after opening engine hood.

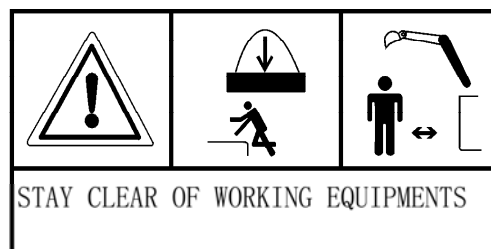


(9) Working device label



Warning

- ◆ Stay clear of working device.

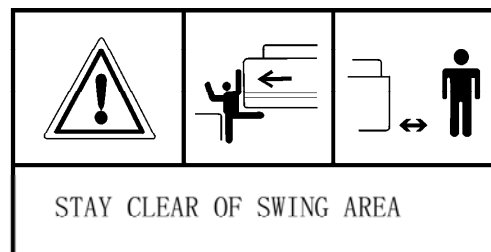


(10) Swing label



Warning

- ◆ Keep clear of swing area.

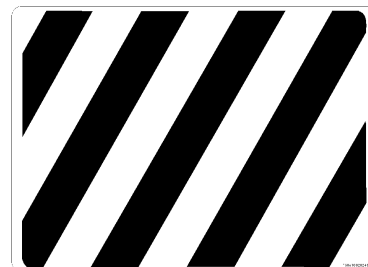


(11) Rump label

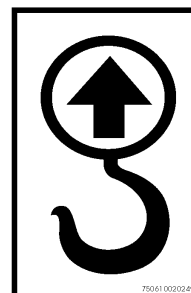


Warning

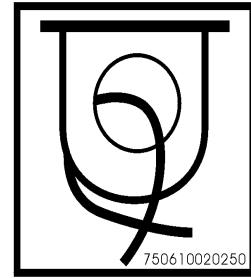
- ◆ Stay clear of machine while it is running.



(12) Lifting direction label

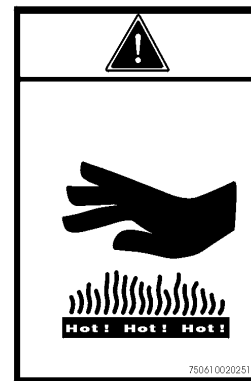


(13) Traction hook



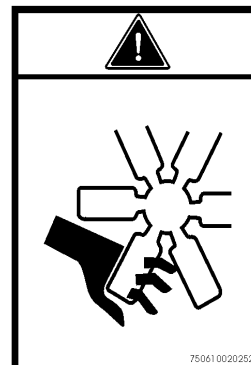
(14) Anti- scald label

- After running operation, engine oil, gear oil and hydraulic oil is getting hot, so do engine, hoses, pipelines or other components. Be cautious of scalding.
- Attempt inspection and maintenance procedure, after machine components and oil cool down.
- There is pressure in existence in hydraulic oil tank. Relieve pressure before opening cap to avoid oil spurt.
- There is pressure which builds up in hydraulic piping. Relieve pressure prior to repair or replacing.



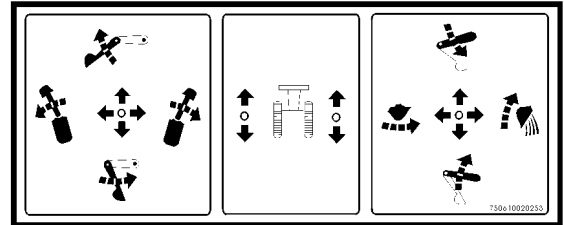
(15) Prevent hand being caught in fan blade.

- Fan would run at high speed while engine is active. Pay much attention to prevent hand, foot, hair and clothing being caught in fan blade, when attempting any inspection and maintenance procedures on machine.



(16) Operation pictogram label

- This machine is equipped with two pilot control joystick and two travel control lever which control working device motion, swing action of upper turret, machine travel accordingly.
- The right pilot joystick controls motions as below:
 - a、boom up-movement
 - b、boom down-movement
 - c、backhoe loading , or grab bucket rotate clockwise
 - d、backhoe dumping, or grab bucket rotate counter clockwise.
- Left pilot joystick controls motion as below:
 - e 、 rotate upper carriage to left(counter-clockwise)
 - f、 rotate upper carriage to right(clockwise)
 - g、 extend arm
 - h、 retract arm
- Operation together with two pilot joysticks can also execute compound motion. In addition, horn switch button is fixed on the joystick.
- Two travel control lever control forward motion, reverse motion and steering of the machine.



(17) Direction symbol

- This label indicates travel direction of machine when “travel control lever is pushed forward”.



Warning

In case that driving wheel is located underneath cab, machine will tram in reverse when pushing “ travel control lever ” forward. (On this occasion, symbol indicates backward).

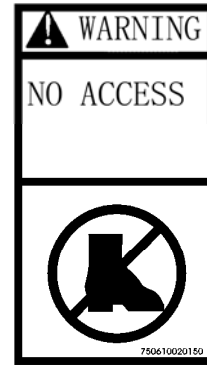


(18) No unauthorized access label

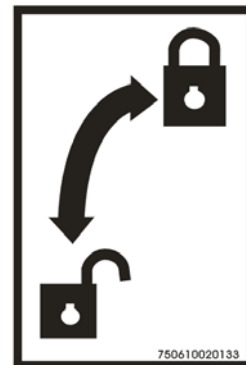


Warning

- ◆ Stay clear of operation area of working device.



(19) Pilot safety lock label

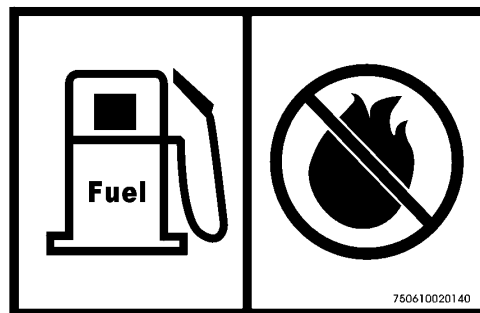


(20) Fuel label



Warning

- ◆ Handle fuel with extra care due to its high flammable property. In case that fuel is ignited, this can cause explosion or fire, and even death or injury to person.
- Always refilling fuel at outdoor. Be sure to top engine before refilling fuel.
- Do not refill fuel while smoking or near fire or sparks.
- All fuel and most of lubricants are flammable.
- Flammable liquid should be stored at proper place far from fire.
- Do not burn out or stab at pressurized container.
- Do not store rag containing oil. This can cause self-ignition and can be lighted up.
- Fasten cap of filling opening.

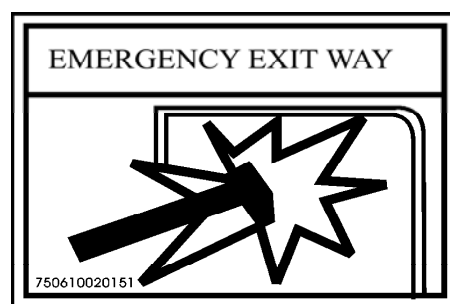


(21) Life hammer label



(22) Emergency exit label

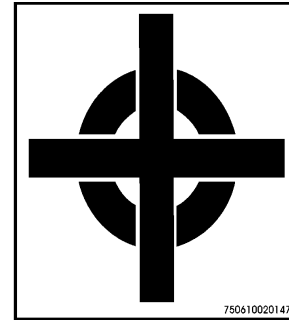
- When accidents happen, and operator is trapped in cab, operator can use life hammer located on the side of cab to destroy window labeled with exit mark to get out of the machine.
- The safety structure being damaged is beyond repair. But you could have it replaced with a new one.



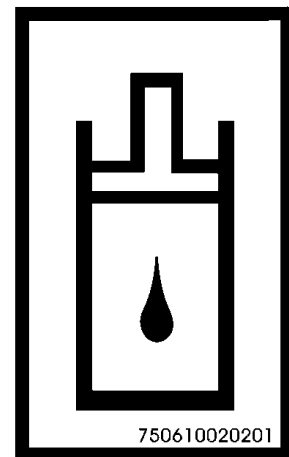
Caution

- ◆ Pay attention to the flying pieces while breaking out emergency exit way. For better protection of your safety, please keep sufficient distance from exit way being damaged.
- ◆ Exit hole must be big enough for operator to get out. Make sure your safety.

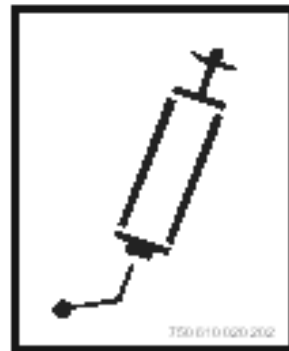
(23) Gravity label



(24) Hydraulic oil label



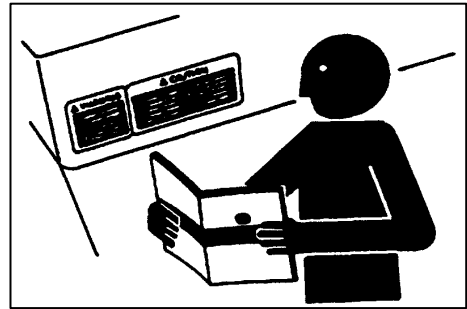
(25) Greasing



1.2 General safety information

1.2.1 Observe safety instruction

- Thoroughly read, understand and follow all safety precautions and procedures found in this manual.
- Regularly affix, maintenance and renew new safety labels, so that they are legible , conspicuous and affixed firmly.
- In case safety labels and manual are damaged or lost, contact us or our authorized distributor to order new ones (when ordering, please specify machine model, and serial NO).
- Learn about how to properly and safely operate machine and its controlling device.
- Use only trained and qualified person to operate on this machine.
- Keep machine at good working condition.
- Unapproved modification on this machine can impair function, effect service life and jeopardize personal safety.
- Note: all safety information described in this section covers only basic safety information of this machine. It's not possible to predict every circumstance which might involves potential hazards. So it's necessary to ask for instruction from your superior before attempting any operation or maintenance procedure.



1.2.2 Understand safety label

Different safety labels containing safety messages are located on different position. All message of safety are identified by words “DANGER” “WARNING” and “CAUTION”(see fig), Their significations are as follow:

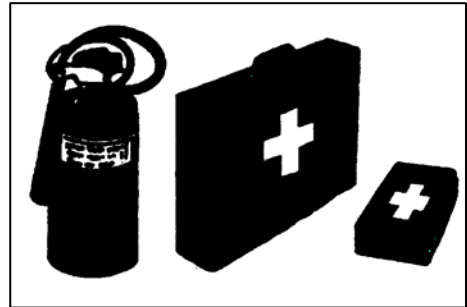
- DANGER ---indicates an imminent hazard, if not avoided, will result in death or serious injury.
- WARNING---indicates a potential hazard, if not avoid it, death or serious injury may incurred.
- CAUTION---indicates a potential hazard. If not avoid, may result in minor or moderate injury.

Label of “DANGER” “WARNING” and “CAUTION” are placed in specific position in which involves a possible hazard. General safety related items are listed in “CAUTION” labels, In this manual, “CAUTION” may also be used to invite attention to safety instructions.



1.2.3 Emergency protection

- Be cautious of fire and accidents: make sure there are fire extinguishers ready for emergency, thoroughly read and understand all instructions on fire extinguisher and know how to operate it.
- Carry out maintenance and inspection procedure regularly to make sure fire extinguisher is available at all time.
- Have a kit ready for emergency. Be sure that all drugs are still in effective period.
- Prepare beforehand the communication means of doctor, ambulance, hospital and fire brigade. Take note of their telephone numbers for emergency contact.

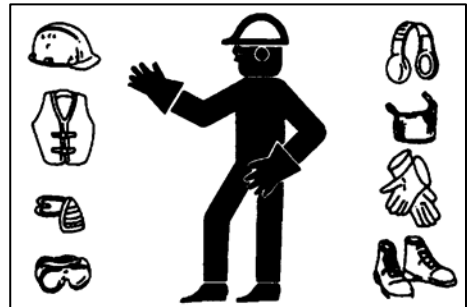


1.2.4 Protective articles

- Do not wear accessories or loose clothing. Always wear close fitting clothing and protective articles suited for operation.

They cover the following items:

Close fitting clothing
Hard hat
Thick glove
Protective glasses, goggles or face shield
Mask or filter face shield
Ear plug or ear shield
Safety belt and rain-proof



1.2.5 Safety equipment

- Make sure that all guards and covers are properly positioned. Repair immediately if they are damaged.
- Understand how to use safety equipments and use them properly.
- Never remove any safety equipments, keep them in good operating condition.

1.2.6 Keep machine clean

- Do not use water or vapor to flush electrical circuit, connector of machine to avoid electrical system failure.
- Remove all mud, oil dirt and other foreign matter. Keep machine clean at all times.



1.2.7 Pre-start inspection

- Inspect surrounding machine daily or before each work shift.

Be sure to follow the instruction described in “pre-start inspection” section during patrol inspection process.

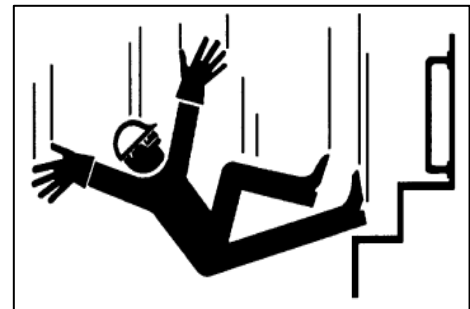
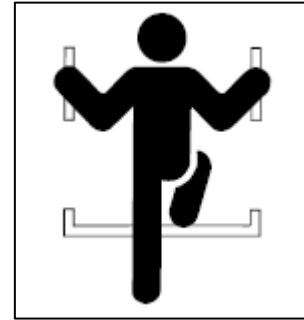


1.2.8 Instruction of entry into cab

- Remove all mud, oil adhered to your shoes prior to access into cab. Failure to do so, your foot may slip and this may cause serious accidents.
- Do not leave parts or tools around operator’s console.
- Do not store flammable and explosive items in cab.
- Do not use radio or cell phone during operation on the machine.
- After smoking, be sure to extinguish dog-end, secure ash tray cover to prevent fire.
- Don’t place transparent bottle and other convex stuff in cab to prevent fire as a result of solar light focusing.
- Don’t leave lighter in cab. There is a possibility that lighter may explode along with the increase of temperature.

1.2.9 Mounting and dismounting

- Always face the machine, maintain a secure three point contact to mount or dismount machine by means of steps or handrails to avoid falling off.
- Do not grip any control levers as a substitute of handrails to mount or dismount the machine.
- Keep all handrails, gangway clean and free of oil and mud to prevent slip.
- Never mount or dismount the machine while it's under the operation of tramping, swing, and digging.
- Do not mount or dismount machine while holding tools in your hand.
- Do not jump on or off the machine.



1.2.10 Adjust operator's seat

A comfortable posture can alleviate operator's fatigue. You may adjust seat for your comfort in relation to your weight, height and arm length.

- Distance from hand-lever: for ideal hand operation posture, adjust distance of upper slide rail as well as armrest angle and backrest tilting.
- Position of pedal: for desired pedal operation posture, adjust distance of lower slide rail as well as seat height.
- Weight support adjustment: adjust load bearing capacity of seat in relation to your weight for better damping effect.



1.2.11 Fasten seatbelt

- Check seatbelt for damage or wear out before starting machine.
- Fasten your seat belt prior to operation.
- Change seat belt every 3 years to ensure the safety performance of seat belt can meet the requirements for use.



1.2.12 Secure perfect visibility

- Stop the machine if the fog, rain, snow or dust has negative effects on your visibility.
- To work at dark, make sure the lighting device can function normally.

1.2.13 Leave operator seat



Warning

Unexpectedly touching unlocked pilot safety control lever can result in sudden movement of the machine and cause injury or damages to the machine.

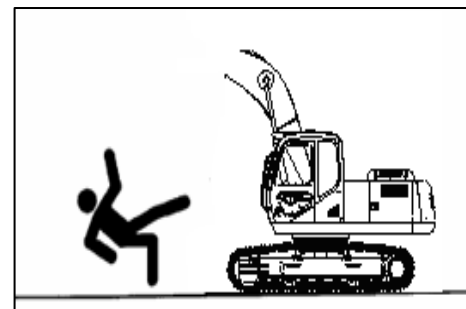
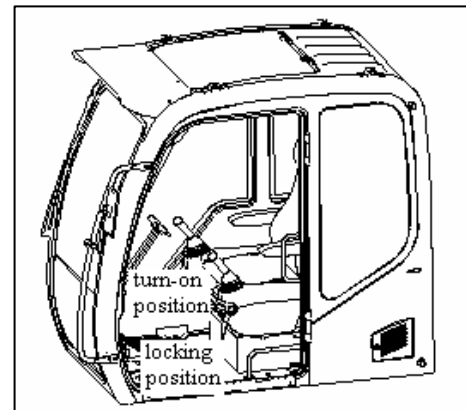
- When operator tends to leave or stand up off the seat(to open or close front or upper windows, remove or install front lower windows, adjust seat), please lower the work equipment to the ground, set pilot safety control lever to LOCK position securely, then stop the engine.

1.2.14 Emergency exit way

- If the door can not be opened for some reason, you may open the back windows, and use it as an alternative exit way for emergency. For details refer to the instructions in “emergency exit way label”.

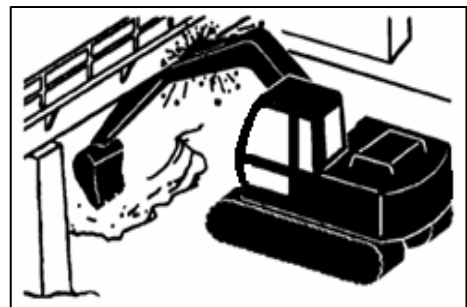
1.2.15 Prohibit passenger

- When machine is in the process of operation or traveling, do not allow anyone to ride on the machine other than the operator. Because there is a hazard that passengers may fall off or get hit by foreign body.
- Passenger may block operator's sight to result in unsafe operation.
- Do not allow anyone to sit on bucket or other front attachments. Serious injury can occur to person.



1.2.16 Worksite safety

- Thoroughly inspect worksite for any abnormal danger situations prior to operation.
- Operate with extra care for any operation in vicinity of flammable materials such as thatched roof, dry leaves or dry grass.
- Survey terrain and ground condition around worksite. Determine a safest operation method in a safe manner.
- Do not operate in vicinity of the area in which there is a risk of landslide or falling rock.
- At the work around place of water or gas lines, or cables underground. Contact relevant utility to identify their locations. Pay attention not to rupture or damage any of these lines.
- Take necessary measures to prevent any unauthorized person from entry into work area.
- In the event of operation over soft ground or in shallow water, it's necessary to check type and condition of rock bed, and take water depth, flow speed into account prior to operation.
- In the event of operation in vicinity of over bridge or overhead stuff, be cautious not to collide with front working device of machine.
- Do not leave the engine running in a place where ventilation is poor. It is particularly dangerous to run the engine in an indoor place where it can be easily filled with the exhaust gas.

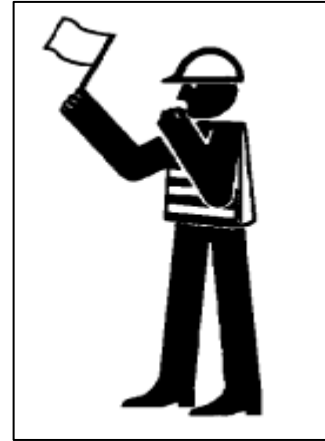


1.2.17 Operation around loosened area

- Do not operate around cliff, shoulder of road or ditch. In this area, the ground is loosened. There is a possibility of getting into danger of ground sinking with vibration and weight of the machine. Bear in mind that the soil is loosened in this area after heavy rain, explosion operation or earthquake.
- When working on a dike or around ditch, there is a possibility of getting into danger of ground sinking resulting from vibration or weight of the machine. It's necessary to take measures to secure safety against tip-over and falling off.

1.2.18 Signals and gestures from flagman

- Provide caution plates when working on shoulder of road or loosened ground. Provide a flagman if necessary. Operator must pay much attention to caution plates and follow flagman's instruction.
- Use only one flagman to instruct.
- Make sure all signals and gestures are understood by the personnel prior to operation.
- It's necessary to offer a flagman to organize operation during multi-machine operation. Be sure all his signals are understood and followed by operators.



1.2.19 Distance to high voltage cables

- Severe injury or death can occur to person due to any contact of any parts or load of machine with electric cables. Always keep safe distance:

	voltage	Min safe distance
Low voltage	100V	2m
	200V	
	6,600V	2m
High-voltage and extra high voltage	22,000V	3m
	66,000V	4m
	154,000V	5m
	187,000V	6m
	275,000V	7m
	500,000V	11m

- If it's inevitable to operate in vicinity of high voltage utilities, contact your local utility company to shut off power supply, always wear proper electrical insulated shoes and gloves.
- If it's inevitable to pass by utilities, provide a flagman to secure safe distance and warn operator in time.



1.2.20 Prevent scald

- Be cautious of coolant burn during inspection or discharging coolant. Hot fluid or vapor can erupt from check port or discharging port and scald. Allow cool before opening.
- Before attempting any inspection or oil discharging operations, wait to prevent scald until oil is cool and internal pressure is released.

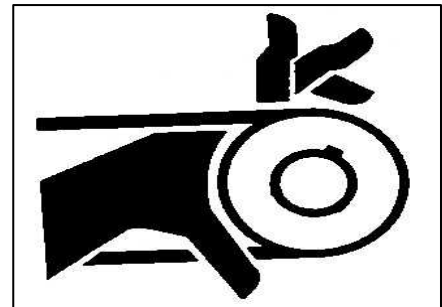


1.2.21 Stay away from power driven parts

- Use extreme care to operate in vicinity of driving parts to prevent hands, feet, hair and clothing being caught in machine.

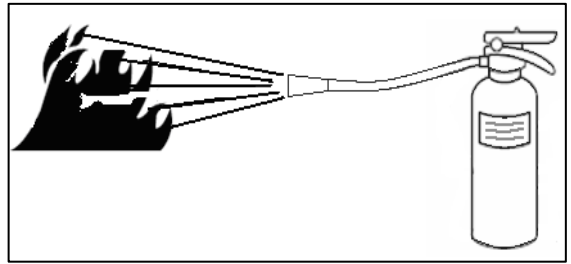
1.2.22 Prevent fire and explosion

- No smoke or using naked flame around fuel and engine oil.
- Stop engine before refilling.
- Do not spill oil to hot surface or electrical equipments of machine.
- Secure and lock oil cap after adding oil.
- Wipe off oil dirt; remove all flammable or explosive material.
- Do not weld or cut pipelines that contain flammable fluids.
- Keep wire terminals secured and clean.
- All leads must be free of damage. Prevent fire due to short circuit of damaged leads and machine.
- Prevent spark due to static electricity or friction.



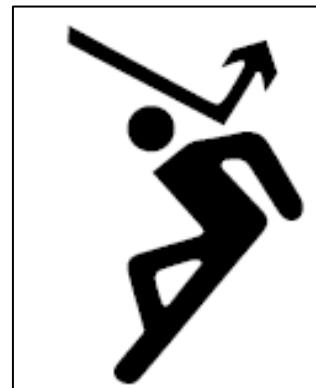
1.2.23 Fire prevention

- Switch starting key to “OFF” position to stop engine.
- Remove fire extinguisher in cab.
- Get out of machine by utilizing handrail and steps.
- Contact fire department and colleagues and superior. Extinguish fire with fire extinguisher.



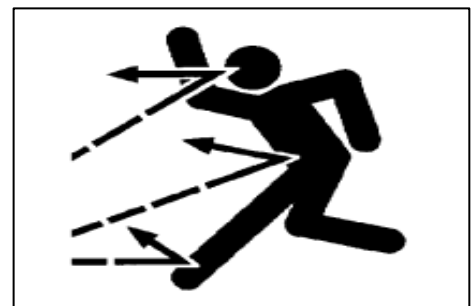
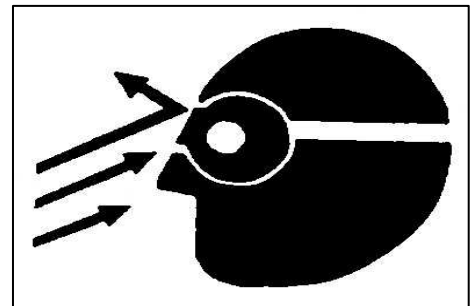
1.2.24 Prevent fly-out or falling object

- Wear protection glasses or goggles to avoid injury resulting from fly-out and falling object (such as metal particles or sand rock).
- When hitting, make working area off-limits to the other person.
- Machine must be fitted with falling object protective structure (FOPS) and front protective structure. If machine is used in mining area or quarry where there is a risk of falling rocks.



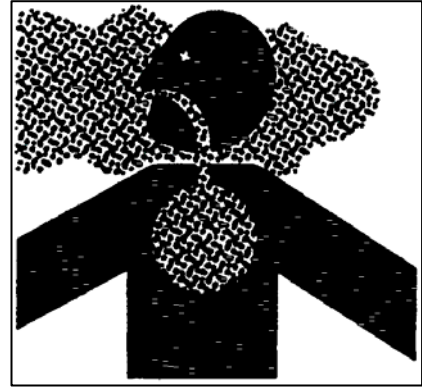
1.2.25 Prevent fly-out parts

- Bear in mind that lubricating grease in track tensioner is under high pressure. Do not remove parts such as oil cup or valve etc to avoid injury.
- Moreover, keep face and body away from valve block in case that part will fly out.
- There is some pressure build up in travel redactor. Gear oil temperature will increase after operation. Keep face and body away from air bleeding plug.
- With gear oil cooled, gradually loosen air bleeding plug to release pressure.



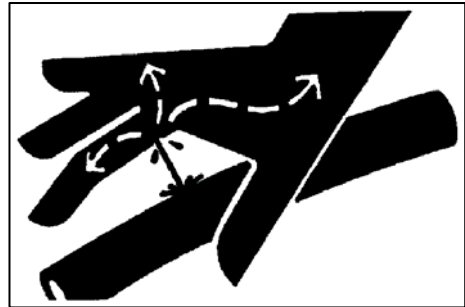
1.2.26 Avoid inhaling asbestos dust

- Asbestos dust is known to cause pulmonary cancer. When handling elements containing asbestos fibers, be cautious not to inhale asbestos dust generating by those elements.
- To avoid dust, do not use pressurized air to clean machine. Do not scrub or grind material containing asbestos. Always wear approved respirator and use recommended dust collector to remove asbestos during maintenance. If you can not find them, wet asbestos material with water or oil. Follow rules and regulations at operational site. Observe relevant laws and regulations in reference to asbestos disposal. Do not allow other person to access working area.



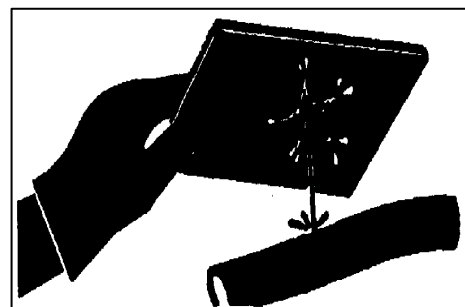
1.2.27 Cautious not to inhale exhaust gas

- If exhaust gas is inhaled, this can cause diseases and even death.
- If machine is operated at indoor, it's necessary to open door and windows to ventilate. Or you can also use lengthened discharge pipe to discharge exhaust gas to outside.



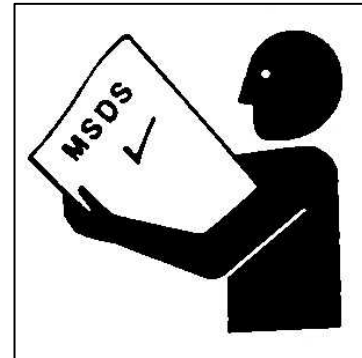
1.2.28 Safety rules for high pressurized fluid

- High pressurized fluid can penetrate leading to severe injury.
- Always release pressure before separating fluid or other pipelines.
- You may release pressure by means of operating control lever.
- Fasten all connector parts prior to pressurizing.
- Use cardboard to locate leakage. Keep your hand and body away from pressurized fluid.
- In case of accidents, consult a doctor experienced in this kind of injury for medical care.



1.2.29 Safe disposal of fluid

- Considering that fuel is highly flammable, handle them with extra care. In case that fuel is ignited, injury or death may occur to persons.
- Always add fuel at open-air. Be sure to stop engine before refilling fuel.
- Do not refill fuel while smoking or around naked flame or spark.
- All fuel and most lubricant and coolant are flammable.
- Keep flammable fluid away from the area involves fire hazards.
- Do not burn out or stab at pressurized container.
- Do not restore rags containing oil. They may be ignited or self-ignited.
- Secure cap on refilling opening.



1.2.30 Chemical disposal

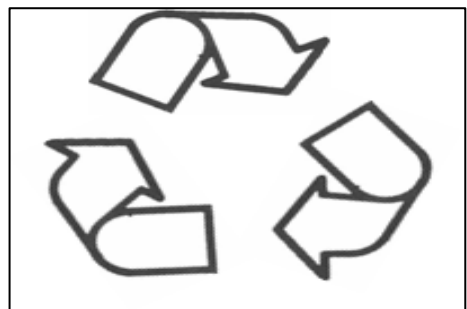
- Serious injury can occur by allowing hazardous medical to make direct contact with person. Medicals being used in the machine such as lubricant, coolant, and binding admixture may be harmful.

1.2.31 Waste material disposal

- Observe local laws and regulations to dispose of waste material, such as fuel, coolant etc.

1.2.32 Unauthorized modification to machine

- Any unauthorized modification to machine may involve hazards.
- SUNWARD disclaim any responsibility for damage, injury or accidents arising from unauthorized modification.



1.3 Safe operation instruction

1.3.1 Checks before starting engine

Before starting daily routine inspection, carry out the following checks.

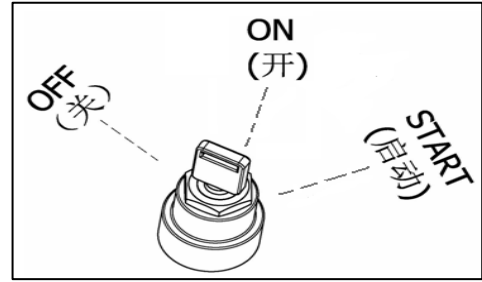
- Wipe off dust on glass window to secure visual field.
- Wipe off dust on the surface of front light and working lamp, check to ensure they are properly functioning.
- Check coolant level, fuel level and oil level in engine oil pan. Check air filter for clogging, check wiring for damage.
- Adjust operator's seat to a position where it is easy to carry out operation. Check seat belt or mounting clamps for damage or wear.
- Check meters to ensure they are functioning properly. Check working lamp angle. Make sure control levers are at neutral position.
- Check safe lock control levers to ensure they are in LOCK (UP) position before starting engine.
- Adjust rear view mirror to a certain position where a clear visual field of back machine is secured.
- Check upper or lower machine to ensure there is no other persons or obstacles surrounding machine.
- In case there are any warning tags posted on control lever, do not start or reach control lever.

1.3.2 Proper engine start



Warning: Inappropriate engine start can cause machine out of control leading to severe injury or death.

- Make sure all control levers are set in neutral position, and honk the horn to alert, before starting engine.
- Start the engine only if operator is in seated position. Do not start machine while standing on the track or ground.
- Never ride on the machine, the machine is for operator only.
- Do not attempt to start engine by short circuiting the engine (including terminal starting), this action is dangerous, beyond dangerous, it will cause damages to equipment.



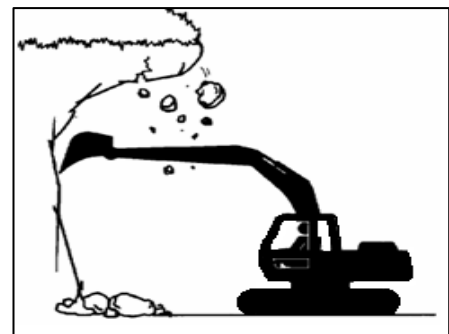
1.3.3 Start engine in cold weather.

- Carry out a complete warm-up operation before operating control lever. Failure to do so, machine will lag in response, this may result in accidents.
- If the battery electrolyte is frozen, do not charge battery or use a different power source to start the engine. Failure to do so may cause battery to be ignited.
- Melt battery electrolyte and check electrolyte for leakage or freezing before charging battery or using different power source to start machine.

1.3.4 Safe operation

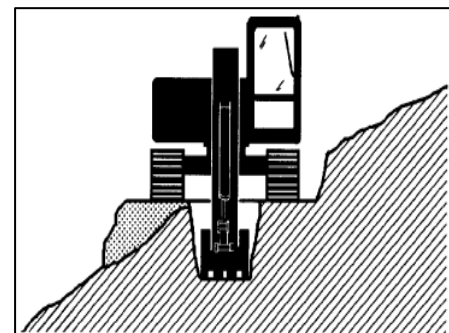
- Before excavation operation, thoroughly check the underground line conditions. Precisely identify location of individual underground utility line such as cables, gas pipeline, water pipeline etc.
- Keep jobsite off-limits to all non operating person.
- Make sure the condition of worksite is stable and capable of supporting the machine.
- To make it easy to escape if there is any collapse, set the tracks at right angle to the pit with sprocket at the rear when carrying out operation near pit.
- When digging the work face under an overhang, the overhang may collapse and fall on top of the machine.
- Do not place bucket above the head of person or operator cab. Falling objects from bucket or collision with bucket can cause serious injury or death or damage to machine.
- When using breakout hammer or other heavy working equipment, there is a hazard of losing its balance and tipping over.
 - ◆ Do not lower, swing or stop working device all of sudden.
 - ◆ Do not extend or retract boom cylinder suddenly, There is a risk of machine tipping over due to impact force.

machine as horizontal as possible.



1.3.5 Operation on slopes

- When operating swing or working device during operation on slopes, there is a risk that the machine may lose its balance or tip over. This may cause serious injury or damage to machine. So it's necessary to provide a flatness area for the machine and operate carefully.
- Do not swing machine from uphill side to downhill side, when bucket is fully loaded. This dangerous act can cause machine to tip over.
- If the machine has to be used on a slope, pile the soil to make a platform which can keep



1.3.6 Operation on snow

- Snow coated or frozen ground is slippery. So pay extreme attention when tramping or operating machine. Do not operate control lever suddenly. Pay much attention when operating on a slope even a slight slope. Can cause slip.
- Frozen ground will become soft along with the increase of ambient temperature. This may cause machine to tip over.
- In case of access to deep snow, there is a hazard that machine may tip over or be buried in the snow. Be cautious not to leave the road shoulder or get trapped in snow.
- When clearing snow, the road shoulder and objects placed beside the road are buried in the snow and can not be seen. There is a hazard of the machine tipping over or hitting covered objects, so always carry out operation carefully.

1.3.7 Avoid tipping over

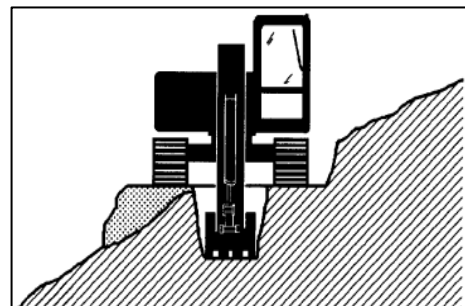
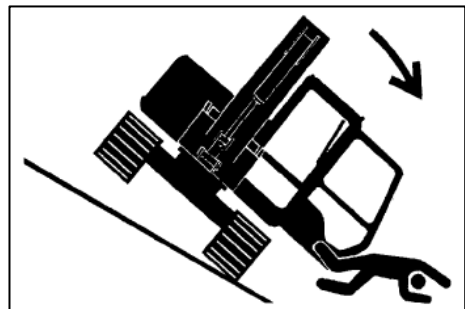


Warning: Do not attempt to jump off a tipping over machine; this may cause severe accidents of injury and death.

Machine will tip over before you jump off the machine.

Fasten seat belt.

- There is a possibility of tipping over when machine is operated on a slope. To avoid tipping over:
 - Smooth jobsite of machine.
 - Lower bucket to ground, keep it close to machine.
 - Lower operation speed to prevent machine from tipping over.
 - Do not change direction when tramping on a slope.
 - Decrease slewing speed of upper carriage, when bucket is loaded.
- Be alert that ground surface becomes soft arising from increase of ambient temperature. This may affect the stability of machine.



1.3.8 Prevent accidents during slewing and reversing

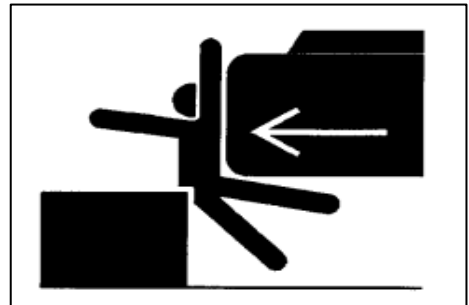
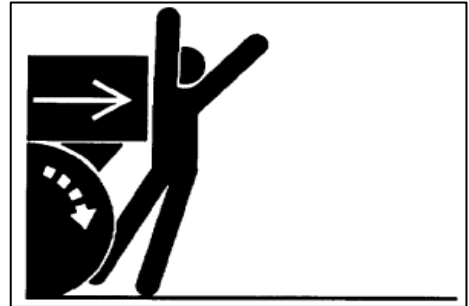


Warning:

There is a possibility to crush or hit person around to cause severe accidents of injury or death, when swing or reversing the machine.

Follow the following instructions to prevent accidents during swing or reversing operation.:

- Check surrounding area to ensure there is no other person around before swing and reversing the machine.
- Ensure that bystanders are out of swing area.
- Ensure that travel alarm is functioning properly. Be alert that no bystander accesses to jobsite. Sound horn or use other alarm to warn people.
- When machine travels in reverse, provide a flagman to assist in case operator's sight is limited. Keep the flagman with operator's sight
- When signal is needed during working, signal man be suppose to use hand signal. Only when the signals are understood by both signal man and operator, the machine can be operated to tram or swing.
- Understand all flags, signs and signals being used during operation. Select the person who is responsible to signal.
- Keep windows, mirrors and light fittings clean.
- In case of improper visibility arising from dust, rain, or fog etc. use appropriate lighting device.
- Please read and understand all safety rules described in this manual.



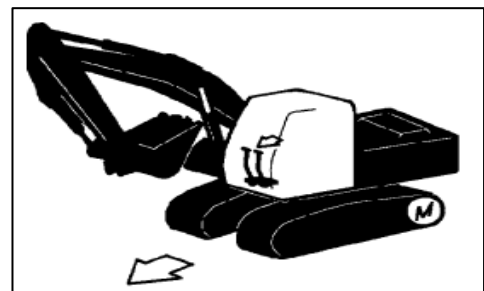
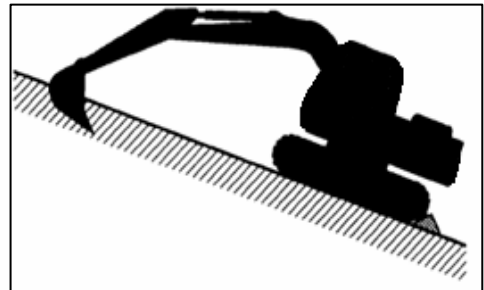
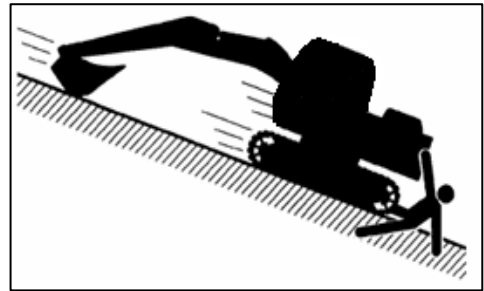
1.3.9 Avoid runaway accident



Warning: When the machine is out of control, any attempt to mounting or to stop a moving machine can result in severe injury or even death.

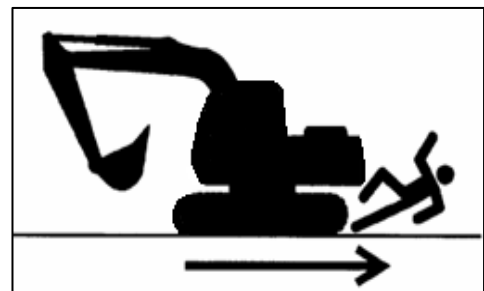
To avert runaway, it's necessary to park machine properly.

- Always park the machine on level ground, do not park the machine on a slope.
- Lower the bucket to the ground.
- Disable the auto-idle speed switch and power selecting switch.
- Allow the engine to idle at low speed for 3 minutes to cool down the machine.
- Stop the engine, remove the key.
- Turn off the pilot control switch.
- When the machine is to park on a slope, chock the machine on both side of the track, lower bucket to dig the teeth into the ground.
- Position the machine to avoid unexpected movement. Keep proper distance from the other machine.



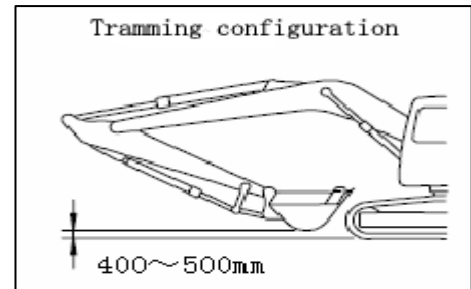
1.3.10 Machine movement

- Before moving the machine, check travel control lever (pedal) to ensure the relationship between operation direction and machine movement direction.
- Before moving the machine, make sure the working area is free of other persons and obstacles, and sound the horn to alert.
- Bypass any obstacles during traveling.
- When traveling, swing, operating working device in confined area, position a signal person and define the meaning of the signals beforehand.



1.3.11 Safety rules during traveling

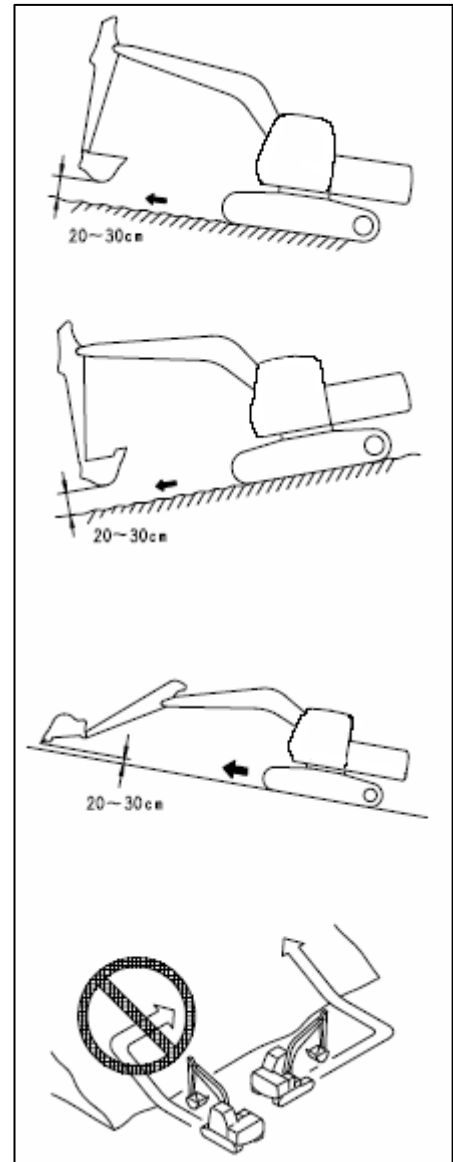
- During operation of machine, do not operate exceeding max load capacity or performance to avoid stall and damage to working device.
- When traveling on flat ground, fold the working device and keep 400 to 500mm high above the ground.
- When traveling on rough ground, travel at low speed. Do not steer sharply, there is a risk of machine turning over. The work device may hit the ground and cause machine to lose its balance or damage the machine or structures.
- When traveling on rough ground or on slope, disable the auto-reduction switch(if present), if auto-reduction switch is on, engine revs may increase. This may cause machine to speed up abruptly.
- Avoid traveling on obstacles if possible. if the machine has to travel on obstacles, lower the working device close to the ground at low speed. Do not travel over obstacles which involve risk of tilting machine to one side.
- When traveling or operating, keep a safe distance from people, structure or other machine to avoid making contact with them.
- When passing over bridges or structures, check first structure is strong enough to support the weight of the machine. When traveling on road, contact relevant authorities and follow there instructions.
- When operating in tunnel, under bridges, under electric wires or other height-limited area, operate slowly and pay much attention not to hit anything.



1.3.12 Travel on slope

To prevent machine from tipping over or side sliding, follow the instructions below.

- When travel on slopes, keep working equipments 20 to 30cm high above ground. In case of emergency, lower the working device to ground to help stop the machine.
- When traveling uphill, set the cab facing uphill direction. For downhill, set the cab facing downhill direction. When traveling, always check the firmness of the ground in front of machine.
- When traveling uphill, extend the working device to the front to improve the balance, keep the working device 20 to 30cm and travel at low speed.
- When traveling downhill, lower the engine speed, keep the travel lever close to the neutral position, and travel at low speed.
- When traveling on slopes, operate machine straight up or straight down, steering or crossing on the slope is very dangerous. Always descend to a flat area to change direction, then travel uphill again.
- When traveling on grass, fallen leaves or wet steel plates always travel at low speed because there is a risk of slip even if traveling on a slight grade.
- In case that engine stops when traveling on a slope, place control lever to neutral position immediately, and re-start the engine.



1.3.13 Safety rules during towing



Warning: Improper towing may damage machine, any mistake on selecting steep rope or inspection can result in serious injury or death.

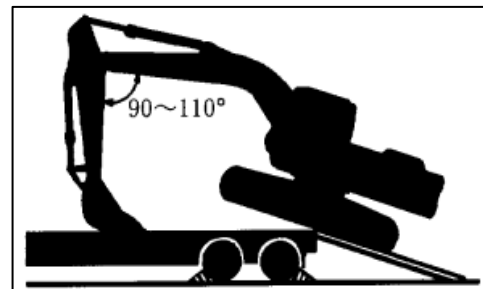
- Always wear gloves when handling steel ropes.
- Secure steel ropes to track frame.
- During towing operation, do not stand between the towing machine and the machine being towed.
- Do not tow machine on slopes.
- Never use a wire rope which has cut strands, reduced diameter, or kinks. There is danger that the rope may break during the towing operation.

