

# OPERATION MANUAL

**SK135SR-3**  
**SK135SRLC-3**  
**SK140SRL-3**

APPLICABLE No.

SK135SR-3	YY07-25001~
SK135SRLC-3	YH07-09001~
SK140SRL-3	LK07-02101~



READ, UNDERSTAND AND FOLLOW ALL SAFETY PRECAUTIONS AND INSTRUCTIONS FOUND IN THIS MANUAL BEFORE OPERATING THE MACHINE.

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Destination : OCEANIA

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# IMPORTANT INFORMATION

## PREFACE

This is the operator's manual for safety and effective use of this machine.

Before operating this machine, be sure to read this manual and fully understand the methods of operation, inspection and maintenance.

---

### WARNING

Improper operation or maintenance of this machine may cause personal injury, death or damage to the machine.

Before operating, inspecting and maintaining this machine, fully read and understand the each function and operation methods in this manual.

Always keep this manual in the specified storage space and the certified personnel handling this machine should read this manual periodically.

- As for the machine with a special specification, read not only the chapter for the optional attachment in this manual but also the separate volume for the optional attachment.
- If this manual is lost or damaged, place an order with KOBELCO authorized dealer/distributor for a replacement.
- This manual should be attached to this machine if this machine is transferred to a new user/owner.
- The contents of this manual are based on the use of KOBELCO genuine parts. Do not use the parts other than KOBELCO genuine parts.
- Manufacturers cannot anticipate every possible circumstance that might involve a potential hazard in operation, inspection and maintenance.

Because of this, the warnings in this manual and on the product do not display all of the safety precautions.

Therefore, when operation, inspection and maintenance is performed in the circumstances that is not written in this manual, all of necessary actions for safety should be considered under the responsibility of customer himself/herself.

- If a tool, procedure, work method or operating technique not specifically recommended by the manufacturer is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance and/or repair procedures you choose.

In this case, works and operations prohibited in this manual must not be taken.

- Owing to the policy of continual improvement and enhancement of products, details of this manual may be different from the actual machine.
- Should there be questions, errors, omissions or anything to be pointed out, contact KOBELCO dealer/distributor.

And also if you have any questions about ordering a manual, contact KOBELCO authorized dealer/distributor.

KOBELCO provides machines produced in accordance with regulations and standards of a country in which machines to be used. If you have a machine purchased in a foreign country or from a person or company in a foreign country, your machine may lack a necessary safety devices, or components or specification for operating the machine in your country. Please contact KOBELCO authorized dealer/distributor to ask whether your machine's specification meets regulations and standards of your country or not.

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## [IMPORTANT INFORMATION]

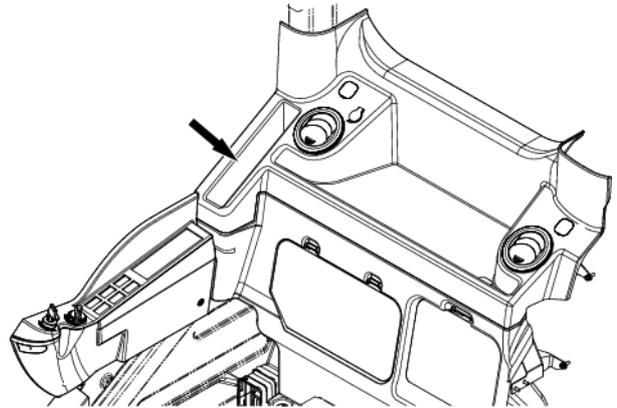
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### KEEP OPERATION & MAINTENANCE MANUAL IN STORAGE

Keep this manual in the magazine box of right rear of the operator's seat.



### READ THIS MANUAL BEFORE OPERATING THE MACHINE

Most accidents occurring during work are due to non-observance of simple safety norms and elementary precautions.

Many accidents can be avoided if the causes are known and opportune cautions taken beforehand.

There is no device or protection, no matter how advanced, that many prove so effective at avoiding accidents as a careful and attentive behaviour.

---

## SAFETY INFORMATION IN MESSAGES OR LABELS IN THIS MANUAL AND ON THE MACHINE

Most of accidents concerned with "operation, inspection and maintenance" and repair work are caused by not following safety precautions and not predicting dangerous situations.

Predicting dangerous situations can prevent accidents beforehand. Therefore, pay attention to where, what kind of danger may occur.

Improper operation, inspection and maintenance are very dangerous and it may cause personal injury.

Before operating, inspecting and maintaining this machine, fully read and understand function and operation methods in this manual.

If these warnings are ignored, it may result in severe injury or death.

This manual's safety messages or product safety labels on this machine are displayed with following signal words.

Signal words indicate degrees of potential danger and also contain the ways how to avoid danger.



**When this symbol is found, exercise caution and read articles following this symbol carefully because its contents are related to the safety of not only the operator but also personnel in the work site and be sure to let other operators and personnel know about it.**

The following "DANGER", "WARNING" and "CAUTION" displays show and alert personnel that there is potential danger by which may result in serious personal injury and damage to the machine if it is not avoided.



**DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious personal injury.**



**WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious personal injury.**



**CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate personal injury.**

Other than the above-mentioned signal words, the following displays show the things must be kept for the safety of the machine and the things which may be helpful for the operator.



**Important indicates special instructions or procedures which, if not correctly followed, may result in severe machine damage and shortening of the machine life.**

**Notice**

Notice indicates information that may be helpful for the operator.

**WARNING LABELS**

Warning labels are affixed to various places of the machine to alert the operator and surrounding personnel of hazardous situations during operation, inspection or maintenance. There are two types of "warning labels" on this machine. One is "WARNING LABEL BY WORDS" and the other is "WARNING LABEL BY PICTORIAL".

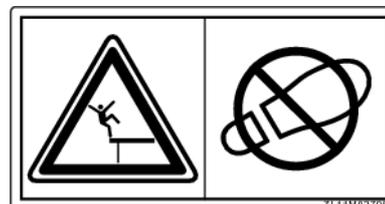
Example of the warning label by words:



Example of the warning label by pictorial:  
The warning label by pictorial is equivalent to "signal word" giving the operator and surrounding personnel the alert of hazardous situation. Pictorial is applied in this label so that the operator and/or maintenance personnel can realize and understand the existence of hazardous situation instantly. In the pictorial warning label, hazard descriptions are shown on the upper box or left box, and actions to avoid hazard are shown on the lower box or right box.



Also the details of hazard are shown in the triangle and actions to avoid hazard is shown in the circle or by pictorials themselves.



## SUMMARY OF THE MACHINE

### APPLICABLE WORKS

Use this machine in the following applications:

- Digging
- Trenching
- Loading
- Leveling

For details of work procedures, please refer to the chapters of MACHINE OPERATION and OPTIONAL EQUIPMENT/ATTACHMENT.

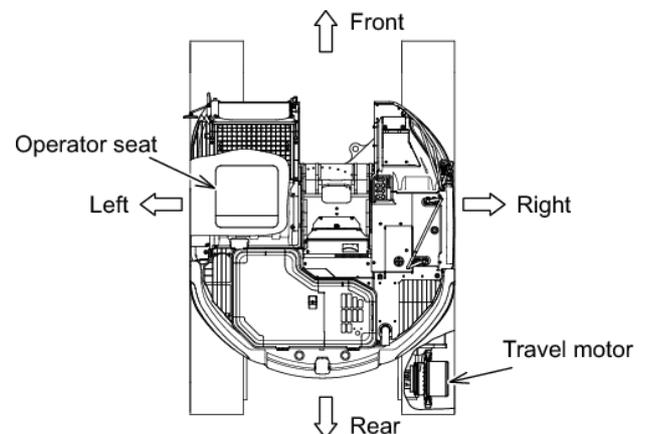
- Demolishing

For details of procedures, please refer to the chapters of MACHINE OPERATION and OPTIONAL EQUIPMENT/ATTACHMENT.

Do not apply this machine to the other works than the above-mentioned to avoid personal injury and damage to the machine.

### FRONT & REAR/RIGHT & LEFT OF THE MACHINE

Front & rear / right & left of the machine in this manual are set at the condition of putting travel motor at the rear when the view from the operator cab is facing the forward direction.



## BREAK-IN OPERATION

This machine was shipped after the full factory inspections and adjustment processes.

However, if this machine is used extremely from the beginning, it will accelerate deterioration of the machine performance and shorten the machine life.

Perform the break-in operation in three steps shown to the right until the each part becomes to fit with each other.

Hour Meter	Load Status
Less than 10 hours	About 60 %
Less than 100 hours	About 80 %
100 hours and more	Full load

Especially, take care about following things when performing the break-in operation.

- Do not perform a heavy load nor high speed operation.
- Do not perform a dash start , dash acceleration , unnecessary sudden stop nor sudden turn.

---

### **IMPORTANT**

Use extreme caution to put a full load on the machine before its parts and components fit with each other because it could cause seizures or scratches and significantly affect the machine life.

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## QUALIFICATION FOR OPERATING THE MACHINE

Where a license or special qualification is required to operate a hydraulic excavator by law, the operator of this machine is required to have a valid license or qualification.

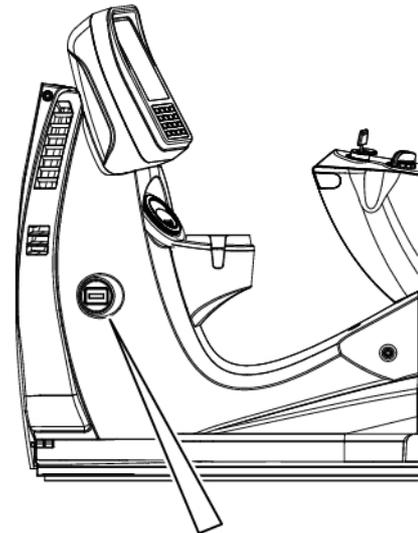
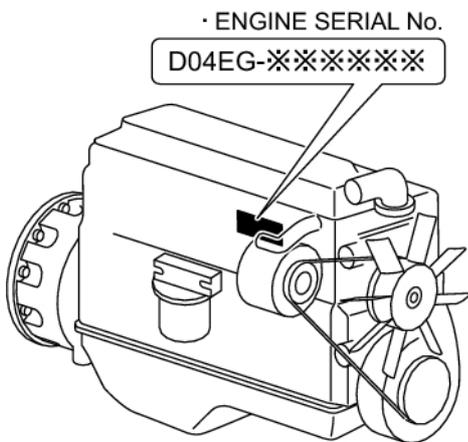
## ORDERING PARTS AND SERVICE

When ordering parts and service, inform KOBELCO authorized dealer/distributor of the machine serial number, engine serial number and hour meter read.

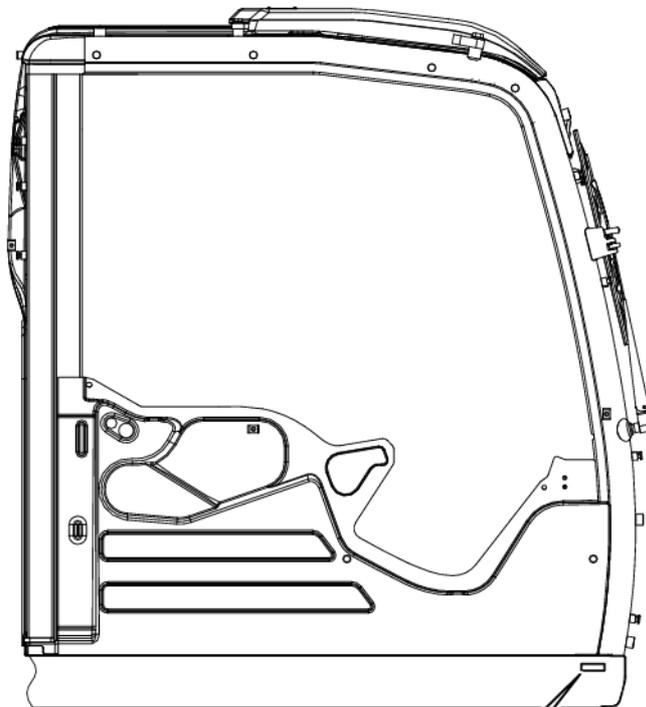
The machine serial number and engine number are stamped in the locations shown below.

For the future reference, confirm and record these numbers in the spaces shown below:

MACHINE TYPE	MACHINE SERIAL No.	ENGINE SERIAL No.	HOUR METER



· HOUR METER



· MACHINE SERIAL No.



# 1. SAFETY PRECAUTIONS

## 1.1 WARNING LABELS

Warning labels are affixed to various places of the machine to alert the operator and surrounding personnel of hazardous situations during operation, inspection or maintenance.

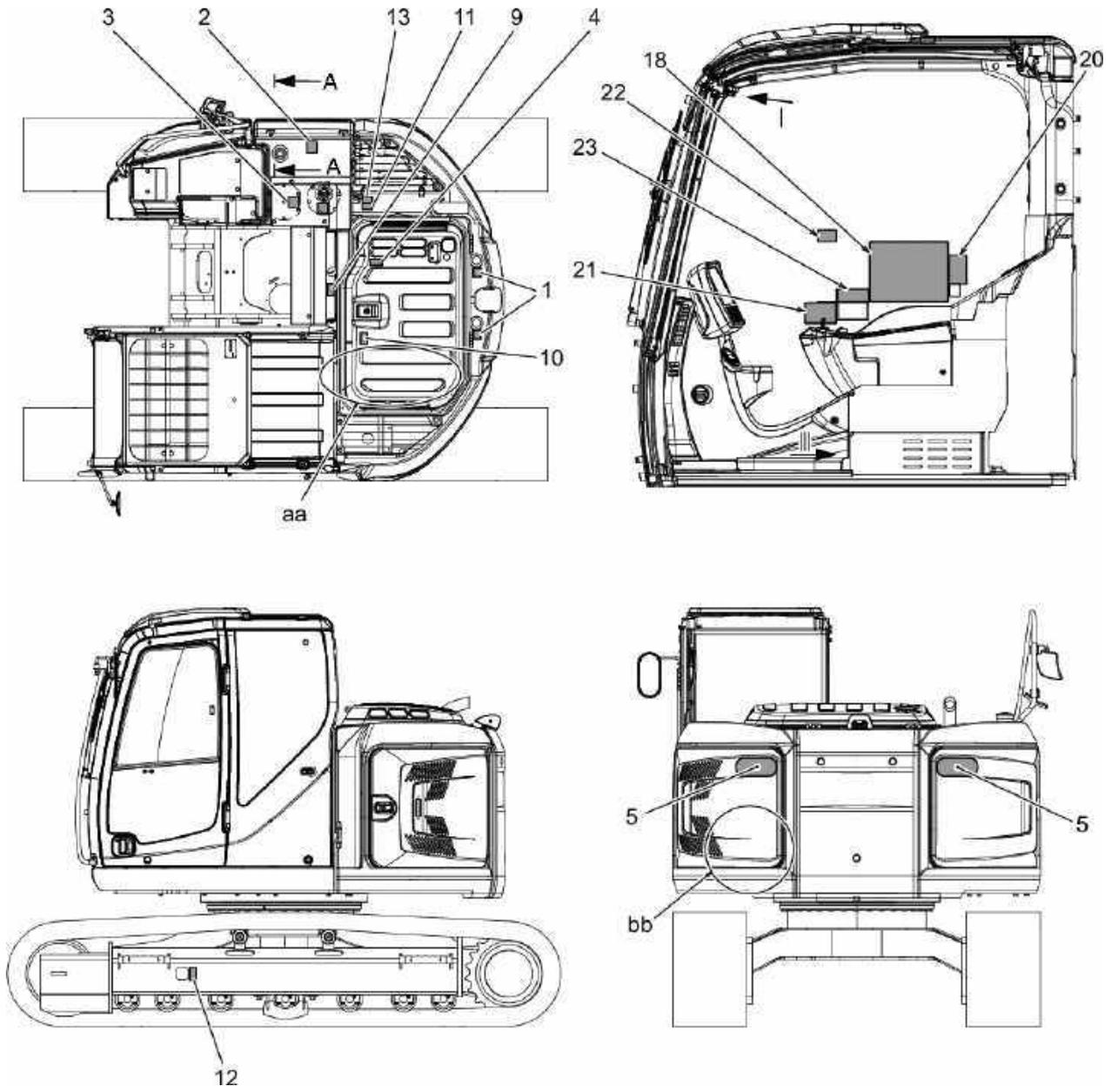
Take enough time to understand the locations of potential danger and hazard status and become familiar with the contents of the hazard prevention.

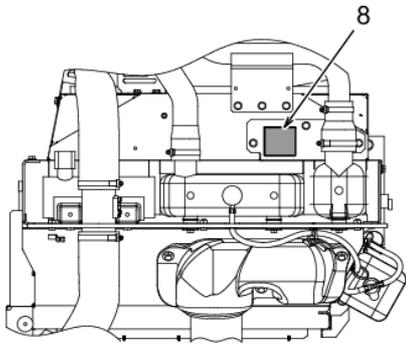
### 1.1.1 WARNING LABELS MAINTENANCE

- Do not remove the affixed warning labels to this machine.
- Confirm that all of these labels can be easily read.
- If words or illustrations are illegible, clean off the dirt.  
Use a cloth, water and detergent to clean the warning labels. Never use organic solvents or gasoline.
- If labels are damaged, missing or illegible, replace them with new ones.  
Contact KOBELCO authorized dealer/distributor for new labels.
- As for the labels other than shown below, treat them in the same ways as the above-mentioned.

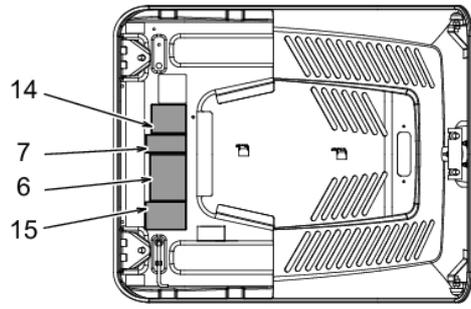
# [1. SAFETY PRECAUTIONS]

## 1.1.2 LOCATION OF WARNING LABELS

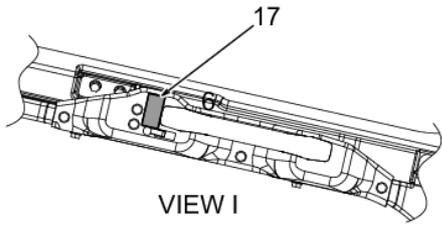




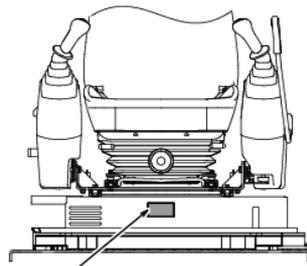
DETAIL aa



DETAIL bb

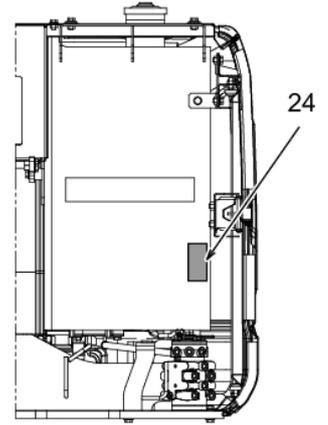


VIEW I

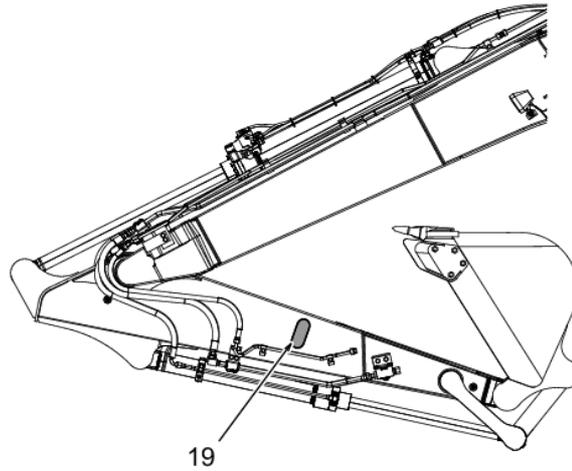


VIEW II

16



SECTION AA



19

1

# [1. SAFETY PRECAUTIONS]

## 1.1.3 WARNING LABELS

### 1. DO NOT USE COUNTERWEIGHT LIFTING

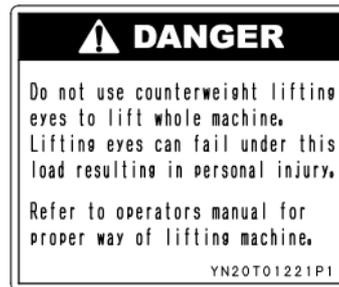
Located on counterweight.

Part Number - YN20T01221P1 (2REQ'D)

Do not use counterweight lifting eyes to lift whole machine.

Lifting eyes can fall under this load resulting in personal injury.

Refer to operators manual for proper way of lifting machine.



### 2. WORKING ABOVE GROUND

Located on top of fuel tank.

Part Number - YN20T01049P1

When servicing or repairing machine, keep surfaces free of oil, water, grease, tools, etc. to avoid possible slipping and/or falling from machine, which can cause personal injury.



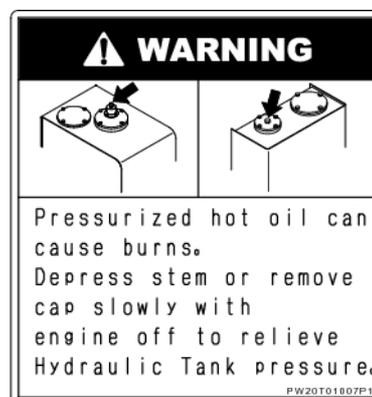
### 3. PRESSUREIZED HOT OIL

Located on top of hydraulic tank.

Part Number - PW20T01007P1 (2REQ'D)

Pressurized hot oil can cause burns.

Depress cap slowly with engine off to relieve hydraulic tank pressure.



**4. WORKING ABOVE GROUND**

Located on top of engine hood.

Part Number - ZL11N02704

There is a danger of falling when working on areas above ground.

- Do not approach edges.
- Use the appropriate equipment, such as ladders or platform when working above ground. In addition, strap yourself to the proper equipment accordingly.
- Avoid spillage of any oil or grease.
- Do not leave any tools around the working area.
- Use extreme caution to avoid slipping while walking.
- Do not jump on or from the machine. Use the steps and handrails and securely maintain a three point contact while mounting or dismounting at all times.



**5. SWING**

Located on each side of the rear counterweight.

Part Number - YN20T01003P2 (2REQ'D)



**6. BOOSTER CABLE**

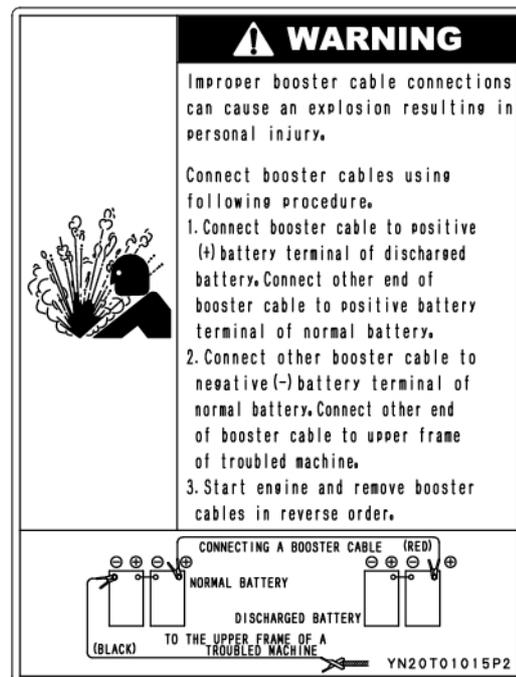
Located on inside of rear door L.H.

Part Number - YN20T01015P2

Improper booster cable connections can cause an explosion resulting in personal injury.

Connect booster cables using following procedure.

1. Connect booster cable to positive (+) battery terminal of discharged battery. Connect other end of booster cable to positive battery terminal of normal battery.
2. Connect other booster cable to negative (-) battery terminal of normal battery. Connect other end of booster cable to upper frame of troubled machine.
3. Start engine and remove booster cables in reverse order.



# [1. SAFETY PRECAUTIONS]

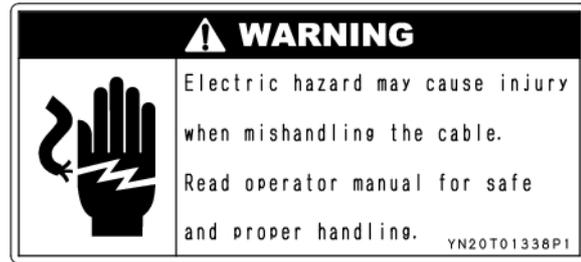
## 7. BATTERY CABLE

Located on inside of rear door L.H.

Part Number - YN20T01338P1

Electric hazard may cause injury when mishandling the cable.

Read operator manual for safe and proper handling.



## 8. HOT COOLANT

Located on top of engine fan shroud.

Part Number - YN20T01010P1

Steam of hot coolant can cause injury or blindness.

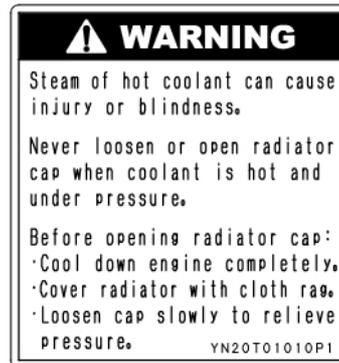
Never loosen or open radiator cap when coolant is hot and under pressure.

Before opening radiator cap:

-Cool down engine completely.

-Cover radiator with cloth rag.

-Loosen cap slowly to relieve pressure.



## 9. ENGINE STOP

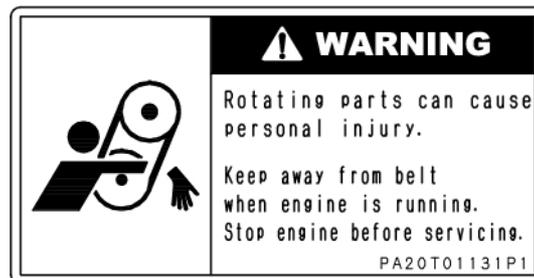
Located on top of engine fan shroud.

Part Number - PA20T01131P1

Rotating parts can cause personal injury.

Keep away from fan and belt when engine is running.

Stop engine before servicing.



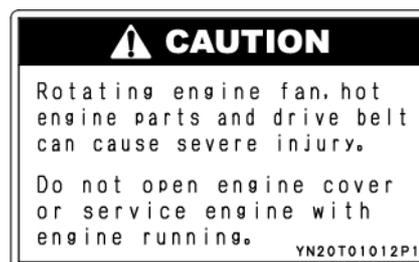
## 10. ROTATING & HOT PARTS

Located on engine hood.

Part Number - YN20T01012P1

Rotating engine fan, hot engine parts and drive belt can cause severe injury.

Do not open engine cover or service engine with engine running.



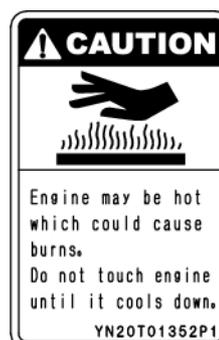
## 11. HOT PARTS

Located on hydraulic pump cover.

Part Number - YT20T01352P1

Engine may be hot which could cause burns.

Do not touch engine until it cools down.



**12. ADJUSTING TRACK TENSION**

Located on crawler frame.

Part Number - YN20T01813P1 (2REQ'D)

- This work must be done carefully by two people. The operator must operate the machine as instructed by the signals of the partner.  
The crawler belt is changed by lifting one side of the machine at a time. Unexpected lowering or movement of the machine can result in serious injury or death.  
Do not operate the boom, arm or bucket / attachment while removing or installing a crawler belt.  
Follow the instructions provided.
- Grease in track tensioning mechanism is under extreme pressure and can penetrate skin causing severe injury. Keep face and body away from grease fitting area. Do not loosen grease fitting more than one turn. If grease does not release after one turn of the fitting, call our dealer/distributor for assistance.
- Before removing the rubber crawler belt, confirm that the pressure inside the track tensioning cylinder has been completely released. Then turn the sprocket.
- If the procedure on releasing the pressure in the track tensioning cylinder is not followed, grease can penetrate skin causing severe injury. If the tension of rubber crawler belt does not release, call the dealer/distributor for repair service.



## [1. SAFETY PRECAUTIONS]

### 13. WORKING ABOVE GROUND

Located on top of pump cover.

Part Number - YY20T01387P1

There is a danger of falling when working on areas above ground.

- Do not approach edges.
- Use the appropriate equipment, such as ladders or platform when working above ground. In addition, strap yourself to the proper equipment accordingly.
- Avoid spillage of any oil or grease.
- Do not leave any tools around the working area.
- Use extreme caution to avoid slipping while walking.
- Do not jump on or from the machine. Use the steps and handrails and securely maintain a three point contact while mounting or dismounting at all times.

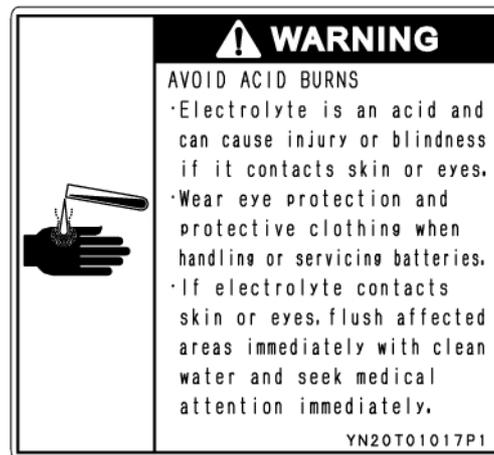


### 14. HANDLING BATTERY

Located on inside of rear door L.H.

Part Number - YN20T01017P1

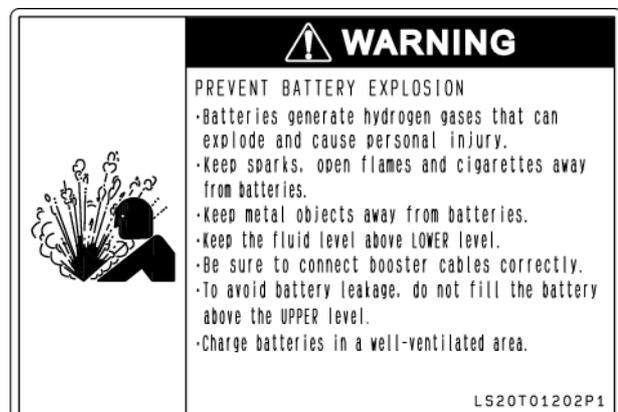
A metallic tools and articles can cause explosion due to ignited by short-circuit batteries terminals. Do not put any metallic tools and articles over batteries.



### 15. PREVENT BATTERY EXPLOSIONS

Located on inside of rear door L.H.

Part Number - LS20T01202P1



**16. DO NOT INSERT HAND IN THE MOVING PART**

Located on seat stand.

Part Number - YN20T01339P1

Be careful not to pinch your hand(s) when operating the lever.



**17. LOCK FRONT WINDOW AT THE HOUSED POSITION**

Located on side of handle on the front window.

Part Number - LC20T01331P1

Lock front window at the housed position.

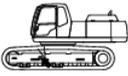
There is always possibility of slipping down of the housed front window resulting in injury.



**18. TRAVEL SPEED, ADJUSTING TRACK TENSION, LEAVING MACHINE, READ OPERATOR MANUAL, POWER BOOST SWITCH, ENGINE STOP, BUCKET TO CAB CONTACT, ELECTRICAL POWER LINES LEAVING MACHINE**

Located inside cab R.H.

Part Number - YT20T01386P1

 <p><b>⚠ DANGER</b></p> <p>Contact with electrical power lines will result in severe injury or death.</p> <p>Keep machine and attachment a safe distance from electrical power lines as per following instruction.</p> <table border="1"> <thead> <tr> <th>VOLTAGE(Volts)</th> <th>SAFETY DISTANCE</th> </tr> </thead> <tbody> <tr> <td>50K or LESS</td> <td>3.0M(10FT)</td> </tr> <tr> <td>50K to 200K</td> <td>4.5M(15FT)</td> </tr> <tr> <td>200K to 350K</td> <td>6.0M(20FT)</td> </tr> <tr> <td>350K to 500K</td> <td>7.5M(25FT)</td> </tr> <tr> <td>500K to 750K</td> <td>10.5M(35FT)</td> </tr> <tr> <td>750K or OVER</td> <td>13.5M(45FT)</td> </tr> </tbody> </table>	VOLTAGE(Volts)	SAFETY DISTANCE	50K or LESS	3.0M(10FT)	50K to 200K	4.5M(15FT)	200K to 350K	6.0M(20FT)	350K to 500K	7.5M(25FT)	500K to 750K	10.5M(35FT)	750K or OVER	13.5M(45FT)	 <p><b>⚠ WARNING</b></p> <p>Extreme high pressure in track adjustment cylinder can cause personal injury when adjusting crawler tension.</p> <p>Loosen grease nipple with care to relieve pressure gradually.</p>	 <p><b>⚠ WARNING</b></p> <p>Releasing power boost switch while lifting a load can cause unexpected lowering of load, resulting in severe injury or death.</p> <p>Never use power boost switch for lifting a load.</p>
VOLTAGE(Volts)	SAFETY DISTANCE															
50K or LESS	3.0M(10FT)															
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750K or OVER	13.5M(45FT)															
<p><b>⚠ WARNING</b></p> <p>Read and understand operator manual before operating or performing maintenance on this machine.</p> <p>Failure to follow or pay attention to instructions in operator manual can result in injury or death.</p> <p>It is your responsibility to be aware of and follow all local laws and regulations.</p> <p>Before starting machine, make sure hydraulic control lever is in lockout position and all control levers are in neutral.</p> <p>Sound horn to alert people.</p> <p>Ensure bystanders and obstacles are clear of machine before moving machine or its attachments.</p> <p>Do not carry riders on machine.</p> <p>Before leaving operators compartment, park on level ground, lower attachments to ground, make sure hydraulic control lever is in lockout position and stop engine.</p>	<p><b>⚠ WARNING</b></p> <p>Machine may move suddenly and cause serious personal injury if a control lever is accidentally touched. Be sure the safety lever is disengaged and in the locked position before exiting the cab.</p>	<p><b>⚠ CAUTION</b></p> <p>Some type of attachment and the combination of attachment may cause an interference with operator's cab and other sections of machine during operation.</p> <p>Before starting operation, make sure to check for the enough space for no interference between the attachment and operator's cab and the other sections. Since it is more danger when the attachment is moved close to the cab and machine frame and so on, special attention must be paid.</p>														
	<p><b>⚠ WARNING</b></p> <p>Automatic two speed travel system changes travel speed automatically and can adversely affect machine control when descending a slope and loading or unloading on a trailer.</p> <p>Personal injury can occur from sudden change in machine control.</p> <p>Put travel speed select switch in LOW speed position when descending a slope and loading or unloading on a trailer.</p>	<p><b>NOTICE</b></p> <p>Stopping engine without allowing it to cool can result in overheating and shortened engine life.</p> <p>Before stopping engine, run at low idle for at least 5 minutes to allow engine and turbo charger to gradually cool down.</p> <p style="text-align: right;">YT20T01386P1</p>														



## [1. SAFETY PRECAUTIONS]

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### 19. KEEP CLEAR WORKING AREA

Located on arm.

Part Number - YN20T01337P1 (2REQ'D)

Make sure the area is clear of obstacles and persons before beginning the operation of the machine. Always look around before you start the swing operation. Make sure everyone is cleared in your worksite. Sound horn before beginning swing operation.



### 20. ENGINE AUTO IDLING STOP

Located inside cab R.H.

Part Number - YN20T01695P1



When you stand up and or move over the control levers during operation, your body or hand may contact the levers and resulting unexpected movement of attachments or upper machinery.

Make sure to set the safety lock lever for inoperative position before you stand up and move from operators' seat.

Auto idle stop (AIS) system will stop engine and any motive power and may result accident if using machine for lifting work.

Make sure to turn off the AIS system when using machine for lifting work.

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**Make sure the following cautions when using Auto Idle Stop (AIS) system.**

-After AIS system activates and stops engine, make sure to turn the starter key "ACC" or "OFF" position once, set accelerator dial to Lo speed range then start engine. If AIS system sounds alarm, engine will not be started till the sound will be stopped.

-Make sure to turn the starter key "OFF" position when you leave the machine for a while.

-AIS system will not activate when multi display monitor indicates an error of engine coolant temperature.

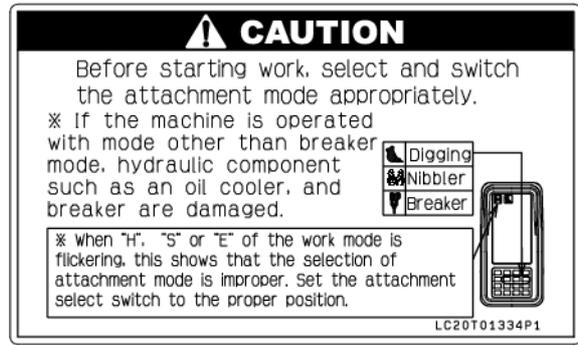
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**21. ATTACHMENT MODE SELECT SWITCH (OPTION)**

Located inside cab R.H.

Part Number - LC20T01334P1

Before starting work, be sure to set the attachment select switch to the proper position.



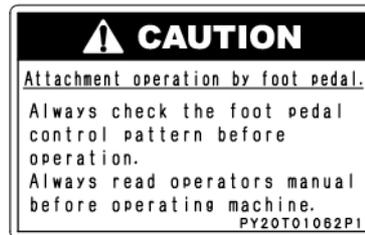
-The work with breaker in any position other than "Breaker" may cause damage to the oil cooler, the hydraulic equipment and breaker.

-When the work mode icon, "H" or "S", is flickering, it tells the wrong choice of the attachment. Set the attachment select switch to the proper position.

**22. OPERATION BY FOOT PEDAL (OPTION)**

Located inside cab R.H.

Part Number - PY20T01062P1

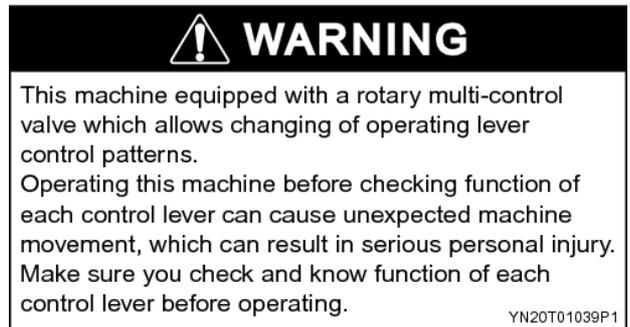


**23. CONFIRM THE MOVEMENT OF THE ATTACHMENT BEFORE OPERATING IT (OPTION)**

Located on inside cab R.H.

Part Number - YN20T01039P1

To prevent accidents, before operating the machine make sure the movement of machine is correct.



# [1. SAFETY PRECAUTIONS]

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## 24. ROTARY MULTI CONTROL VALVE

Located on fuel tank

Part Number - YT20T01406P1 (OPT.)



## 1.2 PRE-START SAFETY

### 1.2.1 OPERATION RULES

#### Follow the Rules

- Where a license and /or special qualification is required to operate a hydraulic excavator, the operator of this machine is required to have a valid license and /or qualification.
- Follow the safety precautions and procedures described in this manual while "operating, inspecting and maintaining" the machine.
- Never operate the machine with poor physical conditions caused from drugs (which makes you drowsy) and alcohol and unstable mental condition.
- Make sure to have communication with people working together including signal persons about work process before start working. The operator should follow the pre-determined signals when operating.

#### Ensure Safety at the Work Site

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##### **IMPORTANT**

Conduct risk assessment with the site manager on each work and confirm that all necessary safety measures are taken.

---

Conduct risk assessment with the site manager on each work and confirm that all necessary safety measures are taken.

For example, confirm whether following safety measures and checks are taken.

- Carefully survey quality of the layer of earth and soil in the work site before operating the machine to establish safety working procedures.
- Choose the place where landslide or rock fall will not occur.
- Put up barricades to make the work area off-limit to unauthorized personnel.  
Especially when working on the road, place the signal person to secure safety for both driving cars and pedestrians.

#### Signs & Signals

Put signs on the areas of soft shoulders and ground, and place the signal person to direct operation when necessary.

The operator should notice the signs and follow the signals from the signal person.

#### No Personnel Allowed to Get on the Attachment and Upper Machinery

Do not allow any personnel to get on the attachment and upper machinery while operating. Neither do personnel get on a lifted cargo.

Severe accidents resulting in personal injury may occur.

## [1. SAFETY PRECAUTIONS]

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### Optional Equipment/Attachment

Use only KOBELCO designed and/or authorized optional equipment/attachments.

- Using an unauthorized equipment/attachment may cause personal injury and severe damage to the machine and its components, and subsequently shorten the machine life.
- In case of installation of the optional equipment/attachments, read, understand and follow all the instructions described in the sections of option in this manual and the separate volume for the option.
- Personal injury, accidents or failures of the machine caused by using an unauthorized equipment/attachment voids our liability for the machine.
- Consult KOBELCO authorized dealer/distributor for the proper equipment/attachment for this machine beforehand.

### 1.2.2 PROTECTION TOOLS

#### Wear Fitting Clothing and Protective Gear

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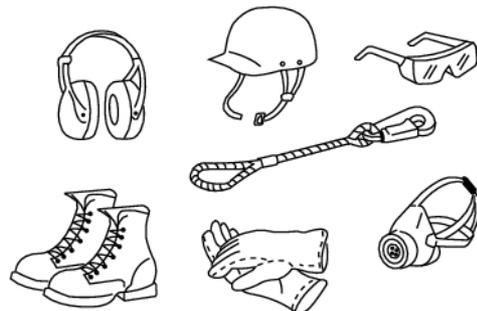


#### WARNING AVOID BURNS

Change clothing with oil stain, as such clothing may catch fire.

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- Do not wear loose fitting clothing and accessories. They may be caught by the control lever and part of the machine and cause unexpected movement of the machine and work device.
- Always wear well-fitting protective shoes and hardhat  
Wear protective gears such as protective glasses, mask, face shield, ear plugs, gloves, safety belt and reflecting vest when necessary.
- Be sure to make surrounding people in the work site wear a hardhat and protective shoes.  
Make them wear protective gears such as protective glasses, mask, face shield, ear plugs, gloves, safety belt and reflecting vest when necessary.
- Tie up a long hair coming out of a hardhat not to get caught by the machine.
- Confirm the function of each protective gear before using it.



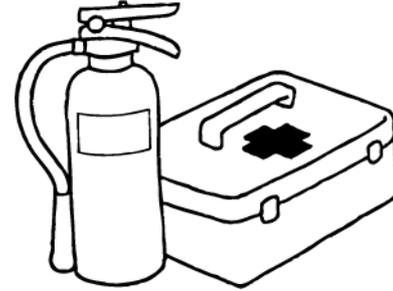
**Prepare for Emergency**

Have fire extinguishers and first aid kit ready for emergency and know where fire extinguishers and first aid kit are.

Know how to operate a fire extinguisher.

Maintain fire extinguishers in compliance with regulations.

- Maintain and check fire extinguishers regularly.
- Determine the emergency communication tools and channels and prepare the list of telephone numbers of personnel.
- Inspect a first aid kit regularly and make it up if necessary.



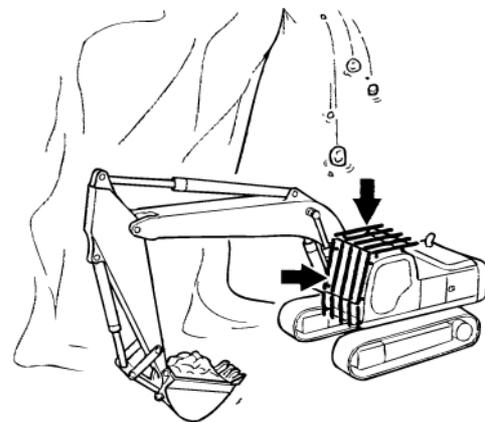
**Precautions for Safety Devices**

- Check all protective guards ,covers, glasses and mirrors are properly installed. Do not repair but replace a failed part immediately, if any damage is found.
- Understand how to use safety devices.
- Never remove safety devices. Maintain them to always function properly.

**Protecting Against the Fall of Rocks and Landslides**

When operating in zones where the possibility of falling rocks or landslides exists or when there is the risk for front impacts with objects that could penetrate the cab, make sure that protection structures are installed : F.O.P.S. (Falling Object Protection Structure) and FRONT GUARD.

- Do not install any cab lifting device to the protection structures.
- Do not weld, drill or modify protective structures. Any type of modification could weaken the structural integrity of the safety system, with serious consequences for the operator, in case of collision, falling objects or landslides.
- After an accident, do not try to straighten or repair protective structures. Contact a Dealer to verify the functionality, to repair or to completely or partially replace the protective structures.



### 1.2.3 ABNORMAL AND EMERGENCY CONDITION

#### When a Failure Is Found

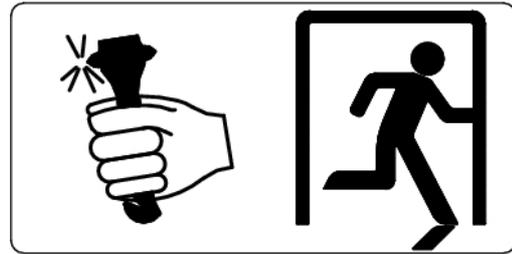
When operating, inspecting or maintaining the machine, if failures such as noise, vibration, smell, malfunction of the instrument, smoke, oil leak and warning display from the warning device or multi-display are found, immediately contact the site manager or your dealer and take proper procedures.

Do not operate the machine until the failure is remedied.

#### Emergency Escape from the Cab

In an emergency, stop the engine, take out the life hammer, break the window and then escape from the cab.

Break the window glass for emergency escape with the life hammer provided in the operator cab.



#### Measures to Be Taken at the Time of Fire

Escape from the machine in the following manner when a fire occurs.

- Turn the starter switch to "OFF" position to stop the engine
- Escape from the machine using hand rails and steps.

## 1.2.4 DANGER IN OPERATION

### Protection Against Noise

Wear ear protectors or ear plugs when going into noisy areas to avoid hearing loss. Hearing loss may occur when an environment is extremely noisy.

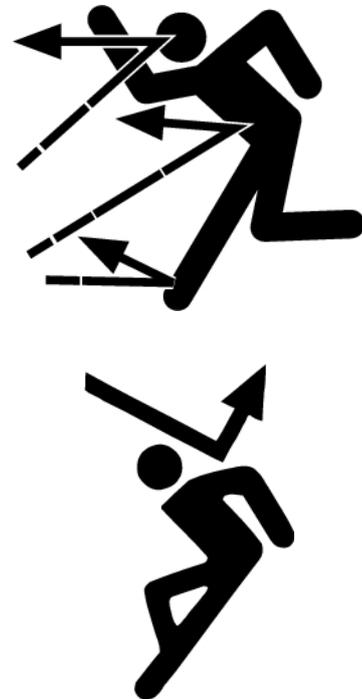


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### Pay Attention to Falling Materials and Flying Debris

If necessary, provide the protective guard on the machine to protect the operator in the work site where falling materials and/or flying debris can be seen.

- Put the front guard (in option) on the machine when operating the hydraulic breaker, demolition or cutting equipment/attachments.
- Be sure to close the front window and doors when performing operation.
- Put the top guard (in option) on the machine in the mining and quarry site to protect the operator from falling stones.
- When performing work which may cause falling materials and/or flying debris, keep other people enough distance from the spots where falling stones and/or flying debris are seen.



Above-mentioned things are for the standard work and depending on the actual work site conditions, further guards may be required.

Be sure to contact KOBELCO authorized dealer/distributor before operation.

## [1. SAFETY PRECAUTIONS]

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### 1.2.5 FIRE PREVENTION

#### Fire Caused by Fuel/Oil

Fuel, oil, electrolyte, coolant and wind washer fluid are flammable if a fire gets close to them. Follow the following items without fail.

- Do not smoke nor use a fire in the areas where flammables are stored and/or handled.
- Refuel only after stopping the engine.
- Do not leave the machine during refueling and refilling oil.
- Watch out not to spill fuel on a heated surface nor on electrical parts.
- Store fuel and oil in designated store house or place where only authorized personnel can go in.
- After refueling and refilling oil, wipe off spilled fuel and/or oil immediately.
- Be sure to close the fuel and oil filler caps securely.
- Remove flammables in the area before grinding or welding work is performed.
- Use incombustible oil to wash parts, etc. Do not use flammable oil such as diesel fuel nor gasoline as washing liquid.
- Do not weld nor perform gas cutting on pipes and tubes which contain combustible liquid.
- Remove flammables such as leaves, wooden debris, paper waste, etc. from the areas of exhaust manifold, muffler, battery and undercover, etc.



#### Fire Caused by the Electric System

Fire may occur if a short-circuit in the electric system occurs.

- Keep all the connectors of wire harnesses clean and fix them securely.
- Repair/replace a damaged wire harness, connector and clamp one and tighten a loose connector and clamp, if any damage or looseness is found at the inspection.

#### Fire Caused by a Faulty Piping

Check the clamps, guards, cushions of hose and tube are fixed securely.

Loose hoses and tubes may damage themselves due to vibration and contact with other parts, during operation, result in spout of the high pressure oil and cause a fire or personal injury.

If any abnormal part is found at the above- mentioned inspection, immediately tighten, repair or replace it.

Do not use damaged or bent hoses or tubes.

#### Use Anti-Explosion Work Lights

Use only work lights with anti-explosion specifications when performing inspection and maintenance procedures on fuel, oil, electrolyte, coolant and wind washer fluid to prevent a fire or explosion.

These flammables may catch a fire and then explode and result in severe personal injury.

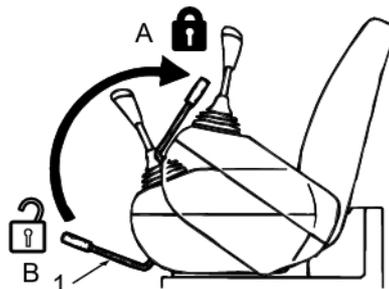
### 1.2.6 GETTING ON AND OFF THE MACHINE

#### Do Not Stand Up or Move While Operating

Before standing up or moving, the pilot control shut-off lever must be pulled up to the "LOCKED" position.

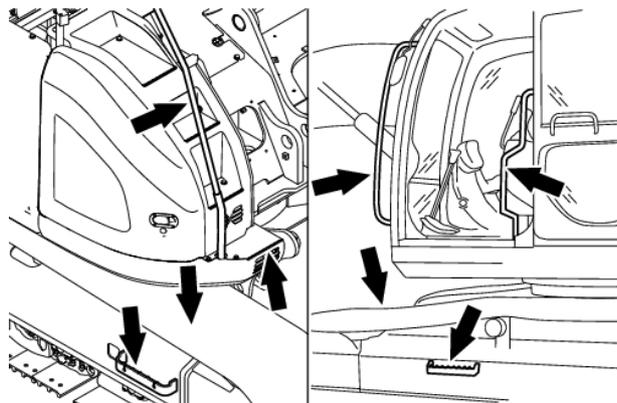
If the operator stands up or moves while operating, a part of the body may contact with the control lever and that may cause the machine to moves suddenly and unintentionally.

- A. Locked Position
- B. Unlocked Position



#### Precautions of Getting On and Off the Machine

- Before getting on and off the machine, inspect the installation parts of the steps and hand rails and if damaged and loose bolts and nuts are found repair them.
- Remove slippery materials such as grease, oil and mud from the steps and hand rails if adhesion of any of them is found.
- Get on the machine from the side where steps and hand rails are provided. When getting on and off the machine, do not fail to use the hand rail, step and crawler shoe while facing to the machine and support the body at three points.
- Do not step on the engine hood nor covers on which non-slip materials are not applied.
- Do not get on and off the machine using the pilot control shut-off lever nor control levers.
- Do not get on and off the machine with tools in hand.



### 1.2.7 INSPECTION AND MAINTENANCE ON THE MACHINE

#### Pre-Start Inspection

Always perform the pre-start inspection and if any abnormal condition is found, repair it before operation.

As for the pre-start inspection, refer to "PRE-START INSPECTION" in chapter 3.

#### Put the Tag During Inspection and Maintenance

Do not start the engine or operate the machine when the warning tag "DO NOT OPERATE" is put on the door or control lever.

After the person put that tag or the person knows well about the situation removes it, start the engine or operation again.

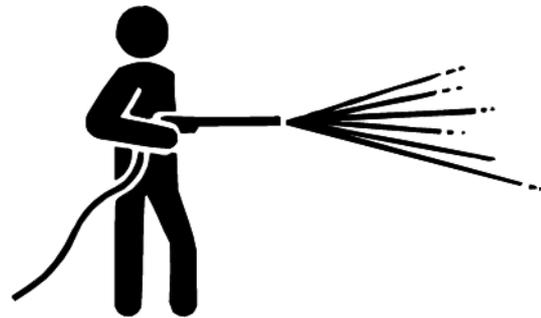
If necessary, put the further warning tags on other machines around the machine.

Part Number : YN20T01320P1



#### Always Keep the Machine Clean

Always keep the machine clean and free of scattered debris, and spilled lubricant and oil.



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#### IMPORTANT

Allowing water to get into the electrical components and system, leads to malfunction and short circuit and may become a cause of failure and fire.

Never clean inside of the operator cab or and the electrical components such as sensors and connectors with pressurized water or steam.

---

#### Keep Inside of Operator Cab Clean

- Remove mud, grease and oil, etc. from the soles of shoes when entering the cab to avoid slippery pedals during operation, which may cause severe accidents.
- Do not leave parts and tools inside the cab when operating.
- Do not leave plastic bottles inside the cab nor put suction cups on the window glasses. They may become lenses generating a fire.
- Do not bring explosive materials nor combustible materials inside the cab.
- Do not leave a cigarette lighter inside the operator cab.  
The temperature inside the operator cab may become very high under sunshine and they may explode.
- Put out a cigarette and lighter and shut the lid of ashtray without fail after smoking.
- Do not use a radio, mobile phone or headphone in the cab during travelling or operating.

## 1.3 SECURE VISIBILITY

### 1.3.1 PRECAUTIONS FOR SECURING VISIBILITY

When operating or traveling the machine, the operator may not recognize people and/or obstacles in the area, which may cause personal injury, death and damage to the machine.

Follow the following instructions strictly to secure the work safety.

- Move the equipment/attachment if the right hand side visibility is disturbed by the equipment/attachment during traveling.
- Adjust mirrors to the proper positions and angles before starting operation.  
To obtain a good visibility, clean the mirrors well before starting operation.
- Clean the lenses to obtain a clear visibility of the rearward, if the machine is equipped with the rearview cameras, (option).
- Place the signal person at the poor visibility area to direct the operator with his/her directions, signals and signs.
- Place the only one signal person at the work site.
- When working in dark places, turn on the work light. Whenever necessary, set the lighting devices to make the work areas bright enough.
- Stop working in case of the poor visibility due to fog, rain and snow, etc.

---

**WARNING**

-Be sure to adjust the mirrors to ensure the good visibility around the machine before starting operation. If the good visibility around machine is not secured sufficiently, it may cause a collision or accident resulting in injury or death.

-Do not install the mirror(s) and/or other article(s) to the handrail of the cab entrance. If they are installed to the hand rail, that may cause to weaken the strength of the hand rail and lead to a damage or coming off of it.

-To avoid the damage or break, do not install the mirror and so on to the handrail of cab entrance. If the mirror and so on is installed to the hand rail, the attaching part of handrail is stressed excessively.

-If the screen or rearward visibility monitoring camera has malfunction, have contact with our company or our company's dealer /distributor for repairing.

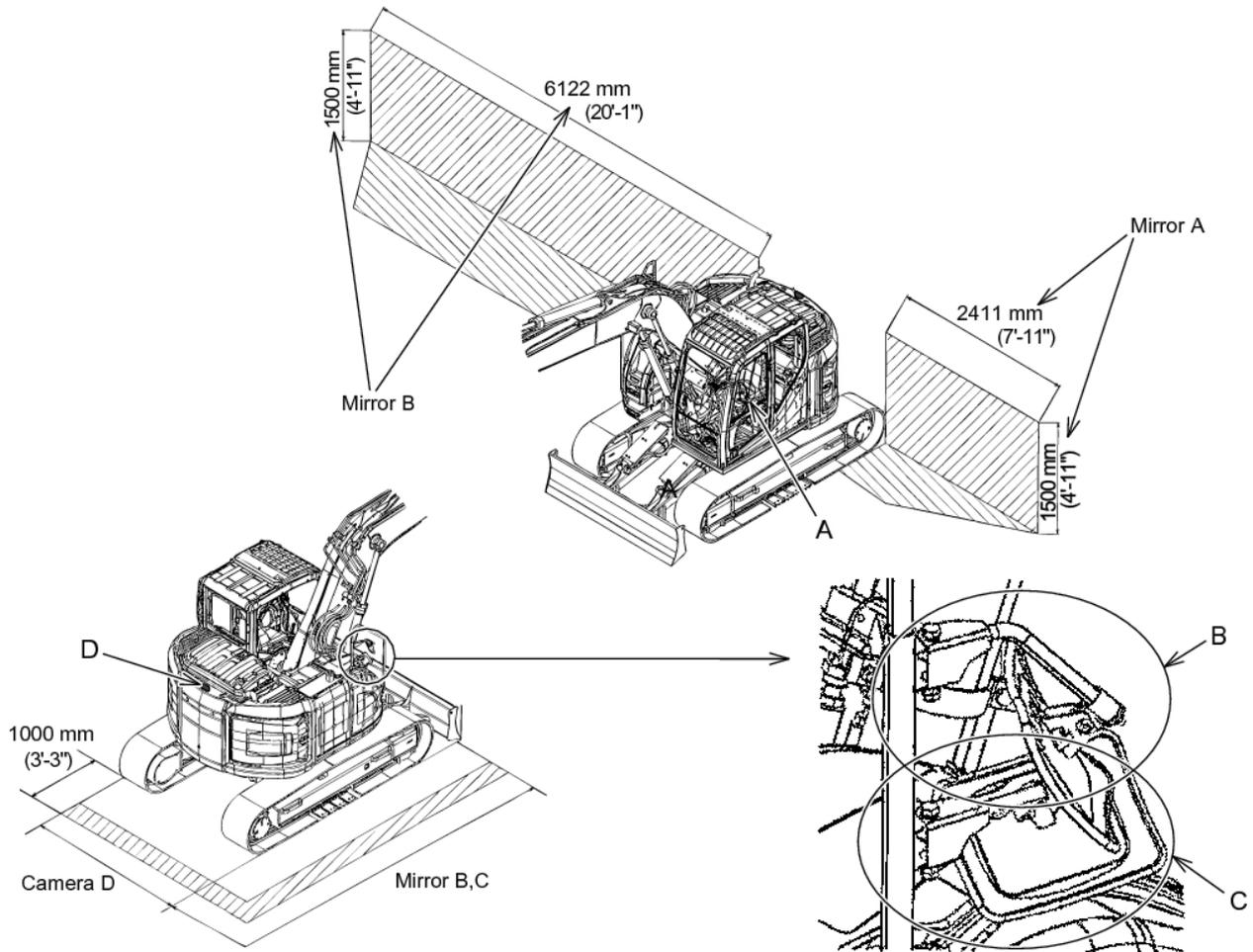
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**CAUTION**

Do not attach mirrors and camera other than our genuine mirrors (A, B and C) and camera (D).

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# [1. SAFETY PRECAUTIONS]



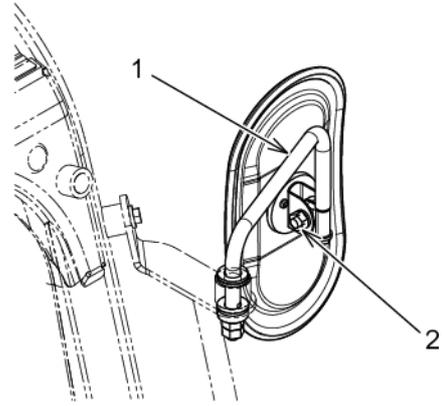
\*The figures of range show reference values only.

### 1.3.2 MIRROR A (CAB LEFT SIDE)

- Adjust the mirror in the way that a person who stands on the left rear end of the machine can be identified by the operator.
- Install the mirror to the position shown in the figure above.
- Install the mirror in the way not to come in contact with the stay (1) of the mirror.
- If the movement of the mirror is not smooth, loosen the nut (2) of the mirror to adjust it.

Tightening torque of the nut (2) M10 :  
18.6~25.5 N·m {13.7~18.8lbf·ft}

- Adjust the mirror to reflect the machine side as shown in the figure above.

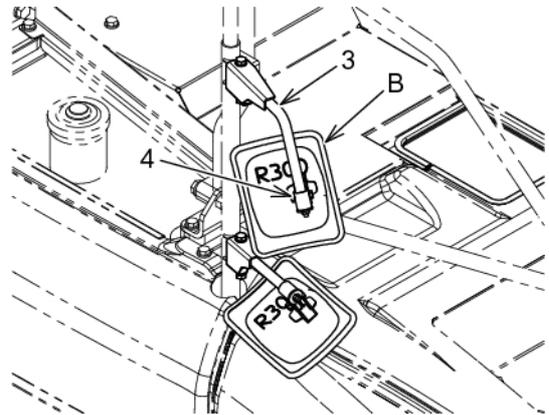


### 1.3.3 MIRROR B (MACHINE RIGHT SIDE)

- Adjust the mirror in the way that a person who stands on the right rear end of machine can be identified by the operator.
- Install the mirror on the position shown in the figure above.
- Install the mirror in the way not to come in contact with the stay (3) of the mirror.
- If the movement of the mirror is not smooth, loosen the nut (4) of the mirror to adjust it.

Tightening torque of the nut (4) M8 :  
8.6~12.7 N·m {6.3~9.4 lbf·ft}

- Adjust the mirror to reflect the machine side as shown in the figure above.



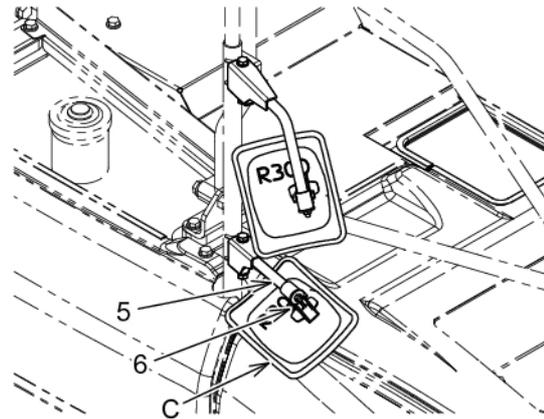
# [1. SAFETY PRECAUTIONS]

## 1.3.4 MIRROR C (MACHINE RIGHT SIDE)

- Adjust the mirror in the way that a person who stands on the right front side of the machine can be identified by the operator.
- Install the mirror on the position shown in the figure above.
- Install the mirror in the way not to come in contact with the stay (5) of the mirror.
- If the movement of the mirror is not smooth, loosen the nut (6) of the mirror to adjust it.

Tightening torque of the nut (6) M8 :  
8.6~12.7 N·m {6.3~9.4 lbf·ft}

- Adjust the mirror to reflect the machine side as shown in the figure above.

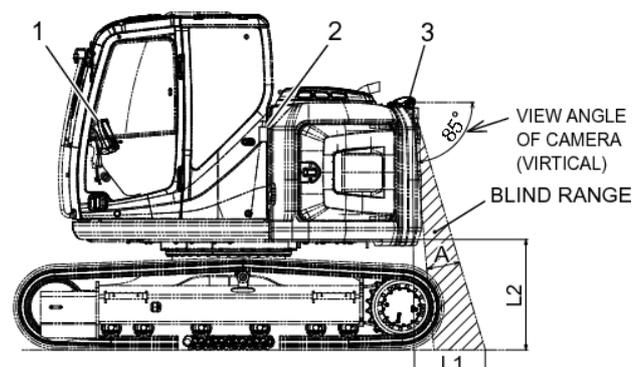
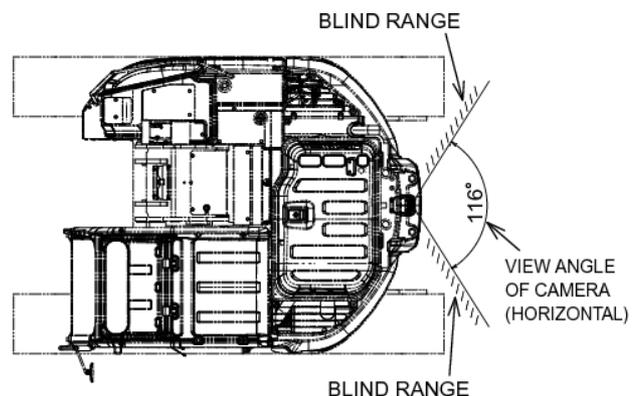


## 1.3.5 CAMERA D (MACHINE REAR SIDE)

1. Gauge cluster (Monitor)
2. Converter
3. Rearview camera

BLIND RANGE		Unit: mm
MACHINE MODEL	L1	L2
SK135SR-3 (NORMAL WEIGHT)	380	927.5
SK135SRLC-3 (ADDITIONAL WEIGHT)	591.3	927.5

BLIND ANGLE	
MACHINE MODEL	A
SK135SR-3 (NORMAL WEIGHT)	6°
SK135SRLC-3 (ADDITIONAL WEIGHT)	11.4°



## 1.4 PROHIBITED WORKS

### 1.4.1 PROHIBITED MACHINE OPERATION

Under no circumstances should any of following operations be attempted.

Such abuse and misuse can result in serious injury, death and severe equipment/attachment damage and shorten the machine life.

Follow the proper operation procedures found in this manual while operating this machine.

#### Do Not Apply Swinging Force to the Following Operations

Never apply swinging force to the rock slide work and breaking work, etc.

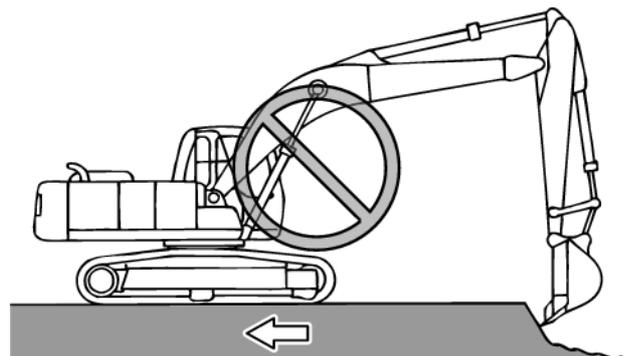
It will exert excessive force to the machine structure and equipment attachment and could cause severe damage to them and shorten the machine life of the swing system.



#### Do Not Apply Travel Force to Digging or Leveling

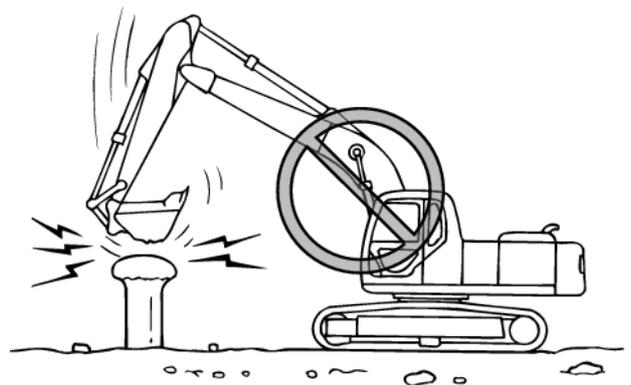
Never apply travel force to digging or leveling with the bucket being wedged into the ground.

It will exert excessive force to the machine structure and equipment/attachment and could cause severe damage to them.



#### Do Not Perform "Hammering" Operations with the Bucket

Never use the bucket for hammering and piling. It will cause severe damage to the machine and its components.

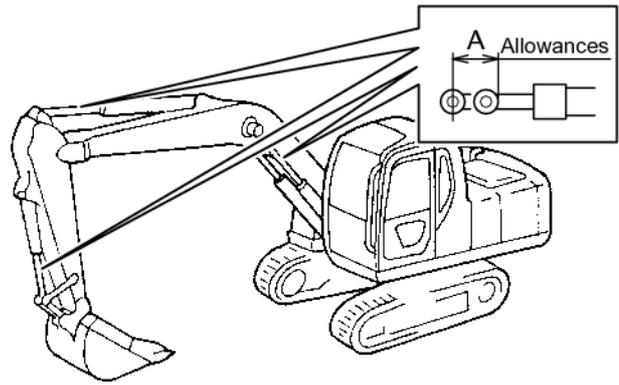


## [1. SAFETY PRECAUTIONS]

### Do Not Operate the Cylinders to the Stroke End

Operate the bucket, boom and arm cylinders to leave some clearances to the both stroke ends.

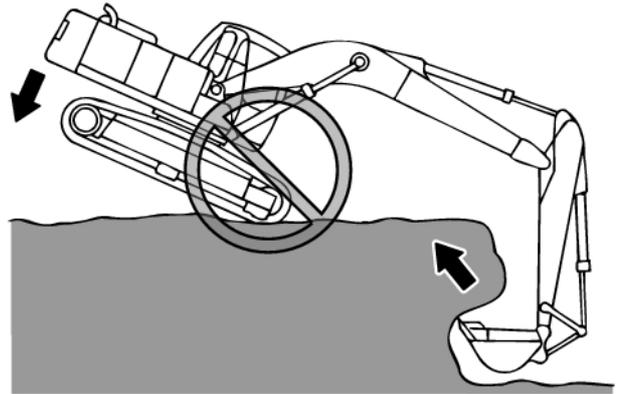
If the cylinder is operated to the stroke end, it will generate an excessive load and cause damage to not only the cylinder but also the pin, boom and arm.



### Do Not Use Machine Weight for Digging Operation

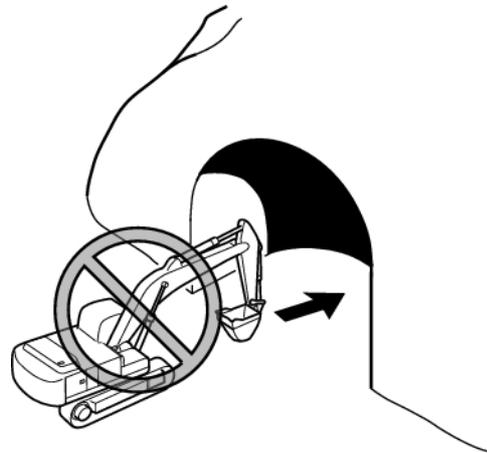
Do not tip or raise the machine to obtain power to dig. This could cause severe damage to the machine and its components.

Before digging the hard bedrock, crack the hard bedrock into pieces by another method and then dig it. It will not damage the machine and result in a more economical way.



### Do Not Operate in Tunnels

DO NOT operate the machine in enclosed spaces or, in any case, without appropriate ventilation. Operations in tunnels or underground sites where potential explosive conditions exist are not allowed. There is a danger for explosions and potentially deadly injuries. Please comply with the ATEX regulation relative to devices to be used in a potentially explosive environment.



## 1.5 PRECAUTIONS FOR OPERATIONS

### 1.5.1 STARTING

#### Do Not Start the Engine

Do not start the engine or touch the control levers while when the warning tag "DO NOT OPERATE" or the tag with the same kind of description is put on the control lever or around the machine.



#### Only One Operator Is Allowed to Enter the Cab

Allowing other personnel in the cab causes hindrance of operation and may cause personal injury. Do not allow personnel other than the one operator not only in the cab but also on the machine body.

#### Safety Check of the Surroundings Before Operation

- Confirm that no one is on, under and around the machine.
- Lock the doors and windows irrespective of their opening and shutting.
- Adjust the mirrors to get a good visibility of the surroundings from the operator's seat. Refer to the chapter 1 "SECURE VISIBILITY" for the way of adjustment.
- Check that the alarm system like the horn and travel alarm (if equipped) functions properly.

#### Seat Belt

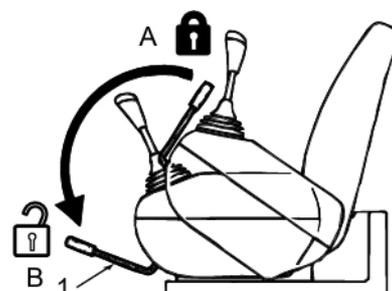
Fasten the seat belt and sit on the operator's seat when operating the machine.

Fasten the seat belt securely to prevent severe personal injury or death caused by hitting heavily to inside the cab, being thrown out of the cab and being crushed under the machine when the machine tips over.

#### Precautions to be Taken When Starting the Engine

##### Starting procedures:

- Pull up the pilot control shut-off lever to the "LOCKED" position.
- Confirm that all control levers are in the neutral position.
- Sound the horn to alert surrounding personnel before starting the engine.
- Be sure to sit on the operator's seat and fasten the seat belt when starting the engine.



A. Locked Position

B. Unlocked Position

## [1. SAFETY PRECAUTIONS]

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### IMPORTANT

Do not start the engine by shorting across the starter terminals or batteries.  
The machine might move suddenly and the electric system might be damaged.

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#### **Check After Starting the Engine**

Check the performances of devices such as the equipment/attachment and dozer (if equipped) and the performances of traveling and swinging.

Such checking should take place in an area where no obstacles or people.

When a failure is found, repair it immediately.

Failing to perform the check after starting the engine may cause late detection of a defect and this may cause severe personal injury or damage to the machine.

Before performing the check, make sure that the area is clear of personnel and obstacles.

#### **Warm Up**

Do not start operation as soon as the engine is started.

If the equipment/attachment is operated without enough warming up running, the response of the equipment/attachment to the control lever is delayed and sometimes it moves unexpectedly and causes severe personal injury.

Always perform warm up running and take enough time for it, especially under cold weather.

#### **Adjustment of the Operator's Seat**

- Adjust the seat position each time the operator change.  
Adjust the seat position according to the operator's body and work type, or excessive fatigue of the operator may cause accidents.
- Fit the operator's back to the back rest then adjust the seat to the position where the operator's feet can reach foot pedals bottom ends and it enables the operator to operate the control levers and switches properly.



#### **Seat Belt Inspection**

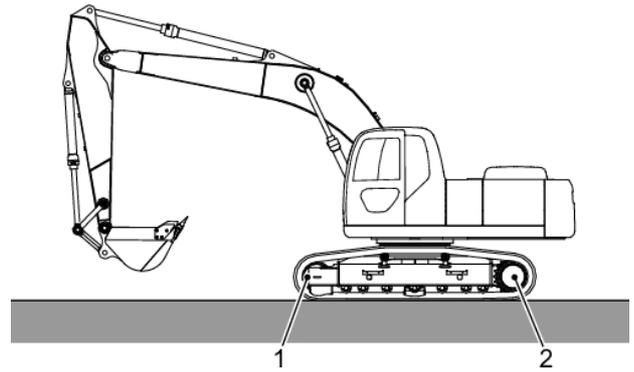
- Make sure that there is no abnormality on the belt installation bracket and bolts before fastening the seat belt.
- Replace belts with new ones every 3 (three) years even when damage or deterioration is not found.

## 1.5.2 TRAVELING

### Confirm the Travel Direction

Check the position of front idlers (1) before starting operation.

The forward travel position is the position that the front idlers (1) are at the forward of the undercarriage and the travel motors (2) are at the backward of the undercarriage.



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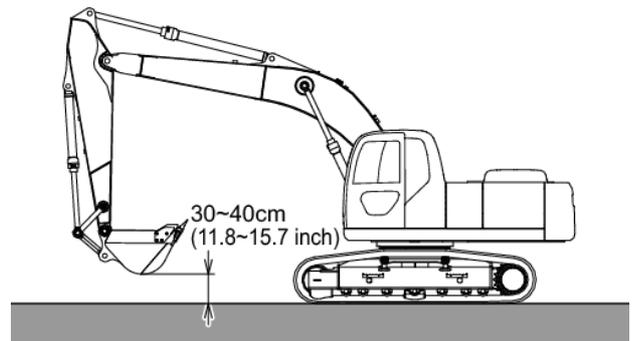
### Prohibition of the Rapid Lever Operation When Travelling

- Do not perform the rapid lever operation that may cause a sudden start.
- Do not move the travel lever from the forward to reverse position or vice versa rapidly.
- Do not perform the abrupt pivot turn or spin turn.
- Do not make the abrupt stop (levers free from hand grip) from the maximum speed.

### Precautions in Traveling

Travel on the level and firm ground as much as possible.

- Keep the attachment at 30 to 40 cm (11.8 to 15.7 inch) high above the ground as the figure shown to the right when traveling.
- Travel slowly on the rough terrain.
- Do not go over obstacles if possible. When going over obstacles, go slowly with the attachment positioned close to the ground as much as possible. Keep the machine not to tilt excessively to the side when going over obstacles. Tipping/rolling over may occur.

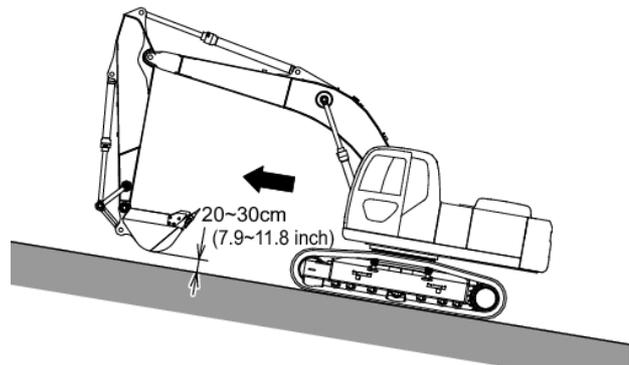


## [1. SAFETY PRECAUTIONS]

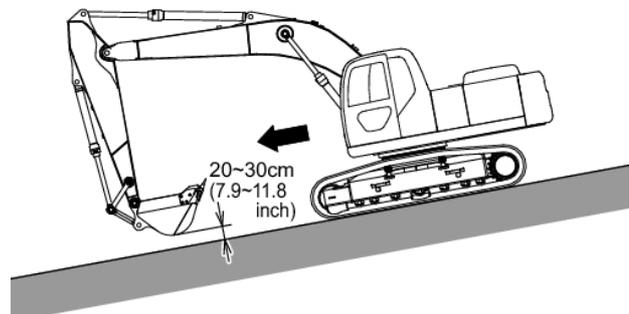
### Traveling on the Slopes

The traveling up and down on the slopes of 30 degrees or more is not allowed because there is a risk of tip/roll over.

- Keep the attachment at 20 to 30 cm (7.9 to 11.8 inch) high above the ground to enable the bucket to touch the ground immediately in case of stopping the machine in an emergency, when traveling on the slopes.  
When traveling down the slopes, go extremely slowly.
- Travel slowly on grasses, leaves and wet steel/wood plates as the surfaces on such are slippery.

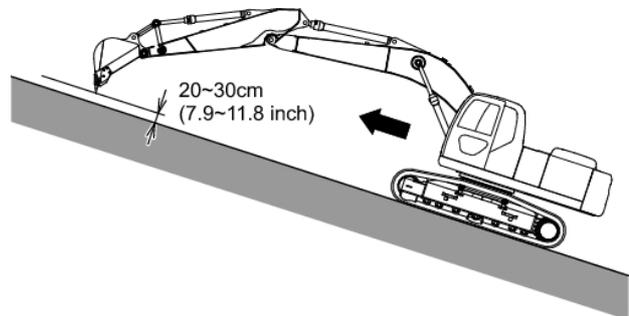


Traveling up on a slope



Traveling down on a slope

- When traveling up the steep slopes, extend the boom and arm to balance the machine well and keep the bucket at 20 to 30 cm high above the ground and go slowly.



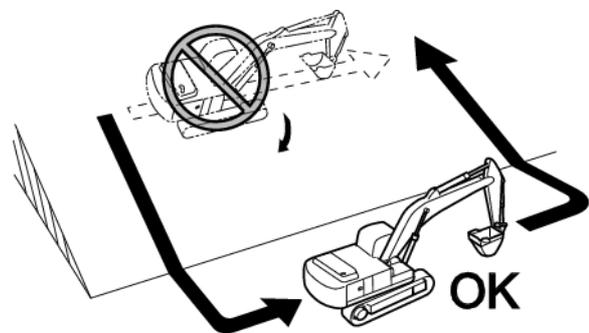
Traveling up on a slope

### Traveling Across the Slopes

There is a risk of tipping/rolling over and skid when travelling across the slopes.

If traveling across the slopes is necessary, keep the attachment at 20 to 30 cm (7.9 to 11.8 inch) high above the ground to enable the bucket to touch the ground immediately in case of stopping the machine in an emergency and go slowly.

Never travel across the slopes of 15 degrees or more.

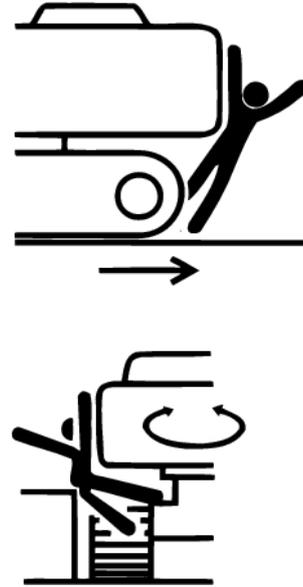


**Traveling on the Frozen or Snow Covered Ground**

- The frozen or snow covered ground is extremely slippery and the machine can skid further by even a small slope. Do not perform the abrupt start, stop and swing and travel slowly.
- Snows on the road shoulders and drifted areas are sometimes deep and make the road shoulders and structures underneath hard to be recognized. Take enough care about it when operating.
- As the ambient temperature rises, the surface conditions of the frozen ground may become marshy.

**Precautions of Swinging/Traveling**

- Make sure that the swing area and around the machine are clear of personnel and obstacles and sound the horn or send signals to alert surrounding personnel before starting operation.
- Place the signal person at the poor visibility area.



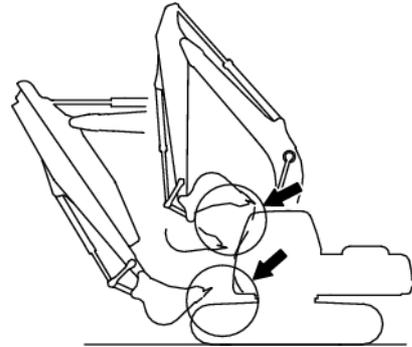
### 1.5.3 PRECAUTIONS OF OPERATIION

#### Control Patterns of the Control Levers

Before operation, be sure to pay attention to the surroundings and operate the each control lever and confirm that the each motion is in accordance with the operating pattern indicated on the label. When it is not matched, replace the label with the proper label matching with the actual motion.

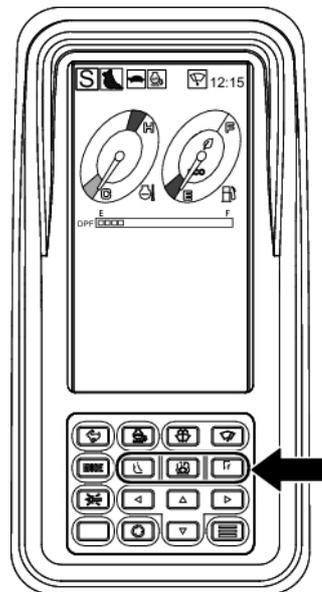
#### Interference of the Attachment to the Cab

Check clearance between the attachment and the cab before starting operation because a certain kinds of attachments and a certain combination of the option and the machine may cause the contact of the attachment and the cab or some other parts of the machine.



#### Attachment Mode Select Switch

This machine has 3 attachment modes, "Digging", "Nibbler" and "Breaker". Select the attachment mode properly and be sure to check that the attachment to be used, the contents of work and the selected attachment mode are conformed each other. When the attachment mode is not properly selected, the machine will not work properly and also be damaged by that. Select the attachment mode in accordance with the work. See "3. SELECTION OF WORK MODE AND SWITCHING OF THE ATTACHMENT MODE" for selection of the attachment mode.

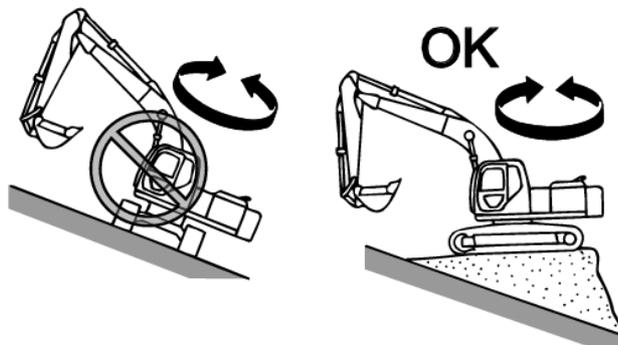


## 1.5.4 PRECAUTIONS OF WORK

### Operating on the Slopes

There is a risk of tip/roll over by losing the balance of the machine when operating on the slope. When operation on the slopes is required, use extreme caution on the followings.

- Place the crawlers parallel to the slope angle.
- There is a risk of losing balance when swing to the downhill side with a loaded bucket.  
Keep a low speed of swing motion.
- The machine might swing by the upper machine's own weight when it stops on the slope.  
Use extreme caution while operating.
- Place the bucket on the ground when the machine stops on the slope.

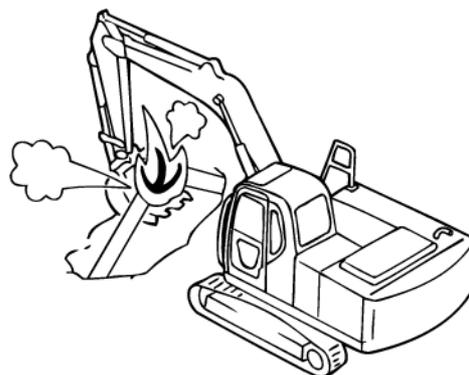


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### Utility Lines

Confirm the local government or the public service company for locations of utility lines such as, gas, water, phone or electrical power, etc. before working at the area, which seems to have these lines.

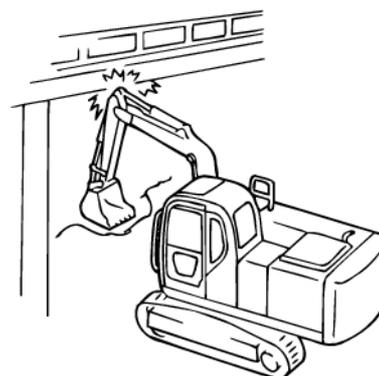
And perform a trial digging to confirm existence or locations of these lines.



### Restricted Work Areas

Use extreme caution when working at the work site with limited height and swing/traveling areas such as tunnels, bridges, around electrical power lines or other utility lines or inside of structures to prevent the equipment/attachment from hitting them.

Keep the machine and its attachment at a safe distance from them to prevent personal injury or death or damage to the machine. Place the signal person to guide the operator.

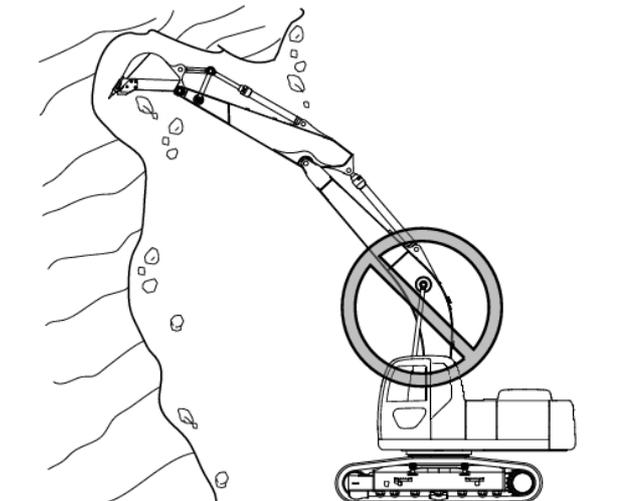


## [1. SAFETY PRECAUTIONS]

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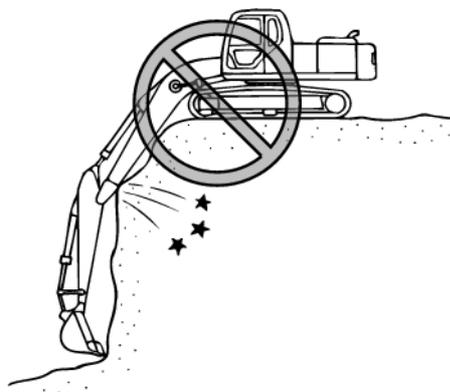
### **Under Precipice/Overhang Operation**

Do not dig under the precipice or overhang. It may cause falling rocks or loosening of the precipice, overhang or ground and result in injury, death or machine damage.



### **Deep Excavation Operation**

Avoid the boom belly and hydraulic piping contacting the ground during deep excavation. When operating the boom to the lowest position at the time of diagonal digging, pay attention to the boom not to hit the crawler shoe.



### **No Personnel Allowed Under the Bucket**

Do not pass the bucket above a person and/or above the driver's cab of truck. Stones, mud or something else may fall off onto them and may cause severe personal injury or death.

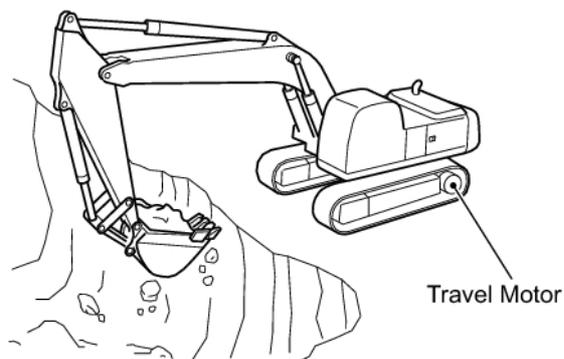


**Ground Conditions**

Put the crawler belts in the right angle to the edge of cliffs or shoulders of roads with the travel motors at the rear to avoid the machine from falling off when working near the cliffs or shoulders of roads.

Secure the safety ground when working on the raised ground and/or the ground soon after rain fall, as the shoulders of roads may become looser.

Take care not to dig the foot areas of the machine too much to prevent the machine from falling off.



