OPERATION MANUAL

SK35SR-6

APPLICABLE No.

SK35SR-6 PX16-30001~

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

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FOREWORD

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FOREWORD

FOREWORD

WARNING **AVOID A CHANCE OF SEVERE INJURY**

Read, understand and follow all safety precautions and procedures found in this manual before attempting any operation, inspection or maintenance of this machine, attachment or systems. KOBELCO cannot anticipate every possible circumstance that might involve a potential danger. The warnings in this publication and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by 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.

GENERAL

- This manual contains procedures to aid the operator gain peak performance through effective, economical operation and maintenance of the machine.
- Do not use this machine before you have read and understand safety, operation and maintenance procedures described in this manual. Failure to follow them may lead to severe injury to persons and/or facility failure.
- Operators and persons working with this machine should continually study this manual until proper safety, operation and maintenance procedures are completely understood.
- This manual describes the basic operating techniques. Skill is gained as the operator utilizes these techniques and completes them with an actual machine.
- Some figures may be different from the actual machine. Along with KOBELCO technical improvements, manuals are periodically updated to reflect these changes.
- This manual may not contain attachments and optional equipment that are available in your area. Please contact KOBELCO authorized dealer/distributor for any optional attachments/equipment required.
- The contents of this manual and operation of the machine are based on the use of KOBELCO genuine manufacturer sourced parts. Replacement with non-genuine parts or modified parts is not recommended.
- Materials and specifications are subject to change without notice.

PERIODIC INSPECTION

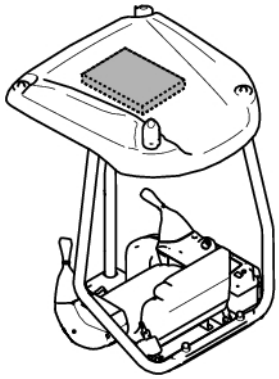
- After delivery of the machine, KOBELCO authorized dealer/distributor will make periodic inspections. These inspections will be free of charge to the owner of the machine and will be performed at time intervals set by KOBELCO. Contact KOBELCO authorized dealer/distributor for any service related questions not explained in this manual.

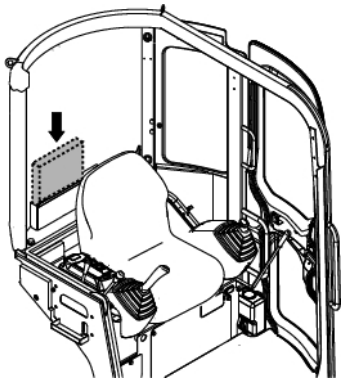
NOTICE

- Owing to the policy of continual improvement, changes may be made by KOBELCO to any of its products without any obligation on the part manufacturer.

STORAGE PLACE OF OPERATION & MAINTENANCE MANUAL

Keep this manual in the box installed on top of the canopy.
In case of the cab specification, keep in the box on the back of the operator's seat.





WARNING **READ THIS MANUAL BEFORE OPERATING THE MACHINE**

Most accidents in operation are due to non-observance of elementary safety rules and precautions. Many accidents can be avoided if the causes are known and proper cautions are taken beforehand. No matter how devices and protections are advanced, many cases prove that they cannot be as effective as a careful and attentive behavior at avoiding accidents.

HANDLING OF THIS MACHINE

SPECIFIED WORKS

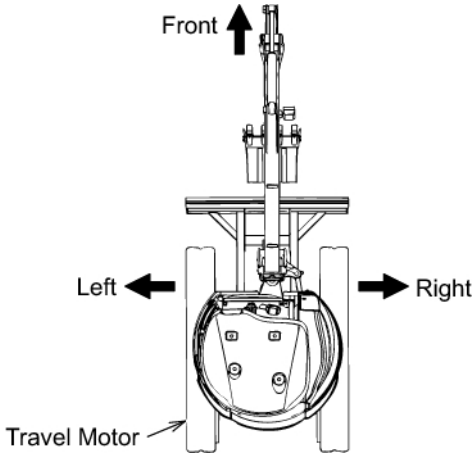
This machine is mainly intended for the following uses:

- Digging work
- Trenching work
- Loading work
- Ground leveling work
- Demolition work

For more information about work procedures, see chapters "MACHINE OPERATION" and "OPTIONAL EQUIPMENT".

FRONT/REAR AND RIGHT/LEFT OF THE MACHINE

In this manual, front/rear and right/left are determined by looking forward from the operator's seat with the travel motors at the rear side.



BREAK-IN

This machine is shipped after enough adjustment and inspection. However, early high-load operations may speed up decline of functions and shorten the service life of the machine.
Break in the machine in three stages listed to the right until every part gets broken in.

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

During break-in, especially note the followings:

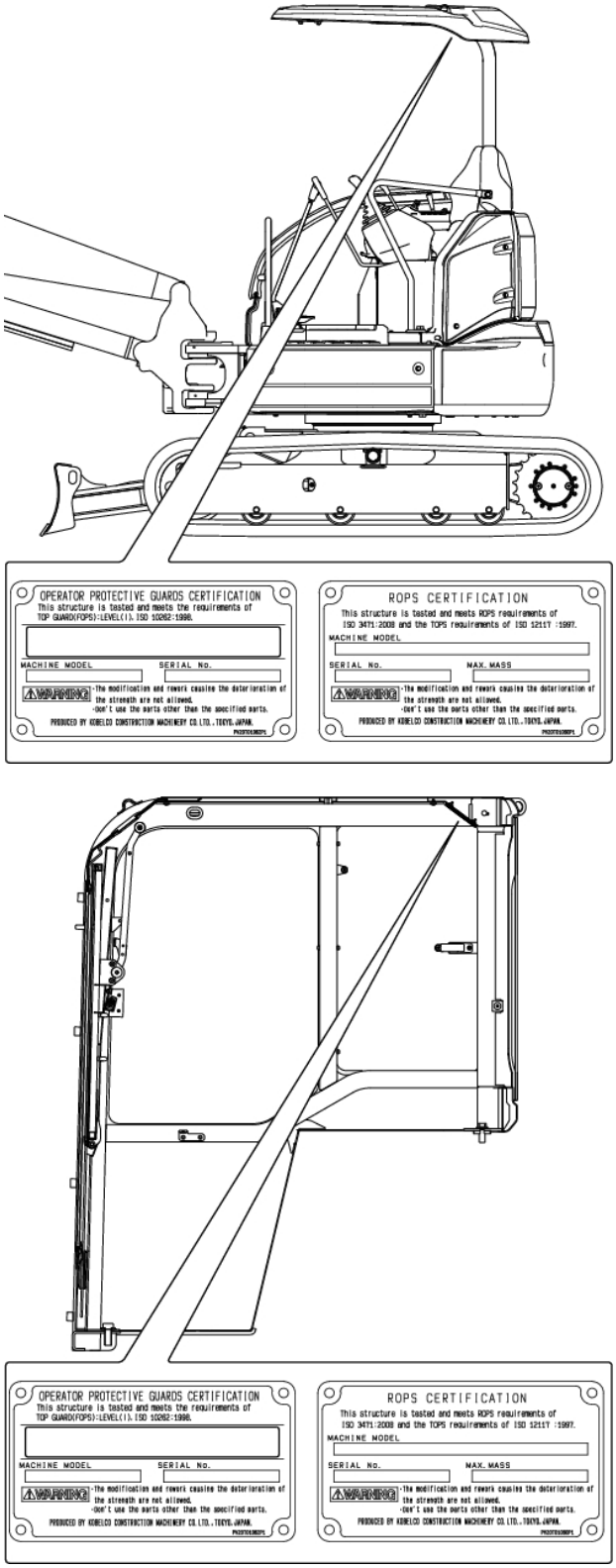
- Avoid works with heavy load or at high speed.
- Avoid dash start and dash acceleration, and unnecessary urgent stop and rapid turn.