1.3.14 Machine transportation



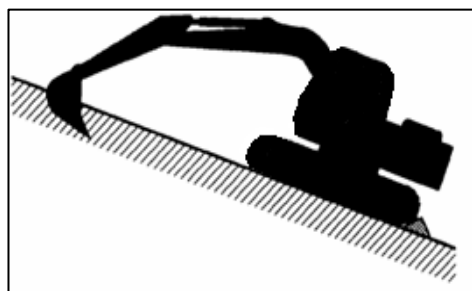
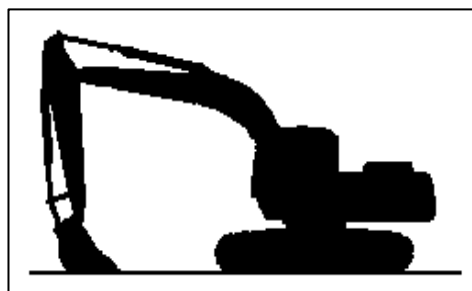
Warning: When loading or unloading the machine, there is a hazard of tipping over or falling.

- During transportation on road, follow the local laws and regulations. Study all local laws or regulations concerning limiting load weight, width and length. Dismantle the machine if necessary. Select proper route or means of transportation according to the width, height or weight of the load.
- Provide proper truck or trailer for road transportation.
- When crossing bridges or private structures, check first to ensure that the ground is firm enough and capable of supporting the weight of the machine. When the machine has to travel on road, it's necessary to contact relevant authorities to follow their instructions.
- For any instructions concerning loading or unloading machine, refer to the chapter 2 (transportation and storage).



1.3.15 Parking machine

- Parking machine on a firm, level ground.
- Select a place without hazard of falling rocks or landslides, or flooding.
- Lower the working devices completely to the ground.
- When leaving machine, place the safety lock lever to LOCK position, and then stop the machine.
- To prevent unauthorized person from operating the machine, always close the cab door, use the key to lock all the equipment. Then remove the key, and keep the key with you, and leave the key in a prescriptive place.
- If the machine has to park on slopes, follow the instruction below:
 - ◆ place the bucket to the downhill side, then dig it into the ground.
 - ◆chock the track to prevent machine from moving.



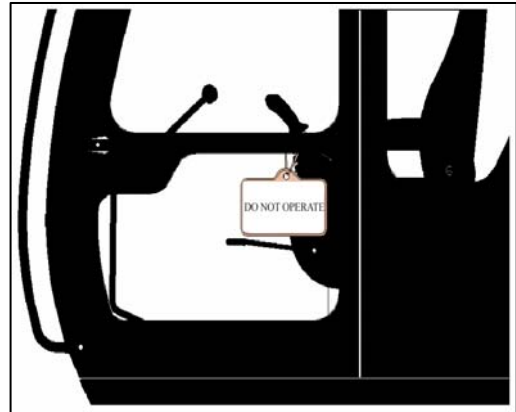
1.4 Safety maintenance information

1.4.1 Use warning signs



Warning: During maintenance or service procedure, any attempt to start the engine, have access or operate control lever of working device can result in serious injury or damage.

- Always post “DO NOT OPERATE” tag to the control lever in the cab to alert the other person that you are carrying out maintenance or service.
- Set the other warning signs around the machine if necessary.

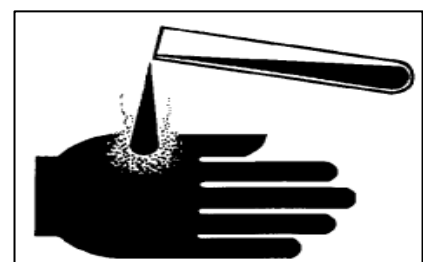
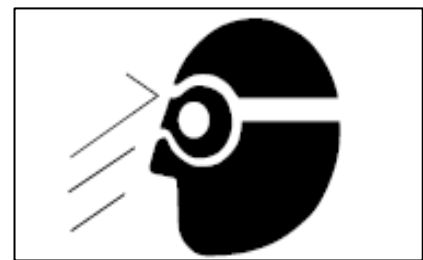


1.4.2 Parking the machine prior to service

- Park the machine on firm level ground.
- Lower the bucket to the ground.
- Switch off the idle, run the machine at low speed for 5 minutes.
- Set the key switch to OFF position, stop the engine.
- Operate individual control lever, release internal pressure of hydraulic system.
- Remove the key from the switch, set the pilot lock lever to LOCK position.
- Post “DO NOT OPERATE” sign to the controls.
- Cool the engine.
- Chock the track to prevent machine from moving.

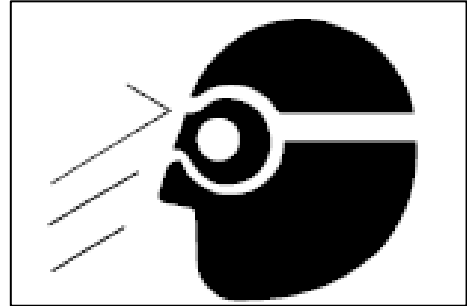
1.4.3 Safety maintenance rules

- Understand all maintenance instructions prior to operation.
- Keep the working site clean and dry.
- Do not spray water and vapor in cab.
- When the machine is moving, do not lubricate the machine or perform any maintenance operation.
- Prevent any parts of the body from reaching moving parts of the machine.
- If the maintenance procedure has to be carried out when engine is running. Position a person in operator seat to stop the engine at any moment. All persons keep each other in touch.
- Do not operate under the machine which is supported by boom. If you have to service the machine with boom supported, use bracket or block strong enough to support the machine and working device securely.
- Dispose of replaced parts in time; remove any accumulated lubricating grease, oil or debris.
- Always disconnect negative terminal from battery before testing on electrical system or welding on the machine.
- Provide complete lighting device for jobsite. When working under the machine or inside the machine, always use maintenance work light with protective hood. Or broken bulb pieces may ignite flammable fluid e.g. spilled fuel, engine oil, anti-freezing fluid etc.
- Do not make contact with coolant, in case of contact; there may be some hazards of blindness, for the skin, cold injury may occur.
- When using pressed air to clean up, injury or damage can occur due to flying-out particles. When using pressed air to clean up filter core or radiator, always wear goggles, dust-preventive mask, gloves and other protective items.



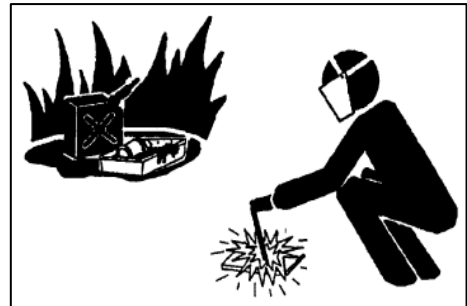
1.4.4 Use hammer

- When using a hammer, pins may fly out or metal particles may be scattered. This may lead to serious injury, always do as follow.
 - ◆ When using a hammer to hit hard metal parts, say pins, bucket teeth, cutting edges or bearings. There involves some hazards that pieces may be scattered and lead to injury. Always wear goggles and gloves.
 - ◆ When hitting pins or bucket teeth, there may be some hazards that broken pieces may fly out causing injury to surrounding persons. Make sure the surrounding area is off limits to the other people.
- When hitting the pins with tough force, there are some hazards that pins may fly out causing injury to surrounding people.



1.4.5 Welding and grinding precautions

- Welding operation can generate flame and gas. Operate must be therefore carried out in well-ventilating area with complete preparation.
- Store flammable substance in safe place prior to welding operation.
- Use only qualified person to carry out welding operation, never allow any unqualified personnel to carry out welding operation.
- Sparks may occur during grinding. Place flammables in safe place prior to grinding operation.
- With welding and grinding operation is made, recheck worksite and its surrounding area for any abnormal signs e.g. spark, smoke etc.



1.4.6 Avoid heating pipeline containing flammable gas

- Do not carry out welding or gas cutting operation to any pipelines containing flammable liquids.
- Use non-flammable solvent to remove all flammable liquids prior to welding or gas cutting.

1.4.7 Avoid heating around hydraulic pressure pipeline



Warning: Heating around hydraulic pressure pipe will cause flammable spray causing serious scald to yourself or bystanders.

- Do not carry out any welding, gas welding, gas cutting or heating operation around hydraulic pressure pipe or other flammable material.



1.4.8 Remove paint prior to welding or heating operation

Paints might be heated during welding or gas cutting operation and generate harmful gases. Inhaling these gases may cause nausea.

- Avoid generating any potential harmful gas and dust.
- Carry out painting operation outdoor or in ventilating area. Dispose of paint solvent properly.
- Remove paints prior to welding or heating operation.
- When using grinder or sand paper to remove paints, always wear proper inhaler to avoid inhaling dust.
- In case of removing paints with solvent, use soap to remove solvent prior to welding as well as to clear all solvent and its container or other flammables. Offer at least 15 minutes for volatilization prior to welding or heating.



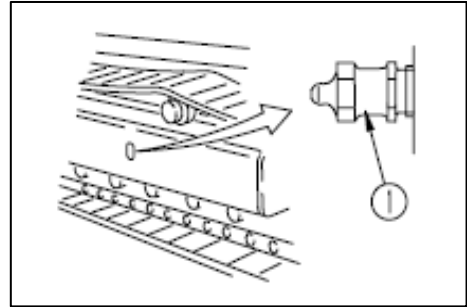
1.4.9 Accessories

There are some hazards that those stored accessories say bucket, breakout hammer might fall off to cause serious injury.

- Store accessories and equipment to avoid falling off. Take necessary measures to prevent children and unauthorized personnel from entering storage area.

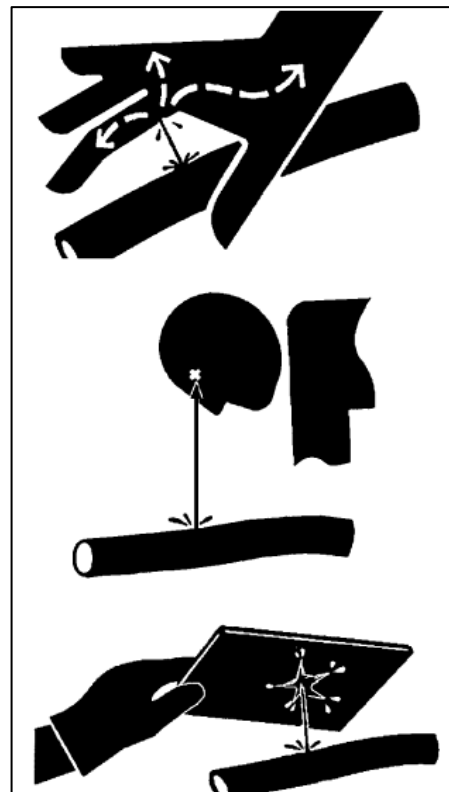
1.4.10 Maintenance precaution of track tension mechanism

- Grease is being pumped into track tension adjustment system under high pressure. During adjustment operation, if the specified maintenance procedures are not followed, the lubricating grease drain plug (1) may fly out leading to serious injury and damage.
- When loosening grease drain plug (1) to loosen the track tension. Never loosen it more than one turn. Loosen the grease drain plug slowly.
- Never put your face, hands, feet, or any other part of your body close to grease drain plug (1).
- Recoil spring assembly contains a compression spring which serves as a shock absorber for the idler. If it is disassembled improperly, spring may fly out and cause serious injury and even death. Do not disassembly recoil springs.



1.4.11 Safety rules for high-pressure oil

- Hydraulic system is always under internal pressure. When inspecting or replacing piping or hoses, always check that the pressure in the hydraulic circuit has been released. If the circuit is still under pressure, it will lead to serious injury, so always do as follow.
 - ◆ Never attempt any inspection or replacing operation if hydraulic system is under pressure.
 - ◆ If there is any leakage from piping or hoses, the surrounding area is wet, so check for cracks or swelling in the hoses. When carrying out inspection, wear goggles and leather gloves.
 - ◆ High pressure oil leaking from small holes may penetrate your skin or cause blindness if it contacts your eyes. If you are hit by a jet or high pressure oil and suffer injury to your skin or eyes, wash the place with clean water, and consult a doctor immediately for medical attention.



1.4.12 Safety handling high-pressure hoses

- If oil or fuel leaks from high-pressure hoses, it may cause fire or defective operation, which may lead to serious injury. If any loose bolts are found, stop work and tighten to the specified torque. If any damaged hoses are found, stop operations immediately and contact your SUNWARD distributor.
- ◆ Damaged hose, deformed mouthpiece, damaged o-ring.
- ◆ Frayed or cut covering or exposed reinforcement wire layer.
- ◆ Covering swollen in places.
- ◆ Twisted or crushed movable portion of hose.
- ◆ Foreign material embedded in covering.



1.4.13 Accumulator

Accumulator is charged with pressurized nitrogen. When handling accumulator, careless operation may lead to explosion and cause serious injury or damage. Always follow the following instructions.

- Do not disassemble accumulator.
- Do not keep accumulator close to fire or expose it under flame.
- Do not drill holes, weld or heat up on accumulator.
- Do not hit or roll accumulator to avoid any shock on it.
- When handling accumulator, bleed the air.
- Please contact SUNWARD dealer to get assistance with this work.

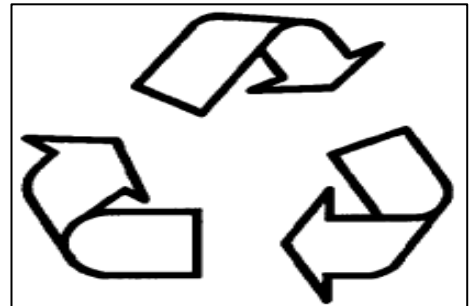
1.4.14 Prevent accumulator explosion

- Do not allow any litten matches or other flame to approach accumulator upper side. Failure to do so may cause explosion.
- Use voltmeter or hydrometer to measure electricity; do not measure the electricity of battery by short circuiting.
- Do not use or charge the battery if the battery electrolyte level is below specific volume. Failure to do so will cause battery explosion.
- Do not charge frozen battery, failure to do so may cause explosion. Heat the battery up to approx. 16°C.
- The electrolyte is toxic. In case of explosion, electrolyte may splash into eyes and cause blindness. When inspecting electrolyte density, always wear protective goggles.



1.4.15 Waste disposal

- To prevent pollution, pay attention to the manner of disposing of waste materials.
 - ◆ Always put oil drained from your machine in containers. Never drain oil directly onto the ground or dump into the sewage system, rivers, the sea, or lakes.
 - ◆ When disposing of harmful objects such as oil, fuel, coolant, solvent, filters, and batteries. Obey appropriate laws and regulations.



2 Transportation and storage



Warning

Before reading this chapter, please thoroughly read and fully understand the contents described in chapter “SAFETY RULES” in this manual.

2.1 Transportation

2.1.1 General transportation instruction

- Before using trailer to transport machine, contact local traffic department to confirm relevant regulations, make sure that machine's overall length, width, height and weight are within allowed spec.
- If there are any dimensions out of spec, obtain special permission from relevant government agencies or dismantle the machine into smaller unit to transport.
- Select proper transportation tools according to machine's weight, length, width and height.
- Survey the traffic condition for transportation in advance, e.g. road condition and width, height of bridges and tunnels as well as the limits of weight and traffic regulation etc.

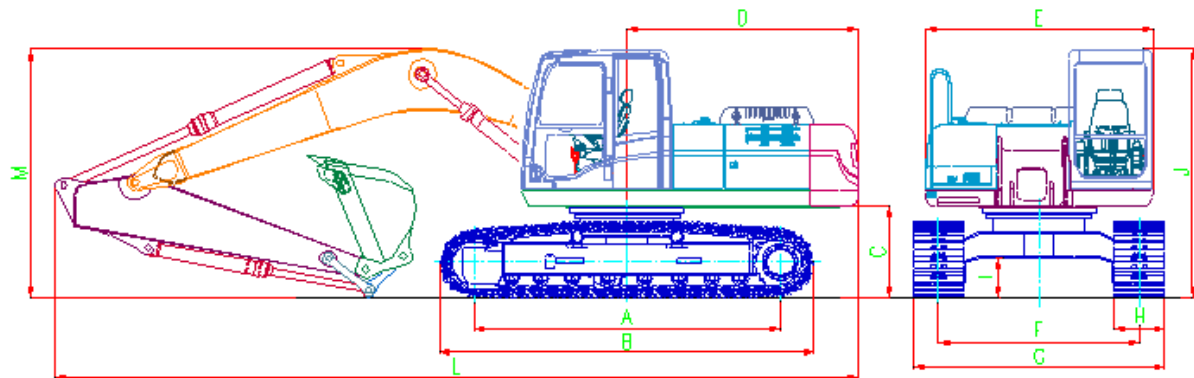


Please note:

- ◆ Transportation weight and dimension of the machine may change with different configuration of the front
- ◆ Device and accessories.

2.1.2 Transportation specification

Transportation parameters are as following picture:



The specific dimension in transport parameter and outline dimensional drawing are shown in section 5(Technical specification).

2.1.3 Loading or unloading with trailer

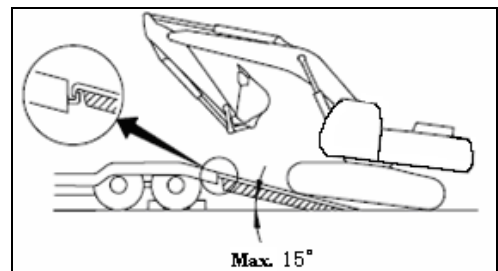
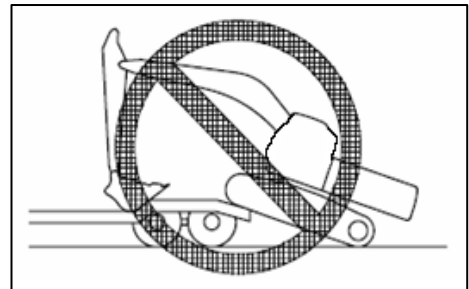


Warning

- ◆ When loading or unloading, do not go at idle speed mode to prevent sudden change in speed.
- ◆ Set travel speed at low position. Do not attempt any travel speed switching operation to avoid that sharp change of speed and over-speed cause danger. Always keep the machine travel at low speed.
- ◆ Be sure engine runs at low speed, adjust throttling knob to keep the engine run at low speed.
- ◆ When loading or unloading, do not attempt any steering operation. At which moment, steering operation is extremely dangerous. The machine is subject to rolling over. If the machine needs to change direction, go back to level ground or trailer platform, then revise travel direction and cross the slope.
- ◆ Do not attempt any other operations (e.g. steering and moving work equipment etc) on slope. Allow only travel operation.
- ◆ Because it's a raised shape at the place where ramp intersects the flats. Pay attention to pass it: the slope should not exceed 15°.
- ◆ Prevent the machine from tipping over and other damages due to upper-structure slewing. Lower the boom, fold arm and bucket and slew the

upper-structure slowly to get the optimum stability.

- ◆ Clean up the track, slope of the trailer and loading surface to prevent hazards resulting from obstacle and oil



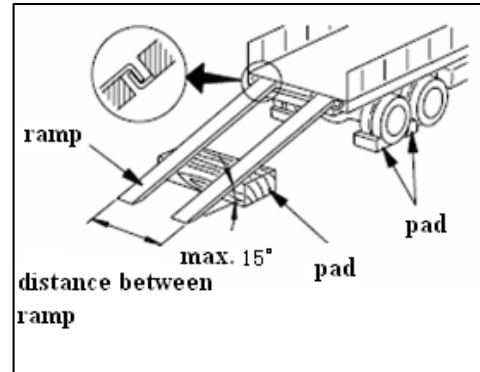
2.1.4 Loading



Note

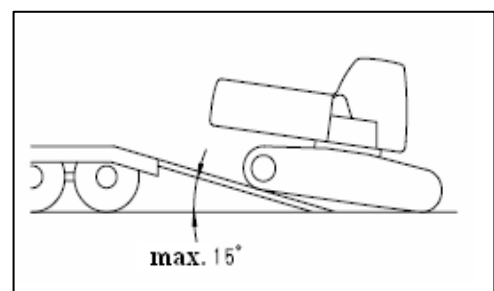
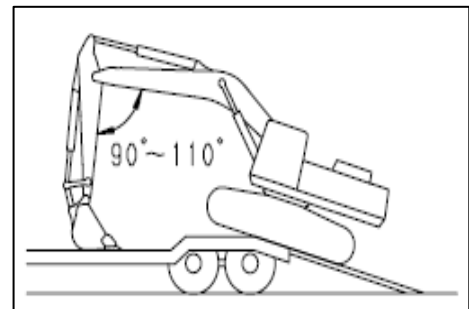
- ◆ Load the machine only on firm, level ground and keep a safe distance with the road shoulder.
- ◆ Chock the machine to prevent the machine movement during loading process.
- ◆ The ramp for loading must have enough strength and width with an maximum slope of 15° , be sure both side of the ramp is at equal level so that machine could travel safely.

the working equipment face backside of the machine.



Loading operation

- Switch off idle speed, set engine speed to low speed by means of fuel control knob.
- Set travel speed selector to low speed position.
- Machine direction: When loading, if machine is equipped with working device, keep the working device at the front of the machine and travel forward. If no working device, travel in reverse to load the machine.
- Align the direction of the machine with the ramp: be sure the center line of the machine track matches that of the ramp and travel slowly.
- Lower the working equipment as much as possible without causing any interference on the machine. When traveling on slope, operate only the travel lever; never operate the other lever or pedal.
- When the machine travels over the rear wheels of trailer, travel the machine slowly so that the smooth change of machine position (from grading to level) is possible. pay attention not to make working equipment hit trailer.
- When the machine travels to the middle of the trailer, slew the upper-structure 180° making

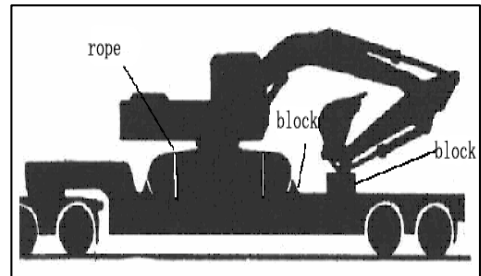


2.1.5 Secure the machine



Note

- ◆ Secure the chains or slings to the machine frame. Do not place the chains and slings across or press on the hydraulic piping or hoses.
- When placing the machine on the specified position of the trailer, fold working equipment to transportation configuration, lower the boom, place an wooden block under bucket cylinder to prevent damages to it during transportation.
- Pull the pilot safety lever to LOCK position, stop the engine, remove engine starting key, and lock the cab door securely.
- Chock the front and rear position of the track to prevent machine movement during transportation.
- Fix the four corners of the machine and front accessories to the trailer with chains or wire ropes.
- Raise the ramp located on the rear part of the trailer then fix it.

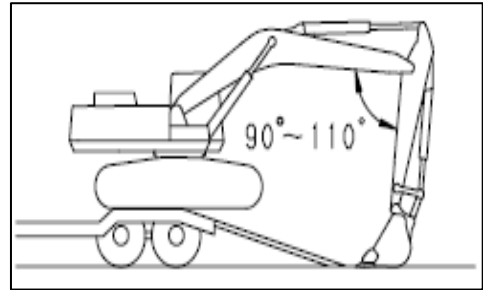
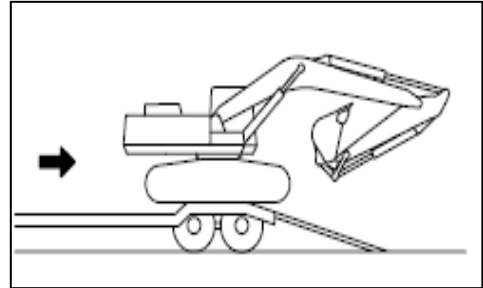


2.1.6 Unloading



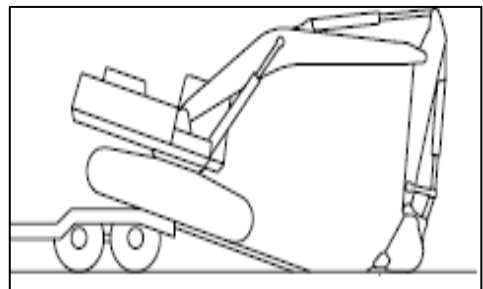
Note

- ◆ Load the machine only on firm, level ground and keep a safe distance with the road shoulder.
- ◆ Chock the machine to prevent the machine movement during loading process.
- ◆ The ramp for loading must have enough strength and width with an maximum slope of 15° , be sure both side of the ramp is at equal level so that machine could travel safely.
- ◆ In case of cold weather, fully warm up the machine.



Unloading procedure

- Switch off idle speed function, set travel speed to low speed position, adjust engine throttle knob to set engine speed at low speed.
- Raise boom to proper height.
- Align the center line of machine track with that of ramp and travel slowly.
- When machine is over the rear wheels of the trailer, operate on the machine slowly so that the machine could transfer to the ramp smoothly.
- When on the ramp, adjust working equipment angle so that the angle of boom and arm is within 90° - 110° . Lower the bucket to the ground until the machine leave ramp.



2.1.7 Lifting procedure for the machine

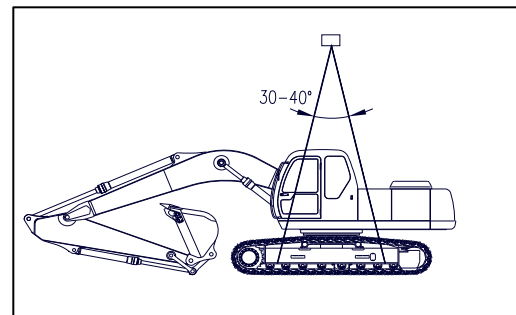
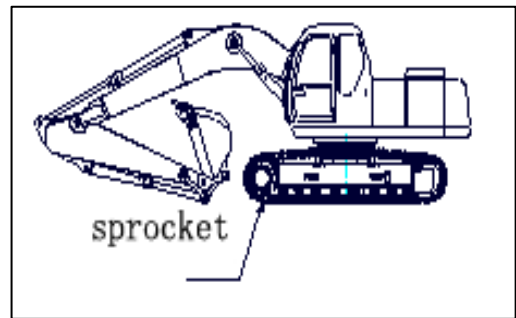


Note

- ◆ Never raise the machine with any worker on it.
- ◆ Make sure the wire rope has sufficient strength for the weight of the machine. The service condition must be in accordance with relevant forced standard.
- ◆ Swing the working equipment to the sprocket end, set the undercarriage and upper structure parallel. Do not swing to the other direction.
- ◆ Do not lift the machine in any posture other than the posture given in the right fig.
- ◆ When lifting, keep the machine horizontal. Never walk under the machine.
- ◆ This lifting procedure applies to machine with standard specifications.
- ◆ To get the lifting methods information for the machines equipped with other accessories or optional devices, please contact SUNWARD or our distributor.

Machine lifting operation

- Set work equipment to the sprocket side. Extend arm cylinder and bucket cylinder to their end of stroke, operate boom cylinder and lower the work equipment to the ground.
- Stop the engine, remove the key and lock cab doors and windows securely.
- Use steel rope and support rod with sufficient length to keep them not to hit machine during lifting operation. Cover steel rope or rod with protective material to avoid damages to machine if necessary.
- Put steel ropes through the place between the first and second track rollers on both side of the machine.
- Adjust steel rope to keep the lifting angle within 30 to 40°.
- Lifting the machine gradually, check that it's balanced. Make sure to keep machine at level, otherwise re-adjust steel rope until it's at level.

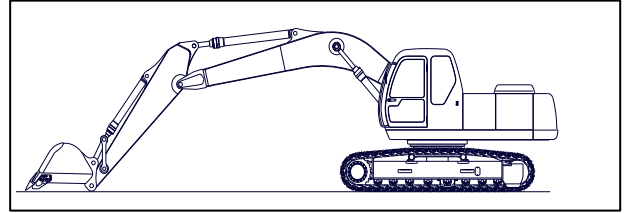


2.2 Storage



Note

- ◆ To protect the hydraulic cylinder piston rod while in storage, keep the work equipment in the fig shown at right. (This prevents rust from developing on the piston rod).



2.2.1 Before storage

- Clean and wash all surface and exposed parts.
- Apply grease to all lubricating parts until fresh grease spills out.
- Change engine oil.
- Apply grease to exposed parts on piston rod.
- Top up fuel tank with diesel oil.
- Disconnect battery negative terminal and secure battery cover. You can also remove the battery from the machine, store it separately.
- If the expected ambient temperature may below 0°C (32°F), mix coolant with anti-freezing liquid.
- Select proper storage position: The machine must be kept at well-ventilated indoor place, if the machine has to be stored outdoors, select level, firm ground and cover the machine with a sheet.

2.2.2 During storage



Note

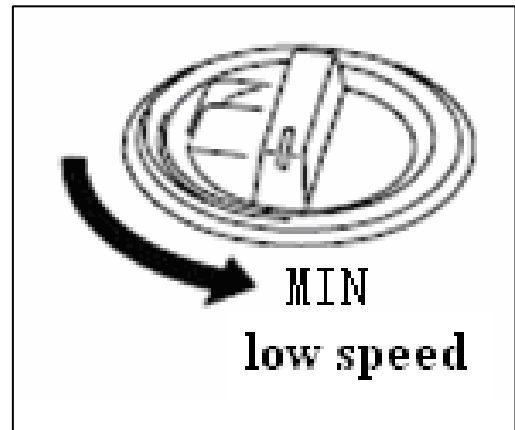
- ◆ When it's necessary to perform the rust-preventive operation while the machine is at indoor, open the doors and windows to ventilate and prevent gas poisoning.
- During storage, operate the machine to travel, swing and dig for 2 to 3 cycles at least once a month so as to lubricate machine, and charge the machine battery.
- Before operating, check cooling water level and lubrication status.
- Air condition must run once a month.

2.2.3 After storage



Note

- ◆ Start engine only in well-ventilated condition.
- Remove lubricating grease on piston rod surface.
- Apply grease to all lubricating parts.
- Check engine oil level, keep it in specified level, if not, and refill engine oil. If some water is found to mix in the oil, replace it.
- Check fuel level and bleed the air.
- Check its level to ensure that it is with the standard range.
- Start and run the engine at half speed for several minutes before operation with full load.
- Cycle all hydraulic function for several times.



3 Operation

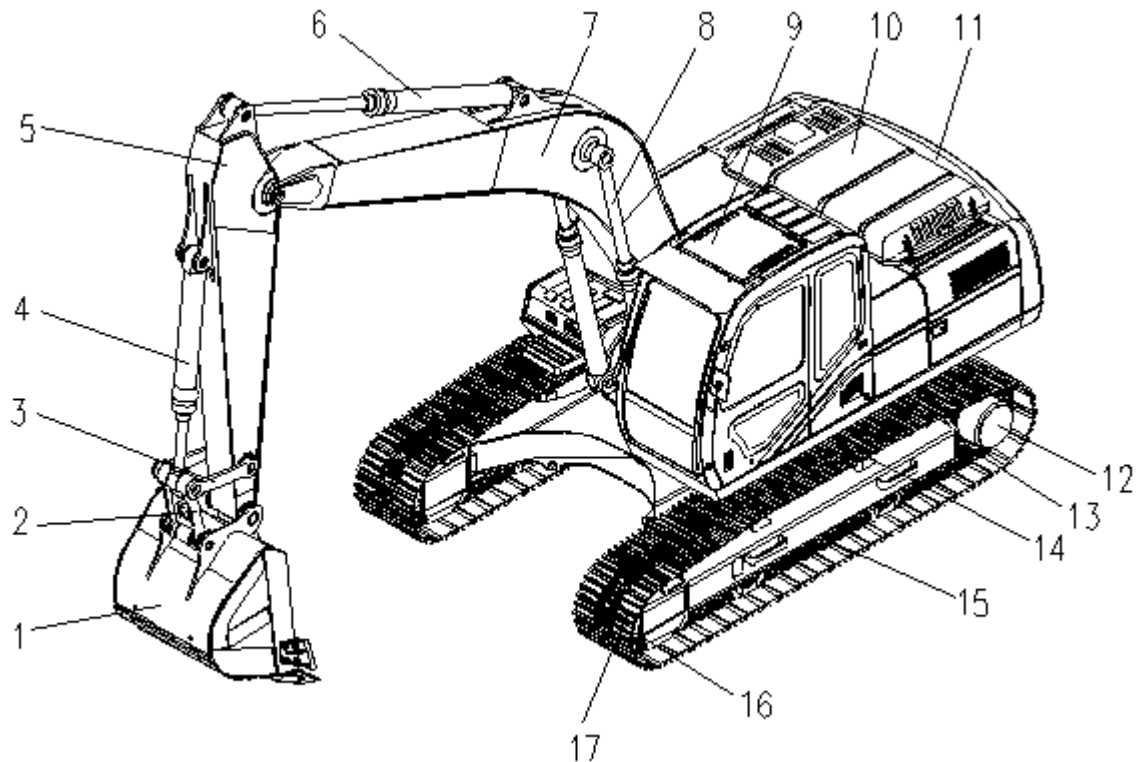


Warning

Before reading this chapter, please thoroughly read and fully understand the contents described in chapter “SAFETY RULES” in this manual.

3.1 Overall machine view

- To operate machine safely and properly, it's crucial to fully understand the machine's individual structure and operation methods for controlling equipments, as well as the presented meaning.



1、 bucket

2、 bucket link

3、 idler link

4、 bucket cylinder

5、 arm

6、 arm cylinder

7、 boom

8、 boom cylinder

9、 cab

10、 engine cover

11、 counterweight

12、 travel motor

13、 sprocket

14、 carrier roller

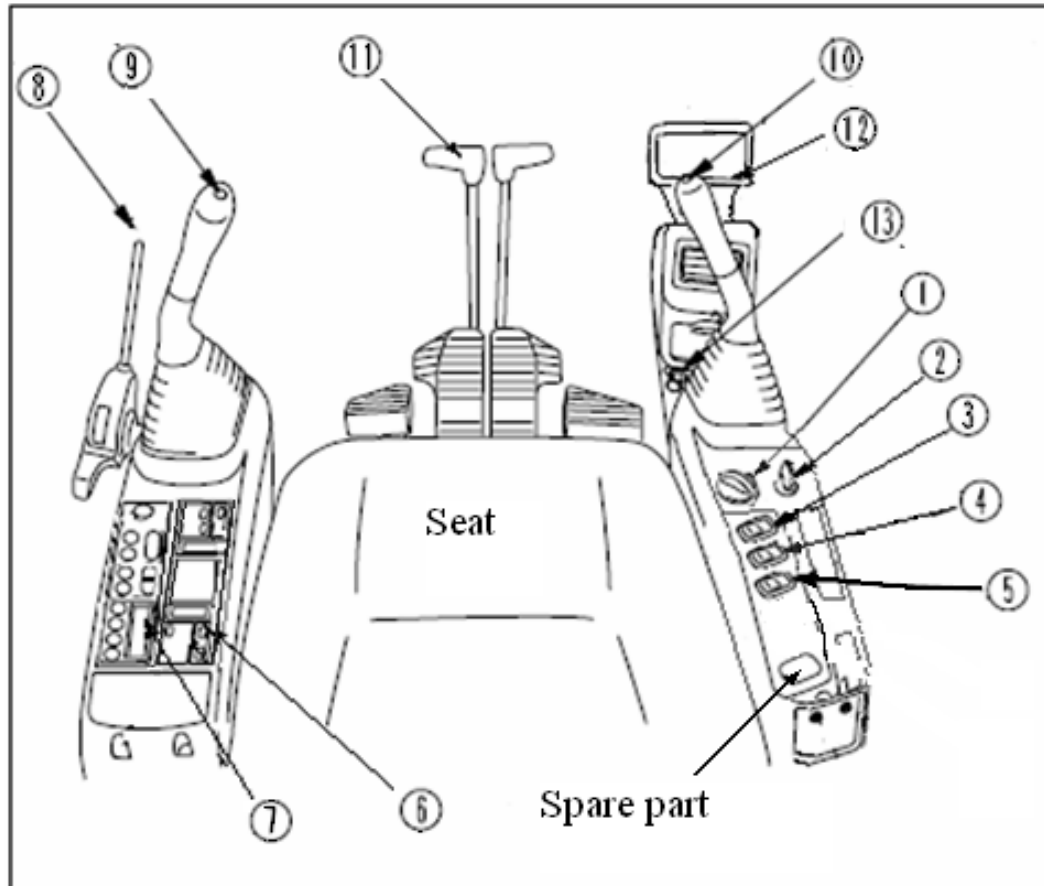
15、 track roller

16、 idler roller

17、 track

3.2 Control and gauges

3.2.1 View illustration



1 — throttle control button

2 — start switch

3 — work light switch

4 — wiper switch

5 — scrubber switch

6 — conditioner control panel

7 — radio

8 — pilot safety control lever

9 — left pilot control handle (with manual idle switch)

10 — right pilot control handle (with horn switch)

11 — travel control lever

12 — monitor

13 — cigar lighter

3.2.2 Pilot safety lock lever

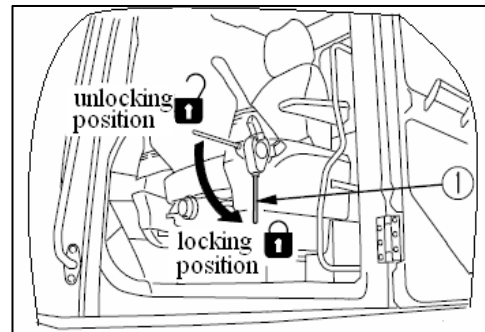


Warning

- ◆ When leaving the cab, always set the pilot safety lock lever (1) to LOCK position. Failure to do so as well as to touch the lever accidentally, serious injury may occur.
- ◆ If the safety lock lever is not set to LOCK position, there is a possibility that it will move and lead to serious accidents or injury. The specification of these control levers is shown in fig.
- ◆ When operating the safety lock lever upward or downward, pay attention not to touch the other control levers.

Pilot safety lock lever is a device being used to lock up working equipments and control levers for swing, travel and accessories (if equipped). Pull the lever to lock up. .

Pilot safety lock lever is pilot hydraulic lock device. Even if it's in locked position, the control lever for working equipment and travel control lever are movable. But working equipments, travel motor and swing motor stop.

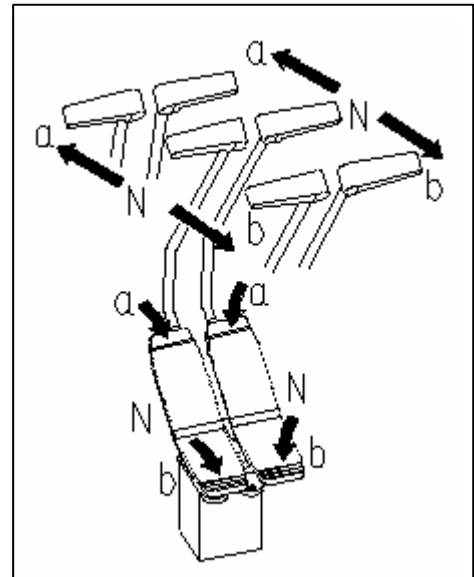


3.2.3 Travel control lever



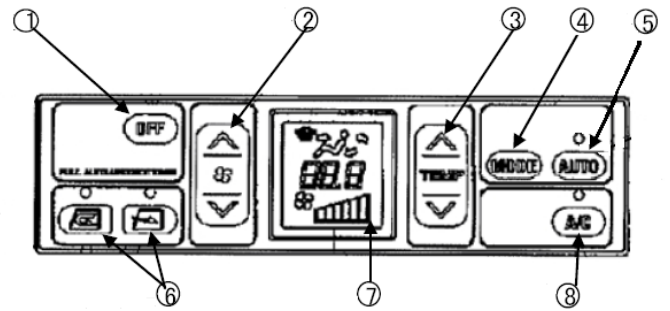
Warning

- ◆ Do not rest your feet on pedal unless the machine travels. If resting your feet on the pedal and stepping down on it accidentally, a sudden movement of the machine may occur and lead to serious accidents.
 - ◆ Only if the idle roller is under the cab, the machine travel direction corresponds to operation direction of lever.
 - ◆ When the machine is traveling, sudden steering can cause damage to machine.
- Travel control lever (2) is being used to control machine's travel.
 - (a) forward:
Push lever forward
(pedal forward tilting)
 - (b) reverse:
Pull lever backward
(pedal backward tilting)
 - (N) neutral: Machine stops
(pedal stays the middle position)
 - For the machine with travel alarm equipment(if present),if setting the lever from neutral position to forward or reverse position, alarm device will sound to alert that the machine is about to travel.
 - Travel control lever is involved in auto-idle speed function of this machine.



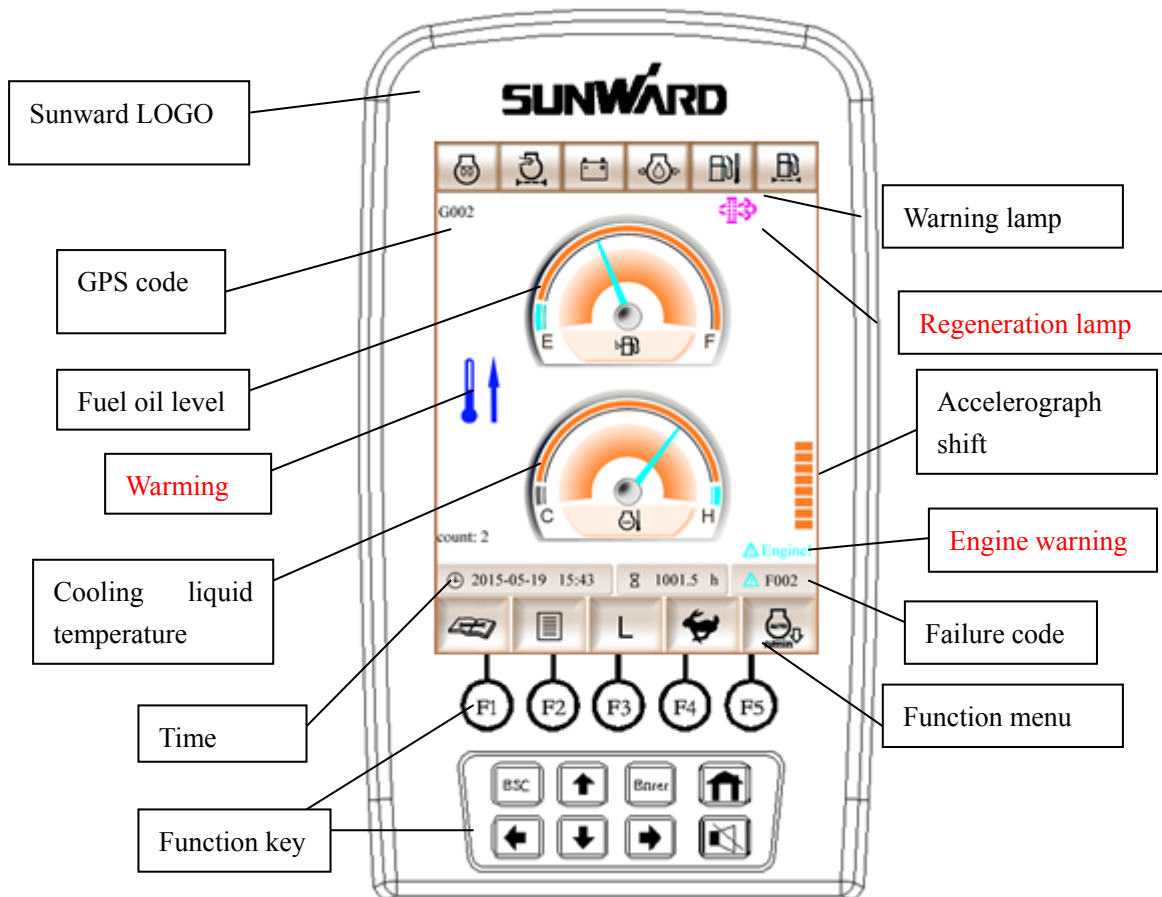
3.2.4 Air condition control panel

- 1 — close button
- 2 — wind speed switch
- 3 — temperature setting switch
- 4 — air outlet mode setting switch
- 5 — auto mode setting switch
- 6 — inner/exterior air-in switch
- 7 — liquid crystal display screen
- 8 — air conditioner start/close switch



3.2.5 Multifunction monitor system

3.2.5.1 Main interface



In this interface:

- (1) Press F1 and enter into maintenance information interface. **This icon will turn red if machine need to maintenance.**
- (2) Press F2 and enter into menu interface.

- (3) Press F3, then display mode will switch among L、S and H. The icon of mode L is **L**,
The icon of mode S is **S**, The icon of mode H is **H**.

Attention: L is light load mode, S is standard mode, H is heavy load mode.

- (4) Press F4, travel speed is switched between high speed and low speed, icon of travel low speed is , icon of travel high speed is .
- (5) Press F5, work state is switched between automatic idle and non-automatic idle, icon of

automatic idle is  icon of non-automatic idle is (grey) .

- (6) If the buzzer is ringing, please press muffle, Buzzer will go on to ring if there has different kinds of warning.

- (7) Warning indication light: When there has warning information, the corresponding warning light will be light, or the indication light will be not light.
- (8) LOGO means the English name of this company is sunward.



- (9) means fuel quantity, E means fuel is a little, F mean lots of fuel. The more fuel , the bigger of area of blue sector. When there is only one or no sector, it is corresponding red area of E and means the fuel is not enough, please fill in fuel.



- (10) means H/L of engine cooling water temperature, C means low water temperature, H means high water temperature. The higher water temperature, the bigger of yellow area of sector. When there is only one or no sector, it is corresponding white area of C and means low water temperature. Or red area of H means high water temperature.

- (11) GPS machine locked information^{G002}: it will display this information when GPS lock the machine, it has 5 states, or it will not display this cue information.
- (12) System time: 2015-5-19 10: 40 means May 19, 2015, twenty to eleven.

- (13) Work hour: display like this  1001.5 h , it means the machine worked for 1001.5 hours.

- (14)  means preheating, when machine is preheating, the icon is red, or is white.

- (15)  is warning icon means cooling liquid has high temperature, when system checked cooling liquid is high temperature, this icon is red, or is white.

- (16)  is warning icon means low fuel oil level, when system checked low fuel oil level, this icon is red, or is white.

- (17)  is warning icon means air filter is clogged, when system checked air filter is clogged, this icon is red, or is white.

- (18)  means is charging, when system checked battery is charging, this icon is red, or is white.

- (19)  means low engine oil pressure, when system checked low engine oil pressure, this icon is red, or is white.

- (20)  F002 is clue icon means system failure, when system checked system failure, this

icon is red, or is white.



(21) means the accelerograph shift, 1~10.



means the engine is warming icon. when machine is started if engine speed less than 1200rpm and the temperature of cooling water under 25C, then engine will turn to warming.



if press the one key idle button, this icon will show in this position. After start the warming icon, the engine speed is less than 1200 r and engine water temperature is less than 25 °C, the machine will enter into warming status, the icon is flash in the process of warming.