**Prohibition of Lifting**

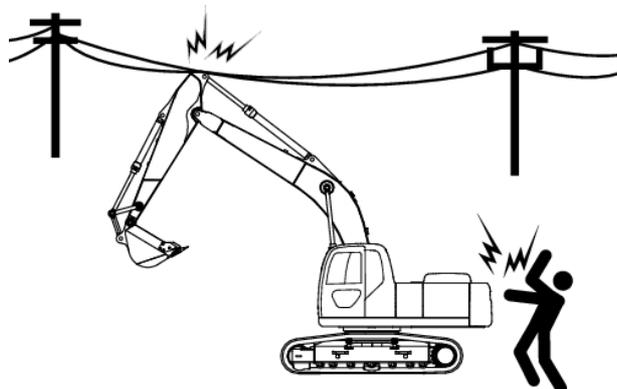
This machine is made for excavating and use extreme caution when lifting and moving loads.

Use the proper lifting attachment having a capacity to handle the load. Never use the bucket teeth to hook and move loads.



**Working Around Power Lines**

- Do not get close to high voltage power lines. Personal injury or death caused by electrification might occur.
- Confirm the voltage of the power lines in the work site to the electric transmission company before beginning work in the area.
- Place a the signal person who sends signals for to prevent the machine from getting close to the power lines and causing electric shock accidents.
- Do not leave the operator's seat, even if the machine contacts with the power lines, and keep other personnel away from the machine.



The reference of the safe distances from high voltage cables are as follows.

LINE VOLTAGE	MINIMUM DISTANCE-m (feet)
0 ~ 50,000	3.0 m (10) or more
50,000 ~ 200,000	4.5 m (15) or more
200,000 ~ 350,000	6.0 m (20) or more
350,000 ~ 500,000	7.5 m (25) or more
500,000 ~ 750,000	10.5 m (35) or more
750,000 ~ 1,000,000	13.5 m (45) or more

## [1. SAFETY PRECAUTIONS]

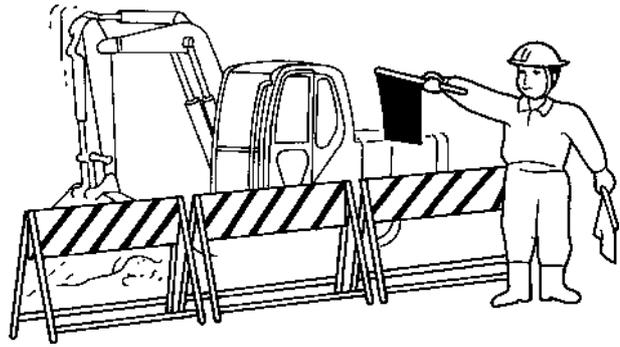
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### **Check Work Site and Set Up Appropriate Procedures**

Set barricades or signal persons to prohibit unauthorized personnel and/or machines from coming into the work site.

Unauthorized personnel and/or machines may cause a bump or personal injury.

Make sure that the area is clear of obstacles and personnel other than signal persons before beginning the operation of the machine.



### **Work Site in Urban Area**

Unauthorized personnel in the work site may cause danger. Put off-limits signs at the work site. And if the work site is in the busy traffic area, place the signal persons to control traffic.

### **Lighting**

When working in dark places, turn on the work light.

Whenever necessary, set the lighting devices to make the work areas bright enough.

Stop working in case of the poor visibility due to fog, rain, and snow, etc.

### **Slippery Condition on a Steel and Wooden Board**

A wet surface of a wet wood/steel board due to rain or water is slippery.

Use extreme caution is required to those on the inclined areas surfaces.

The surface of piled wet leaves and branches are also slippery.

### **Operation on the Soft Ground**

Put logs or lumbers horizontally beneath the crawler belts when working on the soft ground or the marshy area to prevent the machine from getting stuck in mud.

As the ambient temperature rises, the surface conditions of the frozen ground may become marshy.

### **Loose Ground Conditions**

The edge of cliffs, shoulders of roads and near the trenches may become soft.

The machine should not travel or work on these places. The weight or vibration of the machine might lead the ground to collapse and then the machine might tip/roll over.

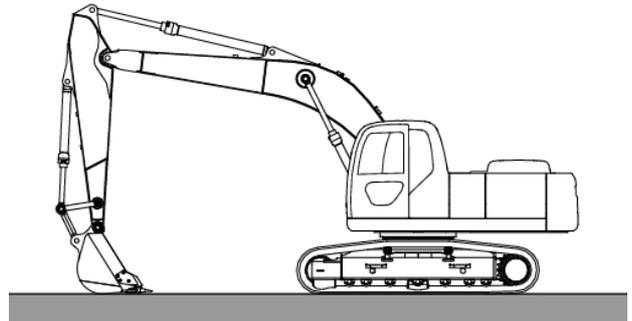
Especially after the rain fall, blasting, and earth quake, etc., the ground conditions in those places may become looser.

### 1.5.5 SAFETY CHECK ON THE PARKING MACHINE

There are risks of creeping, barbarous act or unexpected movement at the time of coming start if the machine is not parked properly.

Park the machine following the safety parking procedures shown below.

- Park the machine on the firm and level ground to avoid the machine from creeping.
- Put the working attachment such as a bucket and dozer (if equipped) on the ground.
- If it is unavoidably necessary to park the machine on the slope due to surrounding geographical conditions and/or unforeseeable malfunction, operate the machine with positioning the counterweight on the upper side of the slope as much as possible, and lower the bucket to the ground.
- Set the auto acceleration switch to the "OFF" position, or the engine speed may increase abruptly when the engine is restarted.
- Be sure to pull up the pilot control shut-off lever to the "LOCKED" position. Failure in doing so may cause unexpected motion of the machine when the engine is restarted with someone accidentally touching on the control levers, pedals and other control devices.
- Keep the engine idling at low speed for about 5 minutes to cool-down the engine.
- Turn the engine switch to the "OFF" position and take out the engine key.
- When leaving from the machine, close the windows and doors of the cab, all doors and covers and lock them.



When parking the machine on the slope unavoidably, strictly observe the following items.

Operate the bucket to face to the valley side and wedge it to the ground.

Chock the crawlers to prevent the machine from moving.

## 1.6 PRECAUTIONS OF INSPECTION & MAINTENANCE

### 1.6.1 PERFORMING THE PERIODIC/SPECIFIC SELF-INSPECTION

- Perform the self-inspection periodically, every once in a year. (specific self-inspection)
- The specific self-inspection should be performed by the qualified inspector or the registered inspection agency.
- Perform the self-inspection periodically, every once in a month. (periodic self-inspection)

See "4 MAINTENANCE" for details of the inspection & maintenance.

When the above-mentioned inspection is performed, record its results and be sure to keep that results for three years.

The machine which already has been performed the specific self-inspection should have the inspection seal stating the month and year of the inspection date.

### 1.6.2 BEFORE INSPECTION & MAINTENANCE

#### Fully Understand the Inspection/Maintenance Procedures

Fully read and understand the maintenance procedures before inspecting and maintaining the machine. (Preparation for safety work, tools, qualifications, important parts, designation of the supervisor and wearing of the protective gears, etc.)

Safely and carefully perform the inspection and maintenance.

Improper maintenance may cause not only personal injury but also damage to the machine.

#### Confirm the Job Procedures

Confirm all working procedures before starting work to prevent accidents caused by lack of the understanding of procedures.

#### Organize and Clean Up the Working Area

Remove obstacles, grease, oil, paint, debris, etc., from the working area and put things in order to clean up the area for safety work.

Inspecting and maintaining the machine at the messy working area may cause personnel to fall down or personal injury by debris.

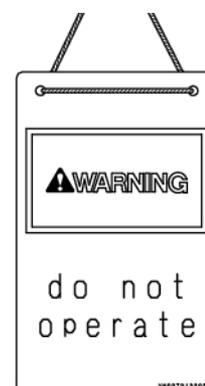
#### Put the Tag "Do Not Operate"

Put the tag "DO NOT OPERATE" on a noticeable place or where people can easily notice such as around the operator's seat before performing the inspection and maintenance.

If necessary, display the tag around the machine.

If unauthorized personnel start the engine or touch the control lever without care during the inspection and maintenance, it may cause severe personal injury.

At the time of the inspection and maintenance, the engine key should be kept by a person in charge of the inspection and maintenance.



### Use Proper Tools

Use properly calibrated and maintained tools.

Use of damaged or deformed tools for the purpose other than its original intention may cause personal injury.

## 1.6.3 DURING INSPECTION & MAINTENANCE

### Precautions of Hot Parts

Do not open the engine hood or service the engine before the engine cools down completely.

Hot engine parts may cause personal injury.

- Do not remove the radiator cap immediately after stopping operation when the coolant is to be inspected or drained.

Extreme The high temperature coolant or steam may spout and cause burn.

Wait until the temperature of the radiator cap goes down enough to touch it with a bare hand and after confirming it, and slowly loosen the cap to release the internal pressure of the radiator and then remove the cap.

- Do not remove the cap or plug immediately after stopping operation when the oil (hydraulic oil or engine oil) is to be inspected or drained. A spout of the high temperature oil or contact of the hot parts may cause burn. Wait until the temperature of the cap or plug goes down enough to touch it with a bare hand and after confirming it, slowly loosen the cap or plug to release the internal pressure and then remove the cap or plug.



## [1. SAFETY PRECAUTIONS]

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### High Pressure Oil

Internal pressure always exists in the hydraulic circuit.

Do not refuel, drain the fuel, inspect or maintain the machine before the internal pressure becomes zero.

High pressure hydraulic oil from even a small hole can penetrate the skin or eyes and cause severe personal injury or blindness.

Use a cardboard and wear a face shield, protective glasses and gloves when inspecting a leakage location.

If the high pressure oil contacts or penetrates skin, see a special doctor immediately.



### High Pressure Fuel in the Fuel Lines

The engine fuel lines internally generate extreme high pressure during the engine running.

Stop the engine and wait for 30 seconds or more to relieve the internal pressure before inspecting and maintaining the fuel lines.

### High- Pressure Oil Hose/Piping

Leakage of oil or fuel from the hose or piping may cause a fire or malfunction of the machine. Stop working immediately whenever looseness of or leakage from the installation parts of the hoses or piping are found and tighten them up with the specified torque.

Consult with KOBELCO authorized dealer/distributor if damage or deformation of the hoses or piping is found.

The hoses in below-mentioned conditions are required to be replaced.

- A damaged hose or hose with a deformed fitting.
- The sheathing material of the hose has scratches or cuttings or exposes the wire reinforcement layer.
- A part of the sheathing material is swelled.
- A part of the hose shows the sign of "torsion" or "crush".

### Use Caution to a High Voltage and the High Pressure Fuel Lines in the Engine

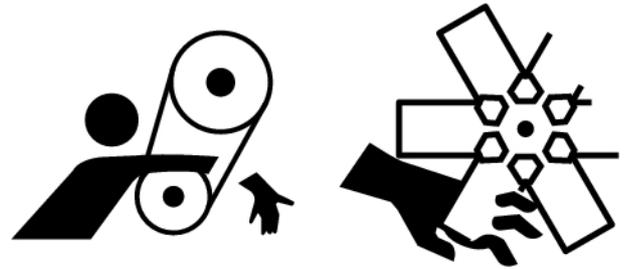
Never touch the engine during or soon after the engine running because a high voltage is generated inside the engine controller and injectors and also a high pressure is generated in the fuel lines.

**Rotating Parts**

Stop the engine completely before inspecting and maintaining it.

Rotating parts such as the fan and belt could catch your body part and result in severe personal injury.

Keep away from the fan and belt when the engine is running.

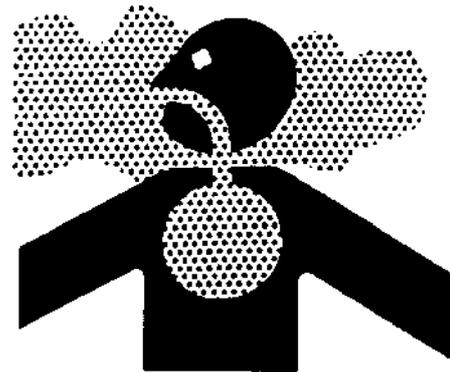


- Do not drop or insert a tool or other thing in the fan or belt.  
If a tool or other thing is dropped or inserted in the fan or belt, it will be blown away or severed.
- Place another person at the operator's seat when the engine running is unavoidable during the engine inspection or maintenance.  
The other person sitting on the operator's seat should be ready to stop the engine at any time while communicating with the person inspecting or maintaining the engine.

**Ventilation Precautions**

Ventilate the working area fully, especially when handling exhaust gas, fuel, cleaning solvent or paint. Inspecting and maintaining the machine indoor or in a place with poor ventilation may cause gas poisoning.

- Provide a proper ventilation when the machine is operated or maintained indoor or in a place with poor ventilation.
- Extend the exhaust pipe to the outdoor and open the doors and windows to let enough fresh air in.  
Provide a ventilating fan if necessary.
- Follow each regulation when handling organic solvents or paint.

**Detaching, Installing and Storing the Equipment/Attachments**

- Designate the supervisor and follow his/her instruction to detach and install the equipment/attachment.
- Store the detached equipment/attachments in stable condition.

## [1. SAFETY PRECAUTIONS]

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### Use the Support Equipment During Service

- Use the proper firm blocks or poles that bear the mass of the equipment/attachment or machine body to support them securely when necessary to maintain or inspect the machine under the equipment/attachment or uplifted machine body.
- Never enter the space under the uplifted machine.

The work under the condition that the crawler is uplifted by the support of equipment/attachment is very dangerous because it may cause the machine or equipment/attachment to fall if the control lever is moved unexpectedly or the piping is damaged.



### Detaching, Installing and Storing the Equipment/Attachments

- Designate the supervisor and follow his/her instruction to detach and install the equipment/attachment.
- Store the detached equipment/attachments in stable condition.



### Lock the Access Panel

Do not raise the boom when the engine hood is opened. The boom interferes with the opened hood. Lower the equipment to place the attachment on the ground whenever you need to before opening the engine hood.

**Caution Against Falling**

Do not get close to the edge of machine.

Falling off from the machine may occur.

- Put away things on the platform before starting work above the ground.
- Use the appropriate equipment such as a ladder and platform when working above the ground.
- Avoid spillage of any oil or grease. If it occurs, wipe it off completely.
- Put all tools together when storing them.
- Use extreme caution to avoid slipping while walking.
- Never jump on and off the machine. Use the steps and handrail and securely support the body by hands and feet while mounting the machine or dismounting at all times.
- Use the proper protective equipment such as a safety belt if required by work.

**Do Not Drop Tools or Parts**

Dropping of any tools or parts in the working area may cause damage to the machine or unexpected machine motion which may result in personal injury.

Be sure to pick them up immediately in case they are dropped.

Do not leave any tools or parts in the machine or in the working area.

Keep all tools properly after maintenance is completed.

**General Guidelines for Welding**

Welding work must be performed by a certified welder at the facility where welding devices are properly equipped or damage of the electric parts, poisonous gas from paint due to heat of welding and a fire may occur.

**Basic Precautions for Welding and Grinding**

- Clear flammable items and provide a fire extinguisher in preparation for a fire.
- Turn the starter key to "OFF" position and remove it.
- Remove the negative (-) cable from the battery terminal to cut off the current. Disconnect the connectors of the all controllers.
- Attach the welder ground cable directly to the area within 1 m from the part to be welded and on the same parent material.  
If the welder ground cable is attached to the area near electric parts/connectors, these electric parts/connectors may be damaged.
- Make sure that neither the bearing nor seal is positioned between the welder ground cable and the part to be welded.
- Do not attach the welder ground cable near the pin or cylinder. It will damage plating.
- Remove paint from any surface to be welded to avoid generating poisoning gas.
- Always wear protective gears appropriate for welding.
- Perform work in a well-ventilated area.
- Confirm no abnormal condition such as smoke occurs at the working area after grinding or welding.

## [1. SAFETY PRECAUTIONS]

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### Use Caution When Adjusting the Track Tension

Loosen the grease fitting within one turn while relieving pressure gradually.

If grease does not come out after one turn of the grease fitting, call KOBELCO authorized dealer/distributor for assistance.

The grease in the track tensioning cylinder is under extreme high pressure and loosening the grease fitting rapidly may cause a spout of grease and result in personal injury.



- Keep a face, hands and feet away from the grease fitting area. See "4 Track Tension" for adjustment of the crawler shoe tension.
- Wash grease completely with the water and soap if grease contacts with skin. It may cause skin inflammation.

### Do Not Disassemble the Recoil Spring

Never disassemble the recoil spring assembly. The recoil spring assembly is used for absorbing shock at the front idler and it has a powerful spring.

If it is disassembled carelessly, the spring may jump out of the assembly and result in severe personal injury.

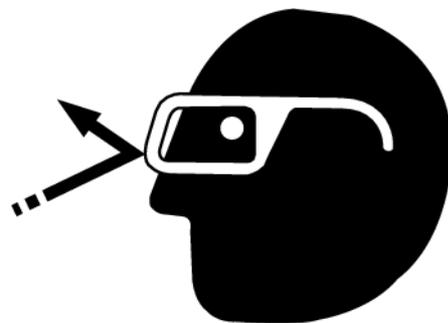
Ask KOBELCO authorized dealer/distributor when necessary to disassemble the recoil spring assembly.

### Paying Attention to Broken Pieces When Hammering

A jumping pin and flying metal piece may cause severe personal injury when hammering.

Strictly follow the below-mentioned things.

- A flying metal piece may cause severe personal injury when hammering the hard metal parts such as a pin, edge, tooth and bearing.
- Wear protective gears such as protective glasses, gloves, hardhat and protective shoes, etc.  
Confirm no one is around the work area before hammering.



- If a pin or tooth is hammered by the strong force, it may jump from the assembly and cause injury of personnel around the work area.
- Put cushions or something like that to the assembly to absorb the direct impact when hammering the hard metal parts such as a pin, edge, tooth and bearing, etc.

### Pay Attention to Refrigerant of the Air Conditioner

- Do not loosen the parts for refrigerant circuit because it may cause blindness by getting refrigerant in eyes and frostbite by directly touching it by a hand.
- Follow the regulations and standards for disposal of refrigerant when disposing it.
- When inhaling refrigerant gas of the air conditioner carelessly, it will exert deadly effect to the human body.
- Never bring a fire near the area where the air conditioner is maintained and gas is generated.

### 1.6.4 PROHIBITED IN INSPECTION & MAINTENANCE

#### Do Not Heat Near the Hydraulic Equipment nor Piping

Cover the tubes, hoses, and other flammable items with a fire-proofed cover.

Do not heat the sections close to the tubes and hoses with pressurized oil when welding, soldering and using a torch.

It may cause generation of flammable steam or gas and result in a fire.



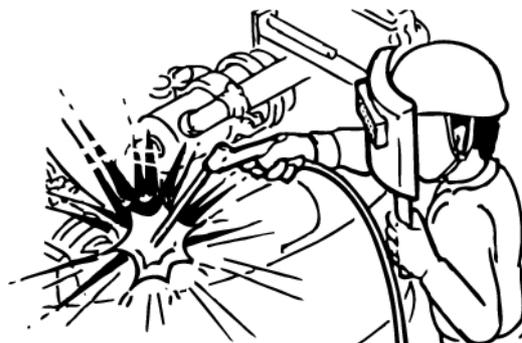
1

#### Do Not Heat Piping with Flammable Oil

- Do not weld or perform gas cutting on pipes and tubes with flammable oil.
- Wash flammable oil completely with nonflammable solvent before welding and gas cutting.

#### Caution to Modification

- Damages and failures of the machine caused by unauthorized modification are not in the warranty coverage.
- Consult KOBELCO authorized dealer/distributor for any modification to the machine beforehand.



### 1.6.5 AFTER INSPECTION & MAINTENANCE

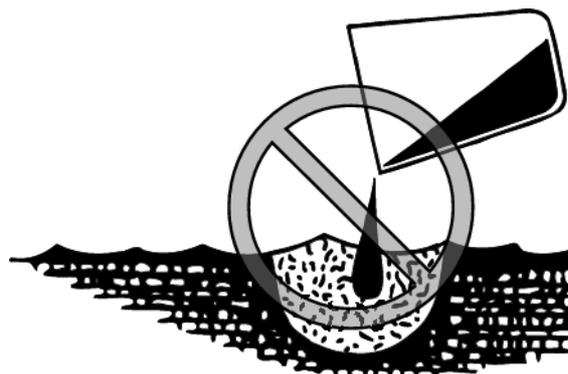
#### After Completion of Maintenance

- Run the engine at low idle, and check oil or water leakage from the maintained part.
- Slowly operate each control lever to confirm its operation performance.
- Increase the engine speed gradually, and again check oil or water leakage.
- Then manipulate each control lever to confirm that it functions properly.
- Close the doors, guards and engine hood, etc.

Maintenance will not be finished until the proper machine performance is confirmed.

#### Proper Dispose of Waste Disposal

- Never dispose the waste oil directly to the ground, sewage, river, pond and sea. For environment protection, contact the local government or public service company to ask proper disposal methods or request for disposal of the waste.
- Dispose the waste oil, fuel, coolant, brake fluid, solvent, filters and batteries, etc. according to federal, state and local codes and regulations regarding the hazardous waste disposal.



## 1.7 HANDLING THE BATTERY

### 1.7.1 PREVENTION OF ELECTROLYTE BURNS

Wear protective glasses, long sleeve shirt and rubber gloves when handling or servicing batteries.

Battery electrolyte contains dilute sulfuric acid. If battery electrolyte contacts skin or eyes, flush affected areas immediately with a large amount of fresh water because it may cause blindness and burns and seek medical attention.



### 1.7.2 BATTERY EXPLOSION PREVENTION

- Definitely keep open flames and cigarettes away from batteries.  
Batteries give off hydrogen gases that can explode and cause personal injury.
- Keep all battery caps tightly secured.



### 1.7.3 CHARGING THE BATTERY

- When batteries are charged, remove the batteries from the machine and remove the battery caps to allow gas to escape in a well-ventilated area.
- Do not charge the frozen battery because it could explode. To prevent the explosion, wait until the battery temperature becomes 16 degrees C or higher. Do not heat the battery with open fire to warm it up.
- Do not use or charge the battery of which the liquid level is lower than the lower limit. This might cause explosion.  
Check the battery liquid level periodically, and make up the battery liquid loss with distilled water to the proper limit of the liquid level.

### 1.7.4 REPLACING THE BATTERY

- Turn the engine starter key switch to the "OFF" position.
- Always disconnect the negative (-) cable first when disconnecting the battery cables. On the contrary, always connect the positive (+) cable first when reconnecting the battery cables.
- Never put tools between the battery positive (+) terminal and the machine. The short circuit and spark will occur.
- Do not make mistake in the booster cable connection. Never connect the positive (+) terminal to the negative (-) terminal. Finally, connect the negative (-) terminal to the upper frame of the machine.
- Connect the terminals securely.

See "3 USING BOOSTER CABLES TO START THE ENGINE" for the starting procedures of using booster cables.

### 1.7.5 BATTERY DISPOSAL

Do not dispose the waste battery by yourselves. Ask KOBELCO authorized dealer/distributor for disposing the waste battery.

For environment protection, contact the local government or public service company to ask proper disposal methods or request for disposal of the waste.

## 1.8 HANDLING OF THE ACCUMULATOR OR GAS SPRING

High pressured nitrogen gas is sealed inside the accumulator or gas spring. Improper handling may cause blast and result in severe personal injury.

Follow the below-mentioned things.

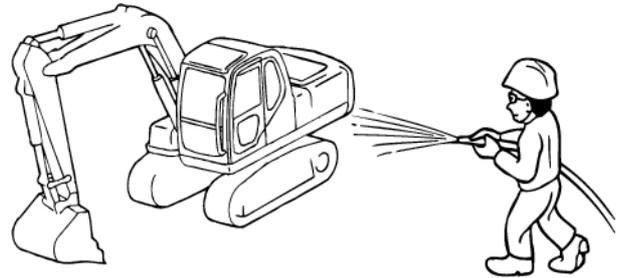
- Do not disassemble.
- Keep a fire away from the accumulator or gas spring and never throw it into fire.
- Do not drill or weld the accumulator or gas spring or cut it with a welding torch.
- Ask KOBELCO authorized dealer/distributor to remove gas from the accumulator or gas spring before disposal.

(The accumulator or gas spring collected by KOBELCO will be transferred to the parts manufacturer to be disposed.)

## 1.9 END OF WORK SHIFT SAFETY

Perform all of the following procedures after each shift is complete to insure the machine it in optimal operating condition for the next shift or job site.

1. Move the machine to a firm, level surface.
2. Lower attachment to the ground.
3. Refill fuel tank to full mark to reduce air volume and condensation (moisture). This will decrease the possibility of freezing in the fuel tank rusting due to moisture and other problems associated with start up and operation.
4. Close and secure all windows in place to prevent water or moisture reaching the electrical components of the machine.
5. Thoroughly clean and inspect the machine. Perform lubrication maintenance and repair or replace any problem areas found before restarting the machine.
6. If performing the machine storage in cold climates, it may be necessary to remove the batteries from the machine and store in a warm well ventilated area. Install the batteries in the machine before next start up. This will help prevent premature battery deterioration.
7. Remove key from key switch and lock all doors and access panels.



**END OF WORK SHIFT SAFETY**

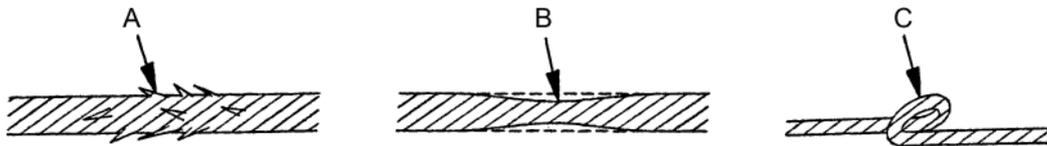
## 1.10 TOWING THE MACHINE

### **WARNING**

Incorrect towing may cause severe personal injury or death.

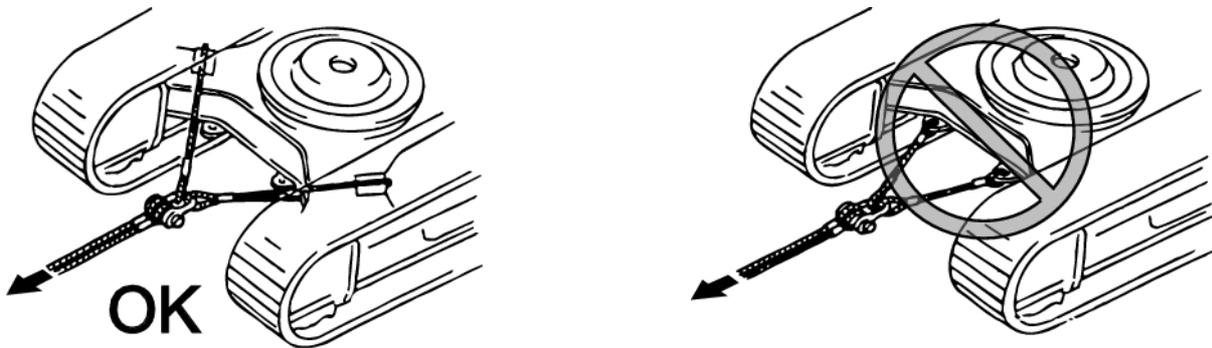
Carefully follow the below-mentioned items when performing the towing operation.

- Always wear leather gloves when handling wire ropes.
- Check if the wire rope for towing has enough strength for the weight of the machine to be towed.
- Never use a wire rope which has cut strands(A), reduce diameter(B), or kinks(C). These ropes may break during the towing operation.
- Never tow the machine on the slope.
- Never stand between the towing machine and the machine(or thing) being towed during the towing operation.
- Provide pads between the wire ropes and corners of the crawler frame to prevent damage to them.
- Operate the machine slowly and be careful not to apply a load suddenly to the wire ropes.
- Shackles must be used for towing.



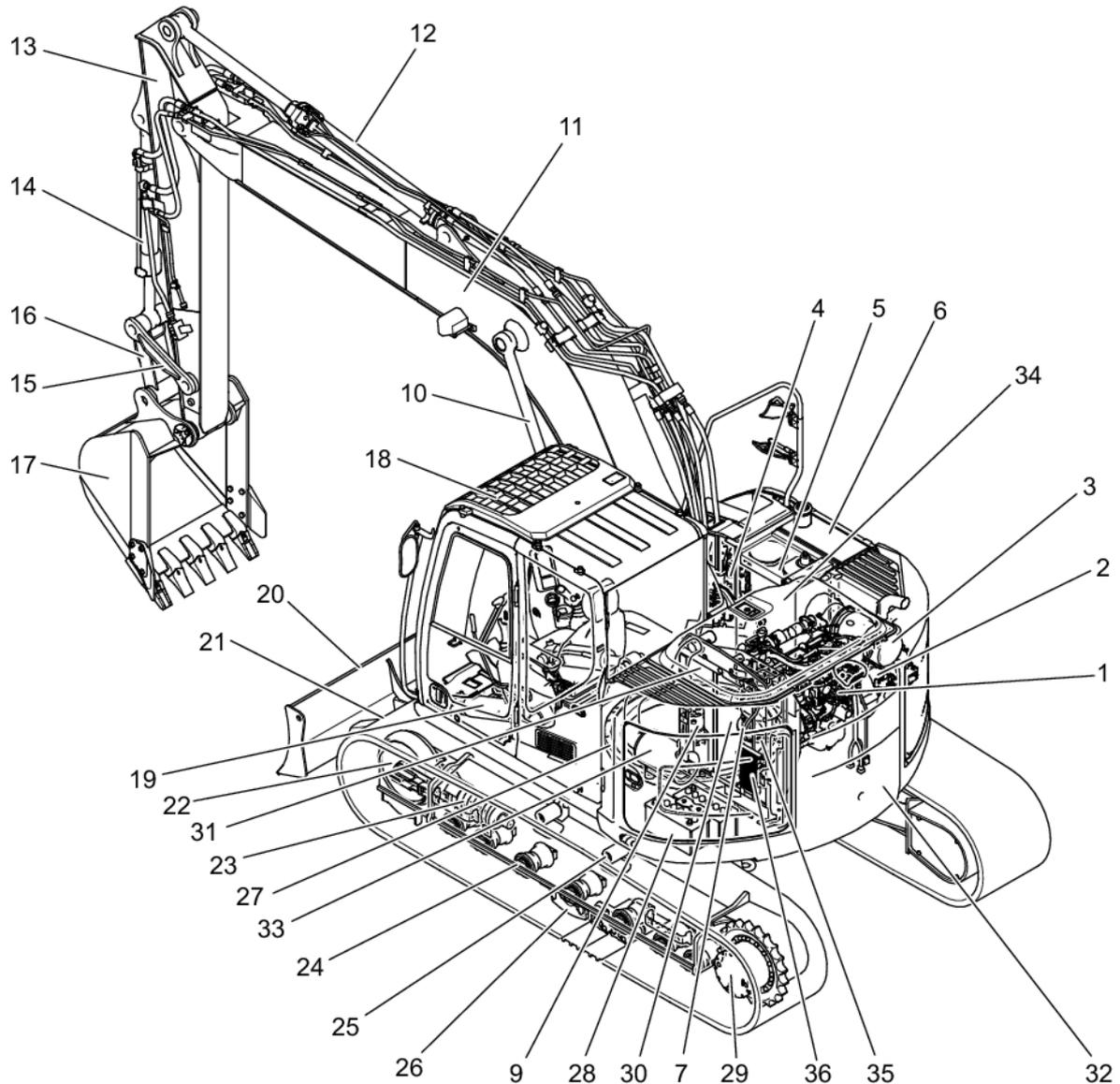
### 1.10.1 TOWING METHOD OF THE MACHINE

- If the machine cannot propel with its own power, attach the wire ropes with proper strength to the positions of the crawler frame shown to the right figure and then tow the machine by another machine.
- Hold the wire ropes in level and direct it straightly to the track frame as shown in the figure.
- In case towing the machine with releasing the travel motor brakes, securely chock the both of crawlers to prevent uncontrollable movement of the machine before releasing the travel motor brakes.



## 2. MACHINE FAMILIARIZATION

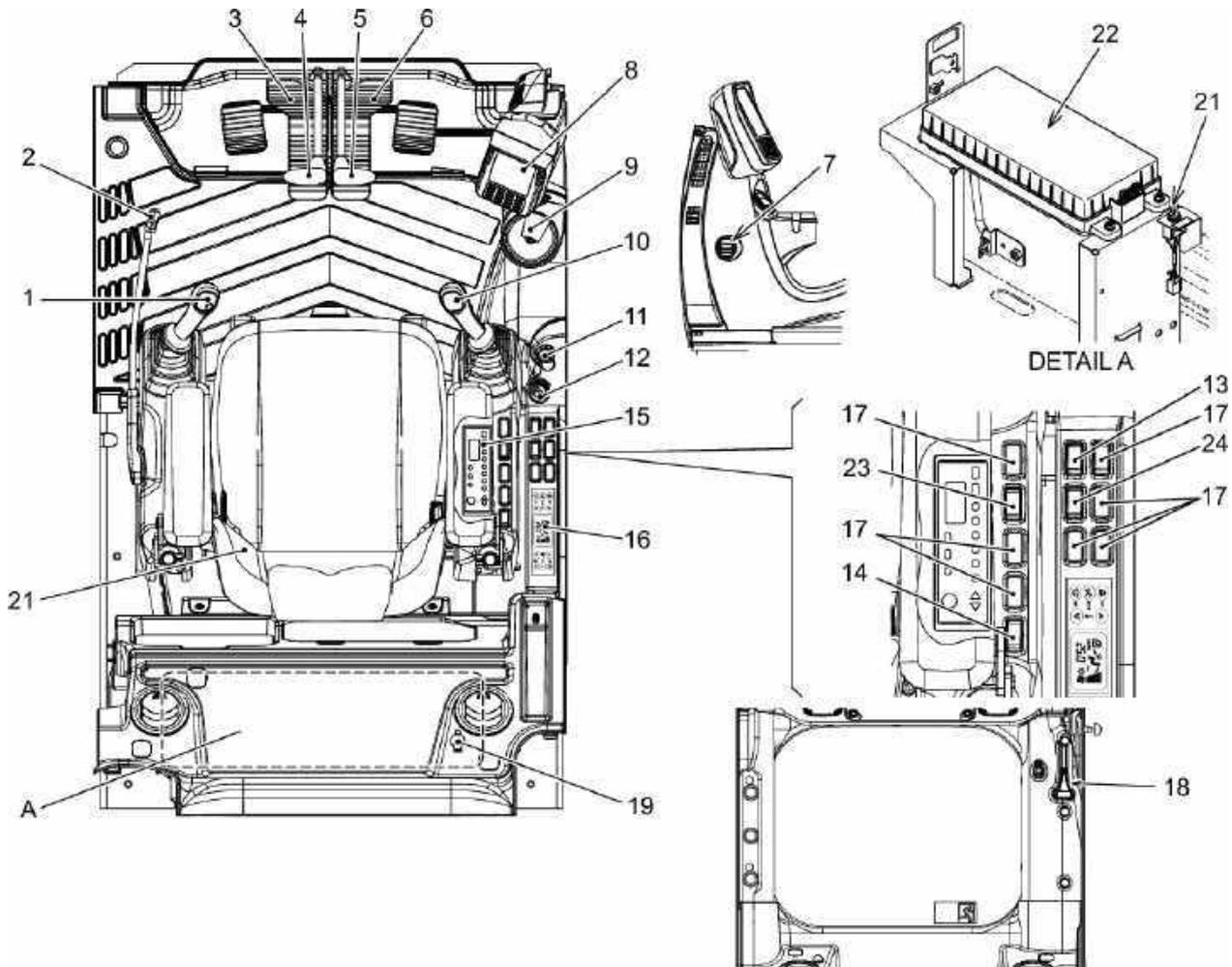
## 2.1 BASIC COMPONENTS OF THE MACHINE



No.	NAME	No.	NAME	No.	NAME
1	MITSUBISHI Engine	13	Arm	25	Upper Roller
2	Hydraulic Pump	14	Bucket Cylinder	26	Track Guide
3	Engine Muffler	15	Idler Link	27	Slewing Ring
4	Main Control Valve	16	Bucket Link	28	Battery
5	Hydraulic Oil Tank	17	Bucket	29	Travel Motor
6	Fuel Tank	18	Operator Cab	30	Engine Radiator
7	Slewing Motor	19	Dozer cylinder (Option)	31	Oil Cooler
8	Rotary Multi Control Valve (Option)	20	Dozer blade (Option)	32	Counterweight
9	Swivel Joint	21	Track Shoe Assembly	33	Engine Air Cleaner
10	Boom Cylinder	22	Track Idler	34	Engine Hood
11	Boom	23	Track Spring	35	Inter Cooler
12	Arm Cylinder	24	Lower Roller	36	Fuel Cooler

## 2.2 OPERATOR CAB NOMENCLATURE

The operator cab nomenclature, see Figure below, points out locations of operator controls of the hydraulic excavator operator cab. Study these areas and locate these components on the machine. Specific information regarding these components are explained on the following pages of this section.



No.	NAME	No.	NAME
1	Left Hand operator Control Lever (Horn Switch)	13	Working Light Switch (Boom, Deck)
2	Pilot Control Shut-Off Lever (For Hydraulics)	14	DPF Regeneration Switch
3	Left Travel Pedal	15	Tuner
4	Left Travel Lever	16	Air Conditioner Control Panel
5	Right Travel Lever	17	Cap (For Opt. Switch)
6	Right Travel Pedal	18	Life Hammer
7	Hour Meter	19	12 Volt Power Supply
8	Gauge Cluster	20	Operator Seat
9	Cup Holder	21	Swing Parking Brake Release Switch
10	Right Hand Operator Control Lever	22	Fuse & Relay Box
11	Starter Key Switch	23	Pressure Release Switch
12	Engine Throttle	24	Cab working Light Switch (Option)

## 2.3 COMPONENT & CONTROLS NOMENCLATURE

### 2.3.1 GAUGE CLUSTER

The gauge cluster is made up of meters (fuel level, engine coolant temperature), switch panel with various switches and multi-display.

#### A. METERS

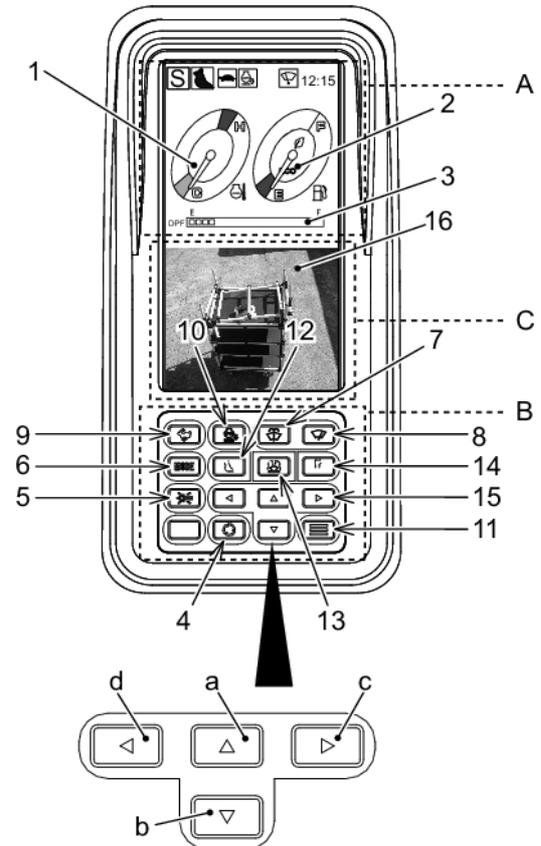
- 1: Engine Coolant Temperature Meter
- 2: Fuel Level Meter
- 3: Soot deposition meter

#### B. SWITCH PANEL

- 4: Screen Change Switch
- 5: Buzzer Stop Switch
- 6: Work Mode Select Switch
- 7: Washer Switch
- 8: Wiper Switch
- 9: Travel Speed Select Switch
- 10: Auto Acceleration Switch
- 11: Menu Switch
- 12: Digging Switch
- 13: Nibbler Switch
- 14: Breaker Switch
- 15: Arrow Switch
- a: Up Arrow Switch
- b: Down Arrow Switch
- c: Right Arrow Switch
- d: Left Arrow Switch

#### C. DISPLAY

- 16: Multi Display (LCD)



**DETAIL OF ALLOW SWITCH**

### **CAUTION**

-When caution sign was displayed on the multi-display, stop the work immediately and inspect and maintain the section in point.

For checking and servicing, refer to the section of "MAINTENANCE".

-The display on the multi-display does not entirely assure the condition of machine.

-For the maintenance and inspection of machine, the visual checking should be carried out further without completely depending on the display on the multi-display.

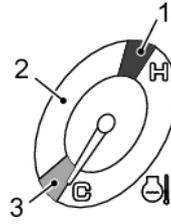
## [2. MACHINE FAMILIARIZATION]

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### A. METERS

#### 1. ENGINE COOLANT TEMPERATURE METER

This indicates the temperature of the engine coolant water. Operates when the starter key switch is at the "ON" position. The temperature is normal in the white range. If the indicator is in the red range, let the engine run in low idle until the water cools down and the indicator moves back into the white range.



1. RED: Maybe overheated
2. WHITE: Operational condition
3. BLUE: Cold condition, warm up the engine

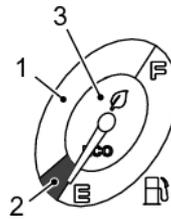
#### 2. FUEL LEVEL METER

This gauge indicates the remaining volume of fuel in the fuel tank.

When the indicator is approaching to the "E" point, the fuel tank is close to empty.

For fuel in use, see "4.4 LUBRICANT, FUEL & COOLANT SPECIFICATIONS".

During the engine running, when the fuel efficiency is in good condition, "Eco Green Mark" (3) lights on.



1. WHITE: Operational zone
2. RED: Refuel is required
3. GREEN: Eco Green Mark

#### 3. SOOT DEPOSITION METER

This meter shows an amount of soot deposited in the DPF by a scale. As the amount of soot increases, the scale increases.



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### Notice

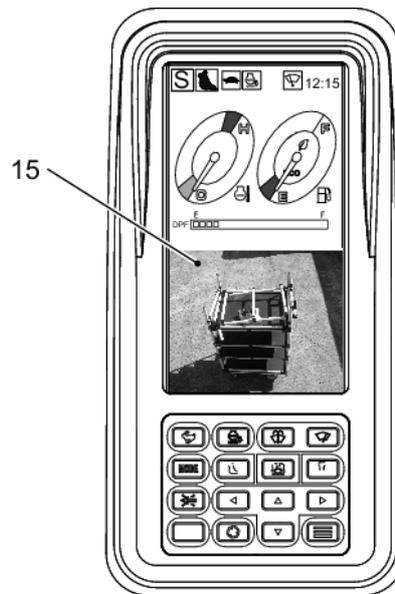
Regarding automatic regeneration, see "ABOUT AUTOMATIC REGENERATION" in Chapter 4.

Regarding manual regeneration, see "ABOUT MANUAL REGENERATION" in Chapter 4.

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**B. SWITCH PANEL**

After starting the engine, main screen (15) shown in the figure is usually displayed.

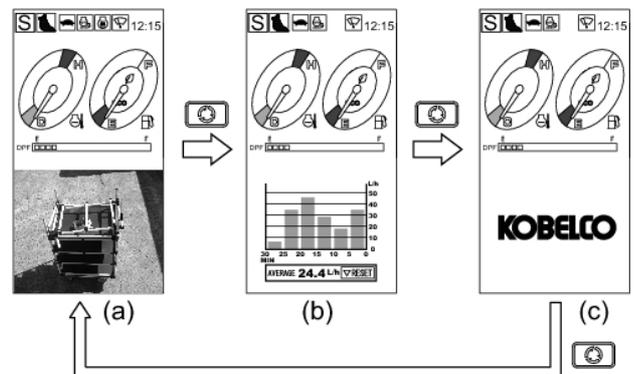
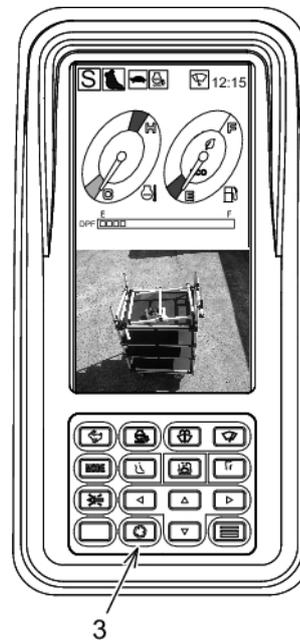


**4. SCREEN CHANGE SWITCH**

After the starter switch is turned "ON" or the engine is started, the display always shows the picture of the rearward visibility monitoring camera. Each time screen change switch (2) is pressed, the display is changed to "the picture of the rearward visibility monitoring camera" (a), "Fuel Efficiency Graph" (b) and "logo mark" (c) in turns.

The fuel consumption from 30 minutes ago to now in a 5 minutes interval is displayed on "Fuel Efficiency Graph" (b).

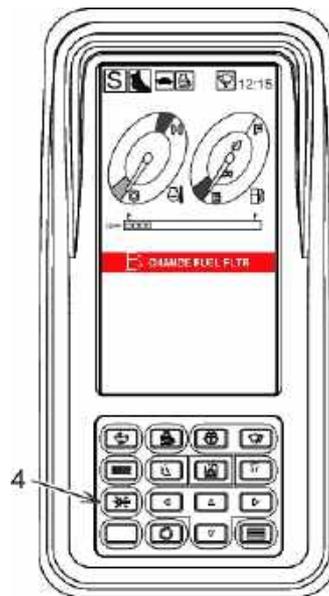
To reset, press and hold "DOWN" arrow switch while "Fuel Efficiency Graph" (b) is being displayed until it goes out.



## [2. MACHINE FAMILIARIZATION]

### 5. BUZZER STOP SWITCH

In case when the buzzer sounds and a warning indication is displayed on the multi-display (LCD), press buzzer stop switch (4) and the buzzer of items shown below stops sounding.



### ABOUT THE ITEMS OF THE WARNING DISPLAY TABLE

The level shown in the table is based on the following contents

Level	Content
1	This warning shows the possibility of personal injury or failure of the machine performance. Stop the machine and inspect and maintain it immediately.
2	This warning shows the change of mode of the machine.
3	This warning shows the condition that might lead to the failure of machine. Inspect and maintain it immediately.
4	This warning shows the condition that might lead to the trouble of operation. Inspect and maintain it immediately.
5	The notification of the machine condition and the need for maintenance.

### Type of Buzzer

Type of Buzzer	Buzzer Sound
Type 1	Continuation
Type 2	Beep ON 0.2 sec., OFF 0.3 sec.
Type 3	Beep ON 0.5 sec., OFF 0.5 sec.

Priority of group A

Level	L. C. D. display	Machine condition	Buzzer Sounds				
			Auto stop	Manual stop	Type	Only starter key ON	Engine Running
1	CPU DATA COMMUNICATION ERROR	The mechatro controller does not send data.	—	○	3	○	○
1	SWING BRAKE DISENGAGED	The swing parking brake release switch is switched to the "RELEASE LOCK" position.	○ (5 sec.)	○	2	○	○
1	ENGINE STOP	The emergency engine stop is performed due to low engine oil pressure.	○ (5 sec.)	—	1	○	—

Priority of group B

Level	L. C. D. display	Machine condition	Buzzer Sounds				
			Auto stop	Manual stop	Type	Only starter key ON	Engine Running
1	SELECTOR VALVE FAILURE	The malfunction of the selector valve	—	○	2	—	○
2	WARM FINISH WARM-UP	Auto warming up is finished.	○ (5 sec.)	—	2	—	○
2	1 LIFT UP LOCK LEVER 2 PUSH REGENERATION SW.	Regeneration is necessary for the diesel particulate filter with accumulated soot.	—	○	3	—	○
2	REGENERATION	Regeneration is being carried out for the diesel particulate filter.	—	—	—	—	○
2	1 LIFT UP LOCK LEVER 2 PUSH REGENERATION SW. EXHAUST GAS AFTER TREATMENT EQUIPMENT WILL BE DAMAGED	Regeneration has yet not been carried out even though it is necessary for the diesel particulate filter with accumulated soot.	—	—	2	—	○
2	EXHAUST GAS AFTER TREATMENT EQUIPMENT FAILURE	Regeneration turns to be impossible because required regeneration for the diesel particulate filter with accumulated soot had not been carried out.	—	—	2	—	○
3	LOW ENG OIL PRESS.	Low engine oil pressure and disconnection	—	○	2	○	○
3	HIGH ENG WATER TEMP.	The engine coolant is high temperature.	—	○	3	○	○
3	LOW ENG WATER LEVEL	The coolant level of the radiator upper tank is low.	—	○	3	○	○
3	DRAIN WATER SEPA.	Water level is high in water separator.	—	○	3	○	○
3	CLOGGED AIR FLTR	The air filter clogged.	—	○	3	○	○
3	I113	Self diagnosis (disorder of the proportional solenoid valve or the pressure sensor, etc.)	—	○	3	○	○
5	LIFT UP LOCK LEVER BEFORE ENGINE START	The starter key switch is turned to the "START" position to start the engine when the pilot control shut-off lever is at the "LOCKED" position.	—	—	—	○	—
5	CHANGE FUEL FLTR	Remaining time until replacement of the fuel filter reaches to 0.	—	—	—	○	—
5	CHANGE HYD. OIL FLTR	Remaining time until replacement of the hydraulic oil filter reaches to 0.	—	—	—	○	—
5	CHANGE HYD. OIL	Remaining time until replacement of the hydraulic oil reaches to 0.	—	—	—	○	—
5	MAKE MAINTENANCE TO EXHAUST GAS AFTER TREATMENT EQUIPMENT	Operating time reaches to the DPF maintenance (cleaning or replacement) interval of 3000 hrs.	—	—	—	○	○

Sound of buzzer

Type 1: continuation, Type 2 :Beep ON 0.2sec., OFF 0.3sec., Type 3 : Beep ON 0.5sec., OFF 0.5sec.



## [2. MACHINE FAMILIARIZATION]

### 6. WORK MODE SELECT SWITCH

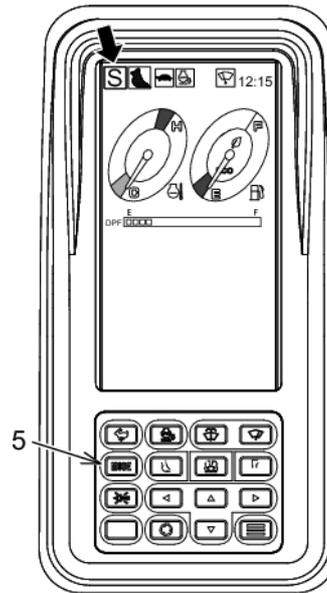
When the engine starts, the work mode is set to "H" mode. Select the proper work mode from 3 modes shown below according to the work condition and the purpose. The work mode is switched in order of "S" --> "E" --> "H" --> "S"

each time the work mode select switch is pressed. The selected work mode is displayed on the left upper corner of the multi-display for confirmation.

H : H mode (for heavy duty digging work)

S : S mode (for standard digging work and loading operations)

E : E mode (for lower fuel consumption digging work)



### **CAUTION**

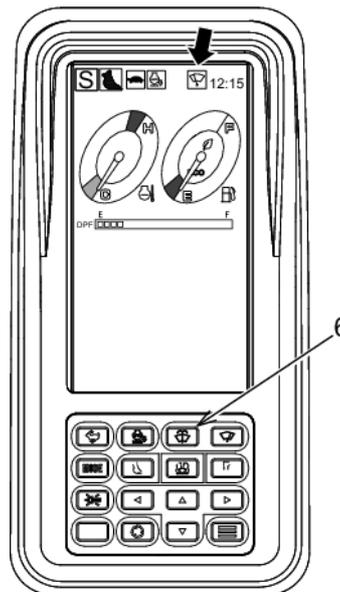
The work mode after the engine start always starts from "H" mode. Before beginning the work, make sure the work mode that had been selected is correct.

### **Notice**

For the reference of each work mode, see "3.1.11 SELECTION OF WORK MODE AND SWITCHING OF THE ATTACHMENT MODE".

### 7. WASHER SWITCH

While washer switch (6) is being pressed, the washer fluid is sprayed through the nozzle of front window. The washer tank is located under of floor plate in cab.



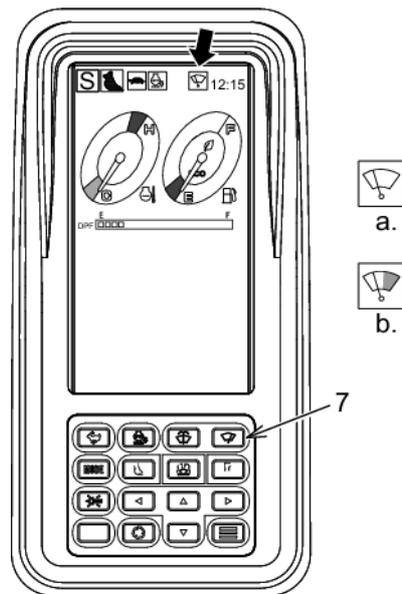
### **IMPORTANT**

Make sure that the washer reservoir has the washer fluid before operating the washer.

**8. WIPER SWITCH**

When wiper switch (7) is pressed, the indication of "Intermittent" (a) or "Continuous" (b) appears on the lower part of the multi-display.

- a. Pressing one time : Wiper moves intermittently
- b. Pressing two times : Wiper moves continuously
- c. Pressing three times : Wiper stops moving

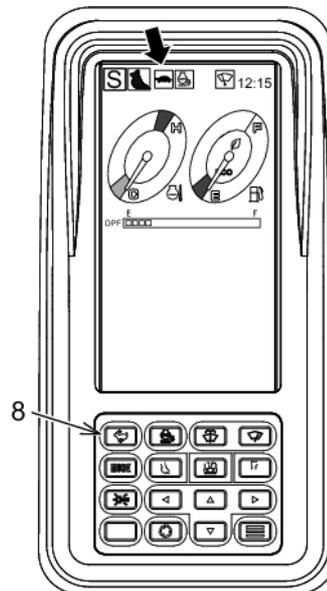


**9. TRAVEL SPEED SELECT SWITCH**



LOW 1st (turtle) speed traveling is necessary to load and unload the machine on to a trailer. During loading or unloading, do not change the travel speed.

The travel speed select switch is located on the gauge cluster switch panel. Each time the engine is started, the travel speed is automatically set to LOW 1st (turtle) speed. Press the travel speed (rabbit) switch on the gauge cluster, and the speed is changed to the HIGH 2nd speed and the (rabbit) is indicated on the multi-display.



LOW 1st speed : turtle

Set to LOW 1st speed when moving the machine on the rough or soft ground, slope, or in the narrow place, or when powerful tractive force is required.



HIGH 2nd speed : rabbit

Set to HIGH 2nd speed when moving the machine on the level and firm ground.



## [2. MACHINE FAMILIARIZATION]

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### 10. AUTO ACCELERATION SWITCH

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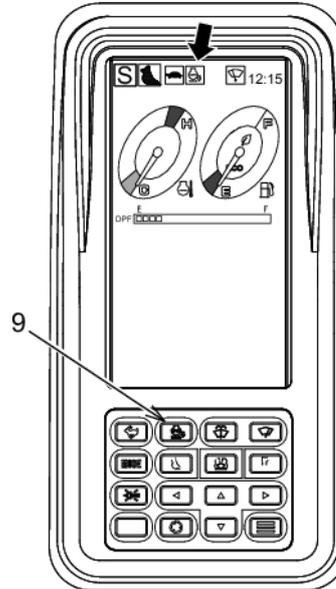
When loading or unloading the machine on a trailer, turn the auto acceleration switch off. If it is operated while the acceleration switch is on, the engine speed changes suddenly.

---

When switch (9) is pressed to turn on, the auto-acceleration system activates. The auto-acceleration makes the engine speed low under the following conditions and this reduces fuel consumption and noise :

1. The acceleration dial position is set at more than the range of the idle speed.
2. The control levers and/or pedals are not operated for 4 seconds or more.

When the control levers and/or pedals are operated, the engine speed rises back to the set level of the acceleration dial gradually according to the displacement of the levers and/or pedals.



### 11. MENU SWITCH

"Menu Switch" (10) is available for clock setting and contrast adjustment. For how to use "Menu Switch" (10), see the following "11.2 Auto Warming Up" to "11.7 Pump Flow Rate Adjustment (Nibbler mode/ Breaker mode) (Option)".

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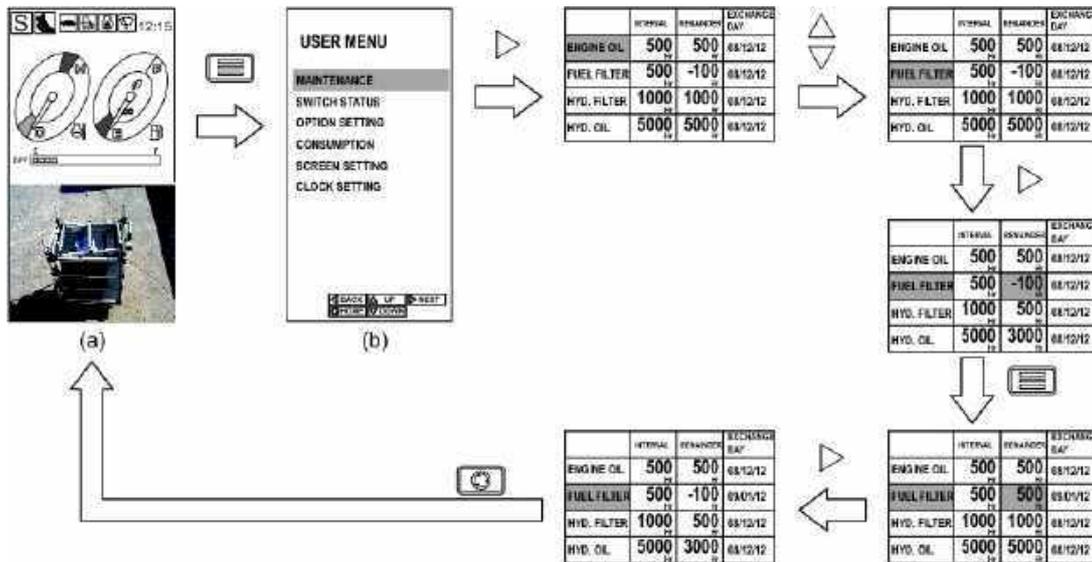
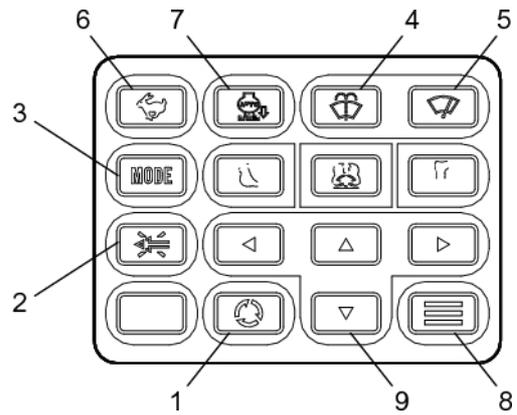
#### Notice

When "Screen Change Switch" (1) is pressed during the above adjustment or setting operations, the screen returns to the main screen.

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11.1 Maintenance Information

- 1: Screen Change Switch
- 2: Buzzer Stop Switch
- 3: Work Mode Select Switch
- 4: Washer Switch
- 5: Wiper Switch
- 6: Travel Speed Select Switch
- 7: Auto Acceleration Switch
- 8: Menu Switch
- 9: Arrow Switch

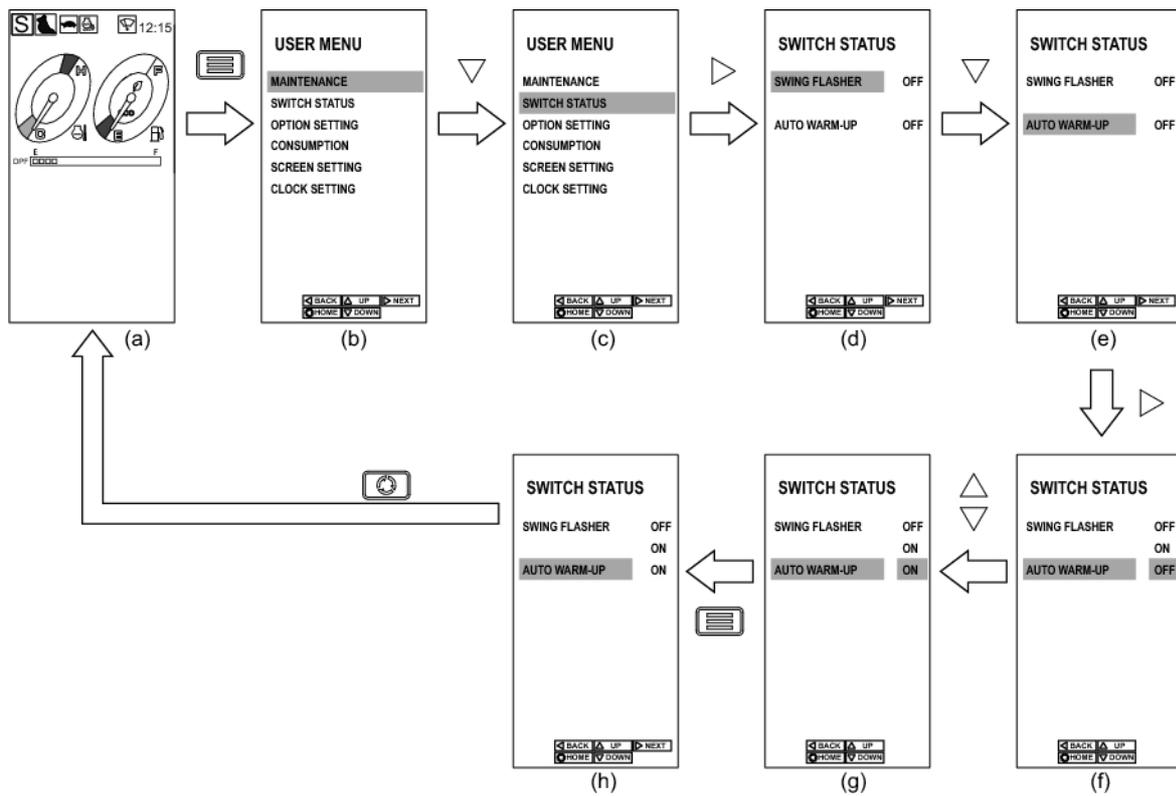
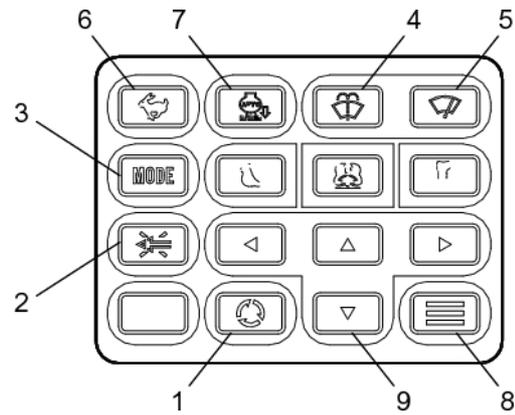


1. After turning the starter key switch "ON", main screen (a) is appeared. Press "Menu Switch" (8) to enter into "USER MENU" display (b).
2. Using "UP" or "DOWN" arrow switch, move the cursor to "MAINTENANCE". Press "RIGHT" arrow switch to select the maintenance information display.
3. Using "UP" or "DOWN" arrow switch, move the cursor to any of "ENGINE OIL", "FUEL FILTER", "HYD. FILTER" or "HYD. OIL".
4. At the desired one, press "RIGHT" arrow switch and then the background color of "REMAINDER" turns to be blue.
5. To reset the remaining time, press "Menu Switch" (8) to reset the value in "REMAINDER" box and at the same time, "EXCHANGE DAY" is renewed.  
When necessary to set the remaining time to another particular value, see "2.3.1.C.4 SET PROCEDURE OF MAINTENANCE SCHEDULE"
6. Press "RIGHT" arrow switch to fix and store the value and then the background color of "REMAINDER" turns back to black.
7. Press "Screen Change Switch" (1), and the display returns to main screen (a).

## [2. MACHINE FAMILIARIZATION]

### 11.2 Auto Warming Up

- 1: Screen Change Switch
- 2: Buzzer Stop Switch
- 3: Work Mode Select Switch
- 4: Washer Switch
- 5: Wiper Switch
- 6: Travel Speed Select Switch
- 7: Auto Acceleration Switch
- 8: Menu Switch
- 9: Arrow Switch



#### Notice

Once "AUTO WARM-UP" is set to be on, resetting is unnecessary thereafter.

**Warming up the engine and hydraulic oil**

1. After turning the starter key switch "ON", main screen (a) is appeared. And press "Menu Switch" (8) to enter into "USER MENU" display (b).
2. Using "UP" or "DOWN" arrow switch, move the cursor to "SWITCH STATUS". Press "RIGHT" arrow switch to enter into "SWITCH STATUS" display (d).
3. Using "UP" or "DOWN" arrow switch, move the cursor to "AUTO WARM-UP" as display (e).
4. Press "RIGHT" arrow switch to enter into display (f), and the background color of "OFF" turns to be blue.
5. Using "UP" or "DOWN" arrow switch, move the cursor from "OFF" to "ON".
6. Press "Menu Switch" (8) to set the status. At this time, the background color of "ON" turns to be black.
7. Turn "OFF" the starter key switch once to store the status of "AUTO WARM-UP". Pull up the pilot control shut-off lever to the "LOCKED" position.
8. When the engine is started in cold condition, "AUTO WARM-UP" starts. During warming up of the engine and hydraulic oil, "WARM-UP" is indicated.
9. After finishing "WARM-UP", "WARM-UP FINISHED" is indicated and the buzzer sounds for 5 seconds to tell the completion of "WARM-UP" operation.

---

**IMPORTANT**

- The warm-up operation is forced to stop by selecting "OFF" of "AUTO WARM-UP" in the display.
- While warming up the engine and hydraulic oil, if the control lever is operated, the warm-up operation is stopped temporarily.

After that, if the lever is at the neutral position for about 10 seconds continuously, the warm-up operation starts again.

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## [2. MACHINE FAMILIARIZATION]

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### 11.3 Auto Idling Stop Function

This switch is usually set to "OFF". When the auto idling stop function is selected, the engine stops automatically after an elapse of the specified time with the safety lock lever (1) set to "LOCKED" position (A) during engine operation. This function is effective in saving of fuel and in restraint of exhaust gas by setting auto idling stop function.

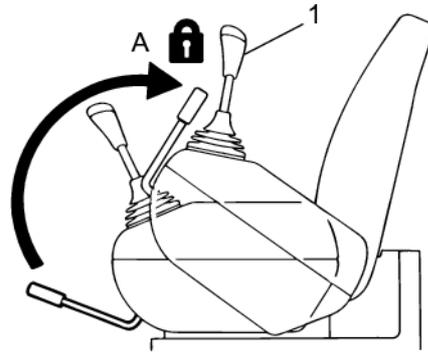
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#### Notice

1. After setting safety lock lever to "LOCKED" position (A), the engine changes to "DECEL" speed about 4 seconds later.
  2. Buzzer sounds for 5 seconds before engine stops.
- 

#### Restart the engine after the engine is stopped by

1. Make sure that the buzzer stops sounding.
2. Set the accel potentiometer to low idling position.
3. Return the starter key switch to "ACC" or "OFF" once and restart the engine.



#### CAUTION

-When you start the engine again after an auto idling stop, start after once returning a key switch at ACC or OFF and also returning a throttle potentiometer to Lo.

But the engine cannot start until a buzzer stops, after engine stops.

-When you leave from machine for a while, turn off the starter key switch to prevent from accident.

-Turn the auto idling stop function off when the following functions are employed. The engine stops and then the function stops, too.

As the safety lock lever is set to "LOCKED" position (A),

- a. When desired to warm up the engine,
- b. When desired to use air-con,
- c. When desired to use work light continuously,

-The auto idling stop function does not function regardless of the auto idling stop function set position in the following cases.

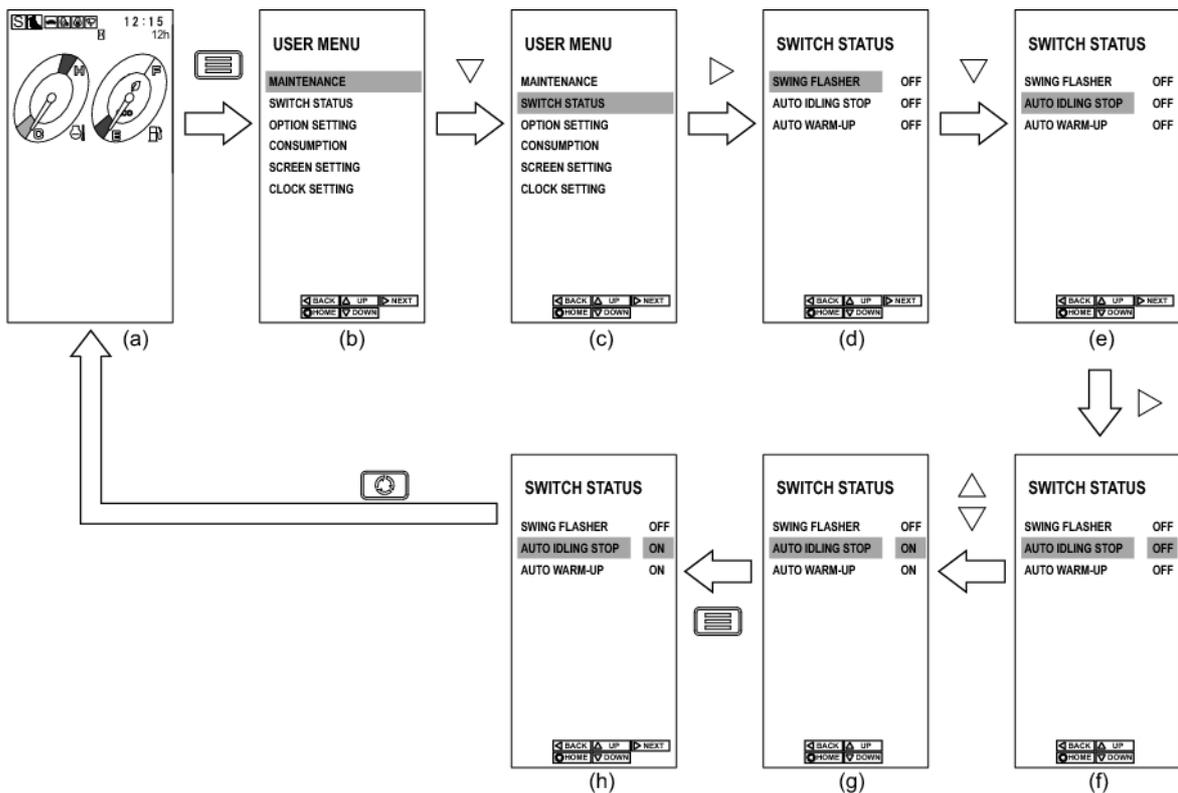
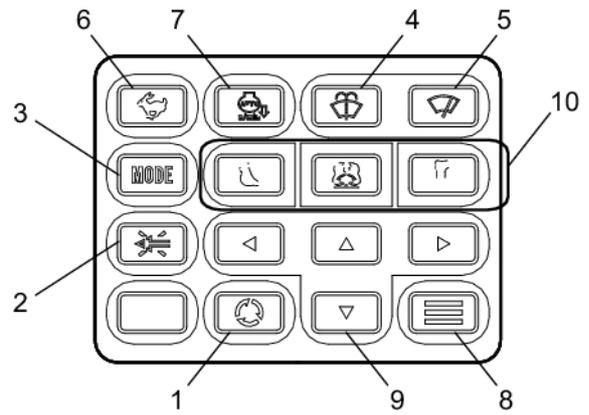
- a. When the alarm for "HIGH ENG WATER TEMP" or "LOW ENGINE WATER LEVEL" is displayed,
- b. When the auto warming up is operated,

-Do not use auto idling stop mode when lifting.

---

**11.3.1 Auto Idling Stop Setting**

- 1: Screen Change Switch
- 2: Buzzer Stop Switch
- 3: Work Mode Select Switch
- 4: Washer Switch
- 5: Wiper Switch
- 6: Travel Speed Select Switch
- 7: Auto Acceleration Switch
- 8: Menu Switch
- 9: Arrow Switch
- 10: Attachment Mode Select Switch



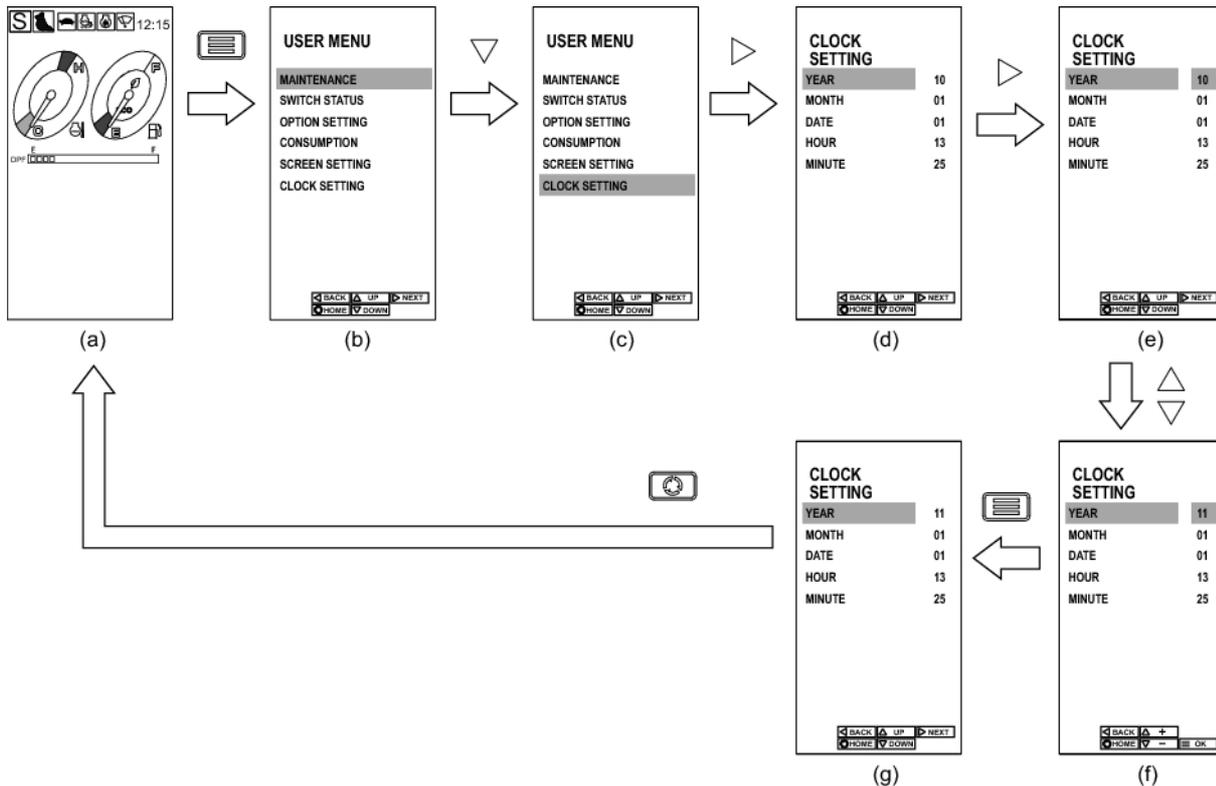
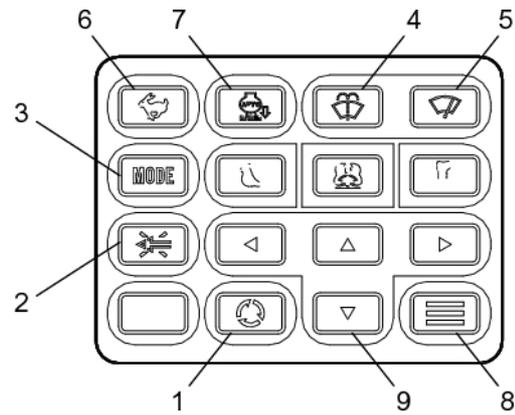
1. Turn the starter switch "ON" to display main screen (a). Press menu switch (8) to enter user menu screen (b).
2. Using the Up or Down arrow switch, move the cursor to "SWITCH STATUS". Press the Right arrow switch to enter the switch setting.
3. Using the Up or Down arrow switch, move the cursor to "AUTO IDLING STOP".
4. Press the Right arrow switch to enter display (f). The background color of "OFF" turns blue.
5. Using the Up or Down arrow switch, select "ON".
6. Press "Menu Switch" (8) to set the status.  
At this time, the background color of "ON" turns black.
7. Turn "OFF" the starter key switch once to store the status.



## [2. MACHINE FAMILIARIZATION]

### 11.4 Clock Adjustment

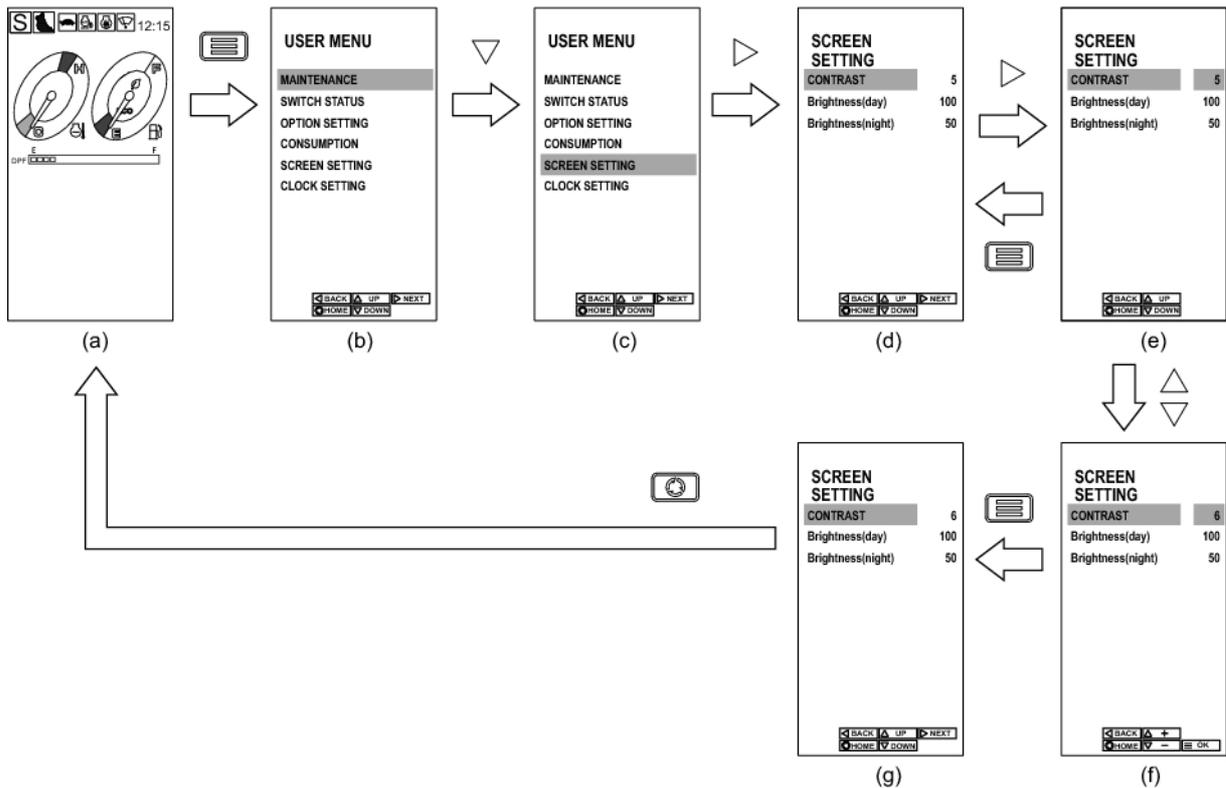
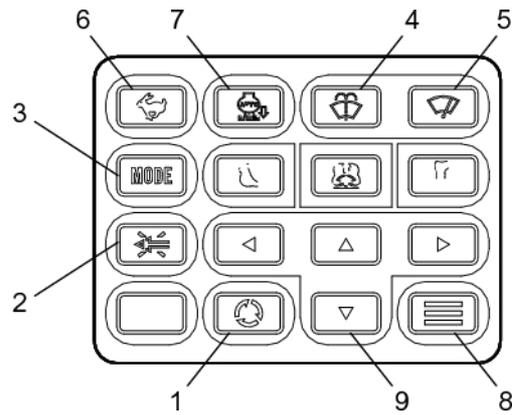
- 1: Screen Change Switch
- 2: Buzzer Stop Switch
- 3: Work Mode Select Switch
- 4: Washer Switch
- 5: Wiper Switch
- 6: Travel Speed Select Switch
- 7: Auto Acceleration Switch
- 8: Menu Switch
- 9: Arrow Switch



1. After turning the starter key switch "ON", main screen (a) is appeared. And press "MENU SWITCH" (8) to enter into "USER MENU" display (b).
2. Using "UP" or "DOWN" arrow switch, move the cursor to "CLOCK SETTING" as display (c). Press "RIGHT" arrow switch to enter into "CLOCK SETTING" display (d).
3. Using "UP" or "DOWN" arrow switch, select any of "YEAR/MONTH/DAY/HOUR/MINUTE" as display (d).
4. Press "RIGHT" arrow switch to enter into display (e). The background color of "value" turns to be blue.
5. Using "UP" or "DOWN" arrow switch, select the desired value.
6. After adjustment, press "Menu Switch" (8) to store the desired value as memory and at this time, the background color of "value" turns to be black.
7. Press "Screen Change Switch" (1), and the display returns to main screen (a).

**11.5 Contrast Adjustment**

- 1: Screen Change Switch
- 2: Buzzer Stop Switch
- 3: Work Mode Select Switch
- 4: Washer Switch
- 5: Wiper Switch
- 6: Travel Speed Select Switch
- 7: Auto Acceleration Switch
- 8: Menu Switch
- 9: Arrow Switch



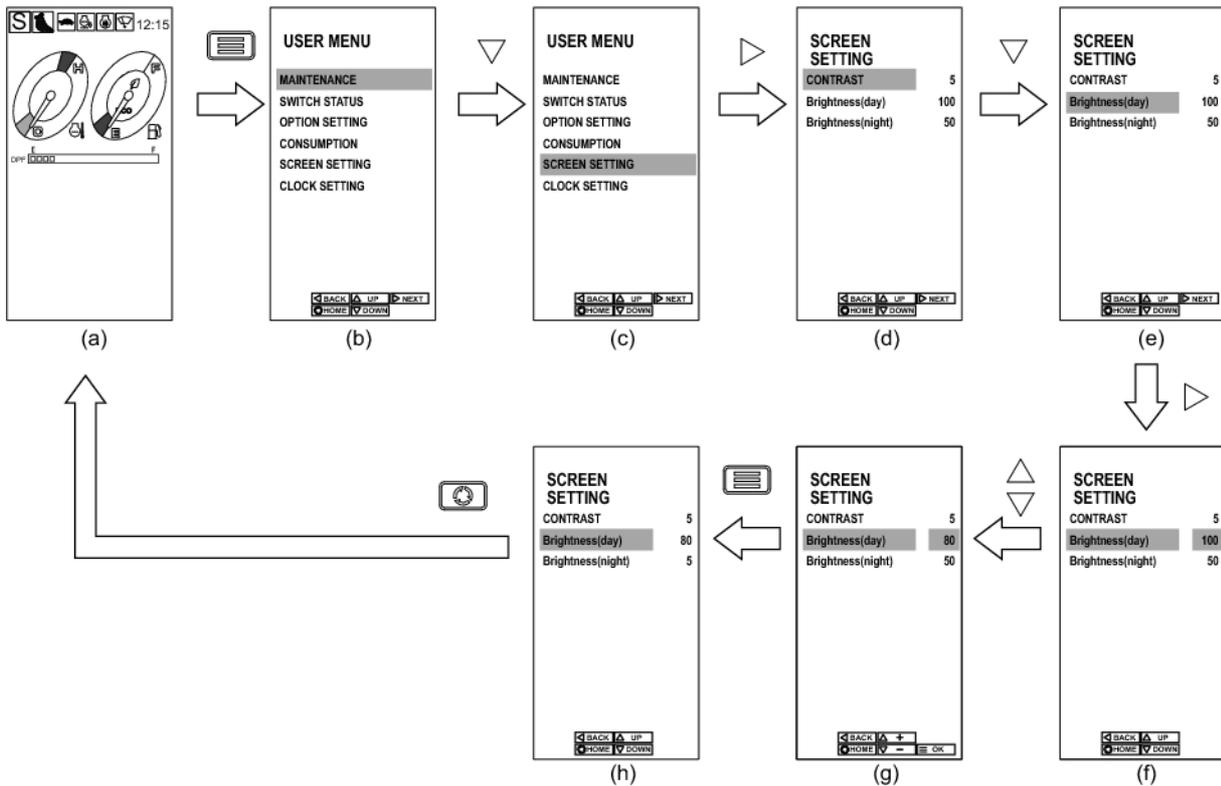
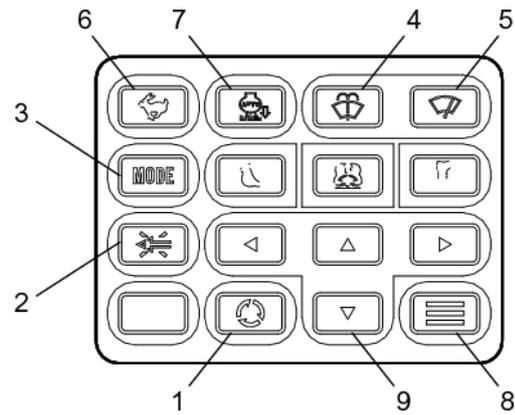
1. After turning the starter key switch "ON", main screen (a) is appeared. And press "Menu Switch" (8) to enter into "USER MENU" display (b).
2. Using "UP" or "DOWN" arrow switch, move the cursor to "SCREEN SETTING" as display (c). Press "RIGHT" arrow switch to enter into "SCREEN SETTING" display (d).
3. Using "UP" or "DOWN" arrow switch, move the cursor to "CONTRAST" as display (d).
4. Press "RIGHT" arrow switch to enter into display (e). The background color of "value" turns to be blue.
5. Using "UP" or "DOWN" arrow switch, select the desired values. The adjustable range is from 1 (Faint) to 10 (Clear).  
\* The default value is 5.
6. After adjustment, press "Menu Switch" (8) to store the desired value as memory and at this time, the background color of "value" turns to be black.
7. Press "Screen Change Switch" (1), and the display returns to main screen (a).



## [2. MACHINE FAMILIARIZATION]

### 11.6 Brightness (Day) Adjustment

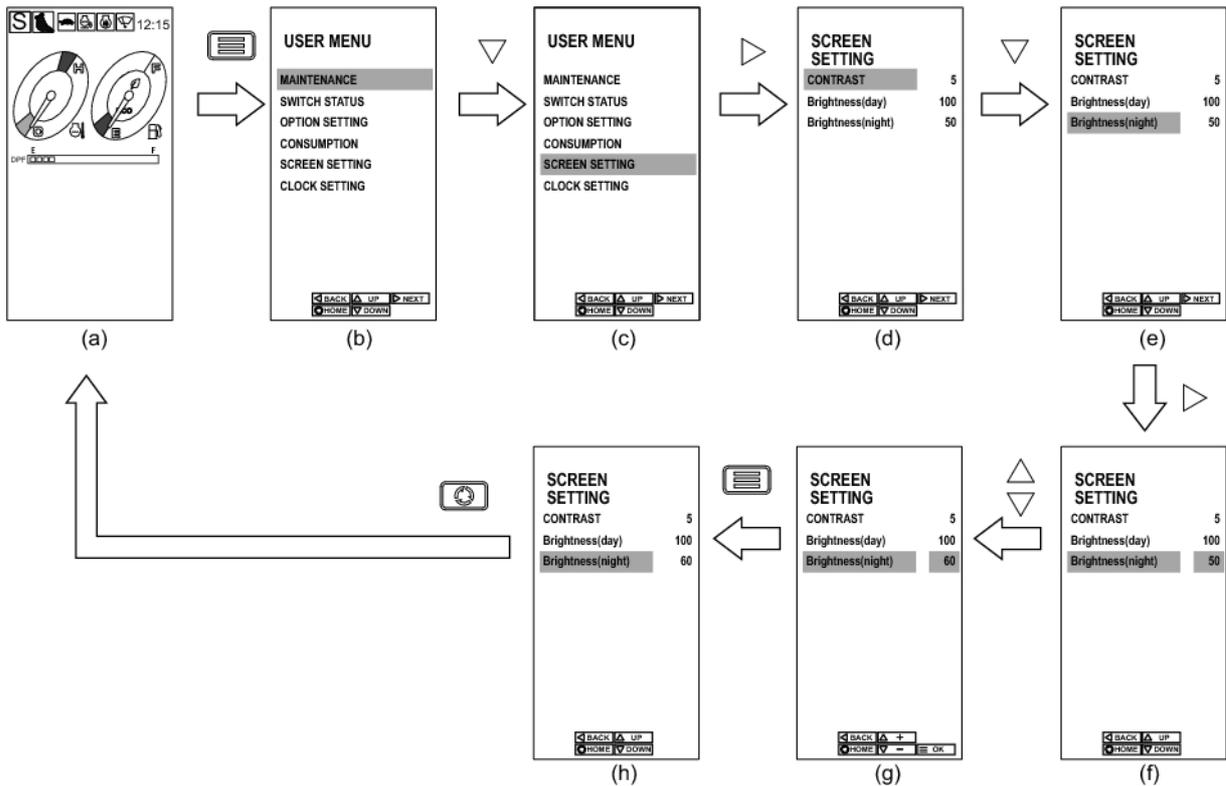
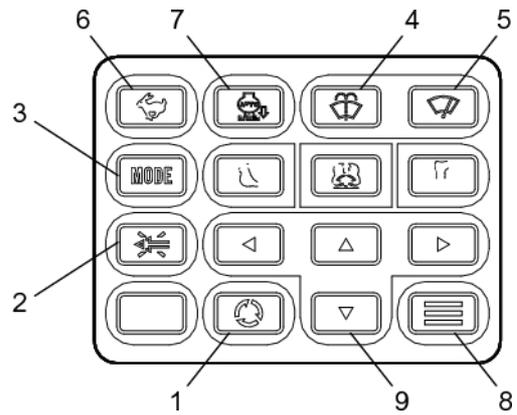
- 1: Screen Change Switch
- 2: Buzzer Stop Switch
- 3: Work Mode Select Switch
- 4: Washer Switch
- 5: Wiper Switch
- 6: Travel Speed Select Switch
- 7: Auto Acceleration Switch
- 8: Menu Switch
- 9: Arrow Switch



1. After turning the starter key switch "ON", the main screen (a) is appeared. And press "Menu Switch" (8) to enter into "USER MENU" display (b).
2. Using "UP" or "DOWN" arrow switch, move the cursor to "SCREEN SETTING" as display (c). Press "RIGHT" arrow switch to enter into "SCREEN SETTING" display (d).
3. Using "UP" or "DOWN" arrow switch, move the cursor to "Brightness (day)" as display (e).
4. Press "RIGHT" arrow switch and the display becomes as display (f). The background color of the "value" turns to be blue.
5. Using "UP" or "DOWN" arrow switch, select the desired value. The adjustable range is from 1 (Dark) to 100 (Bright).  
\* The default value is 100.
6. After adjustment, press "Menu Switch" (8) to store the desired value as memory and at this time, the background color of "value" turns to be black.
7. Press "Screen Change Switch" (1), and the display returns to main screen (a).