IMPORTANT

Use extreme caution to put a full load on the machine before its parts and components get broken in because it may cause seizure or flaws and significantly affect the service life of the machine.

ROPS (ROLL-OVER PROTECTIVE STRUCTURE)/FOPS (FALLING OBJECTS PROTECTIVE STRUCTURE)

The machine is equipped with a ROPS (Roll-Over Protective Structure) and FOPS (Falling Objects Protective Structure) for the cab.
The mounting and fixing hardware used to mount the cab on the machine body are important parts of ROPS and FOPS.
After a fire, corrosion or collision, any possible damage to the cab protective structure must be carefully inspected by specialized personnel, and all damaged parts must be restored using genuine parts.
For structural changes or part replacements of the cab, contact KOBELCO authorized dealer/distributor.



WARNING

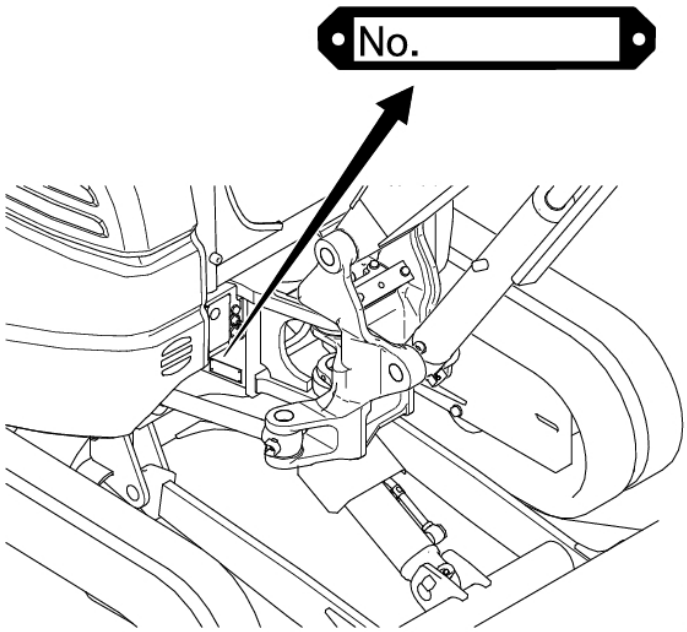
Do not modify the cab body with welding or drilling.
If the function of the protective structure is affected by modification, it may cause severe injury.

ORDERING PARTS OR SERVICES

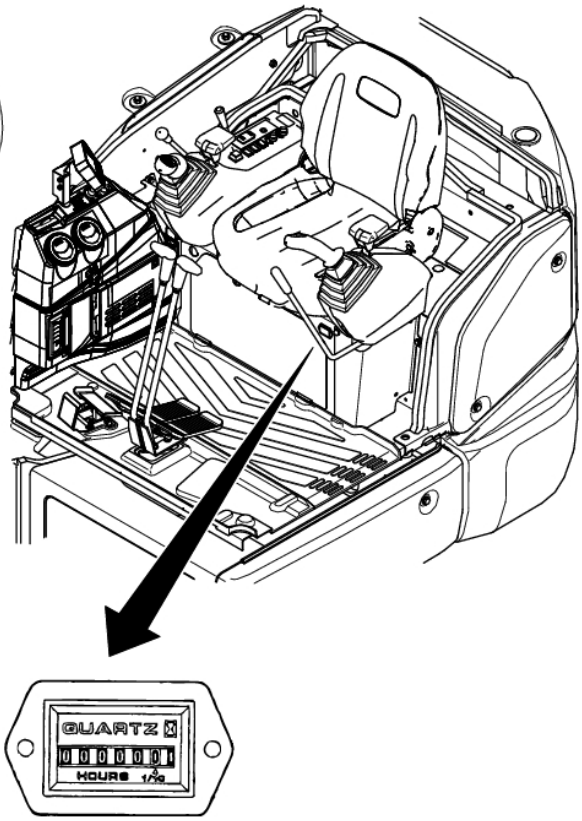
In case of ordering parts or services, inform us the machine serial number, engine serial number and hour meter read. See below for the locations on which the machine serial number and engine serial number are stamped. Write them down in the following blanks.

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

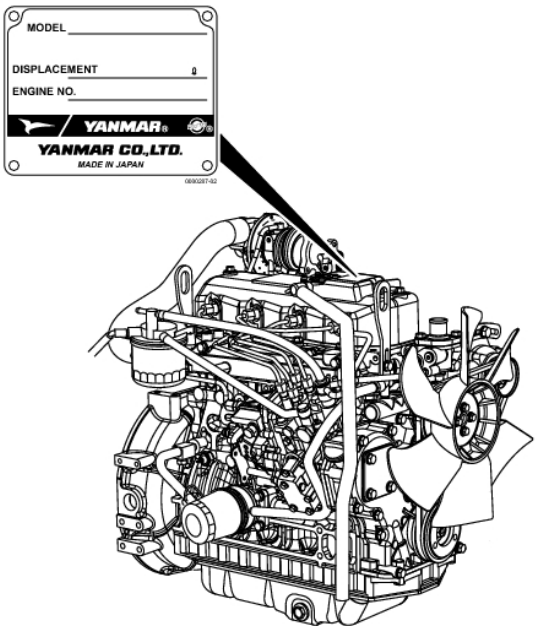
- MACHINE No.



- HOUR METER



- ENGINE SERIAL No.



1. SAFETY PRECAUTIONS

1.1 GENERAL SAFETY INFORMATION

WARNING AVOID INJULY OR DEATH

Do not operate or perform any maintenance on this machine until all instructions found in this manual have been thoroughly read and understood. Improper operation or maintenance of this machine may cause accidents and could result in severe injury or death. Always keep this manual being stored in the place provided on the machine.
If it is missing or damaged, place an order with KOBELCO authorized dealer/distributor for a replacement. If you have any questions, please consult KOBELCO authorized dealer/distributor.