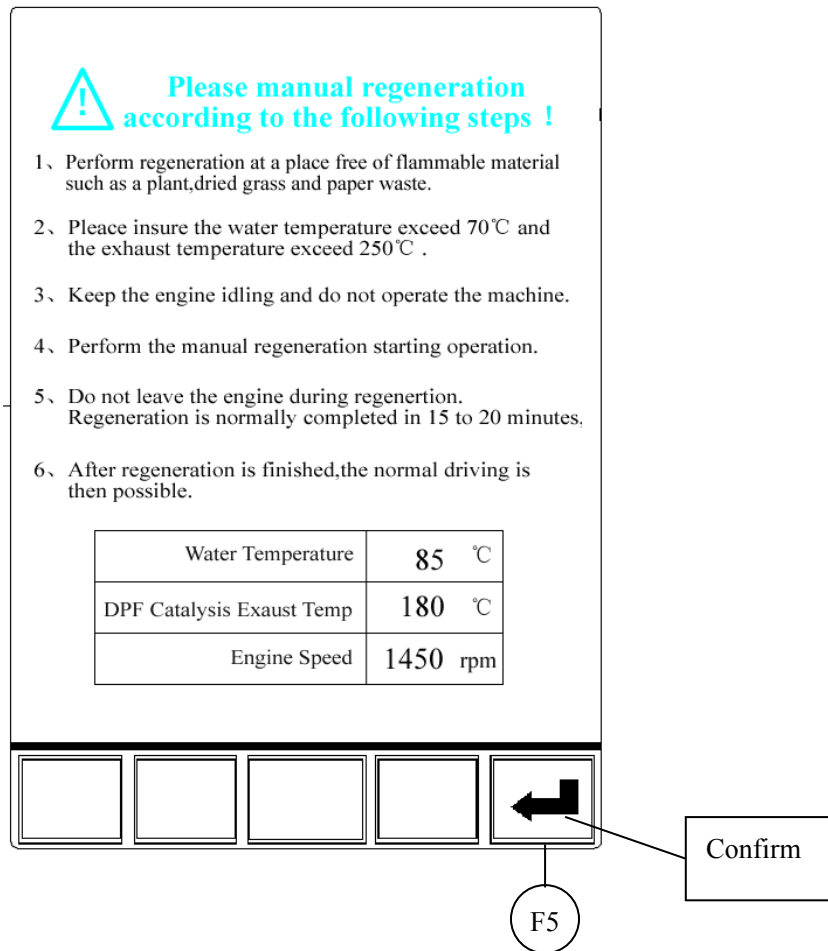


Press the idle speed switch, it will display, means the engine enter into idle speed.

3.2.5.2  means eight situations of regeneration, ① green is auto regeneration, ② yellow and buzzer is hand regeneration, ③ yellow and blink is hand regeneration require, ④ red and blink is emergency hand regeneration require.

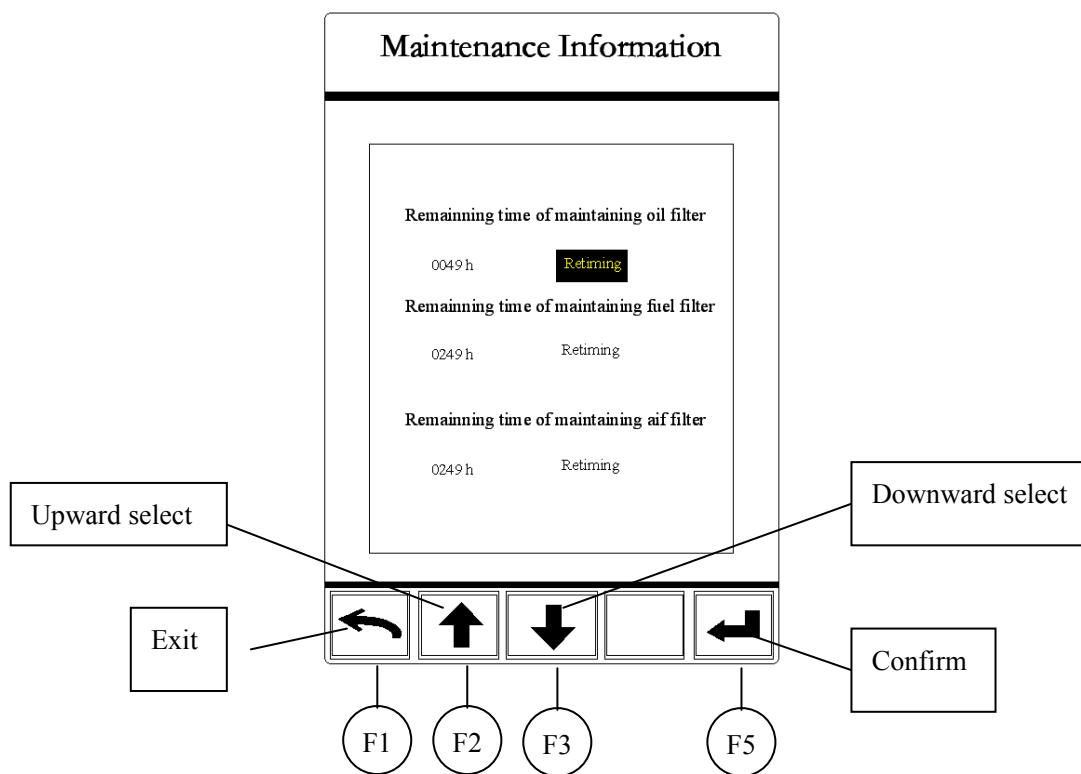
If hand regeneration require is appeared on the main interface, it will enter into the following interface:

3.2.5.3 In the following interface, if engine is entering into hand regeneration, system will return to the main interface, If operator press F5, system will return to main interface, but if engine still have the requirement of hand regeneration, system will enter into this interface in 5 minutes.



3.2.5.4 Interface 1 of maintenance information

Press F1 in main interface enter into interface 1 of maintenance information。

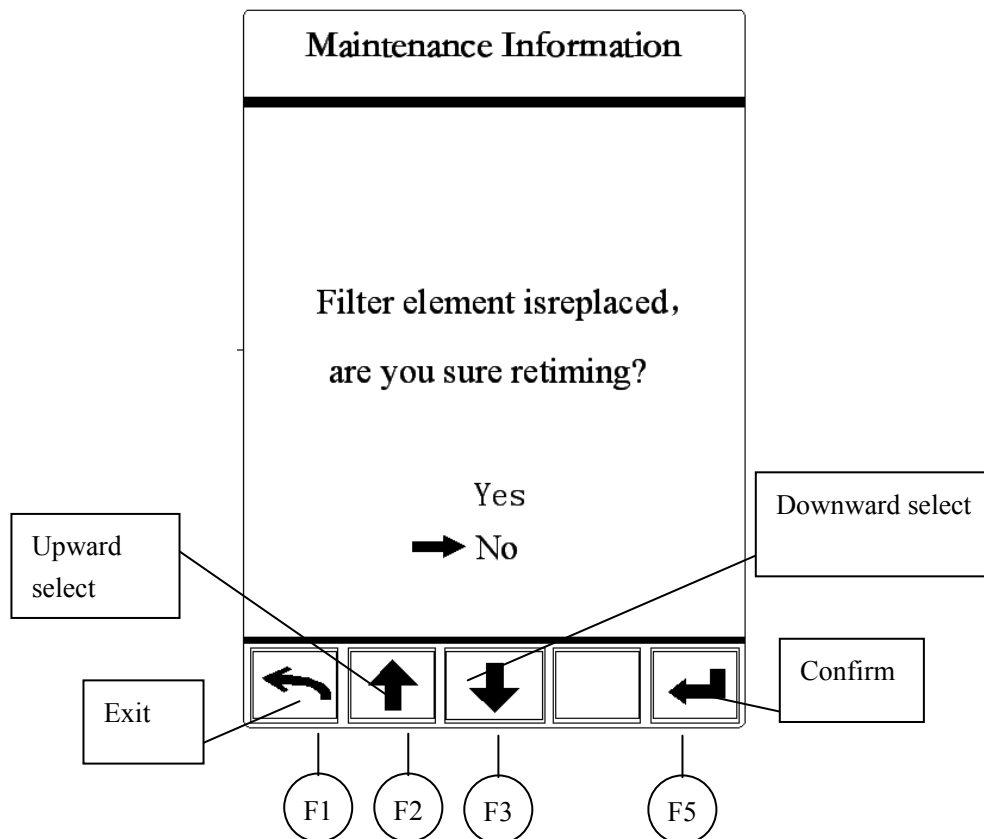


In this interface:

- (1) This interface display rest maintenance time of engine oil filter element、fuel filter element and air filter element. If there are no need to maintenance, please press F1.
- (2) After replaced engine oil filter element, press F5 set maintenance time again。
- (3) After replaced diesel oil filter element, press F5 set maintenance time again。
- (4) After replaced air filter element, press F5 set maintenance time again。
- (5) Press F2 or F3 switch among them。

3.2.5.5 Interface 2 of maintenance information

Press F5 in maintenance interface 1 enter into maintenance interface 2 .

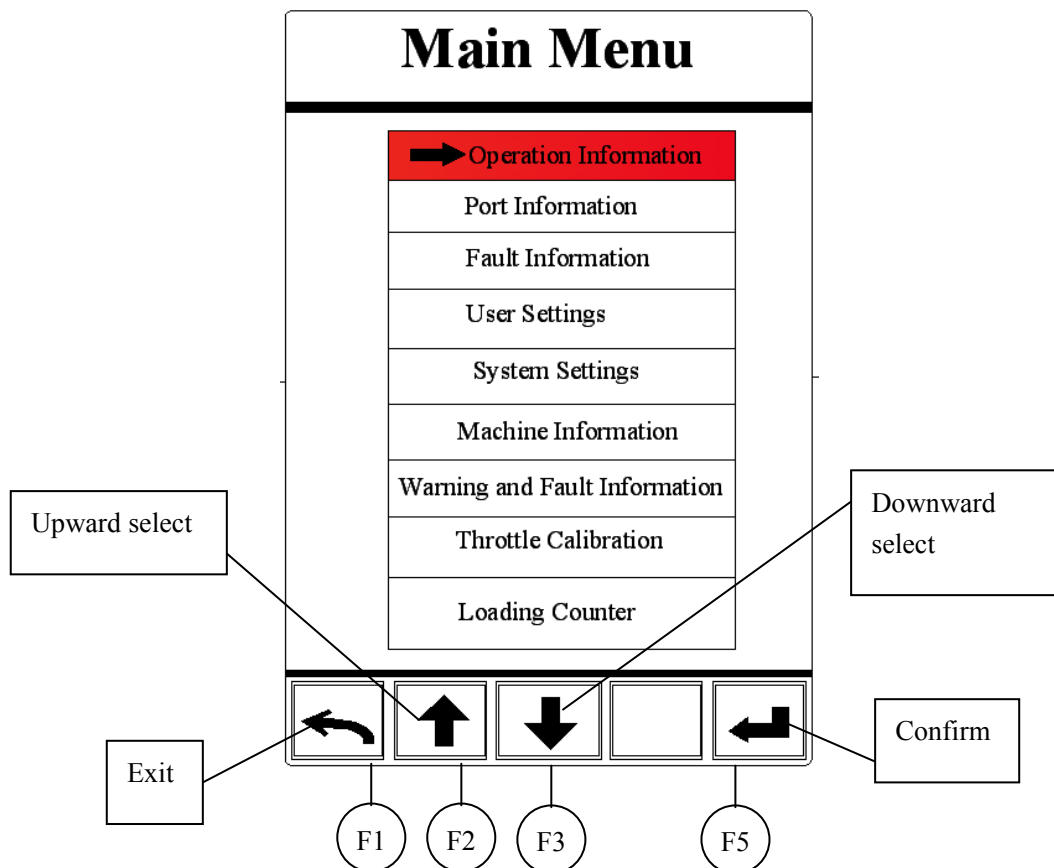


In this interface:

- (1) This interface is used to confirm for re-setting maintenance time of engine oil filter element、 fuel filter element and air filter element.
- (2) Press F5 is confirming for choice。
- (3) Press F1 exit this interface 。
- (4) Press F2 or F3 switch between Yes or No。

3.2.5.6 Menu interface

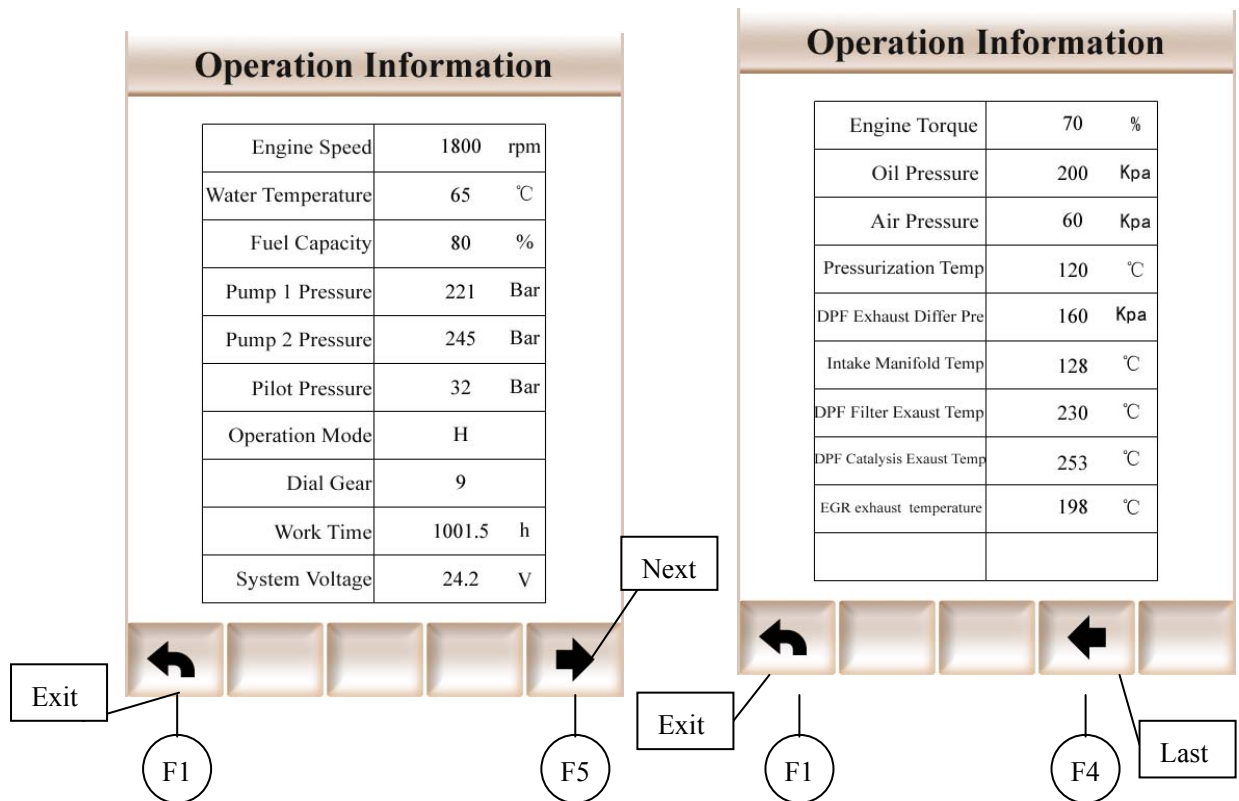
Press F2 in main interface enter into menu interface。



In this interface:

- (1) Included operate information、port information 、warning and failure information、user setting、system setting、machine information、history failure record、throttle calibration、loading technology.
- (2) Blue item is the current item。
- (3) Press F1 is exit。
- (4) Press F2 and F3 switch among menu items。
- (5) Press F5 enter into the selected item。

3.2.5.7 Operate information interface

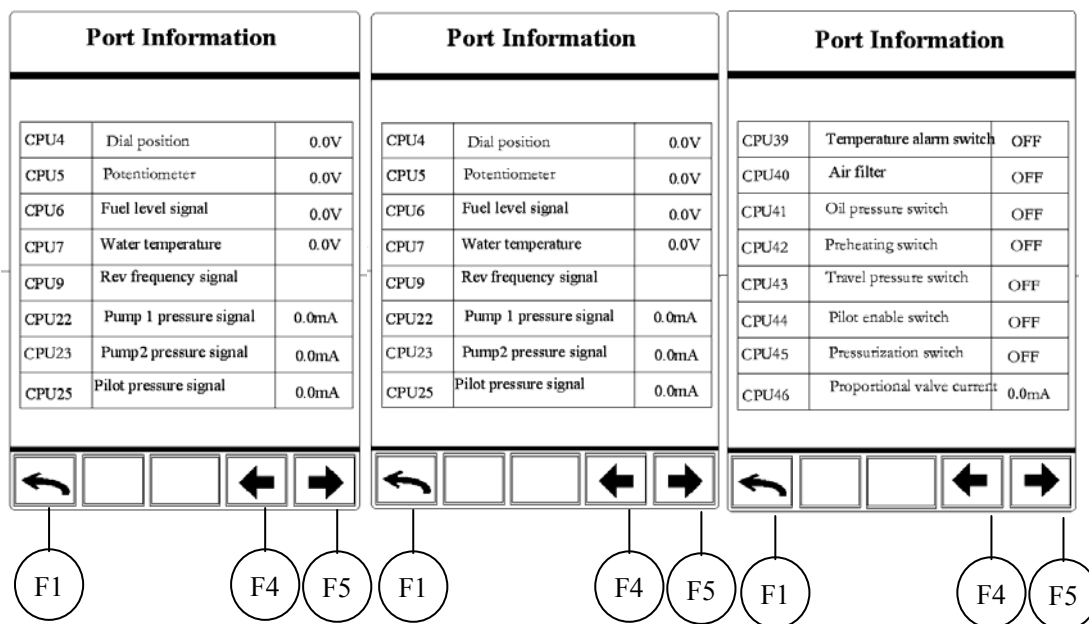


This interface display system operate information, in this two interfaces:

- (1) Display engine rev., cooling liquid temperature, fuel oil quantity, hydraulic pump pressure, power mode, work time, system voltage, pilot pressure and accelerograph shift.
- (2) Press F1 go back to menu interface.
- (3) Press F5 to next operate information interface.
- (4) Engine Torque, Oil Pressure, Air Pressure, Pressurization Temp, DPF Exhaust Temp, Intake Manifold Temp, DPF Filter Exhaust Temp, DPF Catalysis Exhaust Temp, EGR exhaust temperature.
- (5) Press F1 go back to menu interface.
- (6) Press F4 to last operate information interface.

3.2.5.8 Port information interface

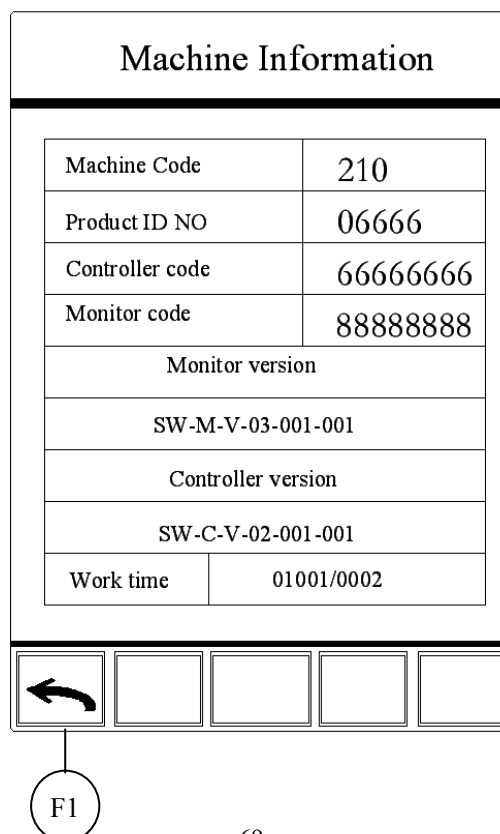
Press F5 to next operate information interface。



This interface display system port information, in this interface:

- (1) Included 3 interfaces, it has simulate signal and digital signal 。
- (2) Press F4 and F5 switch among 3 interfaces。
- (3) Press F1 go back to system menu interface。

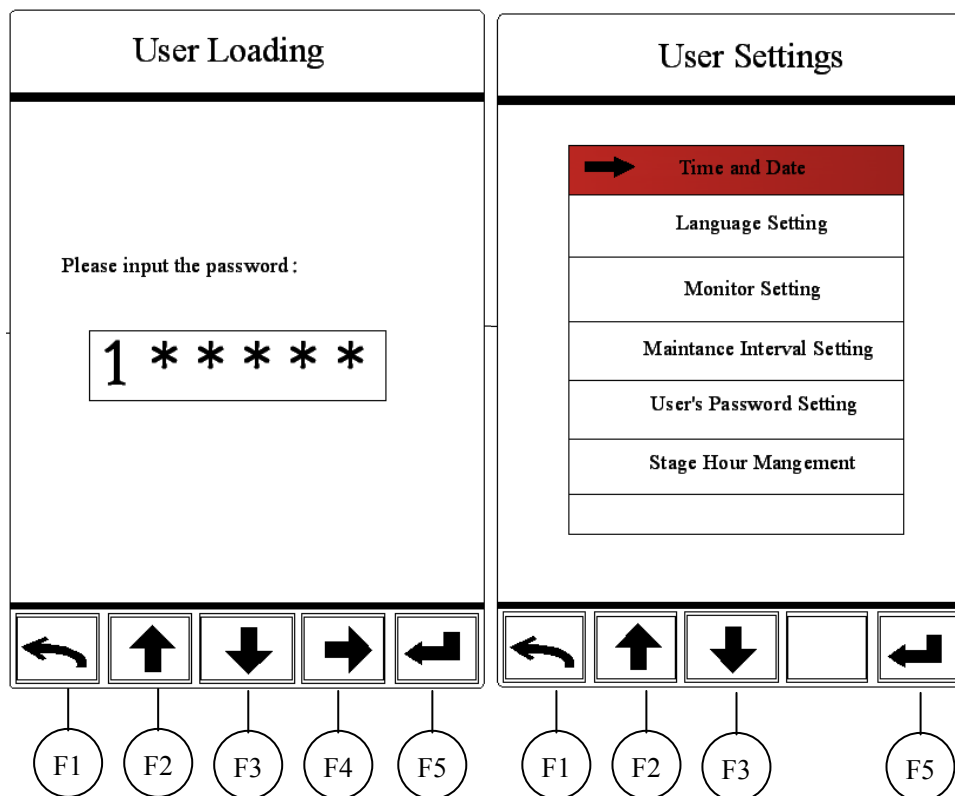
3.2.5.9 Machine information interface



In this interface:

- (1) Display machine mode、 machine code、 controller code、 indicator code and software version。
- (2) Press F1 go back to system menu interface。

3.2.5.10 User setting interface



Via to user setting interface, input correct password and then enter into user interface, in this interface:

- (1) In user setting interface, use F2 and F3 to input password, F4 used for selecting password digit capacity。
- (2) User setting interface is including clock setting 、 language setting、 display setting 、 maintenance interval time setting、 amend user password and stage hour management
- (3) Press F2 and F3 used select menu, press F5 enter into the selected menu.。

3.2.5.10.1 Clock setting interface

User Settings

Time and Date

Hour

Minute

Second

09:22:23

Year

Month

Day

3112/01/03

F1

F2

F3

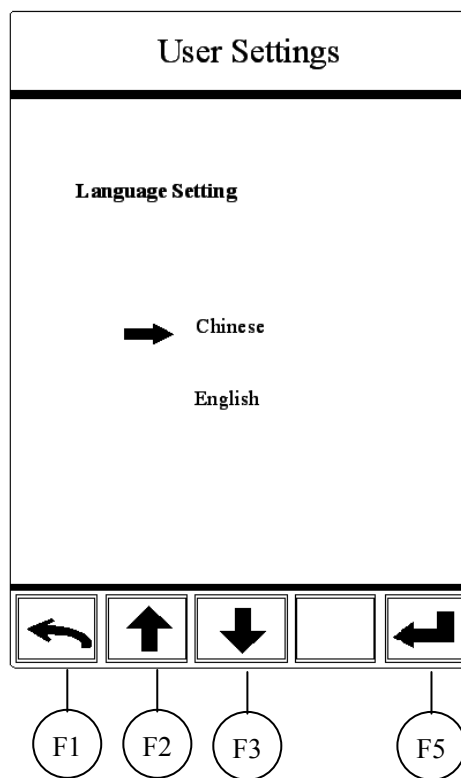
F4

F5

In this interface:

- (1) F4 is used to select amended parameter, F2 and F3 used to amend parameter, F5 is used for conforming the amended value, press F1 is exit.

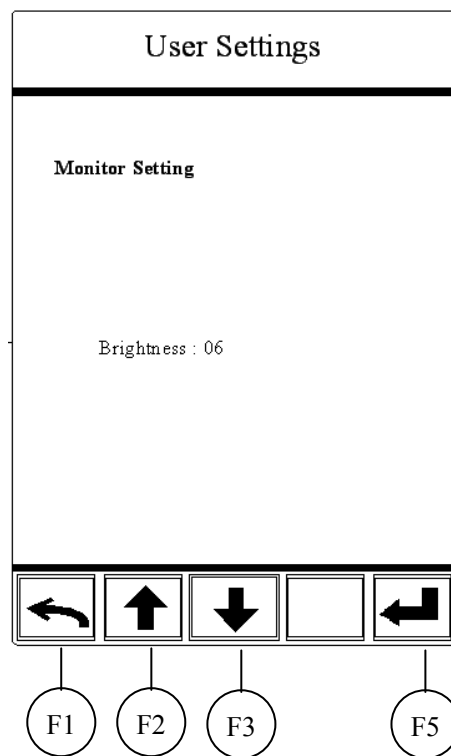
3.2.5.10.2 Language setting interface



In this interface:

- (1) Press F2 and F3 used to select language, F5 is confirming, F1 is exit.

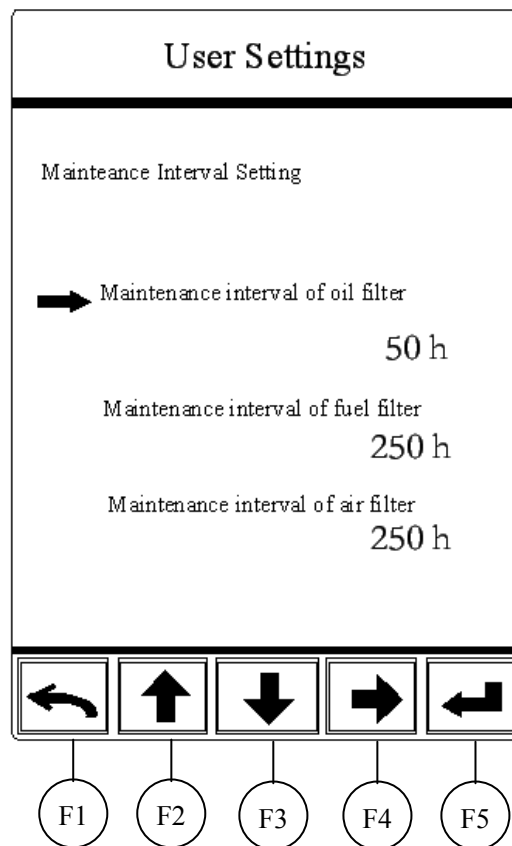
3.2.5.10.3 Screen luminance setting interface



In this interface:

- (1) Press F2 and F3 used to adjust luminance, F5 is confirming, F1 is exit.

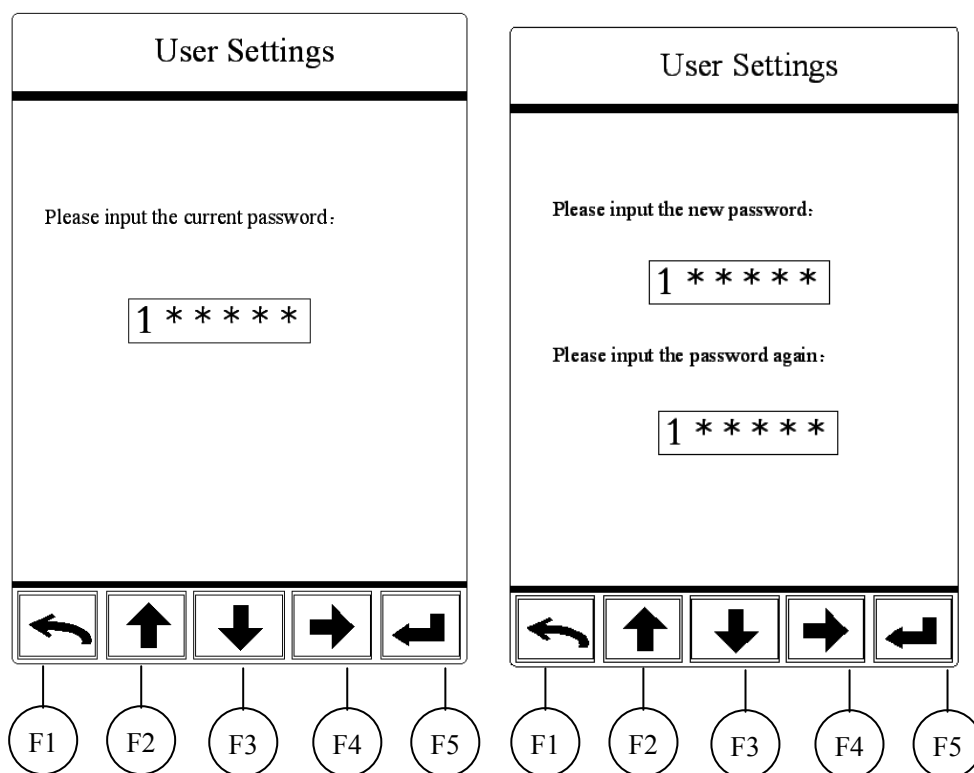
3.2.5.10.4 Screen luminance setting interface



In this interface:

- (1) Press F2 and F3 used to adjust interval time, F4 is used to select project which is need adjust, F5 is confirming, F1 is exit.

3.2.5.10.5 User password amend interface



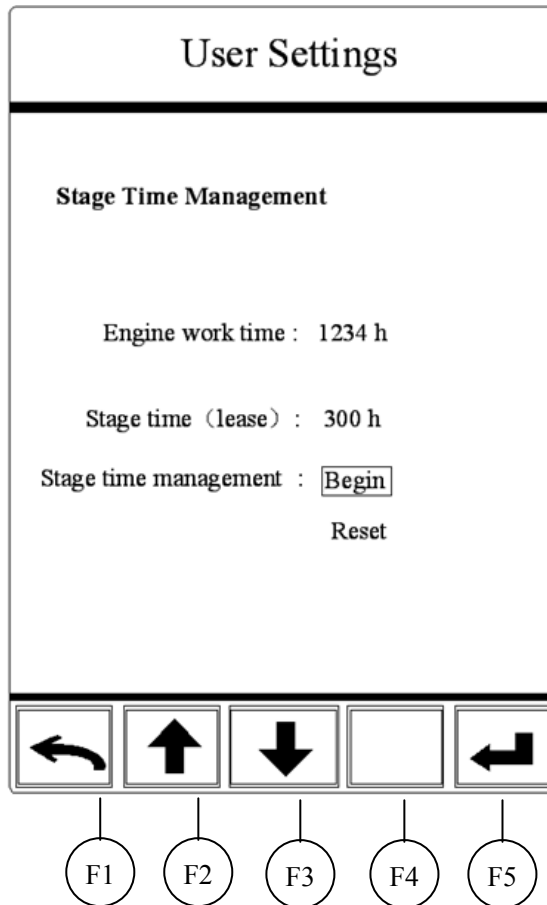
In this interface:

- (1) Press F2 and F3 used to amend password, F4 is used to select needed password digit capacity, F5 is confirming, F1 is exit. When input correct password, then you can set new password

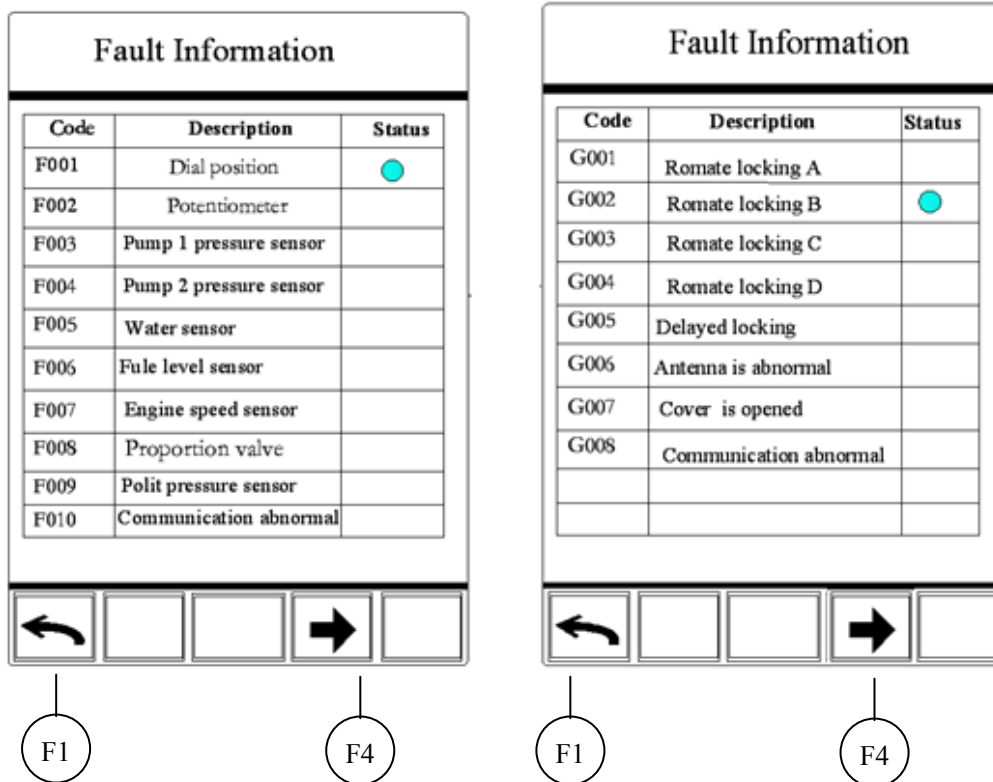
3.2.5.10.6 User password amend interface

In this interface:

- (1) F2 and F3 used to begin to time or time reset, when select begin to time, lease hour triggered, when select time reset, lease hour reset, press F5 confirm, press F1 exit.

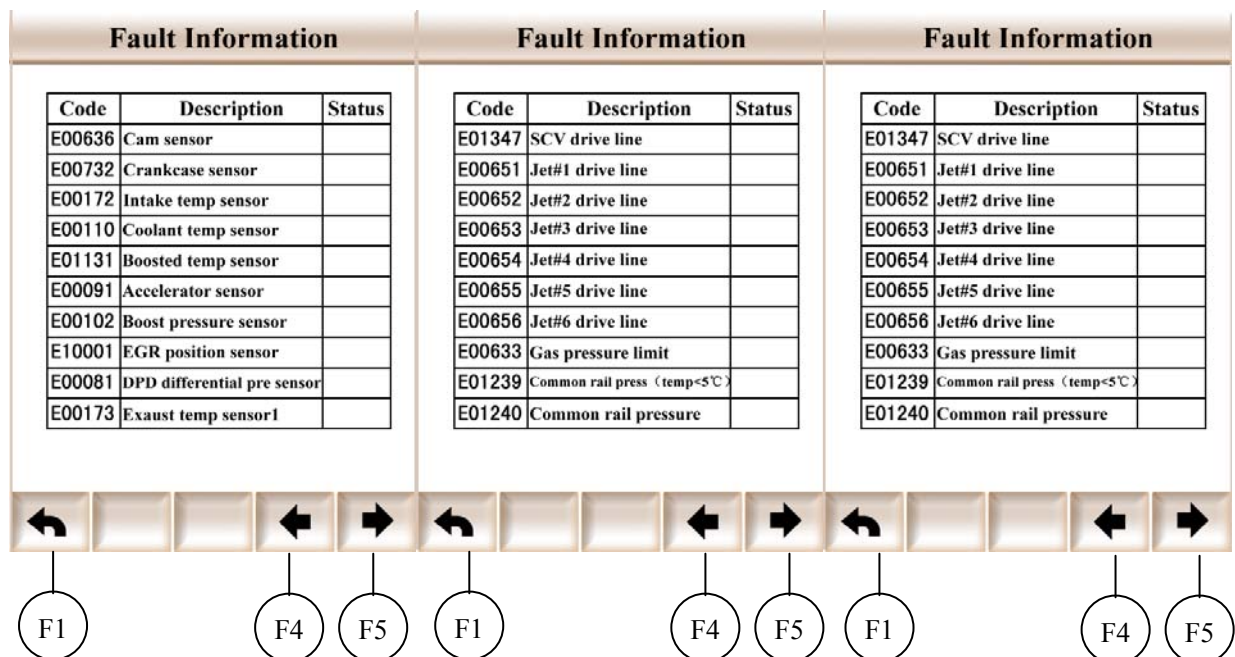


3.2.5.11 Warning and failure information interface



In this interface:

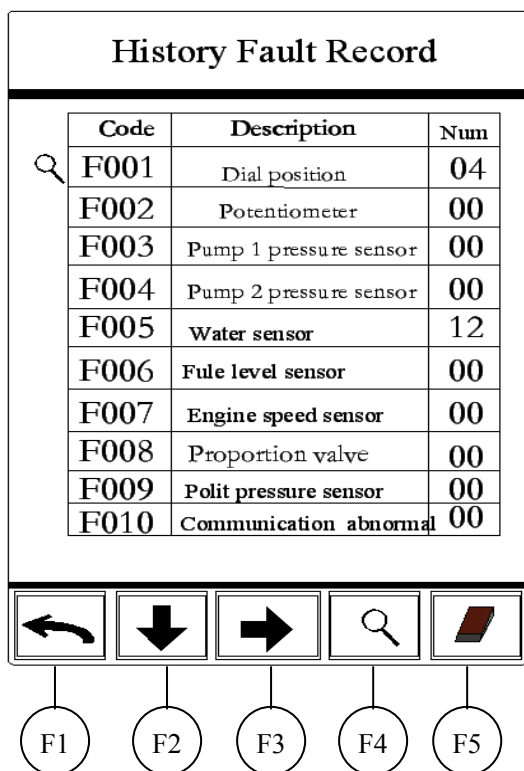
- (1) You can consult corresponding information of failure or warning code
- (2) Interfaces can be switched by F4.
- (3) F1 is exit.



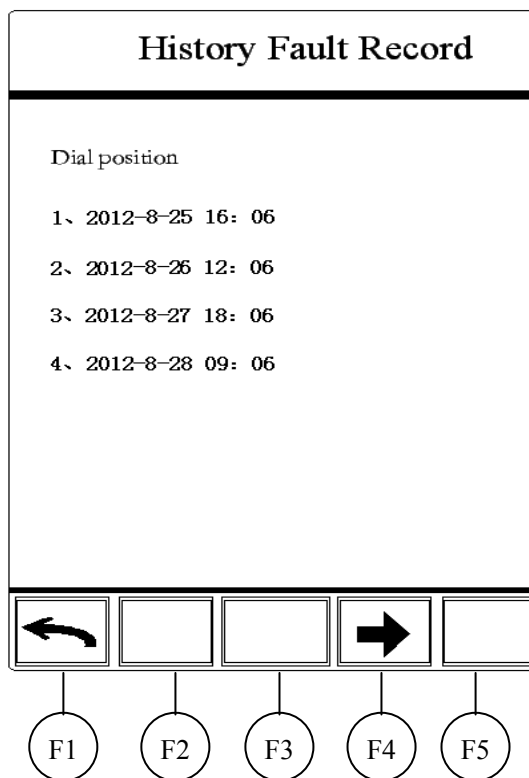
In this interface:

- (4) You can consult corresponding information of engine failure or warning code
- (5) Interfaces can be switched by F4 and F5.
- (6) F1 is exit.

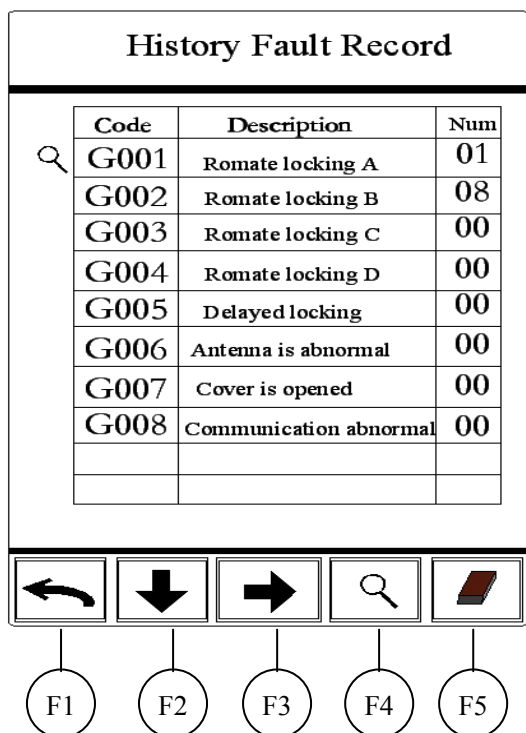
3.2.5.12 History failure record interface



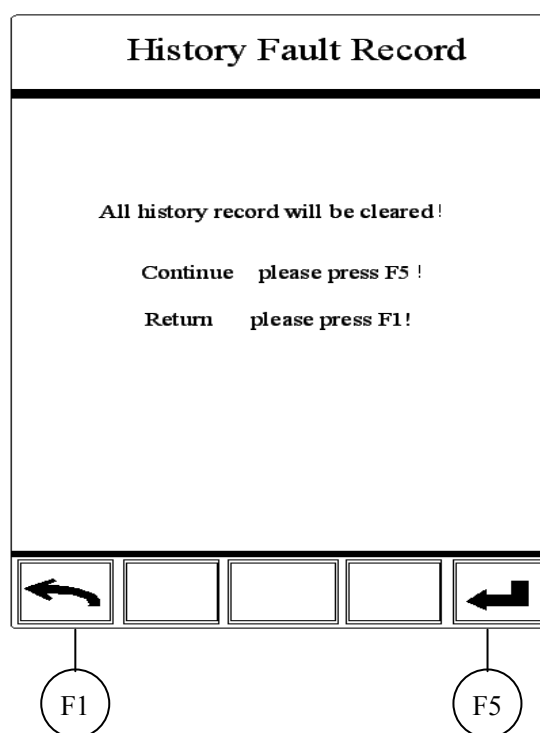
History failure record interface 4-1



History failure record interface 4-2



History failure record interface 4-3
In this interface:

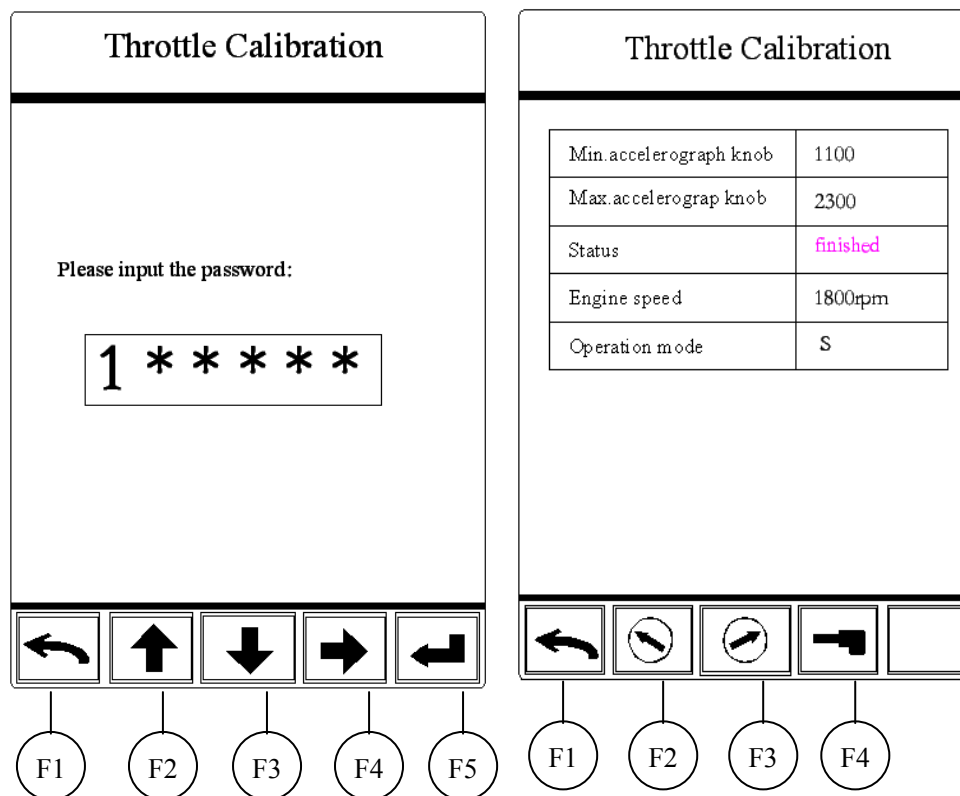


History failure record interface 4-4

- (1) There are four history failure record interface, first enter into interface 4-1, it recorded content and times of history failure
- (2) F2 can be switched among history failure
- (3) F3 can realize switch between interface 4-1 and interface 4-3.
- (4) F4 can consult the detail time of failure, in interface 4-1 or 4-3 can switch to interface 4-2
- (5) In interface 4-1 and interface 4-3, F5 can clear history failure.
- (6) In interface 4-4, F5 is used to confirm clear history failure.
- (7) F1 is exit.

3.2.5.13 Throttle calibration interface

Misoperation can lead to abnormal system, so please try your best to contact with Sunward or the person who is authorized by Sunward to deal with it.