**11.7 Brightness (Night) Adjustment**

- 1: Screen Change Switch
- 2: Buzzer Stop Switch
- 3: Work Mode Select Switch
- 4: Washer Switch
- 5: Wiper Switch
- 6: Travel Speed Select Switch
- 7: Auto Acceleration Switch
- 8: Menu Switch
- 9: Arrow Switch



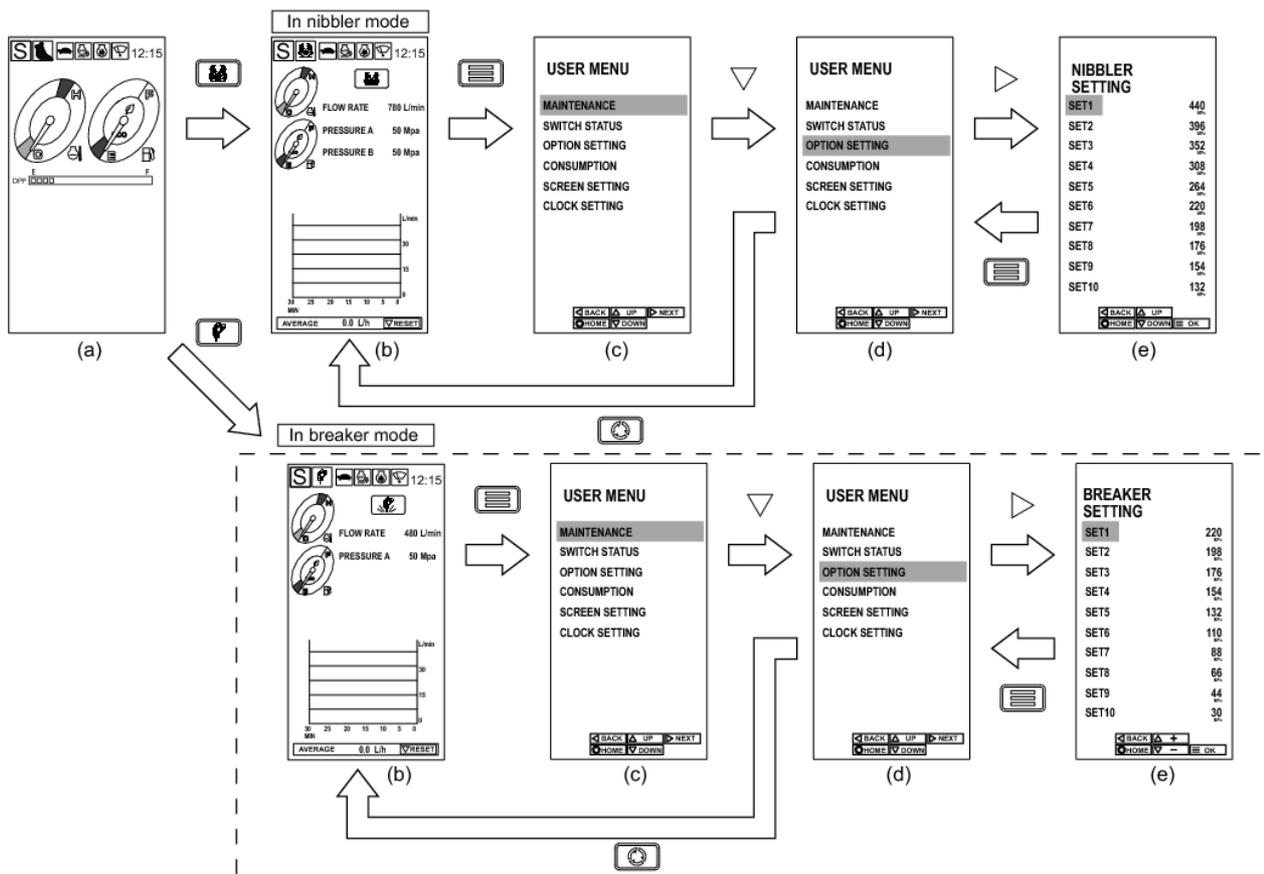
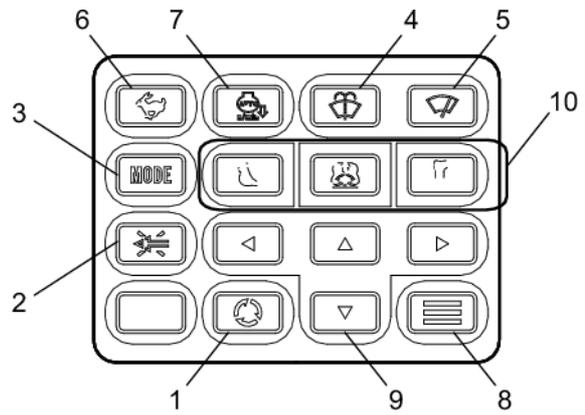
1. After turning the starter key switch "ON", the main screen (a) is appeared. And press "Menu Switch" (8) to enter into "USER MENU" display (b).
2. Using "UP" or "DOWN" arrow switch, move the cursor to "SCREEN SETTING" as display (c). Press "RIGHT" arrow switch to enter into "SCREEN SETTING" display (d).
3. Using "UP" or "DOWN" arrow switch, move the cursor to "Brightness (night)" as display (e).
4. Press "RIGHT" arrow switch and the display becomes as display (f). The background color of the "value" turns to be blue.
5. Using "UP" or "DOWN" arrow switch, select the desired values. The adjustable range is from 1 (Dark) to 100 (Bright).  
\* The default value is 5.
6. After adjustment, press "Menu Switch" (8) to store the desired value as memory and at this time, the background color of "value" turns to be black.
7. Press "Screen Change Switch" (1), and the display returns to main screen (a).



## [2. MACHINE FAMILIARIZATION]

### 11.8 Pump Flow Rate Adjustment (Nibbler mode / Breaker mode) (Option)

- 1: Screen Change Switch
- 2: Buzzer Stop Switch
- 3: Work Mode Select Switch
- 4: Washer Switch
- 5: Wiper Switch
- 6: Travel Speed Select Switch
- 7: Auto Acceleration Switch
- 8: Menu Switch
- 9: Arrow Switch
- 10: Attachment Mode Select Switch



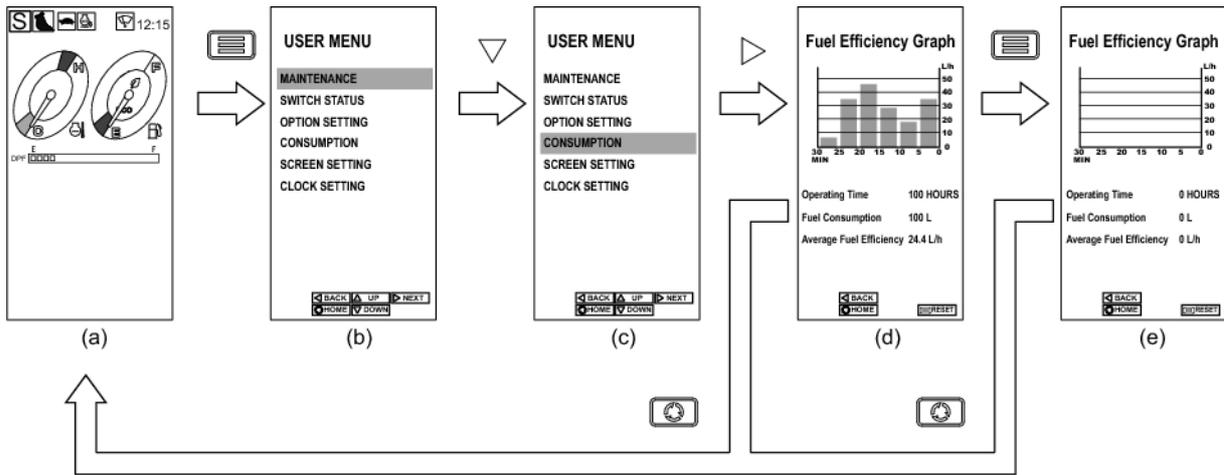
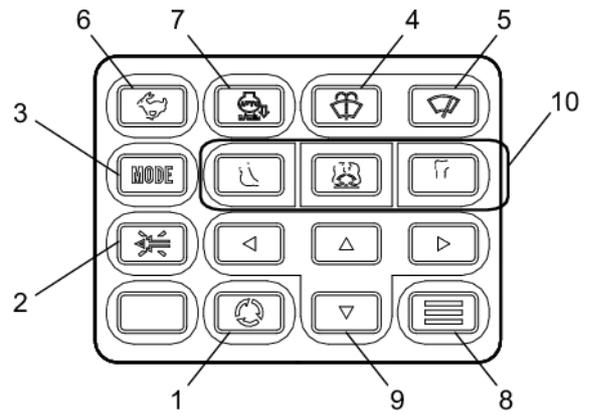
1. After turning the starter key switch "ON", the main screen (a) is appeared.
2. When the display is main screen (a), press "Nibbler" or "Breaker" switch of "Attachment Mode Select Switch" (9) to change the attachment mode from the digging mode to the nibbler mode or breaker mode. The flow rate indication screen (b) appears.
3. Press "Menu Switch" (8) to enter into "USER MENU" display (c).
4. Using "UP" or "DOWN" arrow switch, move the cursor to "OPTION SETTING", and press "RIGHT" arrow switch to enter into "NIBBLER SETTING" or "BREAKER SETTING" display (e).
5. Using "UP" or "DOWN" arrow switch, select the desired flow rate.
6. Press "Menu Switch" (8) to set the desired flow rate.
7. Press "Screen Change Switch" (1), and the display returns to main screen (a).

### IMPORTANT

If there is no switch operation for 20 seconds, the display returns to main screen (a).

**11.9 Consumption**

- 1: Screen Change Switch
- 2: Buzzer Stop Switch
- 3: Work Mode Select Switch
- 4: Washer Switch
- 5: Wiper Switch
- 6: Travel Speed Select Switch
- 7: Auto Acceleration Switch
- 8: Menu Switch
- 9: Arrow Switch
- 10: Attachment Mode Select Switch



1. Turn on the starter key switch "ON" and the main screen (a) is appeared. And press "Menu Switch" (8) to enter into "USER MENU" display (b).
2. Using "UP" or "DOWN" arrow switch, move the cursor to "CONSUMPTION" as display (c), and press "RIGHT" arrow switch. And "Fuel Efficiency Graph" display (d) appears.
3. The graph indicates the fuel consumption from 12 hours ago to now in a 2 hour intervals. And the values of "Operating Time" "Fuel Consumption" and "Average Fuel Efficiency" are indicated.
4. To reset these values, press "Menu Switch" (8).
5. Press "Screen Change Switch" (1) and the display returns to main screen (a).

**Notice**

Use the indicated "Average Fuel Efficiency" for reference.



## [2. MACHINE FAMILIARIZATION]

### C. DISPLAY



When the warning is displayed on the multi-display, stop the work immediately and inspect and maintain the failure part.

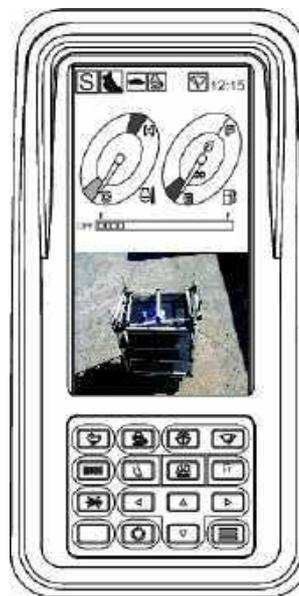
For performing inspection and maintenance procedures, refer to the section of "MAINTENANCE".

The mechatro controller processes signals received from various sensors and switches and outputs the signals to the multi-display and lamp display, and makes the buzzer sound of the gauge cluster. The everyday check should be performed according to not only the multi-display but also the instructions in the section of "MAINTENANCE".

The multi-display function is roughly divided into the following 7 types.

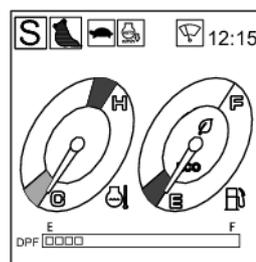
#### Multi-display (Liquid Crystal Display)

- Main Screen
- Switch Operation Display
- Warning Display
- Nibbler and Breaker Mode Display
- User Menu Display
- Picture of Rearward Visibility Monitoring Camera
- Fuel Efficiency Graph Display



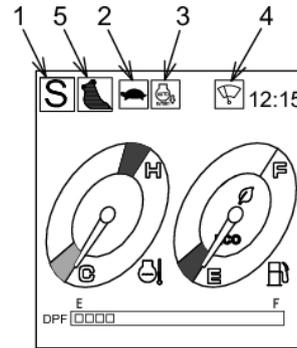
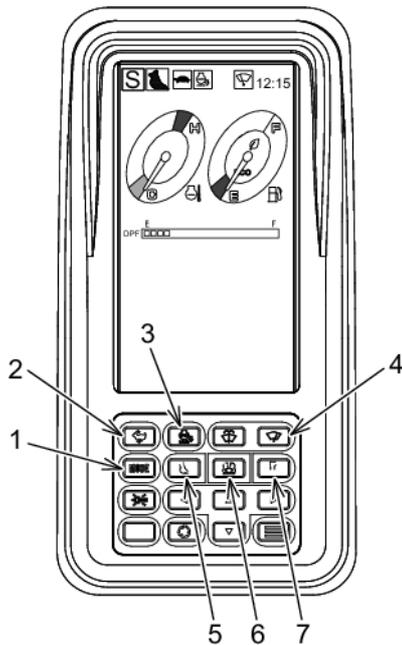
#### C.1 MAIN SCREEN

After starting the engine, usually the clock is displayed.



**C.2 SWITCH OPERATION DISPLAY**

When selecting and using the switch on the switch panel of the gauge cluster, the selected mode is displayed on the upper part of the multi-display.



1	Work Mode Displays (S·E·H)
2	Travel Speed Displays ( 🐢 · 🐇 )
3	Auto Acceleration Display
4	Wiper Displays (Intermittent 🌧️/Continuation 🌧️)
5	Attachment Mode Displays ( 🏠, 🐭, 🏠 )

1. Work Mode Displays  
The work mode changes in order of "S" --> "E"--> "H"--> "S" each time "Work Mode Select Switch" (1) is pressed and the selected mode is displayed on the upper corner of the multi-display.
2. Travel Speed Displays  
The travel speed order of "turtle" --> "rabbit" --> "turtle" icon each time "Travel Speed Select Switch" (2) is pressed and the selected mode is displayed.
3. Auto Acceleration Displays  
Press "Auto Acceleration Switch" (3) and the icon means "Auto Acceleration" is displayed to inform that the auto acceleration is functioning.
4. Wiper Displays  
Press "Wiper Switch" (4) and the icon means "intermittent" is displayed when the wiper motor is running for intermittent wiping of the front window, and the icon means "continuous" is displayed when the motor is running for continuous wiping.
5. Attachment Mode Displays  
Press "Digging Mode Switch" (5) to select the digging mode of the attachment mode. And the selected digging mode is indicated.  
Press "Nibbler Mode Switch" (6) to select the nibbler mode of the attachment mode. And the selected nibbler mode is indicated.  
Press "Breaker Mode Switch" (7) to select the breaker mode of the attachment mode. And the selected breaker mode is indicated.

## [2. MACHINE FAMILIARIZATION]

### C.3 DISPLAY FOR MAINTENANCE

This screen displays the remaining time to the end of recommended replacement interval specified for the filter/oil. After reaching to the end of replacement interval, inspect and maintain them following to the section of "MAINTENANCE".

The recommended replacement interval is the accumulated time counted by the controller when the engine is running.

This menu is available for confirmation of the following items.

#### Replacement Interval

ITEM	DEFAULT
Engine Oil	500 Hrs.
Fuel Filter	500 Hrs.
Hydraulic Oil Filter	1,000 Hrs.
Hydraulic Oil	5,000 Hrs.

	INTERVAL	REMAINDER	EXCHANGE DAY
1 → ENGINE OIL	500 Hr	500 Hr	08/12/12
2 → FUEL FILTER	500 Hr	-100 Hr	08/12/12
3 → HYD. FILTER	1000 Hr	500 Hr	08/12/12
4 → HYD. OIL	5000 Hr	3000 Hr	08/12/12

1. "INTERVAL","REMAINDER" and "EXCHANGE DAY" for "ENGINE OIL"  
"INTERVAL" box shows the recommended replacement time of engine oil, "REMAINDER" box shows the remaining time for the next engine oil change and "EXCHANGE DAY" box shows the date of previous engine oil change.
2. "INTERVAL","REMAINDER" and "EXCHANGE DAY" for "FUEL FILTER"  
"INTERVAL" box shows the recommended replacement time of fuel filter, "REMAINDER" box shows the remaining time for the next fuel filter change and "EXCHANGE DAY" box shows the date of previous fuel filter change.
3. "INTERVAL","REMAINDER" and "EXCHANGE DAY" for "HYD.FILTER"  
"INTERVAL" box shows the recommended replacement time of hydraulic oil filter, "REMAINDER" box shows the remaining time for the next hydraulic oil filter change and "EXCHANGE DAY" box shows the date of previous hydraulic oil filter change.
4. "INTERVAL","REMAINDER" and "EXCHANGE DAY" for "HYD.OIL"  
"INTERVAL" box shows the recommended replacement time of hydraulic oil, "REMAINDER" box shows the remaining time for the next hydraulic oil change and "EXCHANGE DAY" box shows the date of previous hydraulic oil change.

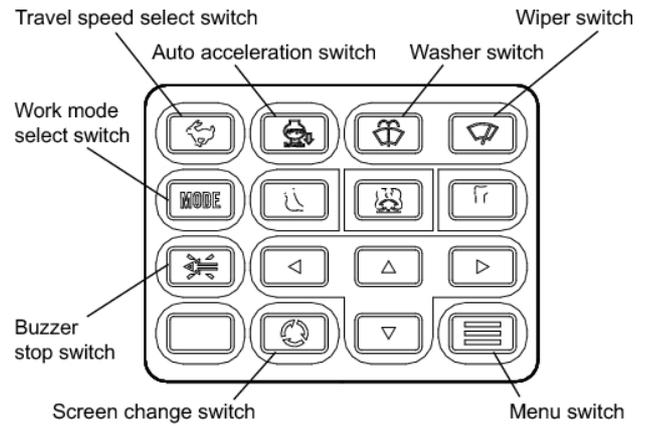
#### Notice

-For the time setting procedure for the next oil or filter change of each type, see "2.3.1.C.4 SET PROCEDURE OF MAINTENANCE SCHEDULE".

-When the recommended replacement time is over, its "REMAINDER" indication turns to be red color. After the oil or filter change, reset the time to return to the original value.

**C.4 SET PROCEDURE OF MAINTENANCE SCHEDULE**

This machine is equipped with the multi-display which shows the remaining time to the next replacement/change time of the engine oil, fuel filter, hydraulic oil filter and hydraulic oil. When the remaining time reaches to zero (0), change that filter or oil and perform the initial setting in the following order.

**Notice**

The recommended replacement time of parts is mentioned below.

Engine oil : 500 Hrs.

Fuel filter : 500 Hrs.

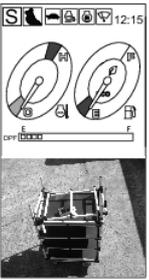
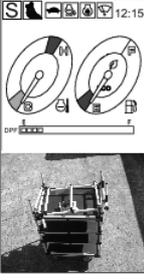
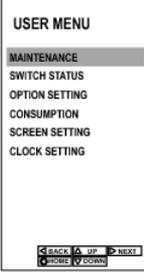
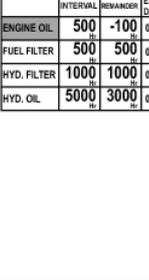
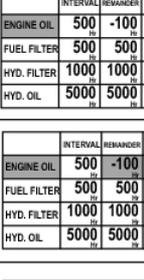
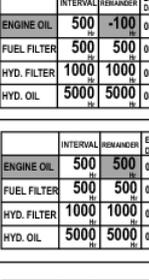
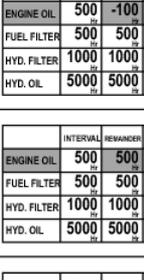
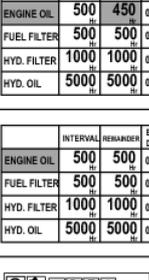
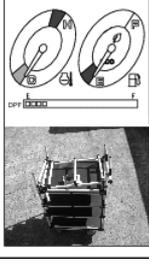
Hydraulic oil filter : 1,000 Hrs.

Hydraulic oil : 5,000 Hrs.

**Notice**

1. The engine oil recommended replacement time is 500 hrs. and when the remaining time reaches to zero (0), it is warned on the multi-display but the buzzer does not sound.
2. The fuel filter recommended replacement time is 500 hrs. and when the remaining time reaches to zero (0), it is warned on the multi-display but the buzzer does not sound.
3. The hydraulic oil filter recommended replacement time is 1,000 hrs. and when the remaining time reaches to zero (0), it is warned on the multi-display but the buzzer does not sound.
4. The hydraulic oil replacement time is 5,000 hrs. and when the remaining time reaches to zero (0), it is warned on the multi-display but the buzzer does not sound.

## [2. MACHINE FAMILIARIZATION]

Procedure	Operating procedure	Displayed on Multidisplay
1	Turn the starter key switch "ON".	 <p>After several seconds, the display changes to the clock display automatically.</p>  
2	Press "MENU SWITCH" located on the switch panel and the display changes to "USER MENU" display.	  
3	Press "RIGHT" arrow switch once to enter into the "MAINTENANCE" display. At this time, the cursor at the setting item turns to be blue.	  
4	Press "RIGHT" arrow switch once more, and the cursor at "REMAINDER" box turns to be blue.	  
5	To set to the default value: Press "MENU SWITCH" once to return to the default value.	  
	To set to the desired value: Use UP" or "DOWN" arrow switch to select the desired value for the remaining time. The possible setting value ranges from the recommended replacement time to 0.	  
6	Press "RIGHT" arrow switch to fix the value.	  
7	Press "Screen Change Switch" once, and the display returns to main screen (a).	

**C.5 WARNING DISPLAY**

The warning display has the order of priority and when many troubles such as level 1 and 2 in priority (A) occurred at the same time, level 1 is displayed in priority to level 2.



When the following warnings are displayed, there is a possibility of serious trouble. Therefore stop the operation immediately, investigate the causes and take a proper measure.

**1. WARNING CLASSIFICATION (PRIORITY A)**

Displays	Level	Warning Contents	Remedy
CPU DATA COMMUNICATION ERROR	1	The mechatro controller does not send data.	Contact our authorized dealer/distributor for inspection and maintenance.
SWING BRAKE DISENGAGED	1	The swing parking brake release switch is switched to the "RELEASE LOCK" position.	
ENGINE STOP	1	The emergency engine stop is performed due to low engine oil pressure.	

**2. WARNING CLASSIFICATION (PRIORITY B)**

Displays	Level	Warning Contents	Remedy
SELECTOR VALVE FAILURE	1	The malfunction of the selector valve	The attachment attached on the nibbler (crusher) or breaker machine does not correspond to the selected attachment mode. Select the proper attachment mode with the attachment mode select switch. Breaker mode: For use of breaker Nibbler mode: For use of nibbler (crusher) When "SELECTOR VALVE FAILURE" does not go out even though the proper attachment mode is selected, contact our authorized dealer/distributor for inspection and maintenance.
POWER BOOST ON	2	Displayed when the attachment boost switch is on.	In this case, do not use the long arm.
WARM FINISH WARM-UP	2	Auto warming up is finished.	The warming up of the engine and hydraulic oil is finished. Start the engine by the qualified procedure referring to the section "STARTING ENGINE" in "3. MACHINE OPERATION"
1 LIFT UP LOCK LEVER 2 PUSH REGENERATION SW	2	Regeneration is necessary for the diesel particulate filter with accumulated soot.	Pull up the pilot control shut-off lever and push the DPF manual regeneration switch. And after pushing the switch, regeneration starts.
REGENERATION Note 1	2	Regeneration is being carried out for the diesel particulate filter.	Hold the machine in condition that the starter key switch is "ON" and the pilot control shut-off lever is pulled up. And wait until the display goes out.
1 LIFT UP LOCK LEVER 2 PUSH REGENERATION SW EXHAUST GAS AFTER TREATMENT EQUIPMENT WILL BE DAMAGED	2	Regeneration has yet not been carried out even though it is necessary for the diesel particulate filter with accumulated soot.	Pull up the pilot control shut-off lever and push the DPF manual regeneration switch. And after pushing the switch, regeneration starts.
EXHAUST GAS AFTER TREATMENT EQUIPMENT FAILURE	2	Regeneration turns to be impossible because required regeneration for the diesel particulate filter with accumulated soot had not been carried out.	Contact our authorized dealer/distributor for inspection and maintenance.

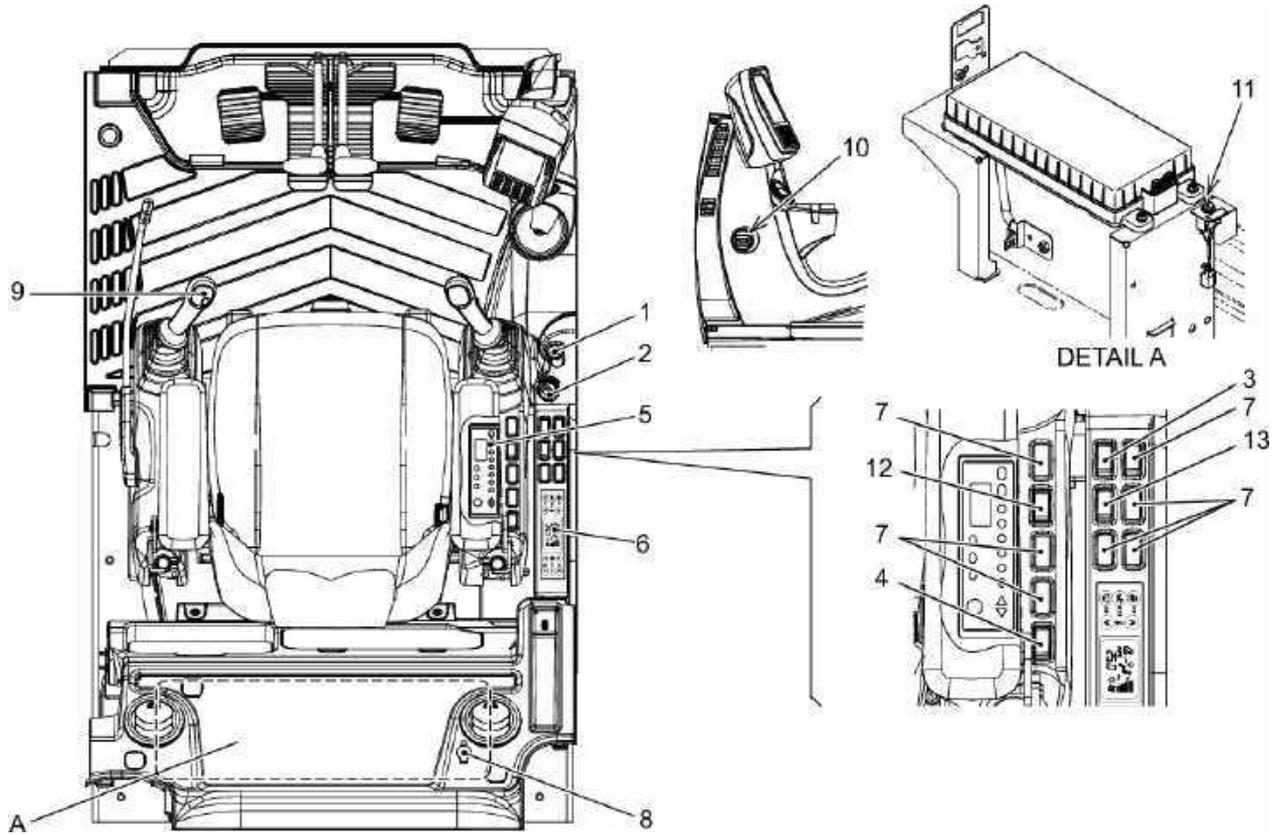
**Note 1**

When only this mark is displayed while the machine is operating, the mark shows that the automatic soot combustion regeneration is being carried out. The operator does not need to take any countermeasures against this mark. The machine operation can be continued.

## [2. MACHINE FAMILIARIZATION]

Displays	Level	Warning Contents	Remedy
 LOW ENG OIL PRESS.	2	<ul style="list-style-type: none"> <li>The output saving control is operating because the engine oil pressure is lowered to the specified pressure or less.</li> <li>The wiring is disconnected.</li> </ul>	<ul style="list-style-type: none"> <li>Stop the engine immediately and check the oil level and the disconnected wiring. If shortage is found, make up the shortage of the oil with the specified engine oil or change it by referring to the "LUBRICANT, FUEL &amp; COOLANT SPECIFICATIONS".</li> <li>If the warning is displayed when the engine is stopped, failure such as disconnection, etc. may have occurred. Contact our authorized dealer/distributor for repair.</li> </ul>
 HIGH ENG WATER TEMP.	3	The coolant temperature is raised to the specified temperature or higher.	Stop the operation and lower the coolant temperature by changing the engine speed to low idle to cool down the engine. When the warning does not go out after several minutes, stop the engine and check the coolant level, fan belt tension and radiator for clogging.
 LOW ENG WATER LEVEL	3	The coolant level of the radiator upper tank is low.	Stop the engine, and after the coolant temperature cools down, open the radiator cap and make up the shortage of the coolant. Check the radiator sub tank too, and if shortage is found, make up the shortage of the coolant.
 DRAIN WATER SEPA.	3	Displayed when the level of water separator (fuel filter) is raised to the specified level or higher.	Drain water from water separator.
 CLOGGED AIR FLTR.	3	The engine output is lowered due to clogging of the intake air filter.	Check the filter and clean it, and if necessary, replace it with a new one.
<b>I113</b>	3	Disorder of the proportional solenoid valve or the pressure sensor, etc.	Contact our authorized dealer/distributor for inspection and maintenance.
 CHARGE ERROR	4	Battery error. (High voltage/low voltage/poor charge) After the engine starts, when the warning does not go out for a while or the warning appears during engine running, poor battery charge may have caused it.	Inspect the working condition of the electric equipment and check the charging circuit.
 LOW FUEL LEVEL	4	The fuel level is the specified level or lower.	Make up the shortage of fuel with the specified fuel.
WARM. FINISH WARM-UP	5	Auto warming up is operating.	Auto warming up is operating. Wait until auto warming up is completed.
 CHANGE ENG OIL	5	The remaining time to the specified engine oil change is zero (0).	Replace the engine oil with the specified quantity of the specified new engine oil.
 LIFT UP LOCK LEVER BEFORE ENGINE START	5	The starter key switch is turned to the "START" position to start the engine when the pilot control shut-off lever is at the "LOCKED" position.	After returning the starter key switch to the "ON" position, pull up the pilot control shut-off lever to secure the safety. Turn the starter key switch to the "START" position again, and then try to start the engine.
 CHANGE FUEL FLTR.	5	Remaining time until replacement of the fuel filter reaches to 0.	Replace the fuel filter with a specified new one.
 CHANGE HYD. OIL FLTR.	5	Remaining time until replacement of the hydraulic oil filter reaches to 0.	Replace the hydraulic oil filter with a specified new one.
 CHANGE HYD. OIL	5	Remaining time until replacement of the hydraulic oil reaches to 0.	Replace the hydraulic oil with specified new one.
 ENGINE IDLING	5	The engine speed is set to low idling and it is warmed up.	To avoid the engine trouble, do not operate the machine until the engine warming-up ends.
 MAKE MAINTENANCE TO EXHAUST GAS AFTER TREATMENT EQUIPMENT	5	Operating time reaches to the DPF maintenance (cleaning or replacement) interval of 3000 hrs.	Please contact your nearest authorized service shop.

2.3.2 LOCATION OF SWITCHES AND METERS



2

No.	NAME	No.	NAME
1	Starter Key Switch	8	12 Volt Power Supply
2	Engine Throttle	9	Horn Switch
3	Working Light Switch (Boom, Deck)	10	Hour Meter
4	DRF Regeneration Switch	11	Swing Parking Brake Release Switch
5	Tuner	12	Pressure Release Switch
6	Air Conditioner Control Panel	13	Cab Working Light Switch (Option)
7	Cap (For Opt. Switch)		

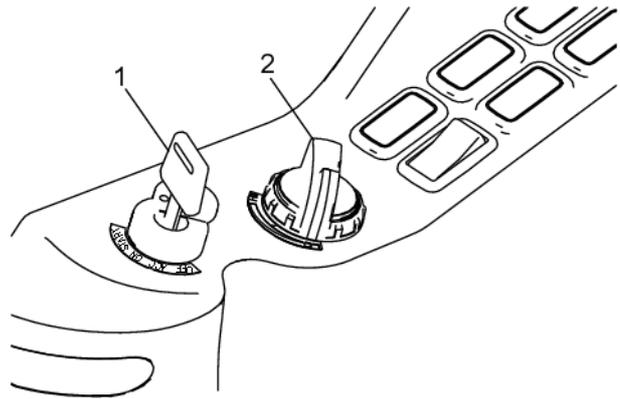
## [2. MACHINE FAMILIARIZATION]

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### 1. Starter Key Switch

The starter key switch is located on the right hand operator console and has 4 operating functions.

- **OFF :**  
When starter key switch (1) is turned to this position, the engine stops and electrical power to the machine's electrical systems is stopped after approximately 3 seconds.
- **ACC :**  
With starter key switch (1) in the "ACC" position only the cigarette lighter, tuner and horn will have power.
- **ON :**  
When starter key switch (1) is in the ON position, electrical power is supplied to all the machine's electrical systems.
- **START :**  
When starter key switch (1) is turned to this position electrical power is supplied to the starter solenoid causing the starter to start the engine. After engine starts key should be released to go back to the "ON" position.



### 2. Engine Throttle

The engine throttle (2) is located on the right hand operator console and controls engine RPM.

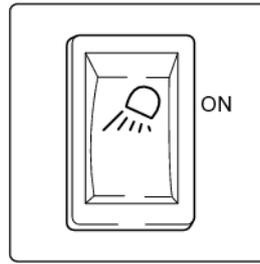
When the engine throttle is rotated to any position it increases or decreases engine rpm and maintains engine at the programmed RPM for that particular position on the dial.

- **LO (Low idling) :**  
The engine speed reduces to the minimum at the position turned to the leftmost.
- **HI (High idling) :**  
The engine speed rises to the maximum at the position turned to the rightmost.

**3. Working Light Switch (Boom, Deck)**

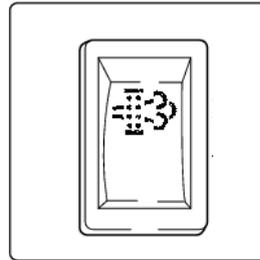
Press the switch and the work lights on the boom and deck (right) go on.

Press the side without symbol mark and the work lights on the boom and deck (right) go off.

**4. DPF Regeneration Switch**

By pressing manual switch, DPF can be regenerated.

For more details, refer to "4.3 DPF(DIESEL PARTICULATE FILTER)".

**5. Radio (Tuner)**

For the control of radio, see "2.3.7 HANDLING OF RADIO"

**6. Air Conditioner Control Panel**

For air conditioner control, see "2.3.8 AIR CONDITIONER".

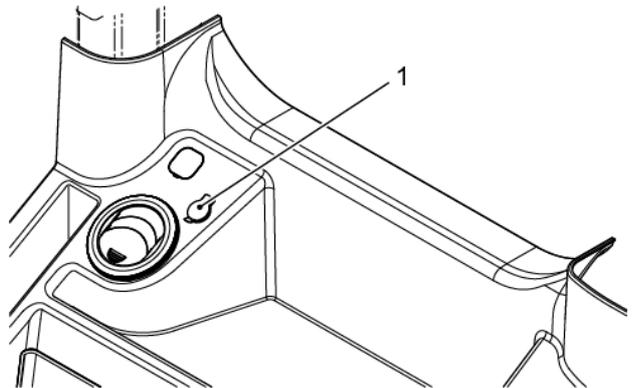
**7. Caps**

These are used to install switches in option.

**8. 12 Volt Power Supply**

The 12 volt power supply (1) is located beside the rear side cover.

Four use of common auto accessories such as a fan or other accessories requiring 12 volt (DC) power. Pull cover away from 12 volt power supply and insert 12 volt male socket into power supply. Replace cover after use.

**CAUTION**

Do not use the cigarette lighter as a power supply source for 12 volt accessories. It is a 24 volt outlet. Plugging a 12 volt accessory into a 24 volt connector may result in shorting and/or fire.

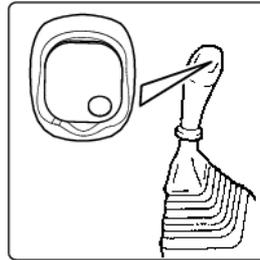
## [2. MACHINE FAMILIARIZATION]

### 9. Horn Switch



Always sound horn before starting engine to alert personnel that the machine is going to be operated.

The horn switch is a momentary push grey button located on the operator's left control lever.



### 10. Hour Meter

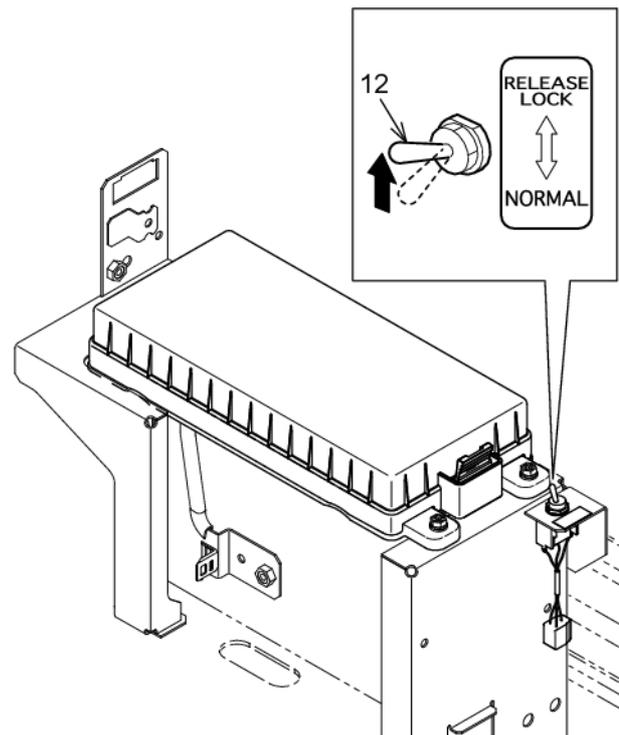
This indicates the total time the engine has run. Even if the excavator is not moving, the meter continues to count as long as the engine is running.



### 11. Swing Parking Brake Release Switch

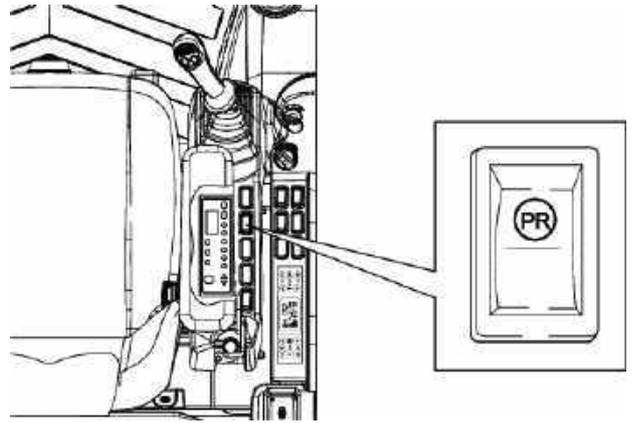
Swing parking brake is usually locked. The swing parking brake is released in swing and arm-in operation. When it cannot be unlocked due to trouble, turn toggle switch to "Release lock" (unlock), and the parking brake is released. Then, move machine to safe area immediately and contact our shop.

And return to toggle switch to "NORMAL" position in normal condition.



**12. Pressure Release Switch**

This switch is used to release the pressure in the hydraulic circuit.

**WARNING**

To avoid injury or death, release the inner pressure according to the following procedure. When the procedure of pressure release is wrong, the attachment falls under the own weight. It is very dangerous.

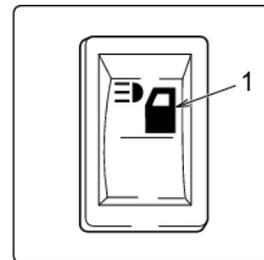
**IMPORTANT**

Regarding the procedure of inner pressure release, refer to the paragraph "4.2.S RELEASING INNER PRESSURE IN HYDRAULIC SYSTEM"

**13. Cab Working Light Switch (Option)**

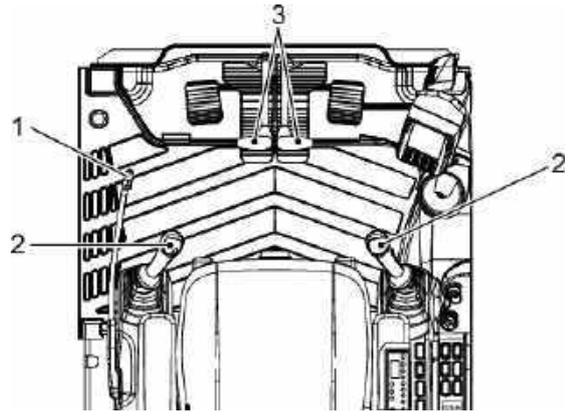
When working in the poor visibility condition, light the cab working light. To light the cab working light, press the symbol side of this switch (1).

- Press the symbol side: The light is ON.
- Press the blank side: The light is OFF.



### 2.3.3 LEVERS AND PEDALS

1. Pilot Control Shut-Off Lever
2. Control lever (ISO Control Pattern)
3. Travel lever



#### 1. Pilot Control Shut-Off Lever

The pilot control shut-off lever is provided to prevent any unexpected operation due to the unexpected movement of control levers.



-Do not stand up and move during operation or there is a possibility of suddenly being moved by unexpectedly touching and shifting the control lever.

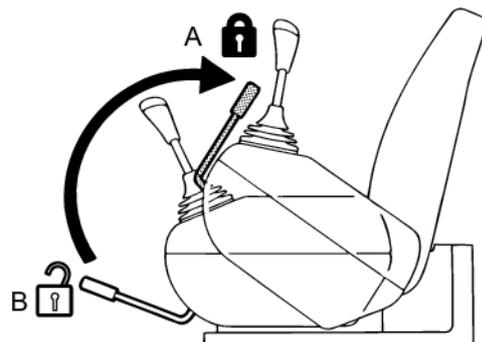
-Raise the pilot control shut-off lever to the "lock position" securely.

Make sure that the pilot control shut-off lever is held to the locked position shown in the figure.

-When unlocking, do not touch other levers unintentionally. If touches other lever unintentionally, this may cause the danger due to malfunction of machine.

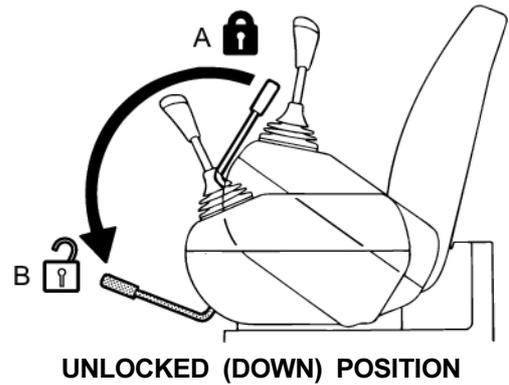
-After completion of work or during transportation, hold the pilot control shut-off lever to the "locked position".

#### Locking Hydraulic System (A)



When the pilot control shut-off lever is set in the "LOCKED (UP) Position" the hydraulic system is shut down.

Unlocking Hydraulic System (B)



When the safety lever is set to the "UNLOCKED (DOWN) Position" all hydraulic functions are active.

**2. Control Levers (ISO Operating Pattern)**

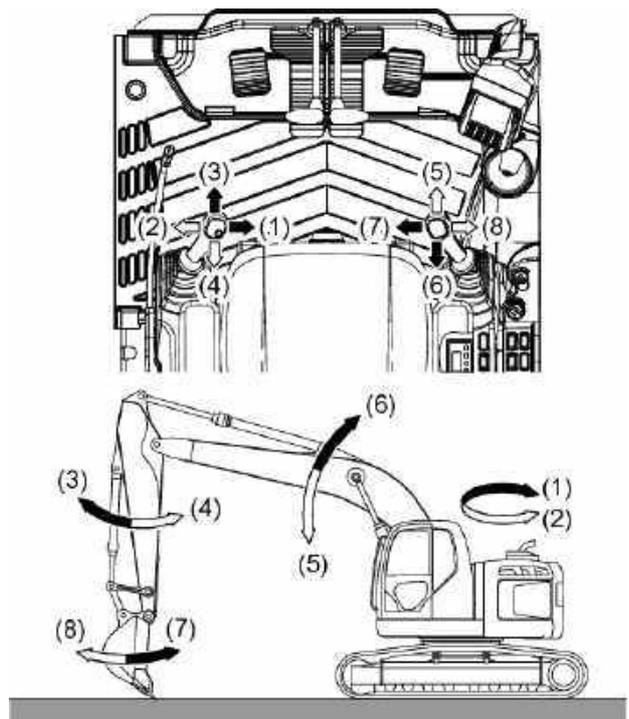
These two levers activate each operation as illustrated in the right.



- Confirm for safety around the working area. Also ensure that each lever operation is in accordance with the operating pattern indicated on the labels.
- If labels do not match the operator's control pattern, replace them immediately to avoid accidents and/or injury.
- When the contents of label do not accord with the machine movement, replace the label with proper label suited for the machine.

Release the hand and the lever returns to the neutral position, and then the attachment stops moving. And it is possible to perform various operations at the same time.

- Left Control Lever
  - (1) Swing Right
  - (2) Swing Left
  - (3) Arm Out
  - (4) Arm In
  - N (Neutral):  
Upper structure and arm are held in the position where those are.
- Right Control Lever
  - (5) Boom Down
  - (6) Boom UP
  - (7) Bucket Digging
  - (8) Bucket Dumping
  - N (Neutral):  
Boom and bucket are held in the position where those are.



## [2. MACHINE FAMILIARIZATION]

### 3. Left and Right Travel Lever & Pedal

The travel lever & pedal are located in front of operator seat. They are used to move the left or right track of the machine either forward or backward.



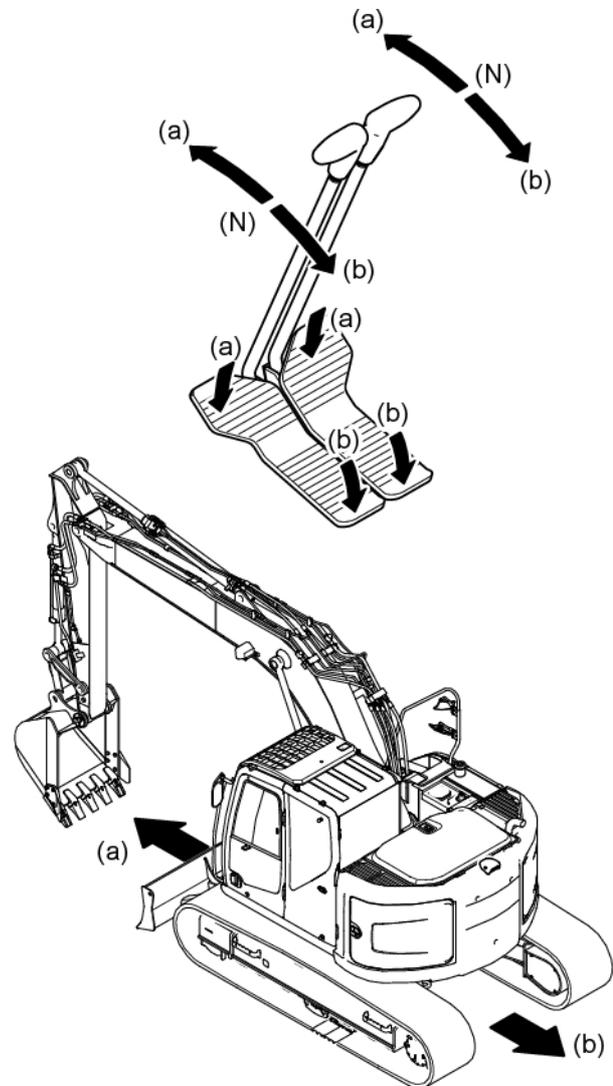
-Take precaution with the control lever in travel operation. There is a possibility of accident because the attachment is suddenly swung and moved by the unexpectedly touching and shifting the control lever.

-When operating the control lever, make sure the crawler frame direction. When the travel motor is located on the front side, the travel lever functions of the travel levers will be opposite.

-Do not perform the work while putting foot on the pedal. There is a possibility of serious accident resulting in injury and death because the machine starts abruptly by unexpectedly depressing the pedal. Do not put foot on the pedal but of driving with foot on the pedal and changing the direction.

-Pay attention when driving and operating with pedal.

- (a) "Forward"  
Variable speed forward track movement.
- (b) "Backward"  
Variable speed reverse track movement.
- (N) "Center"  
Neutral position.



### 2.3.4 FUSES & RELAY BOX

#### CAUTION

Make sure the starter key switch is in the "OFF" position when replacing fuses.

The fuses protect the electrical system from excess current. If operation is not normal, a fuse may be blown. Replace blown or faulty fuses with the spare fuses as follows.

Replace any fuse generating white powder on it or in case that some looseness exists between the fuse and fuse holder.

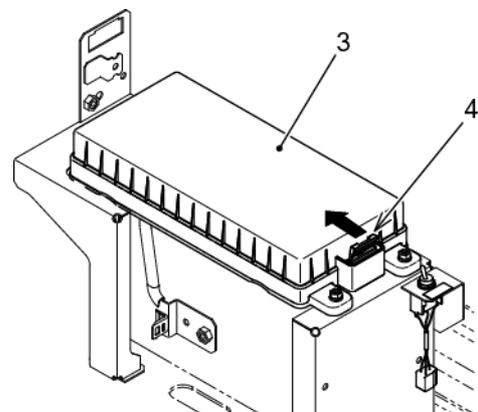
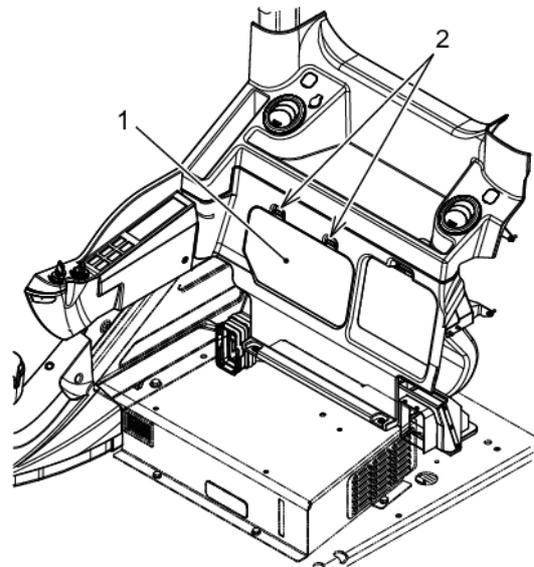
#### IMPORTANT

-When replacing a fuse, replace it with one of the same capacity.

-The spare fuses are stored in the back side of fuse box cover.

#### Replacing Procedure

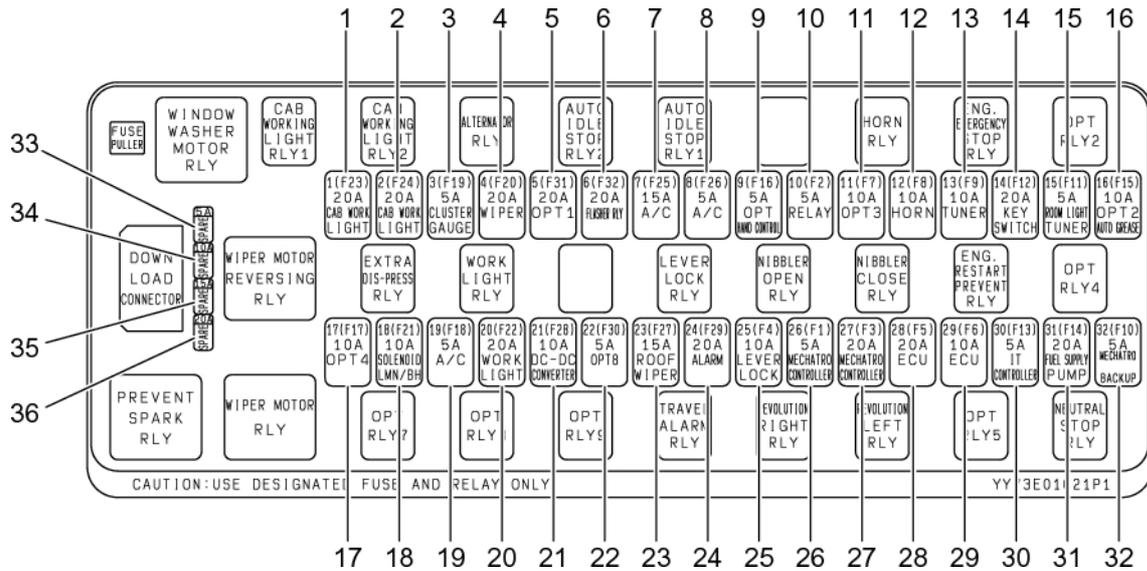
1. Hold grip (2) of cover (1) located on the rear side of operator seat and pulls it forward and take out the cover (1).
2. To remove the cover of fuse box, press lock (4) of cover (3) inward to unlock and then lift it up.
3. When replacing the fuse, remove the fuse from the fuse box with fuse remover.
4. After replacement of fuse, attach the cover securely.



## [2. MACHINE FAMILIARIZATION]

### Fuses

Follow the procedures below to replace "



No.	AMPS	FUNCTION	No.	AMPS	FUNCTION
1	20A	Cab Work Light	21	10A	DC-DC Converter
2	20A	Cab Work Light	22	5A	Option 8
3	5A	Gauge Cluster	23	15A	Option (Roof Wiper)
4	20A	Wiper, Washer	24	20A	Travel Alarm
5	20A	Option 1	25	10A	Pilot Control Shut-Off Lever
6	20A	Flasher Relay	26	5A	Mechatro Controller
7	15A	Air Conditioner	27	20A	Mechatro Controller
8	5A	Air Conditioner	28	20A	Engine Controller (ECU)
9	5A	Option (Hand Control)	29	10A	Engine Controller (ECU)
10	5A	Relay, Hour Meter	30	5A	IT Controller
11	10A	12 Volt Power Supply	31	20A	Fuel Supply Pump
12	10A	Horn, Horn Relay	32	5A	Mechatro Controller (Back Up)
13	10A	Tuner	33	5A	Spare
14	20A	Starter Key Switch	34	10A	Spare
15	5A	Room Lamp, Tuner	35	15A	Spare
16	10A	Option 2 (Auto Grease)	36	20A	Spare
17	10A	Option 4			
18	10A	Solenoid Valve			
19	5A	Air Conditioner			
20	20A	Work Light			

### 2.3.5 FUSIBLE LINK (FOR STARTER)

In case power does not come when the starter key switch is turned "ON", a disconnection of the fusible link is suspected.

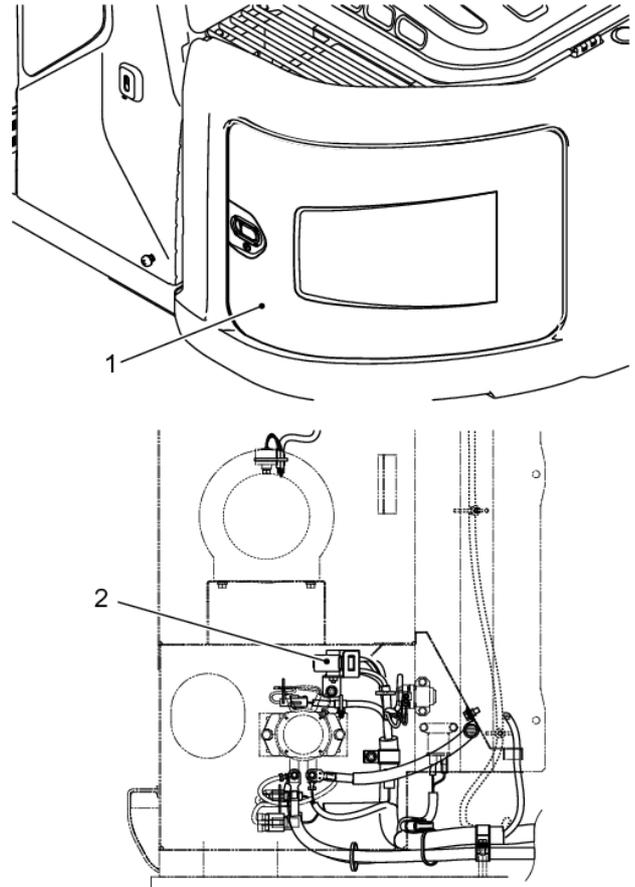
Inspect and replace the fusible link.

#### IMPORTANT

The fusible link is of a fuse wiring of big size provided in the electric wiring

#### Checking and replacing procedure

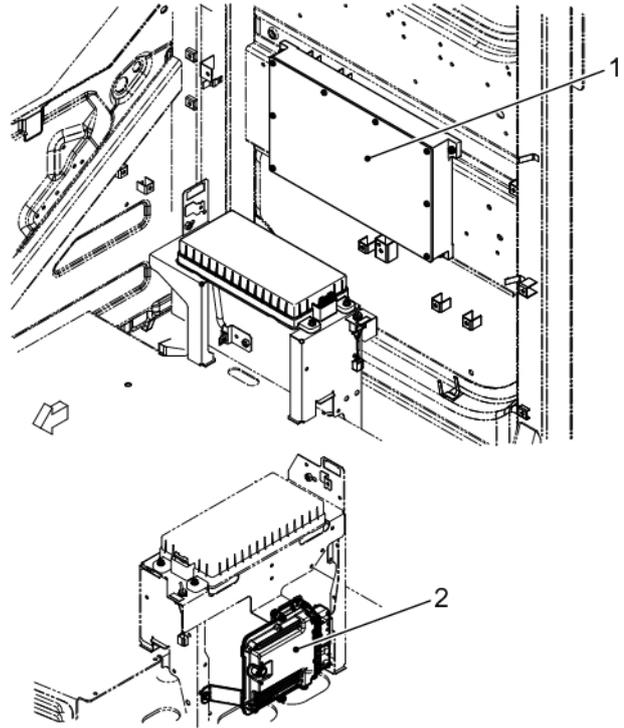
1. Using starter key switch, unlock and open the side door (1) on left side of counterweight, and hold the door open with stay.
2. Remove fusible link (2) and check or replace it with new one.
3. After checking or replacement, remove stay and close the door and lock it securely.



### 2.3.6 MECHATRO-CONTROLLER (CPU), ENGINE CONTROLLER (ECU)

Mechatro-controller and engine controller are positioned at the rear side of operator seat.

1. Mechatro Controller (CPU)
2. Engine Controller (ECU)



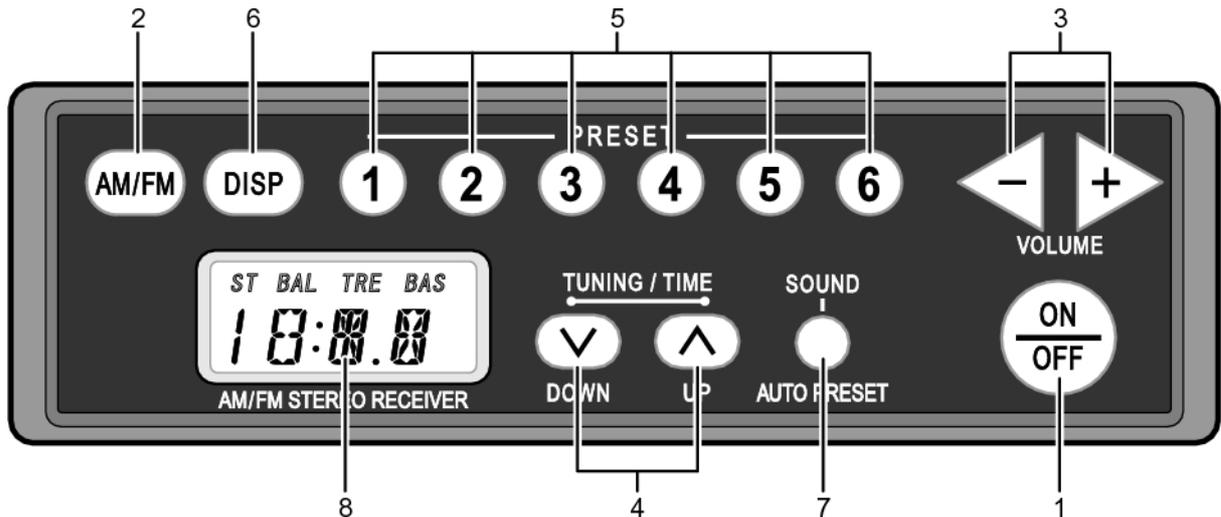
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**IMPORTANT**

- Be careful not to splash water, mud and drinks on the controllers.
  - When error occurred on the controller, do not take self-service, but contact our dealer/distributor.
-

### 2.3.7 HANDLING OF RADIO

#### A. EXPLANATION OF UNITS

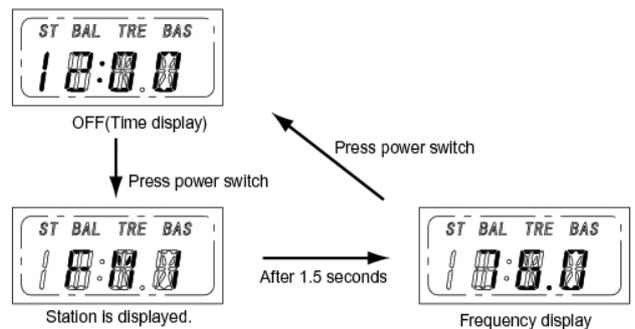
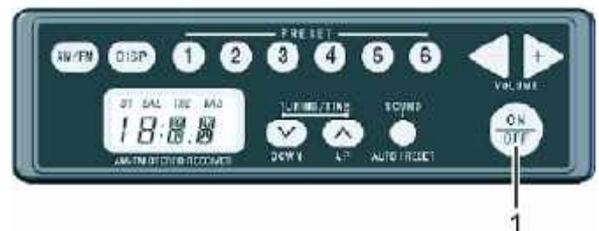


#### 1. Name and How to Use of Each Unit

1. Power switch
2. AM/FM switch key
3. Volume control
4. UP / DOWN key
5. Preset key
6. DISP (display change) key
7. Sound control key
8. Display (Time/frequency)

#### 2. Power control

1. Press the power switch (1) and the power is switched from OFF to ON. After displaying the band AM or FM, the frequency or the time is displayed.



## [2. MACHINE FAMILIARIZATION]

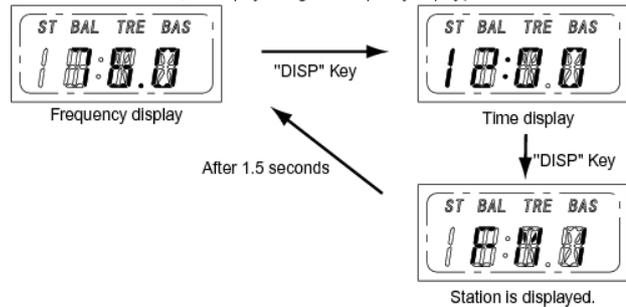
### 3. Display switching

- To change the display from/to the frequency display to/from the time display, press "DISP" key (6).

When the time display is changed to the frequency display, firstly the band display appears and then the frequency display appears.

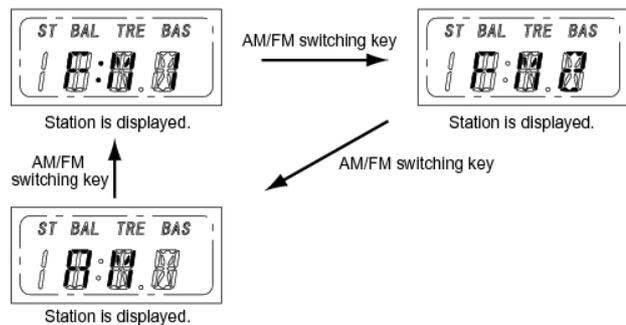


To switch the frequency display to the time display, press the "DISP" key in this condition.  
(To switch the time display to the frequency display, press the "DISP" key. After the display of station for 1.5 seconds, the display changes to frequency display.)



### 4. Band switching

- When pressing "AM/FM" key (2) each time, the band display is switched to FM1→FM2→AM in order.  
When the band is switched, the station received before switching is selected.



### 5. How to select station

This radio can select the station by the following three methods.

- Manual tuning
- Auto select station
- Preset memory

Each selecting method is explained below.

**5.1 Manual tuning**

1. When pressing "UP"/"DOWN" key, the frequency increases or decreases.



**5.2 Auto select station**

1. When pressing "UP" or "DOWN" key (Press more than 1 second), the frequency increases or decreases by one step.
2. When the radio waves are received during auto tuning, or when pressing "UP" or "DOWN" key, the auto tuning is interrupted, but the frequency is keeping as it is.

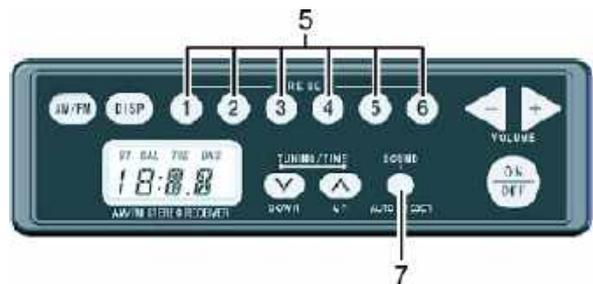


**5.3 Preset memory**

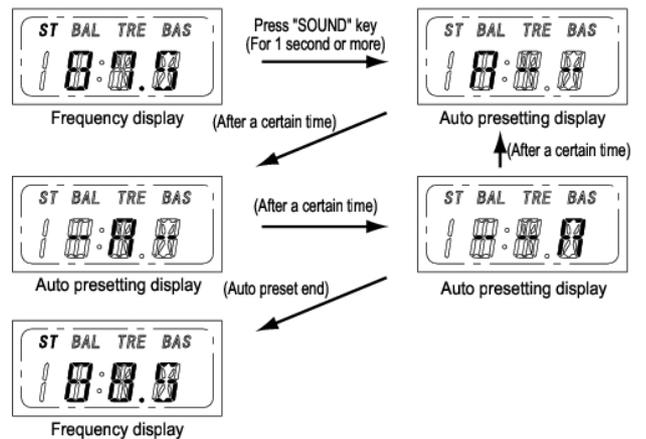
**5.3.1 Auto preset**

The good received frequencies are detected, and they can be memorized in 6 memories of preset automatically.

1. Press the tone control key (7) for 1 second or more.  
The desired station starts the presetting.
2. During presetting, the display "A" moves from left to right.
3. After auto presetting, this function can receive the memorized station.



(Example of FM1 is selected)

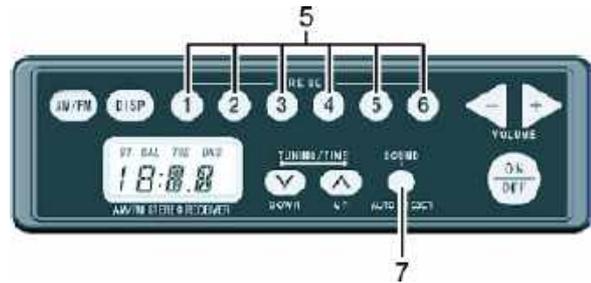


## [2. MACHINE FAMILIARIZATION]

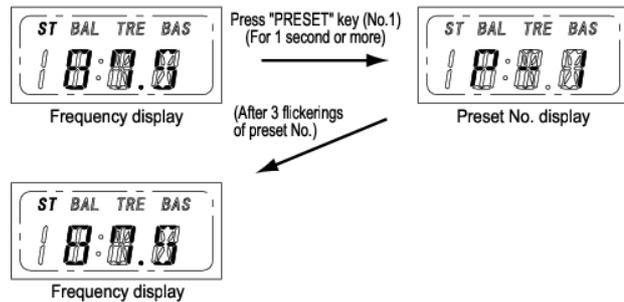
### 5.3.2 Manual preset

Press one of the 6 "PRESET" keys (5) for 1 second or more. The currently received station is memorized in the pushed button of preset No.

1. Press one of the 6 "PRESET" keys (5) for 1 second or more.
2. After 3 flickering of the memorized preset No. display, the frequency is displayed.



(Example of FM1 is selected)

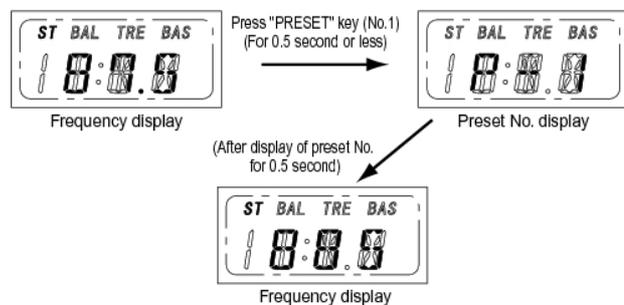


### 5.3.3 Preset memory

Press one of the 6 "PRESET" keys (5) for 0.5 second or less. And the calling frequency which is memorized in the preset No. and its reception are available by pressing the "PRESET" key.

1. Press one of the 6 "PRESET" keys (5) for 0.5 second or less.
2. After the pressed preset No. is displayed, the display is changed to the frequency which is memorized in the preset No.
3. Receive the required radio station by changed frequency.

(Example of FM1 is selected : The frequency 88.5 MHz is registered in advance)

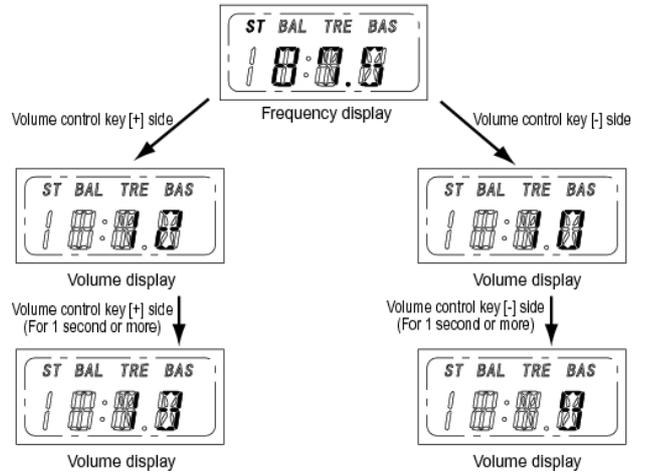


**6. Volume control**

1. To turn up the volume level by 1, press the "+" side of volume control key (3). And to turn down the volume level by 1, press the "-" side of volume control key (3). During the operation of volume control key, the level of volume is displayed.
2. Hold the volume control key in the pressed condition, the volume level changes continuously up and down.
3. After operation of the volume control key, the display returns to the frequency or the time display.



(Example of FM1 is selected : From the nolume 11 level)



**7. Sound control**

The "Balance" and "Tone" are adjustable with this key.

-Balance adjustment: "BAL"

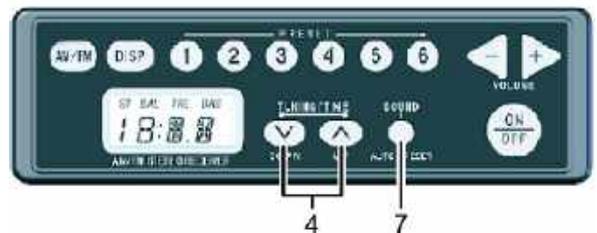
To control the volume of right and left speakers.

-Treble adjustment: "TRE"

To control the treble.

-Bass adjustment: "BAS"

To control the bass.

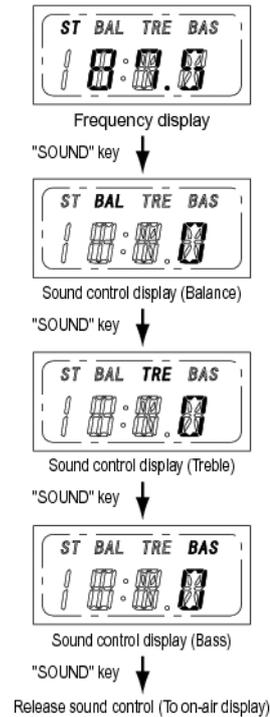


## [2. MACHINE FAMILIARIZATION]

### 7.1 Selection of adjusting item

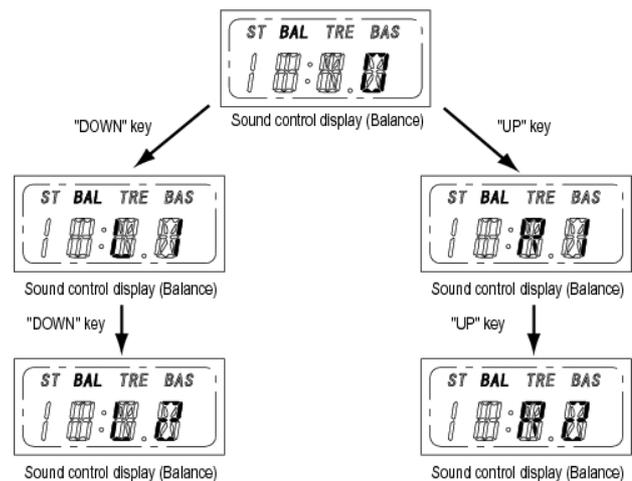
- The display changes to "BAL", "TRE", and "BAS" in order whenever "SOUND" control key is pushed. Choose the item that you desire to adjust.

(Example of FM1 is selected)



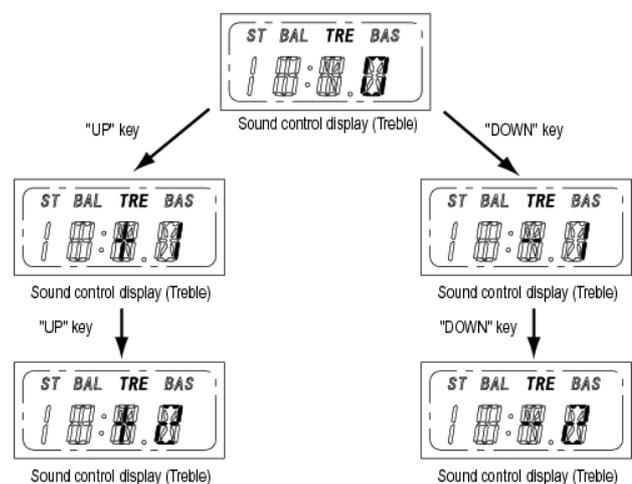
### 7.2 Balance control

- To raise the volume of a left speaker, push the "UP" key (4) while "BAL" is displayed. To raise the volume of a right speaker, push the "DOWN" (4) key while "BAL" is displayed.



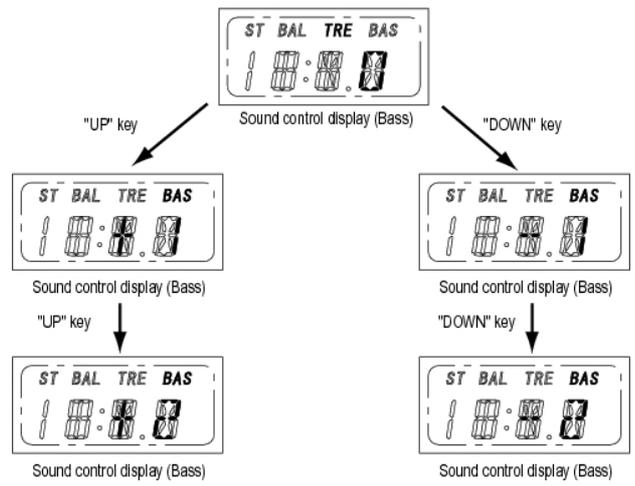
### 7.3 Treble control

- To emphasize the treble, push the "UP" key (4) while "TRE" is displayed. To weaken the treble, push the "DOWN" key (4) while "TRE" is displayed.



**7.4 Bass control**

- To emphasize the bass, push the "UP" key (4) while "BAS" is displayed.  
To weaken the bass, push the "DOWN" key (4) while "BAS" is displayed.



## [2. MACHINE FAMILIARIZATION]

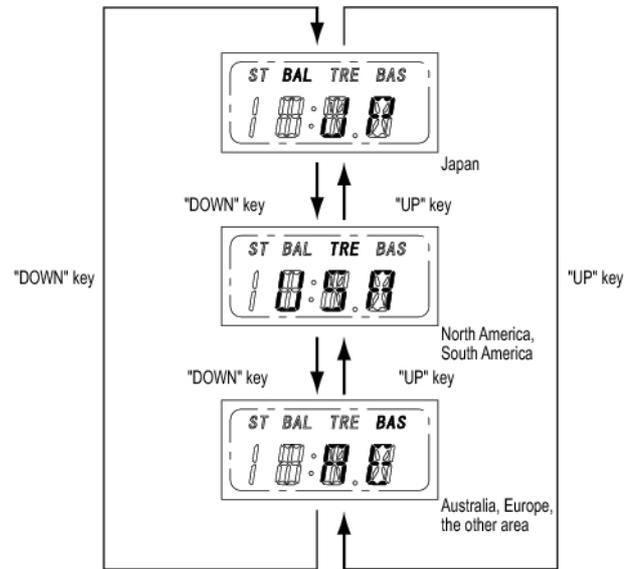
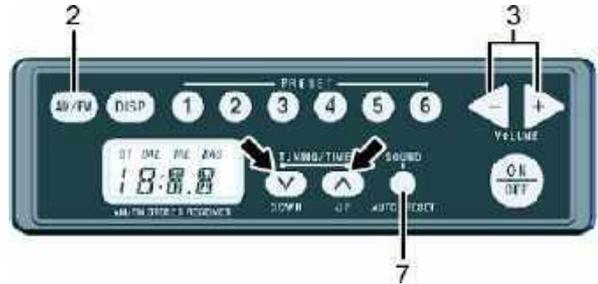
### 7.5 Area setup procedure and check procedure

In case the radio is replaced, some radio models require area setup. If the set area is not the area in which the radio is to be used, radio waves are not received correctly.

When starting to use the radio, read this paragraph.

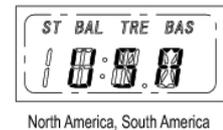
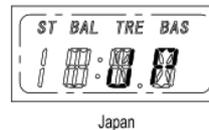
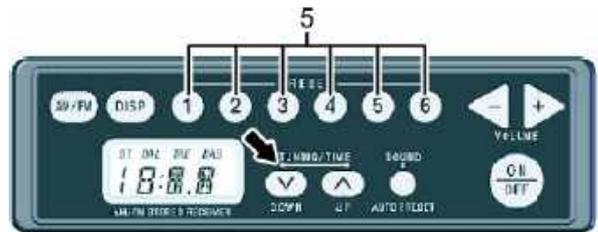
#### Area setup procedure

1. Set the key switch to "ACC" and turn the radio OFF (time display).
2. Press and hold "AM/FM" switch key (2) and volume control key (3) simultaneously for 5 seconds.
3. The present set area appears on the display (the set area at the part shipping is JP).
4. The displayed area changes by the "UP" and "DOWN" keys. Set the displayed area to your area by using them (refer to the right figure).  
If the key operation is stopped for 10 minutes, the area setup mode is cancelled.
5. Press sound control key (7) to store the setting and return to the time display.
6. Turn the key switch from "ACC" to "OFF". Then the procedure is completed.



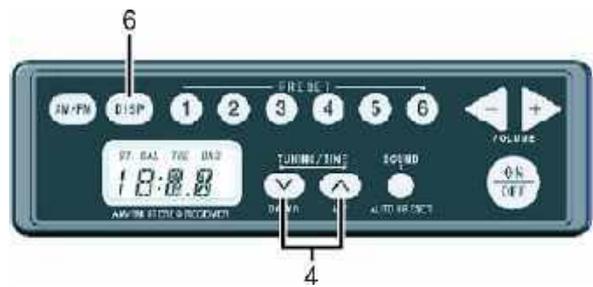
#### Check procedure of setting condition

1. Set the key switch to "ACC" and turn the radio OFF (time display).
2. Press the "DOWN" key and "4" of preset key (5) simultaneously.  
The present set area appears on the display (refer to the right figure below).
3. Turn the key switch from "ACC" to "OFF". Then the procedure is completed.



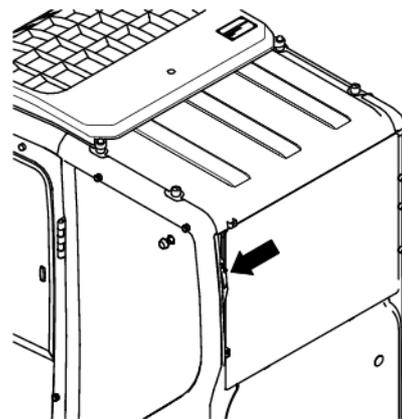
**7.6 Time setting**

1. Press "DISP" key (6) for 1 second or more while the time is displaying. The "Hour" display flickers.
2. To increase "Hour", press the "UP" key (4). To decrease "Hour", press the "DOWN" key (4).
3. Press "DISP" key (6) again, and the "Minute" display flickers.
4. To decrease "Minute", press the "UP" key (4).
5. Press "DISP" key (6) again, and the time setting is completed.



**B. ANTENNA**

To prevent interference, retract the antenna in before transportation and storing.



### 2.3.8 AIR CONDITIONER

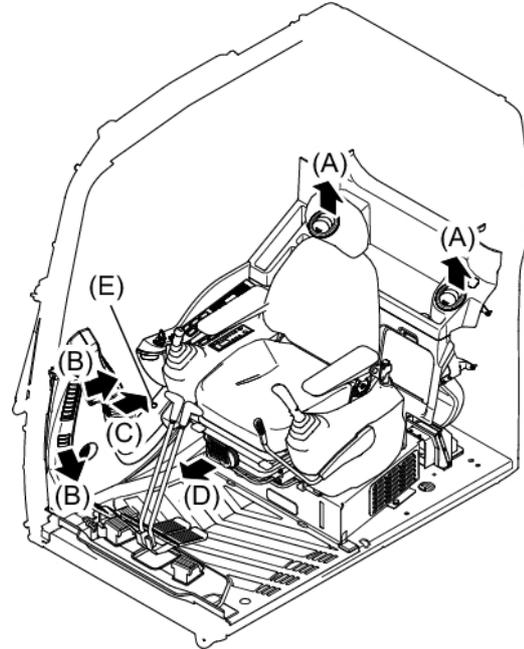
The air conditioner provides the comfortable indoor atmosphere and freely controls the room temperature and also removes the moisture resulting in prevention of blur on the glasses. The air conditioner is located under the operator seat and sends out warm air and cool air in the cab.

#### Grille (Air outlet)

Select air stream in preferable direction by hand.

(A), (B), (C), (D): Air outlet

(E): Solar radiation sensor



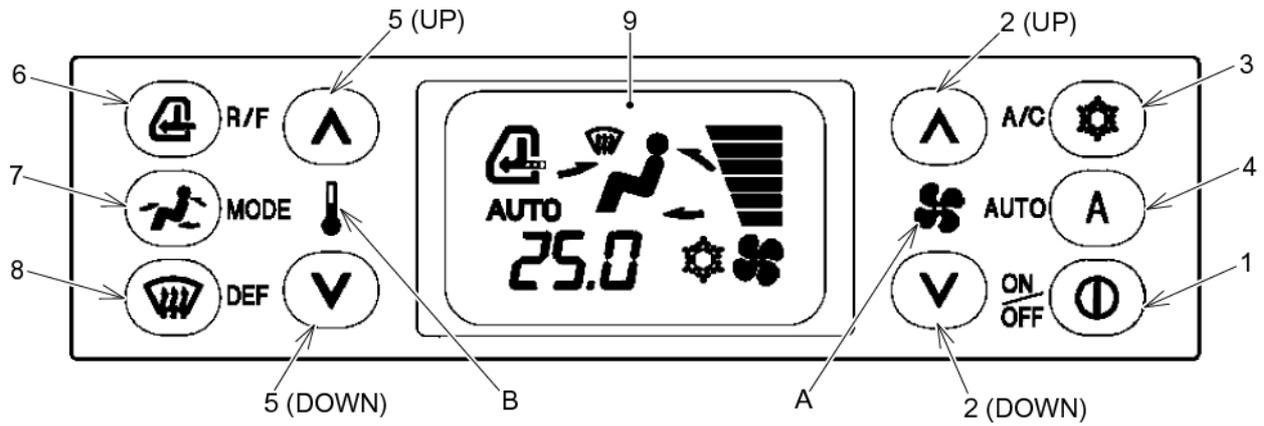
#### Precaution in Use of Air Conditioner

---



- When the air conditioner is running-in, start the engine at slow speed. Do not start the air conditioner at high speed. This might cause failure of air conditioner.
  - Pay attention to the control panel and solar radiation sensor (E) so as not to splash water on them. The entry of water in the control panel and solar radiation sensor might cause unexpected failure. And do not bring fire near the air conditioner.
  - Keep the solar radiation sensor clean to have the auto function of air conditioner achieved sufficiently. And do not place the things which may interrupt the function of sensor on the surroundings.
-

Control panel description



No.	NAME	No.	NAME
1	Main power switch	6	Internal and external air selector switch
2	Fan speed selector switch (UP/DOWN)	7	Air outlet mode selector switch
3	Air conditioner switch	8	Defroster switch
4	Auto control switch	9	LCD display
5	Temperature setting switch (UP/DOWN)		

**Notice**

- The LCD display indicates temperature, air outlet mode, air conditioner ON/OFF, AUTO ON/OFF, internal/external air switching, fan speed and defroster ON/OFF.
- Each switch, fan mark and thermometer mark are illuminated green at night.
- Operation of switch:

• **Valid operation**

Simultaneous pressing of two switches of the switches 1-7

• **Invalid operation**

Simultaneous pressing of two switches of the same kind of switches (2),(5),(7) and (8)

Simultaneous pressing of three switches

Example 1:

If the fan speed selector switch (2: UP) is pressed while the temperature setting switch (5: UP) is held down, both switch functions are valid.

Example 2:

If the temperature setting switch (5: DOWN) is pressed while the temperature setting switch (5: UP) is held down, both switch functions are invalid.

When the electronic sound "bleep" is heard, the switch operation is valid.



## [2. MACHINE FAMILIARIZATION]

### A. FUNDAMENTAL USE

Before turning air conditioner on, close doors of cab and windows to achieve the best performance.

- Press the auto control switch (4) and set the temperature at random in the range from 18.0 degrees C to 32.0 degrees C. The outlet air temperature, outlet opening and fan speed are adjusted automatically by controller so that indoor temperature of cab comes closer to the set temperature.



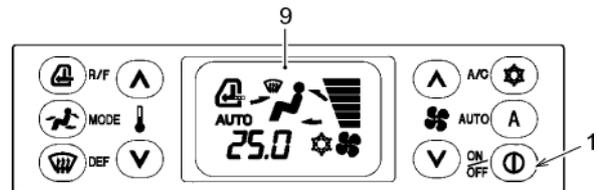
- Select proper mode manually from the internal/external air selector switch (6) and the air conditioner switch (3) ON/OFF.
- Select preferable fan speed manually through the fan speed selector switch (2) when the fan speed is not preferable. This time, the indicator lamp of "AUTO" in LCD display goes out. To return to automatic climate control, press auto control switch (4).

### B. CONTROL PANEL FUNCTIONS

#### 1. Main power switch and display

To start or stop the air conditioner and fan, this switch is used.

1. LCD display (9) is indicated when the air conditioner is operating. And the air conditioner is not actuated, LCD display is not indicated.
2. When the main power switch (1) is pressed, all functions for the air conditioner are active. Whenever this switch is pressed, all functions return to the last stopped condition. (For example, if the last state is "AUTO", the operation returns to "AUTO".)
3. Also the air conditioner is stopped by turning a starter key switch off. But the operating condition just before switching off may not be restored when the key switch is turned on again.