1. Most accidents in operation are due to non-observance of safety rules and precautions. Sufficient care should be taken to avoid these accidents. Erroneous operation, lubrication method, maintenance and inspection are very dangerous and may cause injury or death. Therefore all precautionary measures, NOTES, DANGERS, WARNINGS and CAUTIONS contained in this manual and on the machine should be read and understood by all personnel before starting any work with or on the machine.
2. Operation, maintenance and inspection should be carefully carried out, and safety must be given the first priority. Safety messages are indicated using the following warning symbols and signal words. The safety information contained in this manual is intended only to supplement safety codes, insurance requirements, local laws, rules and regulations.
3. It is very difficult to forecast every danger that may occur during operation. However, safety can be ensured by fully understanding proper operating procedures for this machine according to methods recommended in this manual.
4. While operating the machine, be sure to perform work with great care to avoid damage to the machine, and accidents from occurring.
5. Continue studying this manual until all safety, operation, and maintenance and inspection procedures are completely understood by all personnel working with the machine.
6. Icons used in this manual;
   x (icon): This icon indicates an unacceptable practice or unsafe condition.
   o (icon): This icon indicates an acceptable practice or safe condition.
7. All messages of safety used in this manual and the machine are identified by the words "DANGER", "WARNING", "CAUTION" and "IMPORTANT".

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

DANGER

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

WARNING
AVOID INJURY OR DEATH

c. Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to warn against possible damage to the machine and its components.

CAUTION

d. Special instructions or procedures which, if not correctly followed, may result in severe machine damage.

IMPORTANT

1.2 SAFETY PRECAUTIONS

WARNING **AVOID INJULY OR DEATH**

•Do not operate this machine unless you read and understand the instructions in this manual. Improper machine operation is dangerous and may cause injury or death.
•The proper and safe lubrication and maintenance for this machine, recommended by manufacturer, is outlined in this manual for this machine.
Improper performance of lubrication or maintenance procedures is dangerous and may result in injury or death. Read and understand this manual before performing any lubrication or maintenance.

The service person or mechanic may be unfamiliar with many of the systems on this machine. This makes it important to read "CAUTIONS" carefully when performing service work. Knowledge of the systems and components is important before removal or disassembly of any component.
Because of the size of some of the machine components, the service person or mechanic should check the weight noted in this manual. Follow proper lifting procedures when removing any components.
The following is a list of basic precautions that must always be observed.

1. Read and understand all warning plates and labels on the machine before operating, maintaining or repairing this machine.
2. Always wear protective glasses and protective shoes when working around machines.
   In particular, wear protective glasses when using hammers, punches or drifts on any part of the machine or attachments. Use welders' gloves, hood/protective glasses, apron and the protective clothing appropriate to the welding job being performed. Do not wear loose fitting or torn clothing. Remove all rings from fingers, loose jewelry, confine long hair and change loose clothing before working on this machine.
3. Disconnect the battery and hang a "Do Not Operate" tag in the operator's station. Remove the key from the starter switch.
4. If possible, make all repairs after parking the machine on the level and firm ground. Block the machine so it does not roll while working on or under the machine. Hang a "Do Not Operate" tag in the operator's station.
5. Do not work on any machine that is being lifted, or supported by jacks or a hoist. Always use blocks or jack stands, capable of supporting the machine, before performing any disassembly.
6. Relieve all pressure in air, oil and water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly. Be on alert for possible pressure when disconnecting any device from a system that utilizes pressure.
7. Lower the bucket, dozer (if equipped) or other attachments to the ground before performing any work on the machine. If this cannot be done, make sure the bucket, dozer (if equipped) or other attachment is blocked correctly to prevent it from dropping unexpectedly.
8. Use steps and grab handles when mounting or dismounting the machine. Clean any mud, grease, oil or debris from steps, walkways or scaffoldings before using. Always face the machine when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders or scaffoldings to perform safe repair operations.
9. Avoid back injury. Use a hoist when lifting components which weigh 20 kg (50 lb.) or more. Make sure all chains, hooks, slings, etc., are in good condition and are the correct capacity. Be sure hooks are positioned correctly. Do not apply a side load to the lifting eyes during a lifting operation.
10. To avoid being burned, be alert for hot parts and surfaces immediately after stopping the

machine such as hot fluids in lines and tubes and compartment covers.

11. Be careful when removing cover plates. Gradually back off the last two bolts or nuts located at opposite ends of the cover or device and carefully pry cover loose to relieve any spring or other pressure, before removing the last two bolts or nuts completely.
12. Be careful when removing filter caps, breathers and plugs on the machine. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquids under pressure. The danger is even greater if the machine has just been stopped because fluids can be hot.
13. Always use the proper tools that are in good condition and that are suited for the job at hand. Be sure you fully understand how to use them before performing any service work.
14. Reinstall all fasteners with the same part number. Do not use a lesser quality fastener even if replacements are necessary.
15. Repairs which require welding should be performed only with the benefit of the appropriate reference information and by personnel adequately trained and knowledgeable in welding procedures. Determine type of metal being welded and select correct welding procedure and electrodes, rods or wire to provide a weld metal strength at least equivalent to that of the parent metal. Disconnect battery before any welding procedures are attempted.
16. Do not damage the wiring during repair/removal operations. Reinstall the wiring with caution not to damage it and in the place where it may not be damaged by rubbing with sharp corners, or some objects or hot surface. Do not connect the wiring to a line containing fluid.
17. Make sure all protective devices including guards and shields are properly installed and functioning correctly before starting repair. If the guard or shield must be removed to perform the repair work, use extra caution to remove it and reinstall it after repair is completed.
18. Performing maintenance or repair work on the machine with the bucket/attachment raised is hazardous. The bucket/attachment could fall and injure or kill a person. Be sure to lower the bucket or attachment to the ground before starting work on the machine.
19. Long or damaged fuel, lubricant and hydraulic oil lines, tubes and hoses can cause a fire. Do not bend or strike high pressure lines. Do not insteach part which are bent or struck with something. Inspect lines, tubes and hoses carefully. Do not check for leaks with your hands. Very small (pinhole) leaks may become a high speed oil stream but it may be invisible until seeing the hose up close. This oil can penetrate the skin and cause personal injury. Use a small piece of card-board, wood or metal to locate pinhole leaks.
20. Tighten connections to the correct torque. Make sure that all heat shields, clamps and guards are installed correctly to avoid excessive heat, vibration or rubbing against other parts during operation. Be sure to install the shields correctly because those prevent the oil from splashing onto hot exhaust components when lines, tubes or seals are failed.
21. Do not operate the machine if any rotating part is damaged or interferes any other part during operation. Any high speed rotating component damaged or changed should be checked for balance before the next operation.
22. Be careful when servicing or disassembling the crawlers. Chips can fly when removing or installing a track (crawlers) pin. Wear protective glasses and long sleeve protective clothing. Crawlers can unroll very quickly when disassembled. Keep away from the front and rear of the machine. The machine can move unexpectedly when both crawlers are disengaged from the sprockets. Chock the machine to prevent it from moving.
    Rubber crawler replacement work must be done carefully by two persons. 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 severe injury or death. Do not operate the boom, arm or bucket/attachment while removing or installing the crawler belt. Follow the instructions provided.
    Grease in track tensioning mechanism is under high pressure and can penetrate skin, causing severe injury. Keep a face, hands and legs away from the grease nipple. Loosen the grease nipple within one turn. If grease does not come out after one turn of the fitting, call KOBELCO

authorized dealer/distributor for assistance.
Before removing the crawler belt, confirm that the pressure inside the track tensioning cylinder has been completely released.
Then turn the sprocket.
If the release of the pressure in the track tensioning cylinder is not carried out, grease can penetrate skin, causing severe injury. If the tension of crawler belt does not reduced, call KOBELCO authorized dealer/distributor for repair service.