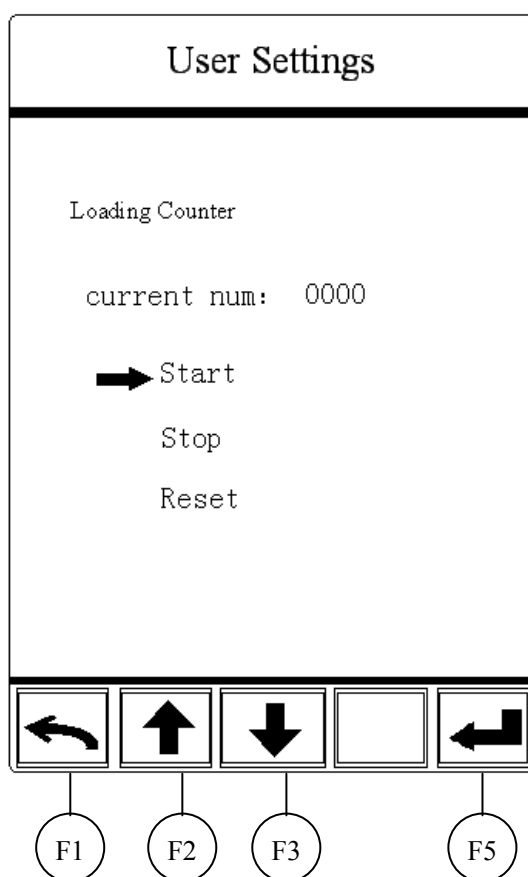


In this interface:

- (1) First enter into password input interface, F4 select amended password digit capacity, F2 and F3 used to amend password. After inputting password, press F5, if password is correct, enter into accelerograph calibration interface, F1 exit.
- (2) There has min. accelerograph dial, max. accelerograph dial, calibrate state, engine rev information and so on in the accelerograph calibration interface.
- (3) Adjust accelerograph to min. position, press F2 to confirm, min. accelerograph dial is confirmed.
- (4) Adjust accelerograph to Max. position, press F3 to confirm, Max. accelerograph dial is confirmed.

- (5) After confirming min.and max.accelerograph dial position, press F4, calibrate accelerograph, it must for 1 minute, it is normal for changing engine rev during calibrating, please just, after system is normal, motor calibration state will cue you 'it has calibrated'.
- (6) Press F1 go back

3.2.5.14 Loading counter interface



In this interface:

- (1) Start/cancel loading counter function , or reset current loading number.
- (2) Press F2 and F3 used to select loading counter and reset loading number, press F5 confirm.
- (3) Press F1 go back。

3.2.6 Right pilot control joystick

(with horn switch)

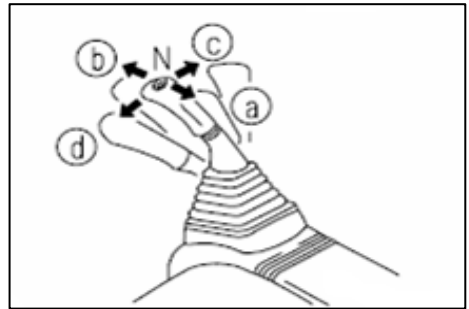
- The right joystick for work equipment is used to control boom up/down movement as well as bucket's digging and dumping.

- (a) boom up movement
- (b) boom down movement
- (c) bucket dump
- (d) bucket dig

N (neutral) : To hold boom and bucket

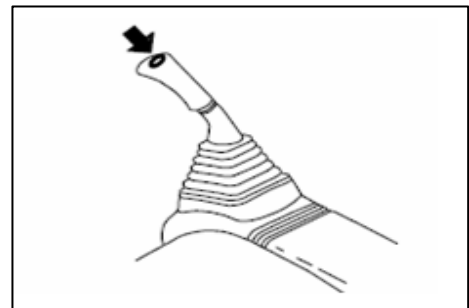
Slant operation of control joystick——simultaneous two actions.

For example, push joystick towards right front, boom down and bucket dumping proceed at the same time.



3.2.7 Horn switch

- Horn switch 97) is used to control hydraulic excavator work horn. This horn switch is located on the upper side of the right control joystick. This switch is an inching switch. We recommend you to use right hand thumb to depress this switch.
- Depress the horn switch as shown in the fig. the horn will sound. The sound frequency and length of time is corresponding to the status of depressing action. When you release the thumb, the sound stops.



3.2.8 Left pilot control joystick

(with automatic slow-down device)

- Left side work equipment control joystick (8) is used to operate arm to dig or dump and control upper-structure to slew.

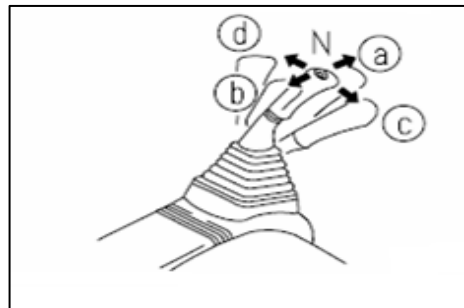
(a) arm dumping

(b) arm digging

(c) right slewing

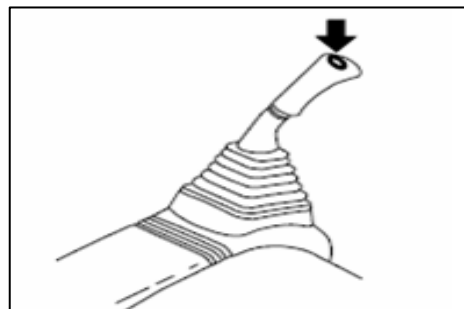
(d) left slewing

N (neutral) : the upper-structure and the arm stay where they are and remain immovable.



3.2.9 Automatic slow-down switch

- The automatic slow-down switch can slow-down rev of engine.
- This switch is located on the top of the left joystick.
- When engine at the high speed, crawl this switch, rev of engine slow-down to idle speed, crawl it once again , rev will restore.



3.2.10 Starting switch

Starting switch (10) is used to start or shut engine.

- **OFF position**

You can insert or remove key. All electrical system switches are shut except indoor lamp.

Engine is stopped as well.

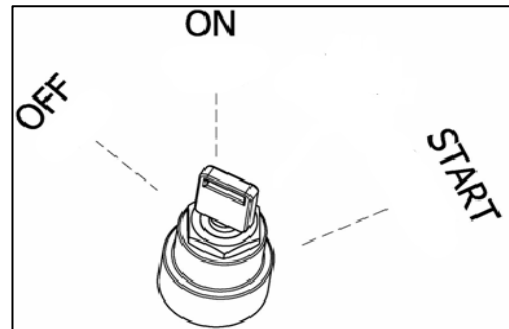
- **ON position**

Current flows in charging circuit and lighting circuit. Hold the starting switch key in ON position when engine is running.

- **START position**

It's engine starting position. When starting the engine, hold the key in this position. With engine started, release the key immediately; it will go back to ON position automatically.

Note: Some starting switch 'ON' and 'HEAT' is the same position, there are has 3 shifts.



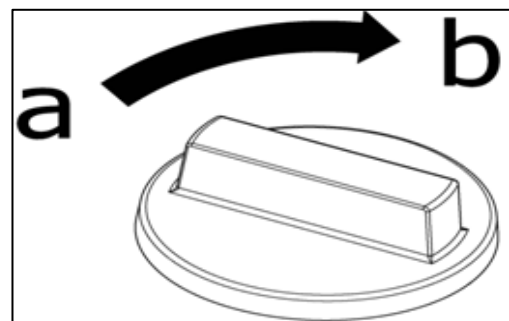
3.2.11 Fuel control knob

- Control knob (11) is used to regulate engine rev and power output.

(a) low idle speed position

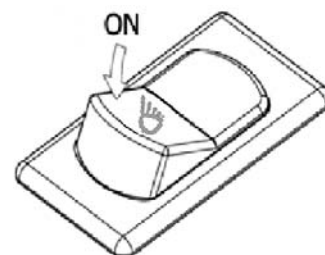
(b) high idle speed position

- When shifting fuel control knob from position "a" to position "b", engine rev will increase.;
- When shifting the knob from position "b" to "a", engine revolution will decrease.



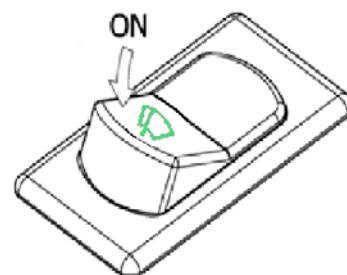
3.2.12 Working lamp switch

- Working lamp switch is used to control headlight, working light, and light for monitor.
- Set working lamp switch to ON position, machine's front light, working light, and monitor light will be electrified and illuminated.
- Set switch to OFF position, the power for front light, work light, monitor light will be cut down. Light will be shut down.



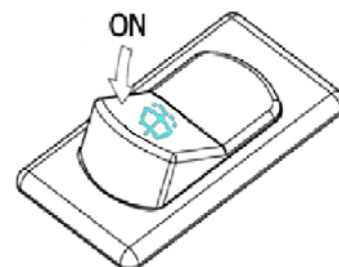
3.2.13 Wiper switch

- Wiper switch is used to control wiper located on front window of the cab.
- Set the wiper switch to ON position to activate wiper.
- Set the wiper switch to OFF position to stop the wiper and reset to original state.



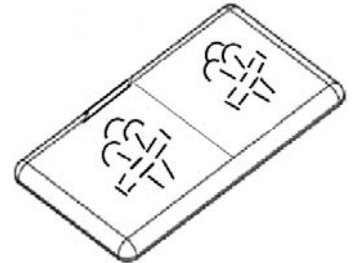
3.2.14 Washer switch

- Washer switch is used to control the washer for cab front window.
- Set washer switch to ON position to activate the washer.
- Set the switch to OFF position to stop the washer.



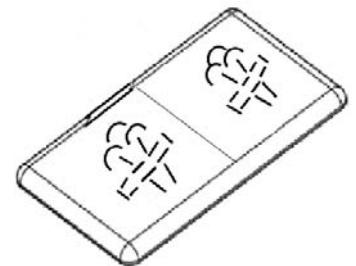
3.2.15 DPD Regeneration Switch

- . Regeneration switch is used to control the engine into the manual regeneration process
- Place regeneration switch on "ON" position, the engine will enter into the manual regeneration process when it meets the requirement.
- The switch as the reset switch, when it looses, it will automatically be reset to "OFF"



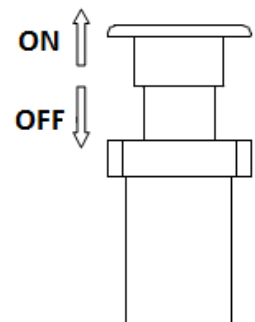
3.2.16 DPD Regeneration Lamp

- Regeneration indicator lamp indicates whether the engine into the ongoing regeneration And what is the regeneration process.
- Green indicator lamp is flash means engine is automatically regeneration process, it ends and lamp is go out.
- Yellow indicator lamp is flash means engine needs to manual regeneration process or at the manual regeneration process, it ends and lamp is go out.



3.2.17 Engine Stop Switch

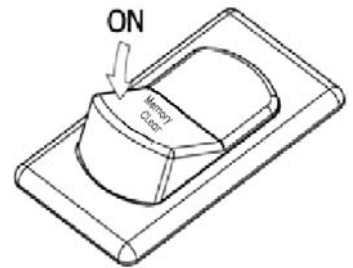
- Engine emergency parking switch is used to stop engine at the emergency status.



- When the switch at "OFF" position, if engine at the status of running, it will immediately stop running, or it will not be able to start.
- When switch at "ON" position, the engine can be normally start and stop.

3.2.18 Memory Clear Switch

- Record clear switch is used to clear the engine failure, the Switch is used for factory after-sales maintenance.



3.3 Other part operation instruction

3.3.1 Cab windows

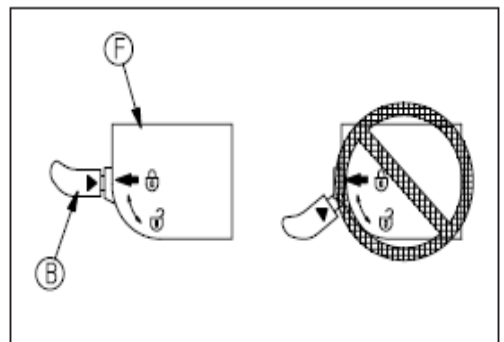
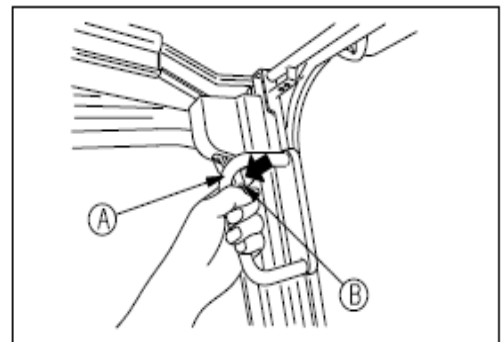
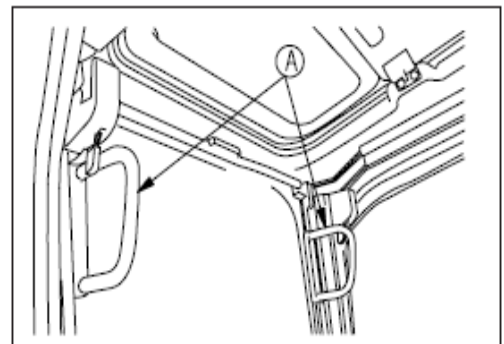
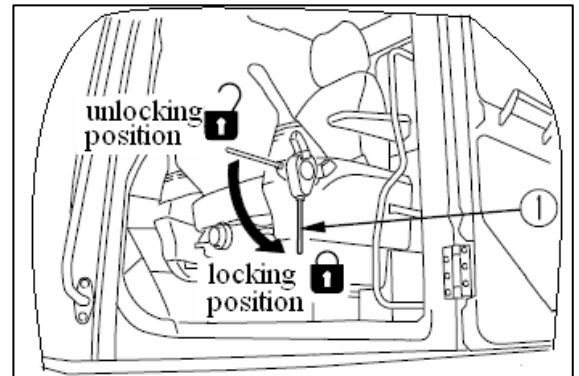
Cab rotary front window

- To open or close the rotary window, always stop the machine at level ground, lower the work equipments to ground and stop the engine before proceeding to other operations.
- Always place the safety lock lever A to LOCK position (see the right fig) while opening or closing upper window, rotary window, lower window or door.



Warning

- ◆ Serious accidents may occur if fail to lock the control lever and touch it unexpectedly.
- Check if the wiper blades are in fixed position.
- Use both hands to grip handle A firmly, press fasten buckle B with thumb (see fig). Use hands to push rotary window back-upward to the top of the cab to fix rotary window.
- To close the front window, grip the handle A by hands, press fasten buckle B with thumb. When close the front window, grip the handle firmly and put it down slowly, push handle A forward when the window get to the bottom to ensure the complete fixing of the lockset.



Cab canopy

- Set safety lock lever to LOCK position.;



Warning

- ◆ Serious accidents may occur arising from failure to lock up the control lever or touching it unexpectedly.
- Open the lock button (A) on the front to check the canopy for movement, then grip the handle (B) and push it upward to open the canopy.
- To close it, grip handle (B) and use lock button (A) to lock canopy automatically (refer to right fig).



Inner lock

- Push ball handle A forward until a sound is heard, then push indoor handle outward, the door will open(refer to the right fig).



Sliding window (left side)

- Depress the window rubber lock A(refer to the right fig) and pull it backward, the window will open.



Outdoor rotary latch

- Open the cab door: push the door until A latches with B(see the right fig.1), following a clack sound, the door is locked(see fig.2).

Fig.1



- Open the cab door: Press the unlock joystick in the right side of under door frame, the fixed lock will be open,(as fig.3),then close the cab door.

Fig.2



Emergency exit

- When the cab door can not open due to some reasons, “safety hummer” can be used to broken the back window, you can escape from the back window.
- Escaping approach:
 1. Take the “safety hummer” outward.
 2. Break the back window with it, escape from the outlet.

Fig.3



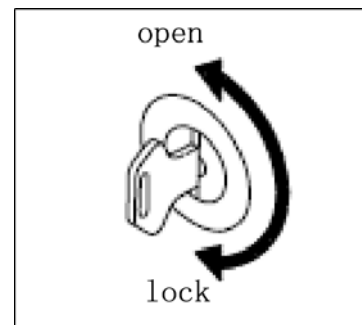
Remark:

Unless using it as the emergency exit, do not break the back window.



3.3.2 Cover, hood with lock

- The fuel filling opening, cab, machine body covering units are equipped with lock.
- When using starting key to open or close these covers, doors and hoods, insert the key to the bottom, then rotate the key. If it is rotated when partially inserted, the key may break.



Opening and closing door or covers with lock

- Insert the key into the key slot, turn the key counter clockwise and pull the handle to open the door or covers.;
- Turn the key clockwise to lock the door or covers (see the right fig).

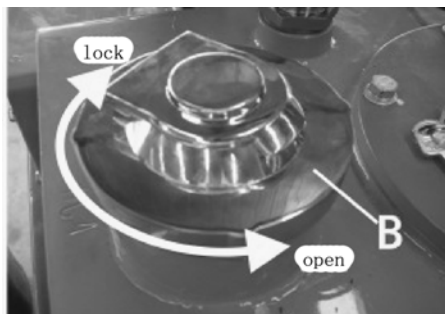
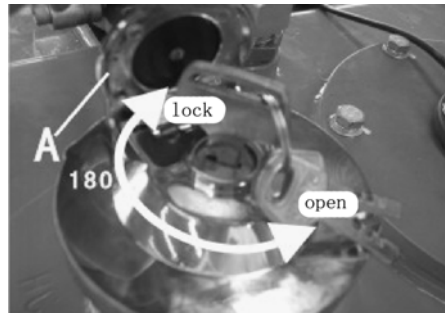


Opening and closing engine hood

- Pull the lock A located on the left/right of the engine hood to release the lock. Use handle to push engine hood up(see the right fig)
- Use engine lock bayonet to secure the hood as shown in the fig. then connect C to open end D (see fig), install lock, so engine hood can be locked.

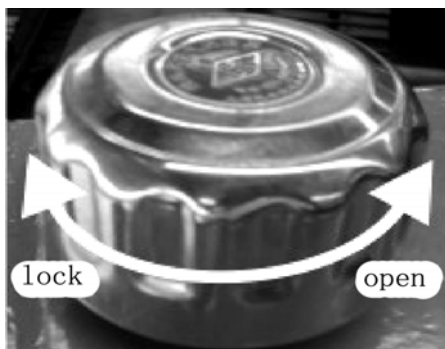
Fuel tank lock

- Open fuel tank filling opening cover A; insert the key into the key slot, turn the key counter clockwise for 180 degree, the lock is open. To lock the fuel filling opening, turn the B clockwise.
- Rotate oil fill cap B counter clockwise to open oil fill port. To lock up oil fill port, rotate B clockwise (see fig below).



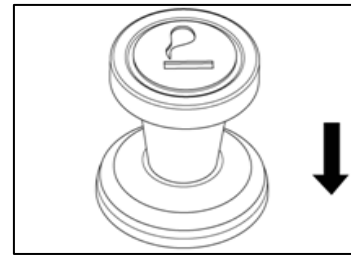
Hydraulic oil tank filling opening

- Turn the hydraulic cover counter clockwise to open it, turn it clockwise to lock the cover. See the fig shown below:



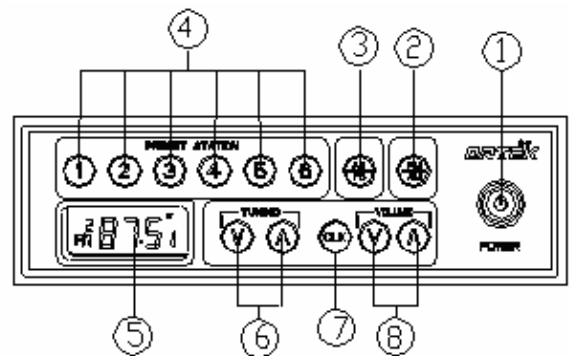
3.3.3 Lighter

- Push the lighter into the hole following the direction given in fig. it will rest in LOCK position until the heat-up is made. Then the light will eject and return to initial position. Take the lighter out to use.
- Pay attention to hold the upper end rubber hand grip to avoid being burned.



3.3.4 Radio

The hydraulic excavator cab is equipped with radio located in position (15). Users can select different frequency channel for listening according to your needs and likes as a way to alleviate your fatigue.

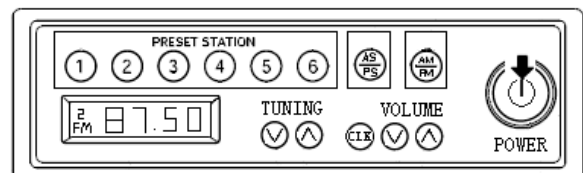


- ①—power control key
- ②—AM/FM
- ③—auto-tuning /brief listening to station presets.
- ④—station preset
- ⑤—LCD display
- ⑥ — manual tuning : “^”frequency increase , “v”frequency decrease
- ⑦—clock
- ⑧—volume control: “^”volume increase, “v”volume decrease.

Radio receiver instruction

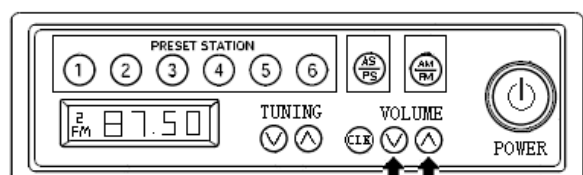
● On/ off:

To turn on the power, press the key “power”. To shut it down, just press the key again.



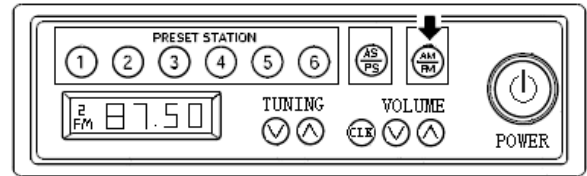
● Volume control:

If press the key “^” under “volume”, the sound volume will increase, for the key “v”, the volume will increase gradually.



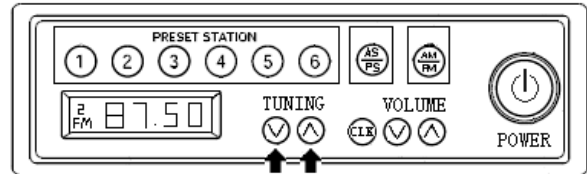
- **AM/FM :**

Pressing key “FM/AM” allow you to change band. The band cycles in the sequence given: FM1/FM2/FM3/AM1/AM2/FM1.



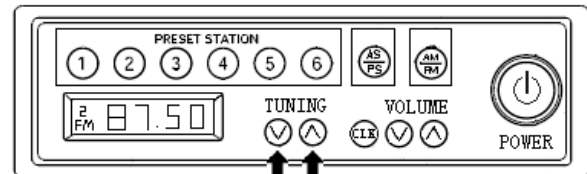
- **Manual tuning:**

Short pressing the key “^”和“v”under “TUNING” allow for manual tuning upward or downward.



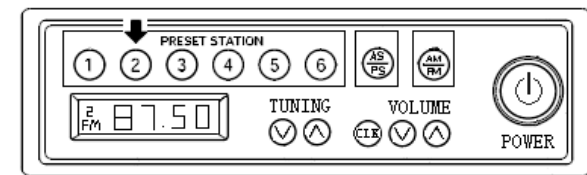
- **Auto-tuning:**

Press on the key “^”和“v”under “TUNING” for longer than 0.5 seconds to allow the radio receiver to auto-tuning until a radio station is pick up, then it will restore this station for listening.

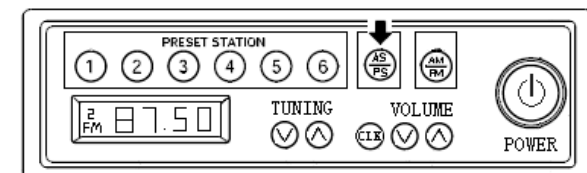


- **Restore radio station:**

After radio stations are picked up by manual tuning/auto-tuning, press station preset key M1~M6 for longer than 2 seconds. The current frequency being listened will be restored in corresponding place. 6 stations for each band, 30 stations total.

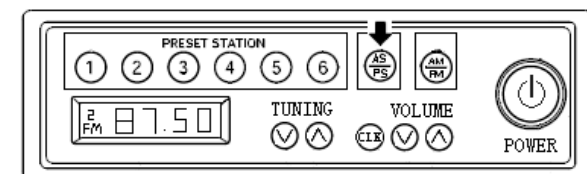


Auto-tuning and restore radio station: the key AS/PS is pressed for longer than 1 second, searching upward from current frequency. The radio stations being picked up will be restored to station preset position.



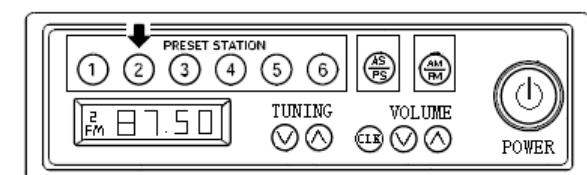
- **Brief listening to station presets:**

Pressing the key AS/PS for less than 1 second will allow you to have a brief listening for all preset stations for 5 seconds. During the process of brief listening, pressing the key again will stop the listening to current station.



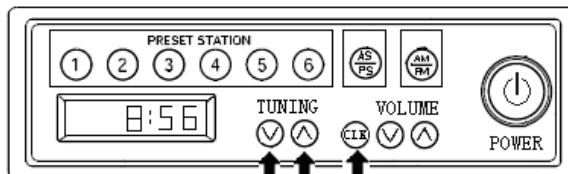
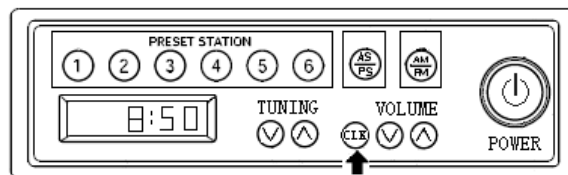
- **Pick up radio stations:**

Short pressing the station preset key for less than 2 seconds will allow for listening corresponding preset station.



- **Clock:**

Press key CLK to enter clock display mode, press key CLK again to return. In clock mode, press this key for longer than 1 second until the display value flashes. press key $\wedge$ to increase the value in hour, press the key $\vee$ to increase value in minute. It will automatically return to clock adjustment mode if there is no operation for 5 seconds.



Precautions

- Set volume in proper position to prevent traffic accident.
- In case of hot or cold weather, please remain this equipment inside the machine. Ideal temperature can guarantee the good performance of this equipment.
- After being spayed by water, this radio is subject to damage. When washing your machine, pay attention not to allow water to reach the radio.

3.3.5 Seat

Seat adjustment specification

- The seat is two stages adjustable and capable of moving forward and backward. the adjustment: 270mm (forward 140mm, backward 130mm);
- The backrest infinite variable adjustment range: 35°-170°;
- Seat suspension adjustment: 60mm; the seat infinite variable adjustment range: 50-130 kg.;
- Headrest height adjustment range: 105mm. it's adjustable in 7 stages.;
- The armrest can be adjusted from -40°~100

Instruction

A: Hand position adjustment

Raise the adjustment lever 1, upper seat move forward or backward. Adjust hand to proper position.

B: Backrest tilting adjustment

Pull up the adjustment lever 3, turn the backrest (or the backrest will turn forward automatically). Adjust the backrest to the optimal position and convenient for operation, then loose the lever.

C: Seat height adjustment

Lift the seat upward, when you hear the fist click sound, the seat rise 30mm, lift the seat again, the seat rise another 30mm, still lift the seat, it will fall down to the lowest position.

D: Arm rest angle adjustment

Rotate the angle adjustment hand wheel 5 under the arm rest; adjust the arm rest 4 to the comfortable position.

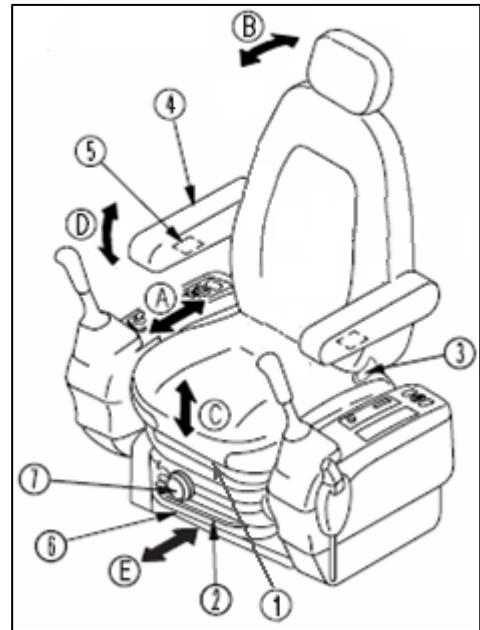
E: Foot position adjustment

Pull up level 2, and adjust the foot position, after it attains ideal position, put down the lever, and realize self-hold.

F: Bearing adjustment

Rotate lever 7, observe the bearing of the seat through

observation window, until the bearing attain to the body weight of the operator.



3.3.6 Fuse



Note

- ◆ Always turn off the key switch prior to fuse replacement.
- The fuses protect the electrical equipment and wiring from burning out.
- Replace any fuse with corrosion or generating white powder or any fuse looseness in fuse holder.
- Replace fuses with equivalent capacity ones.

3.3.7 Air condition instruction

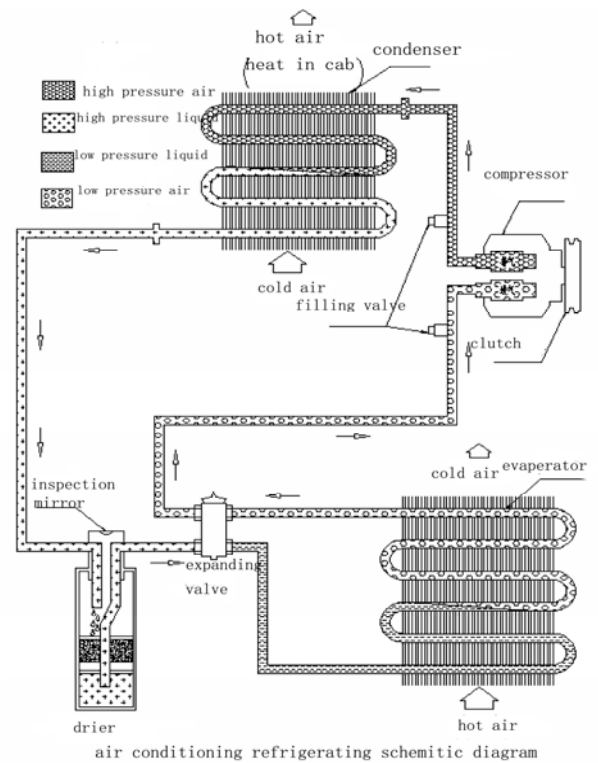


Warning

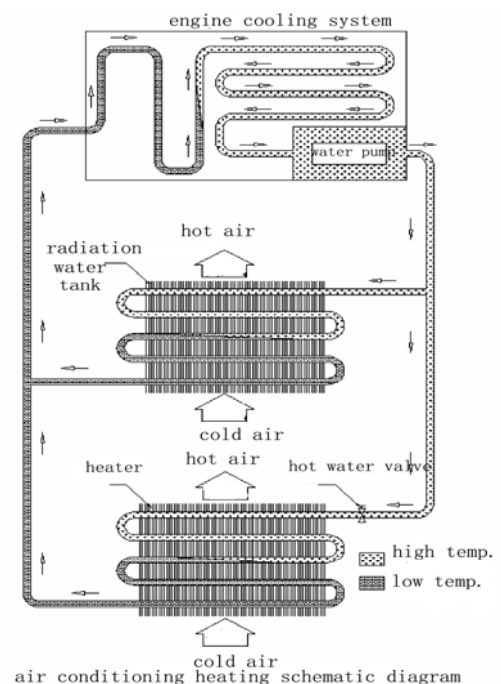
- ◆ It's dangerous to perform improper operation, lubrication, and maintenance or service procedure on the machine. This may cause injury or death.
- ◆ Do not attempt any operation on the machine before you thoroughly understand the information about operation, lubrication, maintenance, and service procedure.
- ◆ Safety precautions and warnings are provided in this manual. If you fail to pay attention to these information, you or the other persons may suffer the injury and even death.

Schematic diagram

This air conditioning is heat/refrigeration A/C. refers to the schematic diagram on the right.



NO	Name	Specification
1	Cooling Capacity	4.0kw
2	Heating Capacity	5.0kw
3	Air Flow Capacity	400m ³ /h
4	Voltage	24V.DC
5	Total Power Consumption	≤250w
6	Motive Power Consumption	≤2.5kw
7	Refrigerant	R-134a(enviroment friendly)
8	Refrigerant Change	1000~1100g
9	Compressor	SE-5H14 B
10	Refrigerate oil	PAG(sp20),300m l

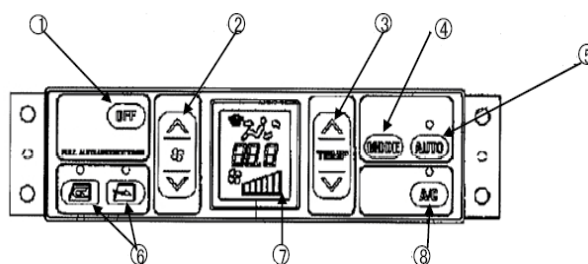


Operation instruction

The cab inner is equipped with air conditioner, the panel is on the left controlling box, and users can start the air conditioner according to environmental temperature and self requirement, and adjusting inner temperature. We suggest use the conditioner according to national environmental protection requirements and conditioner temperature controlling rules.

Control panel of air conditioner shows as following picture:

- 1— close button
- 2— wind speed setting switch
- 3— temperature setting switch
- 4— air outlet mode setting switch
- 5— auto mode setting switch
- 6— inner/exterior air-in switch
- 7—liquid crystal display screen
- 8— air conditioner start/close switch



Remark: when the function of auto mode setting switch 5, inner/exterior air-in switch 6 and air conditioner start/close switch 8 are started, the lamp above the switches will be lighted.

The function of buttons and switches are as follows:

Close button 1: start and close control of fan and air conditioner.

Press the OFF switch 1, the display of temperature and input air will disappear on the screen. The lamp above the auto mode setting switch 5 and air conditioner start/close switch 8 will be turned off. The running will be paused.

Wind speed setting switch 2: the input air can be set from step 1 to 6. The input air will be

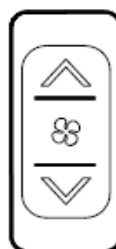
displayed on the screen. Press the button ▲, the input air will be strengthened; Press the button ▼, the input air will be weakened. When auto mode is started, the input air will be switched automatically.

Temperature setting switch 3: setting the temperature of cab inner. The temperature of cab inner can be set from 18.0 centigrade to 32.0

centigrade. Press the button ▲, the setting

temperature will rise; Press the button ▼, the setting temperature will drop. On normal state, the temperature should be set at 25 centigrade.

Display of the input



display	input air
	input air "weak"
	input air "middle 1"
	input air "middle 2"
	input air "middle 3"
	input air "middle 4"
	input air "strong"

Air outlet mode setting switch 4:

Set the air outlet mode. Press button 4, mode switch will be displayed on the screen. Air will be sent out by the outlet mode displayed on the screen. Air outlet mode will switched automatically when auto mode starts.

Display of setting temperature



display	setting temperature
18. 0	maximum refrigeration
18. 5~31. 5	adjusting setting temperature
32. 0	maximum heating

display	air outlet model	air outlet				remark
		front	back	sole	defrost	
	front, back and sole	☐	☐	☐		
	front and back	☐	☐			
	front		☐			can not choose under auto model
	sole			☐		
	sole and defrost			☐	☐	can not choose under auto model
	defrost				☐	can not choose under auto model

remark: ☐ indicates the outlet from which air is blown.

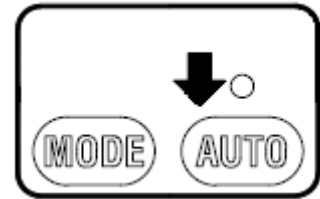
Auto mode setting switch 5:

The input air, air outlet and inner/exterior air circulation can be set automatically according to setting temperature.

Press auto mode setting switch 5, the lamp above the switch will be lighted.

On normal state, press this button and set proper temperature by pressing temperature setting switch 3, then the air conditioner will start automatically.

When auto mode is switched with manual mode, switches should be used to set the input air, air outlet and inner/exterior air circulation, and the lamp above the switch will be turned off.



Inner/exterior air-in switch 6:

Switch between inner air circulation and exterior air leading –in. Press the button, the lamp above the button will be lighted, which indicates setting situation starts.

Under the auto mode, inner air circulation mode and exterior air leading –in mode switches automatically.

inner air circulation	exterior air circulation is closed, only inner air circulation is used
	applied when cab inner need fast refrigeration or heating, or exterior air is dirty
exterior air leading-in	exterior air is led cab inner
	applied when clean air is led in or defrost is used

Liquid crystal display screen 7:

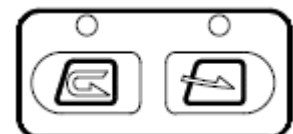
Display the setting temperature, input air, air outlet situation when the air condition is running.

Press close button 1, the display of setting temperature and input air will disappear, and running will be closed.

Air conditioner start/close switch 8:

Control the start or close of refrigeration, heating, dehumidification of the air conditioner. Press switch 8, the air conditioner start, and the lamp above the switch will be lighted; press the switch again, the air conditioner close, the lamp will be turned off.

Note: when the fan is not started, blowing situation is displayed on the screen, press the switch 8, the air conditioner will not start. If you need using air conditioner, please press wind speed setting switch 2, and choose wind speed, make sure that the fan start, then press switch 8.



Internal air-in



Exterior air-in

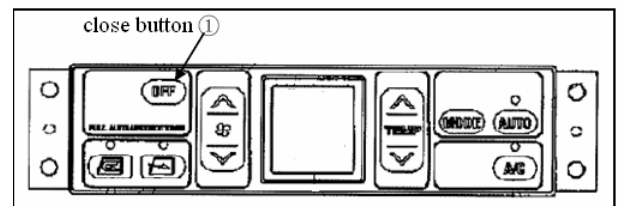
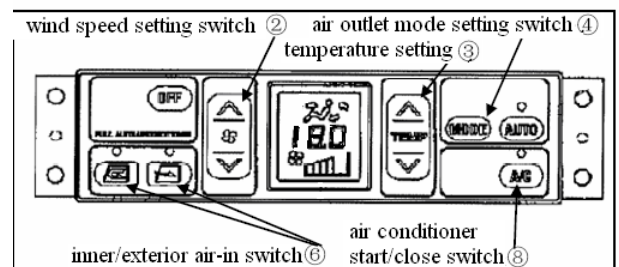
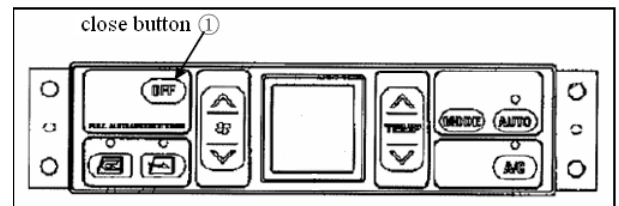
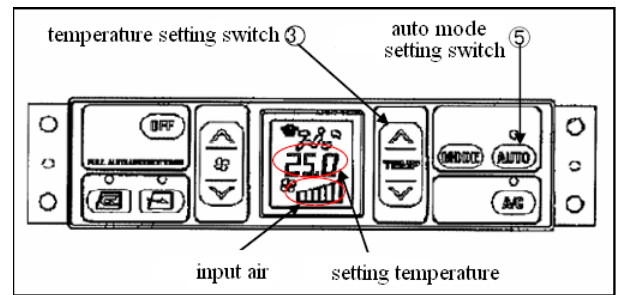




Caution:

- ◆ When you use the air conditioner, do not rotate the temperature detect switch to “cool” position, or rotate the input air switch to low range, to avoid frost of evaporator, and influence the refrigeration effects.
- ◆ When cool/warm type conditioner is on the cool mode in summer, please do not open hot water valve, for fear that refrigeration effect is influenced.
- ◆ For engine cooling water is used by heating system, when environmental temperature is low, and the machine runs for a while, then engine water temperature reaches 50°C, conditioner can heat under warm mode.
- ◆ The air conditioner has intelligent memory function, when power supply of the excavator is shut off, the running situation of the conditioner is stored, when power supply of the excavator is turned on, air conditioner will return the stored situation automatically.

Operation method



Automatic running

When switch 5 is turned on, temperature and input air will be displayed on the screen, and the lamp above switch 5 and 8 will be lighted.

Manual control running

1. Press wind speed setting switch 2, and adjust the input air, in addition, confirm the temperature and input air through display screen.
2. Judge the switch 8 whether is turned on through the lamp above the switch.
3. Set proper temperature through switch 3.
4. Set needed air outlet through switch 4.
5. Choose needed inner/exterior air-in mode through switch 6.

Manual control stop

Press close button 1, temperature and input air will be disappeared on the screen, and the lamp above switch 8 will be turned off, running will stop.

Cool head & warm foot mode

1. Press switch 2 to adjust input air, and confirm the temperature and input air through display screen.
2. Press switch 4 to choose air outlet mode,

 will display on the screen.

3. Make sure that switch 8 is “on” state, and confirm it through the lamp above the switch.
4. Adjust switch 2, 3 and 6 to proper position.

Remark: when cool wind blows towards head ,and warm wind blows towards foot, then the conditioner is under cool head & warm foot mode.

Defrosting running

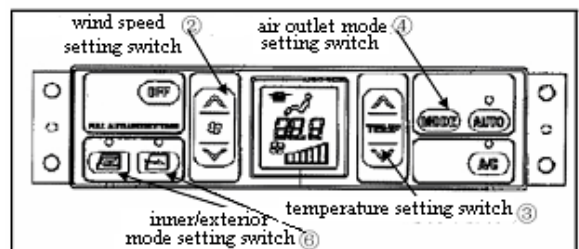
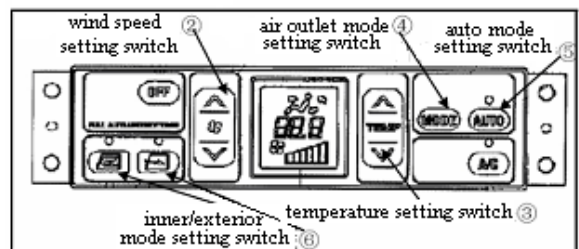
1. Press switch 2 to adjust input air, and confirm the temperature and input air through display screen.

2. Adjust switch 4, and make  display on

the screen, then switch it to .

3. Choose exterior air-in mode through switch 6.
4. Adjust switch 3, temperature is set to 32 centigrade (maximum heating).

Remarks: to keep the wind blow towards the window, adjust the position of louver board of the air outlets. On raining day, if mist is on the window, or you need dehumidification, please open switch 8.



Other function

Self diagnosis function

This function is applied for fault diagnosis of sensors and mechanism of the air conditioner.

1. Press close button 1, display of setting temperature and input air will disappear, running stops.
2. Press switch 3 at the same time, and press button ▲ and ▼ for more than 3 seconds, then fault code will displayed on the screen.

fault code on the display screen

code	representation
E--	no fault
E11	inner sensor disconnection
E12	inner sensor direct short
E15	water temperature sensor disconnection
E16	water temperature sensor direct short
E18	sunlight sensor direct short
E43	abnormal air outlet
E44	abnormal mixed air door

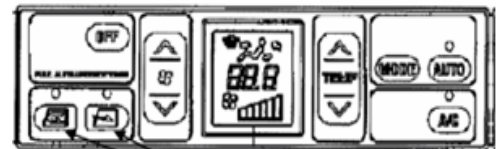
Setting temperature

This function is used for switch between centigrade degree and Fahrenheit degree. Press temperature setting switch ▲ and ▼ at the same time for 5 seconds when fan is running, and the switch will realize.

	display
centigrade degree °C	18.0~32.0
Fahrenheit degree °F	63~91

Reset

This function is used for new planting of conditioner or cancelling of fault code after obstacle avoidance. Press inner air-in and exterior air-in switch at the same time for more than 3 seconds, the fault code will disappear.



inner/exterior air-in mode setting switch ⑥

3.3.8 Accumulator



Warning:

- ◆ The accumulator is charged with high-pressure nitrogen gas. Improper operation may lead to explosion and result in serious injury or damage.

When handling accumulator, always follow the steps below.

- The pressure in control piping could not be completely released. When disassembling hydraulic devices, do not stand in the oil ejecting direction. Loosen the bolts gradually.
- Do not disassemble accumulator.
- Do not place the accumulator close to naked flame or get it exposed in fire.
- Do not drill holes or weld on accumulator.
- Do not get accumulator hit, rolled or shocked.
- When handling accumulator, it's necessary to bleed the air. Please contact distributor.

The accumulator is fixed in control piping. The accumulator is a device being used to store pressure. With this accumulator equipped, you are allowed to operate controlling piping in a short time, even if engine stops. Therefore, work equipments could be lowered under their own weight by means of control lever.

Releasing pressure on a machine equipped with accumulator.

- Lower the work equipment on the ground, turn off its breaker or other accessories.
- Stop the engine.
- Shift starting switch to ON position to flow the circuit current.
- Set safety lock lever to free position. Operate work equipment lever and accessory control pedal forward, backward, leftward and rightward alternately to release pressure in piping.
- Set safety control lever to LOCK position to lock up control lever and accessory pedals.

3.4 Operation and control of the machine

3.4.1 Operator's position.

Operator is seated on the left hand in the cab. It includes operator seat, seat belt, left/right joystick, left/right pedal travel operating valve(joystick), operation display screen, radio and air conditioning.

3.4.2 Setting and adjustment.

The machine has the following settings:

- Engine rev setting:

Turn the throttle knob to get desired revs.

- Work mode setting: S、H、L

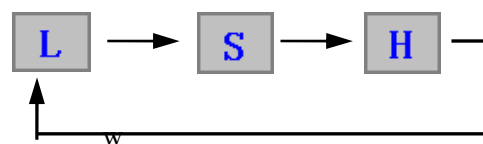
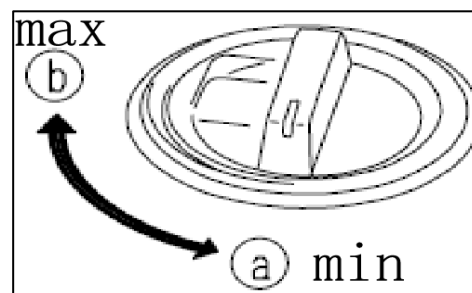
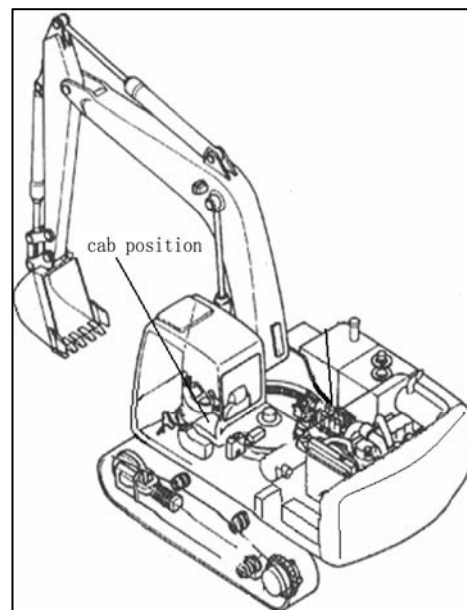
For detailed information, please refer to section “3.2.5 monitor system”.