**2. Air conditioner Switch and Display**

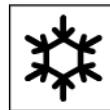
To adjust the airflow of fan, this switch is used. When the air conditioner switch (3) is set to manual mode, display of fan speed is as follows.

FLOW	Lo (MIN FLOW)	M1	M2	M3	M4	Hi (MAX FLOW)
DISPLAY						

When "UP" or "DOWN" of fan speed selector switch (2) is pressed, automatic control of fan speed is released, and "AUTO" display goes out.

**3. To start or stop the air conditioner (cooling and dehumidification), this switch is used.**

When the mark of snow on LCD display (9) is unlit and the air conditioner switch (3) is pressed, compressor is actuated. And the mark of snow on LCD display (9) comes on.

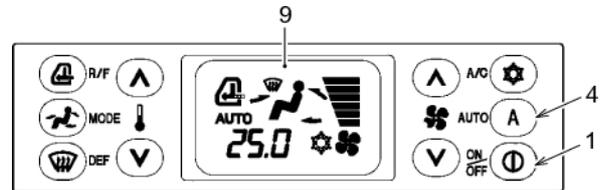


When the switch (3) is pressed again, the compressor stops and the snow mark goes out.

**4. Auto control switch and display**

To start or stop the automatic air conditioner (cooling and dehumidification), this switch is used.

1. When the main power switch (1) is ON, press this auto control switch (4), the air conditioner activates and the LCD display (9) comes on.
2. When the auto control switch (4) is pressed, fan speed and air outlet are automatically controlled, and "AUTO" indicator lamp on LCD display comes on.
3. When the main power switch (1) is OFF, the auto control switch (4) is pressed; the air conditioner power and automatic control are turned on.

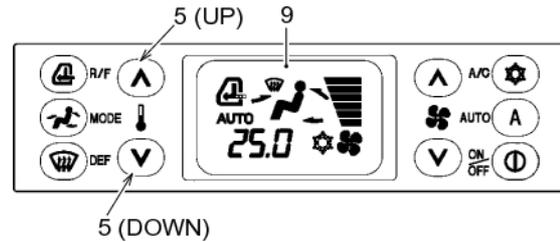


## [2. MACHINE FAMILIARIZATION]

### 5. Temperature setting switch and display

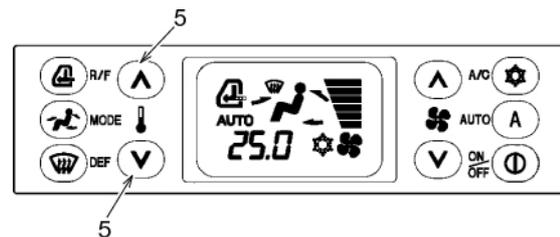
To adjust the temperature, this switch is used.

1. To increase the temperature, press the temperature setting switch (5) (UP).  
To decrease the temperature, press the temperature setting switch (5) (DOWN).  
The temperature goes up or down by 0.5 degrees C.  
To increase or decrease the temperature continuously, continue to press the temperature setting switch (5). And set the temperature in the range from 18 degrees C to 32 degrees C.
2. The set temperature is indicated in digits on LCD display (9).
3. The set temperature 18 degrees C is the lowest cooling temperature. And 32 degrees C is the highest heating temperature. Control beyond either of these limits is not possible.



4. Setting temperature display switching function from/to degrees F to/from degrees C. The setting temperature display can be switched from/to degrees F to/from degrees C.

To change the display from Centigrade to Fahrenheit or vice versa, press the two temperature setting switches (5) simultaneously for 5 seconds.



Display of LCD

Centigrade: LO, 18.5 - 19.0~31.5, HI

Fahrenheit: LO, 64 - 65~89, HI

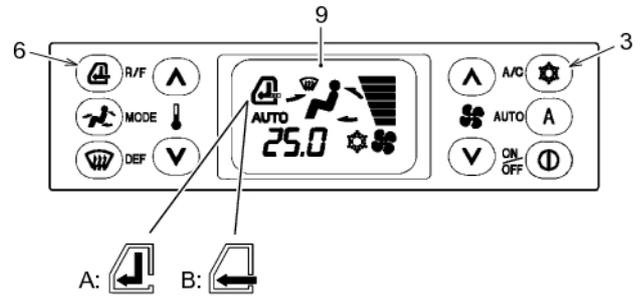
### Notice

If an error occurs, error code display has a priority of display.

**6. Recirculation and fresh air selector switch and display**

To switch the air ventilation mode from/to internal air recirculation to/from external fresh air, this switch is used.

1. Suction (fresh air intake) mode is indicated on LCD display (9).
2. Each time the internal and external air selector switch (6) is pressed, the mode is switched to air recirculation or fresh air intake.

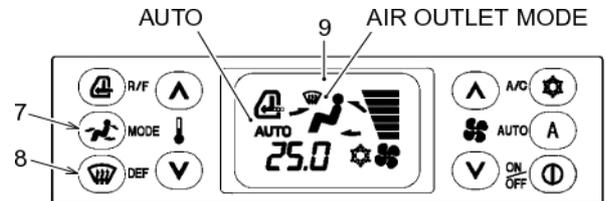


A: Air Recirculation  
B: Fresh Air Intake

**7. Air outlet mode selector switch and display**

To select the air outlet position, this switch is used.

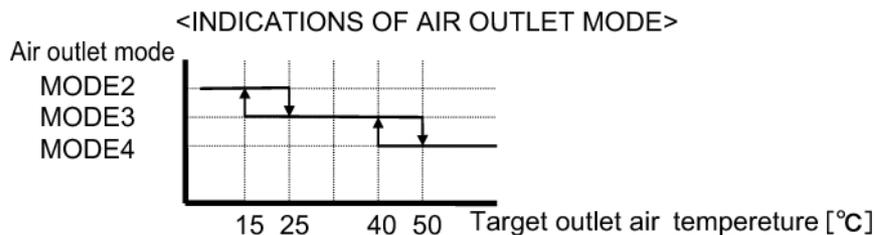
1. Air outlet position is indicated by the arrow on LCD display (9).
2. Press air outlet mode selector switch (7) in the condition where auto display light is on, and the display mode is fixed, "AUTO" indicator lamp on LCD display goes out, and "AUTO" control of air outlet opening is released.
3. Air outlet mode and display



<INDICATIONS OF AIR OUTLET MODE>

MODE	1	2	3	4	5
AIR OUTLET MODE	FACE	VENT	HIGH-LEVEL	F/D	DEF
DISPLAY					

- Each time when this switch (7) is pressed manually, and air outlet mode is changed from FACE to VENT to BILEVEL to FOOT to FACE.
- To select the defroster mode, press the defroster switch (8).
- When air conditioner is controlled automatically, airflow of fan is controlled according to this curve.

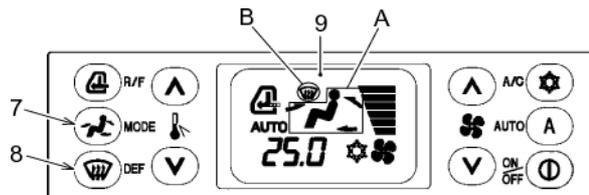


## [2. MACHINE FAMILIARIZATION]

### 8. Defroster switch and display

To remove the humidity from the windshield, this switch is used.

1. Press defroster switch (8), defroster indicator lamp will be displayed (B).
2. Press air outlet mode selector switch (7), and it returns to air outlet mode (A) just before pressing defroster switch.
3. Press defroster switch (8) in the condition where AUTO display is lighting up, "AUTO" indicator lamp on LCD display (9) goes out and the auto control of air outlet opening is released.



**C. HOW TO USE AIR CONDITIONER****1. Cooling**

1. Press the main power switch (1).
2. Press the fan speed select switch (2) and select "HI" airflow.
3. Press the temperature setting switch (5), and set it to preferable temperature.
4. Press the air conditioner switch (3).
5. Press the internal and external air selector switch (6) and select "Recirculation mode".
6. Press the air outlet mode selector switch (7) and select "VENT MODE 2".
7. When the air temperature in the cab is cooled, adjust the temperature and fan speed to desired conditions.
8. When auto control switch (4) is pressed, the temperature and the air outlet mode are automatically controlled.

**CAUTION**

To avoid freezing of the evaporator, do not operate the air conditioner for a long time in the conditions of MAX set temperature and LO airflow.

When the evaporator freezes and cooled air does not come out, stop the air conditioner once. Using the temperature setting switch (5), set the temperature high, and operate the air conditioner for a while in the maximum airflow "HI". After that, turn on the air conditioner switch (3).

**2. Heating**

1. Press the main power switch (1).
2. Press the fan speed select switch (2) and select "HI" airflow.
3. Press the temperature setting switch (5), and set it to preferable temperature.
4. Press the internal and external air selector switch (6) and select "Fresh air mode".
5. Press the air outlet mode selector switch (7) and select "F/D MODE 2".
6. When the air temperature in the cab is heated, adjust the temperature and fan speed to desired conditions.
7. When auto control switch (4) is pressed, the temperature and the air outlet mode are automatically controlled.

**CAUTION**

Engine coolant is used for heating, and it is possible to heat the air when the temperature of coolant is high.

**3. Dehumidification heating and demist**

1. Press the main power switch (1).
2. Press the fan speed select switch (2) and select preferable airflow.
3. Press the temperature setting switch (5), and set it to preferable temperature.
4. Press the internal and external air selector switch (6) and select "Fresh air mode".
5. Press the air conditioner switch (3) and actuate the air conditioner (compressor).

**CAUTION**

When the outside air temperature is 0 degrees C or less, the air conditioner (compressor) may not start.

## [2. MACHINE FAMILIARIZATION]

### D. SELF-DIAGNOSIS

- When error occurs in input circuit of motor actuator drive line, the error can be displayed on the monitor of LCD display.

<Detection of wiring disconnection of motor actuator>

Location of error	Display of failures	
Air mixture	• "HL.E" is displayed on temperature indication	
Air outlet mode	• Human figure display is flashing	
Internal and external air selector	• Recirculation and fresh air selector display is flashing	

- When error occurs in evaporator sensor and intake air sensor, the error can be displayed on the monitor of LCD display.

<Detection of evaporator sensor and intake air sensor>

Location of error	Display of failures	
Evaporator sensor	• "E" is indicated on first decimal place of temperature indication	18 °C : LO. E 25 °C : 25. E 32 °C : HO. E
Intake air sensor	• "HL" is indicated on temperature indication "The figure from 0 to 9" is indicated on first decimal place of temperature indication	HL. 0 to HL. 9

- Detection of each sensor error by monitor mode function (Detection of failure control of control panel)

- When the air conditioner is in operating condition, press the internal and external air selector switch (6) and main power switch (1) for one second or more simultaneously. And the display of monitor mode begins. To return the display to previous display, operate 2 switches according to above mentioned same operation.
- Normal condition, disconnection and short circuit of intake air sensor, evaporator sensor and solar sensor are indicated in segment of display.
- Normal condition and short circuit of solar sensor is indicated in segment of display.  
(\* Detection of disconnection is not indicated.)

<7 segments indication of only use for monitor>

Sensor	7 segments indication
Intake air sensor	0
Evaporator sensor	1
Solar sensor	2

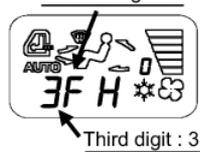
<Example : Special use 7-segment for monitor>



<Error contents of indication>

Sensor	Short circuit indication	Disconnection indication
Intake air sensor	F6H <sup>0</sup>	OCH <sup>0</sup>
Evaporator sensor	F6H <sup>1</sup>	OCH <sup>1</sup>
Solar radiant sensor	GND short circuit D5H <sup>3</sup>	5V side short circuit OCH <sup>3</sup>

<Example : Position of digit indication>  
Second digit : F



<Example : Short circuit of solar sensor 5V side>



<Example : At normal condition>



<3-digits segment list>

Third digit of segment	Second digit of segment															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	Intake air sensor disconnection indication "0CH <sup>0</sup> "															
	Evaporator sensor disconnection indication "0CH <sup>1</sup> "															
	Solar sensor short circuit indication "0CH <sup>2</sup> "															
1	Each sensor is normal															
2																
3																
4																
5																
6																
7																
8																
9																
A																
B	Solar radiant sensor short circuit indication "D5H <sup>2</sup> "															
C	Intake air sensor short circuit indication "F6H <sup>0</sup> "															
D	Evaporator sensor short circuit indication "F6H <sup>1</sup> "															

**E. STORAGE AND TREATMENT OF AIR CONDITIONER****(1) Preseason**

Contact our dealer/distributor for check and service of air conditioner before using so that it is used in good condition for the long term.

**(2) Off-season**

Operate air conditioner for several minutes once a week in the off-season.

The operation maintains the air conditioner in good condition preventing short of oil in each part of compressor.

**2.3.9 HANDLING OF SEAT BELT**

Install the seat belt properly or the fundamental performance may not be achieved.

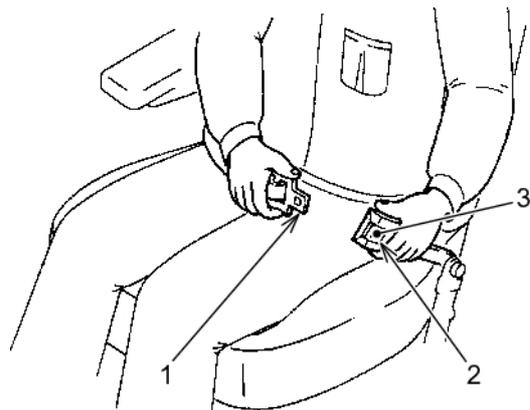
-Make sure that there is no abnormality on the belt attaching bracket and bolts before fastening the belt.

-Check attaching bolts which are used to secure the belt to the seat for loosening and tighten loose bolts again.

-Do not fail to fasten the belt during operation.

**How to Fasten Seat Belt**

1. Since this seat belt is equipped with take-up motion, the adjustment of length is unnecessary.
2. Check that the seat belt (1) is not twisted, and pull the seat belt out.
3. When fastening seat belt, pull it out a little longer than the required length and insert it into buckle until clicking sound is heard. Release hand, and the length is automatically adjusted and the buckle is locked.

**How to Unfasten Seat Belt**

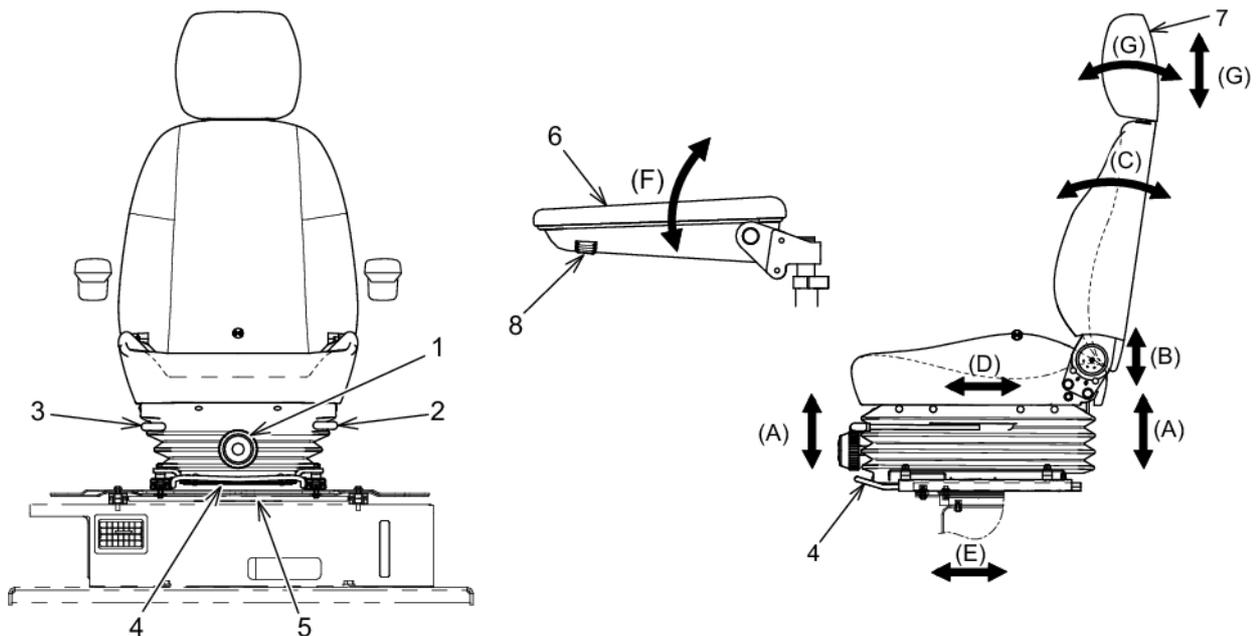
1. Press the red button (3) of the buckle (2), and the belt (1) is unfastened.

### 2.3.10 OPERATOR SEAT

The operator seat incorporates several adjustment mechanisms to insure operator comfort, ease of operation and operator safety. The adjustment areas are as follows.



When adjusting the operator seat, pay attention to hands in order not to be caught between handle and seat.



#### A. Operator Weight Adjustment

While watching the top end of the dial, rotate the adjustment knob (1) until scale of weight reaches close to the weight of operator.

#### B. Seat Height Adjustment

1. To tilt the rear of seat up and down, pull the height adjustment lever (2) up.
2. To tilt the front of seat up and down, push the height adjustment lever (2) down.
3. To adjust the seat height, tilt alternately front and rear of the seat.

#### C. Seat Backrest Angle Adjustment

1. To get desired seat reclining angle, pull the reclining angle adjustment lever (3), and tilt the seat backrest.
2. After the adjustment, release the lever (3) to fix the position.

#### D. Seat Horizontal Adjustment

1. To slide the seat back and forth, pull the handle (4) up.
2. After the adjustment, release the handle (4) and check that the seat is locked securely.

#### E. Control Stand Horizontal Adjustment

1. To adjust the seat and the control stand horizontally together, pull the lever (5) up and shift the seat back and forth.
2. After the adjustment, release the handle (5) and check that the seat and the control stand are locked securely.

**F. Armrest Adjustment**

1. The armrests (6) can be raised up backward.
2. To get fine-adjustment of angle of the armrests (6), turn the control dial (8) located bottom of the armrests by hand.

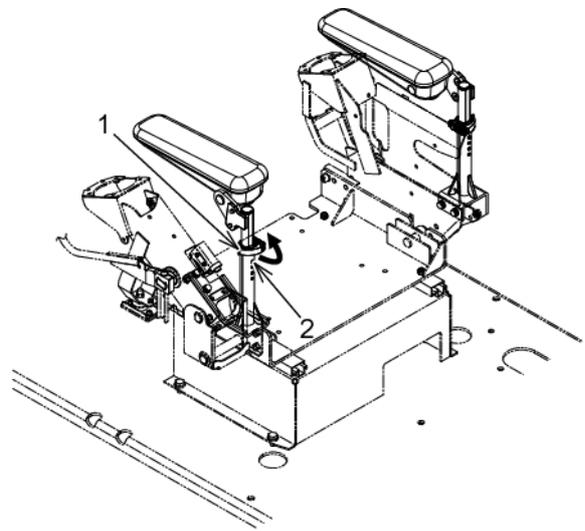
**G. Headrest Adjustment**

1. To shift the headrest vertically, hold the headrest (7) with both hands and move it a small amount up and down.
2. To shift the headrest horizontally, hold the headrest (7) with both hands, and move it back and forth.

**2.3.11 ARM REST ADJUSTMENT**

The height of right/left arm rests is adjustable in 4 steps.

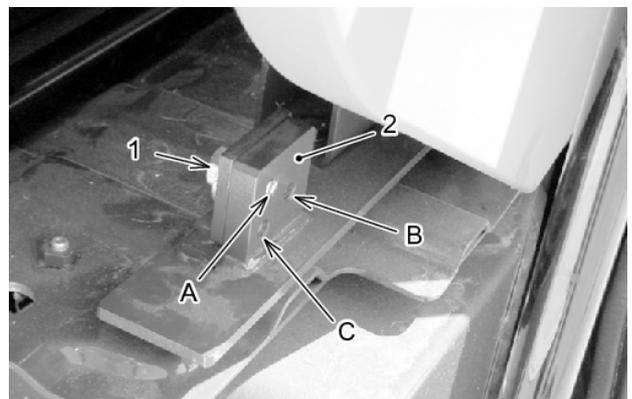
1. Open the clamp (1) in the direction of arrow.
2. Push the protruded pin (2).
3. Slide the armrest up and down to adjust the height of armrest.

**2.3.12 ADJUSTMENT OF CONTROL LEVER**

The height of right/left control stand is adjustable in 3 steps.

1. Remove bolt (1).
2. Adjust the height of hole on plate (2) to your easy to operate position and tighten plate (2) to the fixing position with bolt (1).
3. Similarly, adjust stand height on the other side by procedure 1) and 2).

A : Low position  
 B : Middle position  
 C : High position



### 2.3.13 OPERATOR CAB

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#### **WARNING**

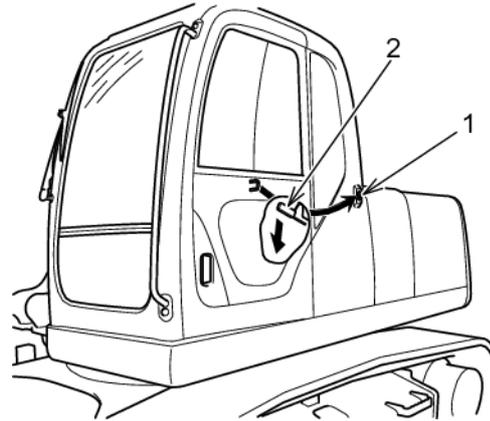
When necessary to leave from the operator seat, lock the pilot control shut-off lever.  
After the control lever is unexpectedly touched without the pilot control shut-off lever locked, this may cause serious accident resulting in injury and death.

---

#### **A. Cab Door Lock**

This is used to fix door in the condition where the door is open.

1. Push door against catch (1) and door is fixed.
2. When necessary to open the door, push down lever (2) on the left side of operator seat and the catch is released.
3. When necessary to fix the door, fix door to the catch securely.



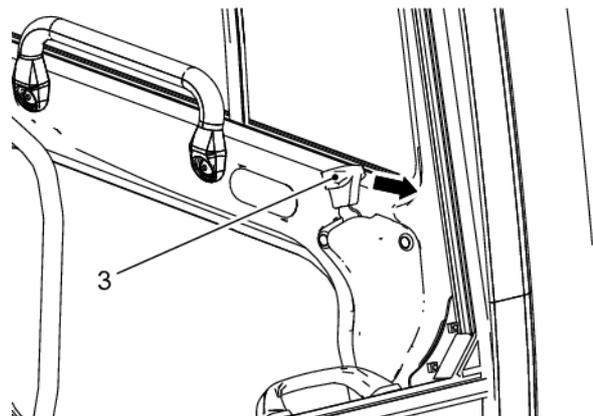
#### **CAUTION**

In operation, lock the door securely even if it is on either open side or close side. When not locked, the door may be open unexpectedly and this might cause the injury. And also it may cause the failure of machine.

---

#### **B. Releasing Door Lock from Inside of Cab**

When necessary to open the door from the inside of cab, pull lever (3) by hand and the door opens.



### C. Opening and Closing Front Window

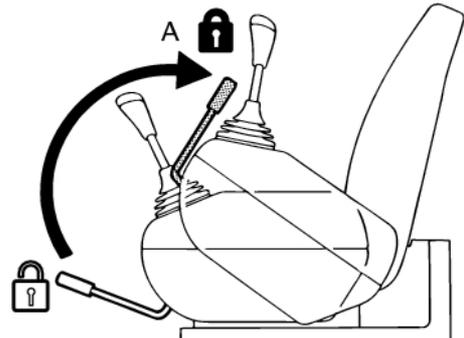
#### **WARNING**

-The front window should be opened and closed in the condition where the machine is parked in level and locked securely. If the lock is released in the forward tilting position of machine there is a possibility of falling of the front window.

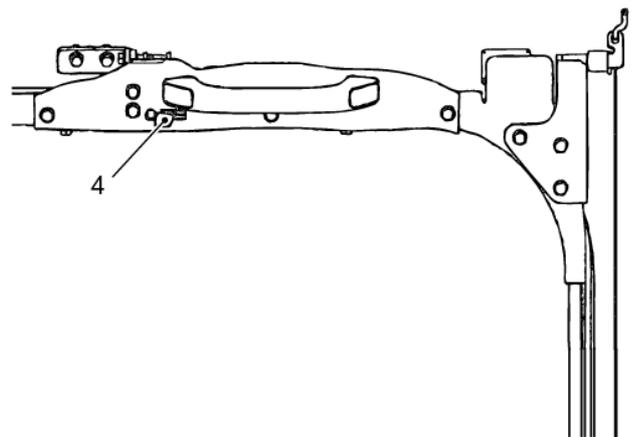
-When closing the front window, the closing speed increases due to the weight of front window. Hold and close it by both hands securely.

-When storing the front window in, pull up the pilot control shut-off lever to the "LOCKED" position and stop the engine.

1. Park the machine on the level ground, put the bucket on the ground, pull up the pilot control shut-off lever to the locked position and stop the engine.



2. Push lock lever (4) on the upper center part of window (upper) right and release the lock.
3. Hold and push up the handle on the upper and lower parts of the front upper window. After the front upper window reached to the end on the rear side of roof, it is locked automatically. And then make sure that it is locked securely.
4. When closing the front upper window, close it by the reverse procedure of that in above items 2.to 3.
5. When closing the front window, push the upper sides of front window forward and lock it securely.



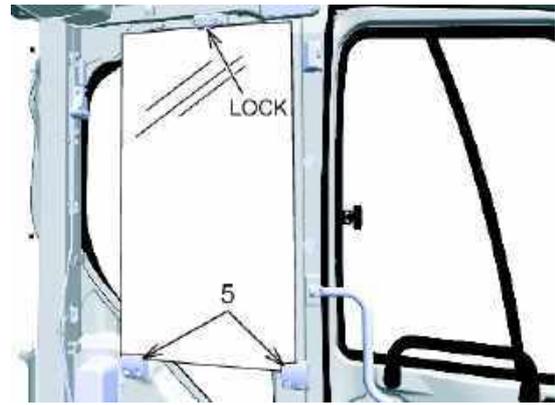
#### **CAUTION**

To prevent from catching your hand between windows, open and close the front window slowly. The work in no locking and incomplete locking conditions might cause injury.

## [2. MACHINE FAMILIARIZATION]

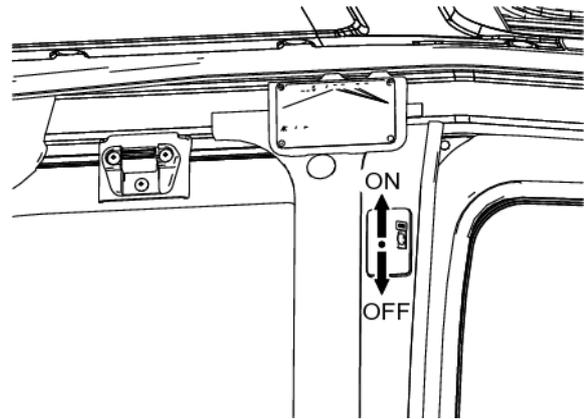
### D. Removing & Storing Lower Front Window

1. After placing upper front window in ceiling, hold lower front window by hands and remove it from window frame.
2. Store the removed lower front window in holder (5) on the left rear side of cab securely.



### E. Cab Room Lamp

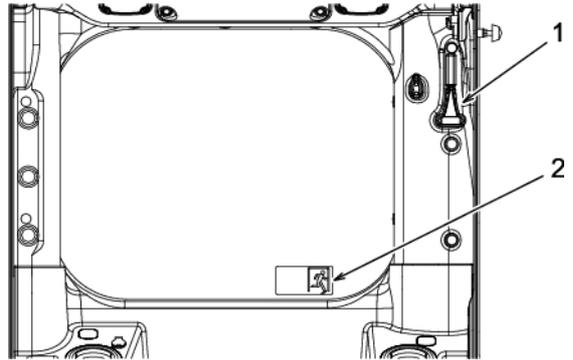
- a. Turn cab lamp "ON" by pushing the lamp switch way up.
- b. The lamp goes out at the neutral position.
- c. Turn "OFF" by pushing switch all the down ward.



### 2.3.14 EMERGENCY ESCAPE FROM CAB

If it is impossible to open the cab door in an emergency, escape from the cab by the following way.

1. Open the front window and escape through the front window.
2. If the front window is unavailable to escape, break the rear window glass by using life hammer (1).



#### Notice

For how to open the front window, see item "Opening and closing front upper window".

#### CAUTION

Pay attention to the broken pieces so as not to be injured when breaking the window glass.

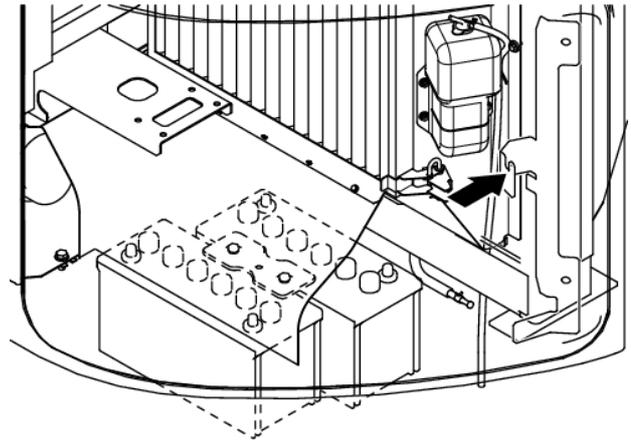
#### IMPORTANT

Label (2) indicating the emergency exit are affixed on the rear window.

### 2.3.15 OTHER EQUIPMENT (ACCESSORY)

#### A. Grease Gun Holder

This is provided on the inside of cover on the left rear side of machine. When the gun is not used, put it on this holder.



---

**CAUTION**

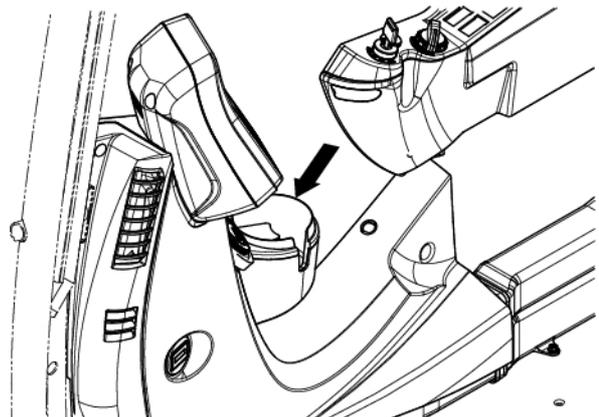
Be sure to store a grease gun in this grease gun holder.

---

#### B. Cup Holder

This is provided on the right side console in the cab.

This is used to put drinks, etc. in.



# 3. MACHINE OPERATION

## 3.1 MACHINE OPERATION

### 3.1.1 EVERYDAY CHECK-UP

#### A. Daily Inspection

Before starting the engine, walk around the machine to check for any loose nuts and bolts, any oil, fuel or coolant leakage, and the condition of attachment and hydraulic system.

Check for any looseness in the electrical wiring and for any accumulated material (leaves, dirt , etc.).

Repair and clean as necessary.



The deposit of combustible, fuel leakage and oil leakage in heated area around the engine, muffler and battery may cause fire of machine. Check the area sufficiently, and if the abnormality is found, repair it or contact our dealer/distributor.

1. Check the engine for any oil, fuel or coolant leakage. Repair as required.
2. Check the area around the engine and radiator for any accumulated material and remove as required.
3. Check the hydraulic equipment, hydraulic oil tank, hoses, and joints for oil leakage, and repair as required.
4. Check the travel system, such as the crawler, idlers, and sprockets, for any damage or wear, and the bolts for looseness.
5. Check the attachments, cylinders, linkages and hoses for any cracks, wear or looseness and repair as required.
6. Check the door, cover, steps and handrails for damage, and the bolts for looseness. Repair and tighten bolts as required.
7. Verify that the gauges and the monitor panel (gauge cluster) function properly.
8. Check rear view mirror for abnormality, and if abnormality is found, repair it.  
Clean the surface of mirror and adjust the angle so that the rear sight is visible from the operator seat.
9. Check seat belt and attaching metal for possible damage and if damaged, replace it with new one.



- During the regeneration, DPF system part, DPF body and outlet of DPF get hot. Keep enough distance between the PDF related parts and the other surrounding parts.
- During the machine operation, if "WARNING of exhaust gas post-cleaning device need to regeneration" is displayed on the gauge cluster, park the machine on safety area. And operate the DPF regeneration switch at low idle speed. Manual regeneration starts and the idling speed increases. Manual regeneration stops automatically within about 30 minutes.
- During the machine operation, even though the "WARNING of exhaust gas post-cleaning device need to regeneration" is displayed on the gauge cluster, if you neglect the manual regeneration, the engine power reduces. Furthermore, if you neglect the manual regeneration, regeneration becomes impossible. In this case, contact our dealer/distributor.
- When white smoke may be emitted temporarily from exhaust outlet with incineration of PM (particle matter) during the DPF regeneration. But this phenomenon does not show the engine trouble.

#### 3.1.2 CHECKING BEFORE STARTING ENGINE

The following checkup should be performed once before the first engine startup in a day.

##### A. Checking Coolant Level for Shortage and Making Up



-Do not open radiator cap if not required.

Check coolant level of the reserve tank (1) when engine is cooled down.

-Never remove radiator cap when engine is hot. Allow engine to cool down before removing radiator cap.

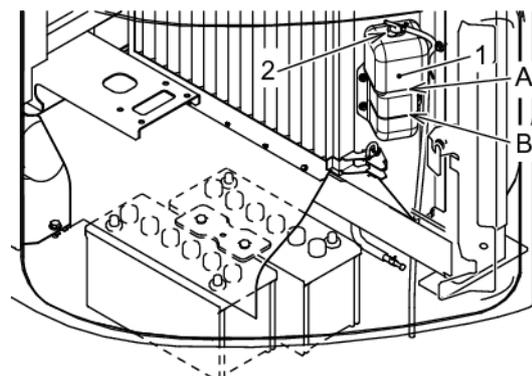
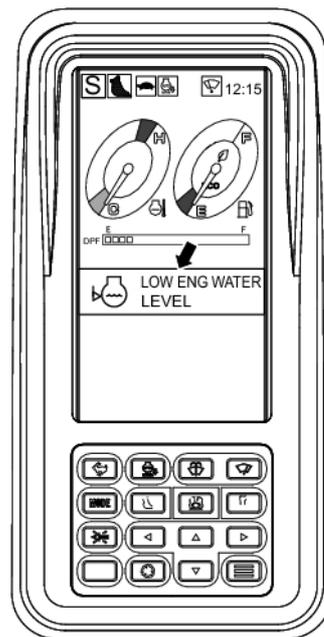
-If the water level in the reserve tank drops frequently, contact Kobelco or a service representative for assistance.



The coolant level check switch is provided on the upper part of radiator upper tank.

If a warning is displayed on the multi-display when the engine is running or when the engine switch is turned ON, loosen the radiator cap and pour coolant water into the neck of the radiator. Also, contact our company or a service representative for assistance.

1. Open left side door of radiator with starter key and check that the coolant level is in the range of FULL (A) - LOW (B) of reserve tank (1). If shorted, remove filler cap (2) of reserve tank and supply to FULL (A) level.
2. After supply, tighten the cap securely.
3. If the reserve tank is empty, check it for water leaks. Next, check the water level in the radiator. If the water level is low, fill the radiator with water and then fill the reserve tank with water. Immediately contact our company or a service representative for assistance.
4. Close the side door on the left side face of machine and lock it with starter key.



---

**B. Checking Oil Level of Engine Oil Pan and Making Up**

---

**⚠ WARNING**

Immediately after engine is stopped, there is a possibility of getting burn with heated parts and oil. Start working after the temperature is not hot.

---

**⚠ CAUTION**

The DPF system starts regeneration (combustion) automatically when a certain amount of soot is deposited in the DPF. To perform this regeneration (combustion), a slight amount of fuel is injected. Because of this, the fuel gradually enters in the engine oil and the amount of oil in the oil pan may be increased. But this is not a failure.

If the oil level exceeds the "change" level of the oil level gauge, it will cause an engine failure. If the oil level exceeds the "change" level, change the engine oil.

The fuel mixed in the engine oil will cause dilution of the engine oil, so be sure to change the engine oil at the specified interval.

---

**IMPORTANT**

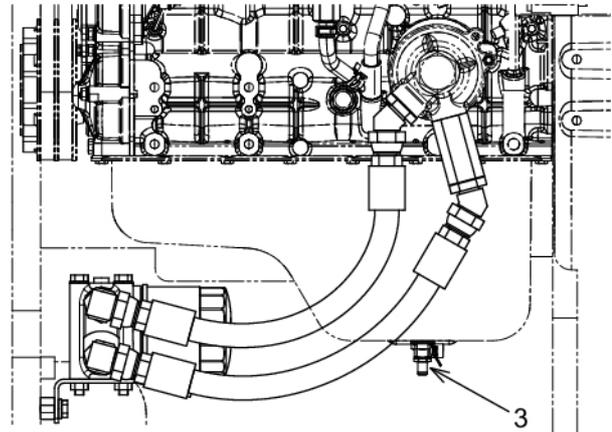
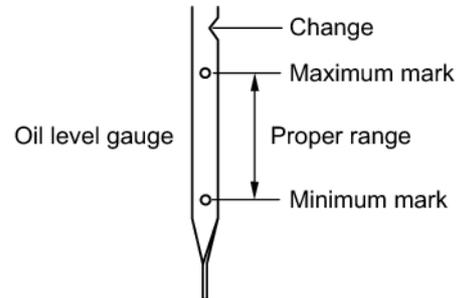
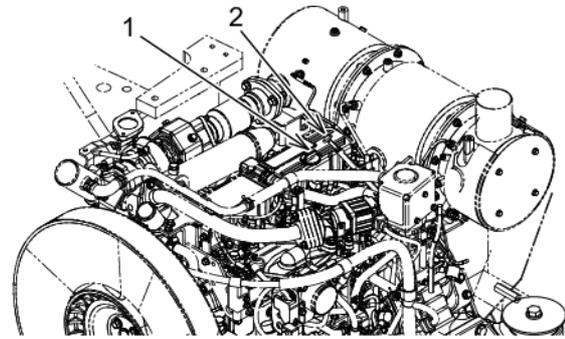
- Make sure the machine is on firm level when checking engine oil level.
  - Always make sure to check engine oil level before starting the engine.
  - Keep the engine to standstill for at least 30 minutes, when checking engine oil level after working.
-

### [3. MACHINE OPERATION]

1. Open engine hood and support it with stay.
2. Pull out oil level gauge (1) and wipe oil with a clean cloth.
3. Insert oil level gauge (1) in oil pan fully.
4. If the oil level attached to oil level gauge (G) is at between "maximum mark" and "minimum mark", it is normal. If the oil level is low, add the specified engine oil. If the oil level exceeds the "change" level, or the engine oil is contaminated or deteriorated, change it ahead of the periodic replacement interval.

When changing the engine oil, see "4.16 500 HOUR INSPECTION & MAINTENANCE PROCEDURES".

5. If the oil level is proper, insert level gauge (1) securely, close engine hood and lock it with starter key.



### C. Checking Fuel Level and Making Up

#### WARNING

- Use diesel fuel only and stop engine before refilling.
- Do not overflow fuel while refilling. It may cause damage to the fuel system and cause oil spouting. Clean up all spilled fuel to prevent fire.
- Dispose of all hazardous waste in accordance with government environmental laws and regulations.

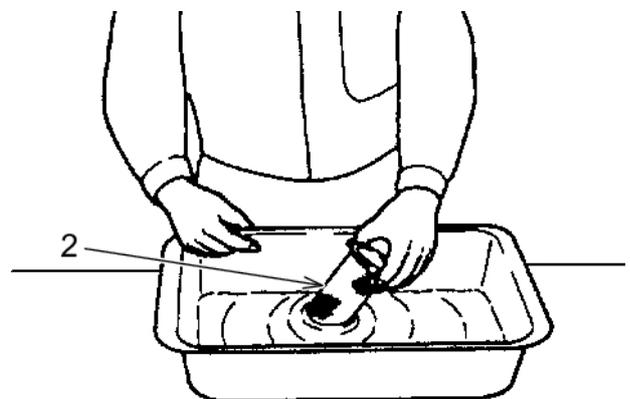
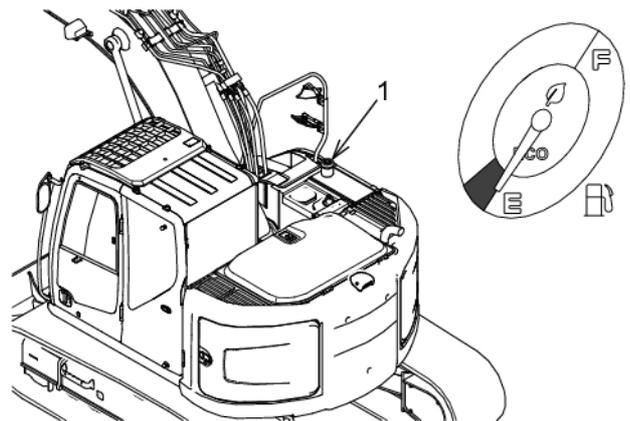
#### IMPORTANT

-It is possible to operate machine for 2 days (8 hours a day) in general use when the tank is full. Be sure to fill it up to the brim after the work in 2nd day was finished. But do not supply with fuel to the level more than necessary (to the top end of tank). There is a possibility of overflowing because the fuel expands as the outside air temperature rises.

-Use specified diesel oil for fuel.

This engine is equipped with electronic control high pressure fuel injection system to obtain the features like excellent fuel consumption and emission in clean condition. This system requires the parts in high precision and high lubricating ability. Therefore if low viscosity fuel in low lubricating ability is used, the durability may be notably lowered.

1. Check fuel level with fuel gauge by turning starter switch on. The fuel level is low when the fuel gauge reads close to E point.
2. Stop engine with starter key, remove filler cap (1) of fuel tank and make it up with fuel making sure of the level.  
When strainer is fitted to filler port, do not remove the strainer for making up.
3. When dirt is adhered on strainer (2), take out the strainer and clean it with light oil or air gun, and then fit it to filler port again.
4. Refer to "4.4 LUBRICANT, FUEL & COOLANT SPECIFICATIONS" in Chapter 4.  
-Fuel tank capacity: 200 L (53 gal)
5. After refueling, tighten filler cap (1) securely.



### [3. MACHINE OPERATION]

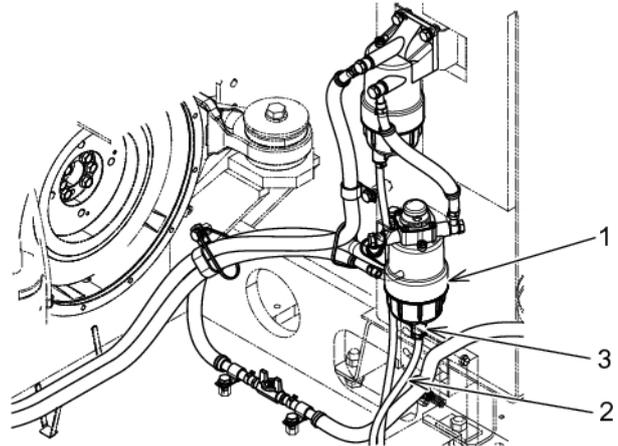
#### D. Fuel Pre-Filter Drain

Draining water collected in fuel pre-filter the fuel filter is used to separate water contaminated in fuel. When water is collected in fuel tank, drain water.



To avoid the damage of O-ring, remove foreign matter around the mounting area of drain plug. Damage of O-ring causes leak of fuel, and it causes fire.

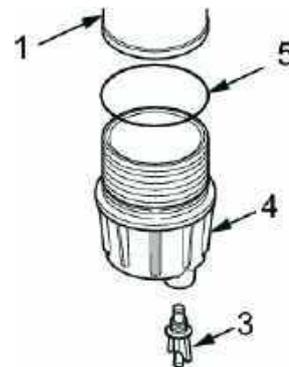
1. The fuel pre-filter (1) is installed in front of counterweight on the right rear side of machine.
2. Open side door on the right side.
3. Place a container of a suitable capacity for drain oil under the drain hose (2).
4. Loosen the drain plug (3) 1/2 to 1 turn and drain fuel from fuel pre-filter (1), and remove mixed water and accumulated sediment from case (4).
5. After draining, tighten the drain plug (3).



#### Note

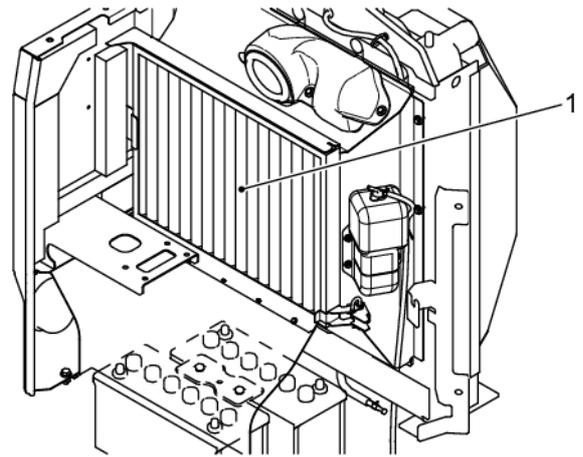
When sediment remains in a case (4) after draining, clean the case (4) and drain plug (3) again as follows.

6. Open the drain plug (3), and drain fuel and water from the fuel pre-filter (1) completely.
7. Remove the drain plug (3).
8. Clean the drain plug (3) and O-ring up. When the O-ring is damaged, replace it with new one.
9. Remove the case (4) and clean it up. When the O-ring (5) is damaged, replace it with new one.
10. Install the case (4). At this time, when the O-ring (5) of the case (4) contact with the bottom surface of fuel pre-filter (1), tighten it 1/2 turn by hand.
11. Tighten the drain plug (3) to the specified torque.  
Tightening torque :  $2\pm 0.5$  N·m ( $1.48\pm 0.37$  lbf·ft)



**E. Checking Radiator, Oil Cooler and Filter**

1. Using starter key, unlock side door on left side of counterweight, and open it.
2. By visual check, check mud, dust and leaves which contaminate filters (1).
3. When filter is contaminated heavily, refer to "4.15 250 HOUR (3-MONTH) INSPECTION MAINTENANCE PROCEDURE" for Radiator and oil cooler debris screen.



### [3. MACHINE OPERATION]

#### F. Check Hydraulic Oil Level



It is very danger because the inside of hydraulic tank is heated and pressurized.

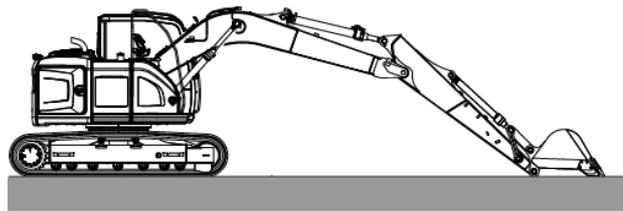
When removing filler port plug, stop engine and remove breather top end cap (1) and then release pressure from hydraulic oil tank by pressing the valve head.

For safe operation on inclines, the hydraulic oil level must be maintained between "Proper Level" and "Upper Limit" mark.

#### Checking

1. The hydraulic tank is installed on the right side.
2. Move the machine to firm level ground and set it in the hydraulic oil level check position.

Hydraulic Oil Level Check Position

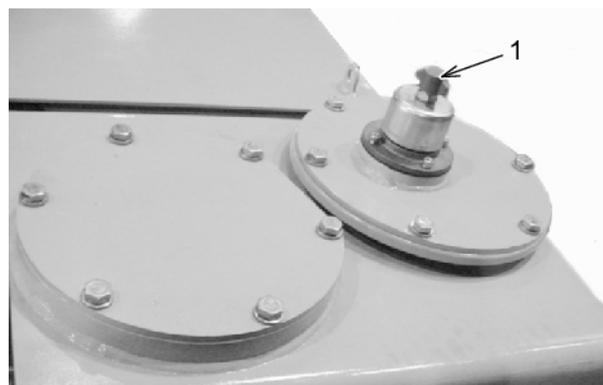
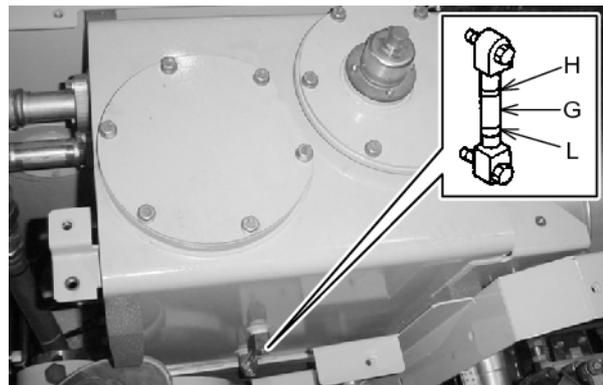


3. Check the oil level through sight level gauge (G) provided on the side of the hydraulic tank.  
Hydraulic oil level should be between H and L.

Oil level varies depending on oil temperature.

Check the oil level referring to the followings.

- Before starting :  
"L" level oil temp. 10 to 30 degrees C (50 to 86 degrees F)
- Normal operation :  
"H" level oil temp. 50 to 80 degrees C (122 to 176 degrees F)



#### IMPORTANT

Avoid overfilling. It causes damages on hydraulic equipment or oil spouting.

#### Notice

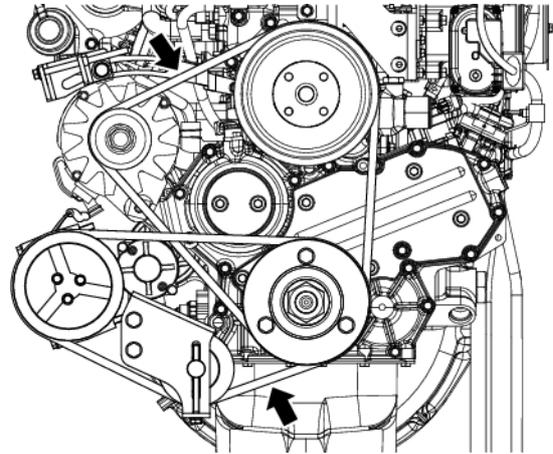
For make up procedure of hydraulic oil, refer to section "4.20.A Change Hydraulic Oil" in Chapter 4.

**G. Checking Belt Tension**

**WARNING**

Rotating parts can cause injury.  
 Keep away from fan and belt when engine is running.  
 Stop engine before servicing.

Check the fan and alternator belt for insufficient tension, wear, and damage. Insufficient belt tension may cause battery charge failure, engine overheating, or abnormal belt wear. If too much tension is applied to the belt, the bearings or belt may be damaged prematurely. Apply a force of 98 N {22 lb} to the center of belt between pulleys, and measure the belt deflection. The table below shows normal condition.



**3**

Belt	When new belt replaced mm (in)	When inspected mm (in)	Force N (lbf)
Alternator, Fan	9 to 11 mm (0.35 to 0.43")	11 to 13 mm (0.43 to 0.51")	98 (22)
Air-conditioner	3 to 4 mm (0.12 to 0.16")	5 to 6 mm (0.20 to 0.24")	24 (5.4)

**IMPORTANT**

- When replace with new belt, there is a lack of initial adaptability of the belt. Run the engine at idling speed for about three or five minutes. After that, adjust the belt tension again.
- New belts get complete initial elongation after being run about two hours.

See the section "4.15 250 HOUR (3-MONTH) INSPECTION & MAINTENANCE PROCEDURE" for details on the inspection and adjustment procedure for the belt.

### 3.1.3 ADJUSTING OPERATOR SEAT

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- Adjust the operator seat before starting operation or at the time when operator was changed.
  - Be careful not to put hands between handle and seat stand.
- 

Adjust the operator seat position so that the control lever, each control pedal and switch can be easily manipulated in the condition where operator takes seat and has his back fitted to the back seat.

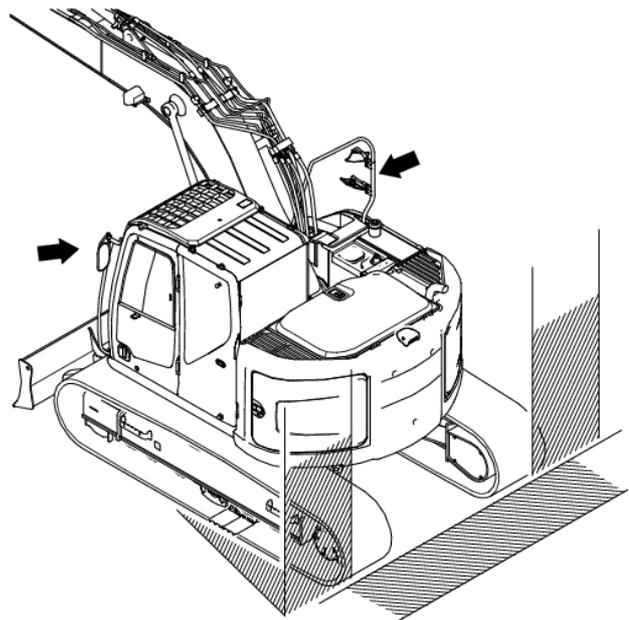


For adjustment of operator seat, see "2.3.10 OPERATOR SEAT".

---

### 3.1.4 ADJUSTING MIRROR

Before any operation, make sure that the rear view mirrors are correctly adjusted. First, take the operator's seat and adjust it correctly. Two rear view mirrors are equipped at left side of cab, on the hand rail. Adjust all mirrors so that the blind spot may reduce most from the operator's seat.

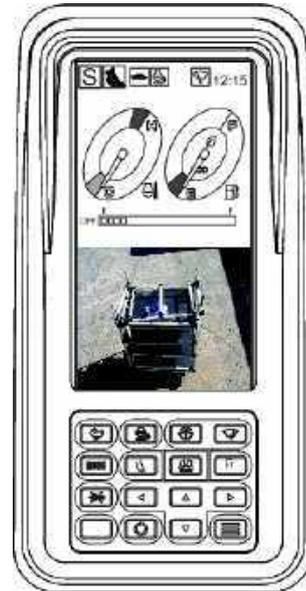


- Before any working, make sure that the mirrors are correctly adjusted. If the mirror position is incorrectly adjusted, the best all-around operator view is not obtained. This can result in serious injury, death, or machine damage.
  - Regarding adjusting mirror position, refer to "1.11 ENSURING VISIBILITY".
-

### 3.1.5 CHECKING FUNCTION OF GAUGE CLUSTER

Before starting the engine, check the warning display and gauge according with the following procedures:

1. Make sure the safety lever is in the "LOCKED" (Up) position.
2. Make sure all control levers are in the "NEUTRAL" position
3. Insert starter key and start engine.



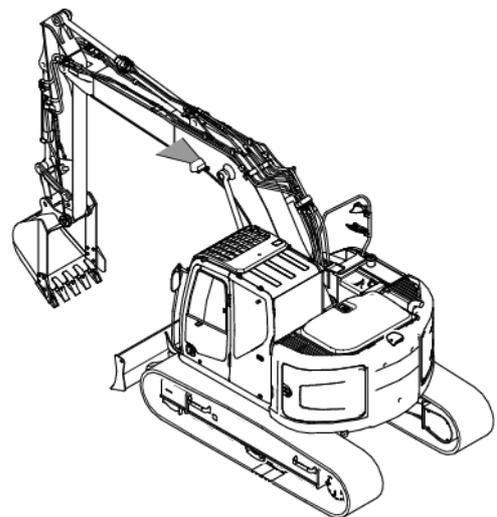
3

#### **CAUTION**

When starting engine, if warning is displayed on the multi-display, stop engine immediately and contact our dealer/distributor.

### 3.1.6 CHECKING WORK LIGHT

While the key position in the starter key switch is being "ON" position, turn on the work light switch to check the lightening of work light. If it does not lighten, presumably the light bulb is burned out or electrical wire is broken. Contact our dealer/distributor for repair.



#### 3.1.7 STARTING ENGINE

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##### **WARNING**

After making sure that no one is stayed and no obstruction is left around the machine, sound horn and start the engine.

---

##### **IMPORTANT**

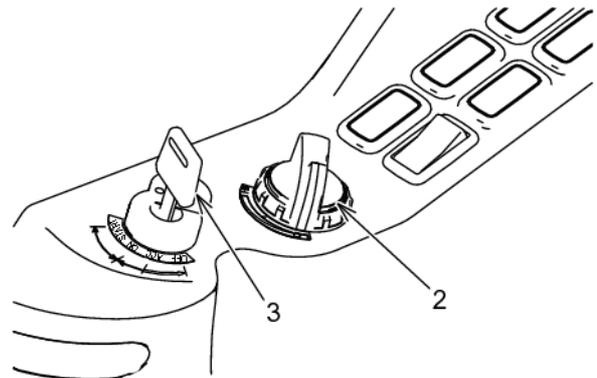
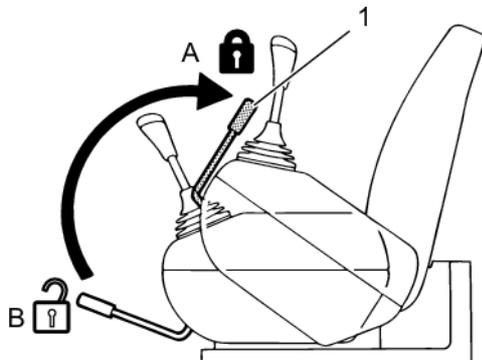
-Do not hold the starter key switch in the START position for more than 15 seconds. If the engine does not start, return the starter key switch to the OFF position, wait 30 seconds, and then try it again.

-When starting engine, if warning is displayed on the multi-display, stop engine immediately and identify the cause, and then repair it if necessary.

---

##### **A. Start-Up Under Normal Conditions**

1. Make sure that pilot control shut-off lever (1) is set to the "LOCKED" (Up) position.  
A. Locked (Up) Position / B. Unlocked (Down) Position
2. Make sure all control levers are set to the "NEUTRAL" position.
3. Set engine throttle (2) to low idling position.
4. Turn the starter key (3) to "ON" position, and confirm the operating condition of multi-display.
5. Turn the starter key switch (3) to the START position to start the engine and release after starting the engine.
6. Release the starter key switch immediately after the engine starts.  
The starter key switch will return to the "ON" position by itself.



##### **CAUTION**

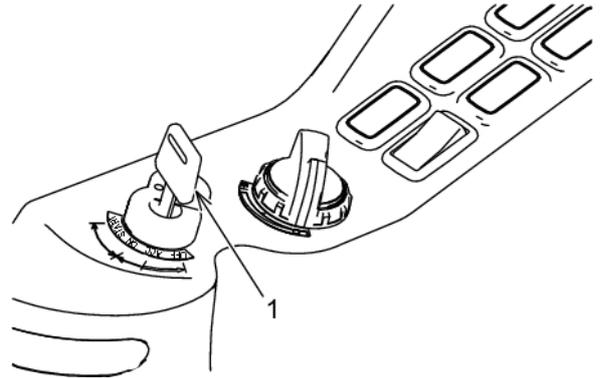
When the pilot control shut-off lever is not locked, the engine does not start.

---

**B. Start Up in Cold Conditions**

In cold weather, due to the increase in oil viscosity and decrease in battery performance, starting the engine may be difficult. Use the preheater to start the engine easily under these conditions.

1. Turn starter key switch (1) to the "ON" position and hold it for about 10 seconds.
2. After preheating is completed, start the engine immediately.



3. After engine starts, to prevent the occurring of white smoke exhaust, the preheating continues and stops automatically.
- Under cold weather, after engine start, the engine speed is fixed at low idle to prevent the turbo from being seized. During this, "ENGINE IDLING" appears.

 **ENGINE IDLING**

**3**

**Notice**

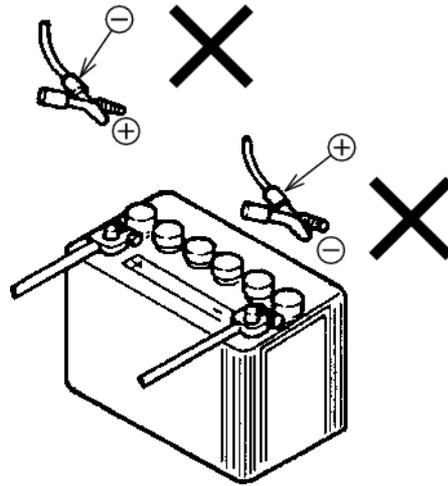
For the engine start procedure with auto warming up system, "2.3.1.B.11.2 Auto Warming Up".

### [3. MACHINE OPERATION]

---

#### C. Using Booster Cables

Observing the following precautions when using booster cables to start a disabled machine.



---

#### **WARNING** AVOID BATTERY HAZARDS

- Flammable gas (hydrogen gas) is generated in the battery. Do not allow sparks or flames to come in contact with batteries to avoid triggering an explosion.
  - Do not allow the vehicle or machine used for boosting to touch metal to metal with the disabled machine.
  - Wear hard hat, approved protective glasses or face shield rubber, gloves and other safety equipment when working with batteries.
  - Do not allow the booster cable clips to come in contact with each other once connected to a battery.
  - The negative cable, when connected to the upper frame of disabled machine, may arc causing sparks. Connect the booster cable to a ground surface in the engine compartment as far as possible from the battery.
  - If the battery fluid is frozen, do not attempt to start the disabled machine. Either allow batteries to thaw and then charge or replace the batteries.
  - Follow the order indicated in the next page for connecting or disconnecting the booster cables.
- 

#### **IMPORTANT**

- Use the battery of which the capacity is equivalent to that of the machine in out of order for the machine in normal condition.
  - Select suitable size for the booster cables and clips according to battery size.
  - Do not use booster cables that are damaged, i.e., broken insulation, damaged clamps or damaged by corrosion.
  - Connect clip securely.
  - Check that the pilot control shut-off lever is to the locked position.
  - Check that control lever has returned to neutral position.
  - The starter key switches on both machines in normal condition and out of order must be held in off condition. When the power was connected, it may unexpectedly start and cause accident.
- 

#### **Notice**

Follow the order indicated in the section "3.1.7.D Connecting / Disconnecting Booster Cables".

---

**D. Connecting / Disconnecting Booster Cables**

Make sure the starter key switch is in the OFF position before connecting the booster cables.

Proceed as follows to connect and disconnect the booster cables.



**AVOID EXPLOSION**

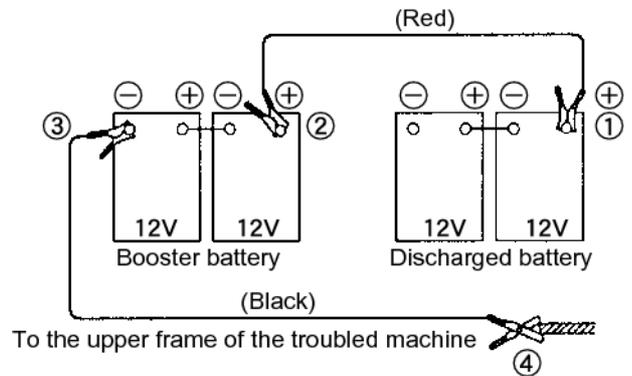
-Wrong connection of booster cables may cause explosion of the batteries. Pay special attention while connecting and disconnecting the booster cables.

-The starting system of this machine is 24 volts. Therefore the boost battery voltage in use should be 24 volts.

The application of high voltage employed for welding machine, etc. to start the engine may cause damage to the electric system.

1. Put attachment on the ground, return all control levers to neutral position and then lock the safety lever.
2. Set the starter key switch to "OFF" for both boost vehicle and disabled machine.
3. Connect the booster cable (red) clip to the positive (+) terminal on the battery of disabled machine.
4. Connect the clip from the other end of the positive (+) booster cable (red) to the positive (+) terminal on the battery of boost vehicle.
5. Connect the booster cable (black) clip to the negative (-) terminal on the battery of boost vehicle.
6. Finally, connect the clip from the other end of the negative (-) booster cable (black) to the upper frame of disabled machine, away from the battery.
7. Start the engine of boost vehicle, and run it for about 10 minutes at high idle.
8. Start the engine of disabled machine.
9. After starting the engine of disabled machine, remove the booster cables in the reverse order of the above connection order.
10. Check and repair the cause of the problem of the charging system on the disabled machine.

Cable connecting order ① → ② → ③ → ④  
 Cable disconnecting order ④ → ③ → ② → ①



### 3.1.8 STOPPING MACHINE ENGINE

Run the engine for at least 5 minutes at low speed before stopping.

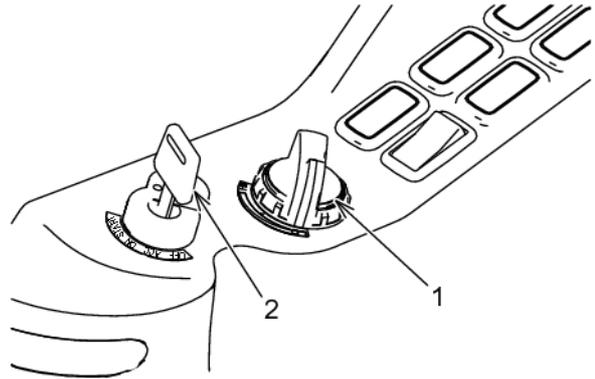
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**IMPORTANT**

Avoid damage to engine. Stopping the engine while running at high speed will cause damage from increased engine temperature affecting seals and oil.

---

1. Place the attachment on the ground before stopping the engine.
2. Place the pilot control shut-off lever in the "LOCKED" (up) position before leaving the cab.
3. Turn the engine throttle (1) all the way forward to "LO" speed position for 5 minutes to lower the coolant temperature.
4. Turn the starter key switch (2) to OFF to stop the engine.
5. Remove the starter key switch (2).



### 3.1.9 INSPECTION AFTER STARTING ENGINE

Check and ensure the following items after starting the engine.

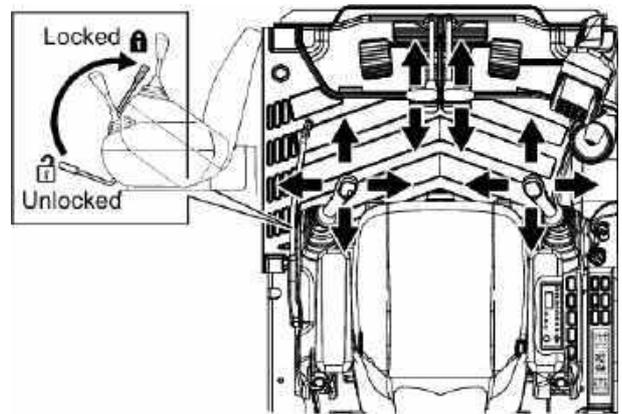


-Careless movement of any control levers may cause unexpected movement of the machine. Set the pilot control shut-off lever to the "locked"(up) position before leaving the cab.

-Make sure the swing area of machine is clear of people and obstacles before operating. Know the position of the travel motors before starting traveling and sound horn before starting operation.

#### A. Pilot Control Shut-Off Lever

1. With the engine running, set the safety control lever to the "LOCKED" (up) position.
2. Move all control levers.
3. Make sure the all functions do not operate when the safety control lever is in the "LOCKED" (up) position.
4. Move the travel control levers to make sure the machine does not move.



#### AVOID INJURY OR DEATH

If any improper operation is found, stop the engine immediately. Contact the dealer/distributor and have the machine repaired to avoid any unexpected machine movement.

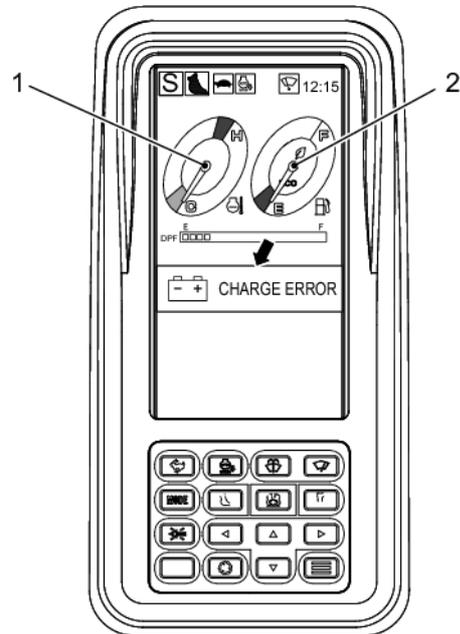
### [3. MACHINE OPERATION]

#### B. Checking Function of Engine and Multi-Display

#### **CAUTION**

When warning was displayed on the multi-display, stop the engine immediately and investigate the cause of error.

1. Check leak for oil and water around the engine.
2. Check that warnings of battery charge and engine hydraulic pressure are disappeared, and the readings of engine coolant temperature meter (1) and fuel level meter (2) are correct.
3. Check that exhaust sound and exhaust color and vibration are normal.



#### **IMPORTANT**

-Check the exhaust gas color (After warming-up and at no-load)

Colorless or light blue : Normal

Black : Abnormal, incomplete combustion

White : Abnormal, oil combustion due to oil loss by way of piston ring or valve guides

-Due to cold weather in winter the smoke may appear white. Be careful not to get confused.

### 3.1.10 MACHINE WARMING-UP

#### **WARNING**

-The proper hydraulic oil temperature for this machine is about 50 degrees C.

The abrupt operation when the hydraulic oil temperature is 25 degrees C or less may cause serious trouble for hydraulic equipment. Warm up the hydraulic oil before starting the work.

-The operation of attachment with insufficient warming-up makes the reaction of attachment to the control lever slower and may move the attachment against the purpose of operator. Do not fail to perform the warming-up.

Especially in cold weather, the sufficient warming-up is necessary.

Perform the warming-up by the following procedure.

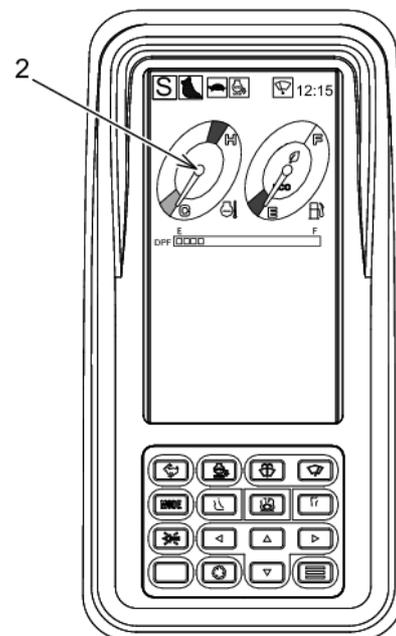
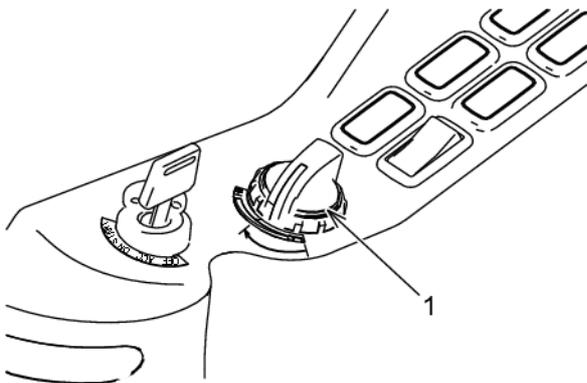
#### A. Engine Warm-Up

#### **IMPORTANT**

-The revolution up of engine while idling may cause failure and trouble to the engine. Do not revolution up the engine while idling.

-In warming-up the engine, turn auto idling stop function switch OFF.

1. Allow the engine to run for 5 minutes under no load conditions with engine throttle (1) at "LO" idle position.
2. When the pointer of engine coolant temperature (2) moves and points to the range in white, the warming-up of engine is completed.



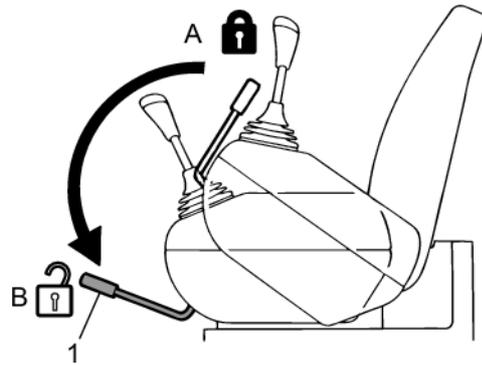
#### **Notice**

For the engine start procedure with auto warming-up system, see "2.3.1.B.11.2 Auto Warming Up".

### [3. MACHINE OPERATION]

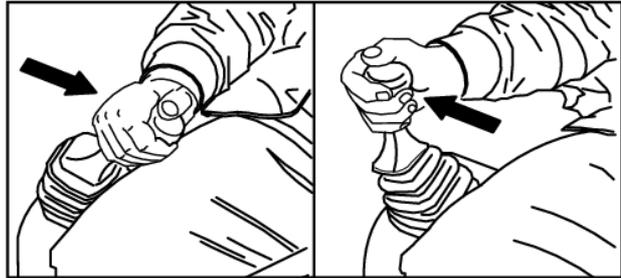
#### B. Warming Up Hydraulic Oil

1. Make sure that pilot control shut-off lever (1) is set to the "UNLOCKED (DOWN)" position.
2. Move throttle control to "HI" idle position.

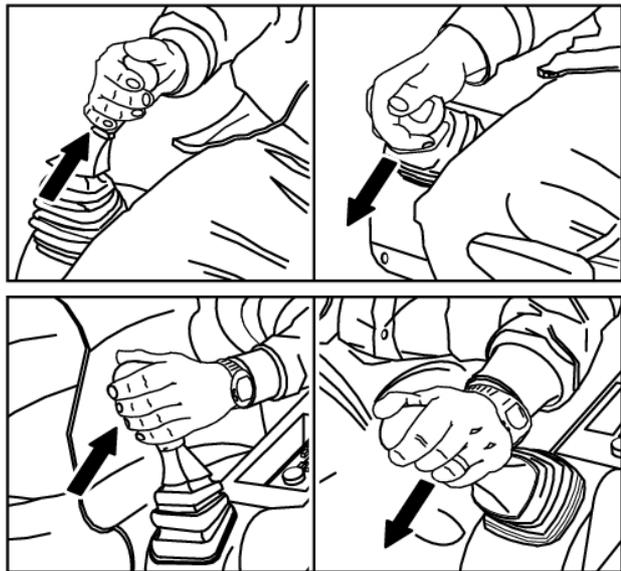


3. Move right control lever slowly to the stroke end of bucket digging side, and execute relief action for about 2 minutes. And then extend and/or retract the rod of each cylinders several times slowly for the purpose of circulating of warm hydraulic oil.
4. When the machine warming up is not sufficient, move the control lever to the stroke end of bucket digging side, and execute more 2 minutes relief operation. And then extend and/or retract the rod of each cylinders several times slowly for the purpose of circulating of warm hydraulic oil. Also operate swing and travel slowly and circulate the warm hydraulic oil.

Operate Bucket Dig and Dump Overrelief repeatedly.



Operate each the Boom and Arm.



#### **CAUTION**

While operating the machine with cold hydraulic oil, the operator may experience slow or unexpected movement of functions.

Damage to the hydraulic components may result due to the cold oil not providing adequate lubrication.

#### **Notice**

For the hydraulic oil warming procedure with auto warming-up system, see "2.3.1.B.10.2 Auto Warming Up".

### 3.1.11 SELECTION OF WORK MODE AND SWITCHING OF THE ATTACHMENT MODE

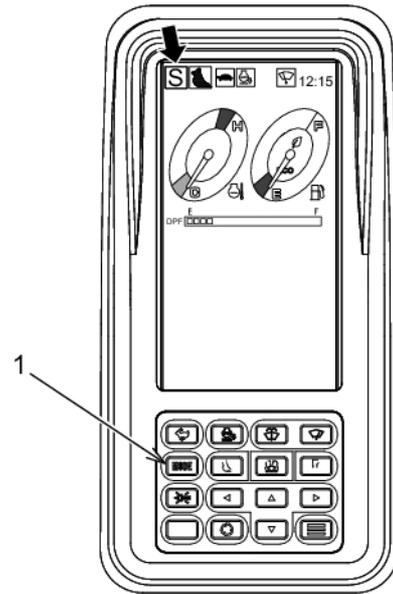
#### 1. Selection of Work Mode

Press the work mode select switch (1) in order, and three modes of "S", "E" and "H" are switched alternately each time the work mode switch (1) is pressed.

Select the appropriate work mode depending on the working condition and the work purpose.

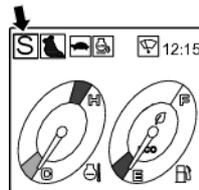
The selected mode is displayed on the left lower corner of the multi-display.

The mode after the engine starting is always the start from "H" mode.



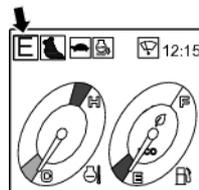
#### S mode

"S mode" is suitable for standard digging and loading works and is in saving fuel consumption and is in good balance to the workload.



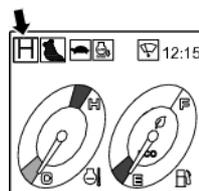
#### E mode

"Eco mode" is the mode focusing on better fuel economy, allowing for normal digging operation with lower fuel consumption than S mode.



#### H mode

"H mode" is suitable for heavy duty digging work which gives priority to the workload at the high speed.



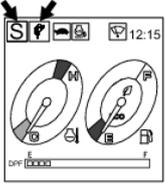
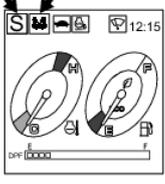
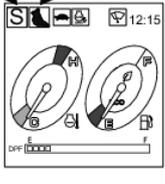
### [3. MACHINE OPERATION]

#### 2. Switching of The Attachment Mode

The screen is changed from "Digging" to "Nibbler" to "Breaker" each time the attachment mode switch is turned to respective position.

Depending on the attachment employed, select the applicable mode from "Digging", "Nibbler", and "Breaker".

Before the working, confirm whether appropriate attachment had been selected.

Attachment Mode	Switch Position	Displays of Multi-Display	Selection of Attachment
Breaker Mode		 Breaker mark is displayed. As work mode, "E" or "S" or "H" is displayed on the left lower corner of the multi-display.	Select single flow when the attachment like a breaker requires single flow circuit
Nibbler Mode		 Nibbler mark is displayed. As work mode, "E" or "S" or "H" is displayed on the left lower corner of the multi-display.	Select conflux flow when the attachment like a nibbler requires conflux flow circuit
Digging Mode		 Normal display is indicated As work mode, "E" or "S" or "H" is displayed on the left lower corner of the multi-display.	Select in case of digging

Regarding the explanation for the attachment and hydraulic circuit, refer to the chapter 7 "OPERATION OF HYDRAULIC BREAKER AND NIBBLER".

#### **CAUTION**

- Select the attachment mode appropriately when you use the breaker or nibbler. Confirm the position of attachment mode switch and the screen of multi display closely.
- Turn the attachment mode switch to a correct position when the switch position is improper. Match the attachment mode to the attachment that is used from now.
- Select the breaker mode absolutely when you work with breaker. If the machine is operated with mode other than breaker mode, hydraulic component and breaker are damaged.
- Lower the attachment to the ground and confirm safety before you change the attachment mode. Especially, the load that is held by the nibbler falls during changing from the nibbler working to the breaker mode, and this is very dangerous.
- When "S" or "E" or "H" of the work mode is flickering, this shows that the selection of attachment mode is improper.

### 3.1.12 CONTROLS DECAL

#### A. Operating Pattern

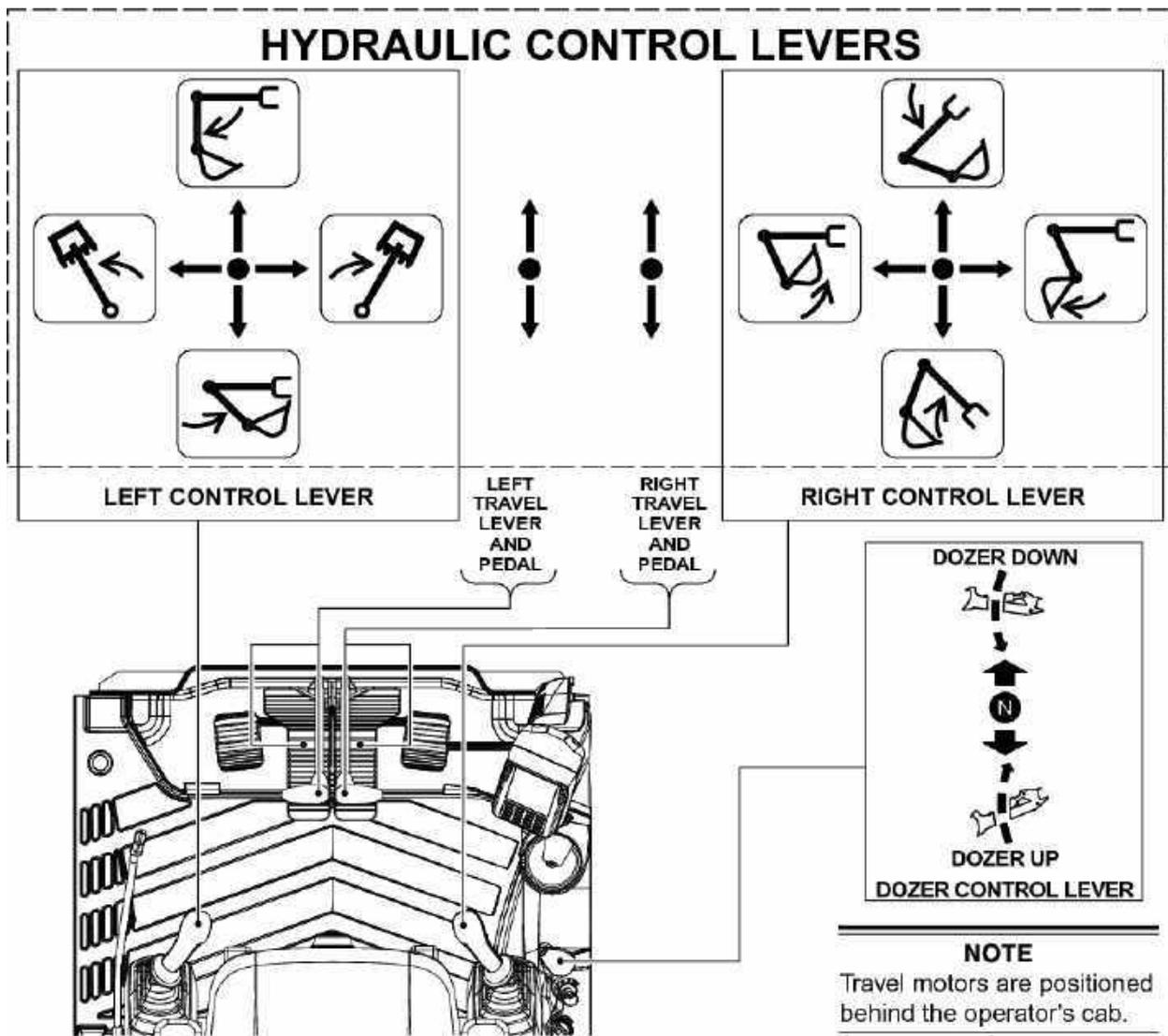
The operating and travel controls of this machine are factory set to ISO standard operating patterns for optimum performance of the machine and its systems.



Check and make sure that operating pattern control matches the decal provided inside the right side window.

#### B. Operating Pattern Decal

Figure is a representation of the "CONTROLS" decal located on the right side window inside the operator cab. Study this decal and understand the directions each control can be operated and the functions associated with each movement of particular control. Detailed instructions for each control and its functions are explained on the following pages of this section. Should this decal become damaged or missing, install new decal Part Number LC20T01333P1.

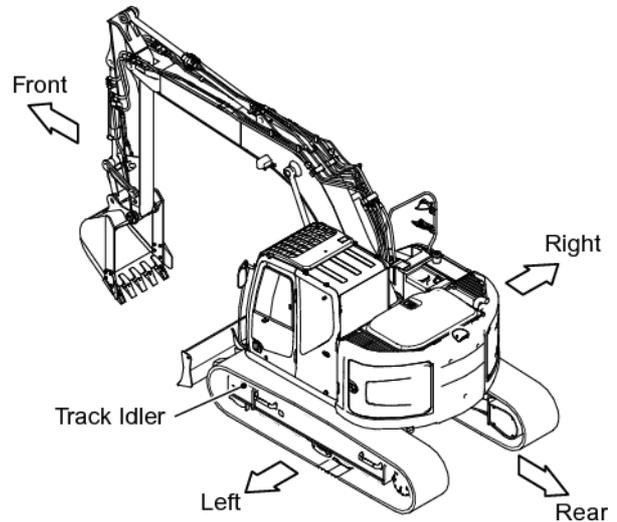


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### 3.1.13 MACHINE OPERATION

The following instructions are aimed at providing an operator with the basic function of each hydraulic control. Use these instructions, and practice with a machine, will allow a given operator to become more efficient in the operation of this equipment. Each operator must read thoroughly, understand, and follow these basic instructions along with all safety precautions found in this manual and on the machine before operating this equipment.

#### A. Caution In Machine Operation



---

#### **WARNING**

- Before start traveling, see around the machine for safety and sound horn.
  - Do not permit for people to gain access to the machine.
  - If the operation of control lever in auto accel operation could cause abrupt increase of engine speed. Pay attention to the operation.
- 

#### **CAUTION**

- The display on the multi-display does not completely ensure the condition of equipment. The daily check should follow not only the display on multi-display but also the instructions in the Manual.
  - When abnormality was detected in operation, stop the machine immediately and take proper measure.
  - Do not operate the machine until the abnormal section is repaired and recovered. The operation in abnormal condition may cause serious accident.
-

**B. Machine Travel**

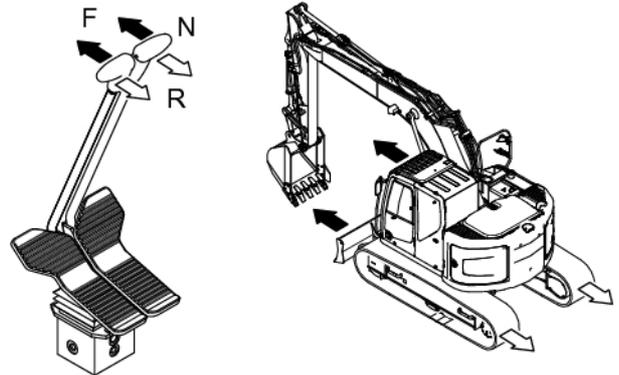


-Identify the travel motor position before traveling. When the travel motor is positioned on the front side the traveling operation reverses.

The normal traveling for the machine is that the travel motor is on the rear side and the track idler is on the front side.

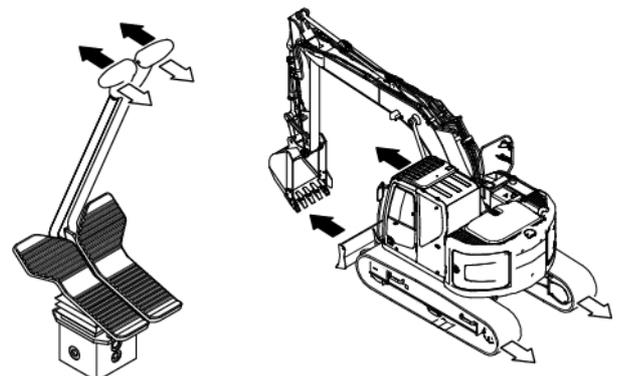
-Sound horn to warn workers in the site.

- F : Forward
- N : Neutral (Stop)
- R : Reverse



**B.1 Forward/Reverse Travel**

1. Make sure the pilot control shut-off lever is in the "UNLOCKED" (down) position. Operate the boom, arm, and bucket control levers to raise the attachments from the ground.
2. To move the machine forward, push both (right and left) travel levers toward the front of machine. To move the machine in reverse, pull back both travel levers. Travel speed changes depending on how far you push or pull the levers.



**Forward/Reverse Travel**

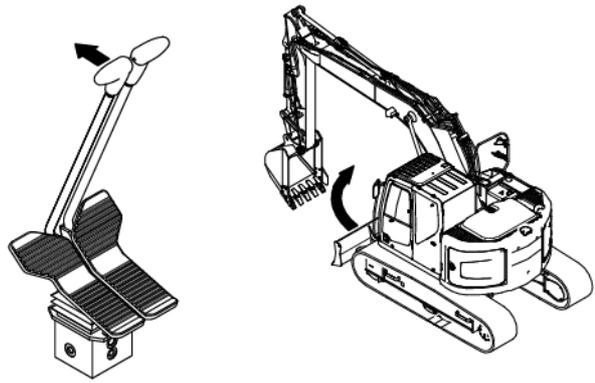


Do not move the travel speed switch during traveling. And change the travel speed in low (1st) speed when the machine is running on the downhill, and is loading/unloading on/from trailer. The sudden change of machine stability may cause accident resulting in injury and death.

### [3. MACHINE OPERATION]

#### B.2 Pivot Turn

- Push the left travel lever toward front of machine to turn machine RIGHT.
- Push the right travel lever toward front of machine to turn machine LEFT.
- Pull the left travel lever back to turn machine LEFT in reverse.
- Pull the right travel lever back to turn machine RIGHT in reverse.

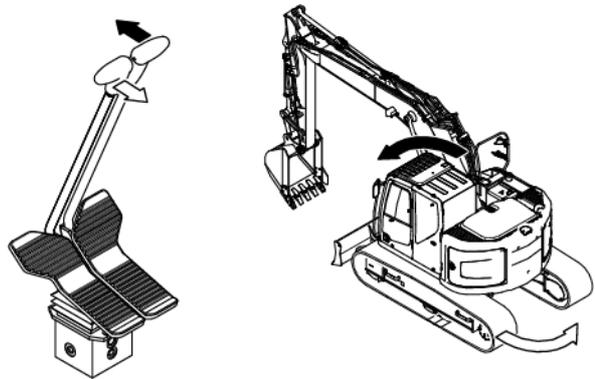


Pivot Turn

#### B.3 Counter Rotating Machine (Spin Turn)

To counter rotate machine to the left, pull left travel lever back and push right travel lever forward.