23. Use caution to avoid breathing dust that may be generated when handling components containing asbestos fibers. If this dust is inhaled, it can be hazardous to your health. Components of manufacturers' products that may contain asbestos fibers are brake pads, brake band, brake lining assemblies, clutch plates and some gaskets. The asbestos used in these components is usually sealed in resin or by other ways. Normal handling is not hazardous as long as the dust containing asbestos is not generated in the air.

If the dust containing asbestos is generated, there are several general guidelines that should be followed.

a. Never use compressed air for cleaning.
b. Avoid brushing or grinding of asbestos containing materials.
c. When cleaning the machine, use wet methods or a vacuum equipped with a high efficiency particulate air (HEPA) filter.
d. Use an ventilating fan when performing a long time machining work.
e. Wear the specified respirator if the dust is uncontrollable.
f. Comply with the rules and regulations applied on the working site.
g. Comply with the environmental rules and regulations on the disposal of asbestos.
h. Avoid areas where asbestos particles may be in the air.

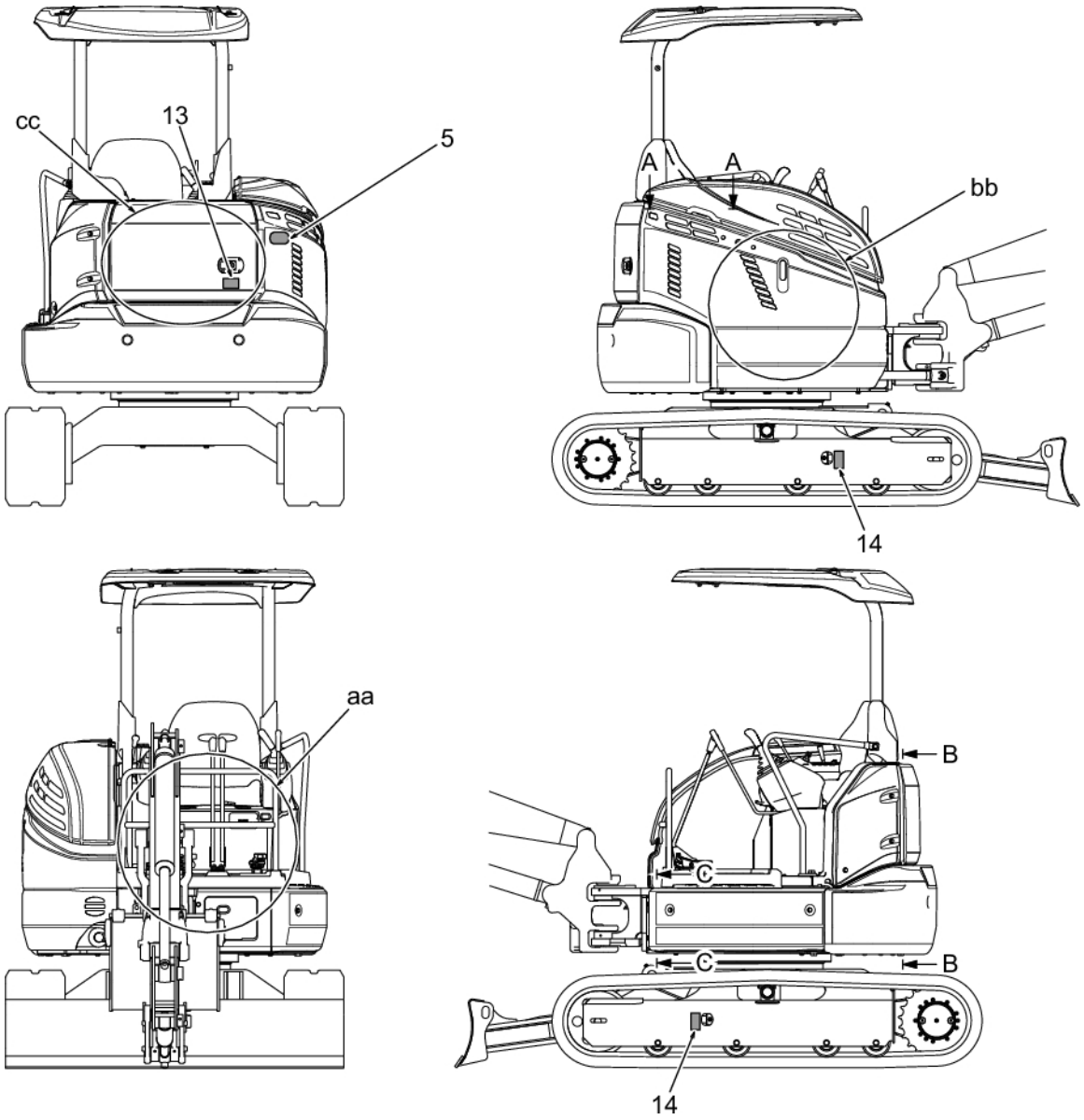
1.3 WARNING LABEL

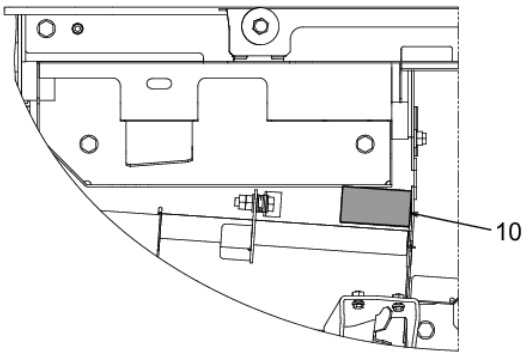
Labels for preventing danger are affixed to the certain areas of the machine where particularly require the operator and personnel to pay attention for safety. Be familiar with the locations of warning labels and the contents of preventing danger by taking enough time.