- Travel speed setting:

Press travel speed switch button to shift between high speed and low speed.

- Auto-idle setting:

Press idle button to shift between “auto-idle” and “auto-idle cancel”.



work mode shift flow



3.4.3 Work mode selection

- Based on different work condition, select different work mode for the high efficiency, energy saving, and environmental friendly purpose.
- You can select relevant mode by means of pressing “MODE” on touch screen. The mode “S” is the default work mode. Each touching corresponds to a shifting operation following a sequence as S→L→H→S

S— medium load work mode.

L— light load work mode

H— heavy load work mode

It's a complete shift cycle

- The applicable work conditions corresponding to individual work mode are as follow::

Work mode	Applicable work condition
S	Applicable for operations with small load and high economical efficiency requirements.
L	Applicable for operations with light load, e.g. operation on flat work ground.
H	Applicable for operations with heavy load and demanding for fast operation speed.

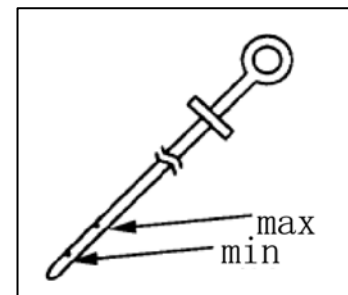


3.4.4 Inspection before starting the engine

Walk-around inspection

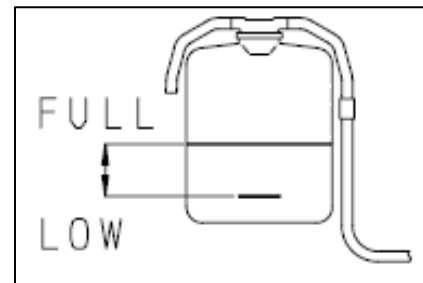
Before starting the engine, do a walk-around inspection covering the following items:

- Remove the dust on the cab windows to allow for a good visibility.
- Remove all foreign matters around engine, radiator or accumulator. Check for engine oil or fuel leakage. If any abnormalities are found, clear them as well as to remove all oil to avoid fire.
- Do a walk-around inspection on machine: check for bolt looseness, wire wear out, piping leakage etc. If any abnormal signs are detected, please clear them.
- Check work equipments, cylinder, link, hose free of crack, wear out or and variation.
- Check engine oil level: the level must be between the lines of “MAX” and “MIN”.
- Check coolant level: the coolant level must be between the lines of “LOW” and “FULL”.
- Drain the water and deposits in fuel tank.



Confirm inspection

- Check around the machine to make sure it's clear of person and obstacles.
- Adjust weight bearing, height, seat tilting, armrest angle, backrest angle etc for operator's comfort.
- Check seat belt and fasten buckle.
- Check horn and light to ensure they are properly functioning.
- Check instruments and monitor for any damage.



3.4.5 Starting engine



Warning

- ◆ Do not start the engine, if any signs or marks are posted to joysticks in the cab.
- ◆ Do not start the engine by short-circuiting the engine starting circuit.
- ◆ Do not start the machine without operator seated.
- ◆ Make sure the surrounding area is clear of person and obstacles before starting the engine. Sound the horn to warn people.
- ◆ Do not start the machine in a confined area.
- ◆ Exhaust gas is toxic, when starting the engine in a confined area, be careful to ensure good ventilation.



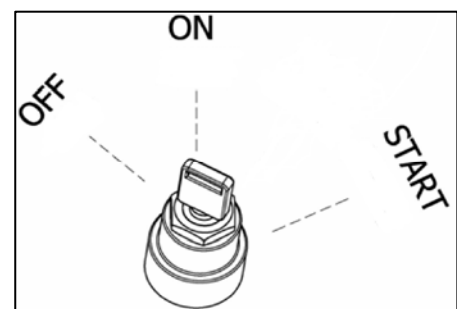
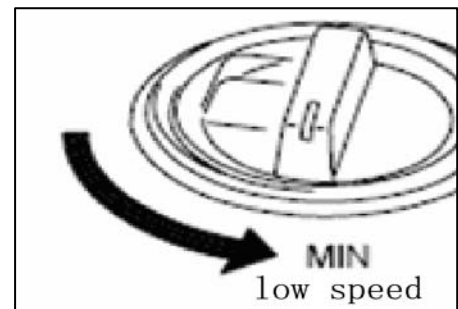
Note

- ◆ Throttle knob should be set to MIN position before starting the engine.
- ◆ Do not keep the starting motor running continuously for longer than 5 seconds. If the engine fails to start, wait 2 minutes before a new attempt.

Start the engine in normal weather condition

- Set pilot safety lever to LOCK position.
- Turn throttle knob to low speed position.
- Shift starting key to “ON” position to “start” position to start the engine.
- With engine started, release the starting switch key, the key will return to “ON” position automatically.
- The engine oil pressure is displayed in screen, check engine oil to ensure it's within specified

range. If yes, you are allow to operate. If no, find out the problem and do not operate until the problem is cleared. You could stop the engine to help find the problem if necessary.

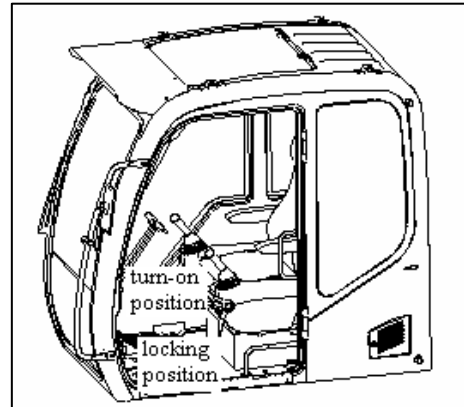


Start the engine in cold weather

- Set pilot safety lock lever to LOCK position.
- Turn throttle knob to low speed position.
- Hold the key in warm-up position for around 20 seconds until the warm-up indicator stop illuminates.
- After warm-up procedure, set starting key to “start” position to start engine.

Do not keep the starting motor rotating continuously longer than 5 seconds. If it fails to start, wait 2 minutes before another attempt.

- With engine started, release the key, it will return to “ON” position automatically.
- The engine oil pressure is displayed in screen, check engine oil to ensure it’s within specified range. If yes, you are allow to operate. If no, find out the problem and do not operate until the problem is cleared. You could stop the engine to help find the problem if necessary.



3.4.6 New machine running-in



Note

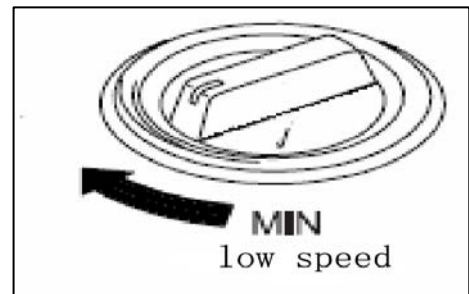
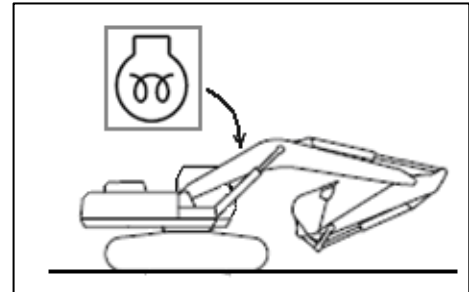
- ◆ All machines have a running-in period.
The running-in period of our machines is the first 50 hours.
- ◆ How well does the machine run during running-in period have direct effect on the machine performance in the future in terms of use effect and service life. Please follow the rules specified in this manual.
- After starting the engine, do not attempt any operation; allow it to idle for 15 seconds.
- After idle running, attempt all digging, swing action without load at idle speed for 5 minutes.
- Do not operate with heavy load or at high speed.
- Before stopping the engine, do keep it running at idle for longer than 2 minutes.
- Do not start, accelerate, steer, travel and attempt all other actions sharply, except in emergency.

3.4.7 Warm up machine operation in cold weather



Note

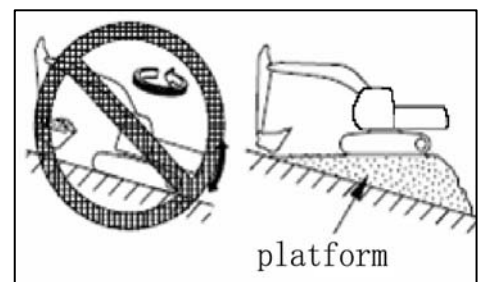
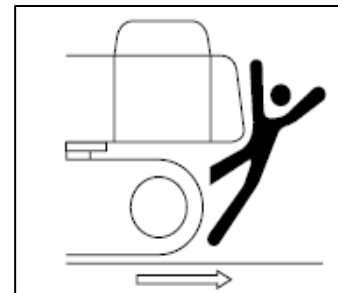
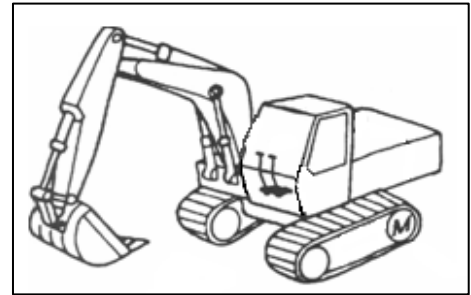
- ◆ When hydraulic oil temperature is below 25 °C, operating machine in this circumstances can cause sudden movement and stop, the machine will become hard to maneuver. And accidents may occur.
- ◆ When the engine is difficult to be started, it's necessary to carry out warm up operation.
- With engine started, cancel auto-idle, adjust throttle knob to low speed position (approx. 1200r/min) to allow the engine to idle for 5 seconds.
- Adjust throttle knob to set engine revs to 1500 rpm, operate bucket to perform “dig” — “dump” blank action for 5 minutes without attempting any other actions.
- Engage engine speed at 1500 rpm, operate bucket and arm to act to full stroke for 5 minutes.
- Adjust throttle knob to speed up engine rev to high speed position (approx. 2000r/min), cycle the following operations for 3-5 times.:
 - Boom up←→down movement
 - Arm fold←→extend
 - bucket digging←→dump
 - turret left swing←→right swing
 - complete machine forward←→reverse
- With warm-up operation done, check gas discharging, noise and all other actions. If the machine is functioning properly, proceed to work. If not, keep carrying out step 4 until it's functioning properly.



3.4.8 Operation safety rules

Steering the machine

- Place the idle roller underneath the cab and place sprocket under counterweight. Only when idle roller is under the cab, the direction of travel control lever matches with that of machine traveling. Otherwise, the direction is in reverse. i.e. if sprocket is located under cab, push travel control lever forward, machine will travel in reverse.
- Before traveling, make sure the surrounding area is clear of person and obstacles.
- Sound the horn to warn people before traveling.
- Do not operate machine unless you are seated in position..
- Do not take other personnel.
- Make sure door, windows are in lock up position and locked securely.
- Do not travel in reverse if possible. swing upper-structure for 180°. Before proceeding to operate, slightly push joystick to confirm the relationship between joystick operation and travel direction.
- If the machine can not swing due to confined area, it's necessary to offer a signal man to assist operator.

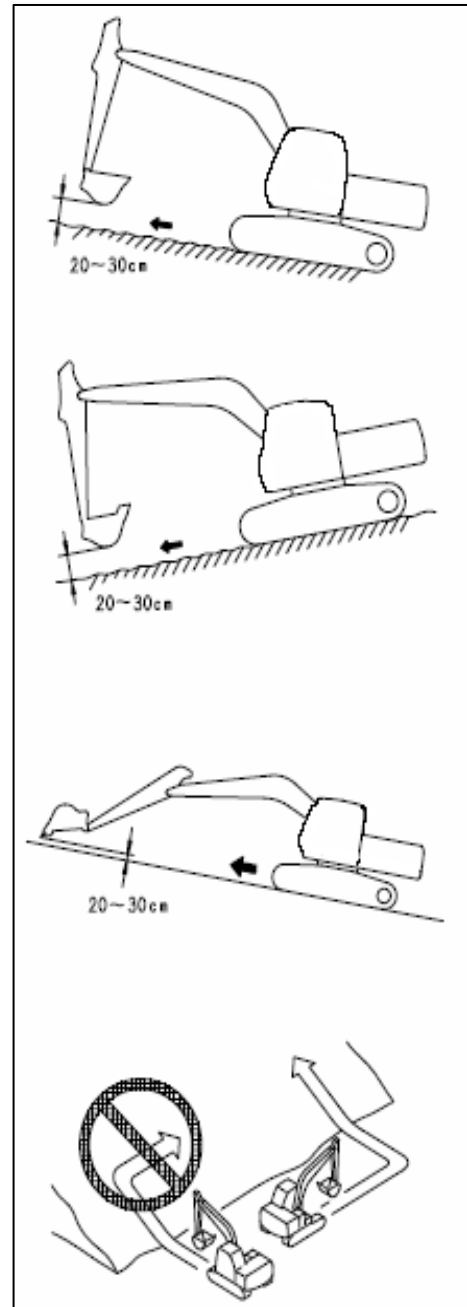
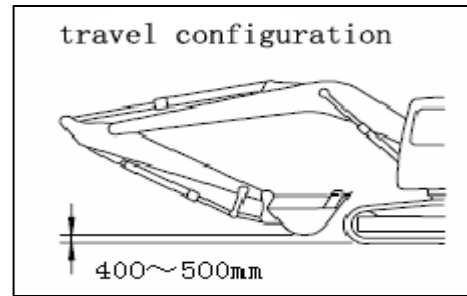


Working on slopes

- Use machine to dig a platform as flat as possible during operation on slopes. Then park the machine on this platform to operate. Do not directly stop the machine on a slope to operate.

Travel operation

- Do not exceed allowed load of the machine to prevent damages to it.
- When traveling on flat ground, lower work equipment (bucket) to a height of 400 to 500mm above the ground level.
- When traveling on slopes, the work equipment must be lowered to a height of 20 to 30cm above. If the slope is steep, the work equipment must be extended accordingly.
- When travel on slopes or in a confined area, cancel auto-idle function as well as to set travel speed at “LOW” position.
- Never change direction on slopes or attempt upper-structure swing operation.
- When passing under bridge, tunnel or other place with limited height, check to make sure the machine could pass through. If yes, travel at low speed.
- When the machine travels on bridge or other place with load limitation, make sure the weight of the machine do not exceed load limits.
- Always keep safety distance, when traveling under high voltage cables.
- Always keep certain distance away from people, structure and other objects.
- Go pass grassland and marsh at low speed.
- Do not immerse the machine in water by more than the permissible depth (under center of sprocket).



3.4.9 Machine traveling



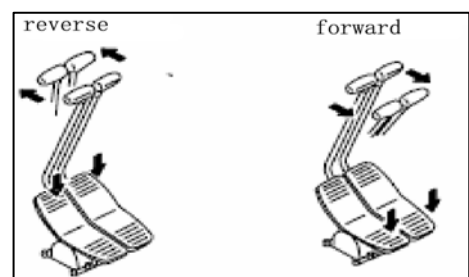
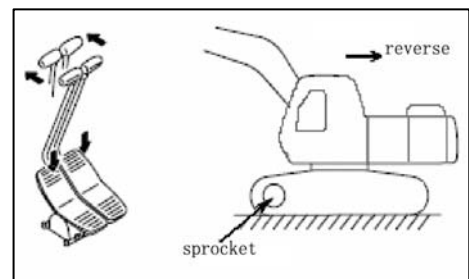
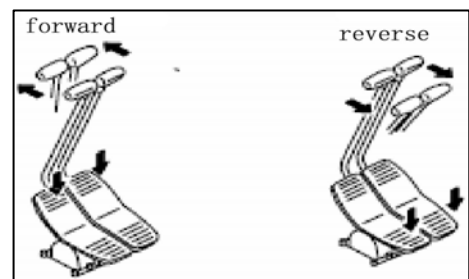
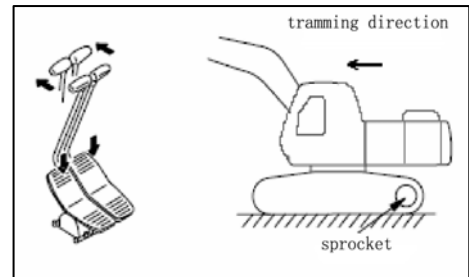
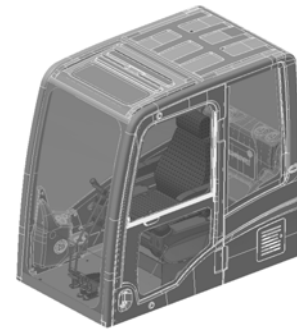
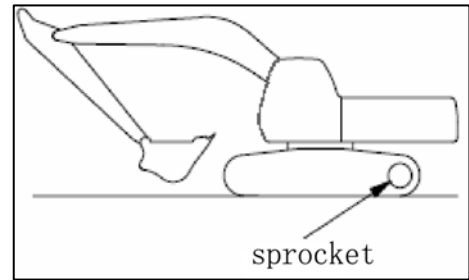
Note

- ◆ Only if the idler roller is under cab, the machine moves in the same direction to the operation of the travel levers.
- ◆ When machine is traveling, do not change traveling direction suddenly to avoid damages to machine.
- When starting the engine, set idle roller under cab. Then place safety lock lever to ON position.
- Fold work equipment, lift boom, and keep the bucket at a height of 400 to 500mm above ground level.
- Push travel control lever or step down travel pedal: push forward both travel control lever(or pedal) in sync, the machine will move forward; pull backward both travel control lever(or pedal) in sync, the machine will move in reverse.
- The machine present 2 travel speed stage: high/low speed, 55km/h and 35km/h accordingly.
- When the sprocket is located under cab, push both travel control lever (or pedal) in sync, the machine will reverse. Pull backward both 2 lever (or pedal), the machine will travel forward.



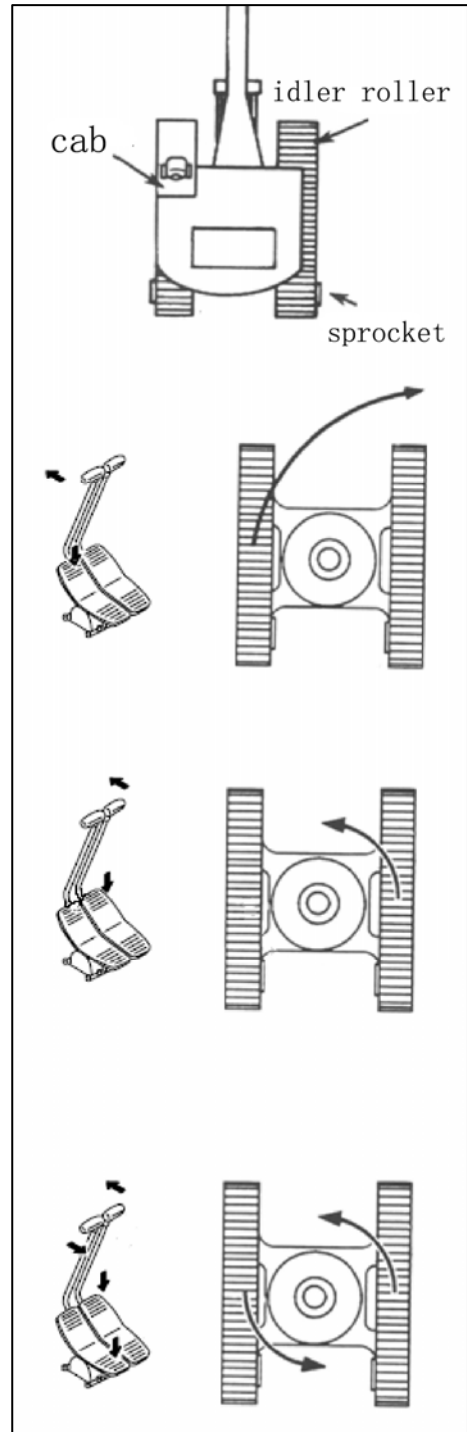
Note:

In real job, should it' s difficult to identify the relationship between machine travel direction and joystick operate direction due to long-time operation, you may give a trial operation by handling joystick slightly. With direction relationship identified, you are allowed to proceed to operate.

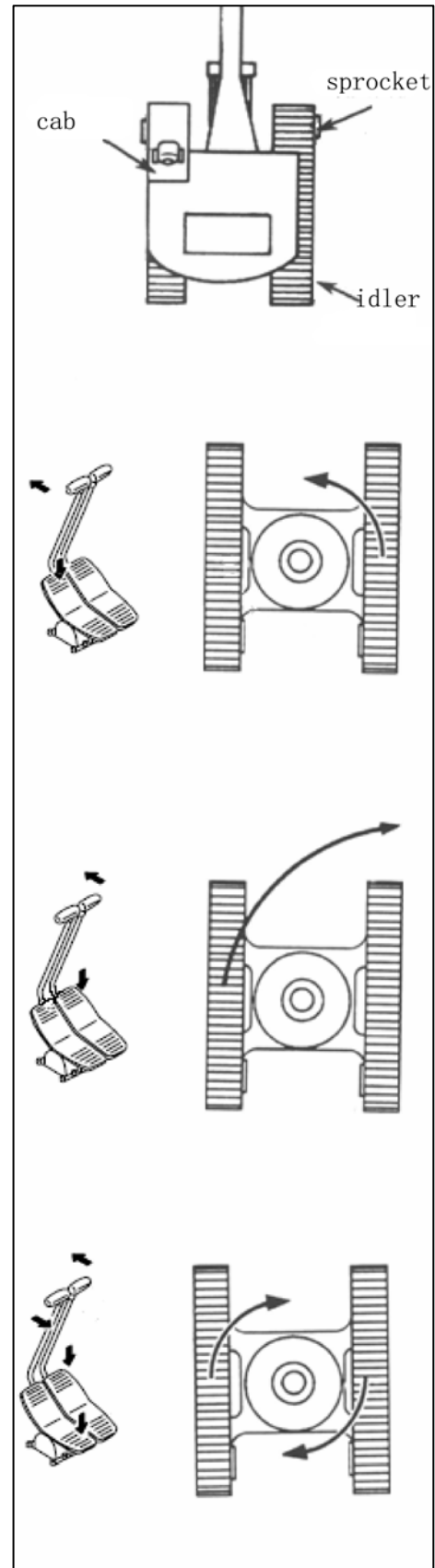


3.4.10 Steering the machine

- When idle roller is located under cab, push left travel lever(or pedal) forward, the machine will travel right, push right travel lever(or pedal) to travel left.
- When idle roller is located under cab, pull left travel lever (or pedal) backward to travel left. Pull right travel lever(or pedal) backward to travel right.
- If push travel lever(or pedal) in different direction in sync, the machine will rotate with center on the machine axis.



- When the sprocket is located under cab, the relationship between operation direction and machine travel direction is in reverse of item ①、② above.



3.4.11 Upper-carriage swing



Warning

- ◆ Before swing operation, check that the surrounding area is clear of obstacles and has sufficient space to swing
- ◆ During swing operation, do not extend bucket and arm at one time, unless the space is larger than machine's max digging radius.
- Start the engine, set safety lever to :ON position.
- Raise boom, fold arm and bucket to keep work equipments at a height of 1 M above ground.
- Operate the lever on the left of seat: to swing the machine to the left, push lever to the left; to swing the machine to the right, push lever to the right.

3.4.12 Operate work equipments



Warning

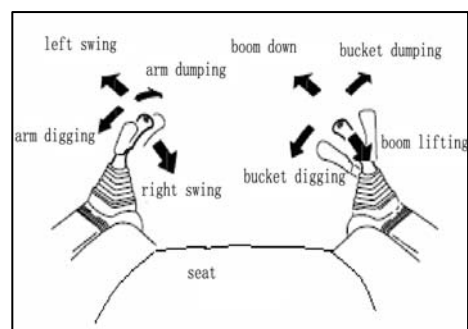
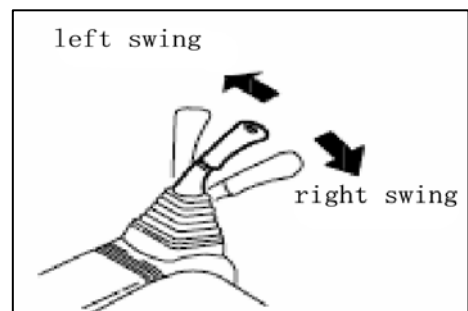
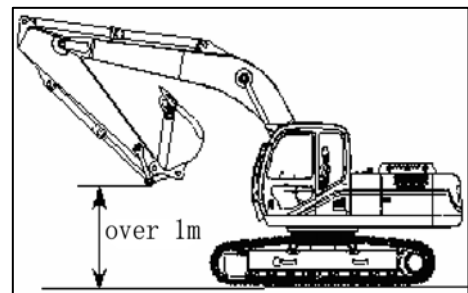
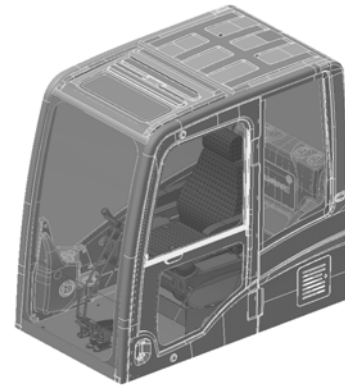
- ◆ When the machine is set to "auto-idle" state, the machine will stop all action for 10 seconds, and then engine will go to idle speed state automatically. Since then, any operation on lever will shift the machine to high rev.
- ◆ The moving speed of work equipments is in proportion with distance of handling lever. i.e. the bigger the distance of lever being moved is, the faster the work equipments move. Avoid sudden movement at high speed.
- Work equipments are regulated by levers located on both side of seat.
- Left control lever
 - Forward, backward movement controls bucket dumping and digging.

Left, right movement controls upper-structure left swing and right swing.

- Right control lever

Forward, backward movement controls boom down movement and up movement.

Left, right movement controls bucket digging and dumping.



3.4.13 Work

Backhoe work

- The bucket should be lowered at 45° to the ground.

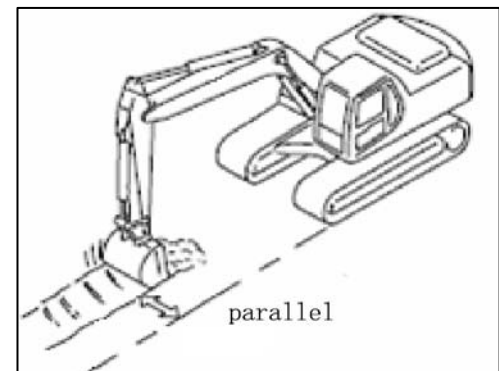
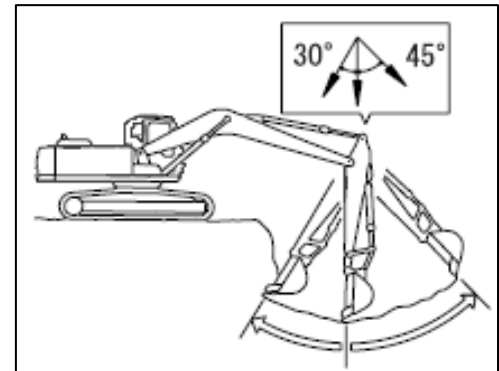
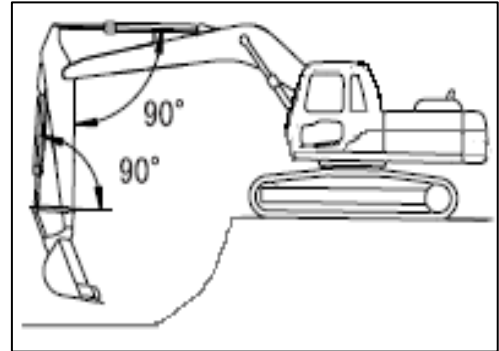
Use arm as a primary digging force to pull bucket towards machine direction.

- If there is mud adhered to bucket, move arm and (or) bucket back and forth rapidly to get rid of mud.



Note:

- ◆ When arm is at 90 degree angle with arm cylinder, and bucket cylinder is at 90 degree angle with bucket link, the max digging force of arm and bucket can be achieved.
- ◆ The range for excavating with the arm is from a 45° away from the machine to a 30° angle toward the machine.
- ◆ Machine can execute short-time intense excavation: a pressurizing button is presented on the top of the left control lever. Pressing it allow system pressure to rise and provide intense excavation for 8 seconds.



Ditching work

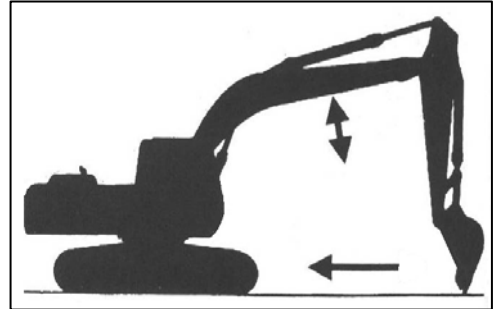
- To excavate a straight ditch, set track parallel to ditch. Excavate to desired depth, then travel machine backward to proceed excavating based on.

Smoothing work



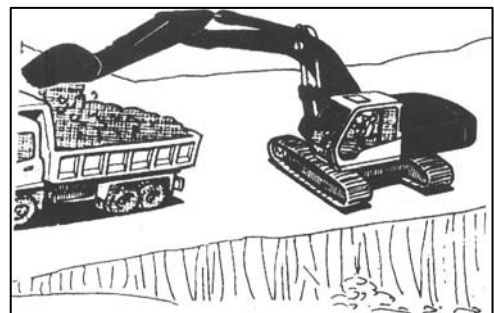
Note

- ◆ Do not excessively use bucket to smooth the ground.
 - ◆ Do not pull bucket in travel manner to carry out smoothing operation.
 - ◆ Do not use bucket in swing manner to carry out smoothing operation. Especially in case of large size obstacles, damages may occur to machine.
- After bucket teeth touches ground vertically, retract it a little.
 - When arm is away from the outer side of excavator, and at right angle to the ground, lift boom and fold the arm to move the bucket teeth in level.
 - When arm is near the inner side of excavator and at right angle to the ground, lower the boom and fold the bucket at the same time to move the bucket teeth in level.



Loading work

- The procedure of using arm and bucket to excavate is identical with that of “backhoes excavate work”.
- Swing upper-structure while raising boom.
- When the bucket is reaching the top of the truck, stop swing operation and boom lifting. Extend arm and bucket to dump.
- After dumping, swing upper-structure, fold arm and bucket appropriately.



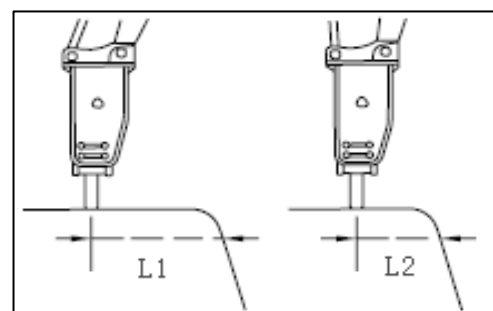
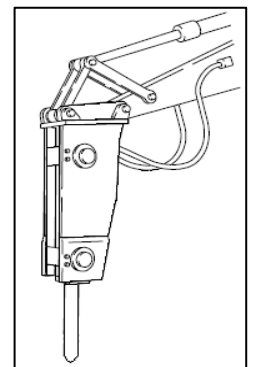
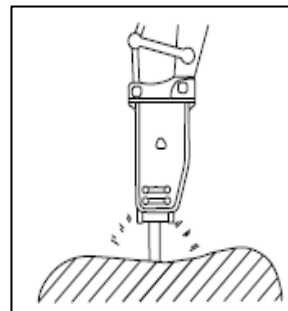
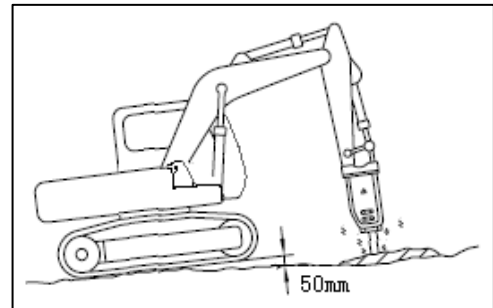
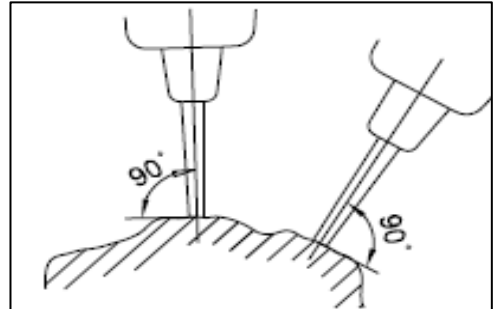
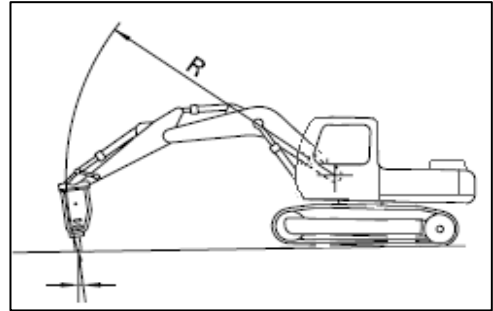
Note : The machine is allowed to swing 90° and 180° for loading. To enhance work efficiency, always perform loading work in 90° swing manner if possible.

Breakout work



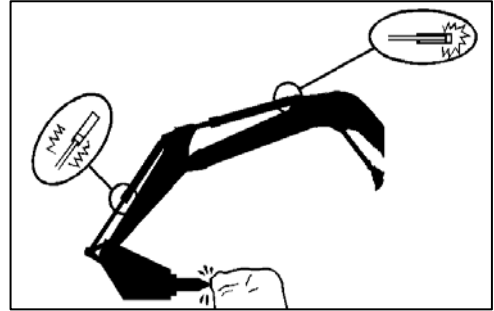
Note

- ◆ Select matched model of breaker according to excavator model.
- Main applications of breaker:
 - Crush rock
 - Road construction
 - Structure demolition
- Keep the chisel pushed perpendicularly against the impact surface when carrying out breaking operation.
-
- When applying impact, push chisel against the impact surface and operate so that the chassis rises approx. 5 cm (2 in) off the ground. Do not let the machine come further off the ground than this amount.
- Always keep the chisel pressed against the impact surface properly to prevent using the impact force when there is no resistance.
- Adjust bucket cylinder at all time, always keep chisel pushed perpendicularly against the impact surface.
- When it's difficult to break, do not apply continuous impact to the same surface for longer than 1 minute. Change the point of impact and carry out breaking operation closer to the edge.

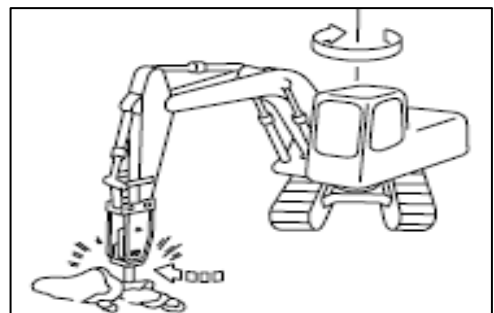


Prohibited works

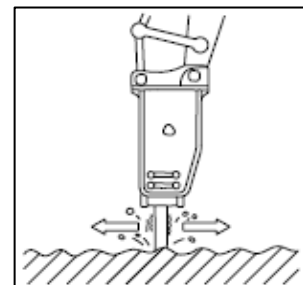
- ◆ Do not operate hammer breaker to the end of strokes.



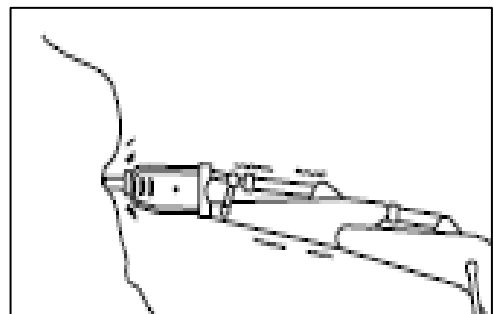
- ◆ Do not operate using the swing force.



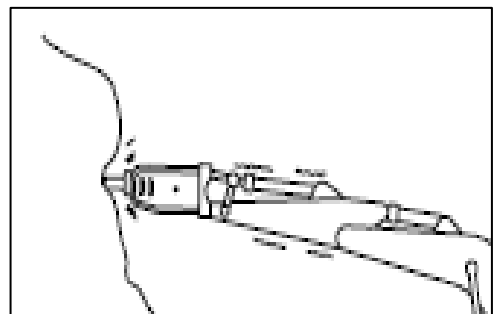
- ◆ Do not move the chisel while carrying out impacting operations



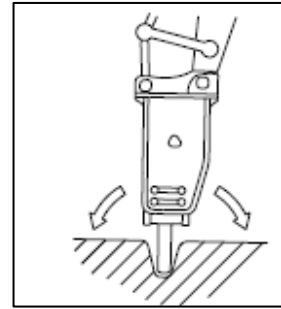
- ◆ Do not move chisel to gather in pieces of rock.



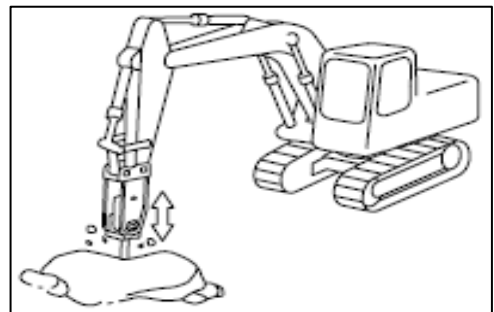
- ◆ Do not holding the chisel horizontal or pointed up when carrying out impacting operations.



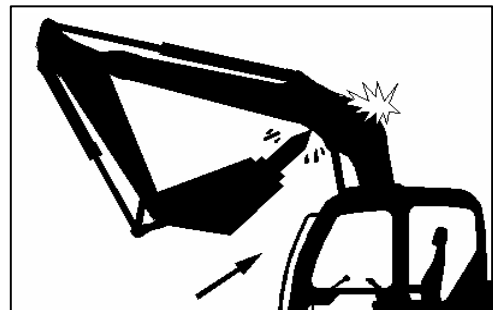
- ◆ Do not twist the chisel when it has penetrated the rock.



- ◆ Do not move work equipments to drive breaker to work.



- ◆ When folding arm and breaker, do not impact boom; let alone step down impacting pedal to cause chisel to hit boom. This can cause direct damage to machine.



3.4.14 Boom emergency stop

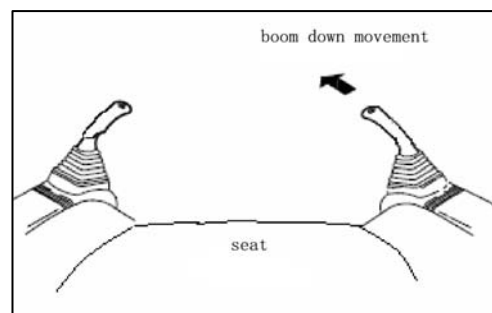
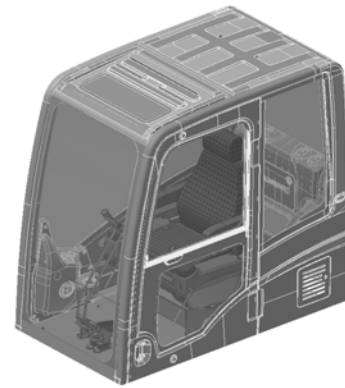
If the engine fails to start due to expected flameout, it's necessary to lower the boom and keep bucket down to ground to prevent accidents arising from boom falling off as well as to facilitate service.

- Carry out the following operation in 5 minutes if expected engine stop happens.
- Set pilot control lever to ON position.
- Honk the horn to alert.
- Gradually move right control lever (for boom action controlling) forward.



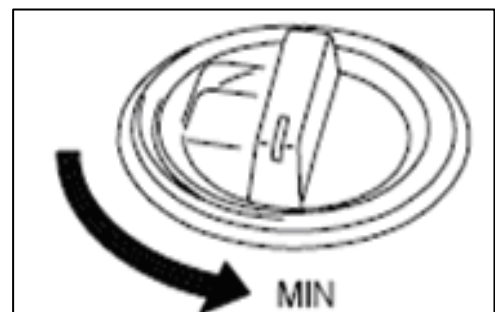
Note

- ◆ Do not operate too quickly, failure to do so may cause boom's sudden up movement and lead to accidents.
- ◆ Do not operate any other lever and actions, failure to do so; boom can not be lowered due to pressure depletion in accumulator.



3.4.15 Parking machine

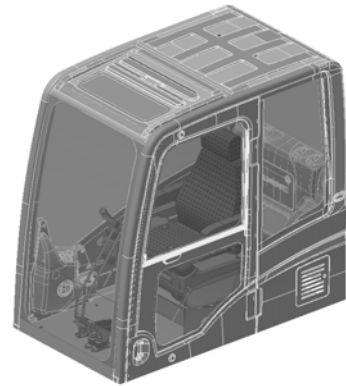
- 1) Drive machine to parking area. The area must be firm level ground.
- 2) Release all operate levers and keep them in NEUTRAL position.
- 3) Set safety lock lever to LOCK position.
- 4) Turn throttle knob counterclockwise to MIN, allow engine to idle at low speed for 5 minutes.
- 5) Set starting key to OFF position, remove the key.
- 6) Close all doors, windows. Shut access door, tool box, engine cover and fuel tank.



3.4.16 Machine stop and emergency stop

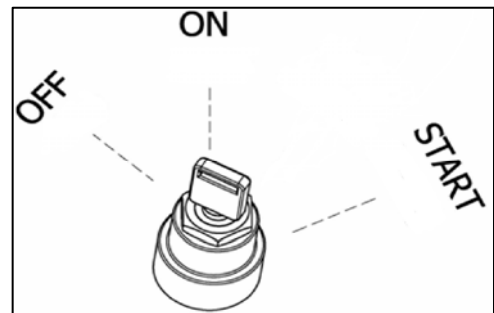
Stop machines

- 1) Stop operating lever and travel pedal, individual control valve will return to NEUTRAL position; all action of the machine will stop. However the machine will act when operating control valve.
- 2) Set pilot safety lever to LOCK position, the machine will stop. In this case, the machine will not be started, even if you operate all control valves.



Emergency stop

In case of emergency, use emergency stop:
Set engine start key to OFF position to stop engine.



3.4.17 Handling the Engine with Diesel Particulate Defuser (DPD)

The DPD purifies particulate matter (PM) contained in the exhaust gas. It traps PM in the DPD filter, and when a certain amount of PM is accumulated in the filter, the DPD automatically removes the PM by combustion (regeneration of the filter).

DPD regeneration has 2 types such as automatic regeneration, and manual regeneration.

1) Automatic Regeneration

While the machine is in operation, regeneration is automatically performed based on the instruction from the engine controller (ECM).

When machine is auto regeneration, icon  is lighting on the discreen, green lamp of operation box is lighting at the same time.

The engine speed may rise while idling. When this occurs, the DPD is in process of automatic regeneration. This does not indicate a failure. Also, it is not required to operate the DPD switch. When the engine is stopped during automatic regeneration, the regeneration operation is interrupted, but it is automatically resumed when the engine is restarted.

When this situation repeatedly occurs the automatic regeneration can not be completed, therefore a manual regeneration is required. It is recommended not to stop the engine as much as possible while automatic regeneration is in progress.

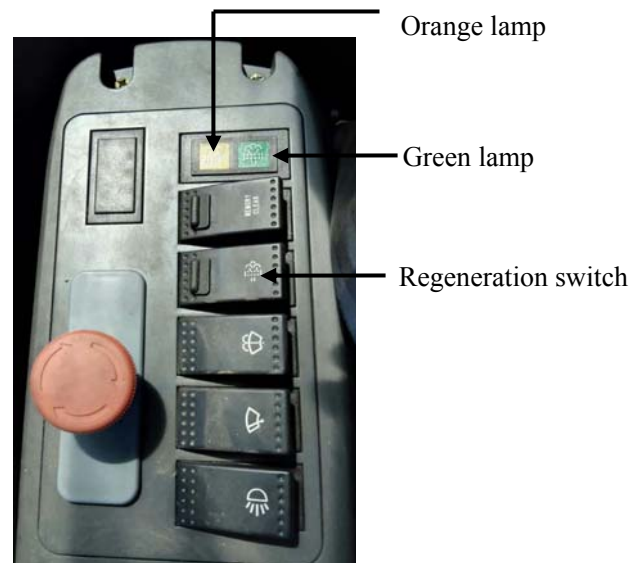
2) Manual Regeneration

If the automatic regeneration can not be completed by some reason, the manual regeneration is requested to operator by blinking the orange DPD indicator light on the button operation box and on the display, two icons will be flicker, may with

warning  

DPD Steps of hand regeneration

1. Perform regeneration at a place free of flammable material such as a plant, dried grass



and paper waste.



Notice

- ◆ To prevent a fire make sure that there are no flammables near the muffler, DPD and exhaust pipe. Also, be aware that there is a risk of burn injury due to the high temperature exhaust gas.

2. Make the water temperature of operation equipment above 70°C.

3. keep the engine at idle speed state, press DPD regeneration switch.

4 When start regeneration, engine rev. speed is automatic rising to 1000 RPM, orange lights up, at



the same time lights on the screen, then don't leave the machine. Regeneration process generally lasts for 15 to 20 minutes, but the last time mainly depend on the external environment temperature.

5. At the end, engine rev. speed recover to idle speed, orange lights out, manual regeneration finished.



Warning

- ◆ White smoke may be produced during regeneration, so do not perform regeneration in a poorly ventilated indoor place.



Notice

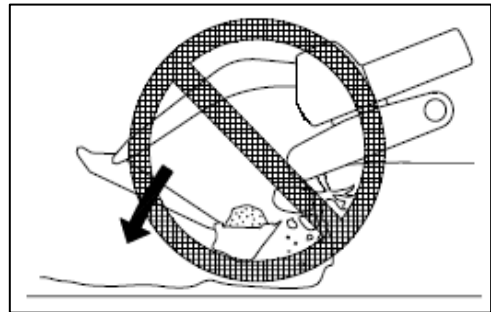
- ◆ If the amount of particulate matter (PM) accumulated in the DPD is small, no DPD regeneration is required, so , no regeneration starts even when you manually operate the buttons or others.
- ◆ When regeneration must be interrupted to drive the machine out of necessity, press the DPD switch once again. in this case, regeneration is required to be performed again, so start over the manual regeneration procedure.