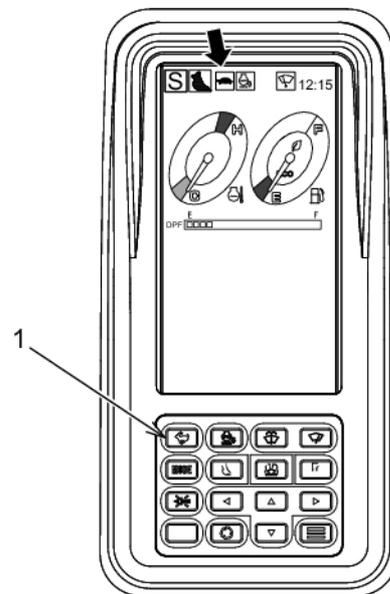
To counter rotate machine to the right, pull right travel lever back and push left travel lever forward.



Counter Rotating Machine

#### C. Changing Travel Speed (1st, 2nd Speed)

The travel speed change (1st, 2nd speed) switch (1) on the switch panel is available to change the travel speed from/to low speed (1st speed) to/from high speed (2nd speed). When starting engine, the switch is automatically set to low speed (1st speed). The mode is changed in order of turtle (1st speed) --> rabbit (2nd speed) --> turtle (1st speed) --> rabbit (2nd speed) each time the switch is pressed.

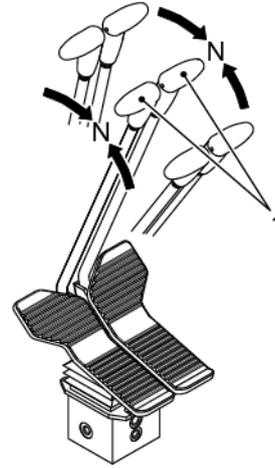


1. Take travel position during the engine being in operation.
2. Travel with travel lever or pedal.
3. The icon "turtle" is displayed for 1st speed and rabbit for 2nd speed.

D. Travel Stop



Do not stop the machine suddenly, but stop it after slow traveling.  
Return the right and left travel levers (1) to neutral (N) position. The machine stops traveling.



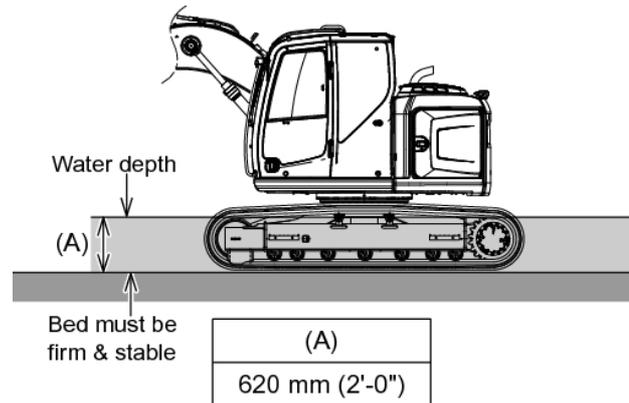
### [3. MACHINE OPERATION]

#### E. Machine Operation in Water

##### IMPORTANT

Be careful not to immerse the slewing bearing, slewing pinion and swivel joint into the water or mud. If the machine is operated in water or mud, the slewing bearing and others may be worn abnormally. If water or mud comes up to the slewing bearing level, put grease in slewing bearing unit the old grease comes out. If water or mud goes higher than the upper frame level, contact the dealer/distributor for cleaning or repair.

1. Make certain travel motor location is known before performing any travel operation.
2. Travel on firm, level surfaces as much as possible.
3. When traveling on rough terrain, travel in SLOW speed with engine at a low idle.
4. Travel with the travel motors in back of the machine for long distance travel.
5. When traveling or operating machine on snow or icy surfaces, clean track shoes frequently to prevent clogging. This will help keep the machine from sliding unexpectedly.
6. Keep a safe distance from stationary objects and electrical power lines.
7. Be aware of load capacities of bridges and road shoulders. Reinforce if necessary.
8. Use decking or plating to protect road surfaces as much as possible. Be careful when turning or spinning machine on asphalt pavement.
9. Do not allow large or heavy objects to strike travel motors.
10. Do not travel over large objects such as boulders rocks etc.
11. If necessary to travel or operate machine in a river or other water, the bed must be firm and water current slow. Water must not be deeper than indicated in the chart in.
12. On soft ground or mud the machine can sink. Stay constantly aware of undercarriage position.



## F. Getting Out of Soft Ground

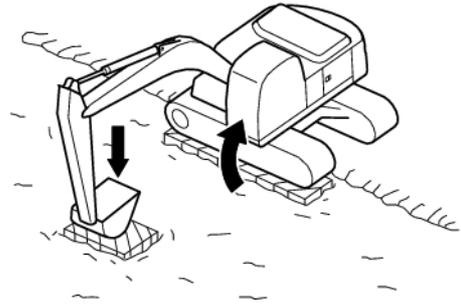
### **WARNING** AVOID INJURY

Attempting to free a machine that is stuck can be hazardous. Avoid operating on soft ground. The machine operator must be careful to avoid injury to himself and others while attempting to free the machine.

If possible, avoid traveling on a soft ground. Avoid getting caught in the mud. In the event that the machine gets caught in the mud, get out of it as follows.

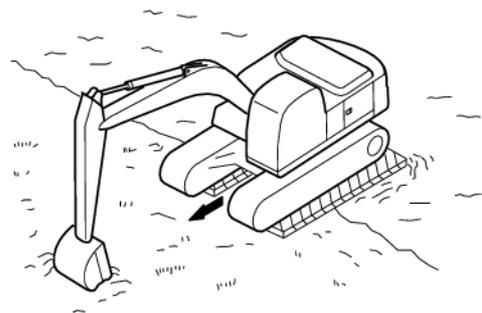
#### F.1 One Crawler Belts/Tracks Get Caught in Mud

When either side of crawler belts/tracks gets caught in the mud, lay logs or boards on the mud to form a base. Operate the boom and arm to form an angle between boom and arm of about 90 to 110 degrees and push on the ground with the bottom of the bucket to lift the machine body up to climb on the logs or boards.



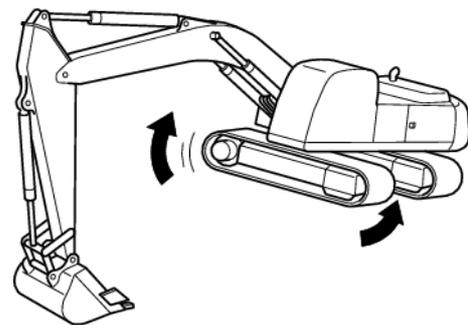
#### F.2 Both Crawler Belts/Tracks Get Caught in Mud

When both sides of crawler belts / tracks get caught in mud and the machine does not move due to skidding, provide logs and boards, as described in the above section. Using the bucket, dig into an area of the hard ground. Then move the bucket control to pull the machine toward the hard ground. If this is not possible, get expert help to free the stuck machine.



If the machine will not travel due to being stuck in mud, sand, gravel or on soft ground, lift each crawler belt / tracks off the ground by placing the bucket on the ground and pushing the boom and arm against the ground. Raise the crawler belt / track a small distance off the ground. Scrape the mud, sand, or gravel off the crawler belts / tracks.

This material may be cleared by rotating the crawler belts / tracks in forward and reverse with the crawler belt / track raised.



### **CAUTION**

Operate the machine at the operator's seat. Do not allow any person to come near the machine.

### [3. MACHINE OPERATION]

#### G. Machine Attachment & Swing Controls

The following instructions are to be used with hoe bucket attachment only. If other attachments are being used, consult the operator's manual for the particular attachment.

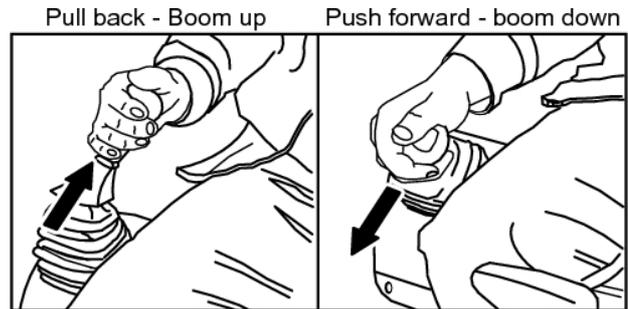


Read, understand and follow all safety precautions during all operations of this machine and its attachment(s).

#### G.1 Boom Operation

Operation of the boom is performed by pushing and pulling the R.H. control lever forward and backward. Boom speed is determined by how far the lever is activated.

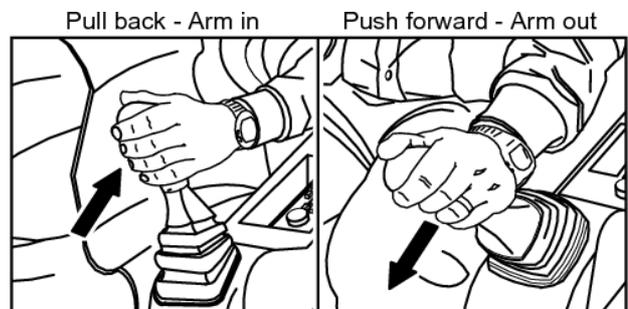
1. Pulling R.H. control lever BACK raises boom.
2. Pushing R.H. control lever FORWARD lowers boom.
3. Returning R.H. control lever to the neutral (center) position stops operation of the boom.



#### G.2 Arm Operation

Operation of the arm is performed by pushing or pulling the L.H. control lever forward and backward. Arm speed is determined by how far the lever is activated.

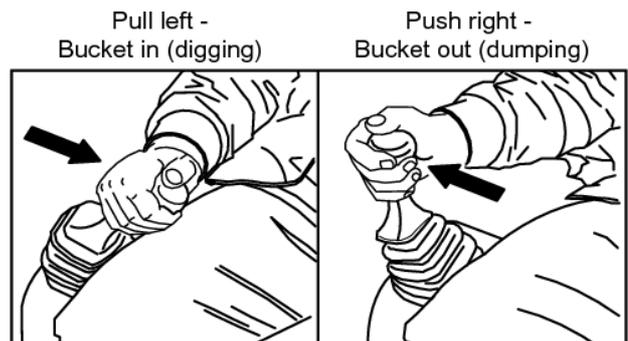
1. Pushing the L.H. control lever FORWARD moves the arm out.
2. Pulling the L.H. control lever BACK moves the arm in.
3. Returning the L.H. control lever to the neutral (center) position, stops operation of the arm.



#### G.3 Bucket Operation

Operation of the bucket is performed by moving the R.H. control lever to the right or left.

1. Moving the R.H. control lever to the LEFT operates the bucket IN (digging).
2. Moving the R.H. control lever to the RIGHT operates the bucket OUT (dumping).



**WARNING**

Be careful when operating certain attachments close to the cab. Certain attachments can hit and damage cab. Stop attachment a safe distance away from cab to avoid damage or injury.

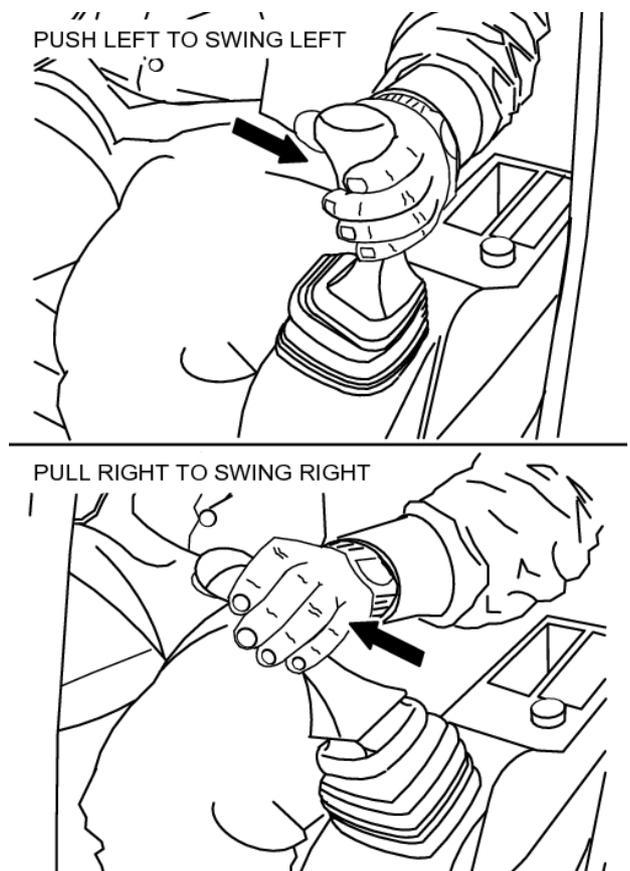
**G.4 Swing Operation**

**IMPORTANT**

Use swing flashers during swing operations.

Swing operation is performed by moving the L.H. control lever to the right and left. Swing speed is determined by the amount the lever is moved.

1. Moving the L.H. control lever to the LEFT swings the machine to the left.
2. Moving the L.H. control lever to the RIGHT swings the machine to the right.
3. Returning control to the neutral (center) position stops swing.



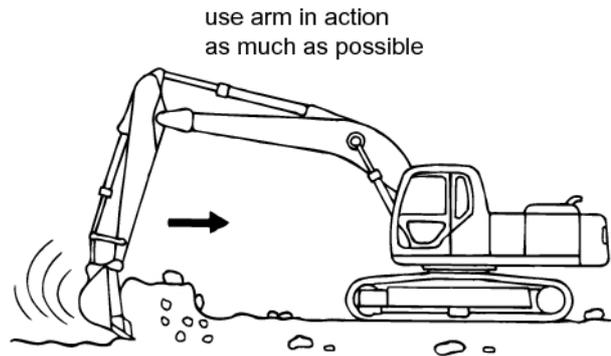
**WARNING**

Make certain area is clear of obstacles and persons before beginning swing operation of the machine. Sound horn before beginning swing operations.

### 3.1.14 PRACTICES TO IMPROVE EFFICIENCY

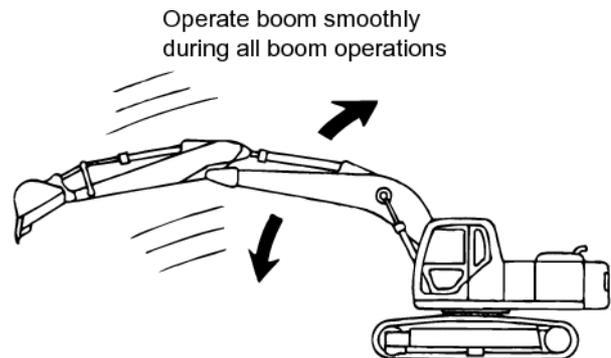
#### A. Use Arm in Action

Operate the bucket at shallow depths and use the arm in action to fill the bucket. Setting the bucket too deep will decrease the machine's efficiency.



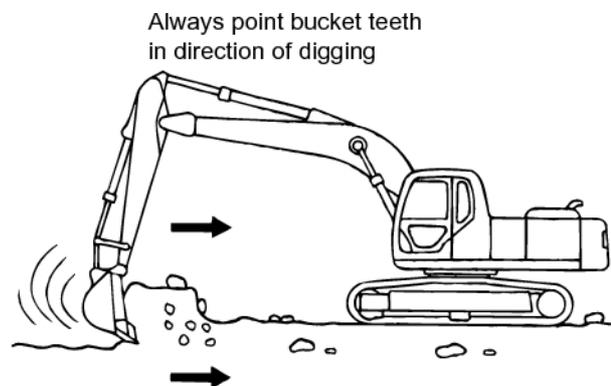
#### B. Operate Boom Smoothly

Always begin and end boom operation slowly with smooth, careful movement of the control lever. Do not perform sudden starts and stops of the boom as this creates unnecessary stress on the machine and its components.



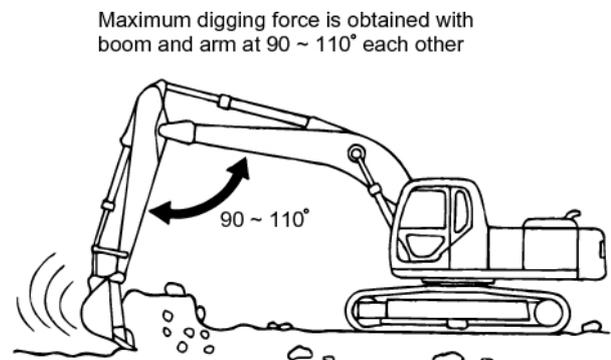
#### C. Bucket Teeth Direction

Always point bucket teeth in the direction the machine will be digging to reduce digging resistance and the possibility of bucket teeth damage.



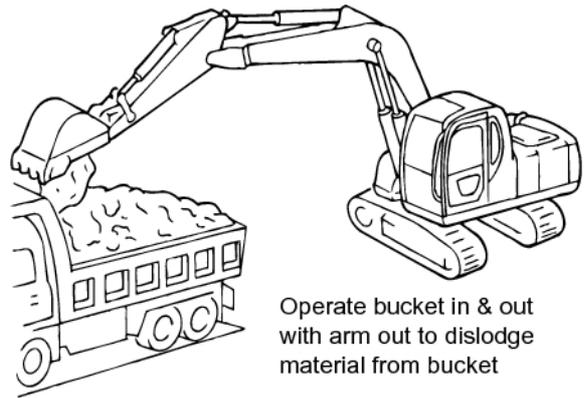
#### D. Maximum Digging Force Position

The attachment will provide maximum digging force when the arm and boom are at 90 to 110 degrees of each other.



**E. Cleaning Sand & Soil from Bucket**

Operate arm to a near level position and bring the bucket to a dumping position. If sand and soil do not fall out, move the bucket lever right and left a few times.



Operate bucket in & out with arm out to dislodge material from bucket

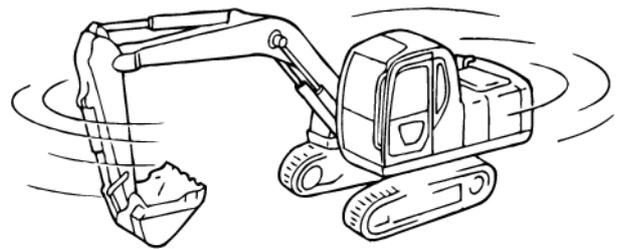
**CAUTION**

Avoid shaking out soil using shocks at the end of the bucket cylinder stroke.

**F. Stop Swing Motion Early**

To stop slewing action, release the swing lever before you get to your final point of digging or dumping.

Release swing before reaching desired digging position



### [3. MACHINE OPERATION]

#### G. Back Filling & Leveling

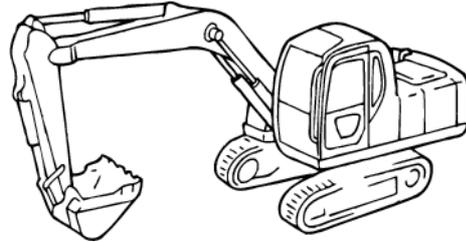
For back filling and leveling work after digging, move the bucket back and forth horizontally.

#### IMPORTANT

Do not push or pull material with the bucket like a bulldozer when using the machine to level material.

1. In leveling ground toward machine, pull the arm gently, lift the boom a little and when the arm has passed the vertical point, lower the boom gently and manipulate the machine so the bucket moves horizontally.
2. For leveling ground away from machine, reverse operation in step 1 above.
3. In the above operation, bucket motion may be used together with the boom. By controlling the action of the boom work lever, you can dig a slope- like, slope facing operation.
4. Never travel with attachment touching the ground. Severe structural damage could occur.

Use arm to move bucket horizontally for leveling

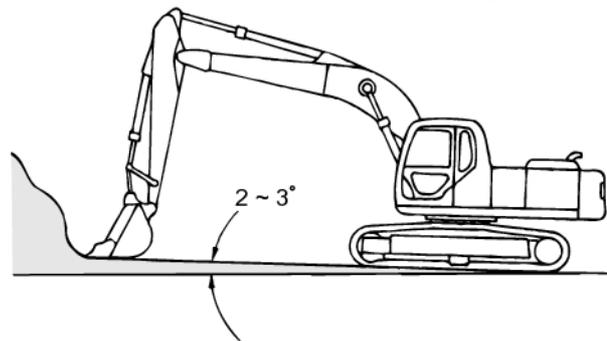


#### H. Operating The Shovel

Digging with the shovel differs slightly from digging with backhoe.

1. Using the arm cylinder, scrape the ground.
2. Scrape the ground at 2 to 3 degrees to improve draining in areas near the groundwater level.
3. Be careful not to bump the reversed bucket into the cab.
4. The excavating power during shovel operations is less than that during backhoe operations.
5. If machine bucket is equipped with a lifting eye, check to make sure that the eye will clear arm with bucket cylinder in full extended (full dump) position.

Grade at 2 ~ 3° slope for drainage

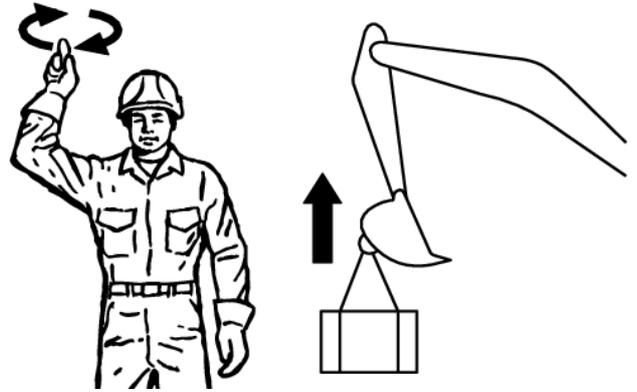


### 3.1.15 FLAGMAN HAND SIGNALS

The following is a compilation of the hand signals to be used when a flagman is required for excavator operation. All personnel associated with the operation of the excavator should know these signals and their meaning before attempting to operate this machine.

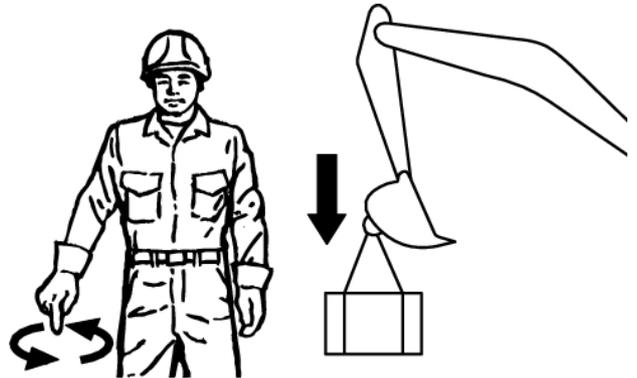
#### A. Raise Load Vertically

Face machine operator, raise right forearm vertical, with index finger pointing up and move hand in a small circular motion.



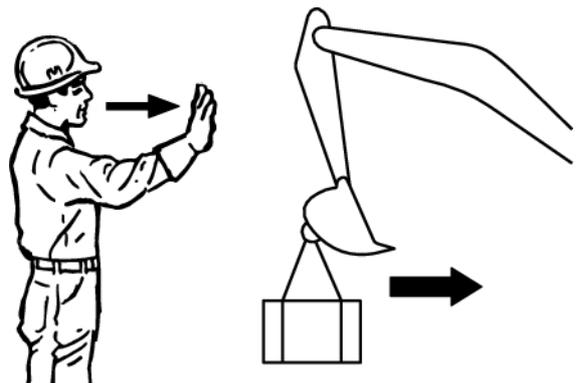
#### B. Lower Load Vertically

Face machine operator, extend right arm down, point index finger down and move hand in a small circular motion.



#### C. Move Load in Horizontally

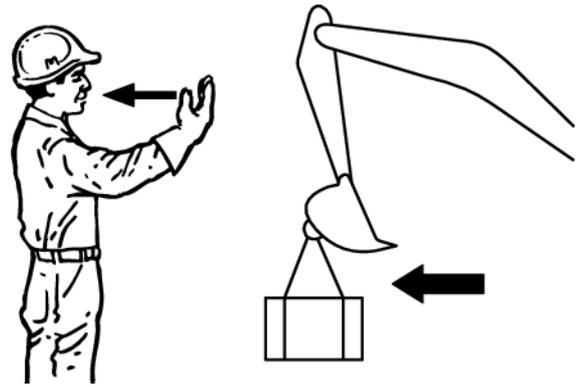
Face machine operator, extend right arm toward operator with hand facing operator and move hand in direction of movement required.



### [3. MACHINE OPERATION]

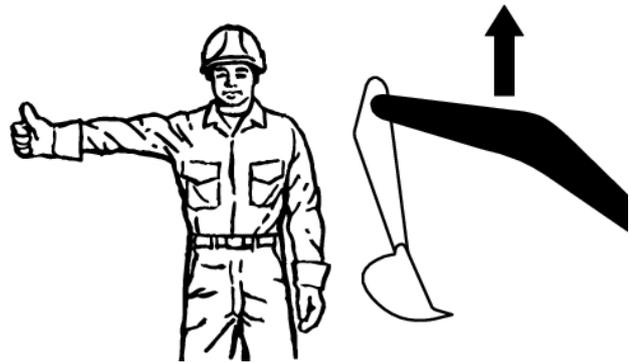
#### D. Move Load Out Horizontally

Face machine operator, extend right arm toward operator with back of hand facing operator and move hand in direction of movement required.



#### E. Raise Boom

Face machine operator, extend right arm out horizontally from shoulder, make a fist with thumb up.



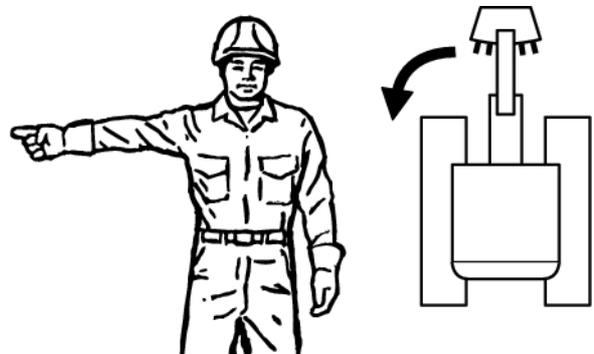
#### F. Lower Boom

Face machine operator, extend right arm out horizontally from shoulder, make a fist with thumb down.



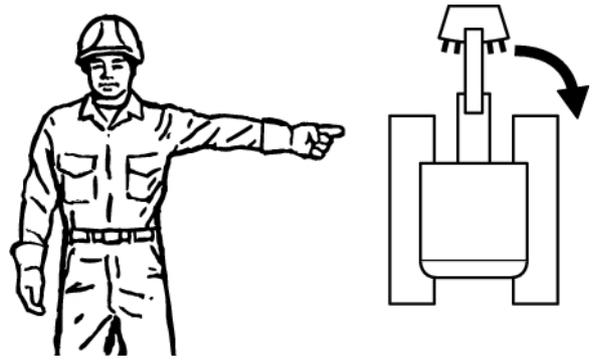
#### G. Swing Left

Face machine operator, extend right arm out horizontally from shoulder, make a fist with index finger pointing in swing direction.



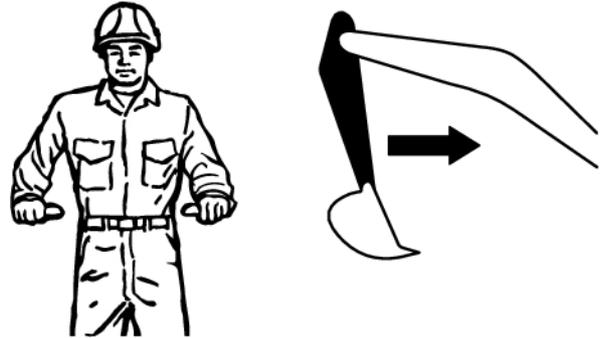
**H. Swing Right**

Face machine operator, extend left arm out horizontally from shoulder, make a fist with index finger pointing in swing direction.



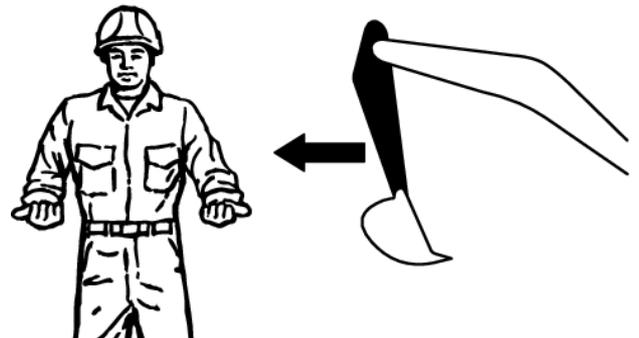
**I. Arm In**

Face machine operator, bend at elbows with arms facing operator, make fists and point thumbs in toward each other.



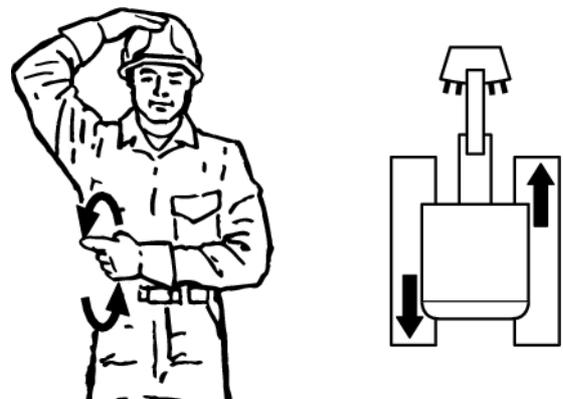
**J. Arm Out**

Face machine operator, bend at elbows with arms facing operator, make fists and point thumbs out away from each other.



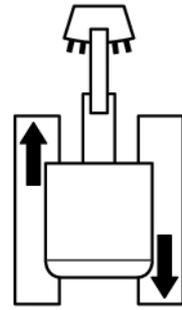
**K. Counter Rotate Left**

Face machine operator, place right hand on top of hard hat, bend left arm at elbow to the right, make a fist with left hand with index finger pointing out and rotate hand in a reverse circular motion.



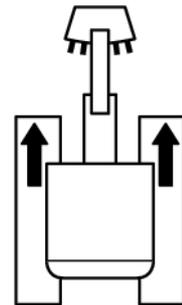
**L. Counter Rotate Right**

Face machine operator, place left hand on top of hard hat, bend right arm at elbow to the left, make a fist with right hand with index finger pointing out and rotate hand in a forward circular motion.



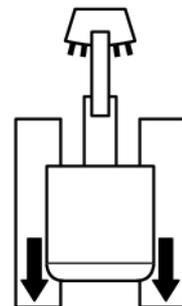
**M. Travel Forward**

Face machine operator, bend both elbows in, make fists and rotate fists one over the other in a reverse circular motion.



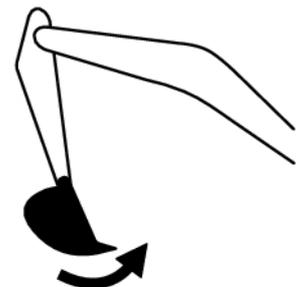
**N. Travel Reverse**

Face machine operator, bend both elbows in, make fists and rotate fists one over the other in a forward circular motion.



**O. Close Bucket (Bucket In or Dig)**

Face machine operator, hold left hand in, closed and stationary, hold right hand in, make a fist with index finger pointing toward left hand and move right hand in a small reverse circular motion.



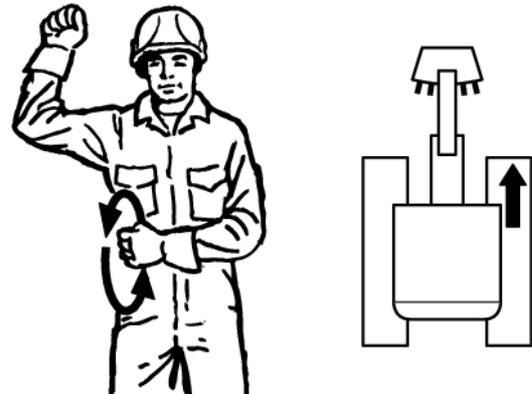
**P. Open Bucket (Bucket Out or Dump)**

Face machine operator, hold left hand in, open and stationary, hold right hand in, make a fist with index finger pointing toward left hand and move right hand in a small forward circular motion.



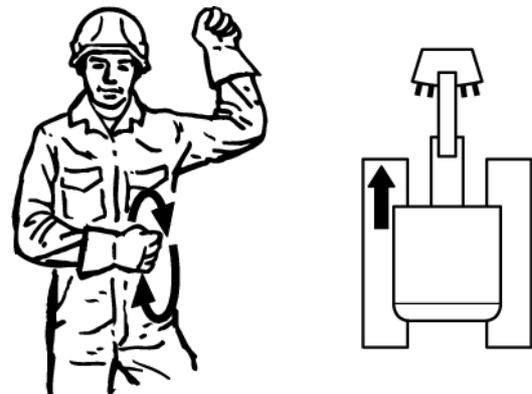
**Q. Turn Left**

Face machine operator, raise right forearm up, make fist with right hand and hold stationary, bend left arm in, make fist with left hand and rotate left fist in a small reverse circular motion.



**R. Turn Right**

Face machine operator, raise left forearm up, make fist with left hand and hold stationary, bend right arm in, make fist with right hand and rotate right fist in a small forward circular motion.



**S. Move This Much**

Face machine operator, raise both forearms up, hands open and facing each other, move hands in laterally indicating how far to go.



3

### [3. MACHINE OPERATION]

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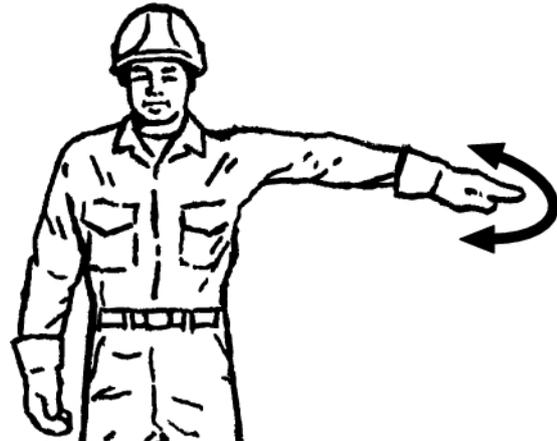
#### T. Move Slowly

Face machine operator, raise left arm out horizontally toward right shoulder with hand open and facing down, point right index finger up toward open left hand and rotate right hand in a reverse circular motion. (Raise load slowly is illustrated.)



#### U. Stop

Face machine operator, raise left arm out horizontally from shoulder with hand open and facing down, move arm in a horizontal motion back and forth.



#### V. Emergency Stop

Face machine operator, raise both arms out horizontally from shoulders with hands open and facing down, move arms in a horizontal motion back and forth.

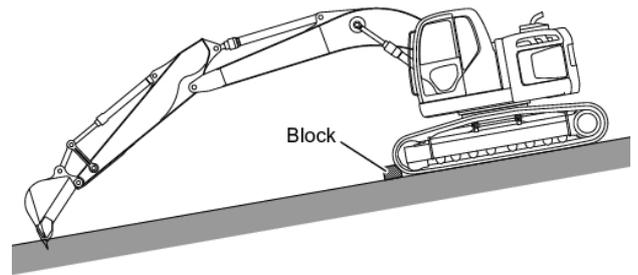


#### W. Stop Engine

Face machine operator, right arm at side, draw left thumb or index finger across throat.



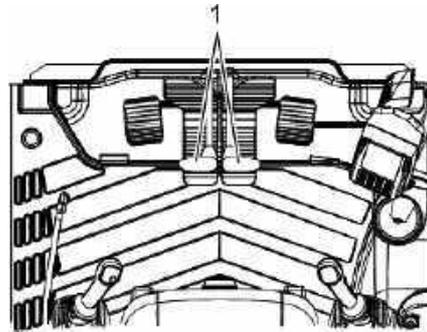
### 3.1.16 PARKING THE MACHINE



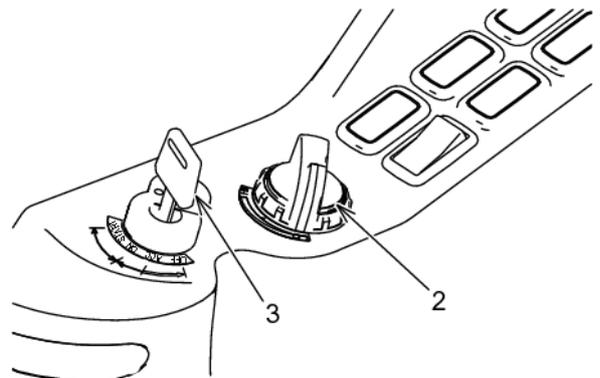
#### **WARNING** AVOID INJURY

- Always park the machine on a hard level, surface.
- When parking on a slope is unavoidable, position the machine as shown in the figure. Block the crawler track, dig bucket teeth into ground, lower dozer blade (if equipped) to the ground. This will help prevent machine movement.
- Set the pilot control shut-off lever to the "locked" (up) position to avoid any unexpected machine movement.
- Stop the engine before leaving the cab.
- If the machine is to be parked on a road way, move the machine to the shoulder to allow passing of traffic. Also post reflective warning signs and markers at a distance from the machine to safely warn motorists. Refer to local code and regulations regarding the posting of work area warnings and markers.

1. Place both travel levers (1) into the "NEUTRAL" position.

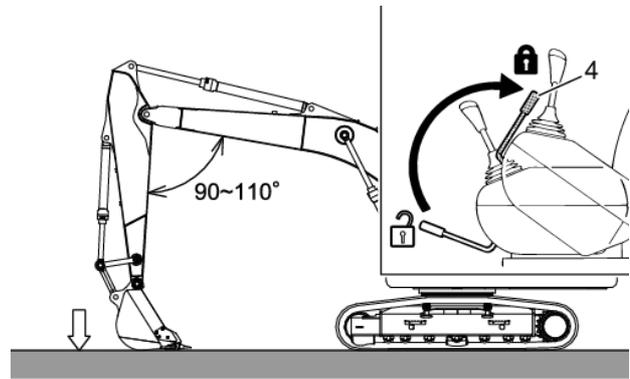


2. Turn throttle dial (2) to low idling position and cool down for about 5 minutes.
3. Put bucket on the ground holding the bucket bottom level.
4. Set starter key switch (3) to "OFF" position and stop the engine, and then pull out the starter key.



### [3. MACHINE OPERATION]

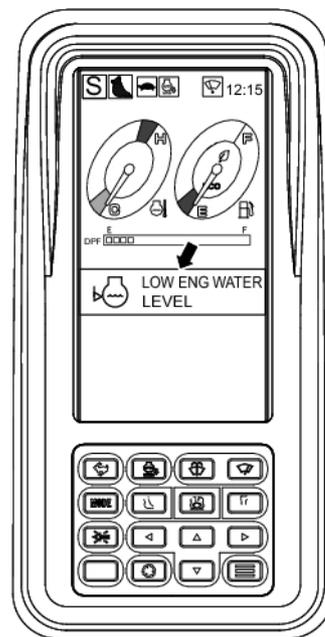
5. Pull up pilot control shut-off lever (4) to "LOCKED (UP)" position.
6. When necessary to leave from the machine, close windows, cab door and each door, and then lock it.



#### 3.1.17 PRECAUTIONS AFTER OPERATION

Check engine coolant level, engine oil pressure and fuel level for shortage through the use of multi-display.

1. If warnings of engine coolant and engine oil pressure are displayed, move the machine to a safe place and stop the engine. And then repair it according to applicable procedure in Chapter 4 "INSPECTION & MAINTENANCE CHART".
2. Check for any oil or coolant leakage. Check the attachment, exterior, and travel system components. If leakage and damage are found, repair it immediately according to applicable procedure in Chapter 4 "INSPECTION & MAINTENANCE CHART".
3. Fully refill with fuel. However, do not overfill (to the top of the tank) to avoid overflowing due to fluid expansion under normal temperature.
4. Remove mud, etc., stuck to the traveling components.



### 3.1.18 MACHINE OPERATION IN ADVERSE WEATHER CONDITIONS

#### A. Operation in Extreme Cold



At the low ambient temperature, the fluidity of oil becomes worse and causes the engine startability to be worse.

The coolant may freeze under that condition and it may result in damage of the radiator.

##### A.1 Fuel and Oil

Use the good quality and low viscosity engine oil, hydraulic oil and diesel fuel for each component. As for the recommended oil viscosity, see "4. LUBRICANT, FUEL & COOLANT ECIFICATIONS".

##### A.2 Coolant

When the machine is to be operated or stored in cold regions, the ratio of the additive for the cooling system should be decided in accordance with the forecast temperature. If the coolant freezes, the radiator, cylinder block or cylinder head, etc. may be damaged. At the time of shipping from the factory, the coolant is mixed with LLC to prevent rust and freeze in the engine cooling system. When the machine is to be operated or stored in the cold climate, check the concentration of the coolant often and keep a proper concentration. See "4. LUBRICANT, FUEL & COOLANT SPECIFICATIONS" about the concentration of the coolant.

When the engine is to be re-started, perform the machine warming up procedures as described in the section "3.1.7 STARTING ENGINE" to prevent premature wear of or damage to pumps, motors and other hydraulic components due to lack of lubrication.

#### IMPORTANT

This machine uses the non-amine type LLC.

##### A.3 Battery

At the low ambient temperature, the capacity may be lowered or the electrolyte may freeze.

Fully charge the battery beforehand and take enough care to keep the proper temperature by putting the cover on, etc.

When the machine is to be left outside overnight, it is recommended to remove the batteries and store them in a warm indoor room.

Do not measure the specific gravity of the battery electrolyte right after operation.

Wait until the temperature of electrolyte goes down to the same as the ambient temperature.

As for the charge ratio, measure the specific gravity and estimate the charge ratio roughly according to the following list.

#### Ambient Temperature

Charge	20 degrees C (68 degrees F)	0 degrees C (32 degrees F)	-20 degrees C (-4 degrees F)
100 %	1.28	1.29	1.31
90 %	1.26	1.28	1.29
80 %	1.25	1.26	1.28
75 %	1.24	1.25	1.27

### [3. MACHINE OPERATION]

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#### **A.4 After the Daily Work**

Observe the following precautions to prevent the machine from undercarriage malfunction due to frozen mud or water.

- Fully remove mud or water attached to the machine. Especially, remove the water around the undercarriage completely and park the machine on the hard, dry ground to prevent the undercarriage from freezing.
- Wipe the hydraulic cylinder rods clean.
- If frozen mud or water is attached to the cylinder rod, it might break the seal. Retract the bucket and arm cylinders completely to make the exposed length of the cylinders minimal.  
See "3. MACHINE STORAGE" for the storage position of the machine.

#### **B. Operation at the Seashore or Salty Climate**

After operation, thoroughly wash the machine to remove salt and coat it with the anti-rust oil or grease to prevent rust.

#### **C. Operation in Sandy and Dusty Areas**

- Clean and replace the air cleaner elements ahead of the replacement interval.
- Clean the radiator core ahead of the maintenance interval.
- Take care not to let the dust enter into the fuel tank when refueling. And also inspect the filter elements ahead of the replacement and maintenance interval.
- Clean the electric components, especially such as the starter and alternator ahead of maintenance interval to avoid the accumulation of dust.

#### **D. Operation in Extreme Heat**

- Use the engine oil, hydraulic oil and fuel designed for use in hot climates.
- Clean the radiator, oil cooler and debris screen often to prevent overheating of the engine.
- Confirm the approved long life coolant is used.
- Idle the engine to cool down, stop it and then check the coolant level, if the machine becomes overheated.  
If the machine stays in the condition of overheating after filling the coolant to the proper level, stop the engine and contact the KOBELCO authorized dealer/distributor.
- Always keep the specific gravity of the battery electrolyte (acid) to the appropriate value.

## 3.2 MACHINE STORAGE PROCEDURES

Before storing the machine, take care about the below-mentioned points to prevent the performance degradation at the next operation.

### 3.2.1 WASHING THE MACHINE

Thoroughly wash the machine and inspect and maintain the undercarriage, etc. for damaged or worn parts. If any scars or coming off parts of paint are found, touch them up. Apply grease to each of the greasing port.



Protect the CPU and all electrical components with covers to prevent water or steam from entering when cleaning the machine.

---

### 3.2.2 REFUEL, GREASING AND COATING OF EACH PART

Check the fuel, hydraulic oil and lubricant for the level and contamination and if the level is low, refuel it. If they are highly contaminated, replace them.

- Completely fill the tank with fresh and clean fuel to prevent condensation of moisture inside the fuel tank.
- Coat the areas tend to rust, especially the exposed part of the cylinder rods, with the anti-rust oil to prevent rust during storage.

### 3.2.3 BATTERY

Disconnect the negative (-) terminal and cover it or remove it from the machine and store it at a well-ventilated warm place.

Charge the battery once a month to make up the self-discharge voltage during storage.

### 3.2.4 COOLANT

Add the antifreeze mixture (non-amine type) to the radiator when the coolant is likely to freeze.

At the time of shipping from the factory, LLC is filled and nothing is required to be added.

See "4. LUBRICANT, FUEL & COOLANT SPECIFICATIONS".

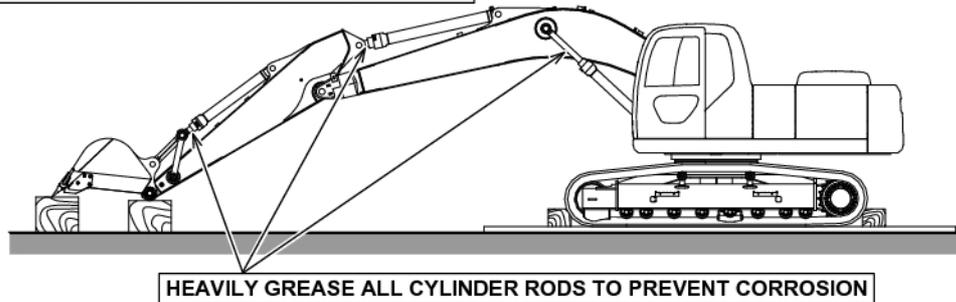
#### 3.2.5 PREVENTION OF DUST AND HUMIDITY

Store the machine at a dry indoor location. When necessary to keep the machine outside place it on the wooden blocks placed on the level ground and cover the machine with sheets, etc.

Especially, cover the muffler, breather of hydraulic tank, fuel cap and level gauge of the swing motor.

- Retract the bucket and arm cylinders completely to make the exposed length of the cylinders minimal.  
Then lower the boom to place the attachment on the floor and secure the crawlers with chocks.

POSITION MACHINE AS SHOWN INSIDE A STORAGE BUILDING



#### 3.2.6 PERIODIC MACHINE OPERATION TO CIRCULATE THE OIL (DURING STORAGE)

During storage, run the engine and operate the machine working devices to make the fluid circulate and reach to each component thoroughly, once a month.

If oil coat is dried and that part rusts, it may cause abnormal wear.

---

**Note**

Operate the machine for approximately 1 hour to make all fluids reach to each component.

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- When starting the engine, check the level of engine oil and coolant. If shortage is found, make it up.
- Completely remove the anti-rust oil from the exposed part of the cylinder rods. After the operation for circulating the fluid is finished, coat them again with the anti-rust oil.
- Take enough time for warming up after the engine is started and perform travel, swing and digging operation for several times to prevent the oil coated parts from drying.
- Take enough care for ventilation during warming up if the machine is stored in an indoor room.

**3.2.7 PROCEDURES AFTER LONG PERIOD OF STORAGE**

Perform all Inspection and maintenance procedures as described below before operating the machine after long period of storage.

- Remove the drain plugs from the travel motors and swing gear reduction unit to remove any moisture and dirt accumulated during storage.
- Lubricant is degraded even if the machine is stored. Take enough care when starting the operation again.
- Carefully and closely inspect all hydraulic hoses after long period of storage for signs of deterioration. Replace all deteriorated hoses.
- Completely remove the anti-rust oil from the exposed part of the cylinder rods.
- Refuel and grease all of the oil related parts and components.
- When starting the engine, check the level of engine oil and coolant. If shortage is found, make it up.
- Take enough time for warming up after the engine is started and perform travel, swing and digging operation for several times to prevent the oil coated parts from drying.
- Take enough care for ventilation during warming up if the machine is stored in an indoor room.

# 4. MAINTENANCE

## 4.1 GENERAL INFORMATION

### **WARNING**

Read, understand and follow all safety precautions contained in this manual before performing any inspection or maintenance procedures on this machine, it's systems or components.

### **IMPORTANT**

For the adjustment, disassembling and repair of the engine, reduction gear and electronic equipment (controller, etc.), contact the dealer/distributor.

A. It is recommended, that an inspection and maintenance schedule be developed and maintained on a regular basis for this machine. Developing and maintaining such a schedule helps to keep the machine in optimum operating condition.

B. The information contained in this section gives the proper procedures for performing inspection and maintenance functions for this machine. Use these procedures when performing inspection and maintenance as they will guide the technician step by step for each procedure. Also, refer to the inspection and maintenance charts for general service interval recommendations.

C. Lubrication and maintenance intervals are determined by the hour meter. If performing lubrication and maintenance according to calendar time is preferred, the hour meter reading must correspond to the lubrication and maintenance period (8 H, 50 H, 120 H, 250 H, 500 H, 1000 H, 2000 H, 5000 H, etc.) in calendar time; then calendar time can be used. Items for which service time cannot be specified are explained in the section WHEN REQUIRED.



**IMPORTANT**

The inspection and maintenance charts provided in this section give only general time intervals. It may be necessary to develop a custom schedule to perform machine maintenance at more frequent intervals based on the work conditions such as severe applications, work in dusty or humid circumstances, etc.

See "4.10 INSPECTION & MAINTENANCE CHART".

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D. Use only specified oils, fluids, lubricants, filters and replacement parts to keep machine in optimum operating condition. Use the oils and greases with the specified viscosity depending on the ambient temperature.

Store containers of oils, fluids and grease indoors in appropriate location. This will prevent contamination from dust, water, etc.

**Dispose  
of Waste  
Properly**

## 4.2 GENERAL SAFETY & PRECAUTIONS

**⚠ WARNING**

-Do not attempt any other inspection or maintenance procedures other than those specified in the manual.

Carry them out parking the machine at a flat and conveniently situated place.

-Do not attempt any MAINTENANCE with engine running. Stop the engine and allow machine to cool to avoid injury.

### A. WEAR SAFETY EQUIPMENT TO AVOID INJURY

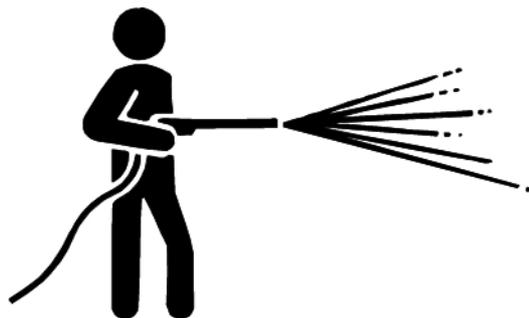


**⚠ WARNING**

Wear hard hat, protective glasses or face shield, work gloves, safety shoes and well fitting work clothes when performing inspection and maintenance procedures on this machine.

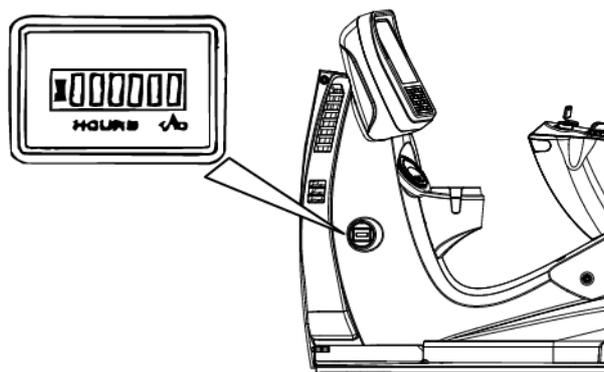
### B. KEEP MACHINE CLEAN

Thoroughly clean machine before performing inspection and maintenance procedures. It is easier and safer to locate problems, perform maintenance and also reduce the risk of hydraulic system contamination when machine is clean.



### C. CONFIRMATION FOR HOUR-METER

Read the hour-meter daily, and check with the scheduled maintenance book. See "4.10 INSPECTION & MAINTENANCE CHART" for better reference. Proceed with any maintenance as required.



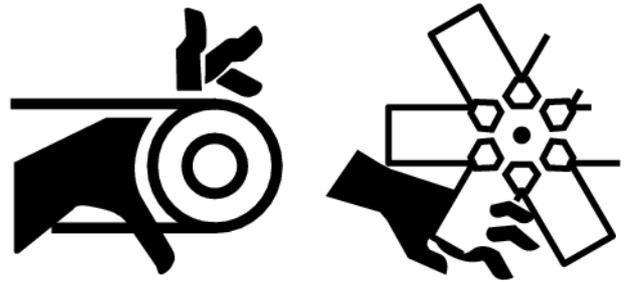
## [4. MAINTENANCE]

### D. STOP ENGINE

Do not attempt any MAINTENANCE with engine running. Always stop the engine and allow machine to cool to avoid injury.

Otherwise, there is a possibility of danger that your hand may be caught in the cooling fan or fan belt resulting injury.

If it is unavoidable to operate the engine for inspection or maintenance, carry out the work with two people. The person seated in the operator's seat should be ready to stop the engine at any time while watching for a signal from the other person.



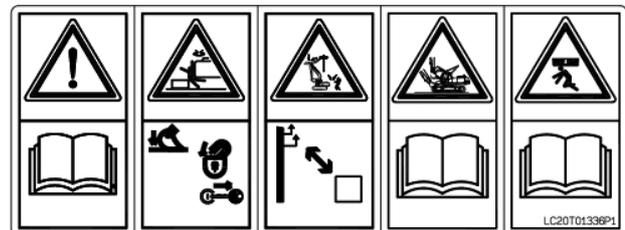
### E. TAG-OUT MACHINE

Before beginning any inspection or maintenance procedures, secure a "DANGER" tag (P/N: YN20T01320P1) to the operator's console to inform the operator that the machine will be inoperable for inspection and maintenance. This tag will help prevent accidental starting of the machine.



### F. OBSERVE PRECAUTIONS

Start the inspection and maintenance work fully understanding the contents of safety precautions indicated on the machine labels.



### G. HOT SURFACES & FLUIDS

Wear the proper safety equipment when working around hot areas. Do not change oils, engine coolant or filters immediately after machine has been stopped. Allow machine to cool down before performing maintenance procedures.



**H. WARM ENGINE OIL**

Engine oil should have a temperature of between 20 to 40C degrees {68 to 104 F degrees} before the oil is changed.

If necessary run engine until the oil is warm within the recommended oil change temperature.

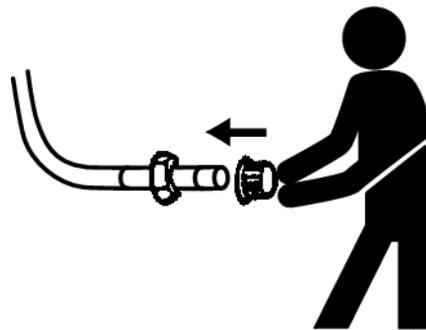
**I. PRESSURIZED SYSTEM HAZARDS**

Release the internal pressure before removing the hydraulic system or fuel system, piping or coupling of the cooling system or other related parts to which internal pressure is applied.

See "4.2.S RELEASING INNER PRESSURE IN HYDRAULIC SYSTEM" to release internal pressure.

**J. PREVENT CONTAMINATION**

Always cap or plug lines when hydraulic components are removed to help prevent hydraulic system contamination that can be caused by dirt, dust and debris entering a line or port.

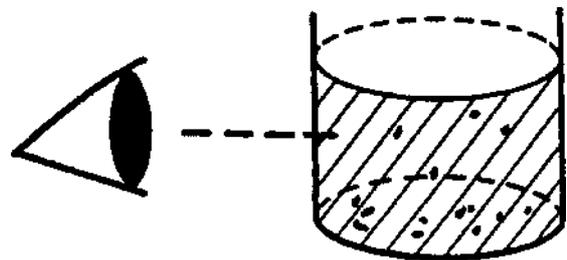
**IMPORTANT**

Do not allow hydraulic line or component to become contaminated. This could cause severe system damage. Contact an authorized dealer/distributor to obtain the proper caps and plugs to be used on this machine.

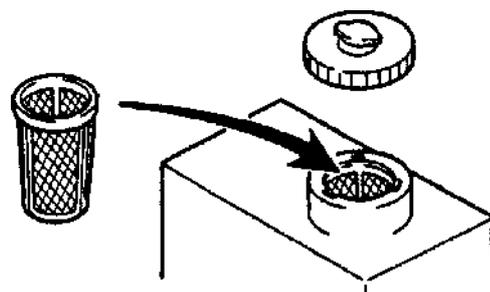
**K. INSPECT WASTE OILS AND FILTERS**

Before disposal, inspect all waste oils, fluids and filters for debris and foreign matter.

It is recommended to cut open the oil filters to determine any abnormal wear.

**L. CAUTION FOR OIL FILLING**

When a strainer is provided on the filling port, do not remove it while refilling fuel, oil or fluid.

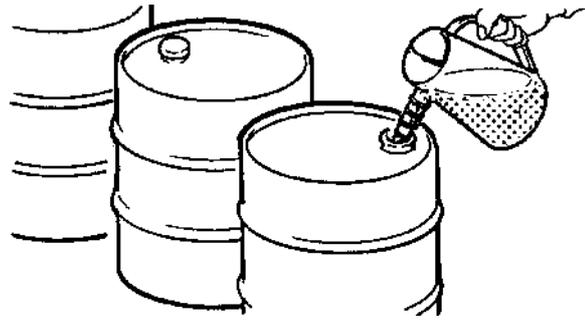


## [4. MAINTENANCE]

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### M. DISPOSAL OF HAZARDOUS WASTE

Dispose of waste oils, fluids, lubricants, filters and other hazardous waste properly.



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### **WARNING** CONTAMINATION HAZARDS

Dispose of all hazardous waste in accordance with government environmental laws and regulations.

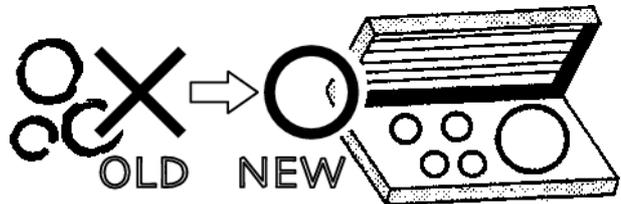
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### N. SEALS AND O-RINGS

After removing the O-ring or gasket, clean the seal surface, and replace with a new one.

Always replace seals and O-rings with new parts.

Never reuse a seal or O-ring during reassembly of components. Lubricate all new seals with the appropriate oil before installation.



### O. USE SUPPORT EQUIPMENT DURING SERVICE

When machine inspection or maintenance is done under the boom, arm or under the bucket/attachment use proper equipments or blocks to secure the attachment.



### P. CAUTION WHILE CHANGING BUCKET/ATTACHMENT

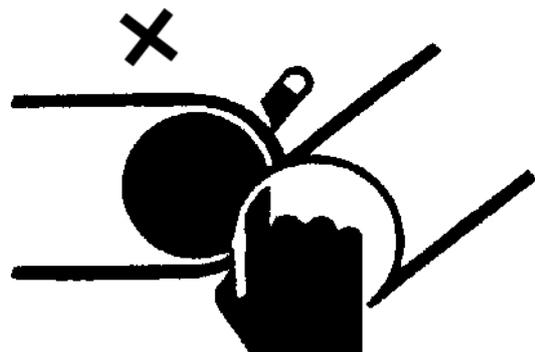
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### **WARNING**

Do not insert your finger, hand or arm into the pin bore.

The alignment must be carried out visually or by using a tool.

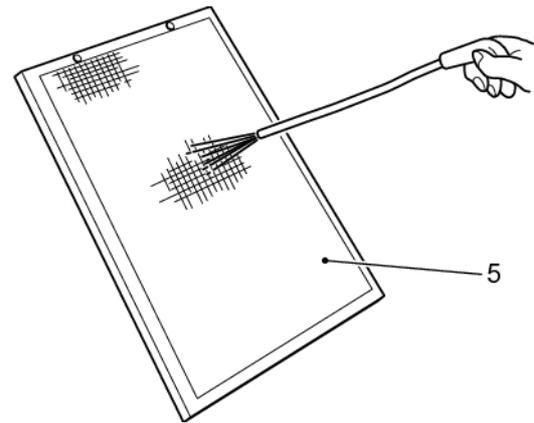
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**Q. OPERATION IN DUSTY CONDITIONS**

When the machine is operated in dusty operating conditions, do the following.

- Frequently check the lamp for the air cleaner clogging. Clean the air cleaner element ahead of the specified period.
- Clean the radiator core ahead of the specified period to prevent it from clogging.
- Clean and replace the fuel filter element ahead of the specified period.
- Clean the electric equipment, especially starter and generator, to not allow deposit of dust on them.



**R. CLEANING PARTS**

Use only approved cleaning solvents and proper equipment to clean parts.



Do not use gasoline, diesel fuel or other flammable solvents to clean parts.  
Clean parts in a well ventilated area.

## [4. MAINTENANCE]

### S. RELEASING INNER PRESSURE IN HYDRAULIC SYSTEM

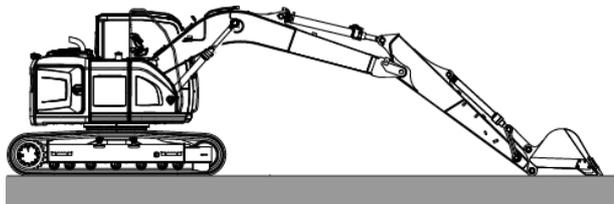


Never change oils or filters on a machine that has just finished working. Allow machine to cool first until oils and fluids are warm not hot.

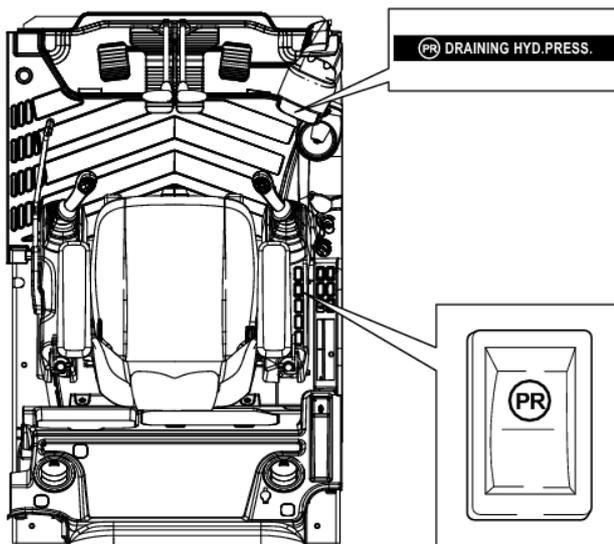
Release hydraulic tank pressure before working with any hydraulic component.

1. Select the hard and flat area and place machine in the position shown in the figure.
2. Start the engine.
3. Press and hold the pressure release switch on the side of the right control stand for 5 to 10 seconds. Then release it 1 to 5 seconds later. And press and hold it again for 5 to 10 seconds. The symbol "DRAINING HYD. PRESS" is displayed on the multidisplay.  
Simultaneously the engine speed reduces to the low idling or less.

Hydraulic Oil Level Check Position



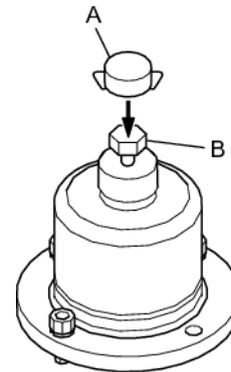
4. Buzzer sounds intermittently. (To stop the buzzer sound, press the buzzer stop switch.)
5. In this condition, operate the lever of attachment to release the pressure (simultaneous operation of multiple levers is available.)  
Special attention must be given to operate because the attachment moves a little by its own weight.
6. Stop the dozer operation at the position the blade reaches to the ground. After the engine stops, move the dozer lever forward and rearward several times, and the blade contacts the ground.  
Consequently the inner pressure is released. (In case of the dozer specification)
7. Turn the starter key to "OFF" position.  
This completes the pressure releasing.
8. If releasing the pressure release fails, the symbol "FAIL DRAIN HYD. PRESS" is displayed on the multidisplay.
9. At the same time, the buzzer sounds continuously.  
Turn the starter key to "OFF" position, and repeat the pressure releasing from "Item 2." again.



**T. HYDRAULIC TANK PRESSURE**

Always release the internal pressure of the hydraulic tank before performing inspection or maintenance procedures.

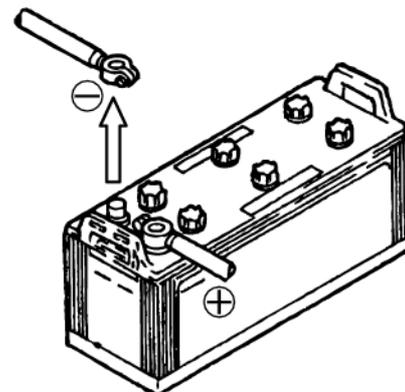
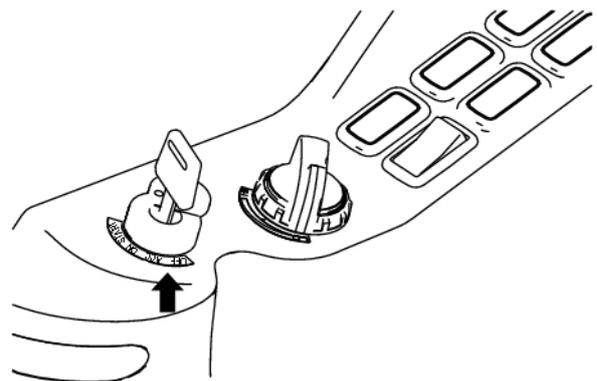
1. Remove cap (A) and push "DOWN" valve (B) to release air pressure in the reservoir.


**WARNING**

Gasses from hydraulic tank may be hot.  
Wear safety equipment to avoid injury.

**U. WELDING SAFETY**

1. Turn starter key switch to "OFF" position.  
Wait 4 seconds for electrical power to disconnect.
2. Remove negative (-) cable from battery terminal.
3. Attach welder ground cable with 1 m {3'3"} away from component being welded.
4. Make sure welder ground is not located at a seal or bearing. Do not locate welder ground at seal or bearing.
5. Make sure that no bearings or seals separates the welder ground and the weld area.

**V. CLEANING AND REPLACING THE RADIATOR CAP**

- The radiator cap adds pressure to the coolant water, preventing the engine from overheating.
- Remove any debris and water scale from the surface of the gasket on the radiator cap.
- If grooves are worn into the surface of the gasket after years of use, steam will escape and pressure cannot be maintained. Replace the worn gasket with a new one.
- The radiator cap should be replaced once a year.

## 4.3 DIESEL PARTICULATE FILTER (DPF)

### 4.3.1 HANDLING OF DPF

DPF is a device which traps soot emitted from the engine using the filter to clean up the exhaust gas. When the certain quantity of soot is deposited on the filter, DPF is changed to a mode of the soot combustion. At this mode, restoring the filter function by the soot combustion is called "regeneration". To avoid malfunction of DPF, observe the following points. (According to operating condition, the deposition time varies.)

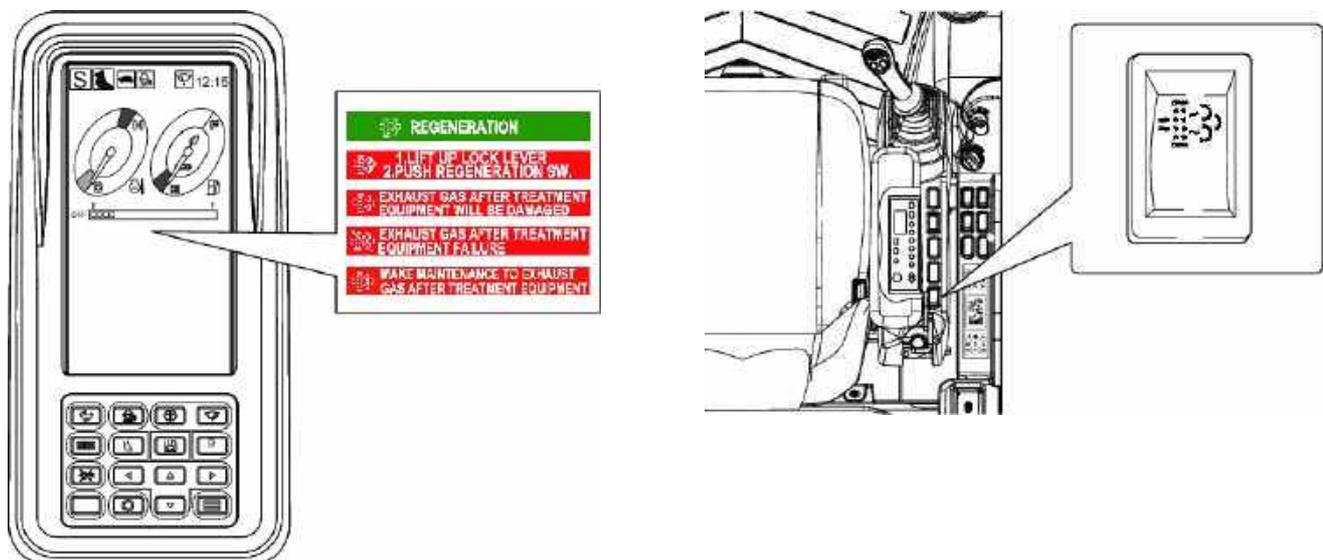
During the soot combustion, the exhaust sound is changed but this is not malfunction.

#### Notice

When the certain quantity of soot is deposited on the filter, DPF automatically carries out the combustion of deposited soot in accordance with operating condition of the machine. See "ABOUT AUTOMATIC REGENERATION" for details.

In some cases, according to operating condition, the soot combustion is not automatically finished. When this occurs, the request for operating the DPF manual regeneration switch will be displayed on the gauge cluster.

At that time, pull up the pilot control shut-off lever to the "LOCKED" position and push the DPF manual regeneration switch. This operation prevents the deposition of extraordinary quantity of soot and keeps the cleaning ability of DPF always in good condition.



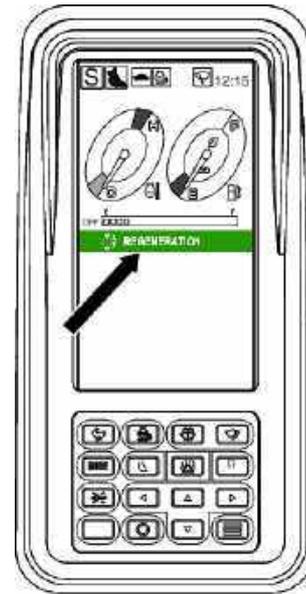
### 4.3.2 ABOUT AUTOMATIC REGENERATION

The automatic regeneration will start when a certain amount of soot is deposited and the exhaust gas is at a high temperature. During the automatic regeneration, the indicator meaning "REGENERATION" is displayed on the multi-display, but normal operation is possible.

Temporarily, engine speed is automatically kept above 1,500 min<sup>-1</sup> in order to increase exhaust temperature, but this is normal.

Also, sometimes the gauge of the soot deposition does not decrease even though the "REGENERATION" is displayed on the multi-display, but this is normal.

Once the regeneration is completed, the indication disappears to go back to the normal condition automatically.



#### **CAUTION**

Immediately after the machine operation or during the regeneration, the exhaust pipe, the area around the muffler, and the exhaust gas are extremely high temperature. If the flammables are brought to near them, it may cause a fire and also cause burns by the high temperature exhaust gas.

While this function is activated, attachment might slightly move.

#### **IMPORTANT**

If the exhaust temperature is decreased, or the engine is stopped during the automatic regeneration, the automatic regeneration is interrupted. When soot does not combust completely because these things are repeated, the request for operating the DPF manual regeneration switch will be displayed on the gauge cluster. At that time, pull up the pilot control shut-off lever to the "LOCKED" position and then push the DPF manual regeneration switch to carry out the manual regeneration.

#### **Notice**

As for the manual regeneration, see "4.3.3 ABOUT MANUAL REGENERATION".

### 4.3.3 ABOUT MANUAL REGENERATION



When this indication is displayed on the multi-display, immediately pull up the pilot control shut-off lever and push the DPF manual regeneration switch to carry out the combustion of soot deposited in DPF. The request for operating manual regeneration tends to be displayed when performing light load operation continuously.

---

#### IMPORTANT

-When the certain quantity of soot is deposited on the filter, DPF carries out the automatic regeneration in accordance with operating condition of the machine. In some cases, according to operating condition, the automatic regeneration is not finished. When this occurs, the above-mentioned indication is displayed on the multi-display, so pull up the safety lock lever to the "LOCKED" position and then push the DPF manual regeneration switch to carry out the manual regeneration. During the manual regeneration, the engine speed is fixed. This is not a failure but to make the exhaust temperature rise to help the soot combustion.

-When the manual regeneration is not carried out immediately, it may cause a limited engine speed due to too much amount of deposited soot. To recover from that condition, remove DPF and bring it to our authorized service shop near you.

---

#### Notice

-The soot combustion is finished in about 20 minutes, though it may differ according to the machine condition.

-The soot combustion makes the temperature inside the muffler rise, so the more the temperature inside the muffler rises, the shorter the time of soot combustion becomes.

-If soot combustion is performed soon after the machine operation is finished, it will finish faster than that performed when the engine is cold. If the engine is cold, the soot combustion may take 20 minutes or more because the warming-up operation is carried out once before the soot combustion.

---

#### Operation procedures

1. Move the machine to the safe place.
- 

#### CAUTION

-Immediately after the machine operation or during the regeneration, the exhaust pipe, the area around the muffler, and the exhaust gas are extremely high temperature. If the flammables are brought to near them, it may cause a fire and also cause burns by the high temperature exhaust gas.

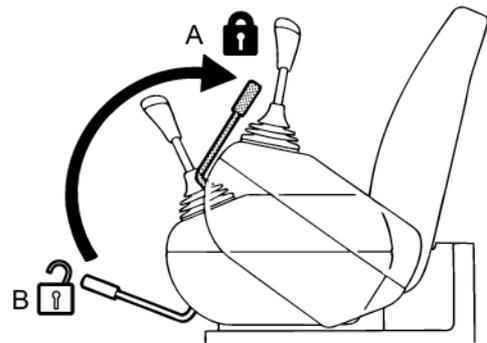
-If the wall is faced to the exhaust outlet of muffler, the wall may be discolored.

-During manual regeneration, the attachment may move, so place the attachment to the ground.

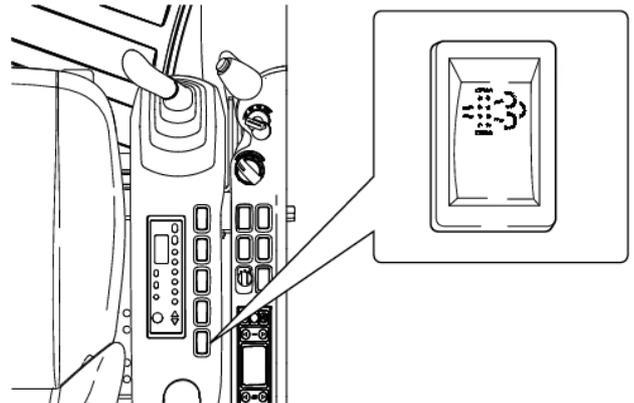
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2. Lower the attachment and take the parking position.
3. Place the safety lever in LOCK position.

A : LOCK position  
 B : UNLOCK position



4. Press the manual regeneration switch once.



5. The icon shown to the right appears on the multi-display.



6. If necessary the regeneration is interrupted, press the manual regeneration switch again or the safety lever is placed in UNLOCK position.
7. When the indication of "REGENERATION" in the screen of multi-display goes out, the soot combustion is finished. Usual machine operation becomes possible. (If the original engine speed is set to low speed, it keeps low speed. If the original engine speed is set to high speed, it keeps low speed until the machine is operated. When the machine is operated, the engine speed returns to its originally set speed. )

4

**Notice**

If regeneration is not performed even when soot is deposited in the DPF too much and regeneration is required, the indication of "1. LIFT UP LOCK LEVER 2. PUSH REGENERATION SW." and "EXHUAST GAS AFTER TREATMENT EQUIPMENT WILL BE DAMAGED" appear alternatively on the multi-display and the engine speed is fixed at low speed. In this case, pull up the pilot control shut-off lever and press the manual regeneration switch. Manual regeneration will start.



## [4. MAINTENANCE]

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### IMPORTANT

If operation is continued without "manual regeneration" and soot becomes deposited too much, "EXHAUST GAS AFTER TREATMENT EQUIPEMENT FAILURE" and "37198" appear alternatively on the multi-display. In this case, please contact our authorized service shop near you. Inspection and maintenance on the DPF is required.

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### 4.3.4 INSPECTION

Inspection interval: Every 1,000 hrs. (Or every 1 year)

Inspection for damage of the body of DPF and the sensor wiring and hoses attached to the body of DPF is required. If damage (cracking etc.) on the surface of sensor hose is found at the time of inspection, replace the hose immediately. Please contact us or our authorized dealer/distributor for inspection and replacement.

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### Notice

To inspect DPF, diagnosis by the special tool is required.

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#### 4.3.5 MAINTENANCE STANDARD

- Inspection and maintenance on the body of DPF and the sensor wiring and hoses attached to the body of DPF are required in every 2 years. Please contact us or our authorized dealer/distributor for inspection and replacement.
- Clean or replace DPF in every 3,000 hrs. Please contact us or our authorized dealer/distributor for cleaning and replacement.

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**IMPORTANT**

If inspection and maintenance are not performed, it may cause malfunction of the engine and DPF. Please contact us or our authorized dealer/distributor for inspection and maintenance.

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**IMPORTANT**

Replace the hose for DPF differential pressure sensor with new one in every 2 years.

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#### 4.3.6 PRECAUTION FOR USE OF DPF

##### A. Do not use the fuel other than the specified fuel

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**IMPORTANT**

Use the low-sulfur diesel fuel (S50: Sulfur content 50 ppm or less). In cold areas, use appropriate low-sulfur diesel fuel. If you use the unspecified fuel, it adversely affects the engine and DPF and causes white smoke or malfunction.

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##### B. Use the recommended brand engine oil

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**IMPORTANT**

To keep the DPF function in good condition for long periods, use the recommended brand engine oil.

---

##### C. Do not modify the tail pipe

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**IMPORTANT**

If the direction or length of the tail pipe is modified, it will adversely affect DPF. Do not modify the tail pipe.

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**IMPORTANT**

-When the oil leak and damage are found in the lower roller, upper roller and front idler, contact our dealer/distributor for repair.

-Use ASTM D-975 or EN 590 No.2 oil for fuel without fail.

This engine is equipped with electric control high pressure fuel injection system to obtain the features like excellent fuel saving and emission in good condition. This system requires the parts in high precision and high lubricating ability. Therefore if low viscosity fuel in low lubricating ability is used, the durability may be notably lowered.

---



**AVOID ANTIFREEZE / COOLANT FIRE HAZARD**

Antifreeze/Coolant is flammable. Direct contact with hot surfaces of flames may cause the Antifreeze/Coolant to burn. Repair leaks immediately and dispose of used Antifreeze/Coolant promptly and in accordance with government environmental regulation.

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**Notice**

\*1 : L.L.C means "Long Life Coolant"

\*2 : Cartridge part number KAPG0420D1 (400 g × 20). Pail can part number KAPG1601D1.

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**Notice**

**LLC [OUR GENUINE ANTIFREEZE / COOLANT]**

The cooling system is filled long life coolant LLC which is our Genuine Antifreeze / Coolant us for this machine. Our Genuine Antifreeze / Coolant protects the cooling system from harmful corrosives while providing superior cooling performance necessary for emissions compliant engines for up to 2 years or 2000 hours of operation. Our Genuine Antifreeze / Coolant also protects the engine from freezing in cold climate regions. Use of coolant other than our Genuine Antifreeze / Coolant is not recommended and may result in poor machine performance and possible damage to the engine and cooling system. Our Genuine Antifreeze / Coolant is specified for all machines operating in all regions including areas where cold temperatures or freezing is not normally expected.

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## 4.5 USE OF BIO-DEGRADABLE OILS

When using Bio-degradable Oil (BIO OIL), refer to the following information.

### A. Grease and Oil for Use

Regarding greases and oils for use, ask your KOBELCO authorized dealer.

### B. Precaution for the Use of Oil

1. When filling the former machine in which mineral oil is charged with BIO oil, try to flush the machine three times.  
The mineral oil will be left in the circuit of the machine without flushing, resulting in the reduction of effect of biodegradation ability.
2. When you use BIO OIL, slewing and travel parking brake performance will be reduced because of lower friction factor of BIO OIL compared to that of mineral oil.

### C. Flushing Procedure

1. Drain mineral oil from the hydraulic tank completely.
2. Drain mineral oil from the cylinder completely.
3. Fill hydraulic oil tank with new BIO oil.
4. After starting engine, move every cylinder 10 strokes respectively.



The abrupt operation may cause burning of seal because of trapped air in the cylinder.  
Try to operate first 4 strokes slowly at engine low idling to charge hydraulic oil in the entire cylinder.

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5. Idle travel motor right and left for about 3 minutes.
6. Repeat swing operation 10 rotations.
7. Drain BIO oil from hydraulic tank completely.
8. Drain BIO oil from each cylinder completely.
9. Fill hydraulic tank with new BIO oil. Similarly, repeat the procedure 4. to 9. two times.
10. For hydraulic oil in final condition, analyze the hydraulic oil and be sure of amount of remaining mineral oil.

### D. Bio Oil Change Interval

The BIO oil change interval is 2,000 hours.

For the changing procedure, refer to the section "4.20.A Change Hydraulic Oil".

## 4.6 MAINTENANCE PARTS

### A. Table of Maintenance Parts

Replace parts, such as filters and elements, during the periodical maintenance or before the service life.

The machine can be used economically if the parts are changed properly and timely.

When you place an order of parts, confirm the parts number on parts manual.

System	Part Number	Parts Name	Q'ty	Replacement Interval
Hydraulic oil tank	YV52V01003R610	Return filter element kit (STD. Breaker)	1	After 50 hours (first change) Every 1000 hours (from 2nd change) (Breaker specification : Every 250 hours)
	(ZD11G18500)	(O-ring)	1	
	YN50V00025F2	Suction strainer	1	Every 2000 hours
	(ZD11G18500)	(O-ring)	1	
Air breather	YN57V00010S002	Element	1	Every 1000 hours Replacement of element a 1000 hours interval is a guideline. If the machine is operated in very dusty conditions, change the oil filter at a reduced hour interval.
Air cleaner	YY11P00008S003	Element (Outer)	1	After 6 times of cleaning or one year whichever comes first
	YY11P00008S002	Element (Inner)	1	For machines equipped with W (double) element the inner element must be replaced together with the outer element. Replace the inner element with new one.
Engine oil filter	VA32A4000400	Cartridge	1	After 100 hours (first change) Every 500 hours
Fuel pre-filter	VA32K6201010	Element kit	1	Every 500 hours
Fuel filter	VA32K6201020	Element kit	1	Every 500 hours
Air conditioner	YN50V01015P3	Air-con filter (Outer)	1	Every 10 times cleanings When heavy clogging of filter occurs, clean or replace
	YN50V01014P1	Air-con filter (Inner)	1	
Pilot line filter	YN50V00020F1	Line filter	1	Every 2000 hours (Cleaning)
Radiator	YY05P00061S005	Radiator cap	1	Every 1000 hours
Bucket (STD)	2412N278D11	Side cutter (R.H)	1	When required
	2412N278D21	Side cutter (L.H)	1	
	ZS13C20050	Bolt	8	
	ZN13C20016	Nut	8	
	2412U16F1	Tooth assy (Inner)	3	
	2412U112F1	Tooth assy (Outer)	2	
Built-in battery of communication controller (Mobile communications)	YN22E00302S001	Battery	1	Every year

## [4. MAINTENANCE]

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### IMPORTANT

- Items enclosed in parenthesis ( ) are the parts to be changed at the same time.
  - The built-in battery of communication controller needs to be replaced every year.  
Contact us or our authorized dealer / distributor for replacement.
-

## 4.7 TORQUE VALUES FOR SPECIFIED

Follow the table below and tighten or retighten every bolt and nut. Check for any loose or missing bolts or nuts before daily operation and during periodical inspections. Retighten or supply new parts for missing ones as required.

Size (M)	Q'ty	Opposing flats mm	Location	Tightening torque N•m {lbf•ft}	Recommended sealant
M5	5	–	• Sending unit mounting (fuel tank)	• 1.96±0.2 {1.4±0.14}	
M8	4	13	• A/C condenser mounting	• 11±1 {8.1±0.7}	
	4	13	• Water subtank mounting	• 10.7±1.1 {7.9±0.8}	
	4	13	• Air cleaner mounting	• 17.5±1.8 {13±1.33}	
M10	6	17	• Swivel joint dust cover mounting	• 14.7±1.5 {10.8±1.1}	Apply Loctite #572
	2	17	• Slewing grease bath inspection cover mounting	• 29.4±2.9 {21.6±2.2}	Apply Loctite #572
	8	17	• Floor plate rubber mounting	• 46.5±4.6 {34±3.4}	
	8	17	• Power take-up bracket mounting	• 64.7±6.4 {47±4.3}	Apply Loctite #262
	12	17	• Hydraulic oil tank cover mounting	• 46.5±4.6 {34±3.4}	
	2	17	• Lower frame grease cover mounting	• 10.8±0.98 {8.0±0.7}	
	6	17	• Fuel tank bottom cover mounting	• 46.5±4.6 {34±3.4}	
M12	16	19	• Engine mounting	• 115±12 {84.8±8.8}	Apply Loctite #262
	4	19	• Radiator mounting	• 120.6±12 {89±8.8}	Apply Loctite #262
	4	19	• Radiator stay mounting	• 120.6±12 {89±8.8}	
	4	19	• Cab mounting	• 80±8 {59±5.9}	
	3	19	• Swivel joint mounting	• 107.8±10.8 {79.5±8.0}	Apply Loctite #262
	4	24	• Idler & Idler adjust setting bolt	• 115±12 {85±8.8}	Apply Loctite #262
	8	19	• Travel motor cover mounting	• 83.4±8.4 {61.5±6.2}	Apply Loctite #262
M16	40	24	• Travel motor mounting	• 279±28 {206±21}	Apply Loctite #262
	2	14	• Hydraulic pump mounting	• 235±24 {173±18}	Apply Loctite #262
	4	24	• Floor plate rubber mounting nut	• 191±19 {141±14}	
	4	24	• Hydraulic tank mounting	• 191±19 {141±14}	Apply Loctite #262
	8	14	• Power take-up coupling mounting	• 220±10 {162±7.4}	
	36	24	• Sprocket mounting	• 279±29 {206±21}	Apply Loctite #262
	34	24	• Slewing bearing outer mounting	• 256±25.6 {189±19}	Apply Loctite #262
	36	24	• Slewing bearing inner race mounting	• 279±29 {206±21}	Apply Loctite #262
	4	24	• Fuel tank mounting	• 191±19 {141±14}	Apply Loctite #262
	56	24	• Lower roller mounting	• 279±28 {206±21}	Apply Loctite #262
	184	24	• Shoe bolt mounting	• 392±29 {289±21}	
	4	24	• Engine mounting	• 191±19 {141±14}	Apply Loctite #271
M18	8	27	• Track guide mounting	• 397±39 {293±29}	Apply Loctite #262
M20	4	30	• Upper roller mounting	• 539±54 {398±40}	Apply Loctite #262
	8	30	• Side cutter mounting	• 539±54 {398±40}	
	9	30	• Swing reduction unit mounting	• 539±54 {398±40}	Apply Loctite #262
	3	30	• Counterweight mounting (ADDITIONAL)	• 490±49 {361±36}	Apply Loctite #262
M27	4	41	• Counterweight mounting	• 1,270±130 {937±96}	Apply Loctite #262
M30	1	22	• Cab mounting pin	• 191±19 {141±14}	
	1	46	• Cab mounting nut	• 191±19 {141±14}	
5/8-18UNF	2	19	• Idler adjuster grease nipple mounting	• 59±10 {44±7.4}	

## [4. MAINTENANCE]

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The counterweight attaching bolts may be loosened by hitting the counterweight against solid obstructions during swing operation.

How to check:

Strike the bolt head or nut by hand hammer lightly and find the looseness by catching dull sound.

Tighten bolts and nuts again if necessary.

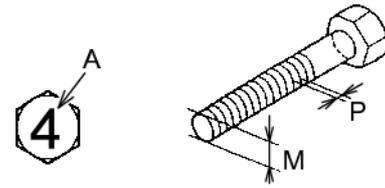
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## 4.8 TORQUE SPECIFICATIONS FOR BOLTS & NUTS

The following torque specifications are provided for use when actual torque value of a fastener is not known.

Check the machine for loose bolts and nuts daily before starting work and at the scheduled maintenance interval. Replace missing bolts and nuts with equal specification as the original parts. Contact the dealer/distributor for assistance if necessary. Tighten loose and replacement nuts and bolts to the specification given in the specific manual section or in the chart below.

Refer to the below table for proper tightening of bolts.



### IMPORTANT

- The torque values in the table do not apply for all bolts used with plastic covers. For the tightening torque for such bolts, consult with dealer/distributor. Over-tightening may cause for damage on the parts to be fixed.
- Check if the torque is specified in a specific section of this manual. If provided, use the torque in the specific section.
- Metric hardware with thread size diameter of M5 or greater have a number on the top of the bolt indicating the strength of the bolt.