1.3.1 WARNING LABELS MAINTENANCE

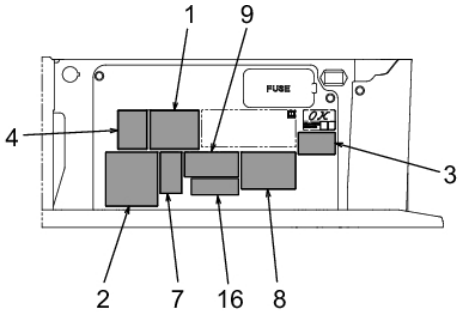
- Do not remove the affixed warning labels to this machine.
- Confirm that all of these labels can be easily read.
- If words or illustrations are illegible, clean off the dirt. Use a cloth, water and detergent to clean the warning labels. Never use organic solvents or gasoline.
- If warning labels are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

1.3.2 LOCATION OF WARNING LABELS

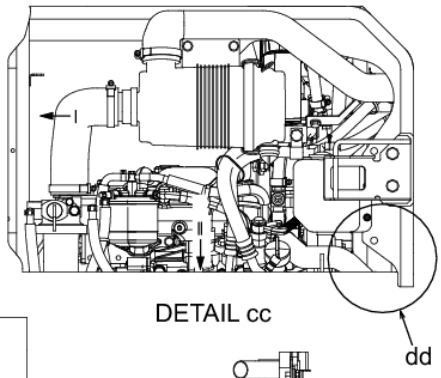




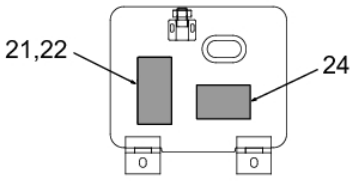
SECTION AA



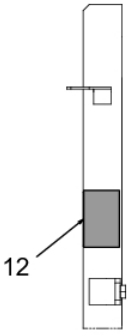
DETAIL aa



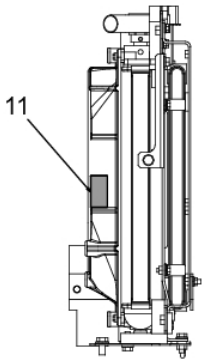
DETAIL cc



SECTION CC

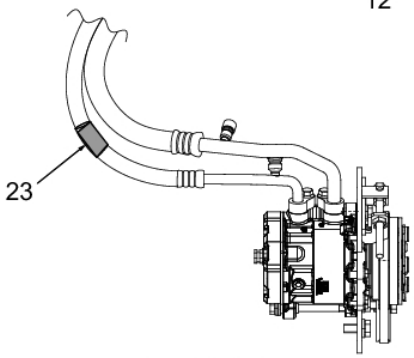


VIEW I

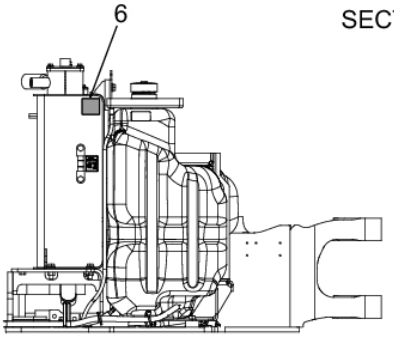


DETAIL dd

11



SECTION BB



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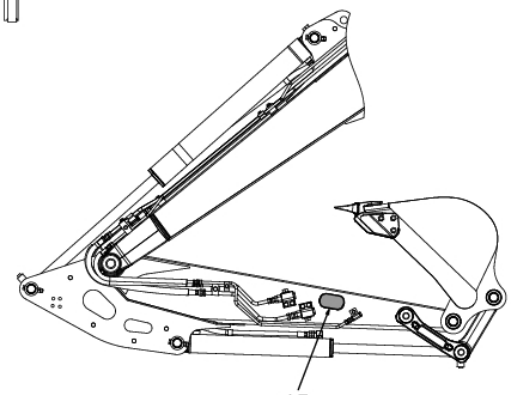
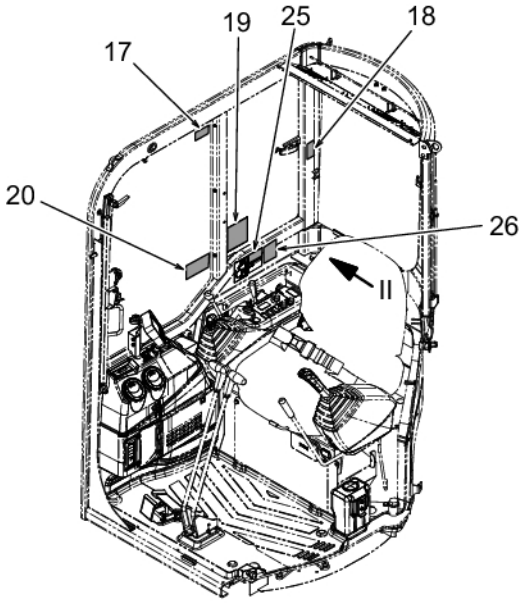
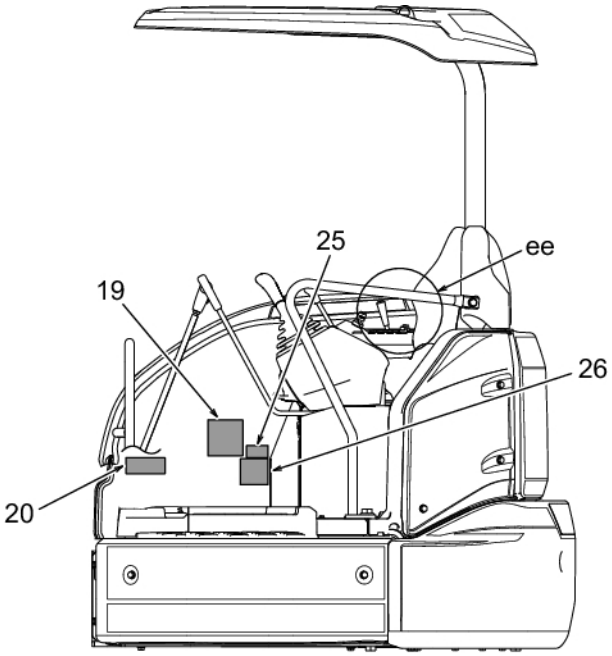
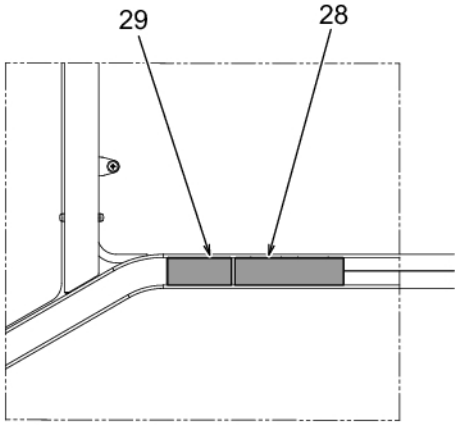