3.4.18 Prohibited operations

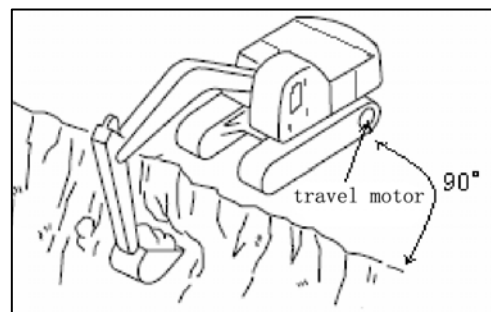
- 1) Do not let bucket loaded pass over people and cab to prevent falling objects.



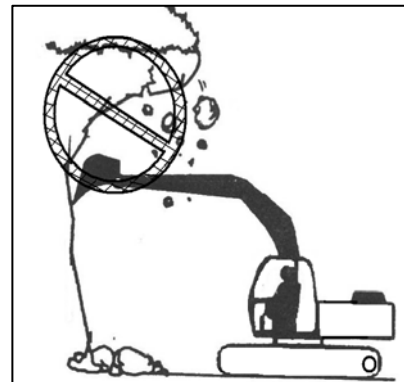
- 2) Do not excavate too deeply under the front of the machine, the ground under the machine may collapse and cause the machine to fall.



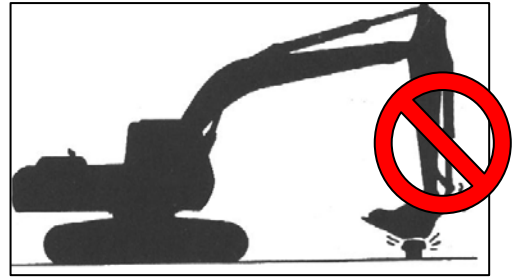
- 3) To make it easier to escape if there is a problem, set the tracks at right angle to the road shoulder or cliff with travel motor at the rear when carrying out operations.



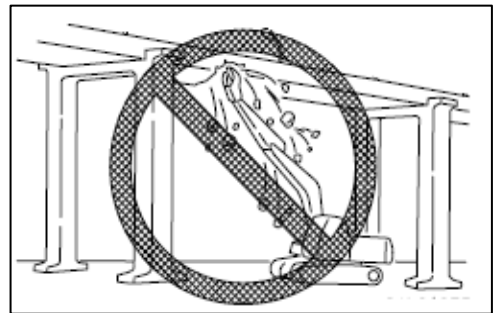
- 4) Do not work under suspension parts or excavate suspension shape to prevent damages to the machine or injury due to collapse.



- 5) Do not use impact of work equipments to carry out break operation. This may cause damages to work equipments.



- 6) When carrying out demolition work, do not carry demolition above your head, there is hazard of broken parts falling off.



- 7) When using breaker or other heavy-duty equipments: do not lower, raise, swing and stop work equipments all of sudden to avoid accidents due to losing its balance.

4 Maintenance and service



Warning

Before reading this chapter, please thoroughly read and fully understand the contents described in chapter “SAFETY RULES” in this manual.

4.1 Maintenance information

Study how to maintenance and service this excavator, follow all maintenance and inspection procedure described in this manual.

4.1.1 Instruction of maintenance and inspection

【Important】

- Use recommended fuel, hydraulic oil and lubricant.
- Use only genuine parts produced by SUNWARD.
- In the event that you fail to use recommended fuel, lubricant, hydraulic oil and genuine parts, your warranty rights will become void.
- Do not adjust engine speed limiter or hydraulic system safety valve.
- Do not allow water to reach electric equipments.
- Do not dismantle engine pump controller, sensor etc.



4.1.2 Daily inspection prior to start-up

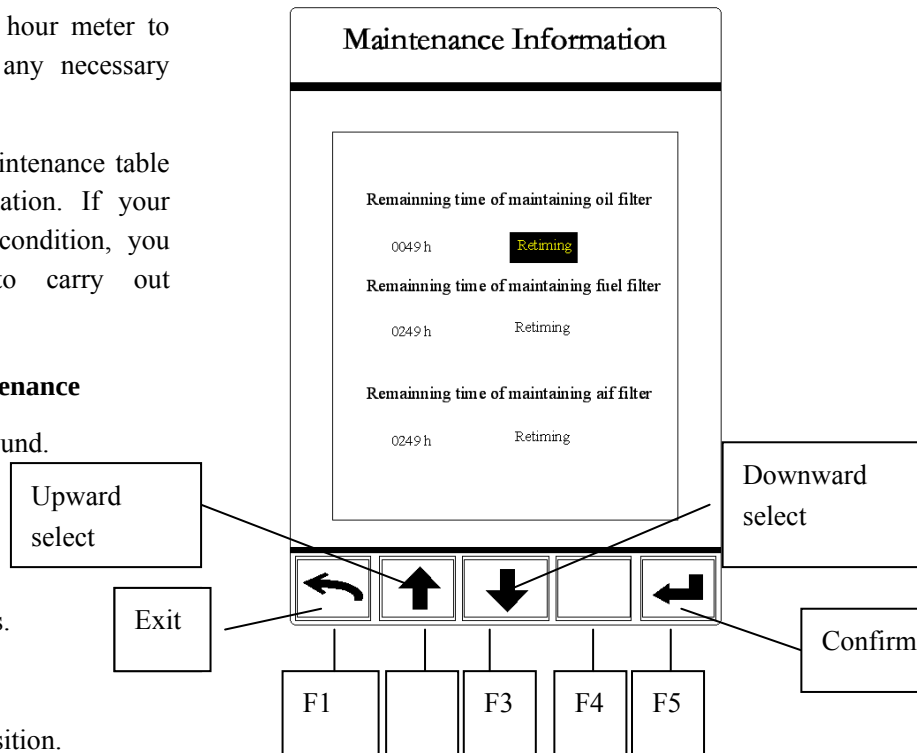
- Check monitor.
- Check individual liquid level.
- Check hose and piping for leakage, twist, wear out or damage.
- Give a walk-around inspection for some normal items, e.g. noise, temperature etc.
- Check parts for looseness or lost.
- If any problems are found, repair them before operation, or you may contact designated distributor for assistance.

4.1.3 Check hour meter frequently

- Check the reading displayed on hour meter to see if the time has come for any necessary maintenance.
- The interval listed on regular maintenance table is made based on normal situation. If your machine works under extreme condition, you may shorten this interval to carry out maintenance procedure.

4.1.4 Preparation work prior to maintenance

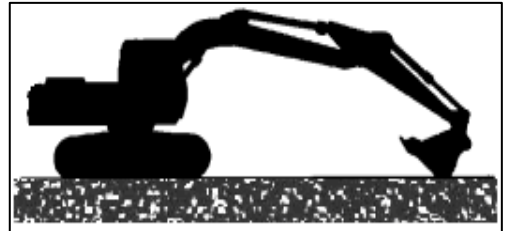
- Park the machine at firm level ground.
- Lower the bucket to the ground.
- Shut down auto-idle function.
- Allow engine to idle for 5 minutes.
- Set the key to OFF position.
- Set safety lock lever to LOCK position.
- Post 'DO NOT OPERATE' to the machine.



4.1.5 Handle fuel and lubricant properly.

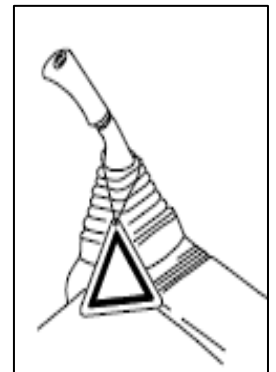
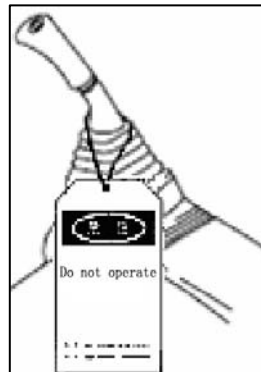
【Important】

- Always use recommended fuel and lubricant, failure to do so will cause damages to excavator, and your warranty right will become void.



4.1.6 Check discharged grease and used filter.

- With oil or filter core replaced, check used oil and filter core for any metal chips and debris. If a large amount of metal chips or debris is found, report to the owner of the machine or your superior, and take proper measures.



4.1.7 Checks after inspection and maintenance

Accidents may occur and cause serious injury or damage, if failed to check after inspection and maintenance. Follow the steps below to carry out inspection.

- **Check after inspection and maintenance(with engine stopped)**

- Have any inspection and maintenance points been forgotten?
- Have all inspection and maintenance items been carried out? Check one by one. .
- Have any tools or parts been dropped inside the machine? It's particularly dangerous if parts are dropped inside the machine and get caught in the link mechanism.
- Check for any water and oil leakage. Be sure all bolts have been tightened at specified torque?

- **Inspection when operating engine.**

- For any detail information about the checks when operating engine. Please maintain it with two people.
- If the inspection and maintenance items work properly.
- Is there any leakage of fuel or oil when engine speed is raised and applying loads to hydraulic system.?

electrical short circuit and may lead to malfunction of the machine.

- Do not use water to flush the inside of the operator's cab.
- Do not allow water to get into the electrical components.
- Service relating to the electric system is checking fan belt tension, checking damage or wear to the fan belt and checking battery fluid level.
- Never install any electric elements other than those specified by SUNWARD.
- When working at seashore, carefully clean the electric system to prevent corrosion.

4.1.8 Electrical system maintenance

- It is extremely dangerous if the electrical equipment becomes wet or the covering of the wiring is damaged. This will cause an

4.1.9 Hydraulic system maintenance

Hydraulic equipment is at high temperature during operations and immediately after operations. During operation, it's also under high pressure, so be careful of the following points when carrying out inspection and maintenance of hydraulic related equipment.

- Stop the machine on level ground, lower the bucket completely to the ground.
- Always stop the engine and release pressure in hydraulic piping.
- Immediately after the engine is stopped, the hydraulic oil and lubricants are at a high temperature and high pressure. Wait for the temperature to go down before starting the maintenance operation.
- Even when the temperature goes down, the circuits may be under internal pressure, so when loosening plugs, screws, or hose connections, do not stand directly in front. Loosen gradually to release the internal pressure before removing.
- Always release the air in the hydraulic tank to remove the internal pressure before carrying out inspection and maintenance of the hydraulic circuit.
- Inspection and maintenance works include checking the hydraulic system for oil level, replacement of filter elements and replacement of hydraulic oil.
- If high pressure hoses have to be removed, check that there is no damage to the O-rings. If any damage is found, replace the O-ring.

4.2 Oil, coolant and filter

4.2.1 Lubricant and hydraulic oil

- Oil is used in the engine and hydraulic equipment under extremely severe conditions (high temperature, high pressure), and deteriorates with the use.
- Always use oil that matches the grade and maximum ambient temperatures recommended in the operation and maintenance manual.
- Even if the oil is not dirt, always change the oil at specified interval.
- Always be careful when handling it to prevent any impurities (water, metal particles, dirt, etc.) from getting in. the majority of problems with machines are caused by the entry of such impurities.
- Never mix oils of different grades or brands.
- Always add specified amount of oil.
- If the oil in the work equipments is not clear, there is probably water or air getting into the circuit. In such cases, please contact your SUNWARD distributor.
- When changing the oil, always replace the related filters at the same time. Especially when changing engine oil filter before installation, add specified fresh and clean oil to new filter.
- We recommend you have an analysis made of the oil periodically to check the condition of the machine. For those who wish to use this service, please contact your SUNWARD distributor.
- The hydraulic system has been filled with SAE 10W CD oil, when the machine is shipped from factory.
- Do not use any hydraulic oil other than those recommended by SUNWARD. Failure to do so may cause filter clogging.
- When changing hydraulic oil, please clean up thoroughly the residual oil in piping and cylinder.

4.2.2 Fuel

- The fuel pump is a precision instrument. If fuel containing water or dirt is used, it can not work properly.
- Be careful not to let impurities get in when storing or adding fuel.
- Always use the fuel specified in the Operation and Maintenance Manual.
- Fuel may congeal depending on the temperature when it is used (particularly in low temperature below -15°C (5°F) . It's necessary to use the fuel that is suitable from the temperature.
- To prevent humidity in air to condense in fuel tank to form water, top up oil tank after the work is finished everyday.
- Before starting the engine, or when 10 minutes have passed after adding fuel, drain the sediment and water from the fuel tank.
- If there runs out of fuel, or if the filters have been replaced, it is necessary to bleed the air from the circuit.

4.2.3 Coolant in cooling system

- River water contains large amount of calcium and other impurities, so if it is used, scale will stick to the engine and radiator, and this will cause defective heat exchange and overheating.
- When using antifreeze, always observe the precautions given in the Operation and Maintenance Manual.
- Antifreeze is flammable, so be extremely careful not to expose it to flame or fire.
- The proportion of anti-freeze to water differs according to the ambient temperature. For details of the mixing proportions.
- If engine is overheating, before adding coolant, wait for the engine to cool down.
- If the coolant level is low, it will cause overheating and will also cause problems with corrosion from the air in the coolant.

4.2.4 Grease

- Grease is used to prevent twisting and noise at the joints.
- If any part becomes stiff after being used for long time, add grease.
- Always wipe off all of the old grease that is pushed out when greasing. Be particularly careful to wipe off the old grease in places where sand or dirt sticking in the grease would cause wear of the rotating parts.

4.2.5 Oil and fuel storage

- Keep indoors preventing any water, dirt, or other impurities from getting in. if drums have to be stored outside, cover them with a waterproof sheet or take other measures to protect them.
- When keeping drum cans for a long period, put the drum on its side so that the filler port of the drums is at the side to prevent moisture from being sucked in.
- To prevent any change in quality during long-term storage. Be sure to use in the order of first in- first out (use the oldest oil or fuel first).

4.2.6 Filter

- Filters are extremely important safety parts. They prevent impurities in the fuel and air circuits from entering important equipment and causing problems.
- Replace all filters periodically. Details see P131-P132.
- Do not clean the filters (cartridge type) and use again.
- When replacing filters, check if any metal particles are affixed to the old filter. If any metal particles are found, contact your SUNWARD distributor.
- Do not open packs of spare filters until just before they are to be used. Always use SUNWARD genuine filters.

4.2.7 Fuel and coolant specifications

		Ambient temperature										Speci fied capac ity	Refill capac ity	
		-22	-4	14	32	50	68	86	104	122°F				
		-30	-20	-10	0	10	20	30	40	50°C				
Engine oil pan	Engine oil					SAE 30								
				SAE 10W										
		SAE 10W-40												
				SAE 15W-40										
			SAE 5W-30											
Swing reductor														
Travel reductor														
Hydraulic system														
Fuel tank	Diesel oil				ASTM D975 No.2									
			★											
				GB252 premium-20# light diesel oil										
Swingmechanism grease chamber	Albany grease													
Oil cup				NLGI No.2										
Cooling system	coolant	Add antifreeze												

4.3 Tightening torque specification



Note

- ◆ If nuts, bolts, or other parts are not tightened to the specified torque, it will cause looseness or damage to the tightened parts, and this will cause failure of the machine or problems with operation.

4.3.1 Tightening torque table for bolt, nut

Thread diameter (mm)	Across flats (mm)	Tightening torque					
		Target value			Service limit		
		N•m	kgf•m	lbft	N•m	kgf•m	lbft
6	10	13.2	1.35	9.8	11.8 - 14.7	1.2 - 1.5	8.7 - 10.8
8	13	31	3.2	23.1	27 - 34	2.8 - 3.5	20.3 - 25.3
10	17	66	6.7	48.5	59 - 74	6.0 - 7.5	43.4 - 54.2
12	19	11	11.5	83.2	98 - 123	10.0 - 12.5	72.3 - 90.4
14	22	177	18	130.2	157 - 196	16.0 - 20.0	115.7 - 144.7
16	24	279	28.5	206.1	245 - 309	25.0 - 31.5	180.8 - 227.8
18	27	382	39	282.1	343 - 425	35.0 - 43.5	253.2 - 314.6
20	30	549	56	405.0	490 - 608	50.0 - 62.0	361.7 - 448.4
22	32	745	76	549.7	662 - 829	67.5 - 84.5	488.2 - 611.2
24	36	927	94.5	683.5	824 - 1030	84.0 - 105.0	607.6 - 759.5
27	41	1320	135.0	976.5	1180 - 1470	120.0 - 150.0	868.0 - 1085.0
30	46	1720	175.0	1265.8	1520 - 1910	155.0 - 195.0	1121.1 - 1410.4
33	50	2210	225.0	1627.4	1960 - 2450	200.0 - 250.0	1446.6 - 1808.3
36	55	2750	280.0	2025.2	2450 - 3040	250.0 - 310.0	1808.3 - 2242.2
39	60	3280	335.0	2423.1	2890 - 3630	295.0 - 370.0	2133.7 - 2676.2

4.3.2 Tightening torque table for hose

Normal No. of threads	Across flats (mm)	Tightening torque					
		Target value			Permissible range		
		N•m	kgf•m	lbft	N•m	kgf•m	lbft
9/16-18UNF	19	44	4.5	32.5	35 - 63	3.5 - 6.5	25.3 - 47.0
11/16-16UN	22	74	7.5	54.2	54 - 93	5.5 - 9.5	39.8 - 68.7
13/16-16UN	27	103	10.5	75.9	84 - 132	8.5 - 13.5	61.5 - 97.6
1-14UNS	32	157	16.0	115.7	128 - 186	13.0 - 19.0	94.0 - 137.4
13/16-12UN	36	216	22.0	159.1	177 - 245	18.0 - 25.0	130.2 - 180.8
★ 1-7/16-12UN-2B	41	215	22.0	159.1	176 - 234	18.0 - 24.0	130.2 - 180.8

Note: The ★ marked torques represent tightening torque for hoses above swing joint.

4.4 Maintenance schedule

4.4.1 Add lubricating grease

Part name		QTY	Interval (hour)						
			8	50	100	250	500	1000	2000
Individual pin roll for work equipment	Connecting pin roll of boom and turret	2	△						
	Pin roll on both side of cylinder	8	△						
	Individual pin roll of arm and bucket	8	△						
Swing bearing all track		2				△			
Swing mechanism grease chamber		1					△		

Recommended lubricating grease

	bucket、arm and boom、rotary gear, swing bearing etc
	—20 to 40°C (—4 to 104°F)
BP	BP Energrease Ls—EP2
Caltex	Multifax EP2
Esso	Beacon EP2
apollo	Daphne Coronex Grease EP2
Mobil	Mobilux EP2
fuchs	2# extreme pressure lithium grease
Shell	Shell Alvania EP Grease 2
Remark	lithium grease with extreme high load capacity

4.4.2 Engine oil

Item		SWE150F/210F	daily	50	500	1000	1500
engine oil	check oil level	1	△				
engine oil	replace	18~24L		▲※	▲	▲	▲
Oil element	replace	1			▲	▲	▲

※ Replace engine oil after the first 50 hours, afterwards, replace every 500 hours.

For the other aspects, please carry out the maintenance procedure following the requirements specified in diesel engine manual.

•The performance difference among different engine oil is big. We commonly adopt API and CCMC standards.

Recommended engine oil grade and brand are listed in the following table.:

LUBRICATION	GRADE		
	API	ACEA	JASO
Diesel engine crankcase, with DPD(low ash oil)	CJ-4	E6/E9	DH-2

4.4.3 Gear oil

Part name		QTY	Interval (hour)						
			8	50	100	250	500	1000	2000
Swing redactor	Check oil level	—				△※			
	Replace	4.5~7 L						▲	
Travel redactor	Check oil level	—				△※			
	Replace	2×(4~8) L							▲

※ Check oil level every 250 hours, refill if necessary.

Note: Filling quantity of gear oil should be defined by the height of oil pointer

Recommended gear oil name

supplier	Gear oil	Gear oil -20°C to 40°C
Esso	Esso Gear Oil	GP80-90,GP85W-90
ENEOS	Gear Lube Sp90	
Mobil	Mobilube	Gx90 ※
Fina	GL-580W-90	
Great wall(Sinopec)	85W/90	
Shanghai oil	API-GL-4	85W/90

Note: The machines are delivered from factory with ※ marked gear oil.

4.4.4 Hydraulic system

Part name		QTY	Interval (hour)							
			8	50	100	250	500	1000	2000	3000
Check hydraulic oil level		1	△							
Replace hydraulic oil		—							▲※	▲※
Clean up oil suction filter		1				△				
Replace oil suction filter		1						▲		
Clean oil return filter		1			△					
Replace oil return filter		1						▲		
Replace pilot oil filter		1						▲		
Check hose and piping	Leakage	—	△							
	Crack and twist	—				△				

Note:： ※——Hydraulic oil replacement interval is relating to its type, with different type of engine oil, the replacement interval varies.

Recommended hydraulic oil brand name

Oil type	Hydraulic oil			
Service point	Hydraulic system			
Replace interval	2000 hour		1500 hour	
Ambient temperature Brand supplier	-20℃ to 40℃	-10℃ to 40℃	-20℃ to 40℃	-10℃ to 40℃
Fina	HM46			
Esso Standard	Essolube D-3 10W 30			40
Mobil	AW46			
Shell	1310			
fuchs	LC46			
Caltex	HD46			
Remark	Abrasive-resistance hydraulic oil			

4.4.5 Fuel system

Inspection/Maintenance Item	Interval (hour)						
	Daily	250	500	750	1000	1250	1500
Fuel leak	△						
Water removal from fuel	△		△※		△※		△※
Replacing the fuel filter element			△		△		△
Inspecting and cleaning the supply pump strainer			△※		△※		△※
Replacing the electromagnetic pump filter (paper type)			△※		△※		△※
Cleaning the electromagnetic pump filter (steel mesh type)							
Inspecting and cleaning the injector							

※ :Shorten the interval from every 500 hours to every 250 hours depending on the fuel management and refuel status.

4.4.6 Intake/Exhaust System

Inspection/Maintenance Item	Daily	250	500	750	1000	1250	1500	Remarks
Replacing the air cleaner element		△						Clean up every 250 hours
Inspecting the air filter case for cracking and replacing it as necessary							△	Every 1500 hours
Inspecting the turbocharger								Every 4500 hours
Inspecting and cleaning the EGR valve								Every 4500 hours
Inspecting and cleaning the EGR cooler								Every 4500 hours
Inspecting or maintenance the DPD and related parts								Every 3000 hours

4.4.7 Cooling system

Item	QTY	Interval (hour)						
		8	50	100	250	500	1000	2000
Check cooling water level	1	△						
Check and adjust fan belt tension	1		※1	△				
Replace cooling water	23~28 L	Twice a year ※2						
Clean up radiator and hydraulic oil cooler mandrel	Outside	1				△※3		
	Inside	1	When replacing cooling water					
Clean up condenser.	1					△※3		

Note: ※1 This item needs maintenance at first inspection.

※2 At delivery, cooling system has been filled with water and genuine long-life coolant mixture. Replace cooling water once a year or every 2000 hours whichever comes first, in the event of using SUNWARD genuine long-life coolant.

※3 If the machine works at dust area, shorten maintenance interval.

4.4.8 Other

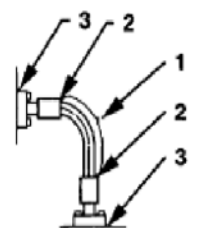
item	QTY	Interval (hour)						
		8	50	100	250	500	1000	2000
Check bucket teeth for fray and looseness	—	△						
Replace bucket	1	Interval						
Adjust bucket connection clearance	1	Interval						
Check and replace seat belt	1	△	Every 3 years (replace)					
Add wind shield detergent	—	Interval						
Check track sag	2		△					
Adjust track sag	2	Interval						
Check air conditioning system	1	△						
Clean cab floor cushion	1	Interval						
Check tightening torque of bolt, nut	—		△※		△			

Note: ※This item needs maintenance at first inspection.

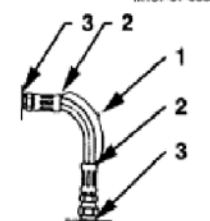
4.4.9 Hose

table 1. hose

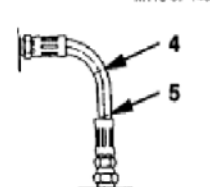
interval (hour)	inspection item	abnormality	remedy
daily	hose appearance	leaks (1)	replace
	hose end	leaks (2)	replace
	joint	leaks (3)	tighten, replace hose or replace o-ring
every 250 hours	hose appearance	crack (4)	replace
	hose end	crack (5)	replace
	hose appearance	strengthening material expose (6)	replace
	hose appearance	partly raised (7)	replace
	hose	bend (8)	replace
	hose	bend (9)	replace (use proper bending radius)
	hose and joint	deformed and corrosion (10)	replace



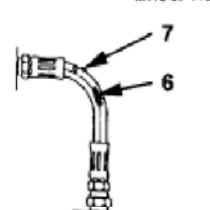
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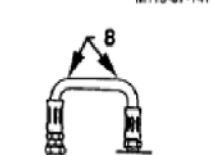
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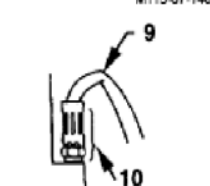
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M115-07-149

4.4.10 Wearing parts table

Item	No.	Part Name	Qty	Replace interval	Remark
	SWE210F				
engine oil filter	750201010335	engine oil filter core	1	Every 500	
fuel filter	750201011065	fuel pre-filter core	1	Every 500	
	750201011066	fuel main filter core	1	Every 500	
hydraulic oil filter core	730403000186	oil return filter core	1	Every 1000	
pilot filter	730403000106	pilot filter core	1	Every 1000	
air filter	750201012270	air outer filter core	1	—	
bucket	750601000116	bucket bush	5	—	
	750601000117	bucket tooth pin	5	—	
	—	circlip of bucket tooth pin	5	—	
	750601000118	left side tooth/guard plate	1	—	
	750601000119	right side tooth/guard plate	1	—	
	701103024049	bolt/round pin	8/4	—	
	701404024001	nut	8	—	

4.4.11 Maintenance in special situation

Work condition	Maintenance instruction
Work in mud, water and rain.	● Check joint, bolt and nut for looseness and lost, and any signs of damages and leakage. ● After work, clean up mud, rock, sand adhered to machine. Check welds for damages, cracks and looseness. ● Execute daily lubrication and maintenance work. ● In the event that machine has to work in circumstances involves acid rain or corrosive stuff, flush parts being effected with fresh water
Seashore	● Check plug and all drain plug to ensure they are tighten securely prior to operation. ● After completing operation, flush machine with fresh water to remove salt. Carry out maintenance operation regularly to prevent corrosion.
Dusty and hot situation	● Clean up air filter and cartridge more frequently. ● Clean radiator and oil cooling fins to remove embedded dust and dirt. ● Clean up fuel suction cartridge and filter more frequently. ● Clean up frequently, especially the surface of alternator and starter rectifier.
In rocky situation	● Operate with extra care. Check chassis and track for damages and excessive wear out. ● Check joint, nut, and bolt for looseness, damage and lost. ● Check bucket or breaker for damage and excessive wear out more frequently. ● Fix a upper or front frame to prevent hazard due to falling objects, if necessary.
In cold weather	● Use premium oil with low viscosity according to ambient temperature. . ● Use proper anti-freezing according to ambient temperature. ● Charge battery a little time earlier than normal situation. The electrolyte will freeze with insufficient charging. ● Remove mud adhered to machine to prevent damages to machine due to freezing.
In existence of falling objects	cab: Add falling objects prevention device to prevent cab from damaging and avoid operator injury if necessary. .

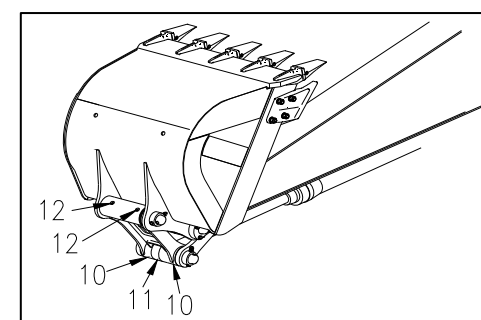
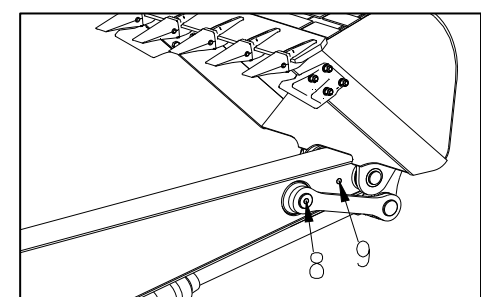
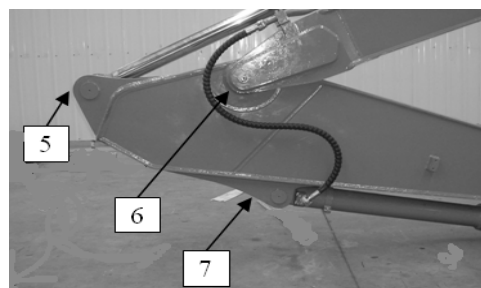
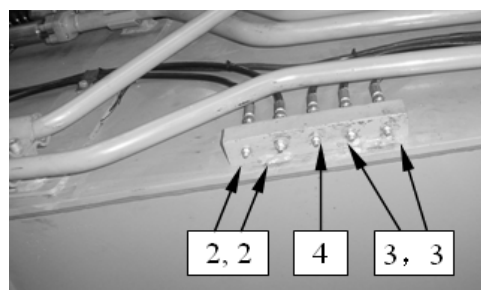
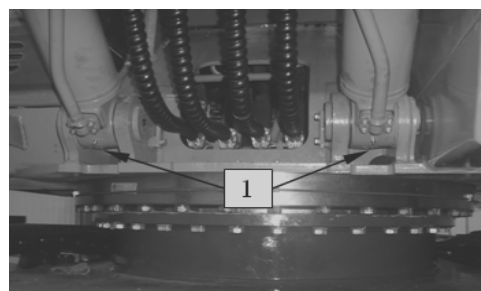
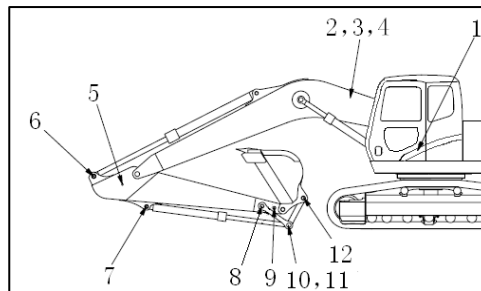
4.5 Machine maintenance interval

4.5.1 Daily maintenance (every 8 hours)

Carry out following maintenance operation
before starting machine daily(every 8 hours):

4.5.1.1 Greasing work equipments

- (1) boom cylinder foot, 2 places
- (2) boom foot pin (2 places)
- (3) boom cylinder rod end (2 places)
- (4) arm cylinder foot pin(1 place)
- (5) boom – arm connecting pin (2 places)
- (6) arm cylinder rod end (1 place)
- (7) bucket cylinder foot pin (1 place)
- (8) arm –link connecting pin(1 place)
- (9) arm – bucket connecting pin(1 place)
- (10) link connecting pin(2 places)
- (11) bucket cylinder rod end.(1 place)
- (12) bucket – link connecting pin(2 places)



4.5.1.2 Check engine oil level

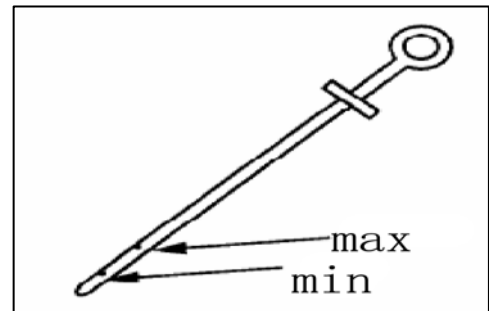
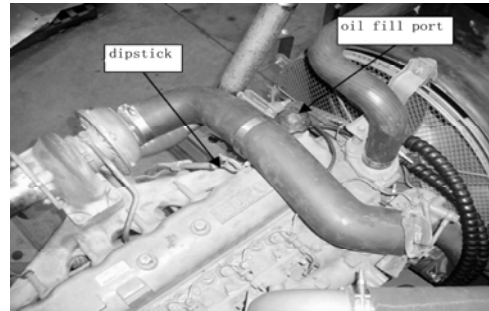


Warning

- ◆ The parts and oil are at high temperature after engine is stopped, and may cause serious burns. Wait until temperature goes down before starting operation.
- Open engine cover, pull dipstick out. Use clean rag to remove oil trace on dipstick
- Re-insert dipstick in position; pull it out to check the oil mark. The mark should be between the lines of MIN and MAX. if not, drain or refill.
- If the oil level does not reach scale L, open port to refill.
- If the oil level overflows scale H, loosen drain plug to drain redundant oil.
- With oil level checked, insert dipstick into the hole and secure port cover.



Note: The oil level checking operation should be carried out 10 minutes after shut-down. If checking oil level the moment machine has just been shut down, incorrect number will be read.

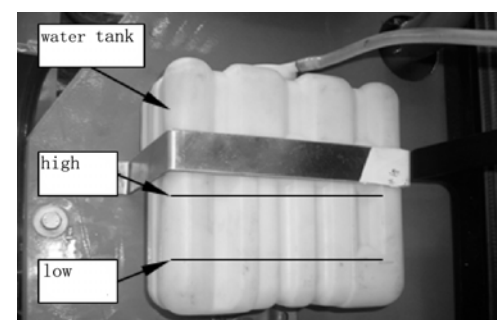
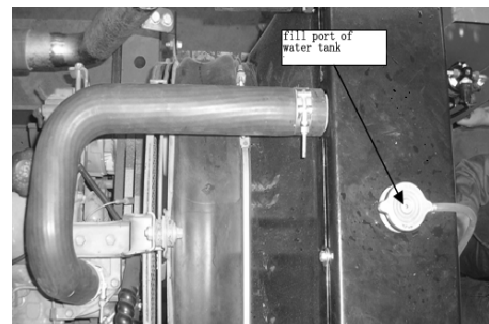


4.5.1.3 Check coolant level



Warning

- ◆ There is high pressure in existence inside the radiator, and coolant temperature is still high, after engine is stopped. Do not open the refilling port cover at this time. Wait until temperature goes down, and then gradually loosen cover to release pressure. Failure to do so will cause serious burn.
- Open left inspection door of the machine, inspect coolant level of secondary tank. The level must be between the lines of HIGH and LOW. If not, drain or refill.
- If the secondary water tank is empty, add coolant to radiator first before adding coolant to secondary water tank.



4.5.1.4 Check hydraulic level

【 Important 】

- ◆ Do not run engine with empty hydraulic oil tank.
- With arm cylinder folded and bucket cylinder extended to their full stroke, lower bucket to ground to stop the machine.
- Shut auto-idle switch to run engine unloaded at low speed for 5 minutes.

【 Important 】

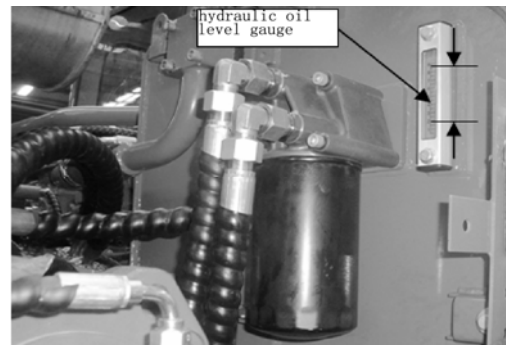
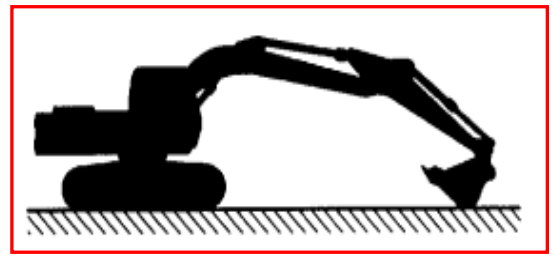
- ◆ Improper engine shut-down will damage turbocharger.
- Set starting key to OFF position, stop the engine and remove the key from starting lock.
- Set pilot safety lock lever to LOCK position.
- Open inspection door (right back door) for main pump, check fluid level to ensure that hydraulic oil will be between fluid level scales. Otherwise Refill if necessary.

Adding oil



Note

- ◆ There is pressure in hydraulic oil tank. Release pressure before opening oil fill cap.
- Release pressure, then remove oil fill cap on top of hydraulic oil tank to fill oil. Recheck fluid level.
- Lock oil fill cap, make sure oil return cartridge and suspension rod are positioned properly.



4.5.1.5 Drain deposit in fuel tank

- To facilitate access, swing upper-structure 90°. Stop the machine at level ground as shown in fig.
- Shut auto-idle switch to run engine unloaded at low speed for 5 minutes.

【Important】

- ◆ Improper engine shut-down operation may cause damages to turbocharger.
- Set starting key to OFF position, stop engine, then remove the key from starting lock.
- Set pilot safety lock lever to LOCK position.
- Loosen drain valve underneath diesel oil tank to drain water and deposit. Collect them with container. Fasten valve the moment clean diesel oil is discharged.



Blow-down valve

4.5.1.6 Check hose and piping for leakage, interference abrasion



Warning

- ◆ Pressurized fluid can penetrate skin causing serious injury.
- ◆ To prevent being injured, use a cardboard to search leakage. Be careful not to allow high-pressure fluid to come into contact with body.
- ◆ In case of accidents, contact experienced doctor for medical attention.



Warning

Exposed hydraulic oil and lubricant can cause fire and injury to person.

To avoid this hazard:

- Stop the machine to firm level ground, lower bucket to ground.
- Stop the engine, remove key from starting lock, set pilot safety lock lever to LOCK position.
- Check hose for any twist, abrasion, check hose clamp for looseness or lost. Check damages of cooler. Check flange for looseness, and oil leakage.
- When clamping, repairing or replacing any loosened, damaged, lost hose clamp, hose, pipe, oil cooler and its flange bolt, do not bend or hit high-pressure hose, do not install twist or damaged hose or piping.

4.5.2 Maintenance in running-in period.

The first 50 operation hours are the running-in period. It is necessary to carry out following maintenance operation:

4.5.2.1 Replace engine oil, oil filter.

- 1) Start engine to warm up oil without overheating.
- 2) Lower bucket to ground, stop the machine at level ground. Turn off auto-idle switch to run machine unloaded at low speed for 5 minutes.

【Important】

- ◆ Stopping engine improperly can cause damages to turbocharger.
- 3) Set starting key to OFF position, stop engine, remove the key from starting lock, set pilot safety lock lever to LOCK position.;
 - 4) Open bottom cover underneath engine, place container under drain valve of engine oil pan. Open drain valve to drain engine oil.;



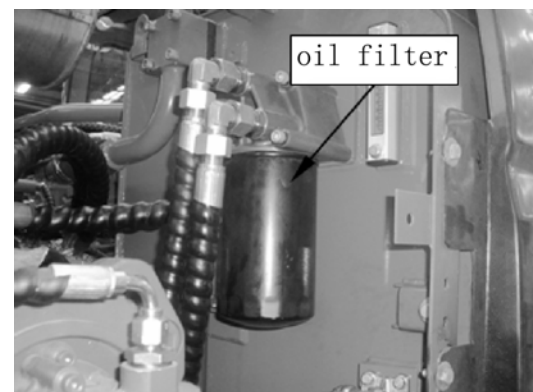
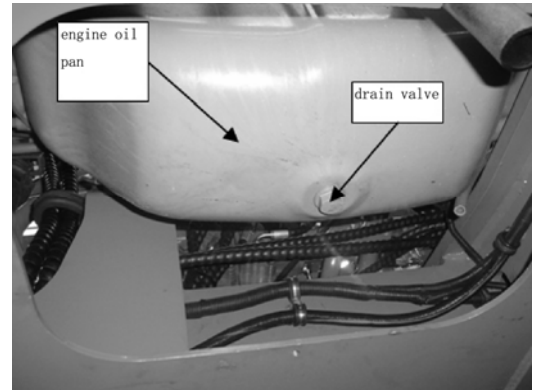
Note

- ◆ The engine oil might be hot, be care to handle it without being burned.
- 5) With engine oil drained, fasten and secure drain valve.

Replace engine oil filter

- 6) Oil filter is positioned on main pump chamber. Open inspection door of main pump (right back door), use supporting rod to secure inspection door.
- 7) Use special wrench for filter to remove filter cartridge in counterclockwise manner.;
- 8) Clean up mounting surface of filter bracket base and cartridge. Apply a layer of clean oil to new filter washer.
- 9) Install the new filter, rotate filter cartridge clockwise until washer is against bracket mounting surface. Be sure that the washer is free of damage during the process of installation.
- 10) Use special wrench for filter to rotate cartridge clockwise for 3/4 or 1 turn.

Pay attention not to over fasten.

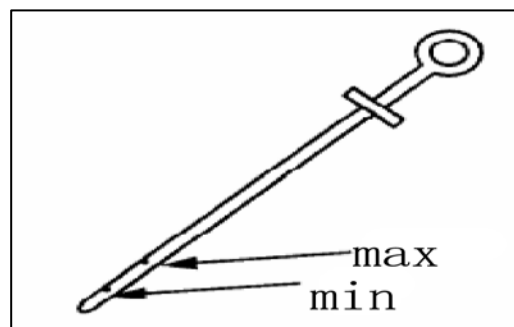
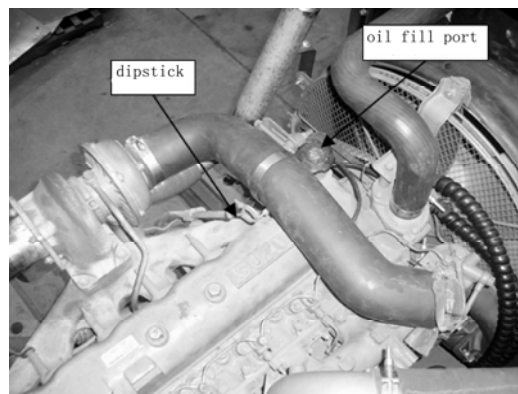


Replace engine oil

- 11) Fill with oil through oil fill cap and check oil fill volume until specific scale position on dipstick is reached.

Engine oil capacity 25L

- 12) Cap oil filling port.
- 13) Start engine; run it unloaded at low speed for 5 minutes.
 - Check engine oil pressure indicator (red) on monitor to make sure it goes off. If it's still on, stop engine immediately and identify the cause.
 - Check drain valve for any leakage.
 - Check dipstick for oil level.



4.5.2.2 Drain water and deposit in water separator

- 1) Water separator is located in main pump chamber, open inspection door (right back door), and use support rod to secure inspection door.
- 2) Loosen drain valve located under water separator to drain water and deposit. Fasten drain valve the moment clean diesel oil is discharged.



Note: With water drained, it's necessary to bleed air from fuel system.



4.5.2.3 Change fuel filter

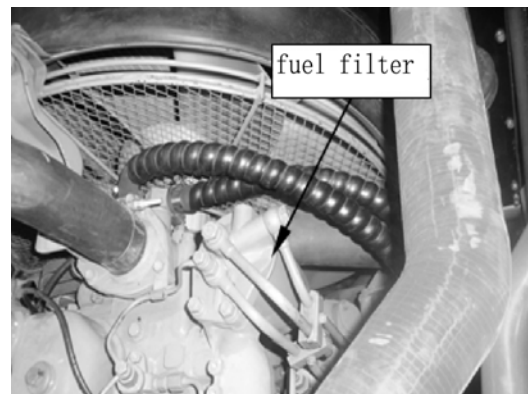


Note

- ◆ To be safe and environmental friendly, use container to collect waste oil, do not drain the oil to ground, ditch, river, pond or lake. Dispose of waste oil properly.
 - ◆ After work, engine temperature is still high. After replacing the oil filter, wait for the engine to cool down.
 - ◆ Keep flame or spark away from fuel.
- 1) Place a container under filter to collect fuel.
 - 2) Use filter wrench to rotate cartridge counter-clockwise to remove it.
 - 3) Clean filter holder, fill new filter with clean fuel, apply a layer of clean fuel on packing surface.
 - 4) Position new filter to filter holder, fasten cartridge by hand until packing surface contacts sealing surface of filter holder.
 - 5) Use wrench to fasten 2/3 turns. Pay attention not to over tighten.



Note: With filter replaced, it's necessary to bleed air from fuel system.



4.5.2.4 Replace fuel primary filter



Warning

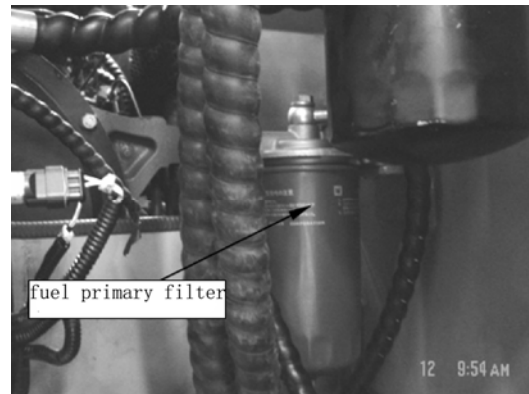
- 1) Place a container under filter to collect oil.
- 2) Use filter wrench to remove filter by rotating filter ① clockwise .
- 3) Clean up filter bracket, use clean fuel to rinse new filter and apply engine oil to contact surface. Then position it to filter bracket.
- 4) During installation, fasten until sealing surface contacts with the sealing surface of filter bracket. Then fasten 1/2 more turns.

Fastening too much may cause damages to contact surface and leading to signs of oil leakage.

If fastening too loose, fuel may leak from contact surface. Therefore it must be tighten appropriately.



Note: With filter replaced, it' s necessary to bleed air from fuel system.