## [4. MAINTENANCE]

1. Metric coarse thread standard tightening torque values. Tighten all bolts and nuts to proper torque values.

### Metric Coarse Thread (Not plated)

Torque value Unit : N•m {lbf•ft}

Classification		4.8T		7T		10.9T	
Nominal size		No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M6	P=1	4.4±0.5 {3.2±0.4}	3.7±0.4 {2.7±0.3}	9.6±1.0 {7.1±0.7}	8.1±0.8 {6.0±0.6}	17.4±1.8 {12.8±1.3}	14.7±1.5 {10.8±1.1}
M8	P=1.25	10.7±1.1 {7.9±0.8}	9.0±0.9 {6.6±0.7}	23.5±2.0 {17.3±1.5}	19.6±2.0 {14.5±1.5}	42.2±3.9 {31.1±2.9}	35.3±3.9 {26.0±2.9}
M10	P=1.5	21.6±2.0 {15.9±1.4}	17.9±1.8 {13.2±1.3}	46.1±4.9 {34.0±3.6}	39.2±3.9 {28.9±2.9}	83.4±8.8 {61.5±6.5}	70.6±6.9 {52.1±5.1}
M12	P=1.75	36.3±3.9 {26.8±2.9}	31.4±2.9 {23.2±2.1}	79.4±7.8 {58.6±5.8}	66.7±6.9 {49.2±5.1}	143±15 {105±11}	121±12 {89.2±8.9}
M14	P=2	57.9±5.9 {42.7±4.4}	49.0±4.9 {36.1±3.6}	126±13 {92.9±9.6}	106±10 {78.2±7.4}	226±20 {167±15}	191±19 {141±14}
M16	P=2	88.3±8.8 {65.1±6.5}	74.5±6.9 {55.0±5.1}	191±20 {141±15}	161±16 {119±12}	343±39 {253±29}	284±29 {209±21}
M18	P=2.5	122±12 {90.0±8.9}	103±10 {75.8±7.2}	265±29 {195±21}	226±20 {167±15}	481±49 {355±36}	402±39 {297±29}
M20	P=2.5	172±17 {127±13}	144±14 {106±10}	373±39 {275±29}	314±29 {232±21}	667±69 {492±51}	559±59 {412±44}
M22	P=2.5	226±20 {167±15}	192±20 {142±15}	500±49 {369±36}	422±39 {311±29}	902±88 {665±65}	755±78 {557±58}
M24	P=3	294±29 {217±21}	235±29 {173±21}	637±69 {470±51}	520±49 {383±36}	1160±118 {856±87}	941±98 {694±72}
M27	P=3	431±39 {318±29}	353±39 {260±29}	941±98 {694±72}	765±78 {564±58}	1700±167 {1250±123}	1370±137 {1010±101}
M30	P=3.5	588±59 {434±44}	490±49 {361±36}	1285±127 {948±94}	1079±108 {796±80}	2300±235 {1700±173}	1940±196 {1430±145}
M33	P=3.5	794±78 {586±58}	667±69 {492±51}	1726±177 {1270±131}	1451±147 {1070±108}	3110±314 {2290±232}	2610±265 {1930±195}
M36	P=4	1030±98 {760±72}	863±88 {637±65}	2226±226 {1640±167}	1863±186 {1370±137}	4010±402 {2960±297}	3360±333 {2480±246}

2. Metric fine thread standard tightening torque values. Tighten all bolts and nuts to proper torque values.

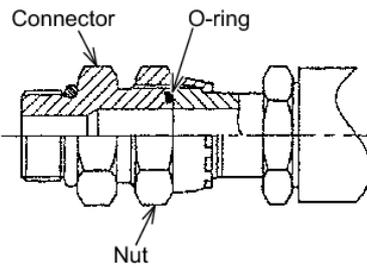
#### Metric Fine Thread (Not plated)

Torque value Unit : N•m {lbf•ft}

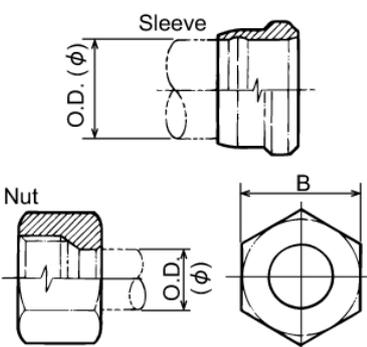
Classification		4.8T		7T		10.9T	
Nominal size		No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M8	P=1.0	11.3±1.1 {8.3±0.8}	9.5±1.0 {7.0±0.7}	24.5±2.0 {18.1±1.5}	20.6±2.0 {15.2±1.5}	44.1±3.9 {32.5±2.9}	37.3±3.9 {27.5±2.9}
M10	P=1.25	22.6±2.0 {16.7±1.5}	18.7±1.9 {13.8±1.4}	48.1±4.9 {35.5±3.6}	41.2±3.9 {30.3±2.9}	87.3±8.8 {64.4±6.5}	73.5±6.9 {54.2±5.1}
M12	P=1.25	39.2±3.9 {28.9±2.9}	33.3±2.9 {24.6±2.1}	85.3±8.8 {62.9±6.5}	71.6±6.9 {52.8±5.1}	154±16 {114±12}	129±13 {95.2±9.6}
M16	P=1.5	92.2±8.8 {68.0±6.5}	77.5±7.8 {57.2±5.8}	196±20 {145±15}	169±17 {125±13}	363±39 {268±29}	304±29 {224±21}
M20	P=1.5	186±19 {137±14}	155±16 {114±12}	402±39 {297±29}	333±29 {246±21}	726±69 {535±51}	608±59 {448±44}
M24	P=2	314±29 {232±21}	265±29 {195±21}	686±69 {506±51}	569±59 {420±44}	1240±118 {915±87}	1030±98 {760±72}
M30	P=2	637±59 {470±44}	530±49 {391±36}	1390±137 {1030±101}	1157±118 {853±87}	2500±255 {1840±188}	2080±206 {1530±152}
M33	P=2	853±88 {629±65}	706±70 {521±52}	1860±186 {1370±137}	1550±155 {1140±114}	3350±334 {2470±246}	2790±275 {2060±203}
M36	P=3	1070±108 {789±80}	892±88 {658±65}	2330±226 {1720±167}	1940±196 {1430±145}	4200±422 {3100±311}	3500±353 {2580±260}

## 4.9 TORQUE SPECIFICATIONS FOR JOINTS & HYDRAULIC HOSES

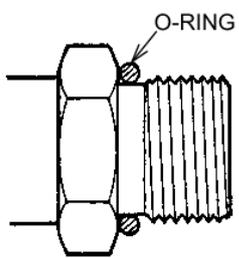
### A. Ors Joint (O-Ring Sealing Type)

Hose mouth ring and coupling	Nominal Size	Wrench Size (mm)	Torque Value N•m {lbf•ft}	
	1-14 UNS	30	137±14 {101±10}	
		32		
	1-3/16-12 UN	36	177±18 {130±13}	
41		206±21 {152±15}		
1-7/16-12 UN	41	206±21 {152±15}		
	46			

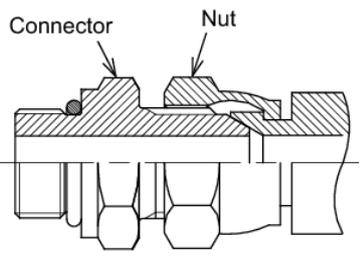
### B. Nuts & Sleeve

Tube Size O.D. × Thickness (mm)	Wrench Size B (mm)	Torque Value N•m {lbf•ft}	
10 × 1.5	19	49±9.8 {36±7}	
15 × 2.0	27	118±12 {87±9}	
18 × 2.5	32	147±15 {108±11}	
22 × 3.0	36	216±22 {159±16}	
28 × 4.0	41	275±27 {202±20}	
35 × 5.0	55	441±44 {325±33}	

### C. Joints for Piping

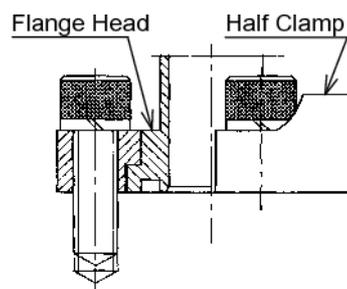
Nominal Screw Size (PF)	Wrench Size (mm)	Torque Value N•m {lbf•ft}	
1 / 8	14	15±2 {11±1.5}	
1 / 4	19	36±2 {27±1.5}	
3 / 8	22	74±5 {54±4}	
1 / 2	27	108±9.8 {80±7}	
3 / 4	36	162±9.8 {119±7}	
1	41	255±9.8 {188±7}	
1 - 1 / 4	50	392±40 {289±30}	
1 - 1 / 2	55	485±49 {358±36}	

### D. Hydraulic Hoses

Nominal Screw Size (PF)	Wrench Size (mm)	Torque Value N•m {lbf•ft}	
1 / 8	14	15±2.0 {11±1}	
1 / 4	19	29±4.9 {22±4}	
3 / 8	22	49±4.9 {36±4}	
1 / 2	27	78±4.9 {58±4}	
3 / 4	36	118±9.8 {87±7}	
1	41	137±15 {101±11}	
1 - 1 / 4	50	167±15 {123±11}	

E. Split Flange

Size	Working Pressure MPa {kgf/cm <sup>2</sup> } 20.6 {210}		Working Pressure MPa {kgf/cm <sup>2</sup> } 41.2 {420}	
	Torque Value N·m {lbf·ft}	Bolts Size (M)	Torque Value N·m {lbf·ft}	Bolts Size (M)
3 / 4	33.9±5.6 {25±4.1}	10	39.5±5.6 {29±4.1}	10
1	42.4±5.6 {31±4.1}	10	62.2±5.6 {46±4.1}	12
1 – 1 / 4	55.1±7.1 {41±5.2}	10	93.3±8.4 {69±6.2}	14
1 – 1 / 2	70.6±8.4 {52±6.2}	12	169±11 {125±8.1}	16
2	81.9±8.4 {60±6.2}	12	282±11 {208±8.1}	20



**IMPORTANT**

These tightening torques are available in the case of tightening without lubricant.

## 4.10 INSPECTION & MAINTENANCE CHART

Follow the chart below for recommended intervals of regular inspection and maintenance procedures. Perform inspection and maintenance according to the calendar time or operation time shown by the hour meter, whichever comes first.

See the inspection and maintenance procedure mentioned below for details.

### Symbols and their meanings :

☐ : Necessary regular inspection item to hour meter

\*1 : Only first replacing is performed

○ : inspection and/or maintenance is needed

### Notice

See "4.4 LUBRICANT, FUEL & COOLANT SPECIFICATIONS" for detail specification for lubricant, coolant, fuel and etc.

LLC: Our genuine antifreeze/coolant.

System	Maintenance to Perform		When required	Interval (Hours on Hourmeter)							Lubricant, etc. (Replacing part)	REF. ITEMS		
				8H	50H	100H	250H	500H	1,000H	2,000H			5,000H	
Engine	Engine oil	Check oil level		○								Engine oil	3.1.2.B	
		Change			*1 (First)			○					4.16.A	
	Oil filter	Change			*1 (First)			○				Cartridge	4.16.C	
	CCV filter	Change							○ (1,500H)			Element	4.18.A	
	Fuel pre-filter	Drain		○								Element	3.1.2D	
		Change						○					4.16.D	
	Fuel filter	Drain		○								Element	3.1.2D	
		Change						○					4.16.E	
	DPF	*5									○ (3,000H)		—	
	Air cleaner elements	Check/ clean						○				Outer element (When outer element is changed, inner element must be replaced without fail)	4.15.A	
		Change				After 6 times of cleaning or one year whichever comes first			○					Outer, inner element
	Coolant level and cleaning of cooling system	Check level		○										3.1.2.A
		Change/ cleaning									○ (or every 2 years)		LLC	4.19.A
	Hoses in cooling system						○							4.15.B
Checking and cleaning of radiator/ oil cooler core/intercooler and filter			○				○						3.1.2.E	
													4.15.C	

### IMPORTANT

When the machine works at dusty site, clean the filter and the core of radiator often. Clean the filter and core depending on their dirt.

System	Maintenance to Perform		When required	Interval (Hours on Hourmeter)							Lubricant, etc. (Replacing part)	REF. ITEMS	
				8H	50H	100H	250H	500H	1,000H	2,000H			5,000H
Engine	Check belt tensioner	Check		O									3.1.2.G
		Adjust				O							4.15.D
	Cleaning or Replacement of Radiator cap	Clean				O							4.15.G
		Change							O				
	Checking for rubber hose of intake system						O						4.15.E
	Checking of engine mount bracket for tightening					*1 (First)			O				4.17.A
	*2 Checking and adjustment of valve clearance								O				—
	*2 Checking and adjustment of compression pressure								O				—
	*2 Checking of intake and exhaust manifold for tightening					*1 (First)			O				—
	*2 Checking of oil pan and other accessories for tightening					*1 (First)			O				—
	*2 Checking of installing turbo charger for tightening					*1 (First)			O				—
	*2 Checking of turbo charger rotor and impeller for rotating								O				—
	*2 Checking of turbo charger rotor for looseness								O				—
	*2 Checking of turbo charger for lubrication			O					O				—
	*2 Checking and cleaning of stator brush and commutator								O				—
	*2 Checking of oil pan and for intrusion of water and fuel					O							—
	*2 Checking of fan mounting bolt for tightening					O							—
	*2 Checking of thermostat for function								O				—
	*2 Checking of starter for function								O				—
	*2 Checking of stability, exhaust color and noise			O									—
	*2 Checking of heater plug/intake air heater (Starting aid)								O				—
	*2 Checking of alternator for function								O				—
	*2 Checking of each pipe joint for tightening					*1 (First)			O				—
	*2 Checking of exhaust pipe and muffler for installation looseness and damage					*1 (First)			O				—
*2 Checking and cleaning of alternator brush (If equipped)								O				—	

**IMPORTANT**

- Contact our dealer/distributor for checking and adjustment shown by asterisk \*2.
- \*1 : Break-in (After first 50, 100, 500 Hours) Inspection & Maintenance Required.
- \*5 : Please consult your nearest specified service shop.



## [4. MAINTENANCE]

System	Maintenance to Perform		When required	Interval (Hours on Hourmeter)							Lubricant, etc. (Replacing part)	REF. ITEMS		
				8H	50H	100H	250H	500H	1,000H	2,000H			5,000H	
Engine	Checking leakage of fuel system			O									3.1.1.A	
	Checking engine oil leakage			O									3.1.1.A	
	Check engine electrical			O									—	
Fuel system	Fuel tank	Check/fuel level		O									3.1.2.C	
		Drain water and deposits			O								4.13.B	
		Clean cap and strainer							O				4.16.G	
	Air bleeding fuel system								O				4.16.F	
Hydraulic system	Hydraulic tank	Hydraulic oil	Check oil level		O							Hydraulic oil	3.1.2.F	
		Change							O		O		4.20.A	
		Suction strainer	Clean								O		Strainer	4.19.B
		Return filter				*1 (First)		O (Breaker attachment)		O			Element	4.17.B
	Air breather filter	Change							O			Element	4.17.C	
	Check for oil leaks			O										3.1.1.A
	Check hoses/lines			O										3.1.1.A
	Pilot line filter	Clean								O				4.19.C
Upper frame	Swing reduction oil level & fill	Check oil level				O (120hr)						Extreme gear oil	4.14.A	
		Change						*1 (First)		O		SAE #90 GL-4	4.19.D	
	Grease slewing ring									O			EP grease	4.16.H
	Check grease in slewing ring grease bath										O		EP grease	4.19.E
	Check slewing brake			O										—
	Check bolts/torque (Slewing ring)									O				4.16.I
	Greasing of control lever push rod and universal joint									O			EP grease	4.16.J
	Check bolts/torque (Counterweight)					*1 (First)		O						4.7
Grease swing reduction unit										O			4.19.F	
Lower frame	Travel reduction unit oil level & fill	Check oil level				O (120hr)						Extreme gear oil	4.14.B	
		Change						*1 (First)		O		SAE #90 GL-4	4.19.G	
	Adjust track tension					O								4.13.C
	Check for oil leaks			O										3.1.1.A
	Check lines for damage			O										3.1.1.A
Check steps & handrails			O										3.1.1.A	

System	Maintenance to Perform	When required	Interval (Hours on Hourmeter)								Lubricant, etc. (Replacing part)	REF. ITEMS
			8H	50H	100H	250H	500H	1,000H	2,000H	5,000H		
Lower frame	Check frame structure		○									3.1.1.A
	Check tracks & links		○									3.1.1.A
	Check sprocket wear		○									3.1.1.A
	Check idler wear		○									3.1.1.A
	Check roller wear		○									3.1.1.A
Attachment	Grease for pins		*3 ○ (50H)				*4 ○	○				4.12.A
	Grease bucket pins		*3 ○ (50H)				○					4.12.A
	Replacement of backhoe bucket	○										4.11.C
	Bucket clearance	○										4.11.F
	Check bucket teeth and side cutters	○										4.11.D
	Check bolts/torque		○									—
Electrical	Battery	Battery electrolyte		○								4.13.A
		Battery maintenance		○								4.13.A
		Voltage check							○			4.17.D
	Inspect all wiring		○									3.1.1.A
	Check switches/light		○									—
Accessories	Air conditioner	Check A/C Refrigerant						○				4.16.K
		Filter	Clean				○					
	Change				After 10 times cleaning is done				○			
	Check wiper washer fluid level	○										4.11.A 4.11.B
	Check frame structure		○									3.1.1.A
	Check bolts/torque		○									4-7
	Seat belt	Check		○								
Change									○ (3 years)			

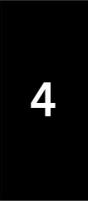
**Note**

**\*3: All attachment has to be lubricated every 8 hours for the first 50 hours of operation.**

Then the attachment should lubricated every 250 hours of operation.

Next it should lubricated every 500 hours of operation, but the lubrication around bucket has to be applied every 250 hours.

\*4: New machine only

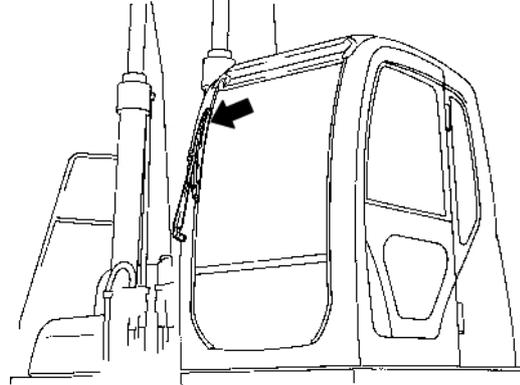


## 4.11 WHEN REQUIRED

Thoroughly read and understand the Section 1 "SAFETY PRECAUTIONS" of this MANUAL before operating or servicing the machine.

### A. Checking and Replacing Wiper Blade

Check wiper blade for wear and damage, replace it if necessary.



### B. Wind Washer Fluid Reservoir

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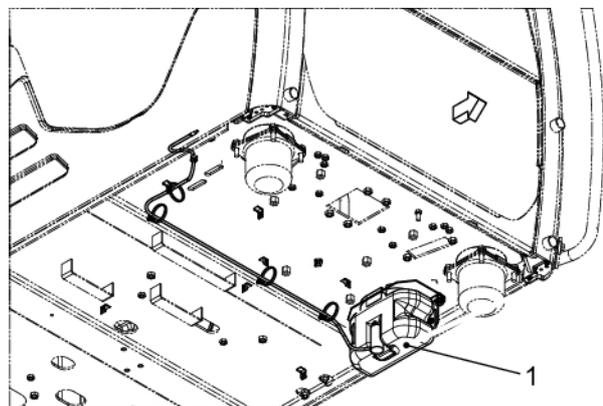
#### **IMPORTANT**

The use of wiper without washer fluid discharged may cause damage to the motor equipped with the washer fluid reservoir.

---

Washer fluid reservoir (1) is located under of floor plate in cab.

1. Remove floor mat.
2. Check washer fluid level of washer fluid reservoir (1).
3. When washer fluid level was short, remove the cap and fill up the short of washer fluid.
4. Reinstall floor mat to the original position.

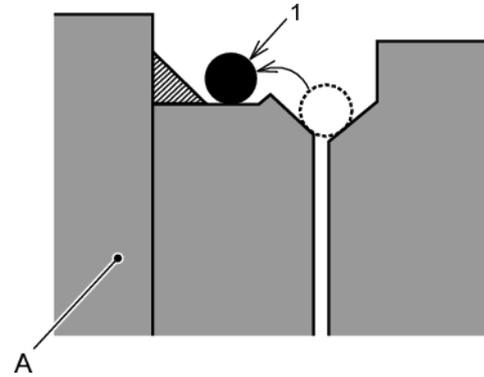


### C. Replacement of Bucket

#### **CAUTION** AVOID INJURY

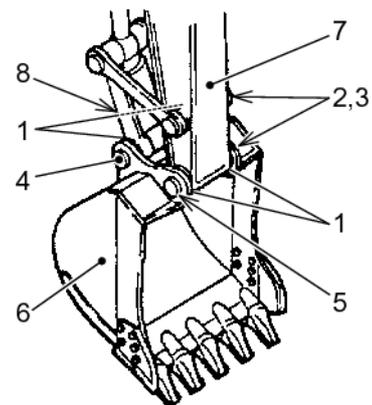
- Replace the bucket on firm level ground. Pay close attention to safety.
- The abrupt operation of front attachment is strictly prohibited because it may cause the danger.
- When aligning the pin bores, do not insert your finger into the bores. It may cause severe injury. Align the bores visually or by using a tool.
- Hold the removed bucket in the stable condition.

A: Bucket Boss



#### C.1 Removal of Bucket

1. Move the machine to a firm, level surface and rest the bucket on the ground, making certain the bucket is stable.
2. Roll O-rings (1) onto the bucket boss. After removing the pins, get them back to the original position.
3. Extend retaining ring (2), and remove pin (3) and pull pins (4), (5) out, and then remove bucket (6).



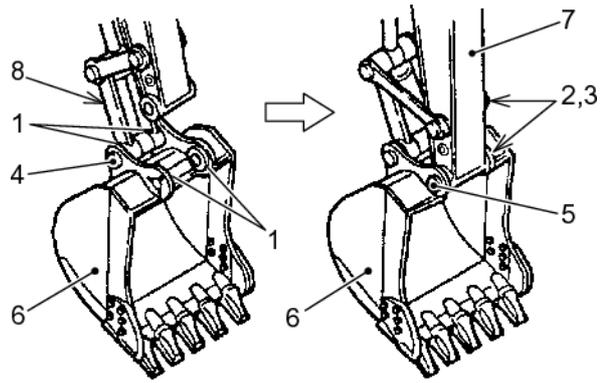
#### **IMPORTANT**

- Keep the pins free from any sand, dirt and other contaminants when removed.
- Do not damage the dust seals on both ends of arm (7) and bucket/bucket link (8).

## [4. MAINTENANCE]

### C.2 Installing Bucket

1. Clean each pin and pin hole and grease sufficiently.
2. Move the bucket cylinder to match the pin bores or the bucket (6) and bucket link (8) with each other, then insert the pin (4).
3. Raise the boom and slightly raise the bucket from the ground.
4. Align bucket (6) with the pin hole of arm (7) moving arm (7), and insert pin (5).
5. Insert pin (3) and fix retaining ring (2).
6. Fit O-ring (1) to the normal position.
7. Apply grease on the grease nipples for respective pin until the grease comes out through the gap between pins and bore.



### IMPORTANT

Replace the O-ring (1) if it is cracked or has lost elasticity, with a new one.

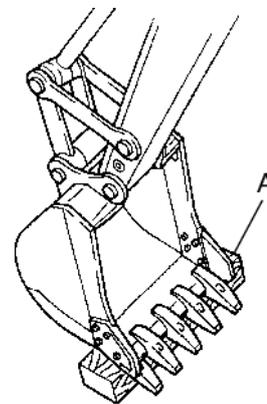
### D. Check for Abrasion/Damages on Tooth Point & Side Cutter

### CAUTION

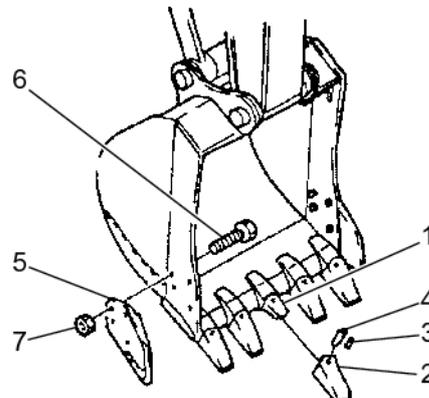
When replacing the tooth point and side cutter, apply a safety block to the bottom face of the bucket.

Check for wear and looseness of the bucket tooth points. Tooth point life cannot be determined only by the number of operating hour; operating conditions must also be considered.

A: Safety Block



1. Adapter Nose
2. Tooth Point
3. Rubber Lock
4. Locking Pin
5. Side Cutter
6. Bolt
7. Nut



D.1 Replacing the Tooth Points



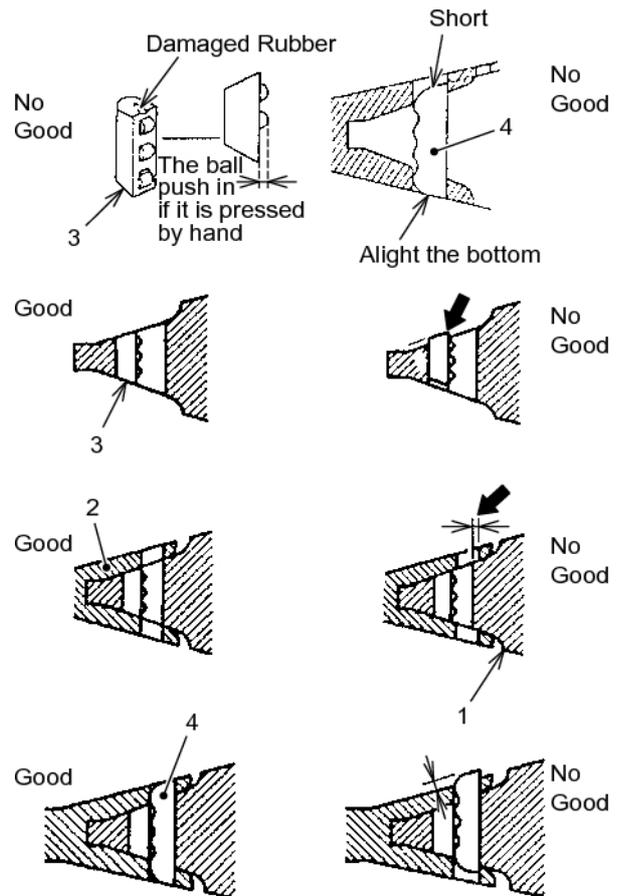
Wear, protective glasses, safety shoes, hard hat, work clothes and work gloves to perform inspection and maintenance on this machine.

Replace the bucket tooth in the following cases.

-When little holes appear on the tooth point.

-When the edge lines of the tooth point are worn.

1. Using a hammer and punching tool, hammer out the lock pin (4). Be careful not to damage the rubber lock (3).
2. Inspect the lock pin (4) and rubber lock (3). Replace them if the lock pin (4) is too short or the rubber lock (3) is in poor condition.
3. Clean the surface of the adapter nose (1) with a putty knife to remove the adhered soil.
4. Fit the tooth point (2) onto the adapter nose (1).
5. Push the rubber lock pin (3) in the hole of the adapter nose (1).
6. Hammer the locking pin (4) until it is aligned with the point surface.



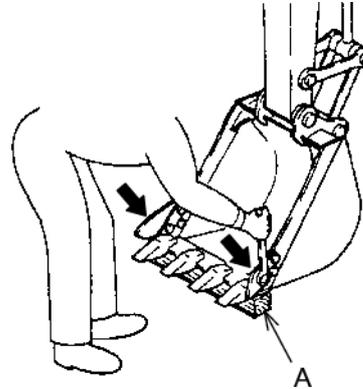
## [4. MAINTENANCE]

### D.2 Replacing the Side Cutters

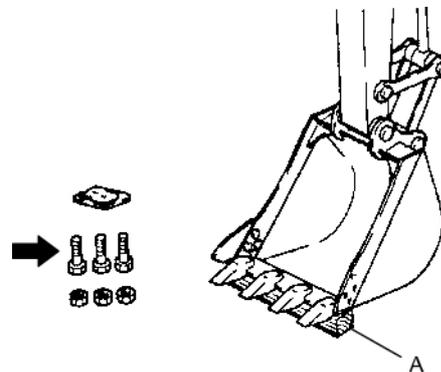


Wear, protective glasses, safety shoes, hard hat, work clothes and work gloves to perform inspection and maintenance on this machine.

1. Remove all sand and soil adhering around the bolts. Use an acetylene torch to cut off the bolts, then remove the side cutter.
2. Clean the mounting face and install a new side cutter. When replacing the side cutter, replace the bolts and nuts with new ones. Tightening torque: 485 to 593 N·m {385 to 437 lbf·ft}
3. After tightening the nuts, spot-weld them.



A: Safety Block



### IMPORTANT

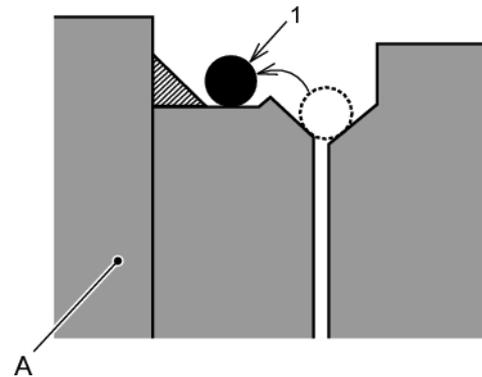
The delay in changing the side cutter from the specified interval may cause damage to bucket. Early replacement is recommended.

**E. Reversing Backhoe Bucket**

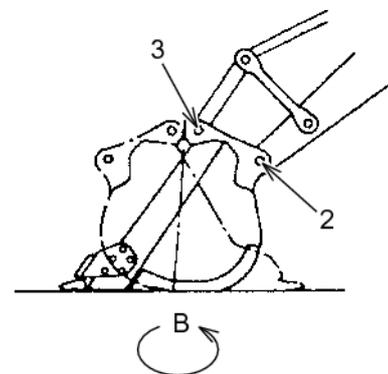
The backhoe bucket which is reversed 180 degrees is available for shoveling work. When working in team, follow the signals exactly and pay particular attention to the safety.

1. Move the machine to a firm level surface and place the bucket on the ground, making certain that the bucket is stable.
2. Roll "O-rings" (1) onto the bucket bosses.
3. Remove retaining ring and pin for bucket pin (2) and for link pin (3). And remove bucket pin (2) and link pin (3).

A: Bucket Boss



4. Rotate arm 180 degrees with the arm slightly raised (B) and bucket in place, and lower the arm again and the pin bore position is changed.
5. Clean pins for each part and pin bores and then apply grease sufficiently.
6. Fit O-ring (1) in place
7. Align each pin bore, and insert pin. After inserting pin, fix the pin with retaining ring and pin.
8. After attaching, rotate bucket softly to the stroke end in engine low idling condition and check that there is no interference of each section.



**CAUTION**

Be careful about the use of bucket for shoveling work because the bucket operation is reversed when compared to that for the work with backhoe.

## [4. MAINTENANCE]

### F. Adjusting Bucket Mount Gap

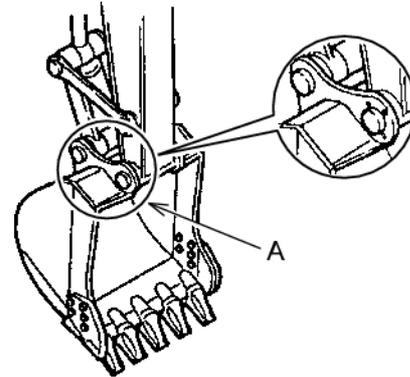


-Unexpected movement of attachment, while adjusting the bucket mounting gap is quite dangerous. Place the bucket on the ground in a stable condition, and set the pilot control shut-off lever to "LOCKED" position, then stop the engine.

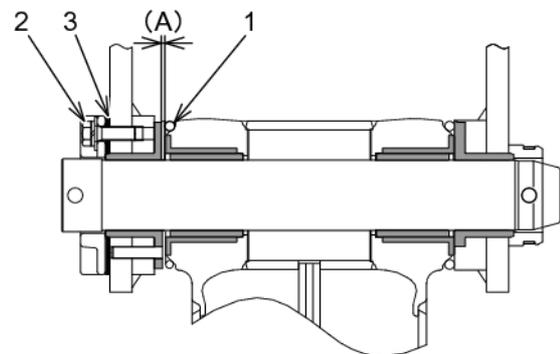
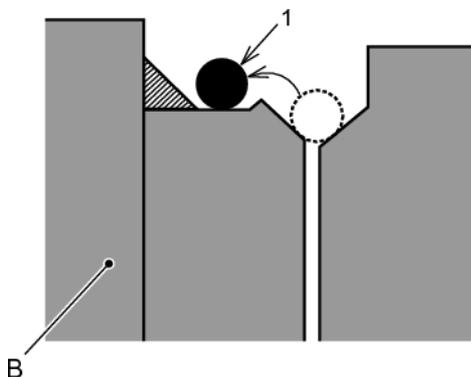
-If the clearance of the bucket is not properly adjusted, galling may occur on the contact faces of the bucket and arm, resulting in abnormal noise and damage of the shaft and O-ring.

Bucket Standard Clearance  
1.2 mm (0.05 inch) or less

A: Bucket Clearance Adjusting mechanism  
B: Bucket Boss



1. Place the bucket in stable condition on the ground.
2. Move O-ring (1) from the regular position to the bucket boss position.
3. Swing rightward slightly and press the arm top end against the bucket right side. (On this side, there is not looseness adjustment mechanism.)
4. Move pilot control shut-off lever to "LOCKED" position and stop engine.
5. Measure clearance (A) between bucket and arm boss. In the event that the measured value is 1.2 mm or more, carry out the adjustment.
6. Three bolts (2) on the clearance adjustment section contain five shims (3) (1 mm in thickness) in average. Loosen each bolt and eliminate sheets of shims equivalent to the clearance.
7. Tighten each bolt (2) to the specified torque equally.  
Tightening torque: 161 to 201 N·m {119 to 148 lbf·ft}
8. Return O-ring (1) in place.



## 4.12 PRE-START (EVERY 8 HOURS) INSPECTION & MAINTENANCE

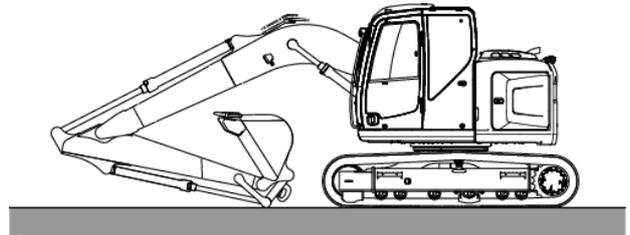
Thoroughly read and understand the "1.SAFETY PRECAUTIONS" of this MANUAL before operating or servicing the machine. The following inspection and maintenance shall be carried out before starting/after starting and after work.

For the following checking and service items, refer to Chapter 3 "MACHINE OPERATION".

- |   |   |
|---|---|
| -3.1.1-A Daily Inspection                                   | -3.1.2-D Fuel Pre-Filter Drain                    |
| -3.1.2-A Checking Coolant Level for Shortage and Making UP  | -3.1.2-E Checking Radiator, Oil Cooler and Filter |
| -3.1.2-B Checking Oil Level of Engine Oil Pan and Making UP | -3.1.2-F Check Hydraulic Oil Level                |
| -3.1.2-C Checking Fuel Level and Making Up                  | -3.1.2-G Checking Belt Tension                    |
|   | -3.1.5 Checking Function of Gauge Cluster         |
|   | -3.1.6 Checking Work Light                        |

### A. Attachment Lubrication

Wipe all grease nipples and apply grease until the grease comes out through the gap of pin. Grease gun is provided inside of side door on the left side of machine.



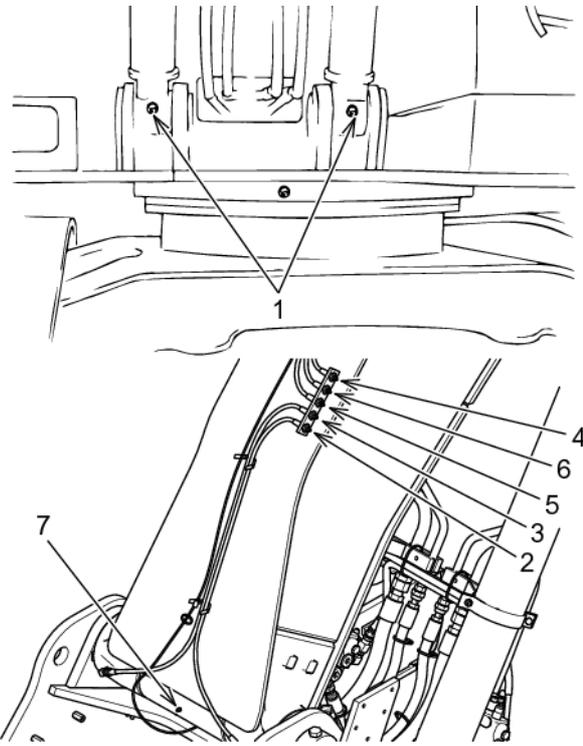
#### Notice

#### Greasing

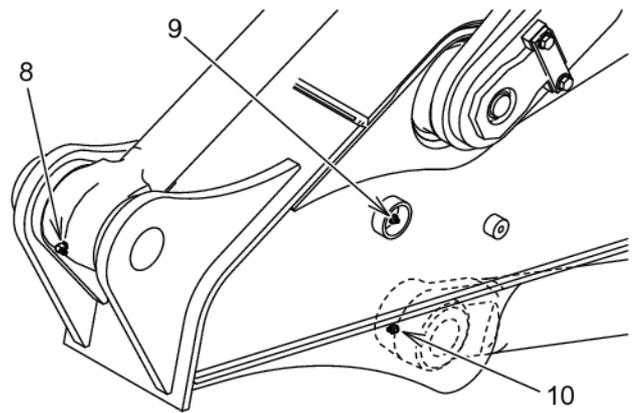
1. All attachment has to be lubricated every 8 hours for the first 50 hours of operation.
2. Then the attachment should be lubricated every 250 hours of operation.
3. Next it should be lubricated every 500 hours of operation, but the lubrication around bucket has to be applied every 250 hours.
4. If attachment is sank in water, it is recommended to lubricate it every 8 hours.
5. Lubricate everyday after heavy duty work with special attachment.
6. For the machine out of operation one month or more has elapsed since the service has stopped, grease the machine without fail before operating again.

## [4. MAINTENANCE]

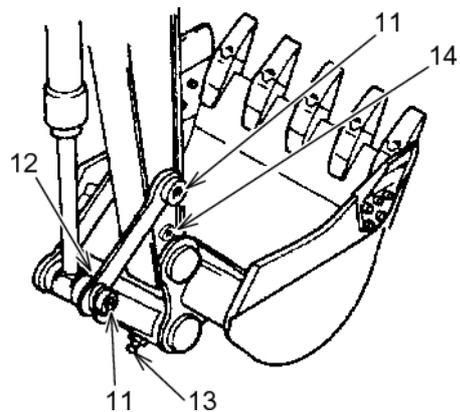
1. Boom cylinder head pins (1).
2. Boom foot pin (2), (3).
3. Boom cylinder rod pins (4), (5).
4. Arm cylinder head pin (6).
5. Boom foot (Center) pin (7).



6. Arm cylinder rod pin (8).
7. Arm to boom pin (9).
8. Bucket cylinder head pin (10).



9. Idler link pins (11).
10. Bucket cylinder rod pin (12).
11. Bucket link (13).
12. Arm top pin (14).



## 4.13 50 HOUR (WEEKLY) INSPECTION & MAINTENANCE PROCEDURES

Thoroughly read and understand the "1.SAFETY PRECAUTIONS" of this MANUAL before operating or servicing the machine.

Perform together with "4.11 PRE-START (EVERY 8 HOURS) INSPECTION & MAINTENANCE".

### A. Batteries



-Wear hard hat, approved protective glasses or face shield, gloves and other safety equipment when working with batteries.

-Flammable gas (hydrogen gas) is generated in the battery. Do not allow sparks or flames to come in contact with batteries to avoid triggering an explosion.

-Battery fluid has strong acid. It corrodes metal very rapidly. If it adheres on skin or enters into eye, it causes for a burn or blindness. At such case, immediately wash skin or eye with lots of water, and ask a doctor to treat it as soon as possible.

-Stop the engine and carry out maintenance and checking service for the battery.

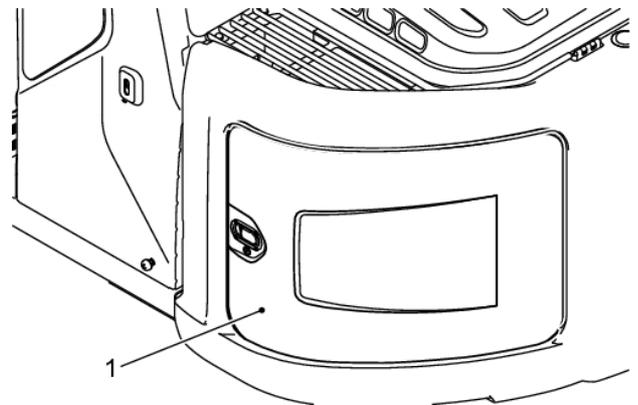
-Remove battery terminal from grounding side (negative terminal) first, and conversely fit the terminal to the grounding side last.

-Do not put tools and hardware on protective cover installed on the battery upper section.

There is a hazard of explosion because the short-circuit may catch fire.

#### A.1 Checking Battery Liquid Level

- Using starter key open the side door (1) located at left rear of machine, and hold it with stay.



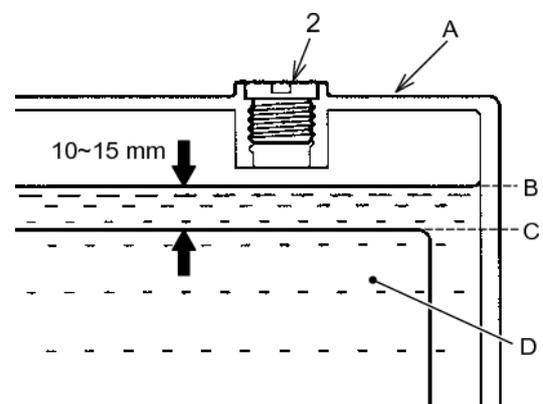
- Remove battery cell caps (2) and visually inspect electrolyte (acid) level. Proper level is 10 to 15 mm (0.4 to 0.6 inch) above cell plates.
- Clean vent of battery cap and tighten cap (2) securely.
- Remove stay and close door side, and lock the door (1) with key.

A: Battery

B: Upper

C: Lower

D: Cell Plates



## [4. MAINTENANCE]

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### Notice

- Clean battery terminal and apply grease or commercial lube oil rust preventive spray.
  - Call in licensed specialty company for the disposal of used battery.
  - Be careful not to use the old battery together with new battery. It may reduce the service life of battery. Therefore replace two batteries together with new ones if required to replace.
- 

### A.2 Measuring Specific Gravity of Battery Liquid

Since the specific gravity of battery liquid varies with respect to the liquid temperature, keep the specific gravity within the range specified in the table.

When the specific gravity is lower than the lower limit, it is necessary to charge the battery.

### Ambient Temperature

Charge	20 degrees C (68 degrees F)	0 degrees C (32 degrees F)	-20 degrees C (-4 degrees F)
100 %	1.28	1.29	1.31
90 %	1.26	1.28	1.29
80 %	1.25	1.26	1.28
75 %	1.24	1.25	1.27

---

### Notice

Do not measure the specific gravity of battery immediately after operation, but measure it at ambient temperature.

---

### Precaution for Operation in Cold District

1. Pay attention to thermal insulation for battery. The drop in temperature may cause freezing of the battery liquid, or the capacity is significantly reduced.
2. Charge battery earlier in the live time.

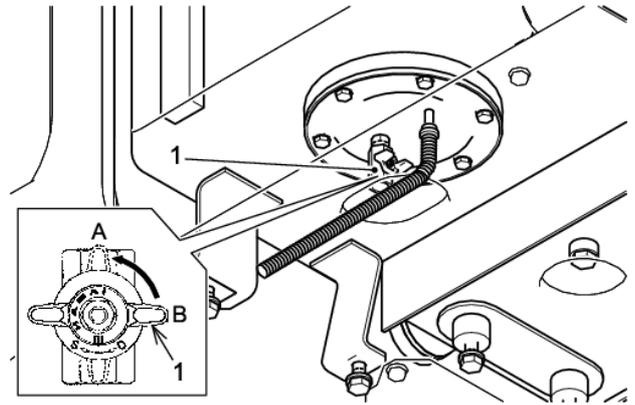
**B. Fuel Tank Drain**

Loosen the drain valve (1) to drain the water and deposits in an empty container.

Since the water is deposited during the night, it is effective to drain before starting up the engine in the morning.

A: Open

B: Close

**WARNING**

Clean up all spilled fuel.

Fuel oil is highly flammable. Spilled fuel can cause fires.

1. Swing the upper structure of the machine so that the drain valve (1) under the fuel tank comes to midway between the crawler shoes of left and right. Place bucket to the ground and stop the engine.
2. Place an empty container under the drain valve (1) to catch the fuel discharged.
3. Open drain valve (1) and discharge water and sediment deposited on the bottom. In this time, be careful not to be showered by flushed fuel.
4. Close drain valve (1) when clean fuel was discharged.

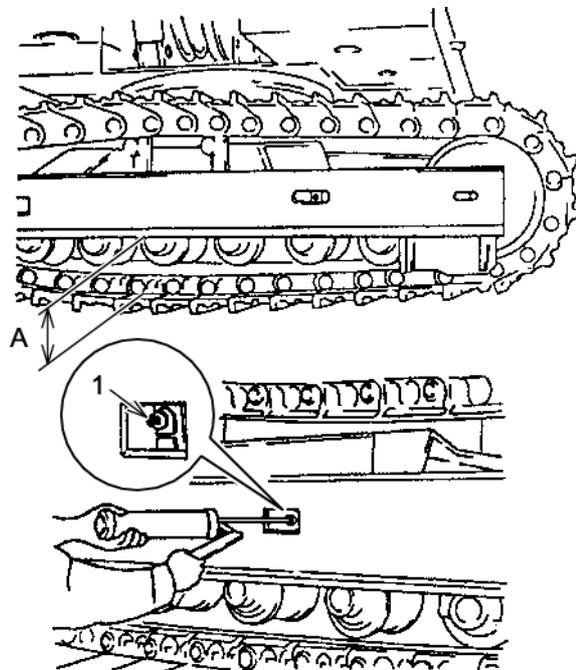
## [4. MAINTENANCE]

### C. Track Tension



- Support lower frame with suitable blocks.
- Before inspecting and greasing, completely wash and remove the mud and dusts attaching to the truck.

1. Operate swing, arm, bucket and boom controls until machine is set up as shown in.
2. In center of track, measure the distance between the bottom of frame rails and surface of shoe.
3. Perform steps 1 and 2 on right track.
4. To increase track tension, set machine as shown in figure and with grease gun inject extreme pressure No.2 grease into idler adjustment grease nipple (1) until proper tension is reached. Perform this procedure on both tracks.



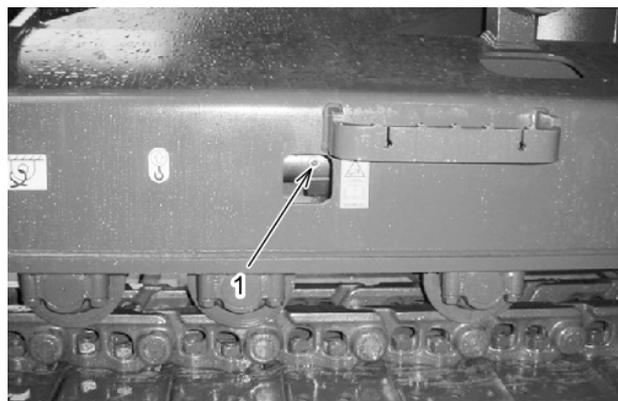
Slack:

Proper Tension (A): 270 to 300 mm (10.6 to 11.8 inches)

### IMPORTANT

After injecting grease, operate the travel control forward and reverse for the track being adjusted. This will balance the tension between the idler and the sprocket. Then remeasure as shown in figure.

5. To decrease track tension, set machine up as shown in figure.
6. Carefully loosen the adjusting grease nipple (1) to allow grease to escape.
7. Tighten grease nipple (1), measure track tension as shown in figure.  
Tightening torque: 49 to 69 N·m (36.1 to 50.9 lbf·ft)
8. If necessary, perform steps 5 through 7 on other track.



Grease in track tensioning mechanism is under extreme pressure and can penetrate skin causing severe injury. Keep face and body away from grease nipple area. Never loosen grease nipple more than one complete turn. If grease does not release after one turn of the nipple, call an authorized our service dealer for assistance.

## 4.14 120 HOUR INSPECTION & MAINTENANCE PROCEDURE

Thoroughly read and understand the "1.SAFETY PRECAUTIONS" of this MANUAL before operating or servicing the machine.

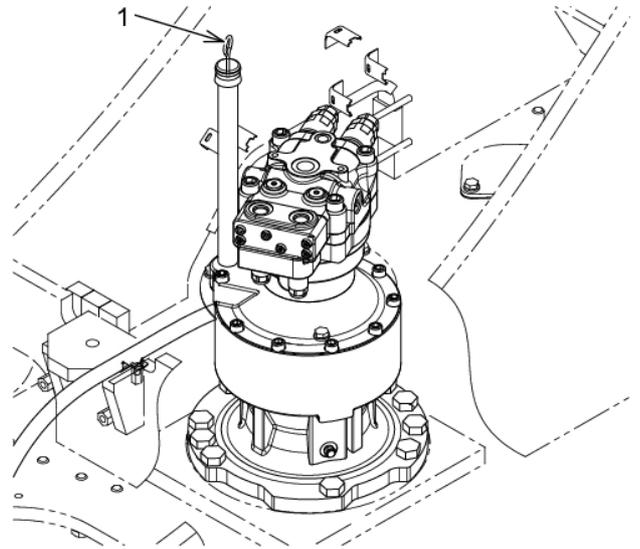
Perform together with daily and 50-hour inspection and maintenance.

### A. Swing Motor Reduction Oil



Never change oils on a machine that has just finished working. Allow machine to cool first until oils and fluids are warm not hot.

1. Before checking, find level place, place bucket on the ground, stop engine and move pilot control shut-off lever to "LOCKED" position.
2. Check gear oil level with the level gauge (1).
3. If the reading of level gauge (1) is within the specified range, it is in proper level. Make up short of specified gear oil through gauge attaching hole. For specified gear oil, refer to the section "LUBRICANT, FUEL & COOLANT SPECIFICATIONS".
4. Attach level gauge (1).



## [4. MAINTENANCE]

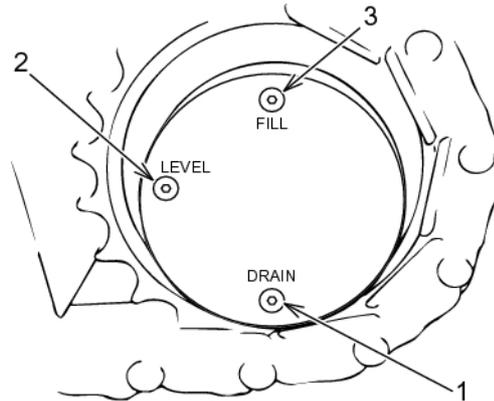
### B. Travel Reduction Unit Oil



-Travel reduction unit could be under pressure. Carefully loosen plug and remove slowly filled air pressure. Where the plug was loosened abruptly, there is the danger of spouting out of plug and oil. Do not face the plug to prevent from flying plug etc.

-Never change oils on a machine that has just finished working. Allow machine to cool first until oils and fluids are warm not hot.

1. Before checking, find level place, stop machine locating plug (1) bottom, and move pilot control shut-off lever to "LOCKED" position.
2. Remove level plug (2) and check for short of oil level and contamination. If the oil level is to the top side of level plug, it is in proper level. If shorted, remove fill plug (3) and make up short of specified gear oil. For specified gear oil, refer to the section "LUBRICANT, FUEL & COOLANT SPECIFICATIONS".
3. Clean level plug (2) and fill plug (3) with light oil, and then attach it in place.
4. Similarly check on the travel reduction unit on the other side.



## 4.15 250 HOUR (3-MONTH) INSPECTION & MAINTENANCE PROCEDURE

Thoroughly read and understand the "1.SAFETY PRECAUTIONS" of this MANUAL before operating or servicing the machine.

Perform together with daily, 50-hour and 120-hour inspection and maintenance.

### A. Air Cleaner Maintenance

#### **CAUTION**

-Direct contact of the body with compressed air, steam and high pressure water can cause injury.

Wear protective glasses, mask, safety cap, safety shoes, etc., to avoid injury.

-Stop engine first and clean and replace the air cleaner element.

#### **IMPORTANT**

-For machines equipped with double element and the inner element (6) must be replaced together with the outer element (3). Do not fail to replace the inner element (6) with new one.

-When cleaning outer element, do not remove inner element to avoid dust getting into engine air intake.

#### A.1 Cleaning or Replacement of Outer Element

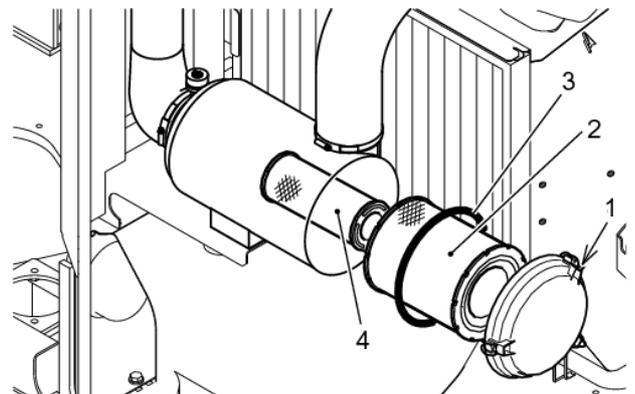
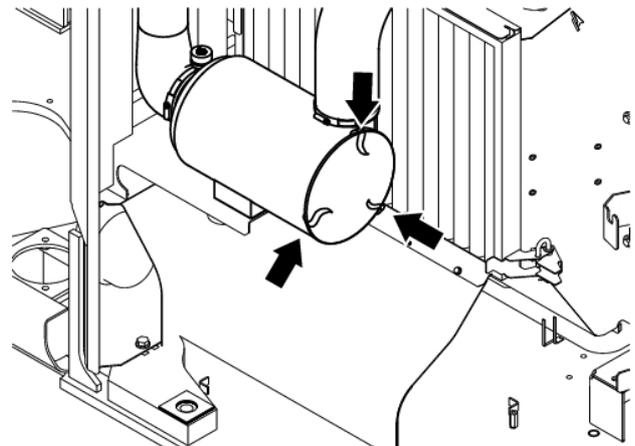
Cleaning and replacement of outer element.

Cleaning :

When warning is indicated on multidisplay or every 250 HOURS.

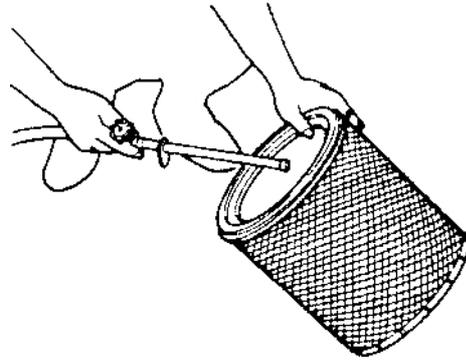
Replacement :

After 6 times of cleaning or one year whichever comes first.



## [4. MAINTENANCE]

1. Using starter key, open side door located at left rear side of machine, and hold it with stay.
2. Remove 3 clamps (1) on the cover and pull out outer element (2).
3. Clean the inside of air cleaner housing
4. To clean the outer element, blow compressed air (less than 0.2 MPa {29 psi}) up and down along the folds of the filter element interior to remove clogged dust or other contaminants.



### **CAUTION**

O-ring (3) is attached around the rim of cover, do not lose this O-ring.  
The water intrusion due to loss of O-ring (3) may cause failure of engine.

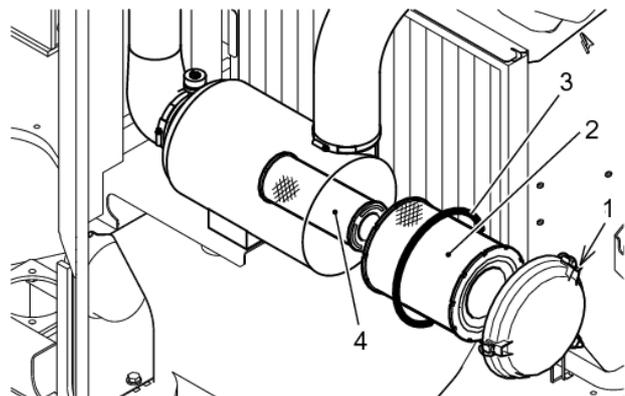
5. After cleaning, check outer element (2) and if pin hole and excessively thinned part were found, replace it with new one.
6. Remove stay and close side door, and lock the door with key.

### **IMPORTANT**

Do not reuse the element with damaged folds, gasket and/or seal.  
Do not heavily tap the element not hit it to anything else for cleaning.

#### **A.2 Replacement of Inner Element**

1. Remove outer element (2) first and then remove inner element (4).
2. Cover air outlet side with clean cloth or sealing tape to prevent intrusion of dust.
3. Clean inside of body and remove the cover attached in item 2.
4. Fit new inner element (4) to connector.
5. Install outer element (2), fit O-ring (3) to cover and install cover with clamp (1).

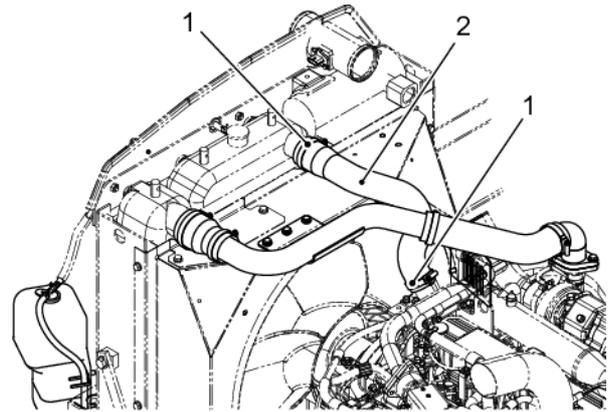


### **IMPORTANT**

Install the air filter so that "ARROW" position mark is faced upward.

**B. Checking the Radiator Hoses**

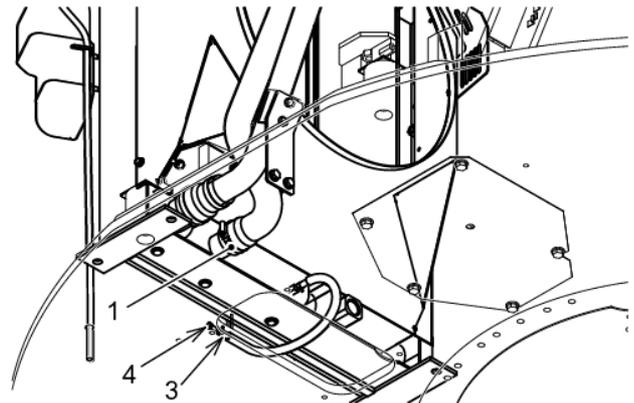
The hose replacement before trouble occurs provides economical and good maintenance. The hose replacement before the hose is damaged will result in cutting costs and minimize the unexpected interruption of work. Replace the hose (2) and clamp (1) immediately if the crack, permanent set in fatigue and water leakage is found. The immediate replacement could protect engine from serious failure like overheating, etc.

**WARNING**

Wear protective glasses, safety shoes, hard hat, work cloths and work gloves to perform inspection and maintenance on this machine.

**B.1 Check**

1. Open engine hood and support it with stay.
2. Check the hoses (2) for coolant leak due to loose clamps (1) or cracked and worn hoses.
3. Tighten loose clamp (1) again, and replace the hose (2) on which crack and permanent set in fatigue were found by the following procedure.



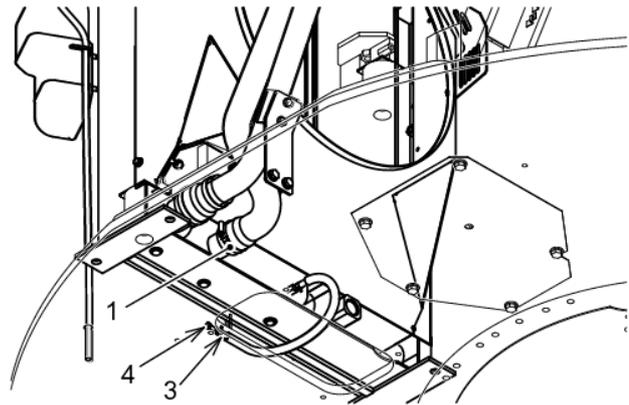
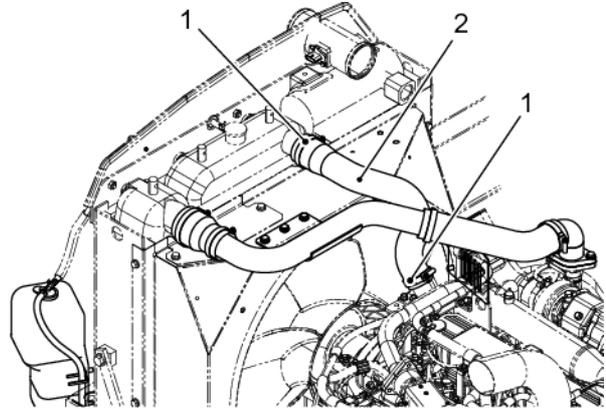
## [4. MAINTENANCE]

### B.2 Replacing the Radiator Hoses



Avoid being burned by hot liquid and steam. Do not loosen the radiator cap when the coolant is hot. The cooling system is under pressure. Stop the engine and allow enough time for system to cool.

1. Loosen 4 bolts on the under cover of lower of radiator, and remove under cover.
2. Loosen radiator cap slowly and be sure that the pressure is released. And then push the cap in and loosen the pushed cap by turning further and remove it.
3. Loosen clamp (3) and remove drain plug (4) until the radiator coolant level is lower than the replacing hose (2) and drain coolant in container.
4. Loosen clamp (1), remove damaged hose (2) and replace the hose with new one.
5. Install drain plug (4) and tighten clump (3).
6. Fill coolant in radiator and then fill reserve tank with coolant.
7. After filling up, tighten radiator cap securely.
8. Release the stay which is supporting hood, close engine hood and lock bonnet catch.
9. Return the under cover to original place.



### C. Radiator and Oil Cooler Debris Screen

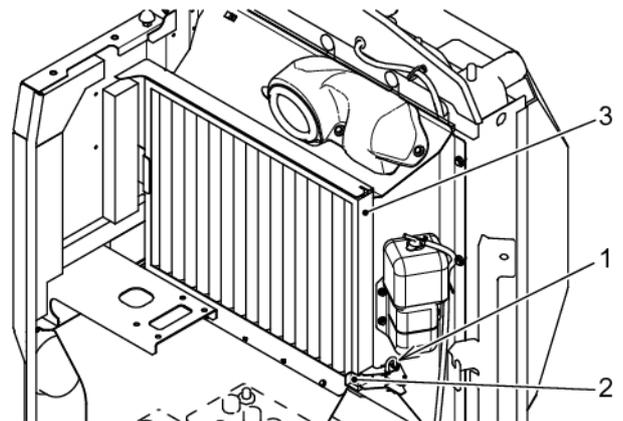
#### **WARNING**

Hot fluids and surfaces can burn. Wear protective glasses, safety shoes, hard hat, work clothes, and work gloves to perform inspection and maintenance on this machine.

#### **IMPORTANT**

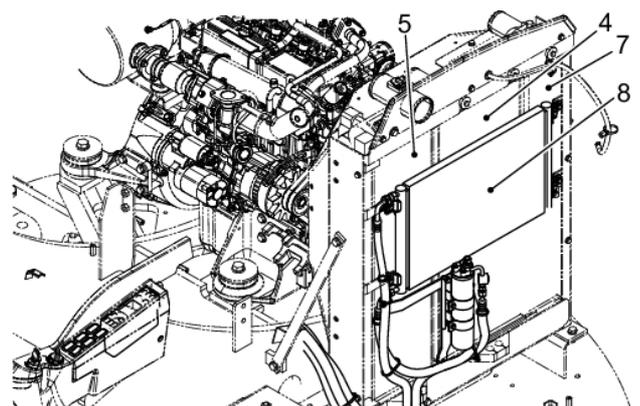
- Direct contact of the body with compressed air, steam and high pressure water can cause injury. Wear protective glasses, mask, safety cap, safety shoes, etc., to avoid injury.
- First remove filter (3) from machine and clean them. If the filter are cleaned on the machine, dust and dirt enter into duct and engine room.
- If tearing of filter is found or clog of dirt can not be removed, replace the filter.
- If deformation of filter flame (made of Aluminum) is found, replace filter with new one.
- When compressed air or jet water is used for cleaning the filter, don not damage the filter by getting too close to screen.

1. Open engine hood with starter key.
2. Using starter key, and open the door at the left side of the counterweight.
3. Lift up the stay (1).
4. Turn the stopper (2).
5. To remove the filter (3) pull out the filter.



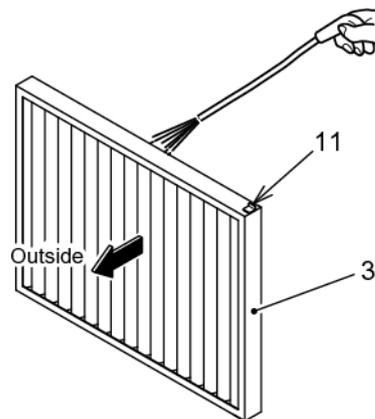
6. Check filter (3), radiator (4), oil cooler (5), inter-cooler (7) and condenser (8) for clogging.

When mud, dust and dead leaves are found, clean them off depending on the degree of dirt.

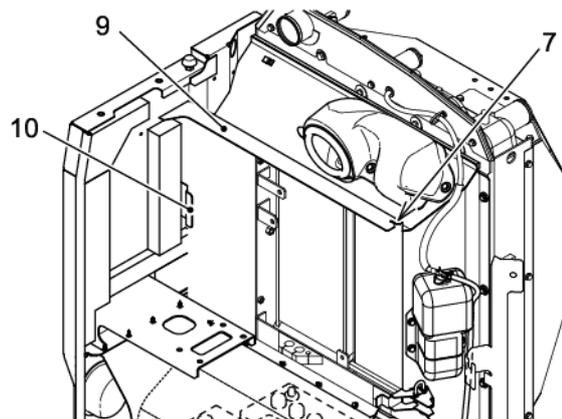


## [4. MAINTENANCE]

7. Remove dust, mud and other dirt from their cores and fins using compressed air (0.2 MPa) or water.



8. Insert the filter (3) into the duct (9). Make sure that the filter (3) is fitted exactly in the catch (10) of the duct (9). And check that the plate (11) is fitted exactly in the slit portion (7).
9. To fix the filter (3), turn the stopper (2).
10. Close the door at the left side of the counterweight, and lock the door.



D. Fan, Alternator, A/C Belt Wear and Tension

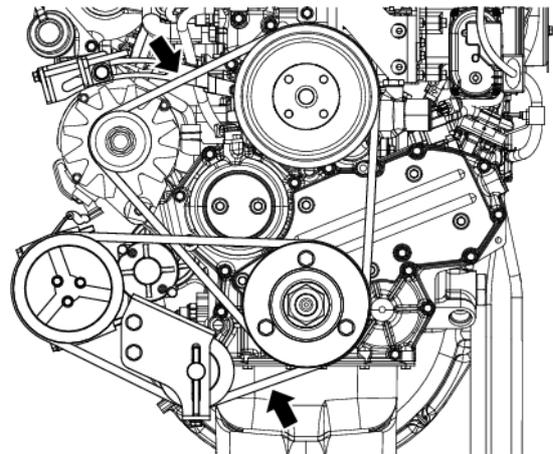
**WARNING**

Rotating parts can cause injury. Keep away from fan and belt when engine is running. Stop engine before servicing.

**CAUTION**

If defects such as cuts or surface separations are found during inspection, replace the belt. Keep oil and grease away from the belt, since they may cause the belt to slip and shorten the service life.

This machine is equipped with belts for alternator, fan and air-con. Check these belts for wear and damage and check the belt tension for slack, and adjust it properly in order to maintain the engine in high performance and the specified service life. Check the tension of belt by pressing on the center of belt by thumb. If the deflection is within the range shown in the table, it is in normal tension.



4

Belt	When new belt replaced mm (in)	When inspected mm (in)	Force N (lbf)
Alternator, Fan	9 to 11 mm (0.35 to 0.43")	11 to 13 mm (0.43 to 0.51")	98 (22)
Air-conditioner	3 to 4 mm (0.12 to 0.16")	5 to 6 mm (0.20 to 0.24")	24 (5.4)

**IMPORTANT**

- When replace with new belt, there is a lack of initial adaptability of the belt. Run the engine at idling speed for about three or five minutes. After that, adjust the belt tension again.
- New belts get complete initial elongation after being run about two hours.

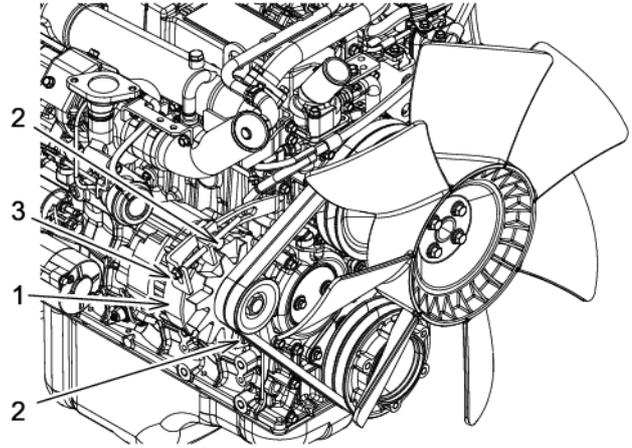
## [4. MAINTENANCE]

### D.1. Adjustment for Alternator and Fan Belt

#### IMPORTANT

Be careful of the alternator and fan belts so that grease and oil are not adhered. The service life may be shortened due to slipping with oil.

1. Open engine hood and support it with stay.
2. Remove the belt cover.
3. Loosen all retaining bolts (2) of the alternator (1) and adjusting plate.
4. Adjust V-belt tension properly with the adjusting bolt (3).
5. Tighten all retaining bolts (2) of the alternator and adjusting plate.
6. After adjustment, start engine and run it at low speed for about 5 minutes.
7. Stop engine and check tension of fan belt.
8. Install the belt cover.
9. Release the stay which is supporting hood, close engine hood and lock engine hood.



### D.2 Air Conditioning Compressor Belt

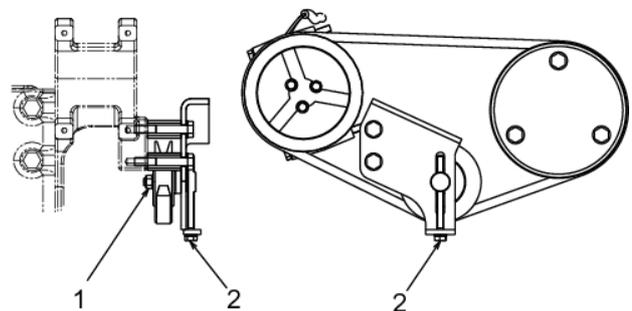
#### WARNING

Rotating parts can cause injury. Keep away from fan and belt when engine is running. Stop engine before servicing.

#### IMPORTANT

The improper belt tension may have the performance of compressor lower resulting in the damage of belt and compressor.

1. Open engine hood and support it with stay.
2. Loosen nut (1) for idle pulley slightly and adjust the belt tension while turning the adjusting bolt (2), and then tighten nut (1). Tightening torque: 42 to 51 N·m (31 to 38 lbf·ft)
3. After adjustment, start engine and run it at low speed for about 5 minutes.
4. Release the stay which is supporting hood, close engine hood and lock engine hood.



## E. Checking for Intake Rubber Hose



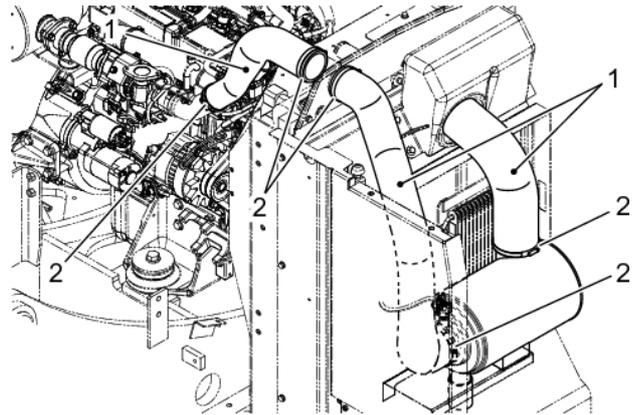
-Don't touch the rubber hose to avoid burns.

Immediately after stopping the machine or during the operation, the temperature of the rubber hose is very high.

-When the rubber hose is replaced, fill the inlet of air intake with clean cloth to prevent the dust from entering.

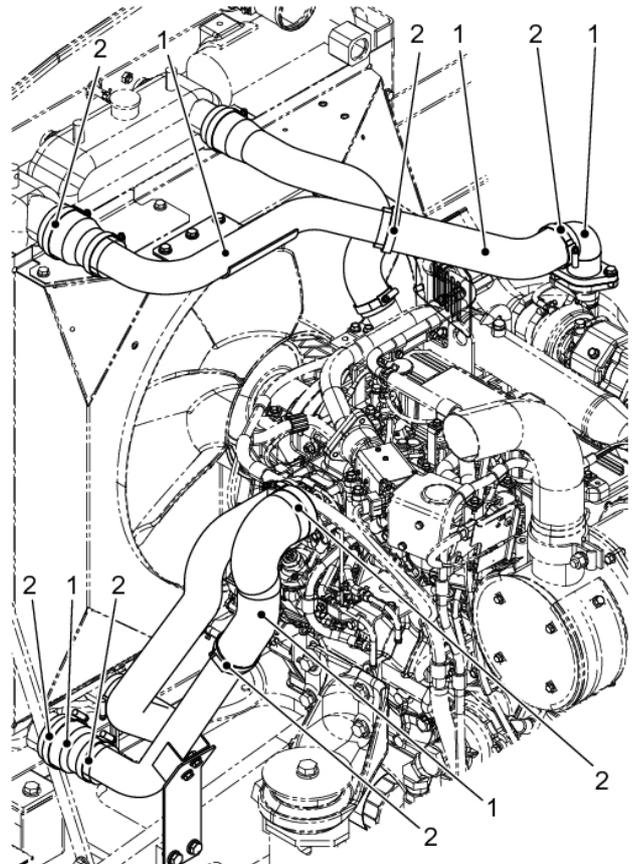
### E.1 Checking rubber suction hose for air cleaner

1. Check the rubber hose (1) for damage, deterioration and for looseness of band (2).
2. Replace the damaged or deteriorated rubber hose (1) and the band (2) at the same time with new parts.



### E.2 Checking rubber hose for inter-cooler

1. Check the rubber hose (1) for damage, deterioration and for looseness of band (2).
2. Replace the damaged or deteriorated rubber hose (1) and the band (2) at the same time with new parts.



## [4. MAINTENANCE]

### F. Air-Conditioner Filters Service

#### **WARNING**

The flying debris due to compressed air may cause accident resulting in injury or death.  
Wear protective glasses and respirator when cleaning the filters of air-conditioner.

Cleaning recirculate and fresh air filters

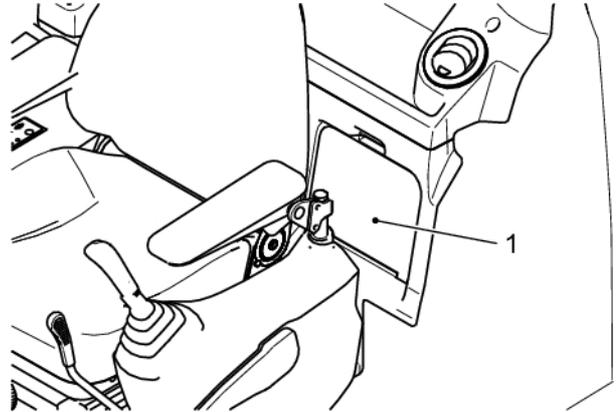
Recirculate air filter : Every 500 hours

Fresh air filter : Every 250 hours

Replacing inside and outside air filters

Recirculation air filter : After cleaning about 10 times

Fresh air filter : After cleaning about 10 times

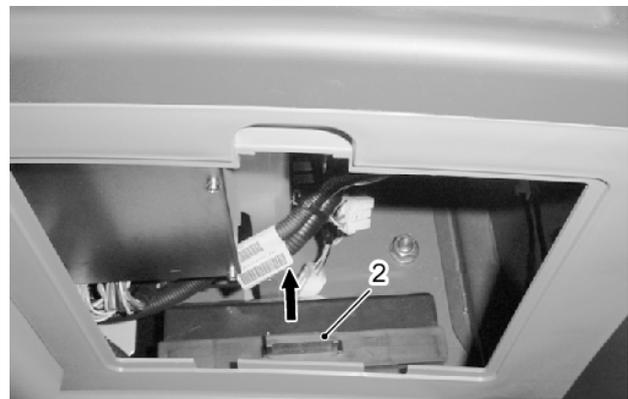


#### **IMPORTANT**

The maintenance time shows the reference value. Clean them earlier than the specified time in case where being used in dusty area.

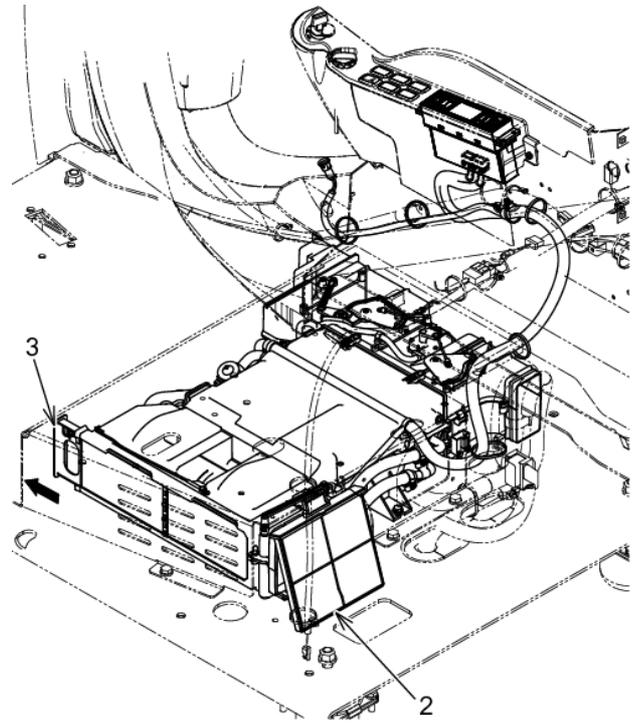
#### **F.1 Removing Fresh Air Filter**

1. Catch cover (1) on the left rear side of operator seat and pull it this side.
2. Catch handle grip of fresh air filter (2) through opening from which cover (1) is removed and pull it out upward.



**F.2 Removing Recirculation Air Filter**

1. The recirculation air filter (3) is placed on the left side under the operator seat.
2. Turn over floor mat, catch handle grip of recirculation air filter (3) and pull it out forward.

**F.3 Cleaning**

Clean recirculation and fresh air filters.

Clean recirculation and fresh air filters by air blowing

**F.4 Attaching Procedure**

Attach recirculation and fresh air filters after cleaning or for replacement by the reverse procedure of the removal.

**IMPORTANT**

Insert the recirculation air filter directing the UP side upward.

## [4. MAINTENANCE]

### G. Cleaning or Replacement of Radiator Cap



To avoid being burned, be careful when removing the radiator cap. Coolant is under high pressure when hot.

-Do not remove the radiator cap when the system is hot.

-Allow enough time for the machine to cool down before removing the radiator cap.



A loose radiator cap will let hot steam and coolant escape from the cooling system. Allow the radiator cap/cooling system enough time to cool before tightening the loose cap.

1. After the radiator cap/cooling system has cooled so it can be touched with a bare hand, slowly loosen the cap (1) to release the pressure.

After all pressure is released, remove the radiator cap.

2. Inspect locations A through C for debris and damage to the cap (1). Use a clean cloth to wipe the cap (1) clean. Replace the cap if necessary.

Inspection locations:

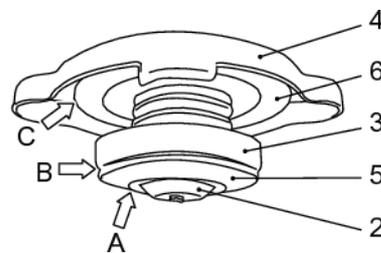
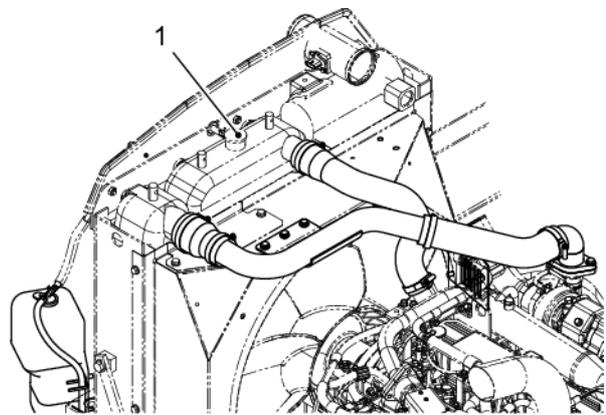
A. Contact surface between the negative pressure valve (2) and gasket (5)

B. Both surfaces of the pressure valve (3) and gasket (5)

C. Both surfaces of the external lid (4) and gasket (6)

Radiator cap (1)

3. Securely tighten the cap (1).



## 4.16 500 HOUR INSPECTION & MAINTENANCE PROCEDURES

Thoroughly read and understand the "1.SAFETY PRECAUTIONS" of this MANUAL before operating or servicing the machine.

Perform together with daily, 50-hour, 120-hour and 250-hour inspection and maintenance.

### A. REPLACING ENGINE OIL

Wear the proper safety equipment when working around hot areas. Do not change oils, engine coolant or filters immediately after machine has been stopped.

Allow machine to cool down before performing maintenance procedures.

#### **WARNING**

Do not touch the heated section during operation or immediately after being stopped. There is a hazard of scalding.

Do not touch the heated section.

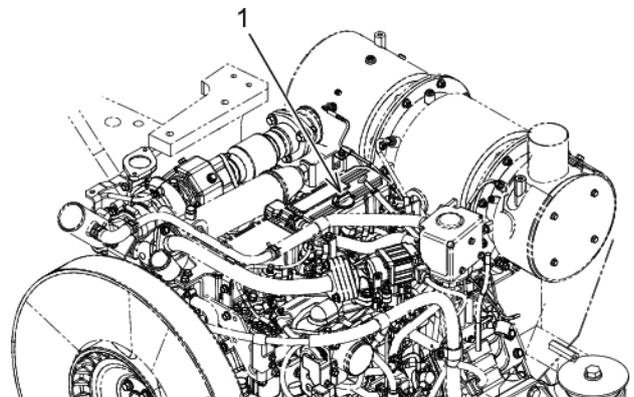
#### **IMPORTANT**

-Check the waste oil. If there are metal chips or powder mixed in the oil, contact our distributor.

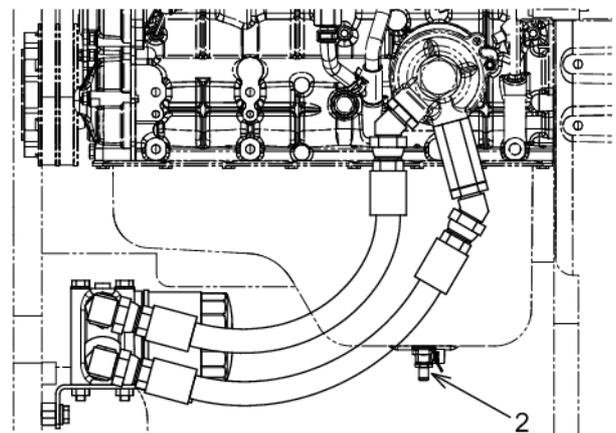
-Replace it at 50 hours operation for the first use of new machine.

-Replace engine oil filter simultaneously with the engine oil change.

1. Loosen 7 bolts for undercover under the engine, remove under cover, and then open engine hood.
2. Prepare container for drain oil.  
Container: 15 L (4.0 gal) or more
3. Clean around oil filler cap (1), remove cap, loosen drain valve (2) of engine oil pan and then drain engine oil.



4. Tighten drain valve (2) securely.



## [4. MAINTENANCE]

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### **CAUTION**

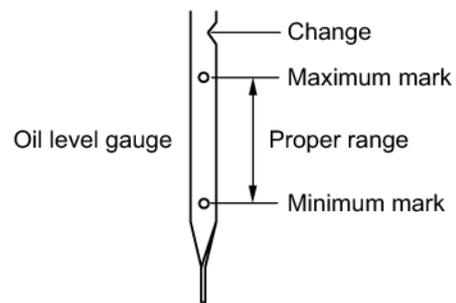
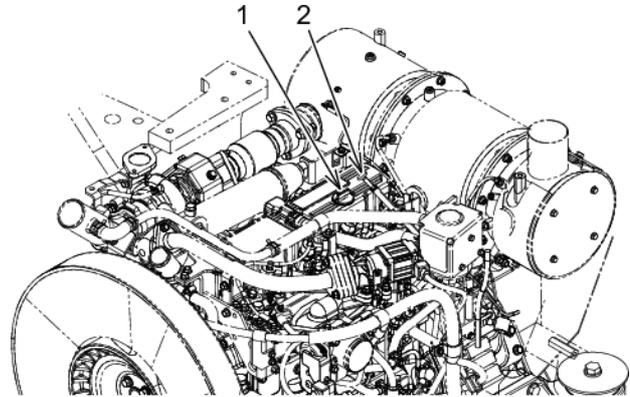
The engine and muffler stay hot after stopping engine.

Allow enough time for the engine to cool before inspection or maintenance to avoid being burned.

---

#### **B. Refilling engine oil**

1. Make sure that the engine oil drain valve is closed.
2. Remove the oil pan with specified engine oil to the specified.
3. Fill the engine oil pan with specified engine oil to the specified level.



---

### **IMPORTANT**

The engine oil filter is located at the separate position from the engine.

Because of this, when the filter is replaced, the oil takes some time to reach the engine. Do not fail to carry out idling operation for several minutes.

The oil filter cannot be reused because it is a cartridge type.

---

4. Check the oil level in the oil pan as follows: Pull out the oil level gauge (2), and wipe it with a cloth.
  5. Insert oil level gauge (2) fully into the oil level gauge guide, and then pull the gauge out. If the oil level attached to the gauge is at between "maximum mark" and "minimum mark", it is normal. If the oil level is low, add the specified engine oil.
  6. Check the oil pan and other parts for oil leakage. Repair any oil leakage found.
  7. Stop engine after idling for several minutes and check the oil level after about 10 minutes, and if the level is low, fill oil pan with the specified engine oil.
- 

### **CAUTION**

To crank the engine, shut off the fuel supply to the engine and operate the starters.

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### C. Replacing the oil filter

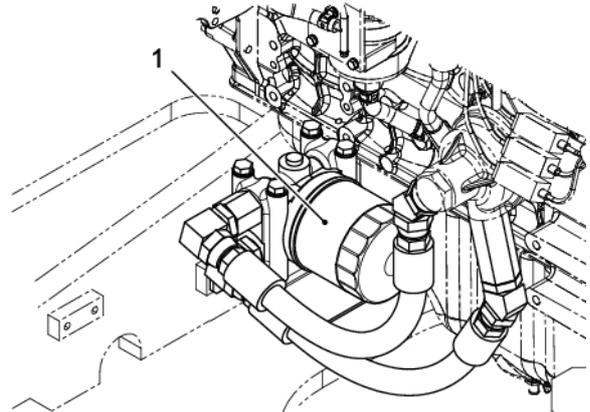


Do not use any oil filter that has dents, as the filter may be damaged during operation, resulting in a fuel leakage and possible fire.

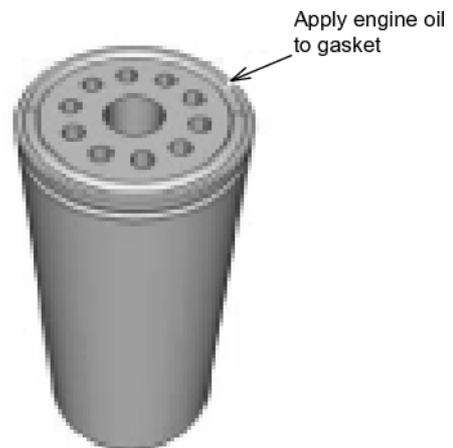


To avoid damage to the filter, do not use a filter wrench. Tighten the filter by hand.

1. Clean around the oil filter (1).
2. Place a drip pan under the oil filter.
3. Using a filter wrench, remove oil filter.  
Filter wrench of parts number :  
YW01T01014P1



4. Thoroughly wipe off oil on the mounting surface of oil filter with a cloth.
5. Check the new oil filter for proper seating of gasket.
6. Apply clean engine oil to gasket on the new oil filter.
7. Install the new filter. Turn the filter until the gasket comes into contact with the filter head then tighten an extra three quarters turn by hand.  
Filter wrench of parts number :  
YW01T01014P1



## [4. MAINTENANCE]

### D. Replacing the Pre-Filter

#### **WARNING**

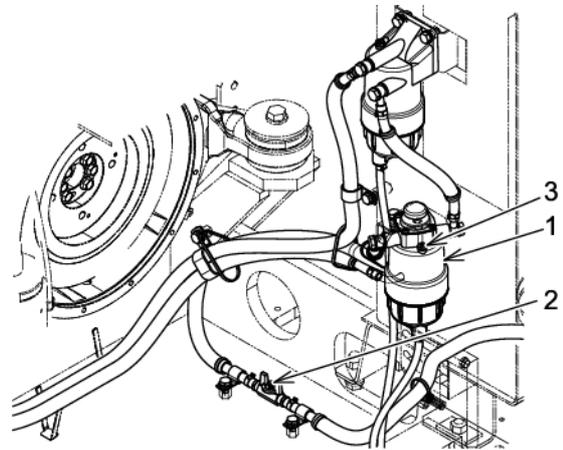
- In the case of handling fuel, do not permit open flames.
- Completely wipe off any spilled fuel. It may cause fire.
- Do not use the filter with dented case. If the filter is damaged or the fuel is leaked, it may cause fire.