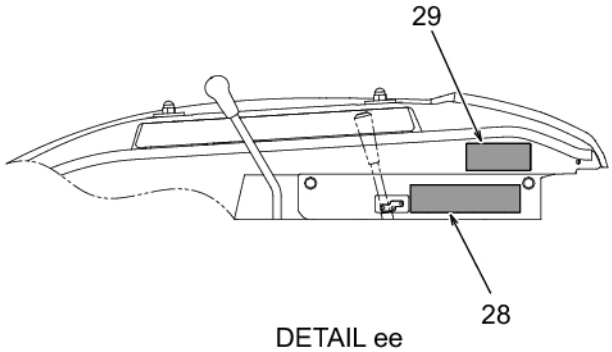
FOR CAB



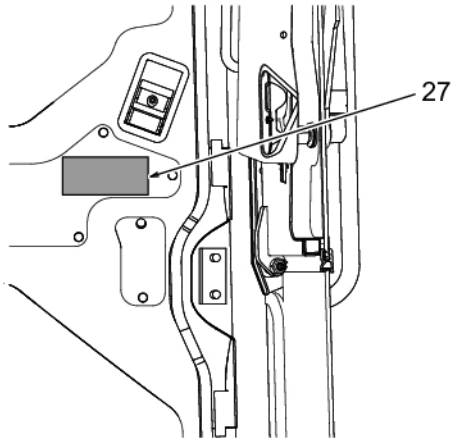
FOR CANOPY



VIEW II



DETAIL ee

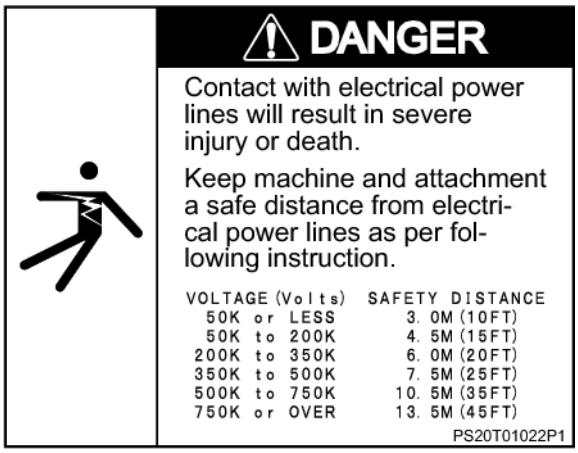


FOR CAB

1. ELECTRIC SHOCK

Location: Seat stand cover

Part number: PS20T01022P1



2. READ THIS MANUAL CAREFULLY

Location: Seat stand cover

Part number: YN20T01016P1

3. HANDLING OF PILOT CONTROL SHUT-OFF LEVER

Location: Seat stand cover

Part number: PY20T01073P1

4. INTERFERENCE BY THE ATTACHMENT

Location: Seat stand cover

Part number: PS20T01023P1

5. KEEP CLEAR OF THE SWING AREA

Location: Counterweight

Part number: PS20T01041P1

When the machine swings, a person's body may be caught by the upper structure. Keep clear of the swing area.

6. DISASSEMBLING THE HYDRAULIC OIL TANK

Location: Side of hydraulic oil tank

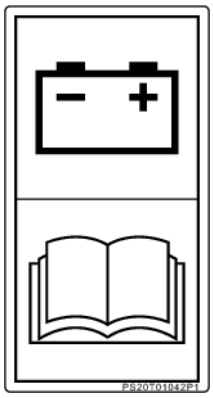
Part number: YT20T01414P1

7. HANDLING THE BATTERY

Location: Seat stand cover

Part number: PS20T01042P1

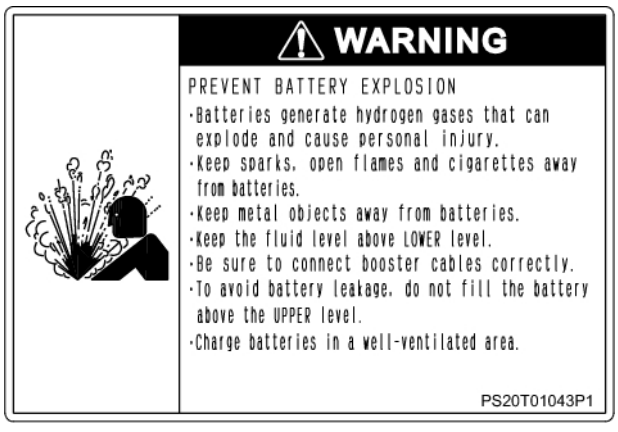
Read this manual to handle the battery properly.



8. HANDLING THE BATTERY

Location: Seat stand cover

Part number: PS20T01043P1



9. HANDLING THE CABLE

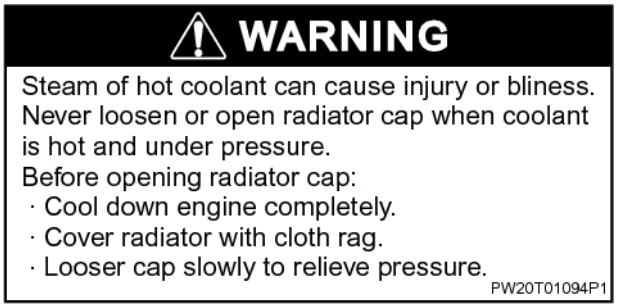
Location: Seat stand cover

Part number: PS20T01044P1

10. HOT COOLANT

Location: Radiator upper surface

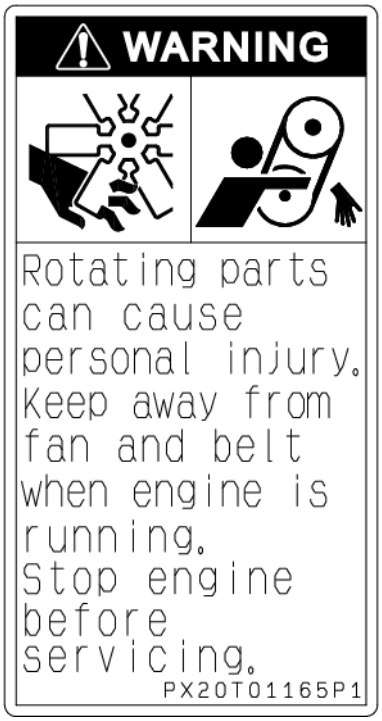
Part number: PW20T01094P1



11. STOP ENGINE BEFORE SERVICING

Location: Side of radiator

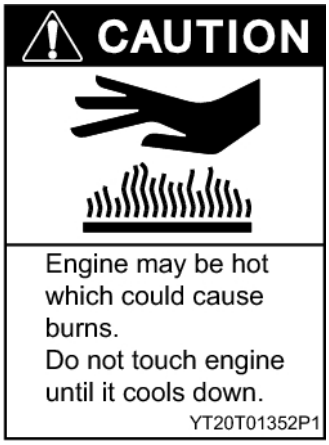
Part number: PX20T01165P1



12. HOT PARTS

Location: Guard

Part number: YT20T01352P1



13. CAUGHT IN PARTS

Location: Engine hood

Part number: YN20T01012P1

14. ADJUSTING THE TRACK TENSION

Location: Left and right crawler frames

Part number: PS20T01050P1

A plug popped up from the crawler adjuster may cause personal injury.

Read this manual to handle the crawler properly when loosening it.

15. ATTACHMENT WORKING

Location: Left and right sides of arm

Part number: PE20T01012P1

Getting hit by the operating machine may cause personal injury.

Do not get close to the machine.