Bleed air from fuel system

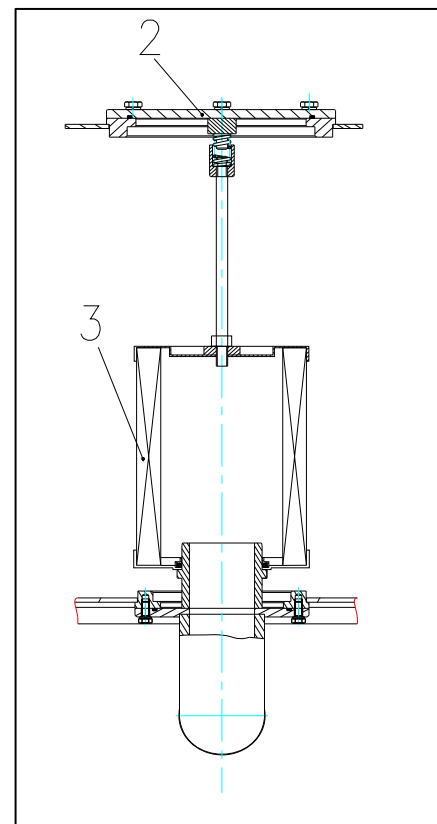
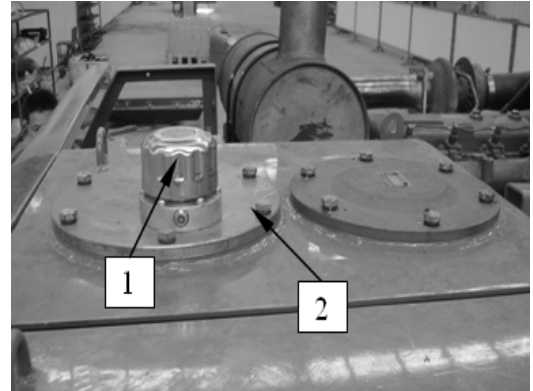
- 1) Loosen air bleeding plug.
- 2) Loosen oil pump button, press on it repeatedly until fuel oil overflows from air bleeding plug.
- 3) Fasten oil pump button and air bleeding plug.
- 4) Start engine to check filter sealing surface for leaks.

4.5.2.5 Clean oil suction filter



Warning

- ◆ With engine shut, parts and oil are at high temperature which may lead to serious burns. Wait until temperature cools down before starting maintenance operation.
 - ◆ There is pressure in hydraulic oil tank. Release pressure first before opening oil fill cap on top of hydraulic oil tank.
- 1) To facilitate access, swing upper turret 90 °, then stop excavator at level ground.
 - 2) Position excavator with arm cylinder completely retracted and bucket cylinder completely extended.
 - 3) Lower bucket to the ground, run the engine unloaded at low speed for 5 minutes. Stop the engine, remove key and set pilot control lever to LOCK position.
 - 4) Clean up upper hydraulic oil tank to prevent dirt getting into hydraulic system. Press lock cap to release internal pressure.
 - 5) Remove hydraulic oil tank cover 2.
 - 6) Remove oil suction filter and suspension bar unit 3. Rinse filter. To replace filter, fix new filter on suspension bar, tighten bolt at torque: 14.5 to 19.5 Nm (1.5 to 2 kgf·m).
 - 7) Install oil suction filter and suspension bar unit 3, make sure filter is positioned on the opening properly.
 - 8) Install tank cover 1, make sure filter and suspension bar are place in position. Tighten bolt at torque: 49 Nm (5kgfm).
 - 9) Start engine; run it unloaded at low speed for roughly 15 minutes to bleed air in main pump and hydraulic system.
 - 10) Shut down engine.

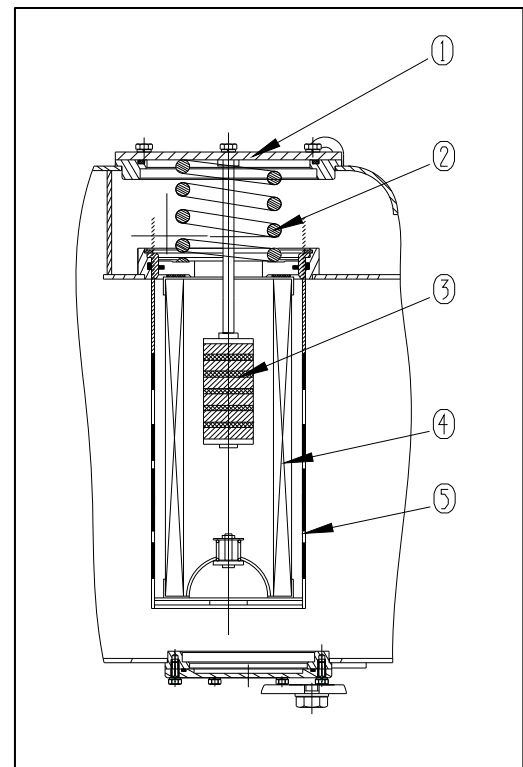
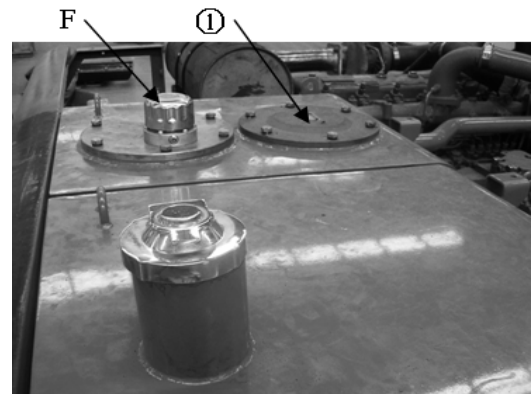


4.5.2.6 Clean oil return filter.



Warning

- ◆ With engine shut, parts and oil are still at high temperature. Wait for engine to cool down, before starting operation.
- ◆ There is pressure inside hydraulic oil tank. Release pressure before opening oil fill cap located on top of hydraulic oil tank.
- ◆ To facilitate access, swing upper turret 90 degree, then stop the machine at level ground.
- ◆ Position excavator with arm cylinder fully retracted and bucket cylinder fully extended.
- ◆ Lower bucket to ground, run engine unloaded at low speed for 5 minutes, then stop the engine, remove key, set pilot control lever to LOCK position.
- ◆ Clean up upper hydraulic oil tank to prevent dirt getting into hydraulic system, press down lock cap to release internal pressure.
- ◆ Loosen 6 bolts to release internal pressure, and remove cap (1) at which moment, the cap might be ejected under spring (2) force, therefore it's necessary to hold the cap down when removing these bolts.
- ◆ Pull out upper end of bar (3), remove spring (2) and filter (4).
- ◆ Remove dirt adhered on filter (4), rinse it with fresh diesel oil or washing oil. If the filter (4) is damaged, replace it with new one.
- ◆ Reinstall filter (4), insert it to the bulge (5) in oil tank.
- ◆ When installing, the bulge under cap (1) must secure spring (2), then use bolt to fasten it.



4.5.2.7 Check and adjust fan tension

【Important】

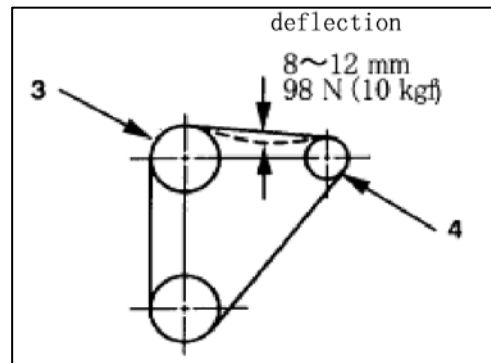
- ◆ Excessive tension on belt will accelerate the wear-out of bearing and belt. Loose belt may cause incomplete battery charging, engine overheating, belt abnormality and premature wear-out.

- 11) Press at a point midway between fan belt pulley and engine belt pulley to check fan belt tension.
- 12) The deflection A should be 8-12mm, when the pressing with a pressure of 10kgf (98N) .
- 13) If the tension is not within specific range, loosen bolts on adjust plate and engine bracket, move engine until proper tension value is reached.
- 14) Tighten the bolts on adjust plate and engine bracket.



Note: Please replace belt if necessary.

With new belt installed, make sure to run engine at low speed for 3-5 minutes. Next, check and adjust belt tension to ensure that belt is position properly.



4.5.3 If maintenance is needed

4.5.3.1 Clean air filter cartridge

- In case of filter clogging, indicator on monitor will flash to notify you to clean air filter.
- Stop the machine at level ground, lower bucket to ground.
- Stop auto-idle switch to run the engine unloaded at low speed for 5 minutes.

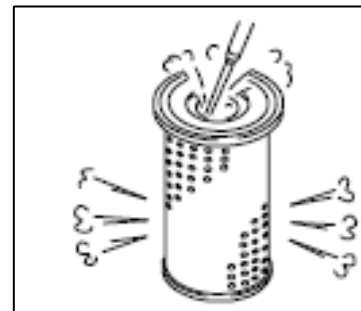
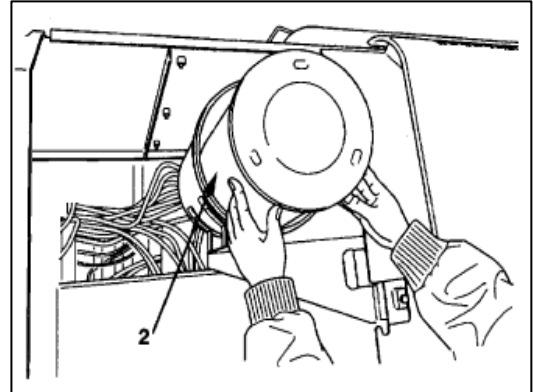
【Important】

- ◆ Stopping engine improperly will cause damages to turbocharger.
- Set starting key to OFF position, stop the engine and remove the key from starting lock. Set pilot safety lock lever to LOCK position.
- Loosen buckle (1) to remove air filter end cover.
- Remove outside filter (2), clap slightly with hand. Never hit it with hard stuff.



Note

- ◆ Minimize pressure of compressed air ($<0.2 \text{ MPa}$, 2 kgf/cm^2), let go of personnel around to avoid scattered metal particles, wear personal protective articles including goggles and protective glasses.
- Use compressed air to clean outside filter (1), following the wrinkle direction to blow air outward.
- Clean up the inside filter.
- Install outside filter (1), end cover, fasten clamp buckle (2).
- Start engine; run it unloaded at low speed. Check filter clogging indicator on monitor. If this indicator illuminates, shut engine immediately and replace outside filter (1).
- Replace internal filter (3) the moment outside filter (1) is replaced.



4.5.3.2 Clean up cooler.

After the machine works a certain period of time, the cooler surface will be covered with dust or other foreign material which will influence radiating effect of cooler. It should be cleaned in time.

- Open left inspection door(left back door);
- Loosen the mounting bolts located on left side of condenser, open up condenser of A/C.
- Use compressed air (below 0.2 MPa) or water to rinse condenser.
- Remove the strainer (if present) in front of radiator for cleaning up.
- Use compressed air (below 0.2 MPa) or water to rinse cooler.
- Reinstall the front strainer (if provided) and condenser of A/C.



Note: Do not remove air conditioning piping, failure to do so will cause coolant leakage and lead to air conditioning malfunction.

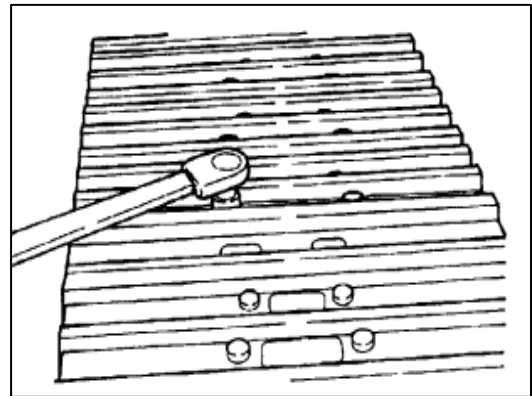


4.5.3.3 Check and fasten track bolt.

If operating machine with bolts loosened, there is hazard that the bolts will rupture. Therefore the loosened bolts should be fastened.

Tightening method

- Track shoe
 - 1) Tighten at torque $490 \pm 49 \text{ N m}$ ($50 \pm 5 \text{ kgf m}$, $360 \pm 36 \text{ lbft}$), then check to make sure that nuts contact with track link surfaces securely.
 - 2) After checking, retighten $120^\circ \pm 10^\circ$.
- Rubber block (if mounted)
 - 1) Tighten at torque: $549 \pm 59 \text{ N m}$ ($56 \pm 6 \text{ kgf m}$, $405 \pm 43 \text{ lbft}$).
 - 2) After tightening, check to ensure that nut and track link contact surface contact against each other securely. .



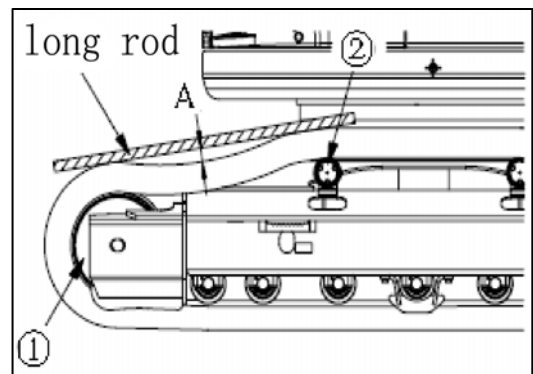
Tighten sequence

- Tighten bolts in the sequence given in right fig.
- With bolts tightened, check bolts and track link mating face to ensure they contact securely.

4.5.3.4 Check track tension

- Run engine at low idling, move the machine forward a distance equals to the length of track on ground. Then stop the machine.
- As shown in right fig, choose a straight long rod; place it on track over idler (1) and carrier roller (2), measure the max distance “A” between upper surface of track and bottom surface of the rod.

Standard deflection “A” should be 20-28 mm (0.8-1.1 in).



- If the track tension is not at standard value, adjust it in the following manner:
 - 1) Pump in grease through grease fitting(2) with a grease pump.(pump fitting (2) and plug screw (1) are integral)
 - 2) To check track to evaluate the proper tension of track. Gradually move machine forward (7-8 m (23 ft - 26 ft 3 in) .
 - 3) Recheck track tension, if the tension is improper, re-adjust it.



Warning

- ◆ There is a hazard that plug screw may fly out under high lubrication grease pressure. Never loosen plug (1) by over one turn. (1).
- ◆ Do not loosen any parts other than plug screw (1). Do not attempt installation facing plug screw (1).

4.5.3.5 Check A/C cooling medium level.



Warning

- ◆ In case that cooling medium gets into eyes or makes contact with hands, this may cause blindness or freezing injury, therefore do not contact cooling medium directly.
- ◆ Do not loosen any parts of cooling medium piping.
- ◆ Do not allow any naked flame to reach the position with cooling medium leakage.

If the cooling medium is insufficient in A/C system, the cooling performance of air conditioning will be bad.

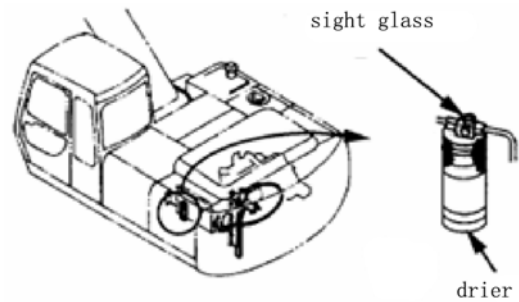
- If setting engine to idle at high speed, and operating air conditioning to extra refrigerating state, there must be small amount of bubbles in inspection glasses which is fixed on condenser reservoir.
- There are bubbles flowing in cooling medium (continuous bubble flowing): Low cooling medium level.

【Important】

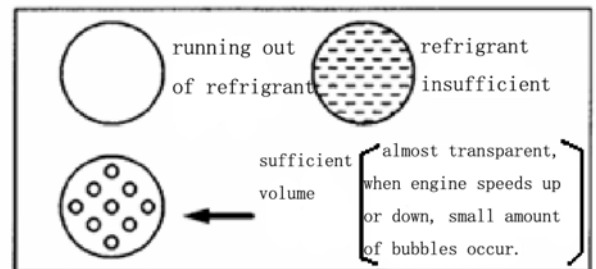
- ◆ If the engine runs at low cooling medium level, this may cause damages to compressor.
- Bubbles indicate low cooling medium level, please contact SUNWARD distributor to add cooling medium.

Inspection during idle seasons

If the air conditioning system is kept inactive for a long time, perform a operation on cooler for 3-5 minutes every month to lubricate each part of the compressor.



illustration



4.5.3.6 Check washer fluid level

- Check reservoir for fluid level, add fluid if necessary.
- When adding fluid, pay attention not to allow any dusts to get in.

Mixture ratio of pure washer fluid and water

The mixture ratio differs according to the ambient temperature. So dilute the washer fluid with water following the table below.

Operation area	Mixing ratio	temperature
In general	Pure detergent 1/3: water 2/3	-10°C (14°F)
Cold area winter	Pure detergent 1/2: water 1/2	-20°C (-4°F)
Extreme area winter	Pure detergent	-30°C (-22°F)



Note: Pure detergent are divided into 2 categories: -10° C (14° F) (general use) and -30° C (-22° F) (cold area use). Select according to the area and season.

4.5.3.7 Adjust bucket clearance



Warning

- ◆ When adjusting, it's dangerous if work equipment is moved by mishandling.
- ◆ Set work equipment at stable state, shut engine and lock up safety lock lever.
- Set work equipment in posture as shown in right fig.
- Stop engine, set safety lock lever to LOCK position.
- Remove O-ring of link to measure clearance "a".



Note:

Move bucket to one side, or measure overall clearance at one place, the measurement is a little bit easy. (The position shown in fig is left position).

It's easy to measure correctly if using pin gauge.

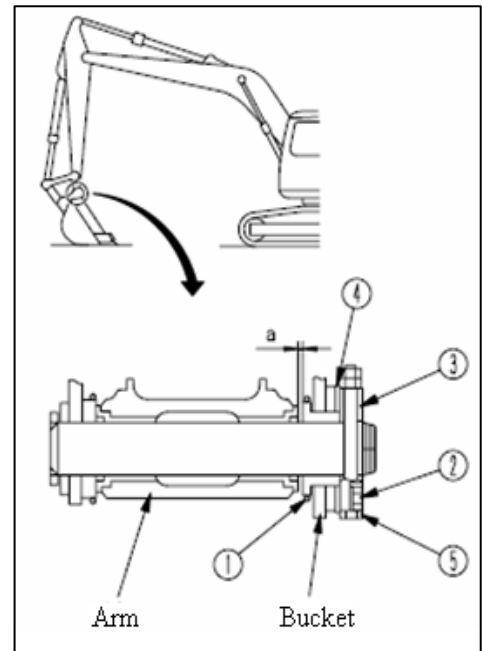
- Loosen 4 fixed bolt (2) and plate (3).
- Remove shim (4) according to clearance "a" being measured in previous step.

【for instance】

For clearance of 3mm, remove 1 pcs shim of 1.0mm and 1 pcs shim of 0.5mm. The clearance will become 0.5 mm. for shim (4), use two types of 1.0mm and 0.5mm.

If the clearance is smaller than one shim, do not attempt any maintenance operation.

- Tighten 4 bolts (2).
If it's difficult to tighten bolt (2), to facilitate tightening, pull out fixing pin bolt (5).



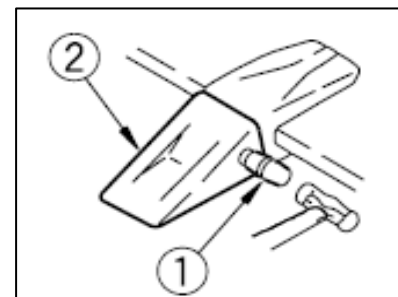
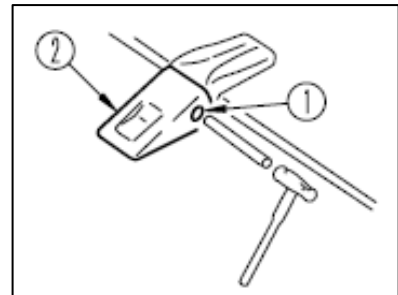
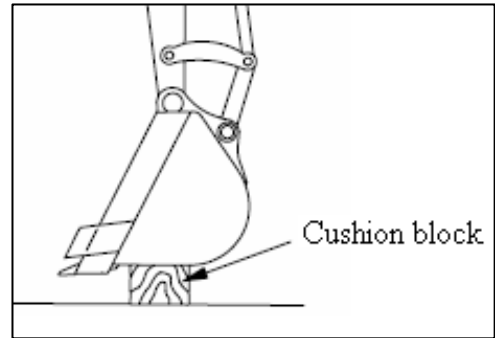
4.5.3.8 Replace bucket teeth.

Replace bucket teeth before bucket teeth holder wears out.



Warning

- ◆ It's dangerous if the work equipment moves by mistake when the teeth are being replaced. Set the work equipment in stable condition, stop the engine, and then set the safety lock levers securely to the LOCK position.
- ◆ If the lock pin is knocked out by force, there is hazard that pins may fly out. Check to ensure nobody is in the surrounding area.
- ◆ During replacement operation, there is hazard of flying out pieces. So wear protective glasses, gloves, and other protective equipment.
- Lower the bottom surface of the bucket on a block, check that the work equipment is in a stable condition, then set safety lock lever to the LOCK position.
- Place a metal rod (diameter is a little smaller than pin) against the back of the pin), use hammer to knock out pin (1), then remove bucket teeth (2).
- Clean mounting surface, place new bucket teeth (2) to teeth holder, push pin (1) partly into it by hand, then use hammer to knock in lock pin to position it to bucket holder.



4.5.4 Every 50 hours

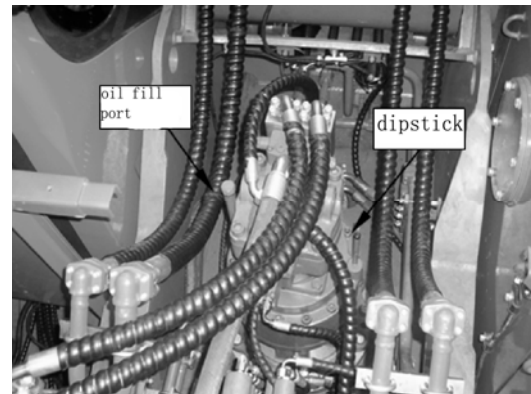
Carry out the following maintenance operation every 50 hours service time.

4.5.4.1 Check and adjust track tension

For detail, please refer to chapter 4.5.3.4.

4.5.4.2 Drain water and deposit from water separator

For detail, please refer to chapter 4.5.2.2.



4.5.5 Every 100 hours

Carry out the maintenance for every 50 hours service at the same time.

4.5.5.1 Check and adjust fan belt tension

For detail, please refer to chapter 4.5.2.7.

4.5.6 Every 250 hours

Carry out 50 hours service at the same time.

4.5.6.1 Checking swing redactor gear oil level

- Stop the machine at level ground.
- Shut auto-idling switch to run the engine unloaded at low temperature for 5 minutes.

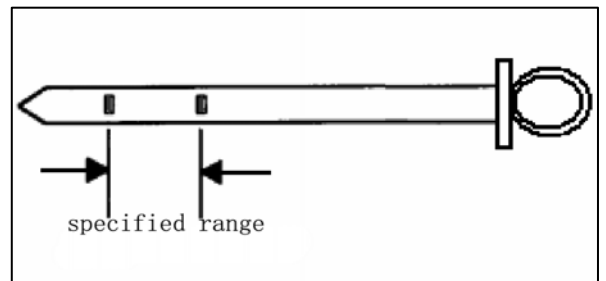
【Important】

- ◆ Stopping the engine improperly may damage turbocharger.
- Set start key to OFF position, stop the engine, remove the key from starting lock, set safety lock lever to LOCK position.



Note

- ◆ After completing work, the gear oil temperature might be very high, wait for temperature to cool down.
- Pull out dipstick of swing redactor, wipe off oil trace, reinsert it and pull out again, the oil mark should be between the two scales.
- If necessary, remove oil fill cap to add gear lubricating oil. Check oil level again.



4.5.6.2 Checking travel redactor gear oil level

- Stop the machine at level ground, set the connect line of travel redactor oil fill port 1 and drain port 3 is vertical from horizontal level.
- Shut auto-idle speed switch, run the engine unloaded at low speed for 5 minutes.

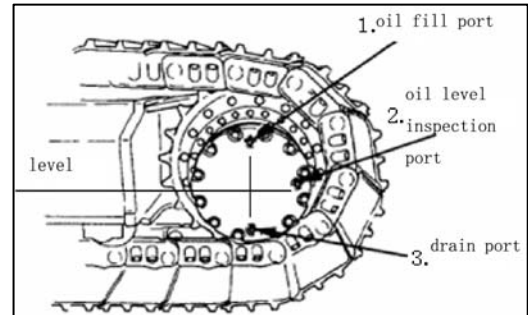
【Important】

- ◆ Stopping the engine improperly may damage turbocharger.
- Set start key to OFF position, stop the engine, remove the key from starting lock, set safety lock lever to LOCK position.



Note

- ◆ After completing work, gear temperature may be very high. Wait for temperature to cool down before loosening oil fill plug of fill port 1. Pay attention that to keep body and face away from oil fill port 1 during operation.
- With gear oil cooled down, gradually loosen oil fill port plug to release pressure.
- Remove plug of oil fill port 1 and inspection port 2, check through inspection port 2 that gear oil level must be within the range of 10mm under inspection port2.
- If necessary, add lubricating gear oil through oil fill port 1, and then recheck oil level.
- Reinstall plug screw of oil fill port 1 and inspection port 2.
- Check the gear oil level on another side of travel redactor with the same manner.



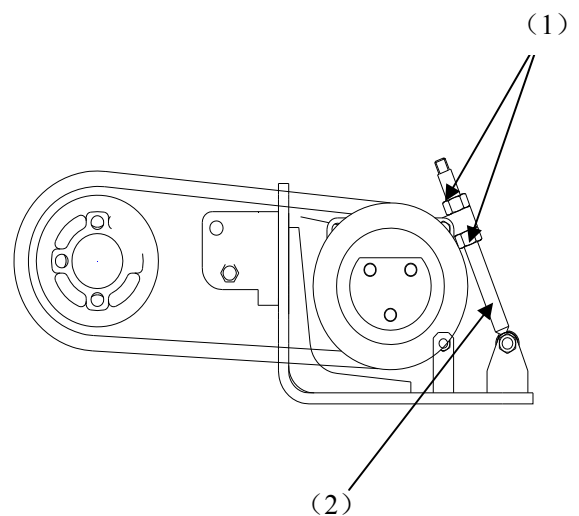
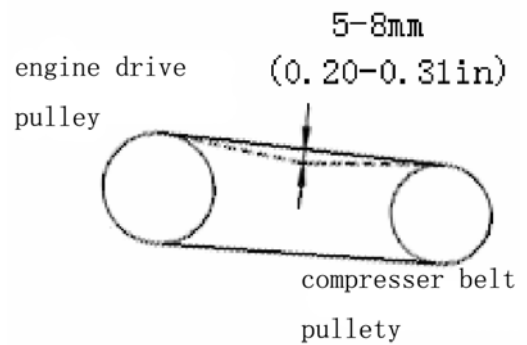
4.5.6.3 Check, adjust air conditioning compressor belt tension.

Inspection

The deflection should be 5 to 8mm, when pressing at a point midway between drive belt pulley and compressor belt pulley with a finger pressure of 58.8N(6kgf).

Adjust

- Loosen bolts (1).
- Pull adjusting screw blot (2) , make deflection of belt to be 5-8 mm (about 58.8N (6 kgf)) .
- Fasten bolts (1).
- Check if belt pulley is broken, and if V groove and V belt are wearing. Especially inspect V belt do not contact with bottom of V groove.
- If belt is stretched, and has no adjusting allowance or cut or split exits, please change belt.
- When adjusting new belt, after one hour's operation, please adjust it again.



4.5.6.4 Clean air filter cartridge

- Stop the machine at level ground, lower bucket to ground..
- Shut auto-idle speed switch to run engine unloaded at low speed for 5 minutes.

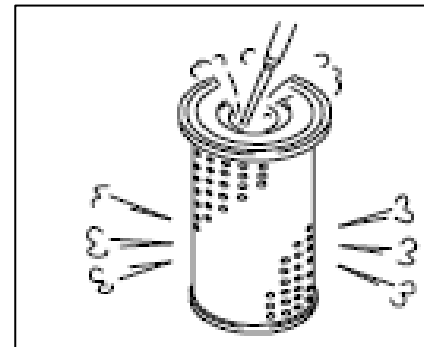
【Important】

- ◆ Stopping the engine improperly may damage turbocharger.
- Set start key to OFF position, stop the engine, remove the key from starting lock, set safety lock lever to LOCK position.
- Loosen clamp buckle (2) to remove air filter front cover.
- Remove outside filter (1), clap slightly by hand, never hit with hard object.



Note

- ◆ Minimize pressure of compressed air ($<0.2 \text{ MPa}$, 2 kgf/cm^2), let go of personnel around to avoid scattered broken pieces, wear personal protective articles including goggles and protective glassed.
- Use compressed air to clean outside filter (1), following the wrinkle direction to blow air outward.
- Clean up the inside filter.
- Install outside filter (1), end cover, fasten clamp buckle (2).
- Start engine; run it unloaded at low speed. Check filter clogging indicator on monitor. If this indicator illuminates, shut engine immediately and replace outside filter (1).
- Replace internal filter (3) the moment outside filter (3) is replaced.



4.5.6.5 Checking hose and piping leakage, interference wear-out.

For detail, please refer to chapter 4.5.1.6.

4.5.7 Every 500 hours service

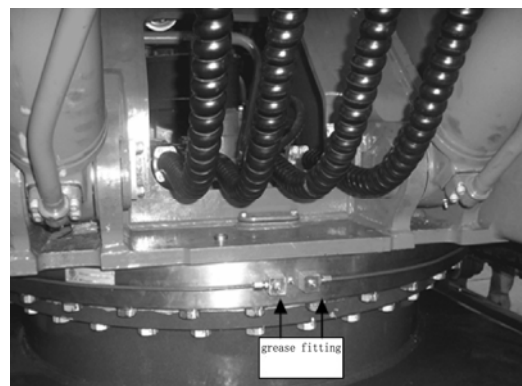
Carry out EVERY 50 HOURS SERVICE and EVERY 100 HOURS SERVICE at the same time.

4.5.7.1 Greasing ball track of swing bearing

- Stop the machine at level ground, lower the bucket at level ground.
- Shut auto-idle speed switch, run the engine unloaded at low speed for 5 minutes.

【Important】

- ◆ Stopping the engine improperly may damage turbocharger.
- Set start key to OFF position, stop the engine, remove the key from starting lock, set safety lock lever to LOCK position.
- Pump in grease through 3 grease fittings to swing bearing ball track.
- Start engine, lift bucket, and swing upper-structure at 45 degree.
- Repeat 3 times from step 3 until lubricating grease overflows from swing bearing seal.

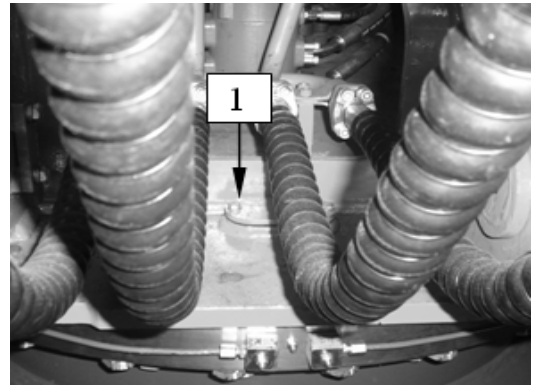


4.5.7.2 Lubricate swing mechanism

- Stop the machine at level ground, lower the bucket to ground.
- Stop auto-idle switch, run the engine unloaded at low speed for 5 minutes.

【 Important 】

- ◆ Stopping the engine improperly may damage turbocharger.
- Set start key to OFF position, stop the engine, remove the key from starting lock, set safety lock lever to LOCK position.
- Loosen 2 bolts of grease fill port cover located on front part of turret. Then remove grease fill port cover (1).
- Check that grease height in the position where pinion passes by should be at least 14mm (0.6in), and free of pollution; add 0.5kg lubricate grease to reach standard height if necessary.
- Check the color of the grease, in case of white, change it.
- Drain port locates around central swing joint under lower carriage frame.



4.5.7.3 Replace engine oil, oil filter.

For detail, refer to chapter 4.5.2.1.

4.5.7.4 Replace fuel filter

For detail, refer to chapter 4.5.2.3.

4.5.7.5 Replace fuel preliminary filter

For detail, refer to chapter 4.5.2.4.

4.5.7.6 Clean up cooler

For detail, please refer to chapter 4.5.3.2.

4.5.8 Every 1000 hours service.

Carry out EVERY 50 HOURS, EVERY 100 HOURS and EVERY 250 HOURS, EVERY 500 HOUR at the same time.

4.5.8.1 Replace swing redactor gear oil (6.6L)

- Stop the machine at level ground.
- Stop auto-idle switch, run the engine unloaded at low speed for 5 minutes.

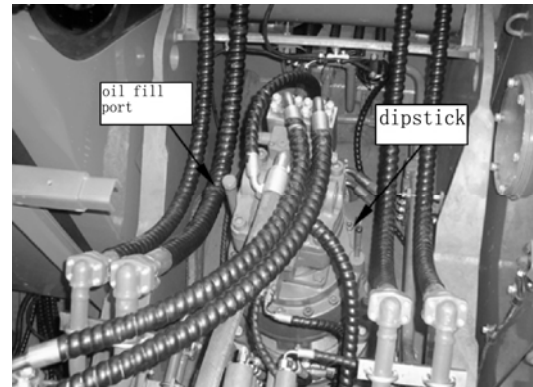
【Important】

- ◆ Stopping the engine improperly may damage turbocharger.
- Set start key to OFF position, stop the engine, remove the key from starting lock, set safety lock lever to LOCK position.



Note

- ◆ After completing work, the gear oil temperature might be very high, wait for temperature to cool down.
- Place a container under drain pipe to collect oil.
- Loosen drain plug to drain the oil, and then tighten the plug.
- Remove oil fill end cover, add specified gear lubricate oil.
- Remove dipstick of swing redactor, wipe off oil with clean cloth, re-insert dipstick, then pull out again, the mark of oil should be between two scales.
- If the oil level doesn't reach mark L, add oil through oil fill port, if the oil level exceeds mark H, drain excessive engine oil and check oil level again.



4.5.8.2 Change travel redactor gear oil(2×4.7

L)

- Stop the machine at level ground, set the connect line of travel redactor oil fill port 1 and drain port 3 is vertical from horizontal level.
- Shut auto-idle speed switch, run the engine unloaded at low speed for 5 minutes.

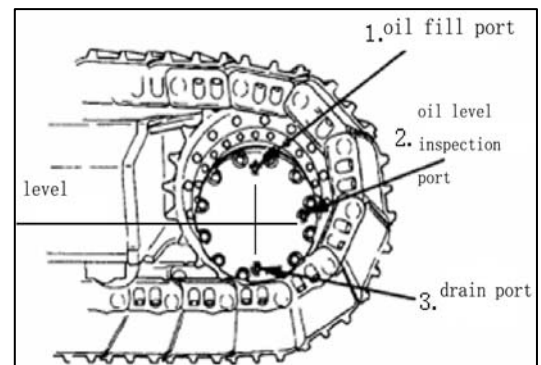
【Important】

- ◆ Stopping the engine improperly may damage turbocharger.
- Set start key to OFF position, stop the engine, remove the key from starting lock, set safety lock lever to LOCK position.



Note

- ◆ After work, the temperature of gear oil might be very high. Wait for the temperature to cool down before gradually loosen the plug of oil fill port 1. Keep face and body away from plug of oil fill port, during the process of work.
- With the oil cooled down, gradually loosen the plug to release pressure.
- Place a container under drain port3 to collect oil.
- Follow the given sequence to remove oil fill port 1, check port 2 and plug screw of drain port 3 and drain the oil.
- Check the o-ring on plug for damages. Replace it with new one if necessary.
- Tighten the plug of drain port 3.
- Add oil through oil fill port1, when the oil overflows from inspection port 2; tighten the plug of oil fill port 1 and inspection port 2.
- Replace travel redactor gear oil on the other side in the same manner.

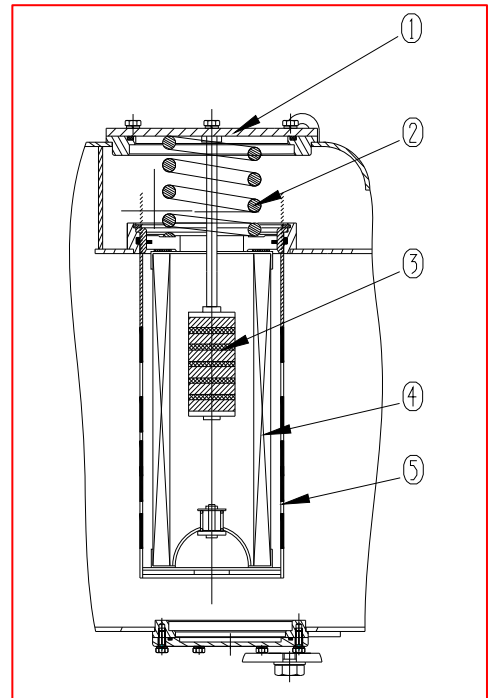


4.5.8.3 Change return filter



Warning

- ◆ After the engine is stopped, parts and oil are still in high temperature which may result in serious burns. Wait for temperature to cool down.
- ◆ There is pressure inside hydraulic oil tank. Release pressure before opening oil fill cap located on top of hydraulic oil tank.
- To facilitate access, swing upper turret 90 degree, then stop the machine at level ground.
- Position excavator with arm cylinder fully retracted and bucket cylinder fully extended.
- Lower bucket to ground, run engine unloaded at low speed for 5 minutes, then stop the engine, remove key, set pilot control lever to LOCK position.
- Clean up upper hydraulic oil tank to prevent dirt getting into hydraulic system, press down lock cap to release internal pressure.
- Clean up upper hydraulic oil tank to prevent dirt getting into hydraulic system, press down lock cap to release internal pressure.
- Pull out upper end of bar (3), remove spring (2) and filter (4).
- Check bottom filter shell for dirt, if any dirt is found, remove it. Pay attention not to let any dirt get into hydraulic oil tank.
- Place removed parts into fresh diesel oil or washing oil to rinse (except filter), replace with new filter.
- Reinstall filter (4), insert it to the bulge (5) in oil tank.
- When installing, the bulge under cap (1) must secure spring (2), then use bolt to fasten it.

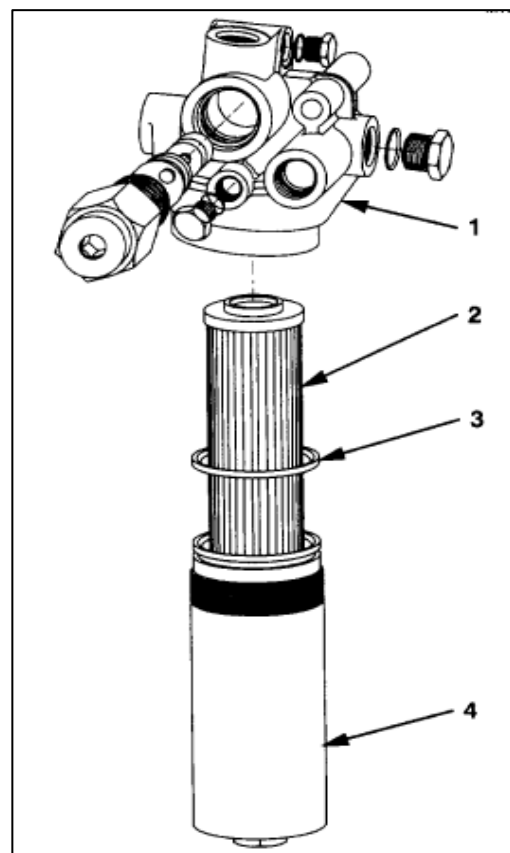
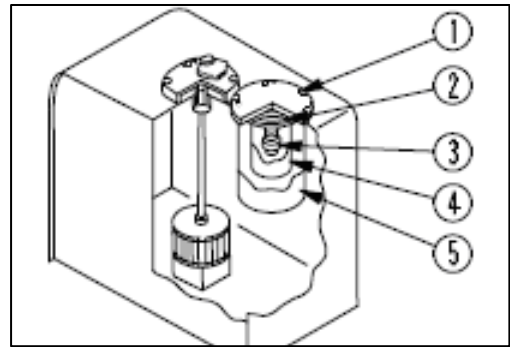


4.5.8.4 Replace pilot oil filter.



Warning

- ◆ After engine is stopped, parts and oil are still in high temperature which may result in serious injury. Wait for temperature to cool down before stating maintenance operation.
- ◆ There are pressures in hydraulic system. Release the pressure before starting maintenance work.
- To facilitate access, swing upper turret 90 degree, then stop the machine at level ground.
- Position excavator with arm cylinder fully retracted and bucket cylinder fully extended.
- Lower bucket to ground, run engine unloaded at low speed for 5 minutes, then stop the engine, remove key, set pilot control lever to LOCK position.
- Rotate filter wrench counter-clockwise to remove shell (4) off mounting seat.
- Clean up mounting seat (1) and shell (4).
- Replace filter (2) and seal ring (3), apply a layer of fresh oil when installation.
- Secure shell (4) clockwise on headstock (1).



4.5.9 Every 2000 hours service

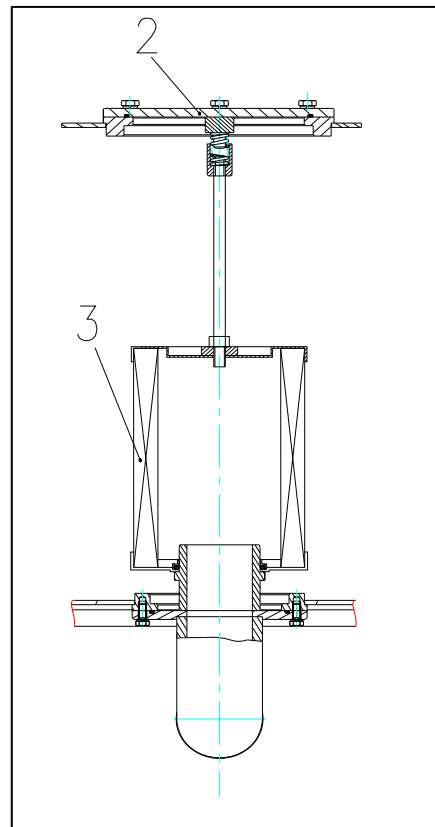
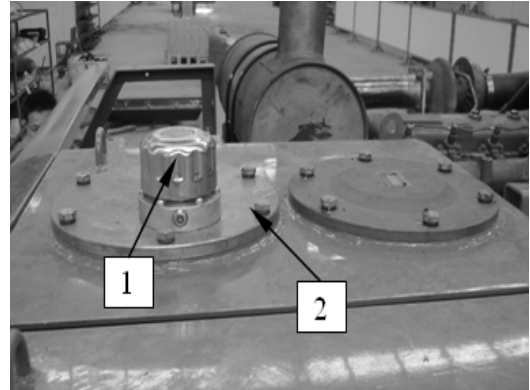
Carry out the maintenance for every 50hours, 100 hours, 250 hours, 500 hours and 1000hours service at the same time.

4.5.9.1 Replace oil suction filter and hydraulic oil



Note

- ◆ High pressure may build in hydraulic oil. Always release pressure and cool down oil temperature before attempting any maintenance operation.
- ◆ Determine replace interval based on the type of hydraulic oil. The interval differs according to different type of hydraulic oil.
- ◆ Determine replace interval based on work condition when using hydraulic breaker, the maintenance and replacement interval should be shortened by half.
- Swing upper-structure by 90 degree; stop the machine at firm level ground.
- Clean upper hydraulic oil tank to prevent dirt from getting into hydraulic system.
- Remove oil fill cap (2).
- Remove oil suction filter and suspension rod unit (4).
- Use pump to drain hydraulic oil from oil tank, remove drain plug (3) located on bottom oil tank to drain the residual oil to a container.
- Clean up hydraulic oil tank; re-install drain plug (3).
- Replace oil suction filter, re-install suspension rod unit (4), and oil fill cap (2).
- Add fresh hydraulic oil; install lock cover (1).
- Start engine, run it at low speed to bleed the air in main pump and system.
- Stop the engine.



4.6 General trouble shooting



Note

◆ If the machine is kept in storage for long time, the oil film coated on kinetic surface may be damaged. After starting the machine. It' s necessary to cycle individual kinetic surface for 2 to 3 times to let it completely lubricated.

Engine		
Problem	Cause	Possible remedy
Engine runs but it's difficult to start or fails to start.	Out of fuel. Mistake type or brand of fuel or it's polluted. Defective wiring. Insufficient battery power Air filter clogging. Fuel filter clogging. Internal leakage in fuel system Fuel manual pump spring up Air gets into fuel system Start engine malfunction	Add fuel Bleed the air from fuel system Drain out the off-grade fuel. Fill with proper fuel Check starting circuit, clear the problem Charging or replace new battery. Clean filter or replace new filter. Clean up filter or replace with new filter. Bleed air in fuel system Check and repair leaks Push down and secure hand wheel Use manual pump to bleed air Replace start motor
Engine fails to make full use of power.	Air filter clogging Fuel piping clogging or oil deliver malfunction Improper fuel or pollution Fuel filter clogging. Ejection oil nozzle gets polluted or malfunction occurs The clearance of eject pump linkage out of spec	Clean or replace filter Clear the problem or replace piping. Drain the fuel and add proper fuel. Bleed air in fuel system Clean or change filter. Bleed air in fuel system Contact distributor Contact distributor Contact distributor

Engine fails to make full use of power.	Turbocharger malfunction Air bleeding failure Temperature of engine is too high or too low. Leakages in intake or exhaust air system	Contact with authorized distributor. Remove muffler and run the engine See “ENGINE OVERHEATING” or “over-cooling” Repair place with leakage
Engine overheating	Coolant level too low Improper coolant (e.g. water) Defective thermostat Defective temperature monitoring element Radiator clogging Defective fan Fan belt wears out or loosened. Defective belt pulley Defective cooling system Defective temperature sensor Ejection oil pump unpunctual Separator sponge peel off.	Add coolant Drain out, then replace with specified coolant Contact your designated distributor. Contact your designated distributor. Clean up radiator and front strainer Replace fan Adjust fan belt or replace. Replace belt pulley Clean up cooling system Change temperature sensor Contact your designated distributor. Replace separator sponge
Engine water temperature too low	Defective thermostat Defective temperature sensor Defective monitoring elements	Contact your designated distributor. Change temperature sensor Contact your designated distributor.