#### **CAUTION**

- When the fuel filter element is installed, do not use filter wrench but tighten it by hand.
- Do not dent and damage the fuel filter element.

The pre-filter is placed on the area where the inside of door on the machine right side.

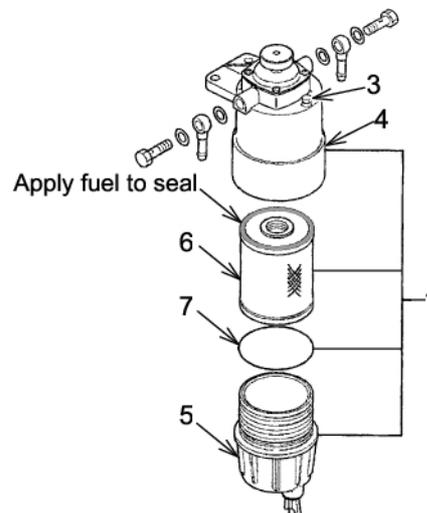
1. Clean the area around the fuel pre-filter (1).
2. Close fuel cut valve (2) and loosen air bleed plug (3).
3. Place a container of a suitable capacity for fuel under the fuel filter. And drain water from the fuel pre-filter (1).



#### **Note**

For the draining water from fuel filter, see "FUEL FILTER DRAIN" that is described above.

4. Remove the case (5).
5. Using filter wrench, remove the fuel filter element (6).  
Filter wrench of parts number :  
YW01T01014P1
6. Using shop rag, completely wipe off any adhered fuel from mounting surface of fuel filter element (6) of filter bracket (4).





Do not reuse the element.

7. Prepare new fuel filter element in advance, and check it that the seal is set in groove properly.
8. Apply the seal with a film of clean fuel.
9. Install the fuel filter element (6) in the filter bracket (4). At this time, turn the fuel filter element (6) until the seal comes into contact with the mounting surface of filter bracket (4). And tighten it more 3/4 turn.
10. Prepare new O-ring for the case (5), and install the case (5) in filter bracket(4).  
At this time, turn the case (5) until the O-ring (7) of case (5) comes into contact with the mounting surface of bottom of the fuel filter element(6). And tighten it more 1/2 turn.

**Note**

- The new O-ring is supplied together with the fuel filter.
- Be careful not to damage the O-rings by twisting.
- Check to see if the O-rings firmly contact to the sealing surface.

11. Tighten air bleed plug (3) and position the fuel cut valve (2) of fuel line to "OPEN"
12. After replacement of the fuel pre-filter element, drain air from the fuel filter.

**Note**

For the draining air from fuel filter, see "FUEL SYSTEM AIR BLEED" that is described below.

13. Start the engine and idle the engine for several minutes.
14. Make sure that there is no fuel leak during engine running. If the leak is found, loosen the fuel filter once and check the seal. And tighten the fuel filter again.





Do not reuse the element.

7. Prepare new fuel filter element in advance, and check it that the seal is set in groove properly.
8. Apply the seal with a film of clean fuel.
9. Install the fuel filter element (6) in the filter bracket (4).  
At this time, turn the fuel filter element (6) until the seal comes into contact with the mounting surface of filter bracket (4). And tighten it more 3/4 turn.
10. Prepare new O-ring for the case (5), and install the case(5) in filter bracket (4).  
At this time, turn the case (5) until the O-ring (7) of case (5) comes into contact with the mounting surface of bottom of the fuel filter element (6). And tighten it more 1/2 turn.

**Note**

- The new O-ring is supplied together with the fuel filter.
- Be careful not to damage the O-rings by twisting.
- Check to see if the O-rings firmly contact to the sealing surface.

11. Tighten air bleed plug (3) and position the fuel cut valve (2) of fuel line to "OPEN"
12. After replacement of the fuel filter element, drain air from the fuel filter.

**Note**

For the draining air from fuel filter, see "FUEL SYSTEM AIR BLEED" that is described below.

13. Start the engine and idle the engine for several minutes.
14. Make sure that there is no fuel leak during engine running. If the leak is found, loosen the fuel filter once and check the seal. And tighten the fuel filter again.

## [4. MAINTENANCE]

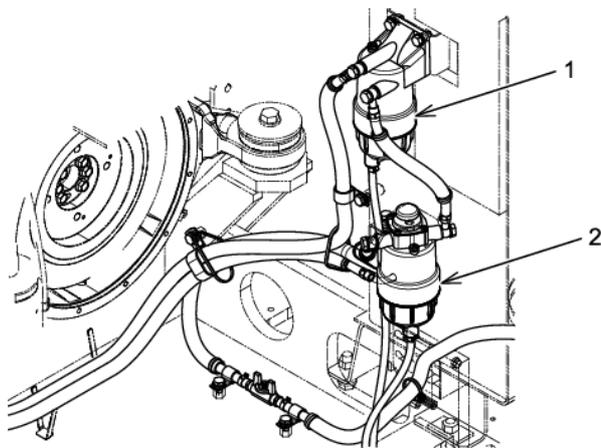
### F. Bleeding the fuel system

#### **WARNING**

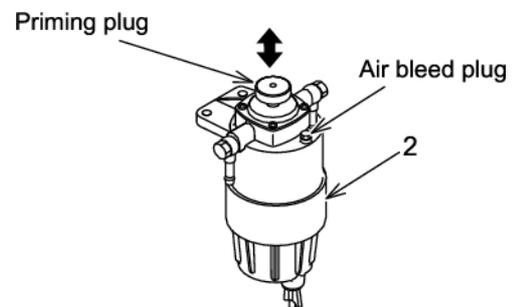
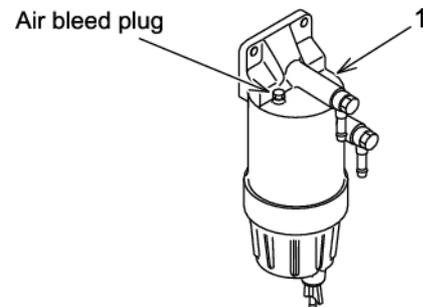
- Using shop rag, completely wipe off any spilled fuel from air bleed plug. It may cause fire.
- After air-bleeding, tighten the priming pump cap securely. If the tightening is loose, the pump is damaged and it may cause leak of fuel, and this leak may cause the fire.

#### **CAUTION**

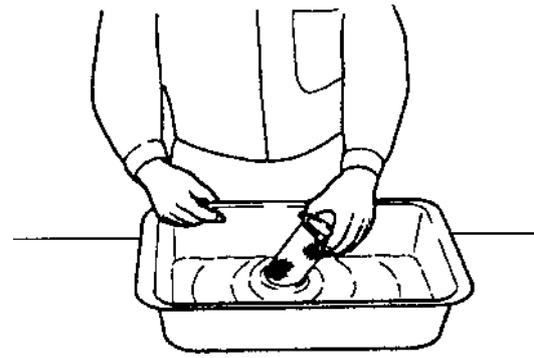
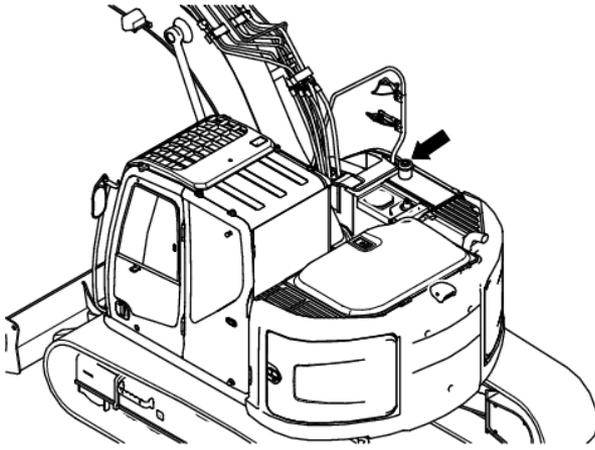
When the air bleed plug, thread of bracket and sealing washer are damaged, replace them with new parts.



1. Fuel Filter
2. Fuel Pre-Filter



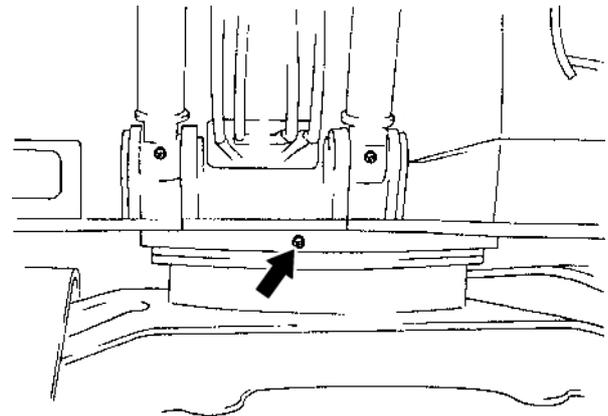
1. Loosen the each air bleed plug of fuel filter approx. 1.5 turns.
2. To unlock the priming pump, rotate the priming pump of fuel pre-filter counterclockwise. And move priming pump up and down.
3. When the fuel without bubbles comes out from the air bleed plug, tighten the air bleed plug securely.  
Tightening torque :  $10 \pm 2 \text{ N}\cdot\text{m}$  ( $7.38 \pm 1.48 \text{ lbf}\cdot\text{ft}$ )

**G. Cleaning Fuel Tank Cap and Strainer**

1. Remove cap with starter key.
2. Check cap seal for damage, and if damaged replace it with new one.
3. Clean strainer with light oil and attach it in place. If damaged, replace it with new one.
4. Attach cap and lock it with starter key.

**H. Greasing the Slewing Ring**

1. Locate the grease nipple at the front of the slewing ring.
2. Using grease gun filled with general purpose EP grease (Section "4.4 LUBRICANT, FUEL & COOLANT SPECIFICATIONS".), lubricate slewing ring with several shots from grease gun.
3. Slew machine 90 degrees right, and repeat step 2. See level on frame.
4. Continue to slew machine at 90 degrees increments and lubricating slewing ring until ring has been completely greased.

**Notice**

Using grease gun, lubricate through grease nipple until the grease comes out from bearing seal when the direction of the slewing bearing is changed at every 90 degrees.

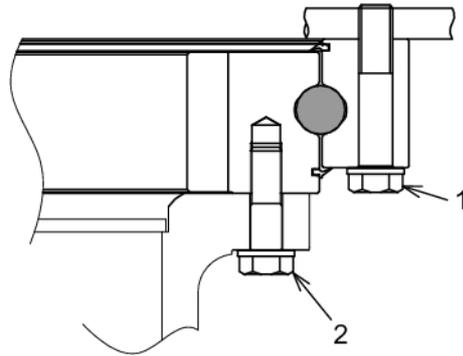
(Grease amount: Max. 30 cc/1 grease nipple)

## [4. MAINTENANCE]

### I. Checking Slewing Ring Fitting Bolts for Loosening

Check that bolts (1), (2) securing slewing ring are not loosened. If loosened, remove bolts (1), (2) once, apply Loctite #262 or equivalent, and tighten them again.

Location	Torque specification N·m {lbf·ft}
Inner race	279 ± 29 {206 ± 21}
Outer race	256 ± 25.6 {189 ± 19}



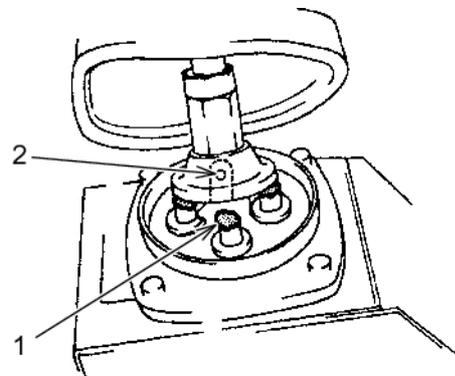
Alternately tighten bolts (1), (2) facing each other in order.

### Notice

Since the tightening of slewing ring requires special tools, contact our dealer/distributor for assistance.

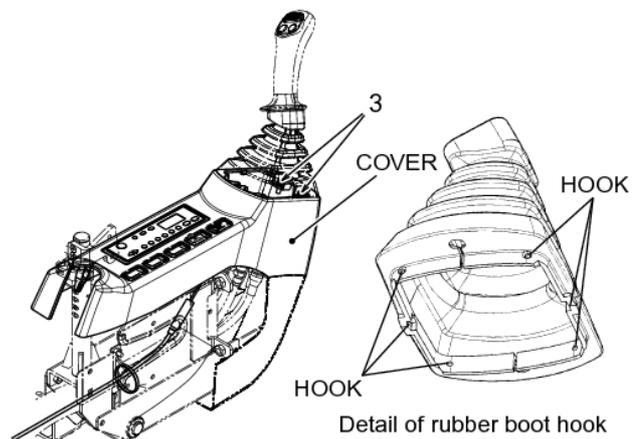
### J. Lubricating Push Rod of Control Lever With Grease

Remove rubber boot of pilot valve and apply a small amount of grease to the push rod and top end (2) of rotation sliding section.

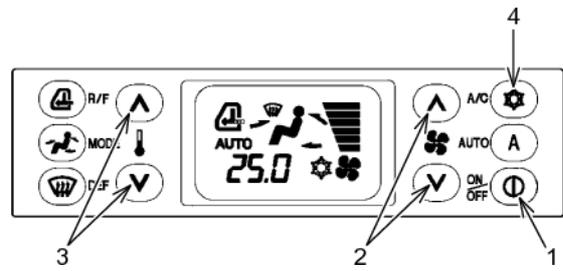
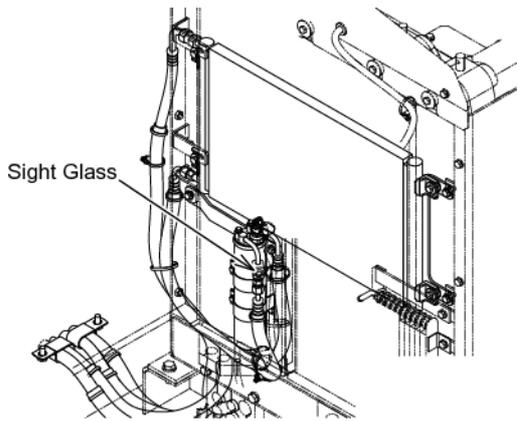


### Removing Boot

1. Turn the forward direction side of boot inside out. And using cross recessed screwdriver, loosen 2 bolts (3).
2. With holding the boot up, release hooks (6 peaces) of rubber boot.



**K. Checking the Air-Conditioner Refrigerant**



**WARNING**

- Do not loosen parts in the refrigerant circuit because there is a hazard of losing sight by getting coolant in eyes and being frostbitten hands by touching it.
- The inhaling of refrigerant gas has serious influence on human body.
- And do not bring fire near the area where refrigerant gas is produced.

**IMPORTANT**

When filling or changing refrigerant, confirm the type of refrigerant and use refrigerant in the specified type.

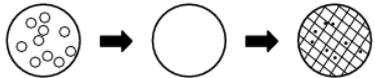
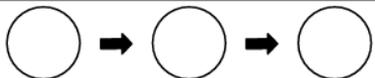
-Refrigerant type and quantity:

R-134a: 790 g to 890 g (1.7 to 2.0 lbs)

The use of unspecified refrigerant may cause damage of equipment.

**K.1 Checking**

1. Start the engine. Set the engine speed to the middle speed position.
2. Set the machine to the conditions shown below when checking the refrigerant.
  - (1)Air conditioner switch (1) : ON
  - (2)Fan switch (2) : HI position (Maximum)
  - (3)Temp. adjustment switch (3) : Lower temp position
  - Door/Window : Close
  - Compressor switch (4) : ON (The lamp lit up)
3. Follow the procedure below and check the refrigerant volume by looking through the sight glass (inspection window) on the upper part of the receiver dryer. See right table for better reference.
  - Figure (A) : Shows that the refrigerant volume is proper.

Refrigerant volume	Description
	 <p>After the air conditioner is turned ON, little bubbles appear. The refrigerant becomes transparent, then turns a light milky white.</p>
	 <p>After the air conditioner is turned ON, no bubbles appear.</p>
	 <p>After the air conditioner is turned ON, bubbles appear continuously.</p>

	Bubbles..... Refrigerant gas is mixed with refrigerant fluid.
	No Bubbles.... Whole refrigerant becomes fluid and transparent.
	Cloudy..... Refrigerant is separated from oil. The fluid becomes a light milky white.

## [4. MAINTENANCE]

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-Figure (B) :

Shows that the refrigerant is over charged.

This will make both high and low pressure extreme and exert a bad influence on the pressure switch operation and the air conditioning system.

-Figure (C) :

Shows that the refrigerant is insufficient. Have the refrigerant recharged at your distributor.

---

### **IMPORTANT**

-Keep the air conditioner ready for use all year round.

Operate the air conditioner at least once every week for several minutes to rotate the compressor regardless of the season. This will prevent the refrigerant gas from leaking from the compressor sealing.

-When oil comes out from the pipe joint, contact our dealer/distributor because it is a sign of gas leaking.

-Follow the following regulations to conserve global environment.

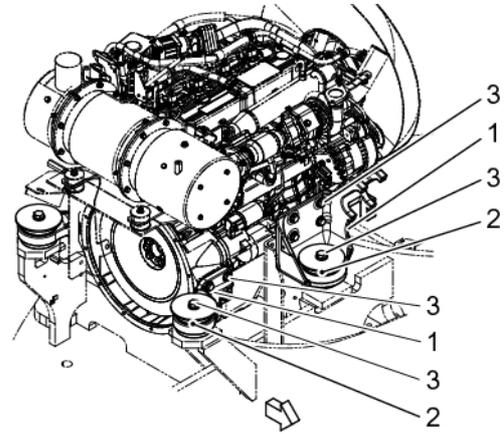
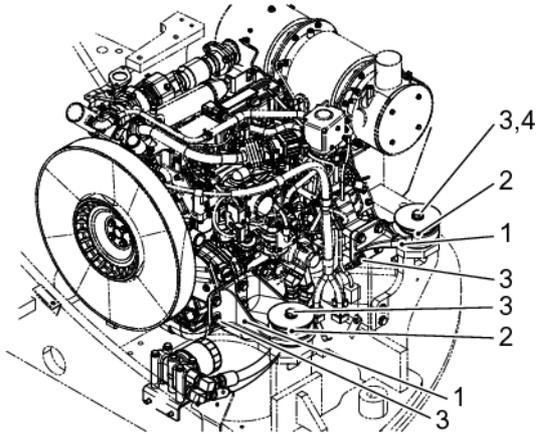
1. Do not release refrigerant which is sealed in this unit in to atmosphere.
  2. Extract the sealed refrigerant from unit when disposing this unit.
-

## 4.17 1000 HOUR (12-MONTH) INSPECTION & MAINTENANCE PROCEDURES

Thoroughly read and understand the "1.SAFETY PRECAUTIONS" of this MANUAL before operating or servicing the machine.

Perform together with daily, 50-hour 120-hour, 250-hour and 500-hour inspection and maintenance.

### A. Checking Engine Mounting Bracket for tightening



1. Check the engine mounting bracket (1) and the rubber mount (2) for damage, deterioration and for looseness of bolt (3) and nut (4).
2. If damage or deterioration is found on mount bracket (1) or rubber mount (2), please contact our dealer/distributor for replacing.
3. Regarding tightening torque of bolt (3) and nut (4), refer to Section "4.7 TORQUE VALUES FOR SPECIFIED".

### B. Replacing Return Filters

The return filter needs delicate treatment because they role important part for removal of contaminant in hydraulic oil to and preventing trouble of hydraulic component to maintain long service life.

#### **WARNING**

-Use extreme caution when removing the cover. The oil is under high pressure when hot. Stop engine first, remove breather cap, press valve, release the pressure from tank, and then remove cover.

-Immediately after operation, there is a hazard of getting burn because oil is hot. The filter should be replaced after being cooled.

#### **Notice**

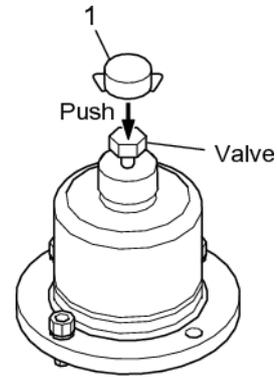
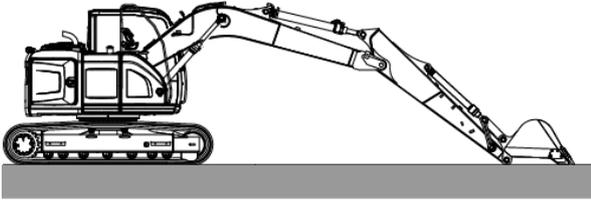
-Long-life return filter is used.

Place an order of return filter element kit,  
P/No. YV52V01003R610.

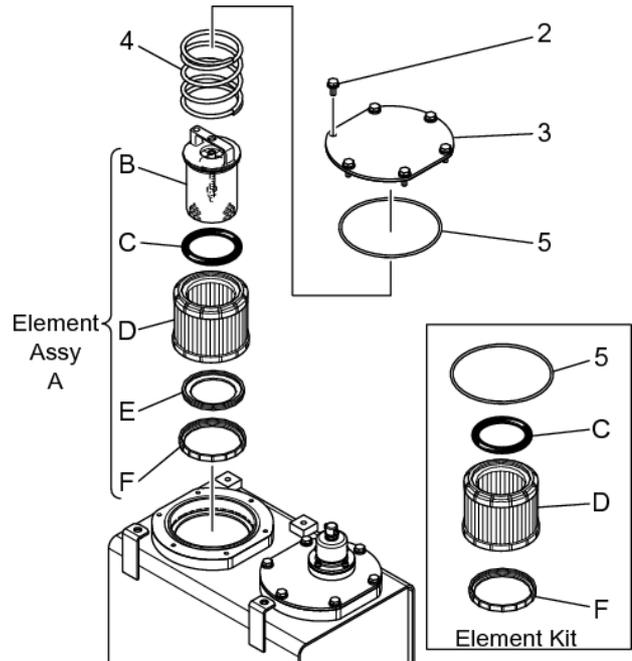
-Change the hydraulic tank return filter on a new machine after the first 50 hours of engine operation then change every 1,000 hours

And for specification for breaker, replace return filter by every 250 hours.

## [4. MAINTENANCE]



1. Park machine on firm level ground in the hydraulic level checking position, stop engine and move pilot control shut-off lever to "LOCKED" position.
2. Remove breather cap (1) on the upper surface of hydraulic tank and release pressure from hydraulic tank by pressing valve several (5 to 7) times.
3. Loosen 6 mounting bolts (2) of tank upper cover, remove cover (3).
4. Remove spring (4) and element assy (A) from tank.
5. Remove "O-ring" (5) of cover (3).
6. Disassemble element assy while turning the handle.  
Disassembling parts ..... (B), (C), (D), (E), (F)
7. Replace "O-ring" (C) of check valve (B).
8. Replace packing (F) of plate (E).
9. Replace element, and assemble element assy (A) disassembled in procedure "6." again.
10. Attach element by the reverse procedure of that shown in items "3." and "4."
11. Attach cover (3) with bolts (2).  
Tightening torque: 41.9 to 51.1 N·m (30.9 to 37.7 lbf·ft)
12. Start engine, put the machine on hydraulic oil level check position while moving each operating lever, and check hydraulic oil level



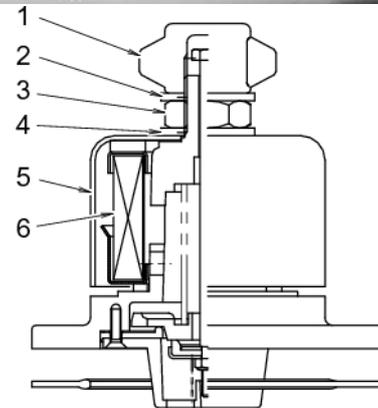
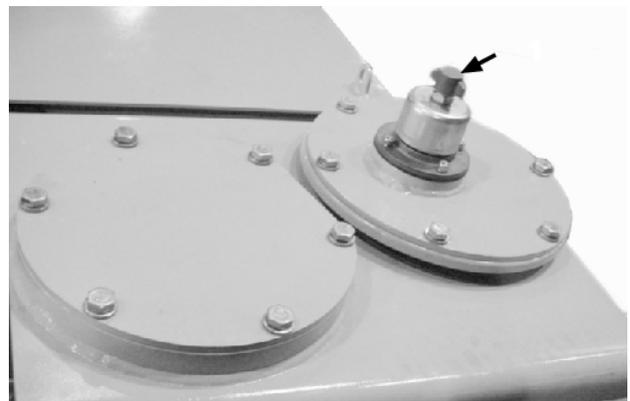
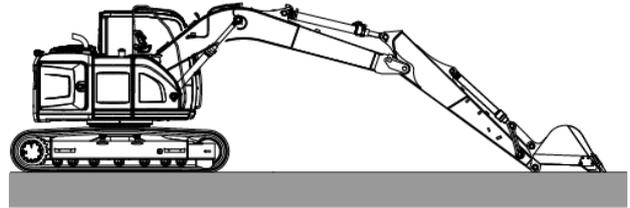
### C. Replacement of Air Breather Element

#### **CAUTION**

The components of machine stay hot after stopping engine. To avoid burn by the gush of high temperature hydraulic oil, allow enough time for the engine and hydraulic oil to cool before inspection or maintenance.

#### REPLACING THE ELEMENT

1. Park the machine on firm and level ground, and extend the bucket cylinder, retract the arm cylinder, and lower the bucket to the ground as shown the right figure.
2. To release the inner pressure of hydraulic oil tank, remove the breather cap (1) located on the tank, and push the valve several times (5 to 7 times).
3. After removing the breather cap (1), remove the seal (2), the nut (3), and the seal (4) in order.
4. Rotate the cover (5) in a counterclockwise and remove the cover. And then remove the element (6).
5. Install the new element (6) and install the cover (5) along the groove.
6. Do not enter the water and dirt into the air intake and exhaust between the cover (5) and the body (7).
7. Install the seal (4) on the cover (5) and tighten the nut (3), and set the seal (2).
8. Rotate the breather cap (1) in a clockwise tightly by hand. And then install the breather cap (1).



4

#### **CAUTION**

To avoid the breakage of bolts, do not tighten the nut (3) too much. Tightening torque [Nut (3)]: 10 to 14N·m

#### **IMPORTANT**

- To keep the hydraulic oil clean and to extend the life span of hydraulic components, replace the filter element at regular intervals.
- Replacement of element a 1000 hours interval is a guideline. If the machine is operated in very dusty conditions, change the oil filter at a reduced hour interval.

## [4. MAINTENANCE]

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### D. Checking Voltage

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-Wear hard hat, approved protective glasses or face shield, gloves and other safety equipment when working with batteries.

-Flammable gas (hydrogen gas) is generated in the battery. Do not allow sparks or flames to come in contact with batteries to avoid triggering an explosion.

-Battery fluid has strong acid. It corrodes metal very rapidly. If it adheres on skin or enters into eye, it causes for a burn or blindness.

At such case, immediately wash skin or eye with lots of water, and ask a doctor to treat it as soon as possible.

-Stop the engine and carry out maintenance and checking service for the battery.

-Remove battery terminal from grounding side (negative terminal) first, and conversely fit the terminal to the grounding side last.

-Do not put tools and hardware on protective cover installed on the battery upper section.

There is a hazard of explosion because the short-circuit may catch fire.

---

1. Measure the voltage of battery and if the measured value does not reach the specified voltage, recharge or replace battery.
- 

#### Notice

-Clean battery terminal and apply grease or commercial lube oil rust preventive spray.

-Call in licensed specialty company for the disposal of used battery.

-Be careful not to use the old battery together with new battery. It may reduce the service life of battery. Therefore replace two batteries together with new ones if required to replace.

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## 4.18 1500 HOUR INSPECTION & MAINTENANCE PROCEDURES

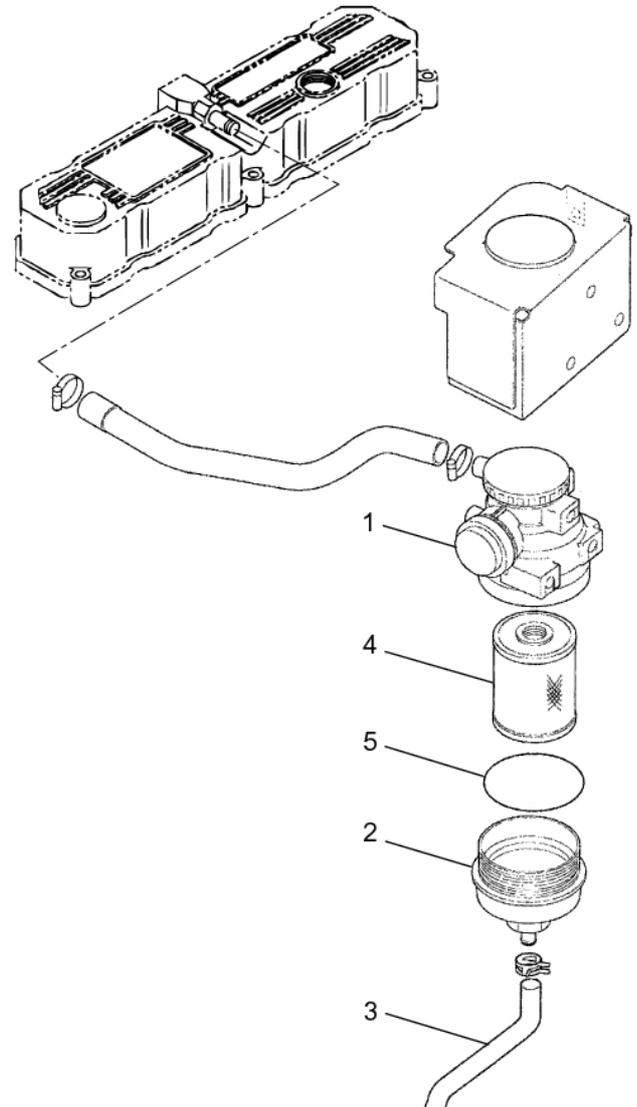
Thoroughly read and understand the "1.SAFETY PRECAUTIONS" of this MANUAL before operating or servicing the machine.

Perform together with daily, 50-hour 120-hour, 250-hour, 500-hour and 1000-hour inspection and maintenance.

### A. CCV filter element

#### A.1 Replacing the element

1. Disconnect the drain hose (3) located on cap (2) lower.
  2. Using spanner, loosen the hexagonal portion of cap (2) lower and remove it. Clean the cap (2) and reuse it.
  3. Remove element (4) and replace it with new one.
  4. Apply oil to the surface of new O-ring (5), install it in the cap (2). After installing of the cap (2) tightly in the breather body (1) by hand. Using spanner, tighten the breather.
- Tightening torque : 9.5 to 10.5 N·m (7.0 to 7.7 lbf·ft)
5. Connect the drain hose (3) to the cap (2).



## 4.19 2000 HOUR INSPECTION & MAINTENANCE PROCEDURES

Thoroughly read and understand the "1.SAFETY PRECAUTIONS" of this MANUAL before operating or servicing the machine.

Perform together with daily, 50-hour 120-hour, 250-hour, 500-hour, 1000-hour and 1500-hour inspection and maintenance.

### A. Changing Engine Coolant

#### **WARNING**

Avoid being burned by hot liquid and steam. Do not loosen the radiator cap when the coolant is hot. The cooling system is under pressure. Stop the engine and allow enough time for system to cool.

Engine anti-freeze/coolant liquid is flammable and can cause injury.

-Keep anti-freeze /coolant liquid away from flames and sparks.

-Avoid contact with eyes and skin. If anti-freeze/coolant contacts eyes or skin, immediately wash with clean water for several minutes and seek medical treatment.

#### **IMPORTANT**

Use clean soft water for coolant in which lime deposit is not produced.

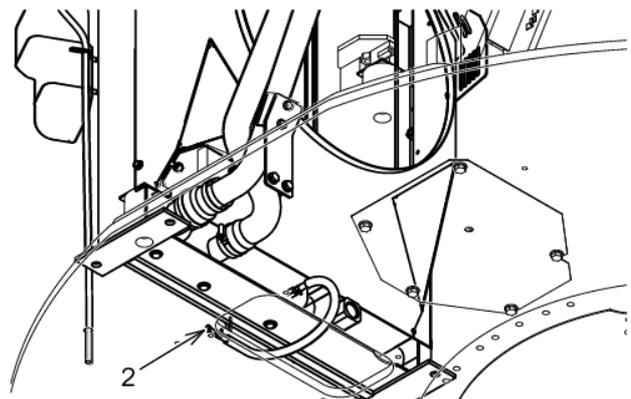
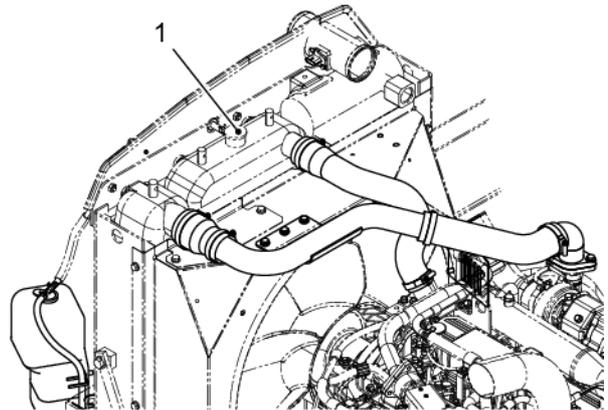
Use our genuine LLC at 50% concentration.

-Use of any other coolant will result in rust forming inside the engine.

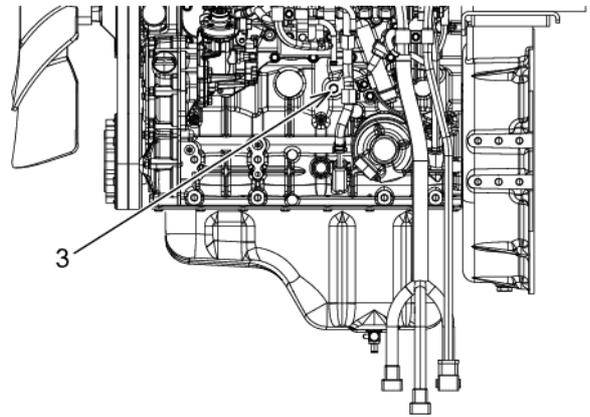
-Non-amine antifreeze mixture is used for this machine.

-Change coolant ahead of the specified period when it was dirty and/or bubbling.

1. Find firm level ground, place bucket on the ground, stop engine, and move pilot control shut-off lever to the "LOCKED" position.
2. Using starter key, open engine hood and hold it with stay.
3. Loosen radiator cap (1) slowly, check that the pressure is released completely, push cap in, and remove the cap by loosening it further. Prepare hose for pouring water.
4. Remove undercover under the radiator, and prepare container for coolant under drain valve (2) and drain plug (3) on the engine side face.
5. After draining, close drain valve (2) and drain plug (3) and fill it with clean soft water.

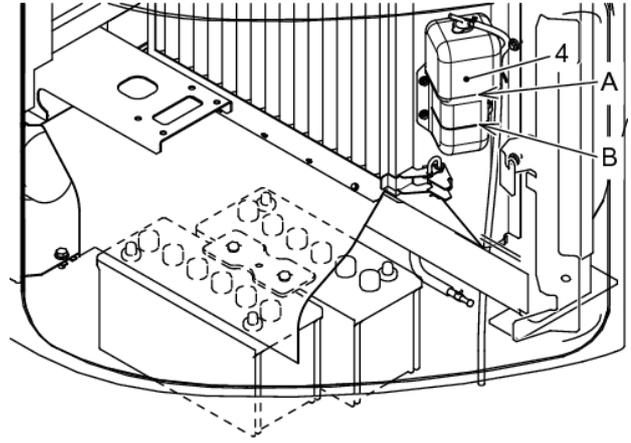


6. Open drain valve (2) and drain plug (3), and operate engine by low idling, and wash it with flowing water for 10 minutes. During washing with the aid of flowing water, regulate the pouring water volume and discharging water volume to keep the radiator in full condition. During water flowing, maintain a continual watch for the disconnection of pouring water hose from the radiator water filling port.
7. After flowing water washing, stop engine and stop pouring water, and then after discharging water, close drain valve (2) and drain plug (3).
8. After discharging water, clean it with cleaning solution. Regarding to how to use cleaning solution, follow the instructions in "Instruction Manual" for the cleaning solution in use.
9. After cleaning, open drain valve (2) and drain plug (3) and discharge water completely, and then close the drain valve and drain plug and feed soft clean water close to the feed water port.
10. After water is fed close to feed water port, open drain valve (2) and drain plug (3) and continue flowing water washing until clean water is discharged. During water flowing washing, regulate the pouring water volume and discharging water volume to keep the radiator in full condition.
11. When clean water is discharged, stop engine and close drain valve (2) and drain plug (3). And then feed "Long Life Coolant" in proper concentration until it is overflowed from the filling port.
12. Run engine by low idling for 5 minutes to remove air contaminated in coolant and continue low idling operation for 5 minutes further.  
(During this operation, leave the cap of filling port removed.)



## [4. MAINTENANCE]

13. Discharge coolant from reserve tank (4) and clean inside of the reserve tank and fill tank with "Long Life Coolant" in proper concentration to the mid point of FULL(A)-LOW(B) marks.
14. Stop engine, and after 3 minutes pour soft clean water in radiator to the edge of radiator filler cap, and then tighten radiator cap.
15. Replace the support of stay, close engine hood and lock hood with starter key.



**B. Cleaning Suction Strainer****WARNING**

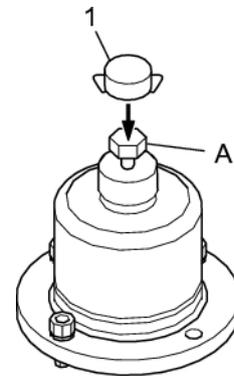
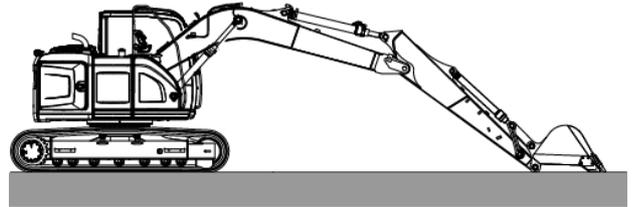
-Use extreme caution when removing the cover.

The oil is under high pressure when hot. Stop engine first, remove breather cap, press valve, release the pressure from tank, and then remove cover.

-Immediately after operation, there is a hazard of getting burn because oil is hot.

The service should be done after being cooled.

1. Park machine on firm level ground in the hydraulic level checking position, stop engine.
2. Move pilot control shut-off lever to "LOCKED" position.
3. Clean the surface around hydraulic tank to prevent intrusion of foreign matter.
4. Remove breather cap (1) on the upper surface of hydraulic tank and release pressure from hydraulic tank by pressing valve (A) several (5 to 7) times.
5. Loosen 6 mounting bolts (2) of tank upper cover, remove cover (3).

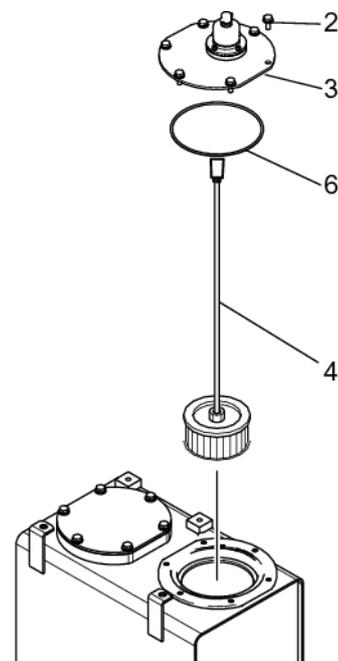


4

**IMPORTANT**

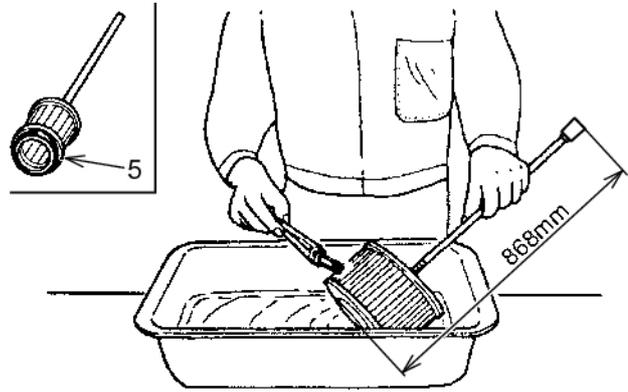
Do not drop bolt or others into the tank during the work.

6. Take out suction strainer (4).
7. Clean strainer with light oil or washings, dry it and check strainer for damage. If damaged, replace the strainer with new one.
8. Check O-rings (5) and (6) on the bottom of strainer for wear and damage. If worn or damaged, replace the strainer with new one.
9. Insert strainer (4) into suction tube.
10. Install cover (3) with bolt (2).  
Tightening torque: 41.9 to 51.1 N·m (30.9 to 37.7 lbf·ft)



## [4. MAINTENANCE]

11. Start engine and operate it by low idling for several (5 to 7) minutes. Operate each cylinders and swing, and then return the machine to the hydraulic level checking position. Stop the engine and check the oil level, if the level is low, make up the oil.



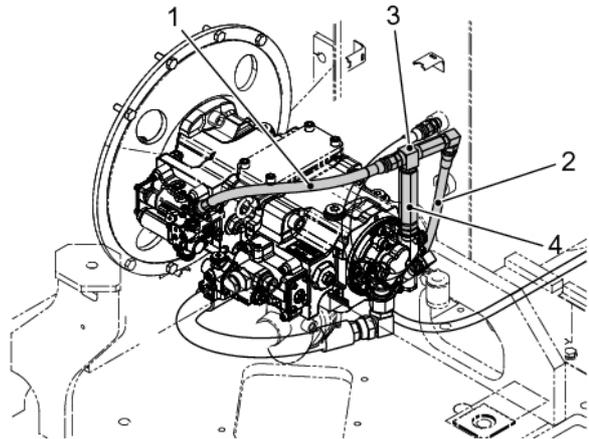
### C. Cleaning of Pilot Line Filter



Immediately after operation, there is a hazard of getting burn due to hot hydraulic oil gushed. Clean the filter after being cooled.

Carry out the replacement of filter after completely releasing internal pressure from hydraulic system.

1. Open side door on the pump side, remove the hose (1),(2), tee (3) and line filter (4), clean line filter with light oil, and attach line filter (4) in place.



## D. Changing Oil in Swing Reduction Unit

### **WARNING**

-Immediately after operation, there is a hazard of getting burn because oil is hot. Start working after being cooled.

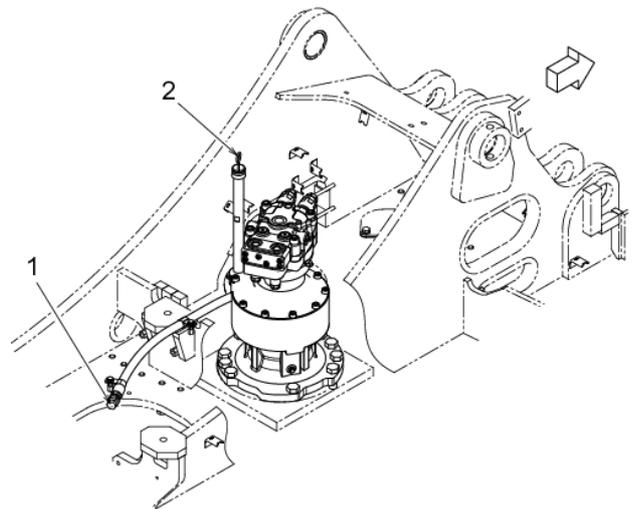
-Swing reduction unit could be under pressure, carefully loosen plug and remove slowly till air pressure is released.

- Container for drain oil: 2 L {0.5 gal} or more
- Changing oil quantity: 1.65 L {0.4 gal}

### **IMPORTANT**

Change the swing reduction unit oil on a new machine after the first 500 hours of engine operation then change every 2000 hours.

1. Prepare container for drain oil.
2. Remove drain plug (1) on the rear lower side of swing reduction unit and drain oil in container.
3. Clean drain plug (1) with light oil, dry it with drain plug.  
Tightening torque: 108 N·m {80 lbf·ft}
4. Remove fill plug (2), and fill with the specified gear oil in the specified quantity referring to "4.4 LUBRICANT, FUEL & COOLANT SPECIFICATIONS".
5. When the reading is within the specified range of level gauge (2), it is normal level.
6. Insert level gauge (2) securely.



### **IMPORTANT**

-Check the metal chips and powder in the drained oil. If the oil includes such contaminant, contact our dealer/distributor for repair.

-Dispose of all hazardous waste in accordance with government environmental regulations.

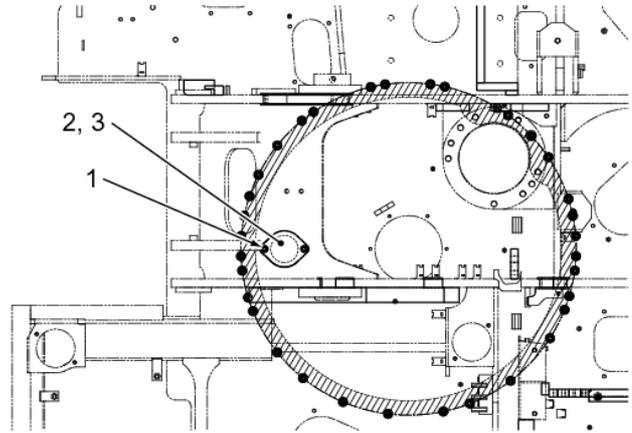
## [4. MAINTENANCE]

### E. Checking Grease In Slewing Ring Grease Bath

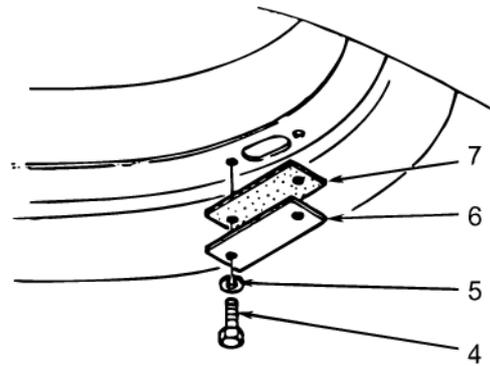
#### IMPORTANT

The deterioration of grease may cause damage of pinion shaft and swing bearing of swing reduction unit.

If the grease is white due to moisture content, and the viscosity of grease is lowered, replace the grease with a new one. Also, if the grease is contaminated with a large amount of water, replace the grease. In that case, contact our dealer/distributor.



1. Loosen bolt (1) on the front side of upper structure and remove cover (2) and packing (3) for checking.
2. After checking bearing gear, replace packing (3) with new one. After cleaning, apply Loctite #572 for prevention from water intruding.
3. Grease may be cloudy due to slight contamination of water, but there is no malfunction if the viscosity is high. When water is there, loosen bolts (4) and spring washers (5) on the lower side of lower frame, remove cover (6) and packing (7) and drain water.

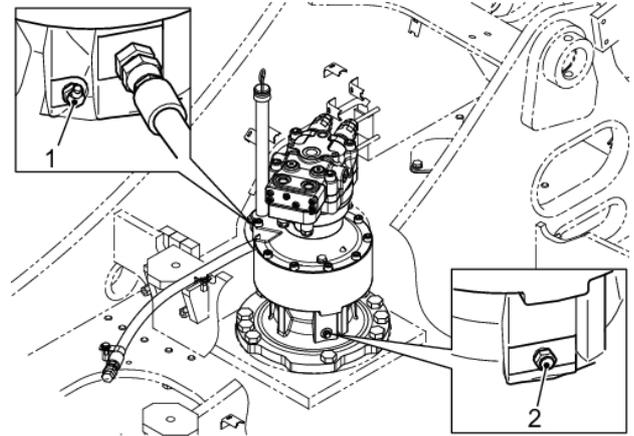


F. Swing Reduction Lubrication



Immediately after operation, there is a hazard of getting burn because oil is hot.  
Start working after being cooled.

1. Park machine on firm level ground, and place the attachment to the ground. Stop engine and move pilot control shut-off lever to "LOCKED" position.
2. Lubricate the swing reduction unit with about 100 cc (about 1/4 cartridge) of grease through grease nipple (1).



## [4. MAINTENANCE]

### G. Change Oil in Travel Motor Reduction Units

#### **WARNING**

-Immediately after operation, there is a hazard of getting burn because oil is hot.

Start working after being cooled.

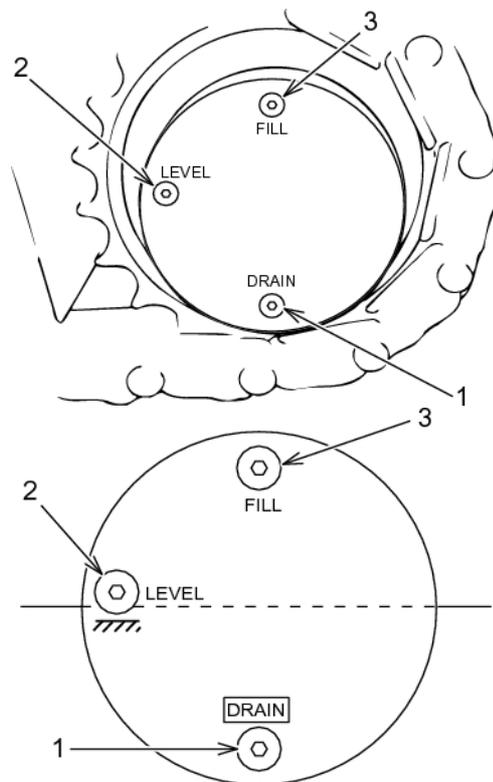
-Travel reduction unit could be under pressure, carefully loosen plug and remove slowly till air pressure is released.

- Container for drain oil: 5 L {1.3 gal} or more
- Changing oil quantity: Right and left 2.1 L {0.6 gal} each

#### **IMPORTANT**

Change the travel reduction units oil on a new machine after the first 500 hours of engine operation then change every 2000 hours.

1. Position the machine directing drain lug (1) downward and stop engine.
2. Remove drain plug (1), level plug (2) and fill plug (3) and drain oil in container.
3. After draining oil completely, clean drain plug (1) with light oil and attach it in place.
4. Fill with the specified oil in the specified quantity through hole for fill plug (3) until the oil overflowed from level plug (2) referring to the section "4.4 LUBRICANT, FUEL & COOLANT SPECIFICATIONS".
5. Clean level plug (2) and fill plug (3) with light oil and attach it in place.
6. Similarly, change oil of travel reduction unit on the other side.



#### **IMPORTANT**

-Check the metal chips and powder in the drained oil. If the oil includes such contaminant, contact our dealer/distributor for repair.

-Dispose of all hazardous waste in accordance with government environmental regulations.

## 4.20 5000 HOUR INSPECTION & MAINTENANCE PROCEDURE

Thoroughly read and understand the "1.SAFETY PRECAUTIONS" of this MANUAL before operating or servicing the machine.

Perform together with daily, 50-hour 120-hour, 250-hour, 500-hour and 1000-hour inspection and maintenance.

### A. Change Hydraulic Oil

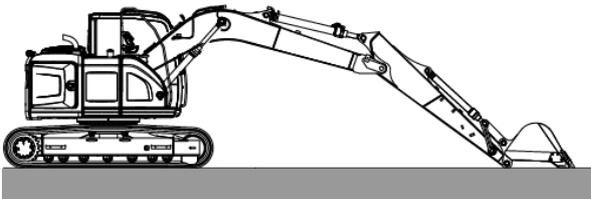
#### **WARNING**

-Use extreme caution when removing the cover. The oil is under high pressure when hot. Stop engine first, remove breather cap, press valve, release the pressure from tank, and then remove cover.

-Immediately after operation, there is a hazard of getting burn because oil is hot. The filter should be replaced after being cooled.

#### **IMPORTANT**

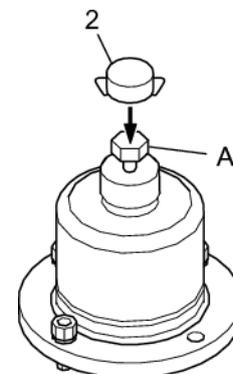
Since the deterioration of hydraulic oil with the breaker installed is larger than that of normal bucket digging work, service it referring to the section "Checking and service" for hydraulic breaker.



4

- Container for drain oil: 90 L {24 gal} or more
- Changing oil quantity: 85.2 L {23 gal}

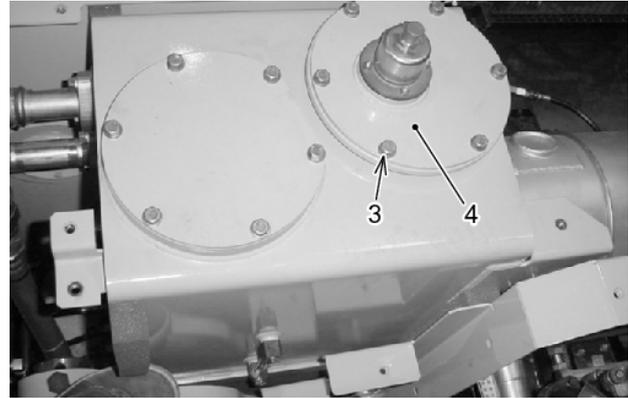
1. Park machine on firm level ground, swing upper structure so that drain plug (1) on the lower section of hydraulic tank is positioned to the mid point of right and left track shoe.
2. Retract arm cylinder and bucket cylinder, place bucket and blade (when installed) on the ground and stop engine.
3. Move pilot control shut-off lever to "LOCKED" position.



A: Valve

## [4. MAINTENANCE]

4. Clean the surface around hydraulic tank to prevent intrusion of foreign matter.
5. Remove breather cap (2) on the upper surface of hydraulic tank and release pressure from hydraulic tank by pressing valve (A) several (5 to 7) times.
6. Loosen 6 mounting bolts (3) of tank upper cover, remove cover (4).
7. Drain the hydraulic oil into container using oil pump.



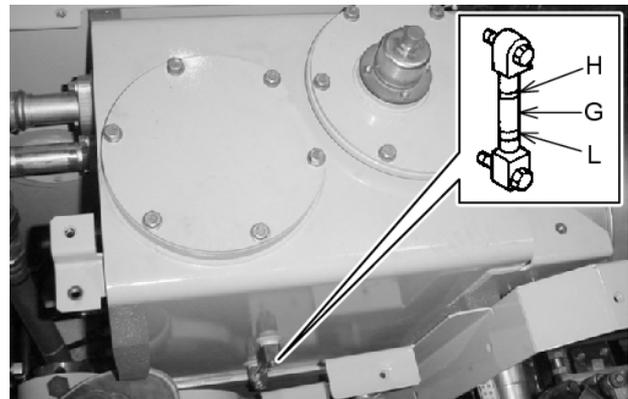
### IMPORTANT

- Do not drop bolt or others into the tank during the work.
- Dispose of all hazardous waste in accordance with government environmental regulations.

8. Place container for drain oil under drain plug (1) of the hydraulic tank bottom.
9. Loosen drain plug (1) on the bottom of hydraulic tank slowly and drain hydraulic oil completely.
10. Clean drain plug (1) and install it in place. Tightening torque: 98 to 118 N·m (72 to 87 lbf·ft)



11. Fill hydraulic tank with hydraulic oil through filler port.  
Fill with hydraulic oil watching the level gauge (G) for oil level.
12. Attach filler port cover (4) with 6 bolts (3).  
Tightening torque: 41.9 to 51.1 N·m (30.9 to 37.7 lbf·ft)
13. Start engine and operate it by low idling for several (5 to 7) minutes. Operate each cylinders and swing, and then return the machine to the hydraulic level checking position. Stop the engine and check the oil level, if the level is low, make up the oil.



# 5. TRANSPORTATION

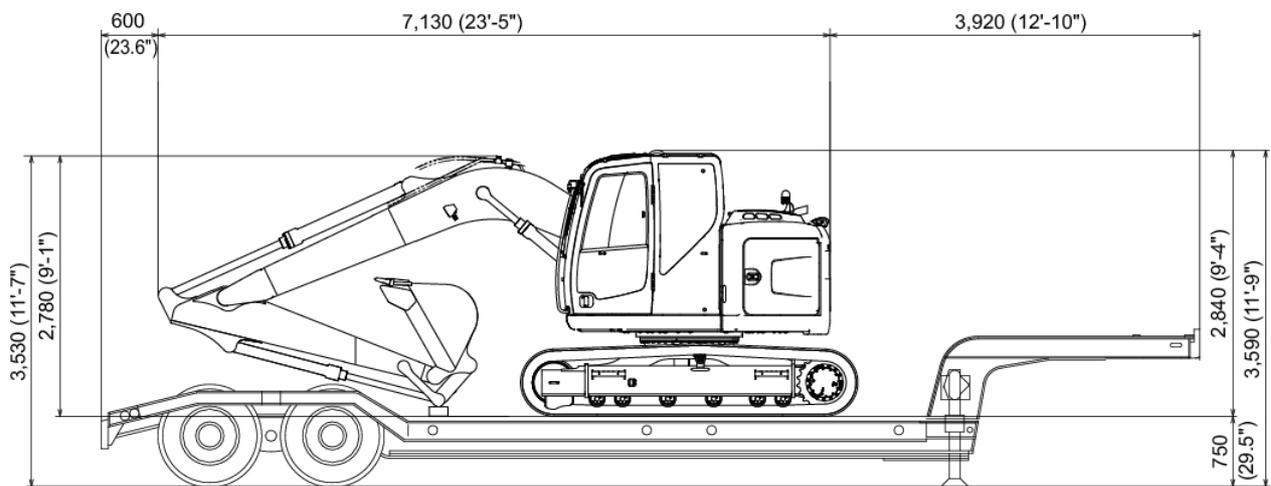
## 5.1 GROUND TRANSPORTATION

### 5.1.1 MACHINE PREPARATION

1. Know the total weight, length, width and height of the machine being transported.
2. Know route to be traveled. Investigate bridges, overpasses, height of road signs on route.
3. Obtain any permits required from proper government agencies for machine transportation.
4. Use only a trailer with a rated capacity sufficient to transport the machine.
5. Make certain trailer has ramps or a ramp is available for loading and unloading the machine.
6. When the machine is transported, to prevent an incident, make sure that all doors, guards and access panels were correctly locked.

#### A. SK135SR-3 · SK135SRLC-3

Unit : mm (ft-in)



Marked \* dimensions do not include height of shoe lug.

Dimensions and weights are 2.38 m (7'-10") Arm, 0.5 m<sup>3</sup> (0.65 cu·yd) Bucket and 4.68 m (15'-4") Boom.

Machine Model	Weight		
	500 mm (19.7")	600 mm (23.6")	700 mm (27.6")
SK135SR-3	13,600 (29,900)	13,900 (30,650)	14,100 (31,090)
SK135SRLC-3	13,800 (30,430)	14,100 (31,090)	14,300 (31,530)

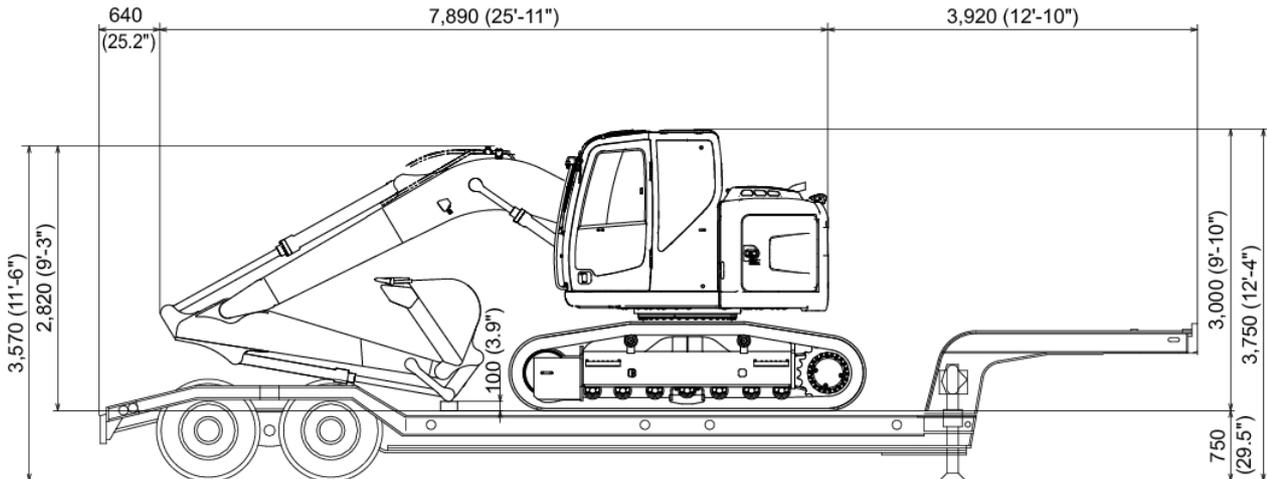


The arm cylinder rod of the machine with the long arm specification should be set as the transport position when transporting the machine.

**[5. TRANSPORTATION]**

**B. SK140SRL-3**

Unit : mm (ft-in)



Marked \* dimensions do not include height of shoe lug.

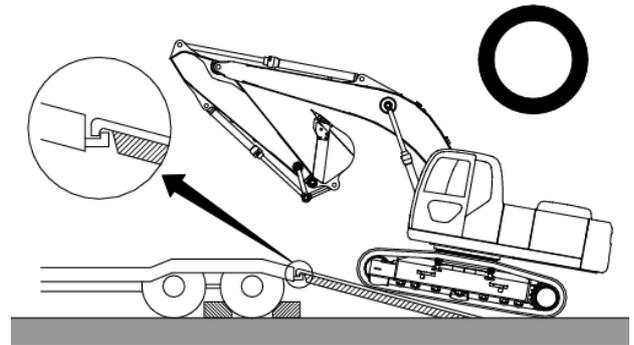
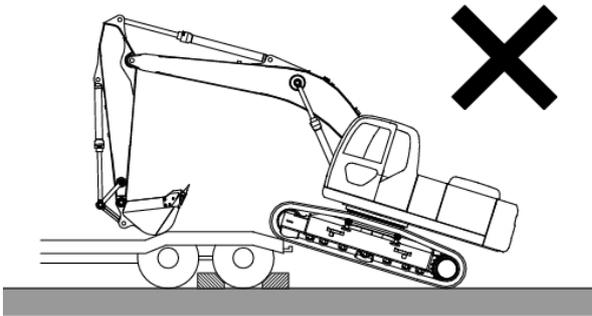
Dimensions and weights are 2.38 m (7'-10") Arm, 0.45 m<sup>3</sup> (0.59 cu-yd) Bucket and 4.68 m (15'-4") Boom.

Machine Model	Weight
	700 mm (27.6")
SK140SRL-3	16,000 (35,280)

**CAUTION**

The arm cylinder rod of the machine with the long arm specification should be set as the transport position when transporting the machine.

## 5.2 LOADING/UNLOADING THE MACHINE

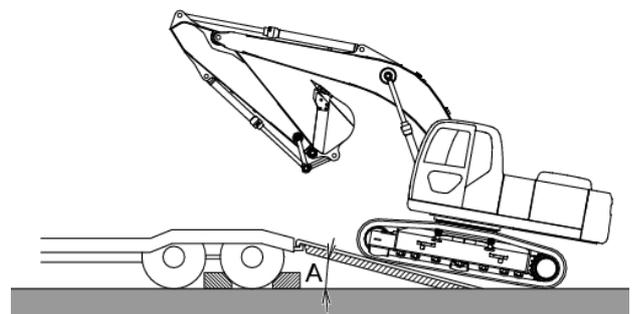


### **WARNING**

- The machine loading and unloading work should be carried out on the firm and level ground.
- Use ramps which have sufficient width, length, thickness and strength.
- Slow speed traveling is necessity to load and unload the machine.
- It is hazardous to use the attachment for loading and unloading the machine. Do not use the attachment for loading and unloading.
- Use only the traveling controls when the machine is on the ramp.
- Be prepared for a change in the machine position as the machine travels up or down the ramp. The machine may rock forward or rearward as the machine center of gravity changes when traveling on the ramp or on the border between the track/trailer and the ramp.
- Turn auto accel switch off surely. The operation with the auto accel switched on may cause sudden engine speed change.
- Remove mud, etc. of the crawler track link of machine surely to prevent skidding. And remove water, snow, grease oil, etc. surely.
- Do not change the course on the ramps to prevent rolling over. Return to ground or trailer's bed once and change the traveling direction.

### 5.2.1 A. In Cases where Making Use of ramps

1. Load machine on firm and level ground.
2. Do not fail to put blocks to the tire of trailer to prevent machine from moving.
3. The width and height of the loading area (earthen bank or loading platform ramp) must be high enough to match the trailer and wide enough to match the width of the machine and trailer, or wider.
4. Make sure the machine position is aligned to ramps before traveling up the ramps, and travel slowly with the dozer (if equipped), raised position. The arm and boom held at angle shown in the figure, and the dozer equipped and attachment lowered as much as possible but do not interfere with trailer bed. And travel slowly.

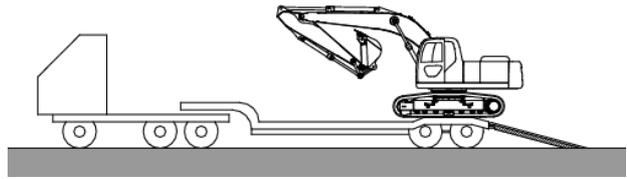


## [5. TRANSPORTATION]

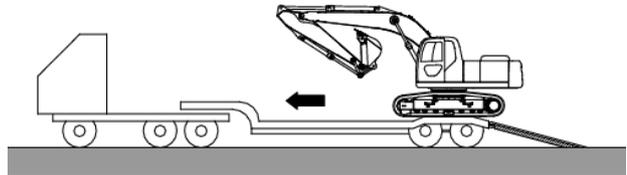
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A. The ramp slope should be 15 degrees or less

5. Since machine is tend to be unstable when going over the rear wheel, travel slowly and carefully.



6. Since the machine is bent-forward when traveling over the rear wheel, travel forward slowly to the required position giving particular attention to the attachment so as not to touch the bed of trailer.



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### **WARNING**

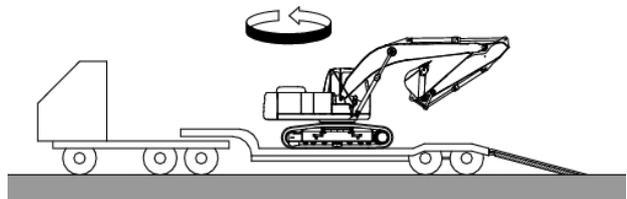
To prevent the arm and bucket cylinder(s) from any damage, you are advised to follow the following instructions.

Do not have the arm and/or bucket cylinder fully extended to a "RAMP OVER CENTER" situation. This allows sudden and abrupt contact of the arm or bucket to a trailer deck, ramp or the ground.

This can result in internal mechanical contact, which can stretch the cylinder rod(s).

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7. After arriving to the required position, turn the upper structure 180 degrees slowly.
8. After positioning, lower attachment softly.



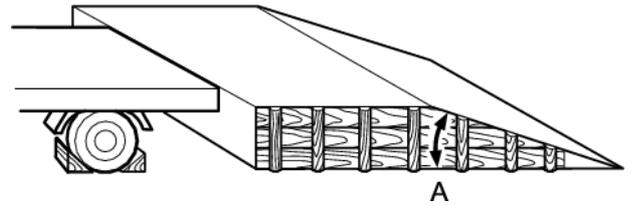
**B. Use of Platform or Earth Banking**

1. Make the width of the earth banking (raising the ground level) enough to the machine width.
2. Make the earth banking strong enough in order no to turn over the machine during loading/unloading due to broken side slope of the earth banking.

If necessary, provide some supporting posts to reinforce both side of the banking.

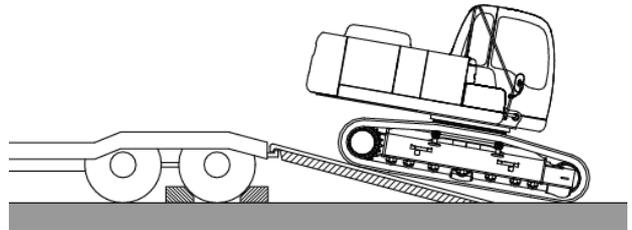
3. The height of the platform or banking must correspond to that of the base of truck/trailer.
4. At loading the machine, climb up to the truck/trailer from front end of the machine for the case of the machine with attachment, and from back end for the machine without attachment.
5. Set the machine at the prescribed position on the truck/trailer.

A. 15 degrees or less



**C. Loading Machine without Front Attachment**

When loading the machine the front attachment is removed, direct counterweight upward direction on the slope.



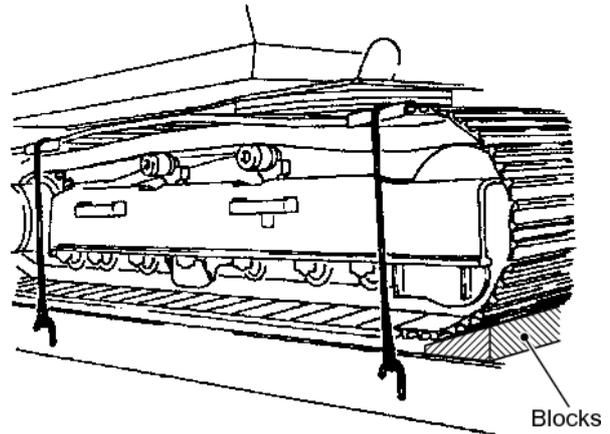
## 5.2.2 SECURING THE MACHINE

### IMPORTANT

- Retract the antenna of radio during transport. And remove mirror when required. Keep the removed parts surely.
- To protect the bucket (attachment) cylinder from damage during transport, place a wood block at the end of the bucket link to keep the cylinder from contact with the truck bed.

After the machine is loaded and positioned, fix the machine by the following procedures.

1. Move the safety lock lever to the "LOCKED" position
2. Turn all switches off and remove the engine starter key.  
Lock all covers and the cab door.
3. Position blocks at the front and rear of the crawler belts and secure them. This will prevent the machine from moving during transport.
4. Position a block under the excavator arm to support during shipping.
5. Tie down the machine using rigging sufficient for safe transport.

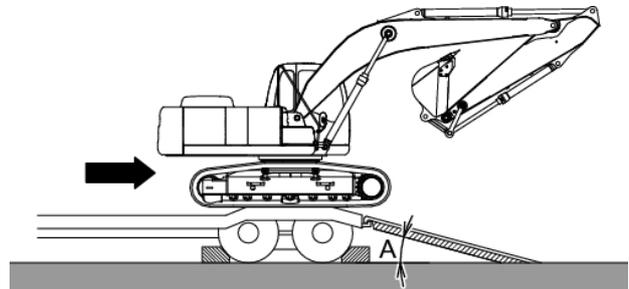


### A. Unloading the Machine

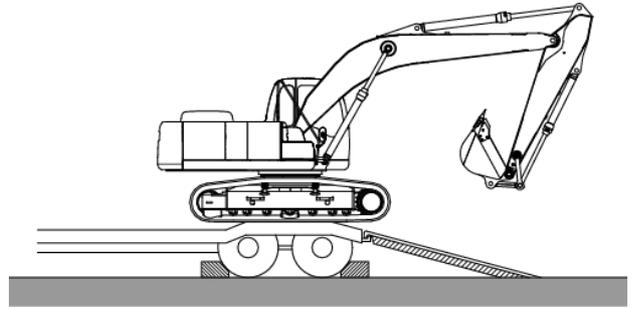
#### **WARNING** AVOID INJURY OR DEATH

- Slow speed traveling is necessary to load and unload the machine.
- Be prepared for a change in the machine position as the machine travels up or down the ramp. The machine may rock forward or rearward as the machine center of gravity changes when traveling on the ramp or on the border between the track/trailer and the ramp.

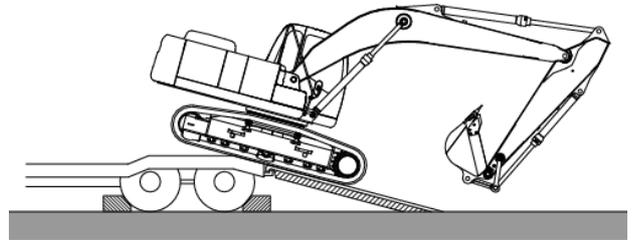
1. Load and unload machine on firm and level ground.
2. Do not fail to put blocks to the tires of trailer to prevent machine from moving. Accord the distance of two ramps with that of centers of crawlers and incline ramps at angle of 15 degrees or less (A).
3. Remove chain or wire rope which is used to fix the machine.



4. Start engine.
5. Move safety lock lever to "UNLOCKED" position.
6. Press travel speed change switch of switch panel on gauge cluster and change the speed to low speed.  
Check that travel speed is set to low speed by watching display.



7. Raise attachment and travel slowly with placing attachments as shown in figure.
8. Park the machine horizontally on the rear end of trailer and then stop it.
9. Set arm and boom to angle 90 to 110 degrees and travel down slowly from trailer to ramps. In this time, the bucket position should be close to ground.



**WARNING**

To prevent the arm and bucket cylinders from any damage, you are advised to follow the following instructions.

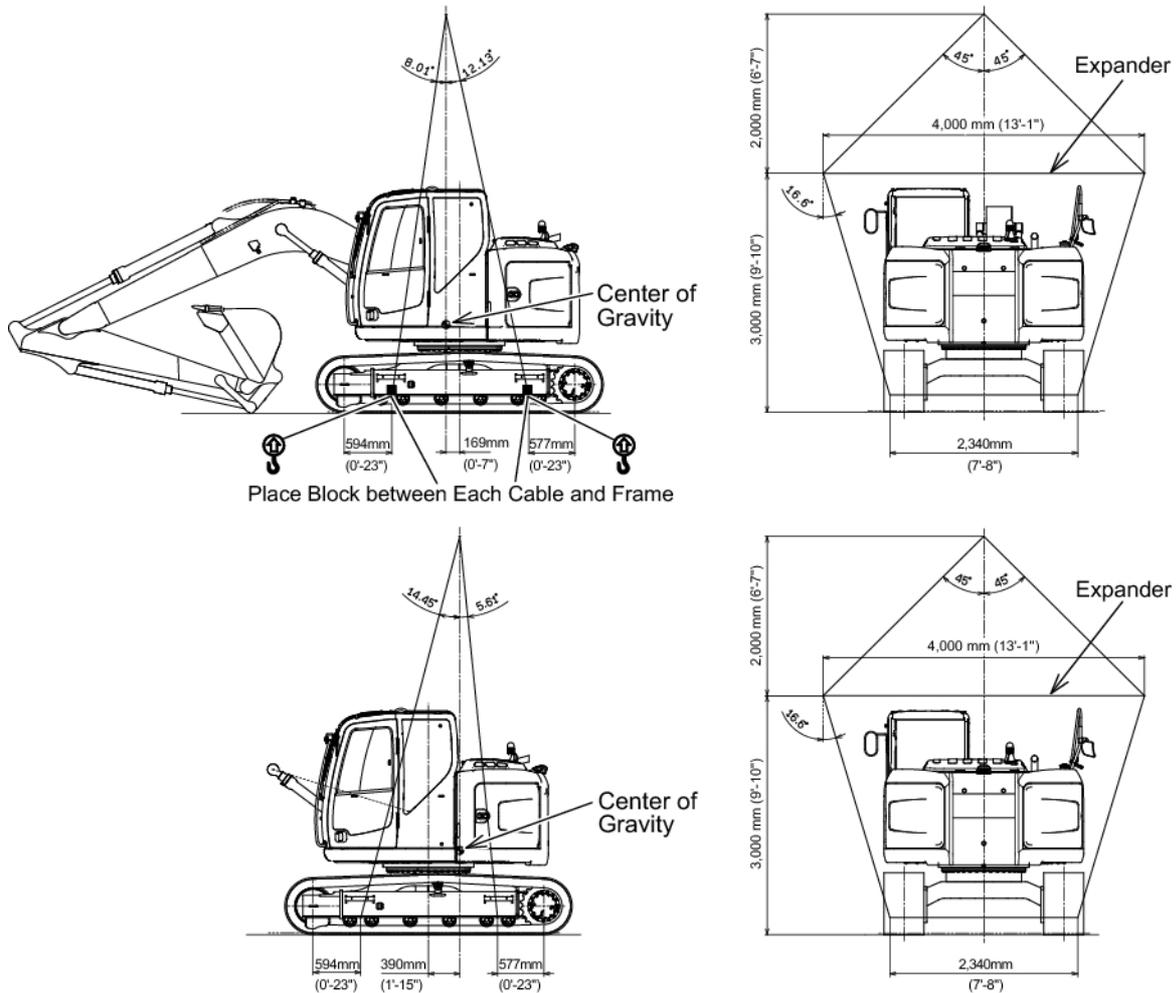
Do not have the arm and/or bucket cylinder fully extended to a "RAMP OVER CENTER" situation. This allows sudden and abrupt contact of the arm or bucket to a trailer bed, ramp or the ground.

This can result in internal mechanical contact, which can stretch the cylinder rod(s).

10. Travel down on ramps slowly while operating boom and arm softly until the machine passes through the ramps completely.

### 5.3 LIFTING MACHINE

The following procedures are for lifting the machine, as built by KOBELCO CONSTRUCTION MACHINE Co., LTD. These procedure do not take into account modifications made to the machine that affect machine weight or center of gravity.



**WARNING**

- Wire rope or chain used for lift the machine must be of sufficient weight lifting capacity for this machine.
- Improper lifting method or rope/chain rigging may cause unexpected movement or slip of the machine when lifted, resulting in serious injury or death or damage to the machine.
- When lifting the machine operate the controls, slowly and smoothly avoiding any sudden/fast control movement for safety of people involved and lift rigging.
- When the machine is lifted with assistance of one or more workers operation signals/communication must be understood by all involved to avoid injury or death.
- During the machine lift procedure, keep people away from the area, especially the area under the machine.
- Do not use the counterweight lifting eyes to lift whole machine.

**IMPORTANT**

This lifting up procedure is applicable for machines in standard specification.

The lifting procedure differs for each attachment type and each machine in option. In such cases, contact our dealer/distributor.

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**Carry out the lifting work on firm level ground.**

1. Position the machine as shown in the figure.
2. Position the boom to the front of machine.
3. Stop the engine and move safety lock lever to "LOCKED" position. Get off machine. Check the operator's seat and area for any loose item, tools, etc. that could fall or cause a problem or injury during the procedure and remove or secure them.
4. Stop the engine and remove starter key, and get off the machine.
5. Use wire rope and expander of sufficient length to prevent interference with the machine body when lifting up machine. Cover wire rope with cloth to protect machine from damaging if necessary.
6. Pass through wire ropes between 1st and 2nd lower rollers on both front and rear sides of machine as shown in figure.
7. Lift up machine with an angle of two wire ropes adjusted within the range of 12 to 30 degrees slowly.
8. After working, stop machine once and lift machine again slightly after machine has stabilized.

## 5.4 INSTALLATION AND REMOVAL OF THE MIRROR

When the machine is shipped from the factory, the mirrors are not installed.  
Refer to "1.3 SECURE VISIBILITY" when install or uninstall the mirrors.

## 6. SPECIFICATIONS

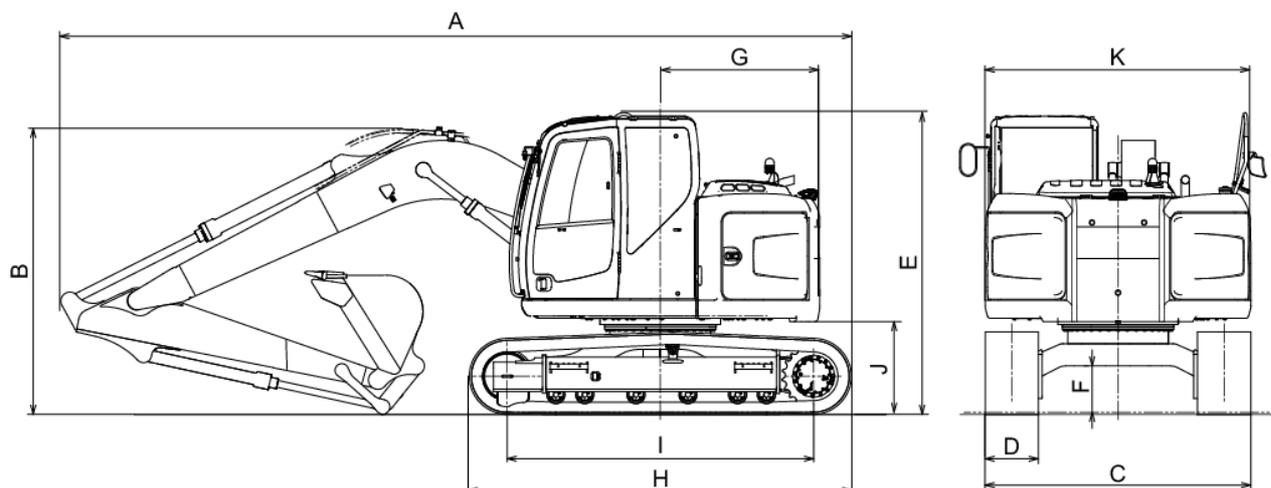
## 6.1 GENERAL SPECIFICATIONS

	Item	Unit	SK135SR-3	SK135SRLC-3	SK140SRL-3
	Working Weight	kg (lb)	13,600 (29,990)	13,800 (30,430)	16,000 (35,280)
	Bucket Heaped	m <sup>3</sup> (cu·yd)	0.5 (0.65)		0.45 (0.59)
	Engine Maker	-	MITSUBISHI D04EG-TAA Water-cooled, 4 cycle 4 cylinder direct injection type diesel engine with intercooler turbo-charger.		
	Engine Output-Rating	kW/min-1	74 / 2,000		
A	Overall Length	mm (ft-in)	7,410 (24-4)	7,430 (24-5)	7,450 (24-5)
B	Overall Height	mm (ft-in)	2,840 (9-4)		2740 (8-12)
C	Overall Width of Crawler	mm (ft-in)	2,490 (8-2)		2740 (8-12)
D	Width of Crawler Shoe	mm (inch)	500 (19.7)		700 (27.6)
E	Height to Top Cab	mm (ft-in)	2,810 (9-3)	2,840 (9-4)	3,000 (9-10)
F	Ground Clearance of Under Carriage	mm (inch)	440* (17.3)		580* (22.8)
G	Radius of Rear End	mm (ft-in)	1,490 (4-11)		
H	Overall Length of Crawler	mm (ft-in)	3,580 (11-9)	3,750 (12-4)	3,790 (12-5)
I	Center Distance of Tumblers	mm (ft-in)	2,870 (9-5)	3,040 (9-12)	2,990 (9-10)
J	Ground Clearance of Rear End	mm (inch)	855* (33.7)		1,040* (3-5)
K	Width of revolving upper structure	mm (ft-in)	2,490 (8-2)		
	Ground Pressure	kPa (psi)	43 (6.24)	41 (5.95)	34 (4.93)
	Swing Speed	min-1 (rpm)	11.0 (11.0)		
	Travel Speed [Low (1st)/High (2nd)]	km/h (mph)	3.4 / 5.6 (2.1 / 3.5)		3.0 / 5.3 (1.9 / 3.3)
	Gradeability	% (deg)	70 (35)		

### IMPORTANT

-The "GENERAL SPECIFICATIONS" are described the standard machine that the boom length of 4.68 m (15'-4") and the arm length of 2.38 m (7'-10") is installed.

-Marked \* dimensions do not include height of shoe lug.



## 6.2 SHOE TYPES

### A. SK135SR-3

Type			Grouser Shoes		
			500 mm (19.7")	600 mm (23.6")	700 mm (27.6")
Use			For Soft Soil (Standard)	For Soft Soil (Option)	For Soft Soil (Option)
Specifications	Working Weight	kg (lbs)	13,600 (29,990)	13,900 (30,650)	14,100 (31,090)
	Height to Top Cab	mm (ft-in)	2,840 (9-4)	2,840 (9-4)	2,840 (9-4)
	Ground Clearance of Undercarriage	mm (inch)	440* (17.3)	440* (17.3)	440* (17.3)
	Overall Length of Crawler	mm (ft-in)	3,580 (11-9)	3,580 (11-9)	3,580 (11-9)
	Overall Width of Crawler	mm (ft-in)	2,490 (8-2)	2,590 (8-6)	2,690 (8-10)
	Ground Pressure	kPa (psi)	43 (6.24)	36 (5.22)	32 (4.64)

### B. SK135SRLC-3

Type			Grouser Shoes		
			500 mm (19.7")	600 mm (23.6")	700 mm (27.6")
Use			For Soft Soil (Standard)	For Soft Soil (Option)	For Soft Soil (Option)
Specifications	Working Weight	kg (lbs)	13,800 (30,430)	14,100 (31,090)	14,300 (31,530)
	Height to Top Cab	mm (ft-in)	2,840 (9-4)	2,840 (9-4)	2,840 (9-4)
	Ground Clearance of Undercarriage	mm (inch)	440* (17.3)	440* (17.3)	440* (17.3)
	Overall Length of Crawler	mm (ft-in)	3,750 (12-4)	3,850 (12-8)	3,950 (12-12)
	Overall Width of Crawler	mm (ft-in)	2,490 (8-2)	2,590 (8-6)	2,690 (8-10)
	Ground Pressure	kPa (psi)	41 (5.95)	35 (5.08)	31 (4.49)

### C. SK140SRL-3

Type			Grouser Shoes
			700 mm (27.6")
Use			For Soft Soil (Standard)
Specifications	Working Weight	kg (lbs)	16,000 (35,280)
	Height to Top Cab	mm (ft-in)	3,000 (9-10)
	Ground Clearance of Undercarriage	mm (inch)	580* (22.8)
	Overall Length of Crawler	mm (ft-in)	3,790 (12-5)
	Overall Width of Crawler	mm (ft-in)	2,740 (8-12)
	Ground Pressure	kPa (psi)	34 (4.93)

**IMPORTANT**

-Do not employ shoes other than 500 mm (19.7") grouser shoe on rough ground (site covered with much rocks and gravels).

The traveling and digging works on the rough ground may cause bent of shoe, looseness of shoe bolt, etc. and also damage of under carriage (link, roller, etc.).

-For SK135SR-3, SK135SRLC-3. The attachment is with the arm of 2.38 m (7'-10") and bucket "SAE heaped" of 0.5 m<sup>3</sup> (0.65 cu·yd) attached.

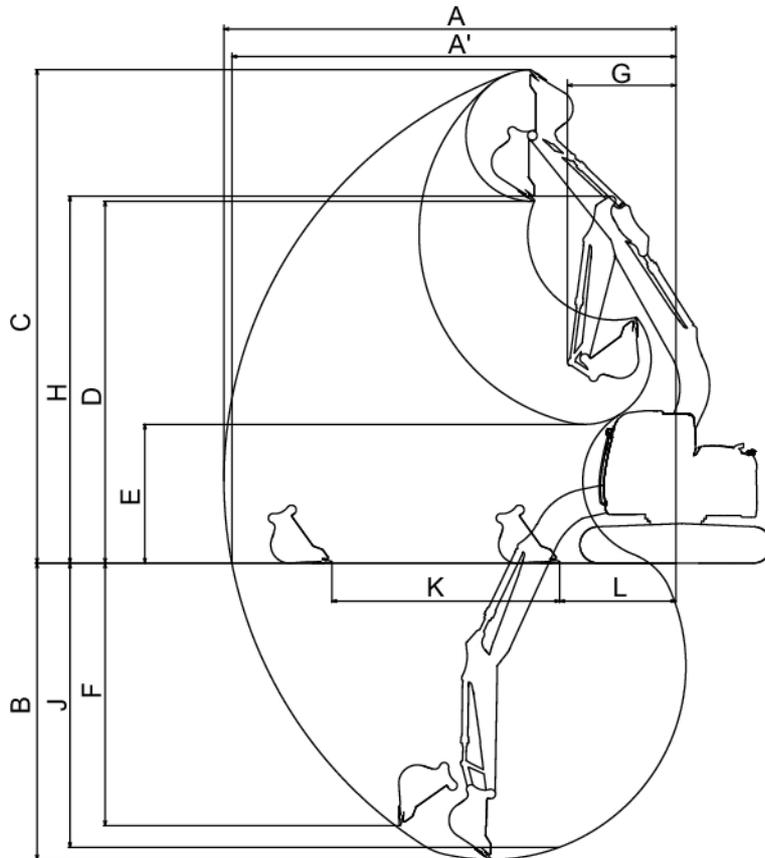
-For SK140SRL-3. The attachment is with the arm of 2.38 m (7'-10") and bucket "SAE heaped" of 0.45 m<sup>3</sup> (0.59 cu·yd) attached.

-Marked \* dimensions do not include height of shoe lug.