16. SEAT BELT

Location: Seat stand cover

Part number: PS20T01049P1

17. FRONT WINDOW LOCK AT THE HOUSED POSITION

Location: Right side inside cab

Part number: YN20T01416P1

18. WATCH YOUR HAND(S) AND LEG(S)

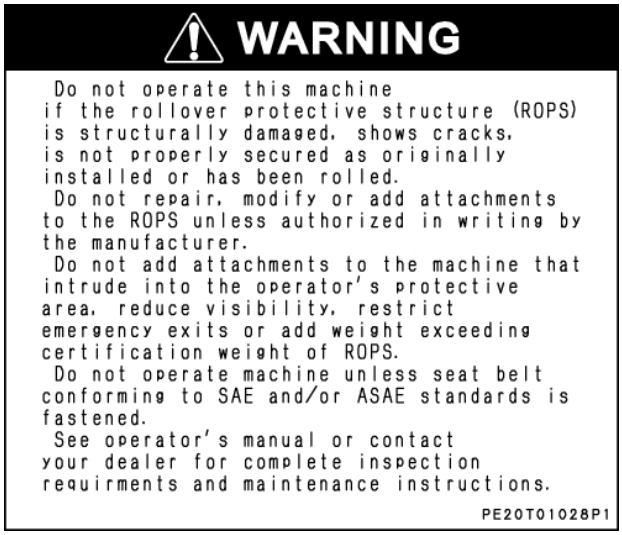
Location: Right side inside cab

Part number: PS20T01031P1

19. ROPS WARNING

Location: Seat stand cover (canopy), right side inside cab (cab)

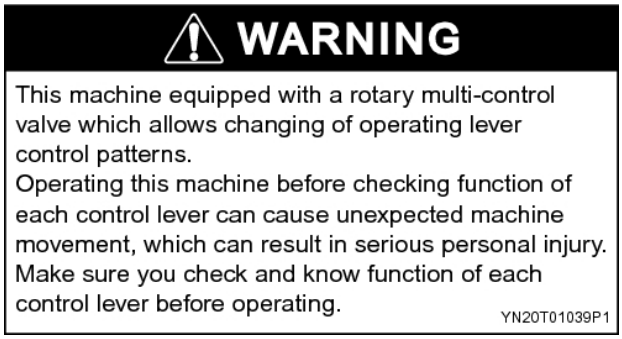
Part number: PE20T01028P1



20. HANDLING ROTARY MULTI-CONTROL VALVE

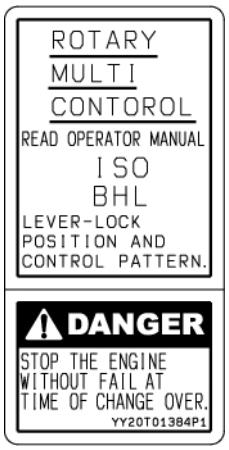
Location: Seat stand cover (canopy), right side of cab (cab)?

Part number: YN20T01039P1



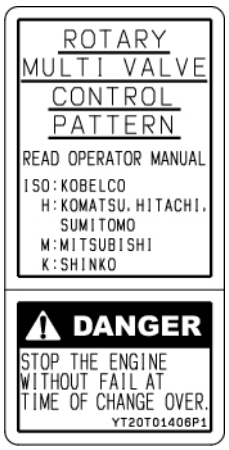
21. HANDLING ROTARY MULTI-CONTROL VALVE

Location: Cover (canopy), right side of cab (cab)
Part number: YY20T01384P1



22. HANDLING ROTARY MULTI-CONTROL VALVE (OPTION)

Location: Cover (canopy), right side of cab (cab)
Part number: YT20T01406P1

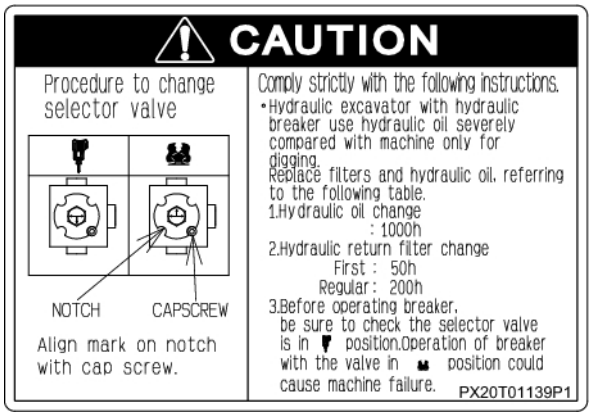


23. AVOID BEING BURNED (OPTION)

Location: Cooler hose
Part number: PS20T01192P1

24. NIBBLER (CRUSHER) AND BREAKER OPERATION

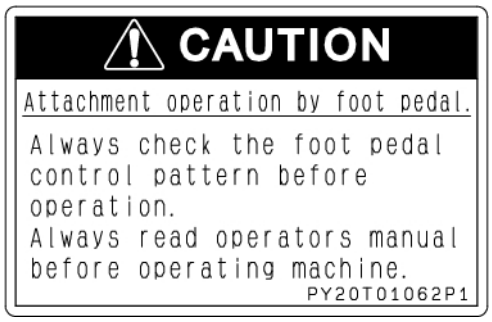
Location: Cover
Part number: PX20T01139P1



25. NIBBLER (CRUSHER) AND BREAKER OPERATION

Location: Seat stand cover (canopy), right side of cab (cab)

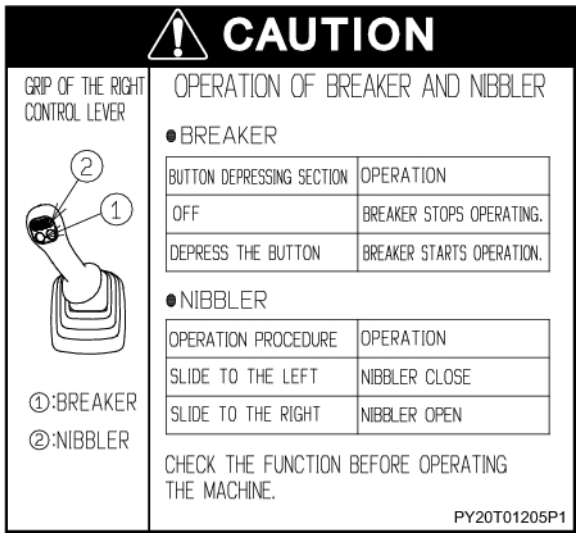
Part number: PY20T01062P1



26. NIBBLER (CRUSHER) AND BREAKER OPERATION

Location: Seat stand cover (canopy), right side of cab (cab)?

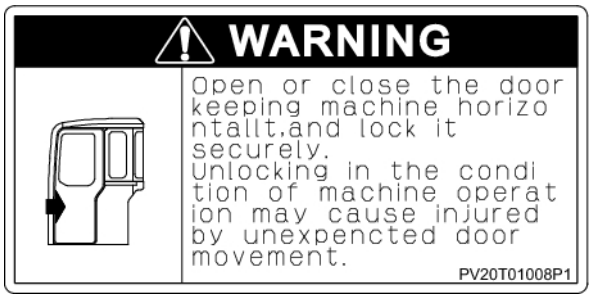
Part number: PY20T01205P1



27. SECURELY LOCK CAB DOOR

Location: Inside cab door

Part number: PV20T01008P1

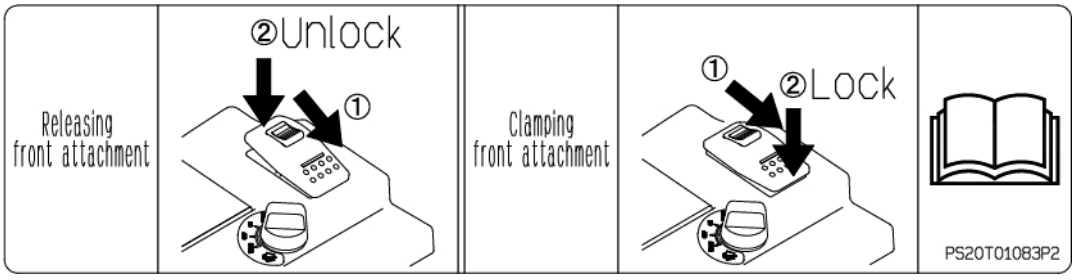


28. HANDLING THE QUICK HITCH

Location: Right side of cab

Part number: PS20T01083P2

Be sure to read this manual before removing/installing the attachment.