Too much engine oil consumption	Improper engine oil Engine oil leakages Excessive engine temperature. Engine internal elements wears out	Drain out and change to specified fuel Check oil delivery system and repair Check cooling system Contact your designated distributor
Exhaust gas is black (out of spec)	Improper fuel Intake system clogging Intake piping damage Intercooler clogging Ejection oil pump unpunctual Ejection nozzle gets polluted. Defective engine main block engine main body malfunction	Draining out and replace with proper fuel Check intake system replace clean up intercooler Contact your designated distributor Contact your designated distributor Contact your designated distributor
Exhaust gas is white	Improper fuel Engine temperature too low Defective thermostat Coolant leaks get into engine cylinder	Draining out and replace with proper fuel Run the engine to warm up Contact your designated distributor Contact your designated distributor

Turbocharger noise or excessive vibration	Insufficient lubrication of bearings. Turbine blades broken Bearing wear out Piping leakage Improper clearance between turbine and its case	Check turbocharger lubricate piping. Remove exhaust pipe and air intake hose for inspection Contact your designated distributor Check piping and repair Contact your designated distributor
Turbocharger joint leakage	Bearing or seal wear out, damage Excessive pressure in crank case Carbon clogging in oil return piping of turbocharger	Contact your designated distributor Check intake pipe to ensure its function Check, clean up

Electric system		
problem	Cause	Possible remedy
Starting motor continues to run after engine is started.	Start relay fails to disconnect or gets pulled in. Defective starting key	Replace starting relay or contact your distributor Contact your designated distributor
While engine is running, charging indicator illuminates.	Engine belt loosened or damaged. Belt pulley wear out Engine damaged Defective charging circuit Low voltage of battery	Adjust engine belt or replace Replace belt pulley Contact your designated distributor Check and repair Charge or replace battery
Display screen does not work	Fuse blown out Defective wire circuit Display screen damaged	Replace fuse Check circuit and repair Contact your designated distributor
All indicators do not work	Fuse blown out Defective wiring circuit Defective circuit board	Replace fuse Check circuit and repair, or Contact your designated distributor Contact your designated distributor
Individual indicator does not work	Bulb damaged Fuse blown out Defective wiring circuit	Change bulb Change fuse Check circuit and repair, or Contact your designated distributor
Abnormal fuel indication	Defective oil level sensor Defective wiring circuit Defective indicator	Check and repair, or replace Check circuit and repair, or Contact your designated distributor
Displayed temperature of coolant do not reflect real temperature	Defective temperature sensor Defective wiring circuit Defective indicator	Contact your designated distributor Check circuit and repair, or Contact your designated distributor Contact your designated distributor

Mode selection		
Problem	Cause	Remedy
Work mode selection does not work	Defective indicator Defective controller Defective solenoid valve Defective wire circuit	Contact your designated distributor Contact your designated distributor Contact your designated distributor Contact your designated distributor
High/low travel speed selection does not work	Travel pilot pressure switch Defective controller Defective solenoid valve Defective wire circuit Travel motor	Contact your designated distributor Contact your designated distributor Contact your designated distributor Contact your designated distributor Contact your designated distributor

Hydraulic system		
Problem	Cause	remedy
Hydraulic function becomes sluggish	Low hydraulic oil level Low hydraulic oil temperature Oil type do not match ambient temperature Low engine revs Main pump wear out Pilot oil circuit malfunction Main suction oil pump blocked	Add hydraulic oil until specified scale level is reached Warm up operation until hydraulic temperature reaches around 50°C. Use proper oil Adjust engine revs or contact distributor Contact distributor Contact distributor Contact distributor
Excessive hydraulic oil temperature	Improper oil Low hydraulic oil level Hydraulic oil polluted Radiator clogging Filter clogging pump suction pipe leakage main pump wear out safety valve improper adjustment on hydraulic element	Use proper hydraulic oil Add hydraulic oil to reach specified scale level Filter or drain out and refill with proper oil Clean radiator and front drainer Clean or replace filter Contact distributor Contact distributor Contact distributor Contact distributor
Hydraulic oil produces bubble	Suction piping leakage Piping twist or depressed mix water into oil improper oil improper oil volume, too high or too low	Contact distributor Check hydraulic piping Drain out and refill with proper hydraulic oil Drain out and refill with proper hydraulic oil Keep hydraulic oil within specified level range
Hydraulic cylinder acts but cant not lift loads	Main pump wear out Main safety valve low pressure Suction filter clogging Pump suction pipe leakage Hydraulic cylinder wear out and cause internal leaks	Contact distributor Contact distributor Clean or replace oil suction filter Check oil suction piping Replace piston ring or contact distributor

Other		
Problem	Cause	Remedy
Turret can not slew or acts slowly or unstably	Defective control pilot valve Swing motor defective Defective swing reductor Defective swing bearing Improper lubrication of swing bearing	Contact our designated distributor Contact our designated distributor Contact our designated distributor Contact our designated distributor Greasing it
Travel abnormally	Track over stretched or too loose Insufficient lubrication of idle roller or track roller Get stuck by stones Defective brake Defective pilot valve	adjust lubricate remove and clear repair, replace or contact our distributor repair, replace or contact our distributor
One side track does not move or moves slowly(off-track)	Controlled pilot valve malfunction Corresponding steering valve and brake valve malfunction Central joint oil-seal damaged Hydraulic motor malfunction Travel redactor malfunction Displacements differ with double hydraulic pump	repair Contact distributor Contact distributor Contact distributor Contact distributor Contact distributor

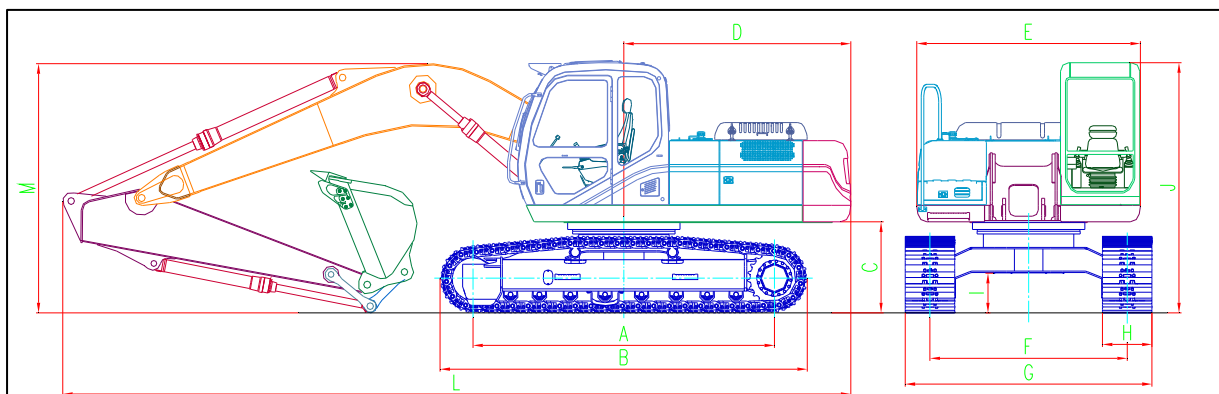
5 Technical specification

5.1 SWE150F Technical specification

5.1.1 Machine specification

Machine specification	SWE150F
Operation weight	14800 kg
Standard bucket capacity	0.6 m ³
Track shoe width	600mm
Power plant	
Engine model	4JJ1XZSW-01 (EU Stage IIIB) AM-4JJ1XZSC01F(IT4)
Type	Direct injection, water cooled, 4 strokes, pressurized and intercool
Cylinder N.O	4
Bore x stroke	95.4mmx104.9mm
Displacement	2.999 L
Rated power/revs	95kW/2200rpm
Max torque /revs	420N•m/1800rpm
Fuel tank capacity	245 L
Fuel capacity	
Main pump	2× axial piston pump
Flow capacity	2x139L/min
Work pressure setting	31.4/34.3/26 MPa
Front work equipment(force increase state)	31.4(34.3) Mpa
Travel	31.4 Mpa
Slewing	26 Mpa
Pilot pump	1× gear pump
Flow capacity	22L/min
pilot pressure setting	3.9 Mpa
Hydraulic oil tank capacity	152 L
Performance specification	
Slewing speed	11.1 rpm
Travel speed	5.4/3.3 km/h
Max traction	115kN
Max grade ability	35°
Bucket max digging force	98kN
Arm max digging force	72.5 kN

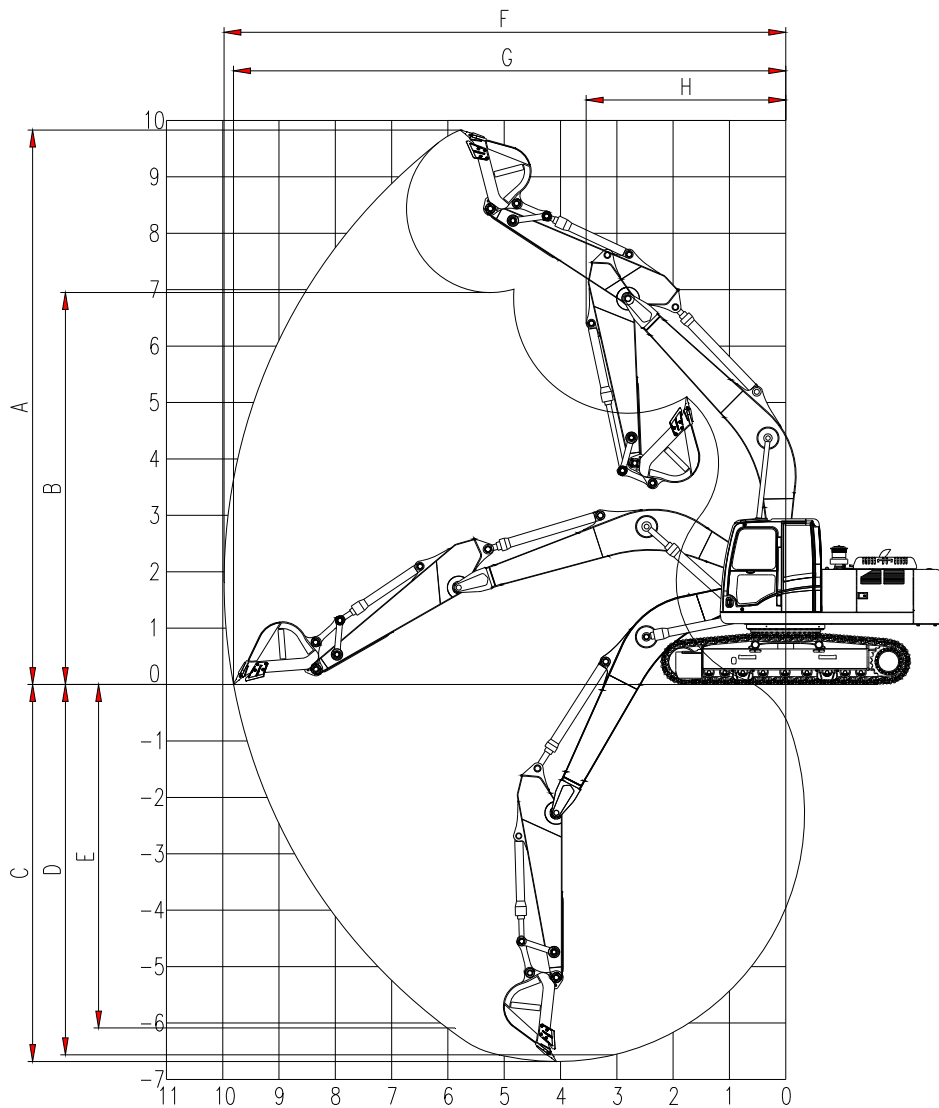
5.1.2 Configuration specification



Unit: mm

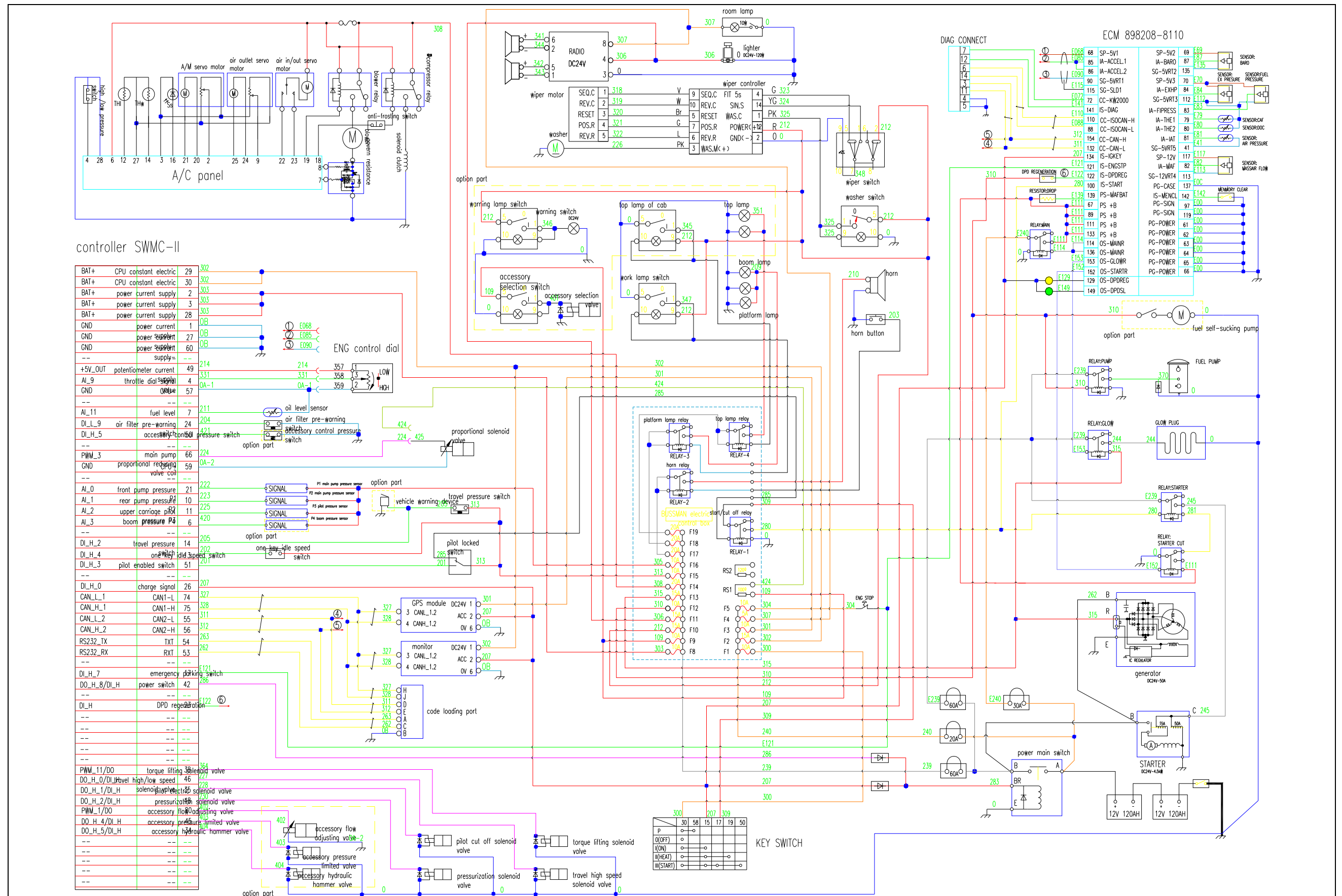
Machine specification		SWE150F
A、	Wheel track	3000
B、	Track total length	3740
C、	Platform distance to ground	920
D、	Platform slewing radius	2350
E、	Upper structure width	2450
F、	Track gage	2000
G、	Chassis width	2600
H、	Track width	600
I、	Chassis distance to ground	470
J、	Cab roof height	2825
L、	Transportation length	7820
M、	Boom height	2850

5.1.3 Work specification



Machine specification		SWE150F
A、	Max digging height	8630
B、	Max dumping height	6130
C、	Max digging depth	5640
D、	8 feet level digging depth	5440
E、	Max vertical digging depth	4540
F、	Max digging radius	8355
G、	Max reach at ground level	8230
H、	Minimum swing radius	2500

5.1.4 Circuit diagram



5.1.5 Electric elements table

No.	Name	No.	Name
1	work lamp	22	micro-switch
2	pressure switch	23	throttle knob
3	pressure sensor	24	work lamp switch
4	electric horn (top)	25	wiper switch
5	electric horn (bass)	26	front top switch
6	scrubber assembly	27	warning lamp switch
7	accumulator 120AH	28	control panel assembly
8	negative pole switch	29	radio
9	atmospheric pressure sensor	30	quick change locked switch
10	main relay	31	pressure selection switch
11	parking motor relay	32	wane switch cover plate
12	preheat relay	33	DPD manual regeneration wane switch
13	start motor relay	34	fault code clear switch
14	ECM	35	jerk button
15	battery relay	36	after treatment generation indicator lamp
16	dropping resistor	37	cigar lighter
17	display	38	flash buzzer
18	controller	39	rubber antenna
19	electric control box assembly	40	wiper motor
20	wiper controller	41	wiper jet
21	Middle excavator GPS	42	horn

5.1.7 Hydraulic elements table

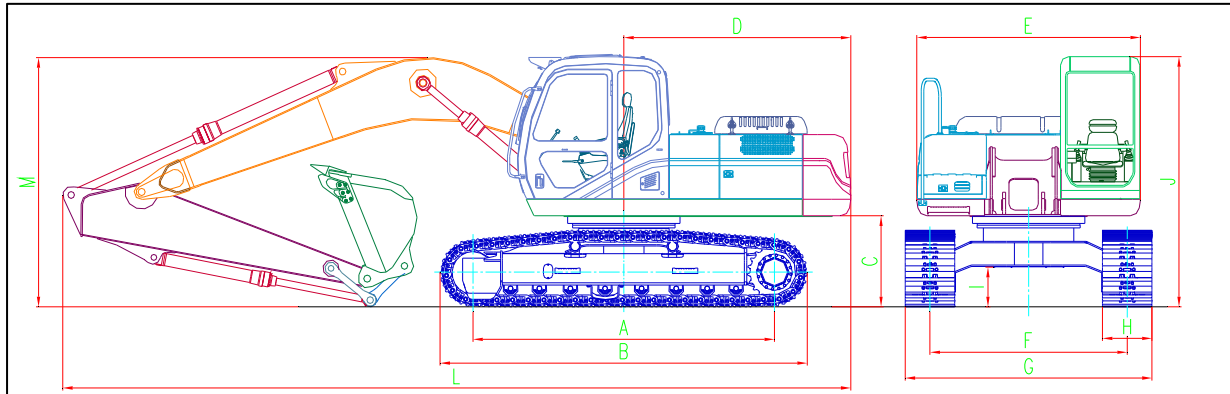
N.O	NAME	QTY
1	Multi-way valve	1
2	Main pump	1
3	Swing motor	1
4	Right travel motor	1
5	Left travel motor	1
6	Central swing joint	1
7	Left pilot joystick	1
8	Right pilot joystick	1
9	Double-pedal valve	1
10	Pilot filter	1
11	Low pressure valve unit	1
12	Boom cylinder	2
13	Arm cylinder	1
14	Bucket cylinder	1

5.2 SWE210F Technical specification

5.2.1 Machine specification

Machine specification	SWE210F
Operation weight	21300 kg
Standard bucket capacity	0.95m ³
Track shoe width	600mm
Power plant	
Engine model	AM-4HK1X
Type	Direct injection, water cooled, 4 strokes, pressurized and intercool
Cylinder N.O	4
Bore x stroke	115mm x 125mm
Displacement	5.193 L
Rated power/revs	128 kW/2000rpm
Max torque /revs	677Nm /1500rpm
Fuel tank capacity	370 L
Main pump	2× axial piston pump
Flow capacity	2x234L/min
Work pressure setting	32.4/34.3
Pilot pump	1× gear pump
Flow capacity	29L/min
pilot pressure setting	3.9 Mpa
Hydraulic oil tank capacity	250 L
Performance specification	
Slewing speed	11.8 rpm
Travel speed	4.9/3.1 km/h
Max traction	193kN
Max grade ability	35°
Bucket max digging force	154kN
Arm max digging force	110 kN

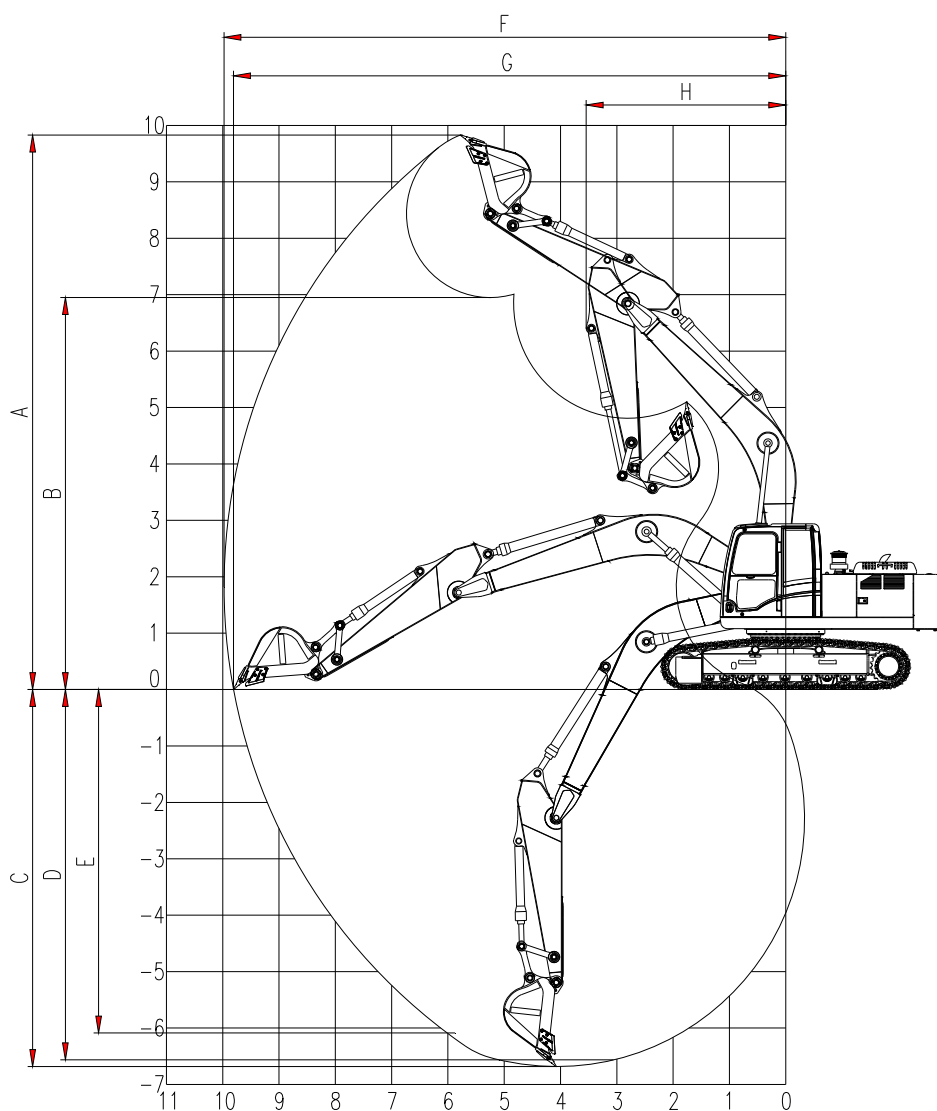
5.2.2 Configuration specification



Unit: mm

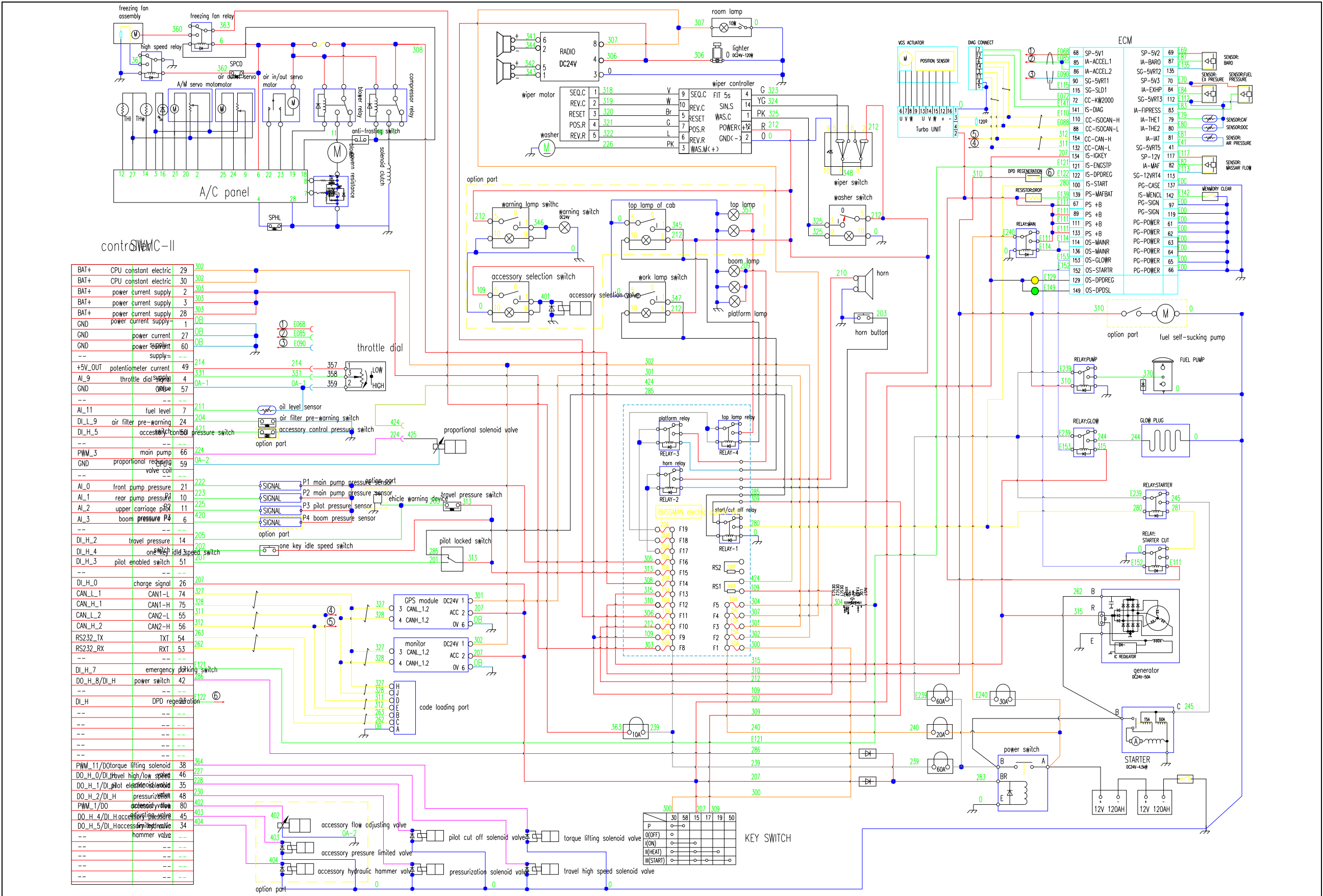
Machine specification		SWE210F
A、	Wheel track	3465
B、	Track total length	4450
C、	Platform distance to ground	1060
D、	Platform slewing radius	2750
E、	Upper structure width	2710
F、	Track gage	2200
G、	Chassis width	2800
H、	Track width	600
I、	Chassis distance to ground	470
J、	Cab roof height	2965
L、	Transportation length	9590
M、	Boom height	3045

5.2.3 Work specification



Machine specification		SWE210F
A、	Max digging height	9740
B、	Max dumping height	6980
C、	Max digging depth	6690
D、	8 feet level digging depth	6500
E、	Max vertical digging depth	6040
F、	Max digging radius	9950
G、	Max reach at ground level	9785

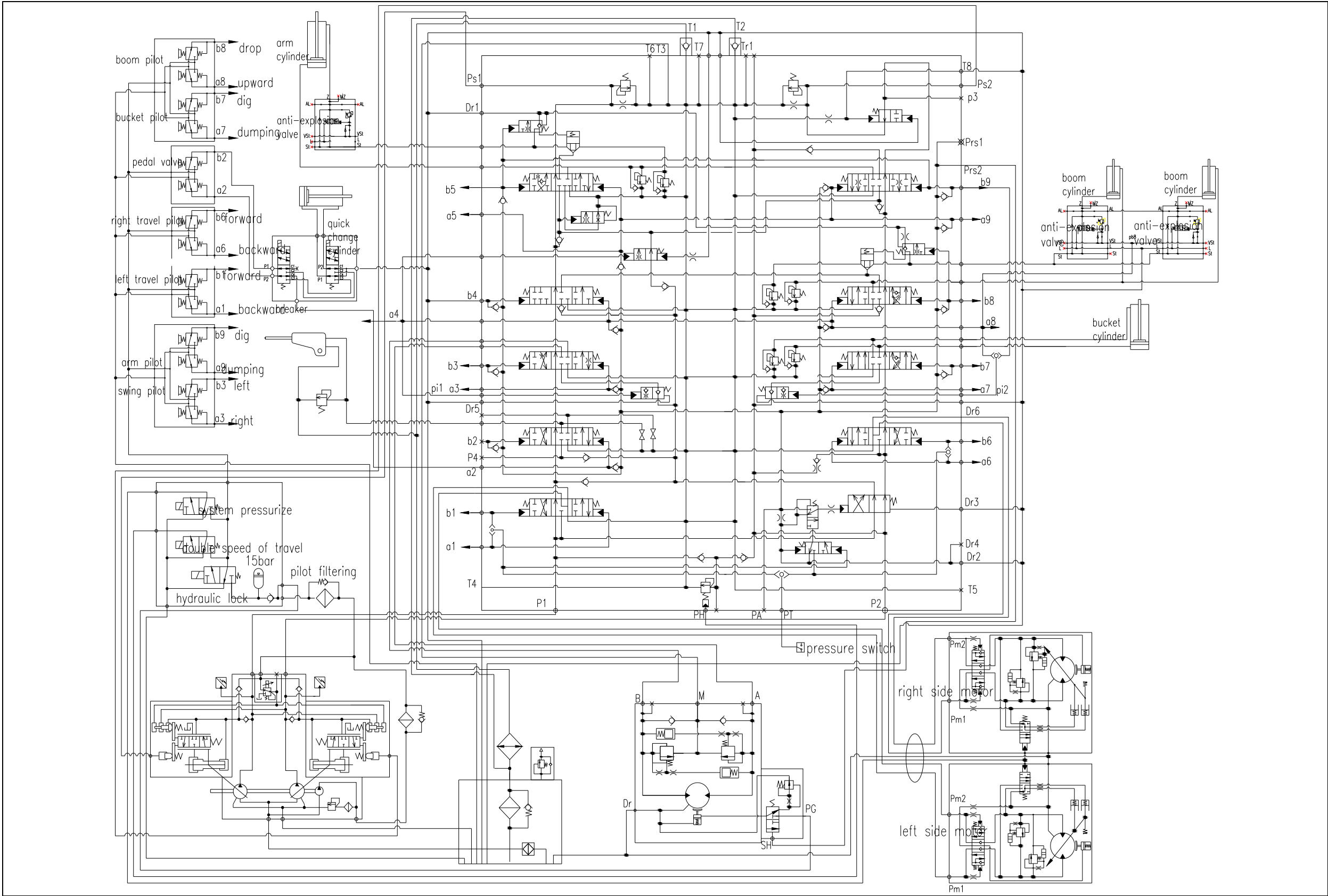
5.2.4 SWE210F Circuit diagram



5.2.5 SWE210F Electric elements table

No.	Name	No.	Name
1	work lamp	23	micro-switch
2	pressure switch	24	throttle knob
3	pressure sensor	25	work lamp switch
4	electric horn (top)	26	wiper switch
5	electric horn (bass)	27	front top switch
6	scrubber assembly	28	warning lamp switch
7	accumulator 120AH	29	control panel assembly
8	negative pole switch	30	radio
9	atmospheric pressure sensor	31	quick change locked switch
10	main relay	32	pressure selection switch
11	parking motor relay	33	wane switch cover plate
12	preheat relay	34	DPD manual regeneration wane switch
13	start motor relay	35	fault code clear switch
14	ECM	36	jerk button
15	battery relay	37	after treatment generation indicator lamp
16	dropping resistor	38	cigar lighter
17	display	39	flash buzzer
18	controller	40	rubber antenna
19	electric control box assembly	41	wiper motor
20	wiper controller	42	wiper jet
21	middle excavator GPS	43	horn
22	engine pressurization controller	44	Relay assembly

5.2.6 Hydraulic diagram



5.2.7 Hydraulic elements table

N.O	NAME	QTY
1	Multi-way valve	1
2	Main pump	1
3	Swing motor	1
4	Right travel motor	1
5	Left travel motor	1
6	Central swing joint	1
7	Left pilot joystick	1
8	Right pilot joystick	1
9	Double-pedal valve	1
10	Pilot filter	1
11	Low pressure valve unit	1
12	Boom cylinder	2
13	Arm cylinder	1
14	Bucket cylinder	1

6. Accessories and option parts

6.1 Safety items



Warning:

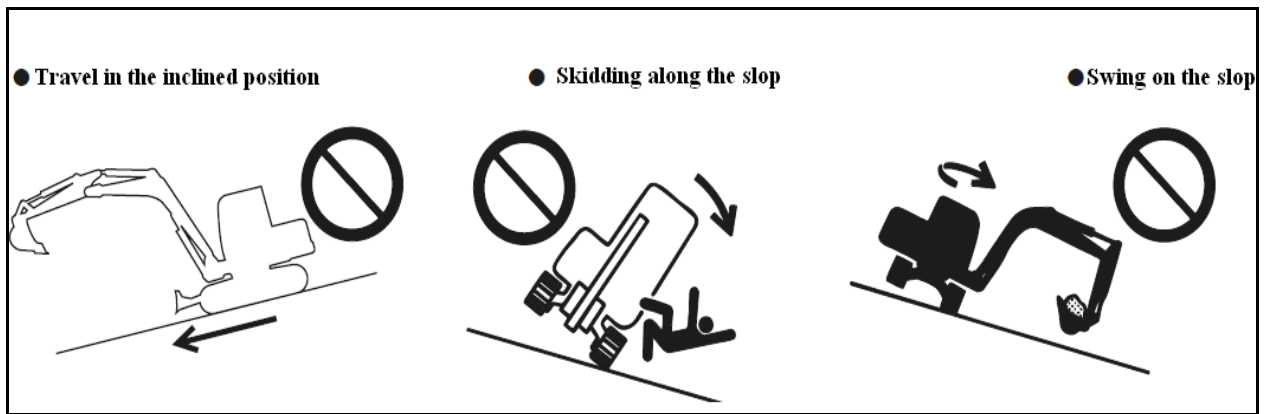
- Please consult Sunward dealer before install option parts;
- Do not use other option attachment which is not agreed by Sunward or Sunward dealer, or, it will influent machine life and other safety problems.
- Sunward will be not responsible for any hurt, accident or machine damage which is caused by unauthorized option attachment;
- According to the statement, vibration noise will difficult to make co-work send operation instruction. Before operating, please appoint one conductor and make sure the signal.
- Select flat、hard ground to operate and make sure good lighting and ventilation
- Clear up spot, clear away objects which are dangerous and obstacles, leaked lubricating oil and grease.
- Appoint one person conduct operating and obey him when the machine is lifting.
- When install or demount operation device, Make sure the machine stop stability and avoid tipping.
- Unauthorized person is not allowed in the working area, because of loading objects fall down or have the dangerous to be hurt.
- When lift or transport heavy objects (exceed 25KG), please use crane.
- Replace or select operation device or other special operation device, please preoperation first and then check oil level, if it necessary, please filling oil.
- Otherwise, please consult Sunward dealer about the detail of assembly and disassembly attachment.

6.2 Attentions of mounting accessories



Warning:

- Lengthened or heavy work attachment will decrease the stability of machine, so if machine travel or swing on the slop, it will tip. The following operation is dangerous, don' t operate the machine as follows.



1. Please lower centrobaric of work attachment to prevent anteverting when the machine downhill.

2. Forbid the machine along the slope side, prevent it from tipping.

3. Forbid swing in the slop.

4. After installing the heavy work equipment, machine swing flight will increase. Therefore, misjudgment will make the machine will crash surrounding objects, and the surrounding objects should allow sufficient margin when operation. In addition, natural subsidence will increase (when the device stopped working in mid-air, under its own gravity, will gradually decline).

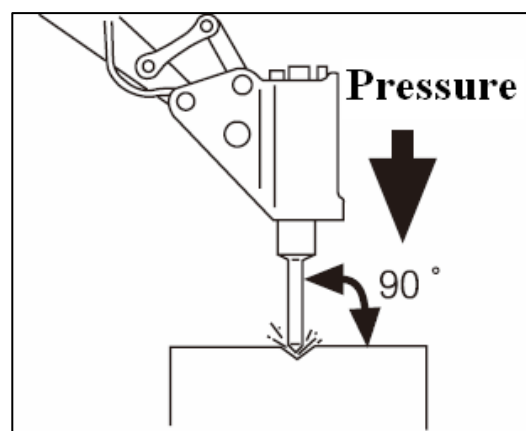
5. After installing long work attachment, work range will suddenly become larger, so it has the dangerous of corrosion objects and misjudged distance. When operate work attachment, please keep distance to any object in the area.

6.3 Hydraulic quartering hammer(option)

Different excavator must assemble different hydraulic quartering hammer, please consult Sunward before assemble hydraulic quartering hammer and confirm the model of hydraulic quartering hammer

6.3.1 Main use of hydraulic quartering hammer:

- a) Crush rock
- b) Demolish buildings
- c) Repair road



6.3.2 Hydraulic hammer assembly

Sunward medium-sized excavators with broken line, including two way hydraulic circuits, two cut-off valves, they are located on both sides of the bucket rod, line terminal is the quick change joint which is connected accessories as shown in figure:



Matching connect oil inlet and the oil return of hydraulic hammer, then open the cut-off valve.

Before dismantling and installation pipe, please close stop valve to prevent the hydraulic oil flow out.

6.3.3 Control hydraulic quartering hammer

Break is controlled by left foot pedal of travel operation bar



Put foot on the pedal when it is operating.



Tread pedal, hydraulic breaker hammer begin to work.

Picture 1



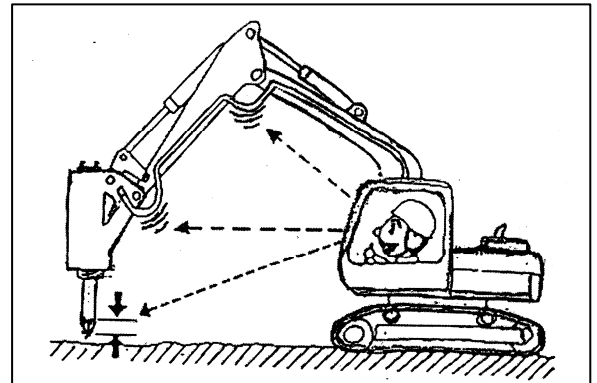
Prohibit put foot on the pedal when it is not operated to prevent misoperation.



6.3.4 Operation safety of hydraulic quartering hammer

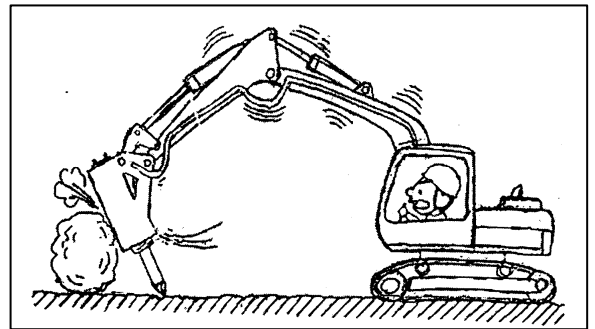
a) Please stop operating when oil tube has big vibration

When high and low pressure oil tube of quartering hammer over vibration, please disassembly and repair, and then contact with nearest Sunward service after sale.



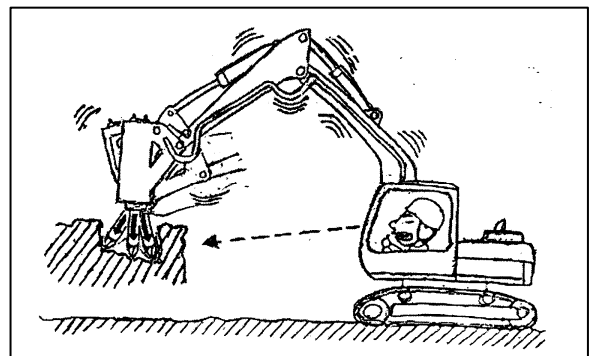
b) Forbid empty hitting

Once the rock hit, immediately stop ,because the continuous empty-hitting not only can damage the drill rod and flat sales, but also damage to the mechanical load, when rod position is incorrect or when used it-as a lever occurs runaway. (Percussion sounds will change when runaway)



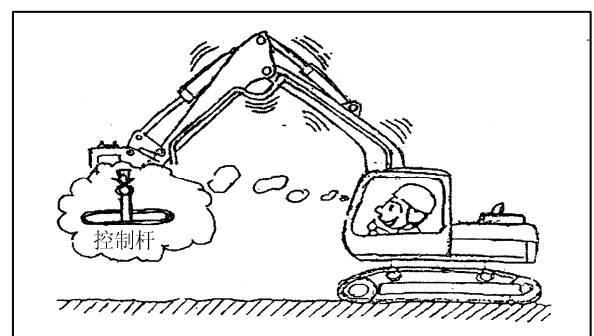
c) Forbid to push rock

Forbid using side wall of quartering hammer to push rock, because this is the main factor of damage bolt of quartering hammer ,drill



d) Do not take drill shank as crowbar

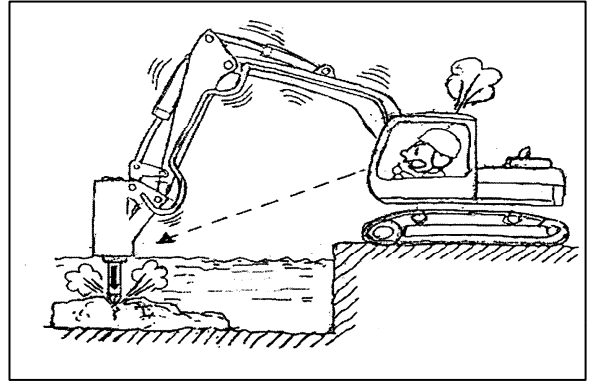
When take drill shank as crowbar, bolt and drill shank will be damaged



e) Do not continue to beat over 1 minute

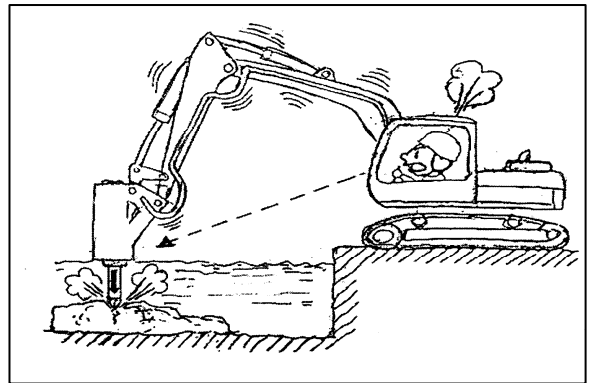
When Quartering hammer continue to hit over 1 minute, rock still not be crushed, please replace hitting point and continue to hit, continue to hit at the same place will quickly wear drill shank.

f) Please from edge to crush big and hard rock
From crack or edge begin to hit ,big and hard rock is easy to be crushed.



g) Operate quartering hammer with proper engine speed

Operate quartering hammer with proper engine speed, high engine speed not only not improve hitting power of quartering hammer, but also make high oil temperature to damage piston and valve.



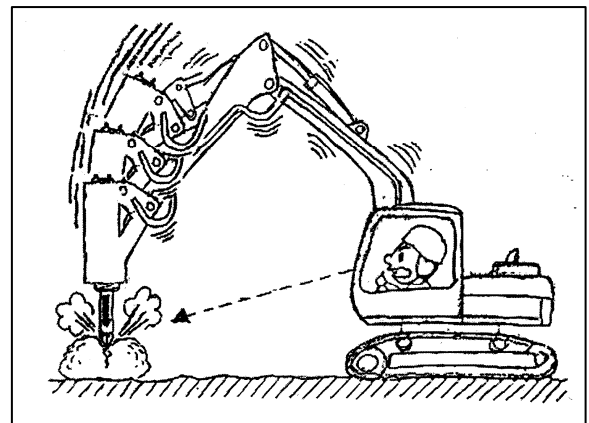
h) Do not operate quartering hammer in the water or mud

When parts except drill shank sink in the water or mud, please stop operating quartering hammer, because piston and related parts will have mud and make quartering hammer be damaged beforehand.

have mud and make quartering hammer be

I) Do not operate quartering hammer in the water or mud

When parts except drill shank sink in the water or mud, please stop operating quartering hammer, because piston and related parts will have mud and make quartering hammer be damaged beforehand.



J) Do not use quartering hammer crack rock

Quartering hammer crack rock will has lots of reaction force to quartering hammer and loaded machine, so it will damage many parts of quartering hammer and loaded machine.

K) Do not hit on the limit position of loaded machine cylinder

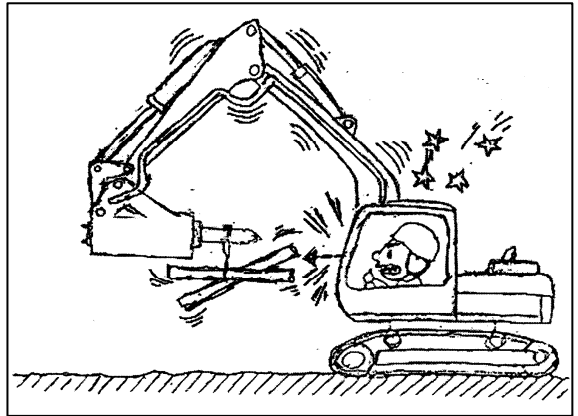
When hit on the limit position of loaded machine cylinder(machine boom completely stretched or shortened), arm and every part of loaded machine will be damaged.

L) Do not use quartering hammer lift objects

Lift object on quartering hammer or drill shank, it will not only damaged quartering hammer but also very dangerous.

M) Replace hydraulic oil and core of hydraulic tank

When use hydraulic quartering, hydraulic oil will go bad quicker than daily excavate, so it must frequently replace hydraulic oil and core, if replace hydraulic oil and core do not on time, it will damage machine and hydraulic system of quartering hammer. In order to improve life of hydraulic system, please according to the table to replace hydraulic oil and core, the replace time please check chapter 3.9.2(replace hydraulic oil and core)



6.4 Option list

SWE150F Option list

Arm	Arm length	
Standard arm	2500mm	
Lengthen arm 1	2800mm	
Lengthen arm 2	3100mm	

Bucket	Rated bucket capacity	Cutting width
Standard bucket	0.6m ³	900
option		

SWE210F Option list

Arm	Arm length	
Standard arm	2920mm	

Bucket	rated bucket capacity	Cutting width
Standard bucket	0.95 m ³	1120
Optin		

7 Manufacture information

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