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### 6.3 WORKING RANGES

#### A. Backhoe Attachment (SK135SR-3 · SK135SRLC-3)



YY11Z00551P1

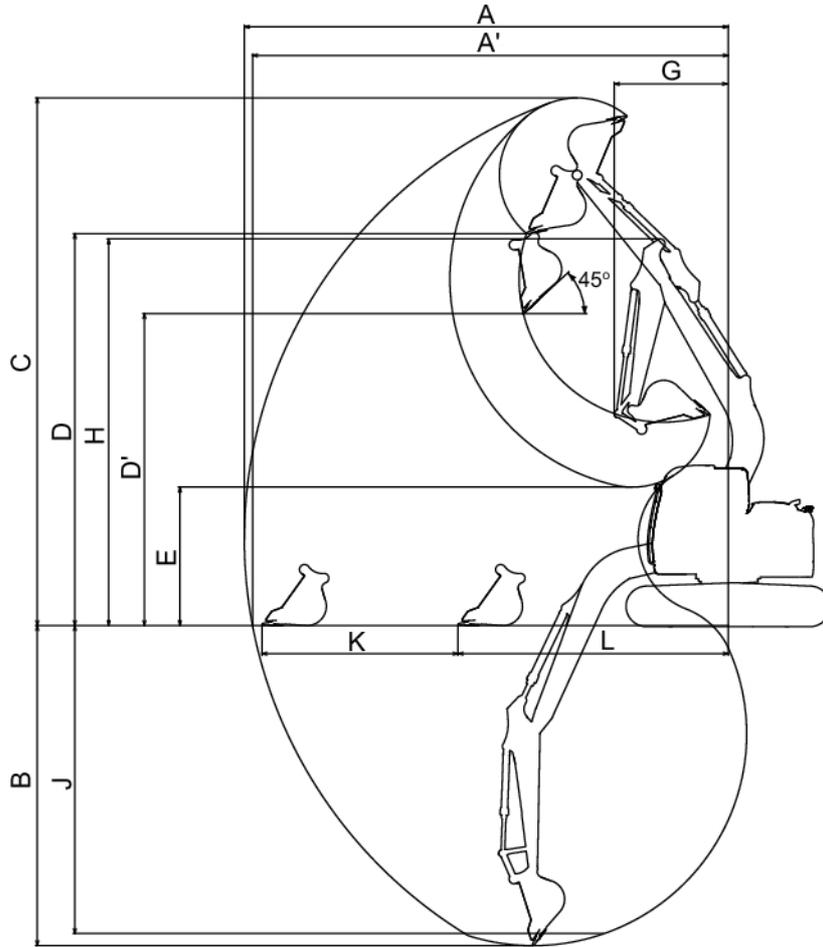
Unit : mm (ft-in)

Item / Attachment		2.38 m (7'-10") Arm + 0.50 m <sup>3</sup> (0.65 cu·yd) Bucket	
A	Maximum digging reach	8,340 (27-4)	
A'	Maximum digging reach at ground level	8,190 (26-10)	
*B	Maximum digging depth	5,520 (18-1)	
*C	Maximum digging height	9,190 (30-2)	
*D	Maximum dumping clearance	6,740 (22-1)	
*E	Minimum dumping clearance	2,580 (8-6)	
*F	Max. vertical wall digging depth	4,890 (16-1)	
G	Minimum swing radius	2,000 (6-7)	
*H	Height at min. swing radius	6,830 (22-5)	
*J	8 feet level digging Depth	5,290 (17-4)	
K	Horizontal digging stroke at ground level	Stroke	4,210 (13-10)
L		Minimum	2,140 (7-0)

**IMPORTANT**

Marked \* dimensions do not include height of shoe lug.

B. Face Shovel Attachment (SK135SR-3 · SK135SRLC-3)



YY11Z00552P1

Unit : mm (ft-in)

Item / Attachment		2.38 m (7'-10") Arm + 0.50 m <sup>3</sup> (0.65 cu·yd) Bucket	
A	Maximum digging reach	8,480 (27-10)	
A'	Maximum digging reach at ground level	8,330 (27-4)	
*B	Maximum digging depth	5,660 (18-7)	
*C	Maximum digging height	9,320 (30-7)	
*D	Maximum damping clearance	6,930 (22-9)	
*D'	Maximum damping clearance (45 deg)	5,510 (18-1)	
*E	Minimum damping clearance	2,450 (8-0)	
G	Minimum swing radius	2,000 (6-7)	
*H	Height at min. swing radius	6,830 (22-5)	
*J	8 feet level digging Depth	5,440 (17-10)	
K	Horizontal digging stroke at ground level	Stroke	3,440 (11-3)
		Minimum	4,730 (15-6)

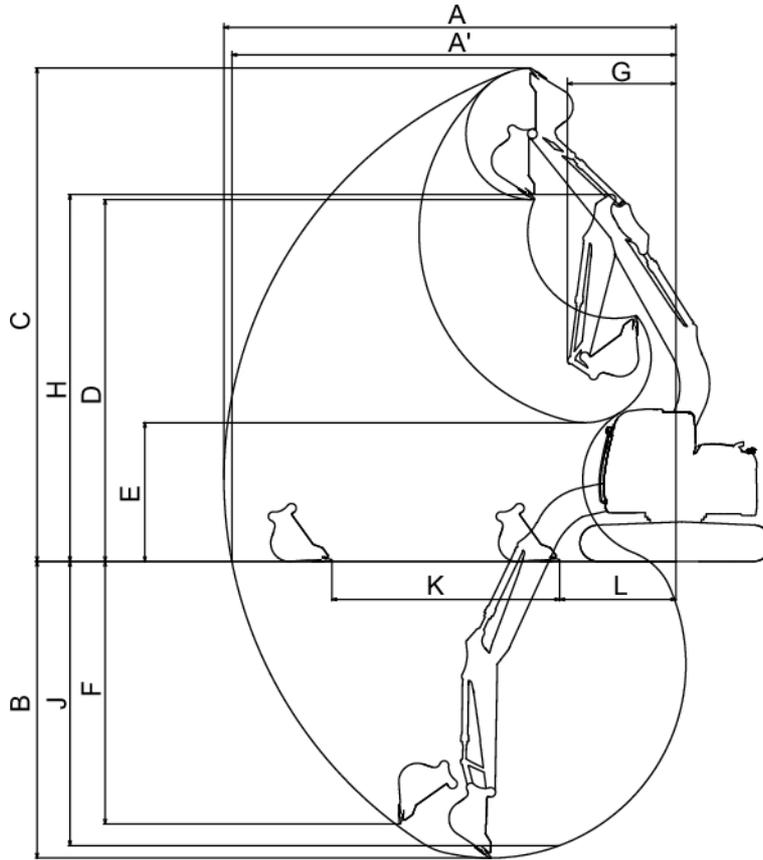
**IMPORTANT**

Marked \* dimensions do not include height of shoe lug.

6

## [6. SPECIFICATIONS]

### C. Backhoe Attachment (SK140SRL-3)



YY11Z00590P1

Unit : mm (ft-in)

Item / Attachment		2.38 m (7'-10") Arm + 0.45 m <sup>3</sup> (0.59 cu·yd) Bucket	
A	Maximum digging reach	8,340 (27-4)	
A'	Maximum digging reach at ground level	8,160 (26-9)	
*B	Maximum digging depth	5,330 (17-6)	
*C	Maximum digging height	9,370 (30-9)	
*D	Maximum dumping clearance	6,930 (22-9)	
*D'	Maximum dumping clearance (45 deg)	2,770 (9-1)	
*E	Minimum dumping clearance	4,700 (15-5)	
G	Minimum swing radius	2,000 (6-7)	
*H	Height at min. swing radius	7,020 (23-0)	
*J	8 feet level digging Depth	5,100 (16-9)	
K	Horizontal digging stroke at ground level	Stroke	4,240 (13-11)
L		Minimum	2,100 (6-11)

## 6.4 BUCKET AND ARM COMBINATIONS

### A. Front Attachment Variation

#### (1) Outline

This machine is equipped with attachments in various types in order to comply with various operations.

- When large capacity bucket is used, it should be used in combination of short arms to secure the stability of machine and not to be forced to operate machine, front section and each cylinder.
- When long boom and arm are used, conversely combine with the small capacity bucket.

Type	Bucket (m <sup>3</sup> ) (cu·yd)		Outside width of bucket (mm)		Number of teeth	Can be turned over		Weight	Arm	
	SAE (Heaped)	SAE (Struck)	With side cutters	Without side cutters		2.38 m Arm	2.84 m Arm		2.38 m	2.84 m
Hoe Bucket	0.24 (0.31)	0.20 (0.26)	590	500	3	Yes	Yes	280	○	○
	0.31 (0.41)	0.23 (0.30)	700	600	3	Yes	Yes	300	○	○
	0.38 (0.50)	0.28 (0.37)	800	700	4	Yes	Yes	340	○	⊙
	0.45 (0.59)	0.35 (0.46)	915	815	4	Yes	Yes	360	○	△
	0.50 (0.65)	0.38 (0.50)	1,000	900	5	Yes	Yes	380	⊙	×
	0.57 (0.75)	0.43 (0.56)	1,100	1,000	5	Yes	Yes	400	△	×
	0.70 (0.90)	0.50 (0.65)	—	1,150	5	Yes	Yes	410	△	×
Breaker	—	—	—	—	—	—	—	—	○	○
Nibbler	—	—	—	—	—	—	—	—	○	○

### **CAUTION**

-If any other bucket except for the backhoe bucket is turned over and used for excavation, damage to the arm and bucket may occur.

-Do not operate the power boost switch when a long arm is installed.

### **IMPORTANT**

⊙ : Standard combination

○ : General operation; Excavation or loading of sand, gravel, and clay

△ : Light operation; Mainly loading of loose gravel (e.g., cultivation or loading of sand or gravel)

× : Prohibited combination; KOBELCO's warranty does not cover any damages resulting from these combinations. Do not use these combinations.

Install only genuine attachment recommended by KOBELCO on the machine. KOBELCO is not liable for any damages to the machine or attachment arising from the installment of attachment other than the specified attachments.

## 7. OPTIONAL EQUIPMENT

## 7.1 OPERATION OF HYDRAULIC BREAKER AND NIBBLER

### 7.1.1 SELECTION OF HYDRAULIC BREAKER AND NIBBLER

When installing a hydraulic breaker or nibbler to the machine, select the optimal breaker or nibbler taking the matters into consideration such as stability, hydraulic system pressure, required hydraulic oil volume.

### 7.1.2 BEFORE OPERATING BREAKER OR NIBBLER

- Consult with your Dealer for the additional piping work and reinforcement for the arm to install the breaker or nibbler to the machine.
- When using the breaker or nibbler, fully understand and peruse the operation manual of its manufacturer and the "PROHIBITED WORK IN USE OF BREAKER" for the work mentioned in this MANUAL, in order to get full performance of them paying attention to damages on the machine and hydraulic breaker or nibbler.

### 7.1.3 PRECAUTIONS FOR IMPURITY AND HYDRAULIC OIL

When the hydraulic breaker or nibbler is removed after its installation, apply a blinding plug to the stop valves attached on the tip of arm and openings on the hydraulic pipings for the hydraulic breaker or nibbler to prevent them from invasion of dust, water, etc.

Before the operation, check the looseness on the clamps which are fixing the piping for attachment, and the leakage on connections of tubes and hoses.

### 7.1.4 PROHIBITED WORK IN USE OF BREAKER

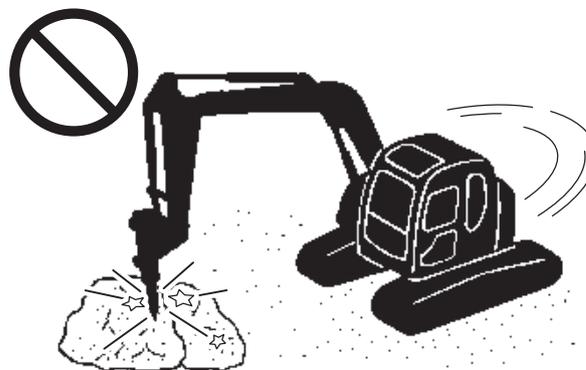
The following safety precautions should be used in conjunction with all other safety precautions found in this MANUAL.

#### WARNING

Read, understand and follow all safety precautions and operating procedures found in this manual before operating the machine or any attachment.

#### A. Do Not Use Lewing/Swing Force

Do not use the swing force of the machine for pushing or sliding objects. This will cause premature failure of the attachment and other machine components.



## [7. OPTIONAL EQUIPMENT]

### B. Do Not Pry and Break Forcibly

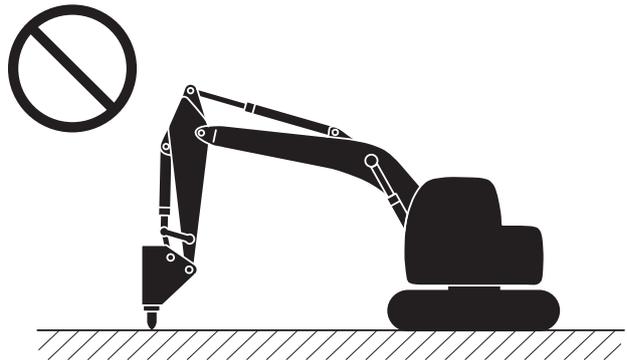
Do not use the breaker to pry and break rock and concrete. This may damage the hydraulic breaker, and the excavator boom, arm and hydraulic cylinders.



### C. Arm In Vertical Position

The arm should not be operated in the vertical position to prevent the hydraulic cylinder from vertical shocks.

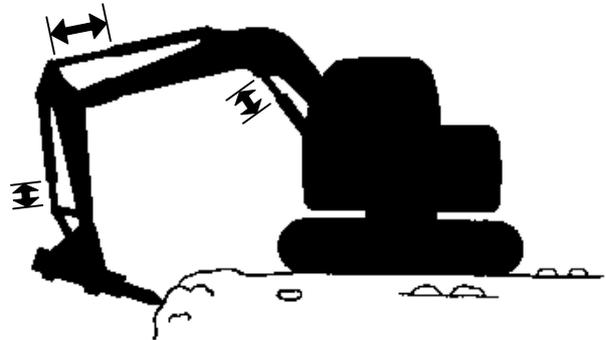
This may damage the rod seal and piston and cause oil to leak from those sections.



### D. Cylinders

Do not operate boom, arm or bucket cylinders at stroke ends when using a breaker attachment.

Doing this can cause undue load on the cylinder rods and result in damage.



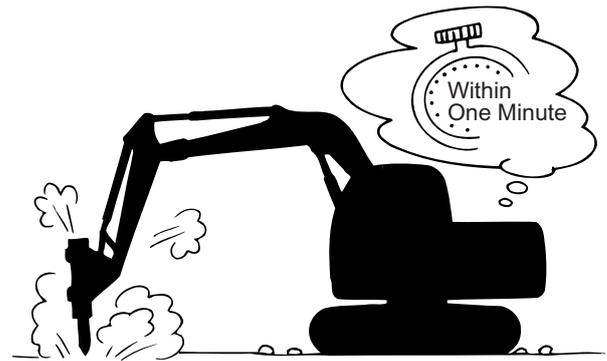
### E. Use for Intended Purpose

Use the attachment only for its intended purpose. If not used in accordance with the manufacturers instructions, the excessive pressure exerted on the boom, arm and frame structure of the machine will cause premature failure of the components.



**F. Avoid Continuous Operation**

Operate the nibbler/breaker in 1 minute intervals. Operation for longer than 1 minute at a time can cause high oil temperatures and the accumulators, cylinder seals and possibly pump damage.



**G. Hose Surge**

Should the hydraulic hoses begin to surge or vibrate abnormally during operation of a breaker or nibbler, immediately stop operation and contact our dealer/distributor for assistance.

This problem often is a result of damaged accumulators and can also result in valve failure.



**H. Do Not Use Dropping Force**

Do not use the dropping force of the attachment to break or drive objects. This will cause extensive damage to the attachment and machine structure.



**I. Do Not Lift**

Do not use an optional attachment to lift or transport objects or material.

Doing so can cause extensive damage to the attachment, the machine structures or cause injury or death due to slipping or dropping of load due to improper attachment.

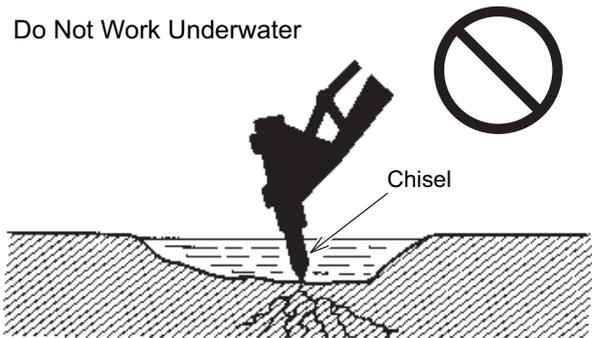


## [7. OPTIONAL EQUIPMENT]

### J. Do Not Work Underwater

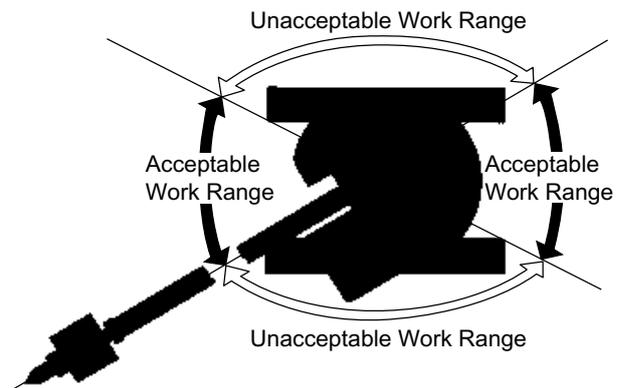
The breaker is rusted, and results in damage of sealing.

Consequently contamination with rust, dust and water enter into hydraulic oil. This causes damage of hydraulic equipment.



### K. Working Ranges

The balance on the machine becomes unstable at the positions shown in the right figure involving a possibility of turning over the machine. Do not carry out breaker work in this position.



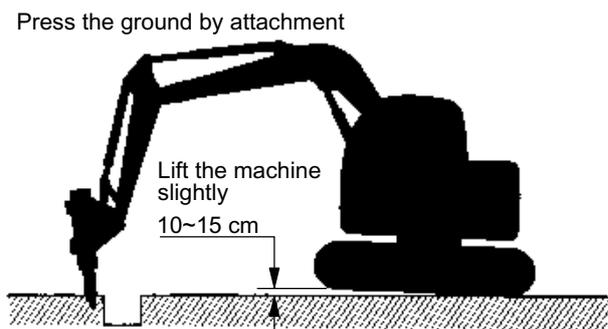
### L. Do Not Hit Chisel Against Boom

To avoid interference of chisel with boom, operate control lever of arm and boom carefully.



### M. Precaution When Lifting Up Machine

Unnecessary machine lifting up is not allowed. It may cause damage of attachment.

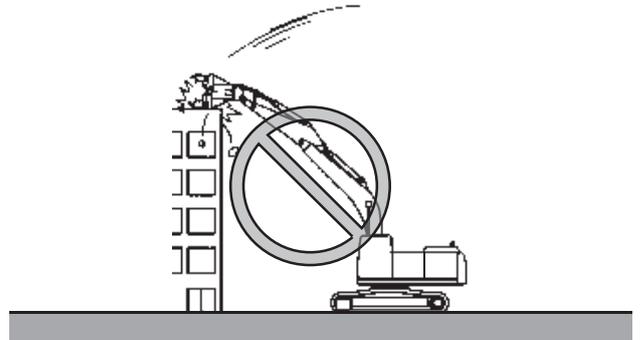


### 7.1.5 PROHIBITED WORK IN USE OF NIBBLER

The wrong nibbler operating method may cause damage of attachment and excavator or result in dangerous work condition. To prevent these trouble, learn correct and safety operating method. The precaution during operation is explained here with operative examples including similar behavior to prevent trouble.

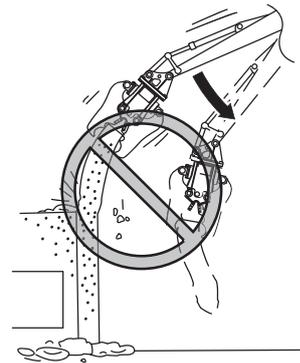
#### A. Do Not Strike the Object with Nibbler

The hitting and striking the nibbler against object will give undue force to nibbler, machine, boom, arm, link and so on resulting in damage.



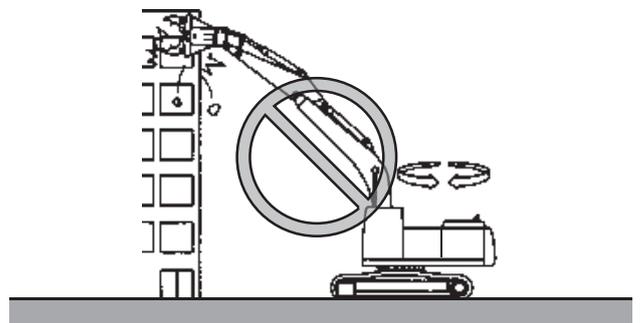
#### B. Do Not Pry and Pull Nibbler during Holding Object

Do not pry and pull nibbler which is holding building and structure partly.



#### C. Do Not Swing the Machine during Holding Object

Do not pull down building and structure by the swing force during holding object.

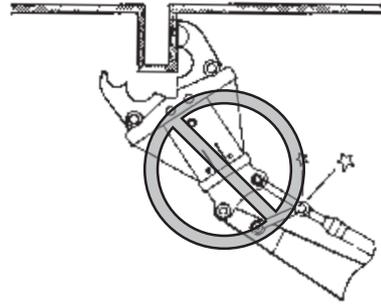


## [7. OPTIONAL EQUIPMENT]

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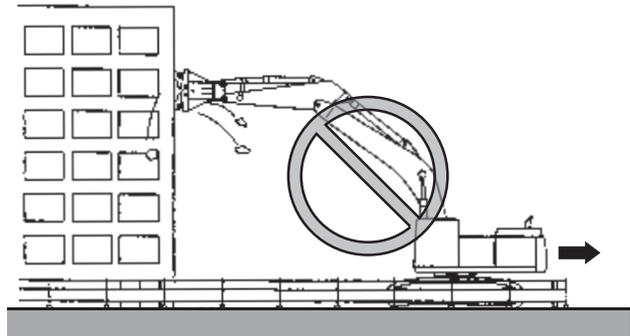
### D. Do Not Hold Object Obliquely

Select machine position and holding position so that nibbler opening does not hold breaking object obliquely.



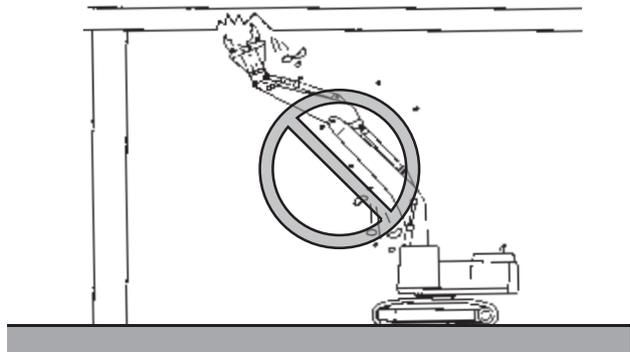
### E. Do Not Travel while Nibbler is Holding Object

Do not pull building and structure by the use of traveling force while nibbler is holding the top side of object.



### F. Attention to the Falling Debris

Take position to prevent from debris.



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### CAUTION

The guard (3 faces) is provided for demolition machine.

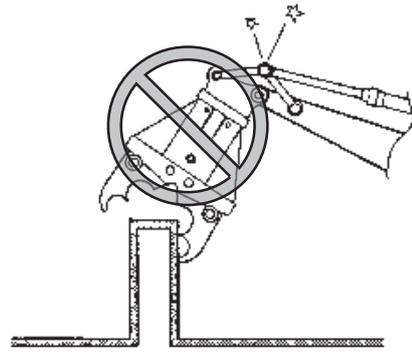
When standard machine is employed as machine for demolition work, replace the cab with 3 faces protected cab.

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**G. Cylinder Stroke with Sufficient Allowance**

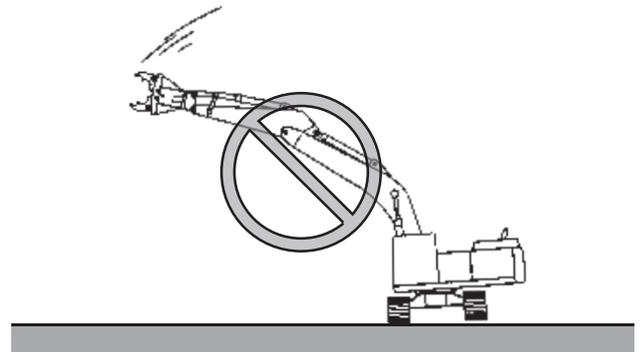
When carrying out the demolition work with hydraulic cylinder rod moving to the stroke end, the hydraulic cylinder may be damaged. Do not operate nibbler with hydraulic cylinder rod moving to the stroke end.

Especially the operation of cylinder with the bucket cylinder moved to the stroke end may cause damage of cylinder, link and rod pin.



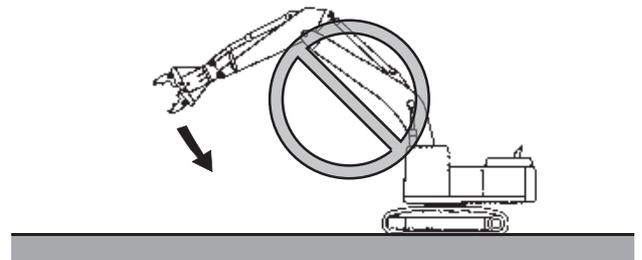
**H. Prohibiting Work Facing Sideways**

Do not operate the attachment over the sides of the machine. It may cause rollover of machine. And do not operate the machine abruptly but operate it slowly.



**I. Move Arm Slowly at stroke End of Cylinder**

When lowering the arm rapidly, and the cylinder rod reaches to stroke end rapidly too, and the impact damages the arm cylinder. Operate the attachment slowly to avoid the abrupt approach to stroke end of arm cylinder.



## 7.2 ATTACHMENT MODE SELECTION AND SELECTOR VALVE

### 7.2.1 SELECTION OF ATTACHMENT MODE

In accordance with the attachment which is equipped, it is necessary to change the attachment mode.

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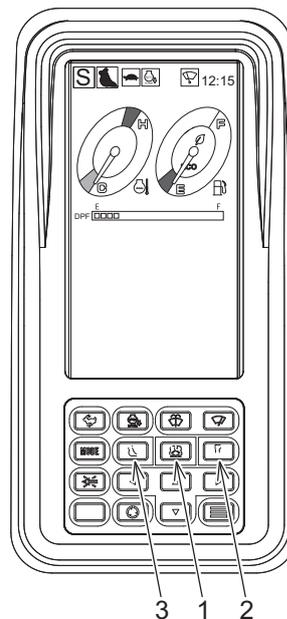
 **CAUTION**

- Select the attachment mode appropriately when you use the breaker or nibbler. Confirm the position of attachment mode switch and the screen of multi display closely.
  - Press the attachment mode switch to a correct position when the switch position is improper. Match the attachment mode to the attachment that is used from now.
  - Select the breaker mode absolutely when you work with breaker. If the machine is operated with mode other than breaker mode, hydraulic component and breaker are damaged.
  - If the selection of attachment mode is not correct, it causes defective operation and the breakdown of the machine.
  - When "S", "E" or "H" of the work mode is flickering, this shows that the selection of attachment mode is improper.
-

The attachment mode is always decided according to the position of the attachment mode switch.

Before the working, confirm whether proper attachment had been selected.

1. Nibbler
2. Breaker
3. Digging



Attachment Mode	Switch Position	Displays of Multi-Display	Selection of Attachment
Breaker Mode		<p>Breaker mark is displayed.</p> <p>As work mode, "E" or "S" or "H" is displayed on the left upper corner of the multi-display.</p>	Select single flow when the attachment like a breaker requires single flow circuit
Nibbler Mode		<p>Nibbler mark is displayed.</p> <p>As work mode, "E" or "S" or "H" is displayed on the left upper corner of the multi-display.</p>	Select conflux flow when the attachment like a nibbler requires conflux flow circuit
Digging Mode		<p>Normal display is indicated</p> <p>As work mode, "E" or "S" or "H" is displayed on the left upper corner of the multi-display.</p>	Select in case of digging

**CAUTION**

- Select breaker mode absolutely when you work with breaker. If the machine is operated with mode other than breaker mode, hydraulic component and breaker are damaged.
- Lower the attachment to the ground and confirm safety before you change the attachment mode.
- When "S", "E" or "H" of the work mode is flickering, this shows that the selection of attachment mode is improper.

## [7. OPTIONAL EQUIPMENT]

Work mode and hydraulic circuit

Attachment	Attachment mode	Hydraulic circuit	Set pressure of overload relief valve
ATT of single flow circuit like breaker	Breaker mode	Return circuit does not pass through control valve automatically.	When shipping: 24.5 MPa (3550 psi)
ATT of conflux circuit like nibbler	Nibbler mode	Return circuit pass through control valve automatically.	When shipping: 24.5 MPa (3550 psi)

### IMPORTANT

-When the breaker is installed, make sure to select the breaker mode, because the return circuit should return the oil to the return filter directly without passing through the control valve.

Select the breaker mode absolutely when you work with breaker.

-The overload relief valve is set to 24.5 MPa (3550 psi) when shipping from factory.

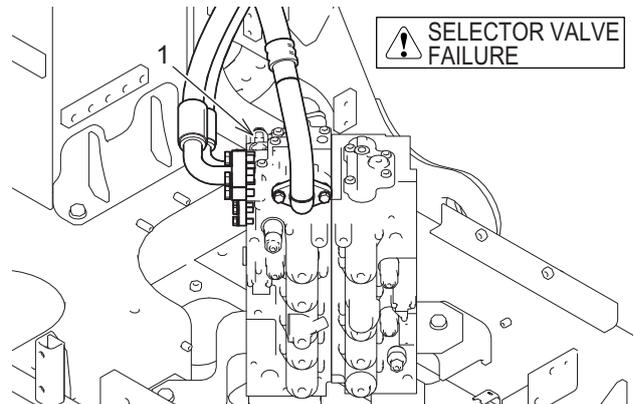
In some cases, the adjustment is required depending on the attachment, contact our dealer/distributor.

### 7.2.2 SWITCHING SELECTOR VALVE

The selector valve (1) is used to change the flowing route of hydraulic oil.

Since the flow is automatically changed according to the selected attachment mode, the switching to proper attachment mode is required depending on the attachment in use.

Switch the attachment mode referring to the page of "Attachment Mode Selection".



Attachment mode	Mechatro controller output	Hydraulic circuit	Mechatro controller input	
	Selector switching valve		Piping	Selector switching valve FB
Digging / Nibbler	OFF	Nibbler	OFF	OFF
Breaker	ON	Breaker	ON	ON

### CAUTION

When the "SELECTOR VALVE FAILURE" is displayed on the multi-display, there is a possibility that the output and input signal of the mechatro-controller is different from the above-mentioned table.

Turn the attachment mode select switch to the required attachment mode again. When the "SELECTOR VALVE FAILURE" does not disappear even if proper attachment mode is selected, since it is suspected that it is caused by electrical failure, contact our dealer/distributor.

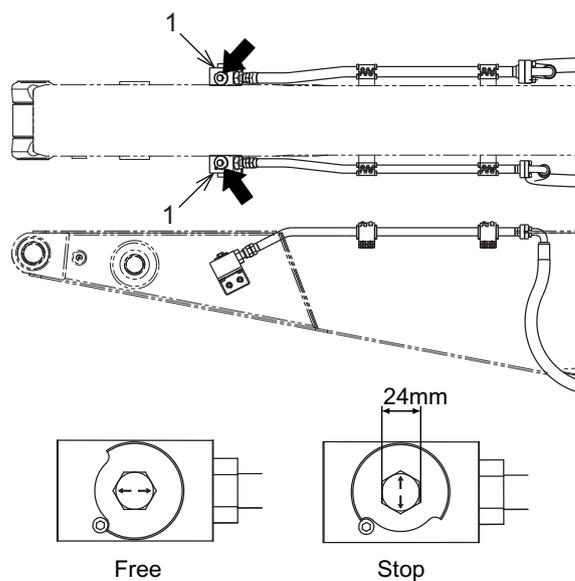
### 7.3 SETTING STOP VALVE

Stop valve (1) on arm top end is used to stop hydraulic oil flowing.

Free : Hydraulic oil flows

Stop : Hydraulic oil stops flowing

Before removing attachment, set stop valve to "STOP" position.



Tools used

Stop Valve	Location	Tools
(1)	Arm	Spanner (24 mm)

## 7.4 FLOW RATE CONTROL

The flow rate of service circuit may be changed according to attachment in use.

For the flow rate setting procedure, see the applicable item in "2. 3. 1. B. 10. 7 Pump Flow Rate Adjustment (Nibbler mode/ Breaker mode)".

## 7.5 OPERATION OF HYDRAULIC BREAKER AND NIBBLER (FOR 1 PEDAL TYPE)

This machine has the common hydraulic circuit that is used in both breaker and nibbler. And in accordance with nibbler work or breaker work, conflux flow and single flow is automatically switched.

### 7.5.1 BASIC OPERATION

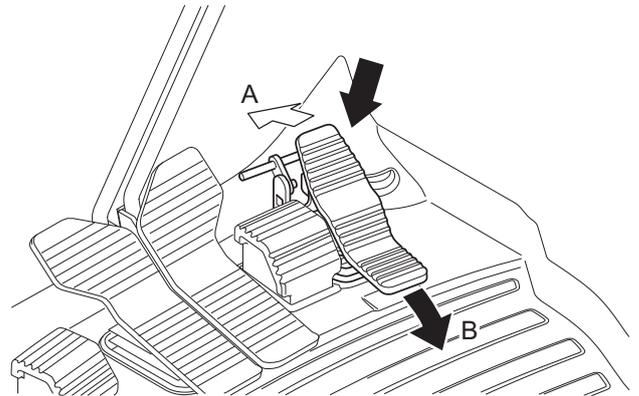


#### ATTACHMENT OPERATION BY FOOT PEDAL

Always check the foot pedal control pattern before operation.  
Always read operator's manual before operating machine.

#### A. Operating Pedal

Release pedal lock on the right front side of driver's seat to operate pedal.



Breaker		Nibbler	
Foot pedal depressing section	Operation	Foot pedal depressing section	Operation
Depress forward (A)	Breaker starts operation	Depress forward (A)	Nibbler close
Pedal in neutral position	Breaker stops operation	Depress rearward (B)	Nibbler open



Do not leave the machine with engine running.

## [7. OPTIONAL EQUIPMENT]

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### B. Pedal Lock Device

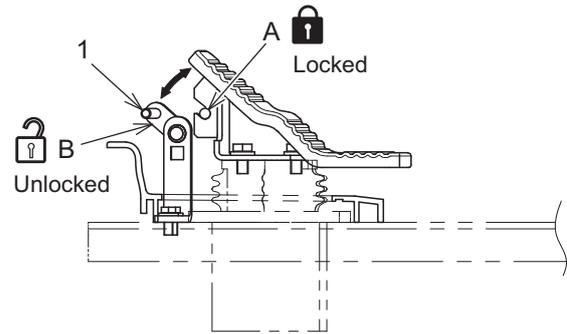
This device is used to lock control pedal.

Move pin (1) forward and the pedal is unlocked.

Move pin (1) rearward and the pedal is locked.

A Position . . . . . Locked

B Position . . . . . Unlocked



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### **WARNING**

Make sure to set the pedal lock to "LOCKED" position while the breaker or nibbler is not used.

Unexpected contact with "UNLOCKED" position of pedal may cause severe injury or death.

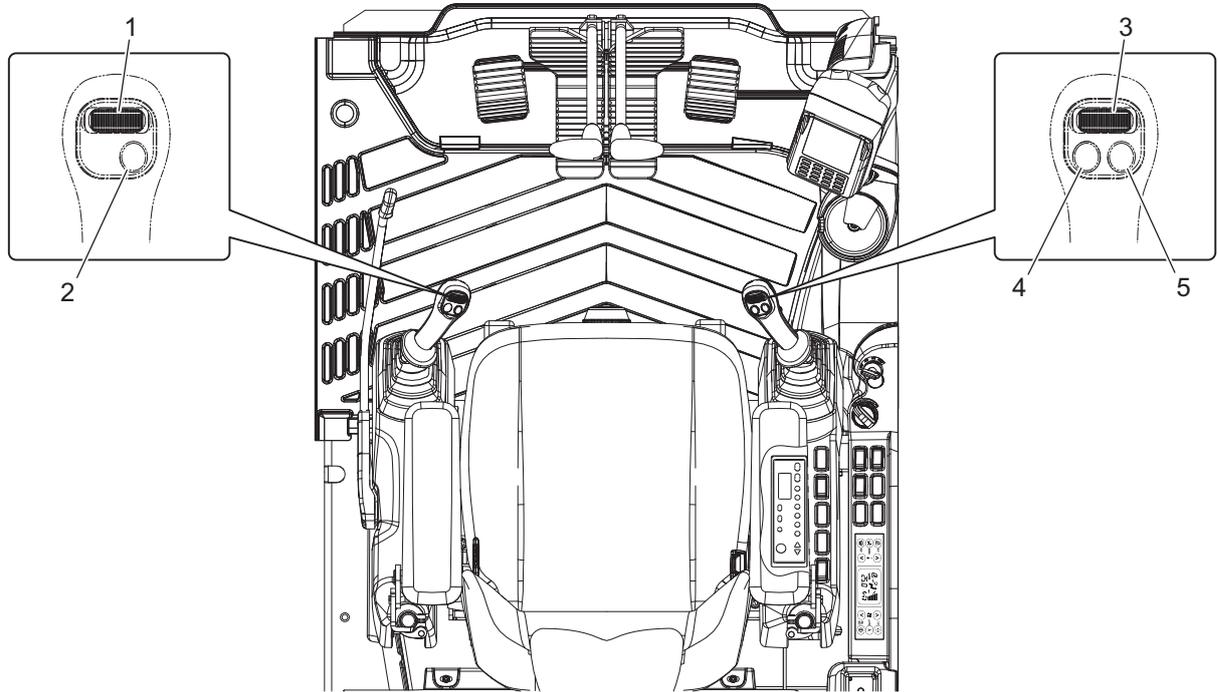
Do not put foot on the pedal except at the time of operation using pedal.

---

## 7.6 PROPORTIONAL HAND CONTROL (EXTRA, NIBBLER AND BREAKER)

To actuate the "extra", operate the switch (1) that is located on left control lever.

And operate the switch (3) that is located on right control lever to actuate the "nibbler (crusher)", and operate the switch (4) to actuate the "breaker".



Left Hand Control Lever Switch		Right Hand Control Lever Switch	
1	Extra control switch	3	Nibbler (Crusher) control switch
2	Horn switch	4	Breaker control switch
		5	Power boost switch

### 7.6.1 BASIC OPERATION

#### **WARNING**

Read, understand and follow all safety precautions and operations found in this manual before operating the machine or any attachment.

#### **CAUTION**

Operation differs depending on the manufacturer specification of an attachment installed. Check the manufacturer specification of the attachment before operation.

## [7. OPTIONAL EQUIPMENT]

---

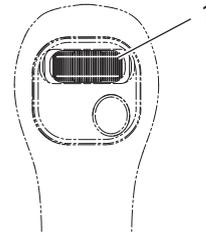
### A. Extra Hand Control

Slide switch (1) on the left control lever to actuate the "extra operation".

The following table shows that when switch (1) is slid and the attachment is seen from the inside of the cab, on which side of the attachment the high pressure oil is delivered.

· Switch operation

Operation procedure of option switch (1)	Oil flow
Slide to the left	Extra (R.H)
Slide to the right	Extra (L.H)



---

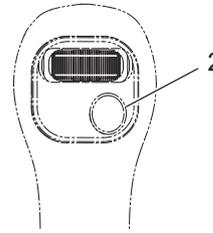
### **IMPORTANT**

According to the slide distance of option switch, hydraulic flow rate increases.

---

### B. Horn Switch

For the horn switch (2), see "2. 3. 2. 10 HORN SWITCH".



C. Nibbler (Crusher) and Breaker Hand Control

**IMPORTANT**

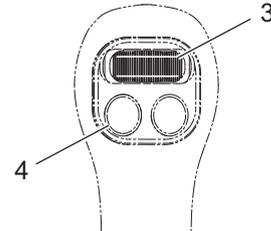
When nibbler (crusher) or breaker is used, refer to the item "ATTACHMENT MODE SELECTION AND SELECTOR VALVE" of "7. 1. 4 ATTACHMENT MODE SELECTION AND SELECTOR VALVE"

**C. 1 Nibbler Operation**

Slide the switch (3) that is located on right control lever to open or close the "Nibbler (crusher)".

· Switch operation

Operation procedure of Nibbler switch (3)	Operation
Slide to the left	Nibbler close.
Slide to the right	Nibbler open.



**WARNING**

Do not touch the Breaker switch (button) (4) when you operate Nibbler.

**WARNING**

**AVOID INJURY OR DEATH**

Do not leave the machine with engine running.

**IMPORTANT**

According to the slide distance of option switch, hydraulic flow rate increases.

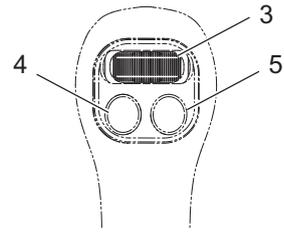
## [7. OPTIONAL EQUIPMENT]

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### C.2 Breaker Operating

Press the switch (4) that is located on right control lever to operate the "breaker".

1. To operate Breaker, press the switch (4).  
Release to stop operation.
2. Operate breaker for 30 seconds then release switch.



Switch depressing section	Operation
Off	Breaker stops operating.
Depress the switch	Breaker starts operating.

---

#### **IMPORTANT**

The Breaker can be operated by sliding the option switch (3) to the left. But, when you operate the breaker, use the Breaker switch (button) (4) as much as possible.

---

#### **WARNING**

#### **AVOID INJURY OR DEATH**

Do not leave the machine with engine running.

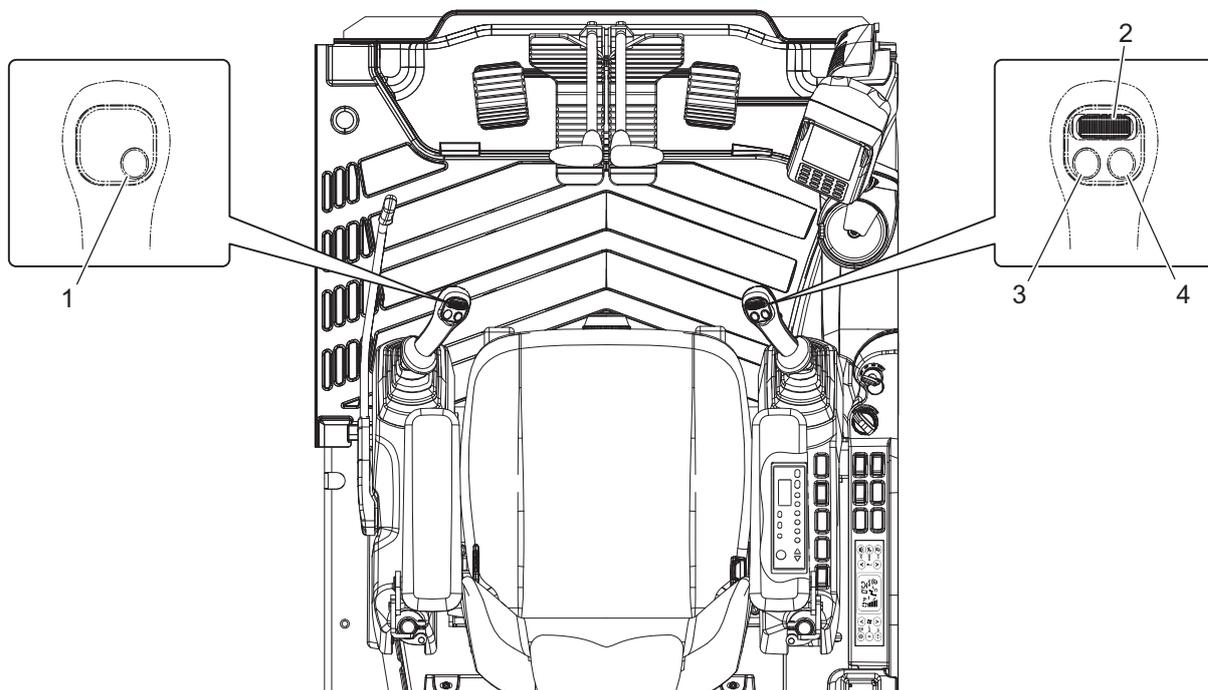
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### D. Power Boost Switch

For the power boost switch (5), see "2. 3. 2. 16 POWER BOOST SWITCH. "

## 7.7 PROPORTIONAL HAND CONTROL (NIBBLER AND BREAKER)

To actuate the "Nibbler" operate the switch (2) and to actuate the "Breaker" operate the switch (3) that is located on right control lever.



Left Hand Control Lever Switch		Right Hand Control Lever Switch	
1	Horn switch	2	Nibbler control switch
		3	Breaker control switch
		4	Power boost switch

### 7.7.1 BASIC OPERATION

**WARNING**

Read, understand and follow all safety precautions and operation procedures found in this manual before operating the machine or any attachment.

**IMPORTANT**

Regarding the procedures of nibbler and breaker operation, see "7.2 PROPORTIONAL HAND CONTROL (EXTRA/NIBBLER AND BREAKER)".

## 7.8 PERIODIC INSPECTION AND MAINTENANCE

### 7.8.1 PERIODIC INSPECTION AND MAINTENANCE INTERVAL

Contamination and deterioration of hydraulic oil may cause function problems with control valves, early wear and possible seizure of the hydraulic pump leading to break down of the machine hydraulic system.

Operation of breaker accelerates the deterioration of hydraulic oil compared to normal earth moving operation with bucket. Replace filters and hydraulic oil as indicated in following table. Prepare and update a maintenance record following example provided.

Component	Location	Replacement interval		
		First	2nd replacement	Regular
Hydraulic oil	Hydraulic tank	-	-	Every 1000 hours
Return filter element kit (P/No. YV52V01003R610)	Hydraulic tank	50 hours	250 hours	250 hours

### 7.8.2 REINFORCING ATTACHMENT

When operating machine with proper breaker and nibble attached, in case of the arm which is made in factory, reinforcement of arm is not required. But when operated in special application, contact our dealer/distributor.

## 7.9 PRECAUTION TO BE EXERCISED ON BREAKERS OF DIFFERENT MANUFACTURES

There are some differences between manufactures as to the piping to breakers and the handling of breakers. For this reason, consult with the manufacturer when mounting a breakers in the field. The following is a summary of how breakers should be handled that is extracted from manufacture's catalog use and operation manuals.

### IMPORTANT

This is a general outline of how breakers should be use and may differ with excavator models. Always contact the breaker manufacture before field mounting.

### 7.9.1 PLACING HIGH AND LOW PRESSURE ACCUMULATORS

N P K } They must be placed basically  
T O K U } (depending upn models)  
K R U P P }

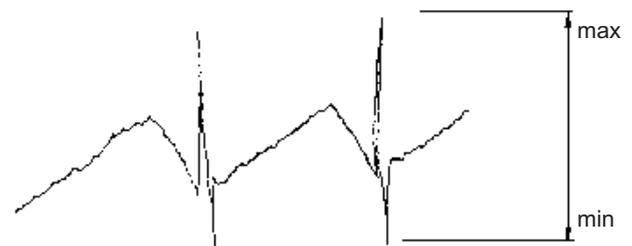
O K A D A } Check the osillation of the pulsation of  
F U R U K A W A } the breaker pressure and if pulsation  
is large, always install acculators.

### 7.9.2 STANDARD OF JUDGMENT ON THE INSTALLATION OF ACCUMULATORS

High pressureside :

Measure the plus oscillation by pressure on the high pressure side of the breaker at the inspection port for the pump's delivery pressure by actuation the breaker at the full revbolution of the engine in mode H and set the maximum pressure difference to within 20 % of the excavator's system pressure 34.3 MPa {350 kgf/cm<sup>2</sup>(4,980 psi).

In case it exceeds 20 %, install a high pressure accumulator.



$$\text{Max.} - \text{Min.} < \text{system press} \times 20\%$$

### IMPORTANT

The pulse oscillation is 34.3 MPa {350 kgf/cm<sup>2</sup>} x 20 % = 6.9 MPa {70 kgf/cm<sup>2</sup>(1,000 psi)}. Therefore, if it is more than this level, and accumulator must be installed.

Install accumulator referring to the result of verification test.

## [7. OPTIONAL EQUIPMENT]

Low pressure side :

Measure the inlet pressure of the line filter on the breaker side by actuating the breaker at full engine revolution in the H mode, and in case the maximum pressure exceeds 5.4 MPa {55 kgf/cm<sup>2</sup>} (780 psi), install a low pressure accumulator.

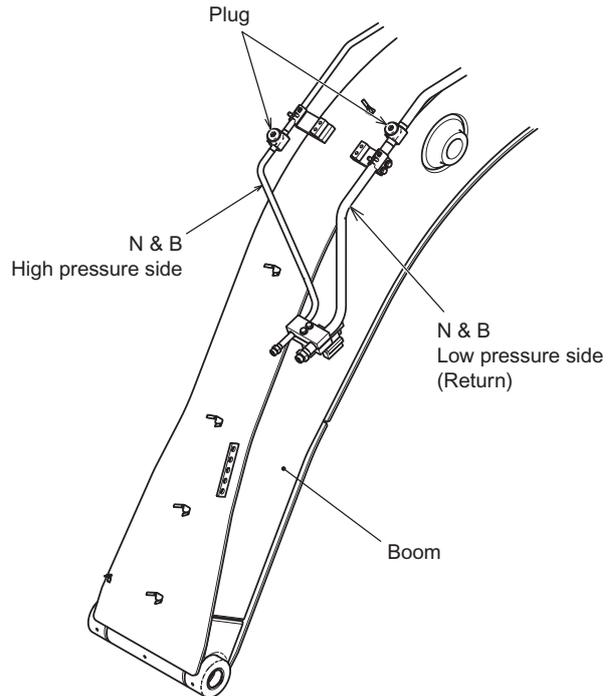
Max. < 5.4 MPa {55 kgf/cm<sup>2</sup>} (780 psi)

Regarding the capacity and the charge pressure of accumulators, contact the breaker manufacturer before installation.

### 7.9.3 INSTALLATION OF A RELIEF VALVE

N P K — Installation is not necessary.  
(Contact the breaker manufacture as it is necessary depending upon modesl.)

T O K U — Installation is necessary.  
K R U P P — A relief valve is specified by each breaker manufacturer.  
O K A D A — Since the method of pressure setting of the relief valve differes with breaker manufacturters, install a relief valve according to the manufacturer's instructions.  
F U R U K A W A —



## 7.10 ROTARY MULTI CONTROL VALVE (ISO AND BHL PATTERN)

**⚠ DANGER**

Stop the engine without fail at time of change over.

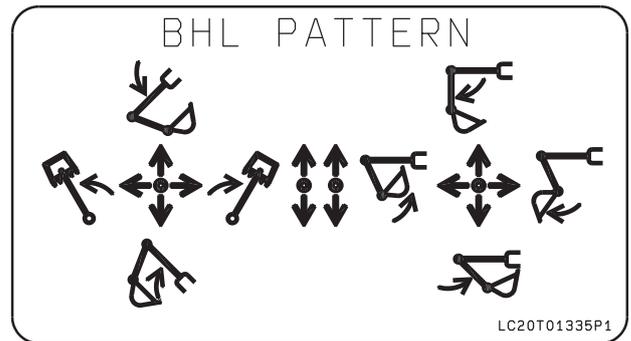
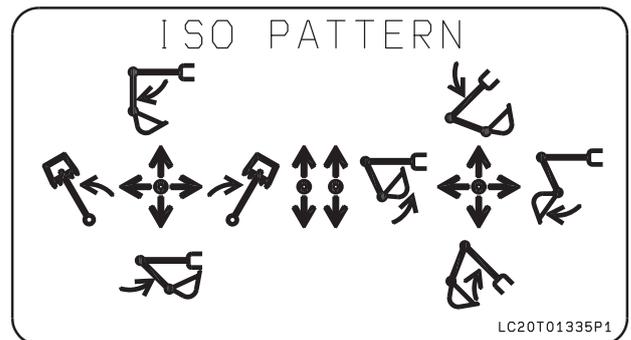
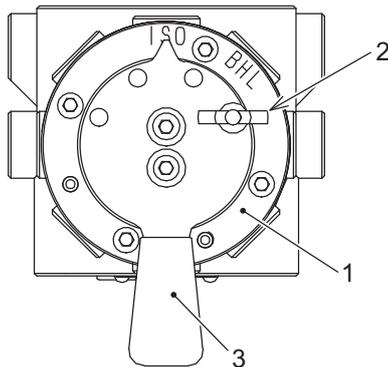
**⚠ WARNING**

- With this control pattern, functions must correspond to the labels located inside of cab.
- Make sure you know the location and function of each control before operating.

**⚠ CAUTION**

Stop engine, and move the lever to each operation position once every 500 hours. Make sure to return the lever to the position of former operation pattern.

This machine is factory equipped with the control pattern.



The patterns of operation are changeable from / to "ISO" to / from "BHL" position with the lever on the multi control valve (1) .

## [7. OPTIONAL EQUIPMENT]

---

### A. Lever of Rotary Multi-Control Valve

1. Park the machine in condition of parking posture, and stop the engine. And shift pilot control shut-off lever to "Locked position".
2. Using starter key , open side door located at right front side of machine, and hold it with stay.
3. Remove butterfly bolt (2), and shift the lever (3) to required arrow marked position.
4. After setting the control pattern, tighten butterfly bolt (2) to fix lever (3) with hand. Never use tools.
5. Remove stay and close side door, and lock the door with key.
6. Operate the attachment and make sure that the control lever pattern is adjusted to the desired one.

## 7.11 OPERATION OF DOZER BLADE

### 7.11.1 OUTLINE

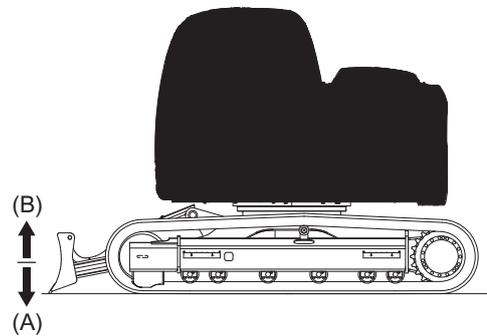
Blade is attached on lower frame with pin, and is used for backfilling and leveling after digging works by operating dozer cylinder through the aid of dozer control lever in cab and moving blade up and down.

### 7.11.2 DOZER BLADE OPERATION

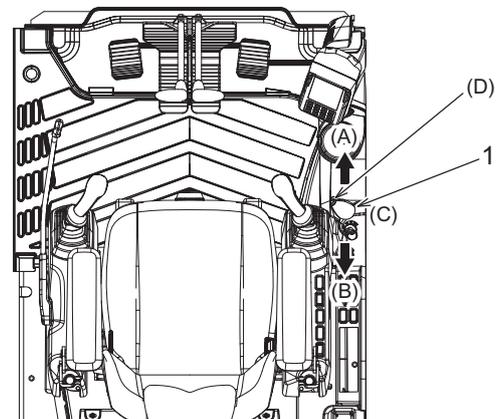
**WARNING**

Read, understand and follow all safety precautions and operation procedures found in this manual before operating the machine or any attachment.

LEVER CONTROL (1)	BLADE MOTION
PUSH LEVER FORWARD (A)	BLADE DOWN
PULL LEVER BACKWARD (B)	BLADE UP
NEUTRAL (C)	HOLD
TRAVEL SPEED SELECT SWITCH (D)	CHANGE HIGH (2nd) SPEED



1. Start machine and place the pilot control shut-off lever in the "UNLOCKED" (down) position.
2. Move throttle control to the "HI" idle position.
3. Using boom, arm and bucket controls set the attachment to desired position.
4. Pull the blade control lever to lift up the blade.
5. Push the blade control lever forward to lower the blade.



**WARNING**

Always place attachments on the ground and lock up the safety lever before leaving the cab.

**CAUTION**

To change travel speed from LOW (1st) to HIGH (2nd), press the "TRAVEL SPEED SELECT SWITCH (D)". The indication of gauge cluster changes simultaneously according to the travel speed. For more information about gauge cluster, refer to "2. 3. 1. B. 8 TRAVEL SPEED SELECT SWITCH"

### 7.11.3 PROHIBITED WORK IN USE DOZER BLADE

#### A. DEEP EXCAVATION OPERATION

During deep excavation with the dozer blade in front, the boom cylinder could come in contact with the dozer blade.

Place the dozer blade in the back of the machine for deep excavations, unless the working area does not permit it.



#### B. ATTACHMENT TRAVEL POSITION.

When moving the attachment into the travel position, do not hit the dozer blade with the bucket/attachment.



#### C. AVOID DISLODGING OBSTACLES WITH BLADE.

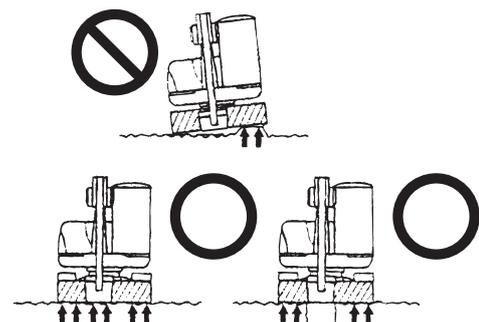
Do not strike any obstacles such as large rocks. The dozer blade may be damaged.



#### D. DO NOT SUPPORT MACHINE WITH BLADE AT ONE END.

When the dozer blade is used as an outrigger, do not support the machine at one end of the dozer blade.

Make sure the support at both ends.



### 7.11.4 PERIODIC INSPECTION AND MAINTENANCE INTERVAL

Check and service the component of dozer blade with reference to the following table.

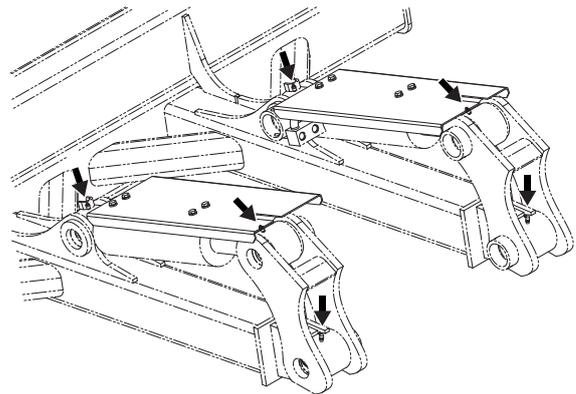
COMPONENT	WHEN REQUIRED	Interval (Hours on Hourmeter)		Lubricant, etc. (Replacement part)	REF. page #
		Pre-start inspection or every 8 hours	Every 3 months or 250 hours		
Grease dozer blade pin		○ (Until 50Hr)	○	EP grease	7-28
Inspection for oil leak and damage of dozer cylinders and hoses	○				—
Inspection for damage of dozer blade	○				—

**Note**

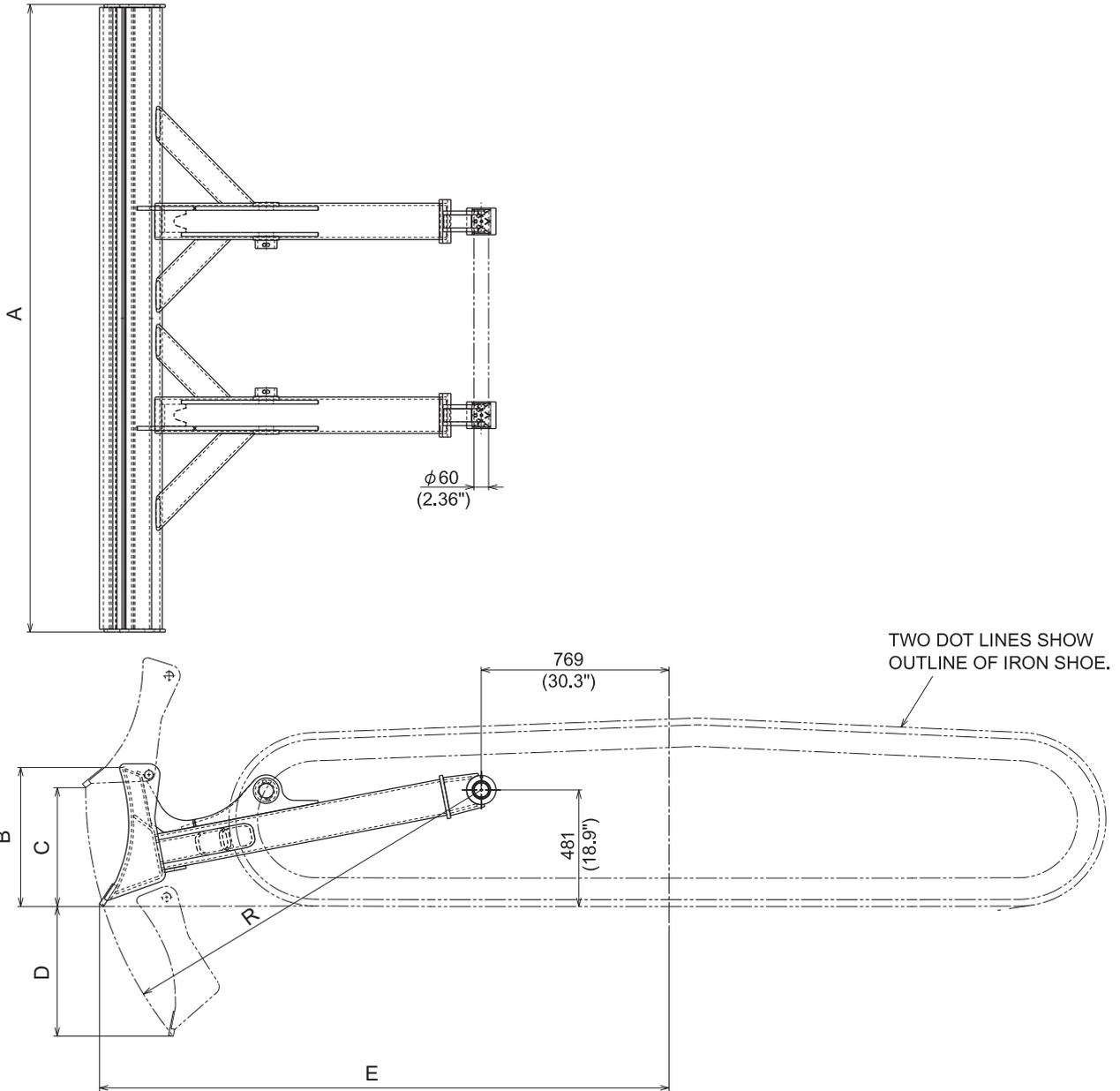
Location of lubrication points.

Lubricate all grease nipples in the figure.

- Blade foot pin (2 places)
- Dozer cylinder rod head (each 2 places)



7.11.5 BLADE DIMENSION



YY51B00092F1

No.	NAME		BLADE OF LC UNDERCARRIAGE
			STD BLADE
A	BLADE WIDTH	mm (ft-in)	2590 (8-6)
B	BLADE HEIGHT	mm (inch)	572 (22.5)
C	BLADE BOTTOM HEIGHT DURING BLADE HIGHEST POSITION	mm (inch)	501 (19.7)
D	BLADE BOTTOM DEPTH DURING BLADE LOWEST POSITION	mm (inch)	588 (23.2)
E	HORIZONTAL DISTANCE FROM SLEWING AXIS TO BLADE END	mm (ft-in)	2433 (7-12)
R	RADIUS OF BLADE EDGE	mm (ft-in)	1716 (5-8)

## 8. SPECIAL PROCEDURES

## 8.1 GENERAL

The SK135SR-3 and SK135SRLC-3 machine incorporates automatically applied spring brake systems in the travel motors and swing motors. These systems will automatically engage the brakes when engine is stopped making it impossible to move the machine.

This section contains the required procedures for releasing the travel motor brakes, the swing motor brake and lowering the attachment to the ground should sudden engine failure be experienced.

---

**WARNING**

Make certain chock blocks are secure at front and rear of each track before attempting to release brakes.

Never stand in the path of the tracks when releasing brakes.

---

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**WARNING**

Read, understand and follow all safety precautions and procedures found in this manual before attempting any operation, inspection, maintenance or repair of this machine, attachment or any of its systems.

---

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**WARNING**

The procedures found in this section should be performed by a well trained experienced service technician who is familiar with the KOBELCO SK135SR-3 and SK135SRLC-3 machines.

---

## 8.2 RELEASING TRAVEL MOTOR BRAKES

### A. Tools and Equipment Required

Attachment on Ground

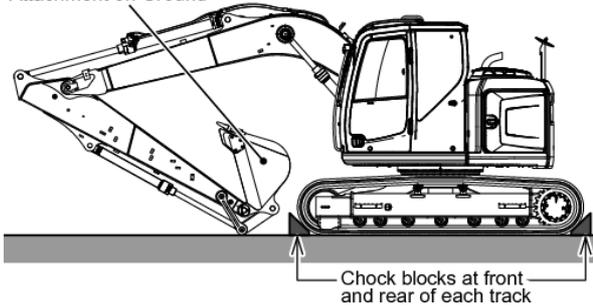


Fig. 8-1

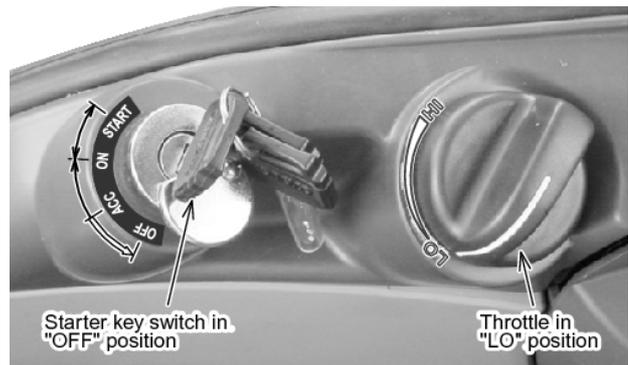


Fig. 8-2

1. Four chock blocks.
2. One 10 mm allen wrench.
3. One 8 mm allen wrench.
4. One 5 liter (1.3 Gal) capacity drain pans.
5. One M10-1.5 x 30 mm lifting eyes.
6. Overhead lifting device capable of lifting and holding 45 kg (100 lb).
7. Torque wrench 70 N·m {52 lbf·ft} capacity or better.
8. Thread sealant (For drain and check/fill plugs).
9. Rubber or soft faced mallet.

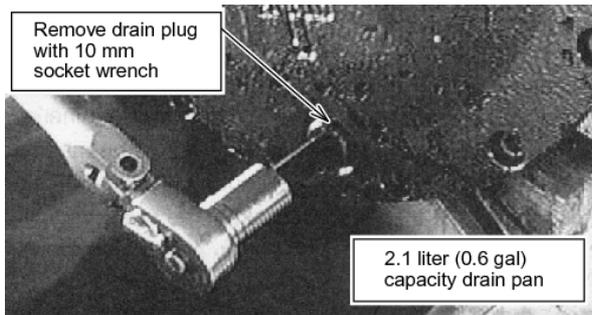
**B. Procedures**

Fig. 8-3

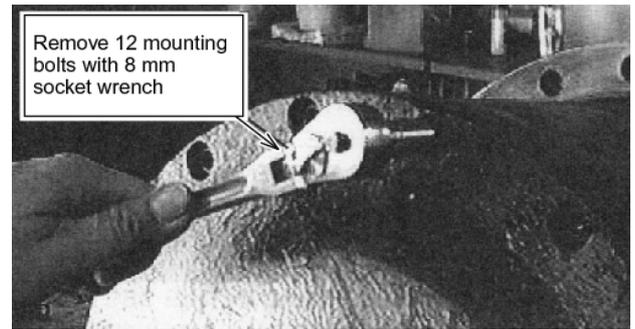


Fig. 8-4

1. Place chock blocks at front and rear of each track to prevent machine from moving when brakes are released. See Fig.8-1.
2. Lower attachment to ground. See "8.4 LOWERING ATTACHMENT WHEN SUDDEN ENGINE FAILURE OCCURS" for proper procedures. See Fig.8-15.
3. Turn key switch "OFF" and remove key. See Fig. 8-2.
4. Remove check/fill plug from each travel motor using the 10 mm socket head wrench. See Fig. 8-3.
5. Place a clean 5 liter (1.3 Gal) capacity drain pan under each travel motor drain plug and remove drain plug using the 10 mm socket head wrench. See Fig. 8-3.
6. After all of the gear oil has drained, cover the drain pans to prevent contamination and move them to an area away from the machine.
7. Remove the fifteen plate mounting bolts from the travel motor reduction unit cover plates. See Fig. 8-4.
8. Remove the covers from both travel reduction units to expose the planetary gears. See Fig. 8-4
9. Remove the thrustplate and sun gear. See Fig. 8-5
10. Carefully remove "Sun gear" from the planetary gear assembly by hand and lay it aside. See Fig. 8-5.
11. Install cover plates onto housings and tighten all bolts securely.

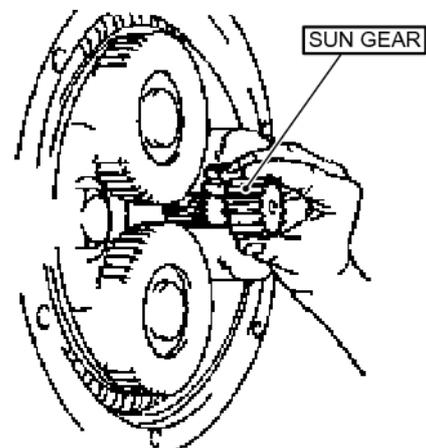


Fig. 8-5

**CAUTION**

- Be careful not to damage lip of cover plate. Any damage to the lip could result in a gear oil leak.
- When removing the following components it will be necessary to have a clean area free of dirt and grit to lay these components.

## [8. SPECIAL PROCEDURES]

12. Install fill and drain plugs into cover plates and re-place gear oil into travel reduction units through fill / check port to proper level.
13. After steps 4 through 12 have been performed on both travel reduction units, the machine may be towed to an area where repairs can be made.
14. After repairs are made reinstall the "Drive Gear" in reverse order. Use the following torque specifications for bolts and plugs.

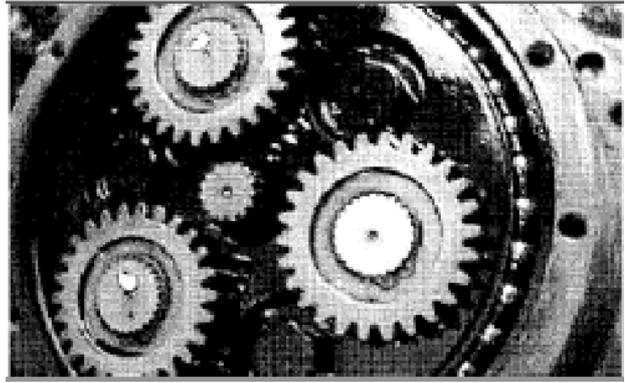


Fig. 8-6

TORQUE SPECIFICATIONS	
COVER BOLTS .....	66.7 N·m {49.2 lbf·ft}
PLUGS .....	58.8 N·m {43.4 lbf·ft}

### 8.3 RELEASING SWING BRAKE

**WARNING**

Make certain that the attachment is on the ground to help prevent sudden rotation of the upper structure before attempting to release the swing brake.

Refer to "8.4 LOWERING ATTACHMENT SUDDEN ENGINE FAILURE OCCURS".

We highly recommends the use of a hydraulic hand pump to release the swing brake manually when the engines fails to start. Refer the Fig. 8-8 to use the proper fitting connector on P port. Remove the hose and install the proper connector on P port. Install the hydraulic hand pump and apply hydraulic pressure as follows:  
**SK135SR-3 ... 29 kgf/cm<sup>2</sup> {413 psi}**

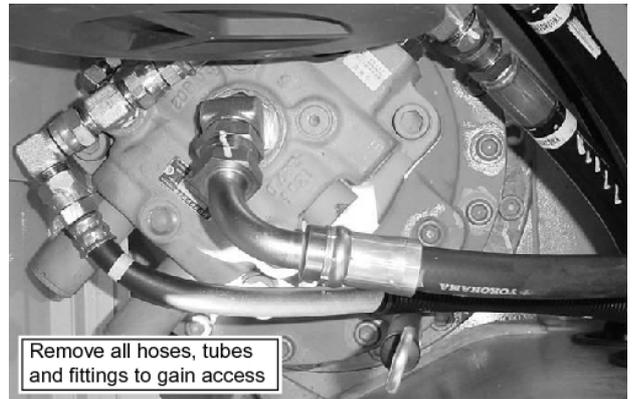
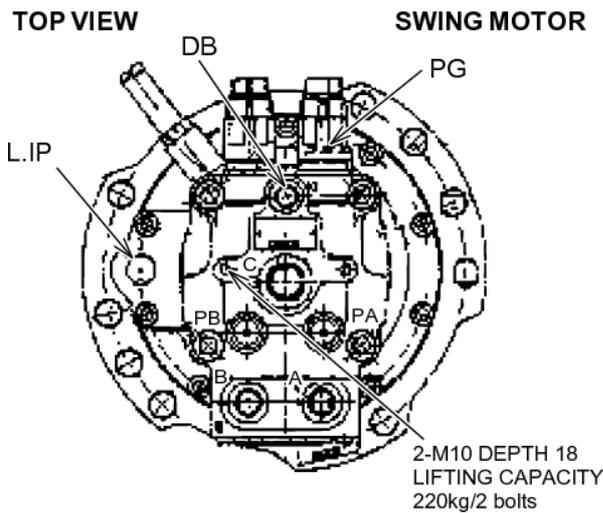
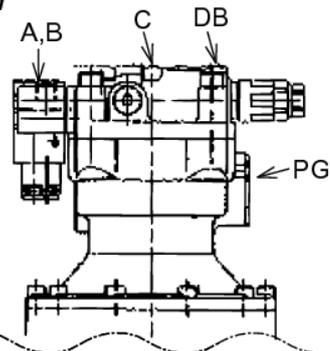


Fig. 8-7



SIDE VIEW



Code	Name	Size	Torque N·m {kgf·m}	Remarks
A,B	Main port	2-PF1/2	108 {80}	
C	Make-up port	PF3/4	167 {123}	
DB	Drain port	PF3/8	74 {55}	
PG	Brake release port	PF1/4	36 {27}	
L	Gear oil level port	PT3/4	98 {72}	
IP	Gear oil filling port	PT3/4		
PA	PRESSURE	PF1/4	36 {27}	
PB	MEASUREMENT PORTS			

Fig. 8-8

**CAUTION**

In highly contaminated environments it is recommended to remove the whole swing motor assembly, if a hydraulic hand pump is not available. Refer to the shop manual for special instructions or contact your distributor for assistance. When the swing motor is removed, make sure to use caps and plugs on hoses, tubes and fittings to protect the hydraulic system from any contamination. Also, a cover must be used to protect the swing reduction unit. If this approach is taken, and the swing reduction unit becomes contaminated, make sure to flush and clean the swing reduction unit. Refer to page 4-11 for proper oil and component capacity.

## [8. SPECIAL PROCEDURES]

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If a hydraulic hand pump is not available, and the contamination can be controlled easily, then proceed to the next page for specific instructions on a different alternative to release the swing parking brake.

---

### CAUTION

Use safety protection such as: hard hat, working gloves, safety shoes and protective glasses when needed to perform this job.

---

#### A. Tools and Equipment Required

1. Handtools required for removal of hydraulic tubes, hoses and fittings.
2. Plugs and caps for tubes, hoses and fittings.
3. 10 mm allen wrench.
4. 5 mm allen wrench.
5. Two M10-1.5 x 18 mm lifting eye.
6. Overhead lifting device capable of lifting and holding 45 kg (100 lb).
7. Plenty of clean, dry shop rags and/or paper towels.
8. 14 mm allen wrench.
9. 441 N·m {325 lbf·ft} torque wrench.

#### B. Procedures

1. Lower attachment to ground. Refer to previous page for proper procedures in lowering the attachment.
2. Remove all hoses and tubes from the swing motor top plate and swing valve to gain access to the top plate mounting bolts. See Fig. 8-7.
3. Install the proper plugs and caps onto hoses, tubes and fittings to avoid the possibility of contamination entering the hydraulic system. See Fig. 8-9.

Install proper caps and plugs on hoses, tubes and fittings to help prevent contamination entering the system



Fig. 8-9

### CAUTION

Use only plugs and caps designed to properly seal the specific hose, tube or fitting they are to be installed on.

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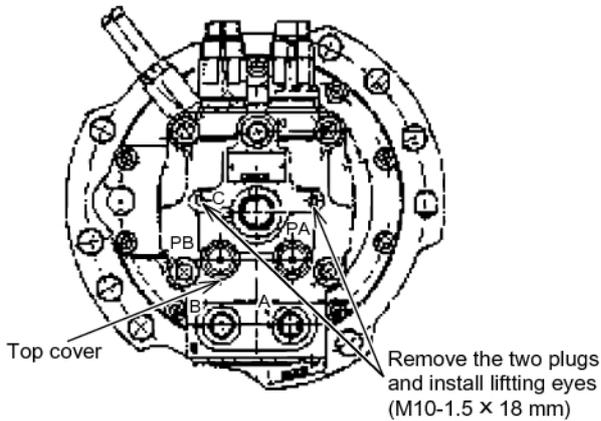


Fig. 8-10

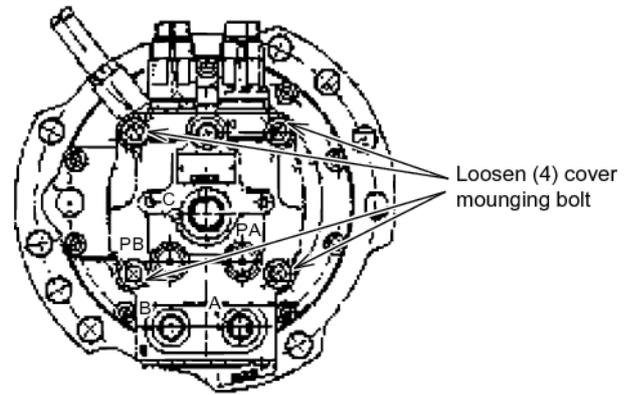


Fig. 8-11

4. Remove two plugs, as indicated in Fig. 8-10, and install 2 x M10-1.5 x 18 mm eye bolts.
5. Loosen the four top plate mounting bolts with the 14 mm allen wrench. See Fig. 8-11.
6. Remove two top plate mounting bolts from corners opposite of each other.

**Note**

Place a large quantity of clean, dry shop rags around the swing motor to help catch any overflow of hydraulic oil from the removal of the top plate.

7. Attach overhead lifting device to the lifting eyes and remove most of the slack from the cable or chain.
8. Carefully remove the remaining two bolts from the top mounting plate.
9. Using the overhead lifting device, carefully lift the swing motor top cover with swing shockless valve assembly and away from the swing motor.

**Note**

The top plate will raise from spring pressure as the last two bolts are removed. Some movement of the upper frame may be experienced as the spring tension is released.

**CAUTION**

Do not allow any dirt or debris to enter the swing motor or settle on the top plate.

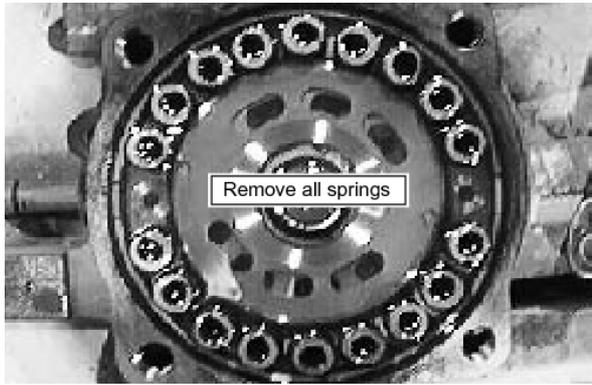


Fig. 8-12

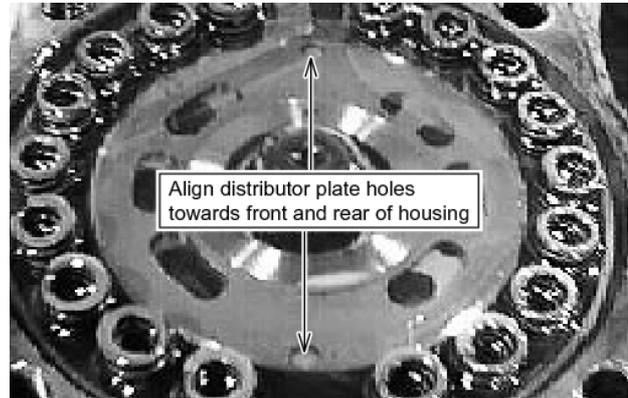


Fig. 8-13

10. Carefully remove all brake springs and place in a container filled with fresh, clean hydraulic oil. Then, seal the container to prevent contamination. See Fig. 8-12.
11. Align the holes of the distributor plate in the swing motor until they are located toward the front and back of the swing motor housing. See Fig. 8-13.
12. Carefully place the top plate over the swing motor and align the dowel pins of the top plate with the holes in the distributor plate. See Fig. 8-14.
13. Carefully and slowly lower the top plate into position on the swing motor and install, by hand, the four top plate mounting bolts.
14. After the machine upper structure is positioned for towing, remove cover again and reinstall the swing brake springs. Repeat steps 11~13 to lock the upper frame into position for proper transportation.

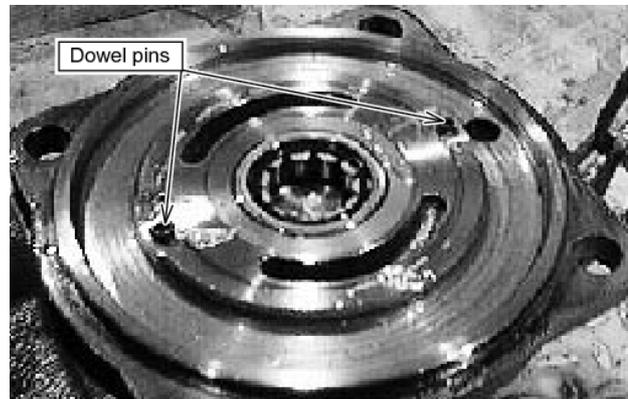


Fig. 8-14

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**CAUTION**

Make certain the top plate dowel pins and the distributor plate holes mesh together.

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**CAUTION**

Avoid oil spills. Use containers, rags, and / or paper towels to contain any oil leakage. Dispose all waste oils, fluids lubricants and other hazardous waste properly, according to government regulations.

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## 8.4 LOWERING ATTACHMENT WHEN SUDDEN ENGINE FAILURE OCCURS

### A. How to Lower Attachment - Fig. 8-15

The port relief valve is used to return the oil remaining in the cylinder to the hydraulic tank to protect the piping when the pressure inside of piping rises higher than the set pressure owing to the external load exerted on the cylinder, and also may be used as a measure to lower attachment when the engine stops owing to trouble, etc.

After loosening lock nut of port relief valve as adjuster screw is loosened the set pressure gradually falls. When the set pressure decreases lower than the hold pressure of cylinder currently holding attachment, the above hold pressure opens the poppet, the plunger moves rightward and the continuity from P to R is made.

**Note**

Before loosening adjuster screw, mark those positions, and after bringing down attachment to the ground, tight-en adjuster screw to the marked positions.

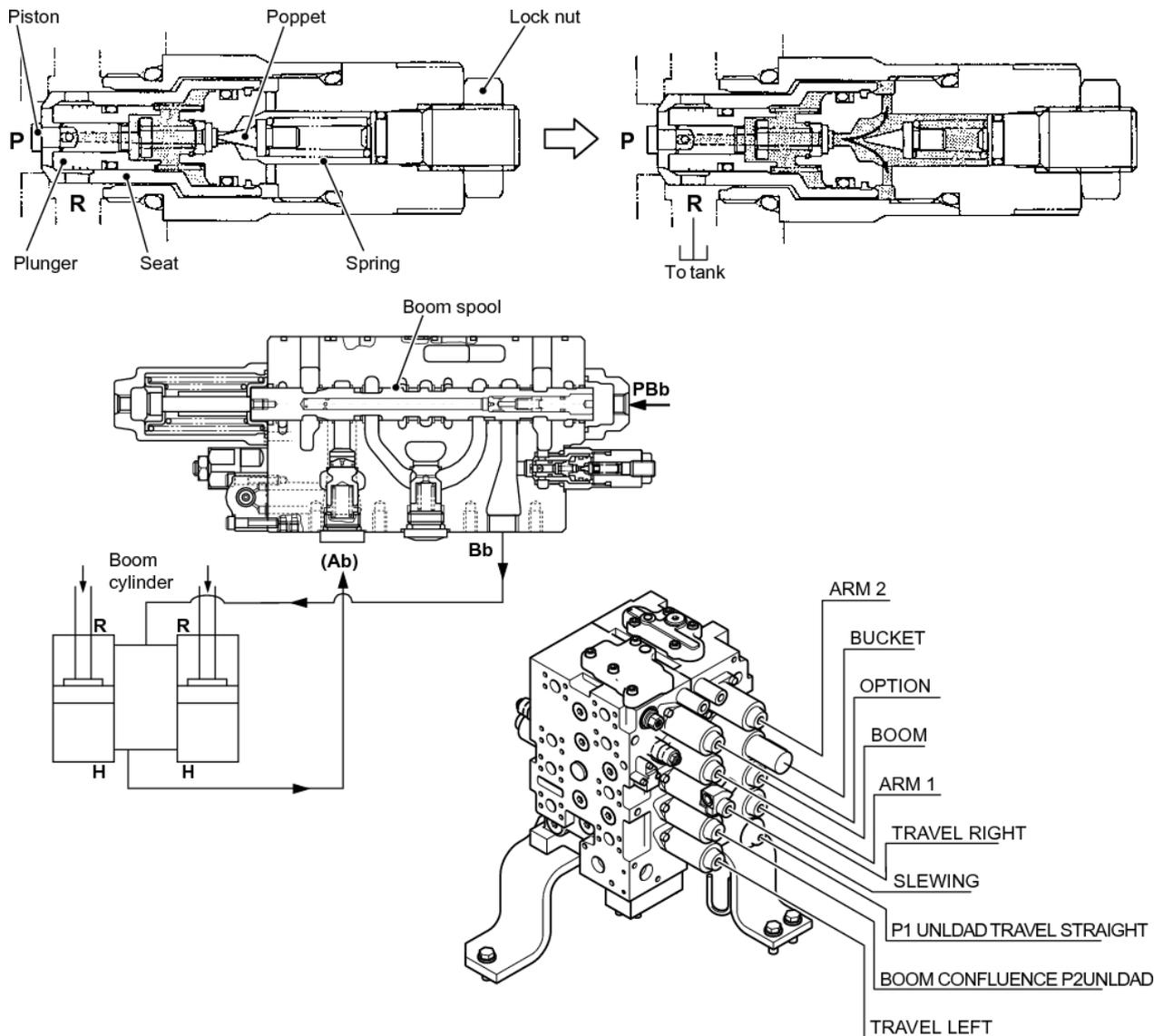


Fig. 8-15

## [8. SPECIAL PROCEDURES]

### B. How to Lower Attachment - Fig. 8-19

When engine stops because of troubles, the relief valve incorporated in the holding valve mounted on the boom cylinder head side is available to lower attachment.

As shown in the figure, after loosening lock nut of stop valve as setscrew is loosened, the poppet is opened and then the oil remaining in the boom cylinder head side returns to the tank through T port enabling attachment to be lowered.

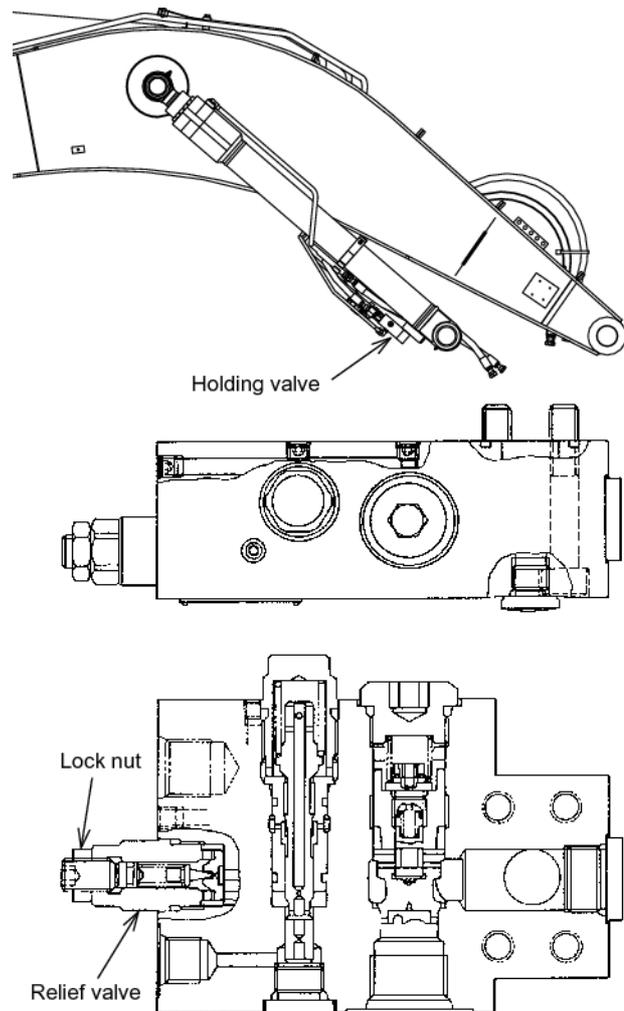


Fig. 8-16

#### Note

Before loosening adjuster screw, mark those positions, and after bringing down attachment to the ground, tight-en adjuster screw to the marked positions.

#### CAUTION

Be careful when lowering attachment. Do not stand un-der boom.

## 8.5 HYDRAULIC TANK PRESSURE

How to release air pressure remaining in the hydraulic tank.

After engine stops, the air pressure remaining in the hydraulic tank.

Can be released by pushing valve on the air breather rubber cap several times (5 to 7 times). Air breather mounted on the upper part of hydraulic tank.