29. HANDLING THE QUICK HITCH OPERATION SWITCH

Location: Right side of cab

Part number: PS20T01082P1

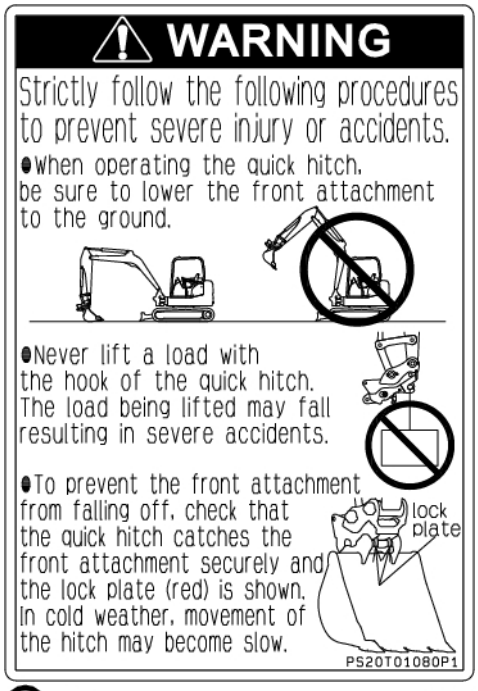
This symbol means an unacceptable sample or unsafe condition.

30. HANDLING THE QUICK HITCH (OPTION)

This label is affixed to the machine equipped with KOBELCO standard quick hitch.

Location: Right side of cab

Part number: PS20T01080P1



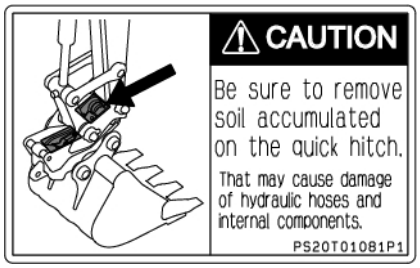
This symbol means an unacceptable sample or unsafe condition.

31. HANDLING THE QUICK HITCH (OPTION)

This label is affixed to the machine equipped with KOBELCO standard quick hitch.

Location: Right side of cab

Part number: PS20T01081P1



1.4 PRE-START SAFETY

1.4.1 OPERATION RULES

BASIC OPERATION 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.
- In operating, inspecting and serving the machine, follow the precaution and procedure for the safety described in this manual.
- Never operate the machine with poor physical conditions caused from drugs (which makes you drowsy) and under the influence of alcohol and unstable mental condition.
- Be sure to have communication with partners including signal persons about work process before start working together.

ENSURE SAFETY AT THE WORKING SITE

Before starting operation, check whether or not there is potential danger in the working site.

•Carefully survey quality of the layer of earth and soil in the working site before operating the machine to establish safety working procedures. Avoid a site where rocks may fall or landslides may occur.

•Put up barricades to make the working site off-limits to the public. Especially, for operations on a road, place the signal person or provide barricades to ensure safety of passing cars and pedestrians.

SIGNS, SIGNALS & SIGNAL PERSON

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

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

All personnel should know the meaning of all signals and signs.

Place the only one signal person at the working site.

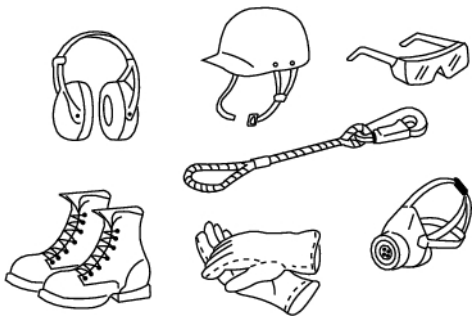
OPTIONAL EQUIPMENT/ATTACHMENTS

- In case of installation of an optional equipment/attachment, read the instruction described in the separate volume for the option.
- Using an unauthorized equipment/attachment may cause personal injury and severe damage to the machine and its components, and subsequently shorten the service life.
- Personal injury, accident, or failures of the machine caused by using an unauthorized equipment/attachment voids our liability for the machine.

1.4.2 PROTECTIVE TOOLS

WEAR FITTING CLOTHING AND PROTECTIVE GEAR

- 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.
- Wear hard hats and protective shoes. Wear protective gears such as protective glasses, mask, gloves, ear protection, safety belt, and reflecting vest as needed.
- Check the function of each protective gear



before using it.

PREPARE FOR EMERGENCY

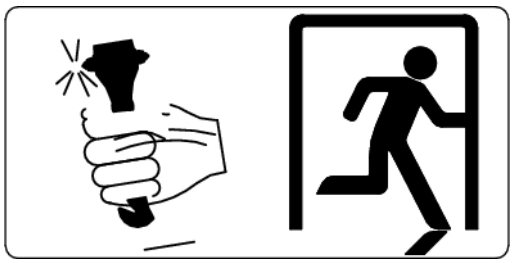
- Check where fire extinguishers and a first aid kit are located in case of accident or fire. Learn how to operate a fire extinguisher.
- Inspect and maintain regularly the fire extinguishers.
- Determine the emergency communication tools and channel and have telephone numbers of people working together.
- Determine the storage place of the first aid kit. Inspect it regularly, and replenish its contents as required.

PROTECTIVE DEVICES

- Check that all protective guards, covers, and mirrors are installed properly. Repair any failed parts immediately.
- Understand how to use protective devices.
- Never remove protective devices and maintain them to always function properly.

1.4.3 ABNORMAL AND EMERGENCY CONDITION

EMERGENCY ESCAPE FROM OPERATOR'S STATION.



Break the window glass for emergency escape with the hammer for emergency exit provided in the operator cab.
In an emergency, take out the hammer for emergency exit and break the window to escape from the cab.
Use the cutter on the grip side of the hammer to cut the seat belt, etc., in an emergency.

1.4.4 DANGER IN OPERATION

PROTECTION AGAINST NOISE

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

1.4.5 FIRE PREVENTION

FIRE CAUSED BY FUEL/OIL

Fuel, oil, antifreeze mixture, and window washer, etc. may catch a fire if a fire gets close to them. Follow the instructions below without fail.

- Do not smoke nor use a fire in the areas where flammable materials are stored and/or handled.
- Refuel only after stopping the engine.
- Do not leave the machine during refilling and refilling oil.
- Be sure to close the fuel and oil filler caps securely.
- Watch out not to spill fuel on a heated surface nor on electrical parts.
- Store fuel and oil in a designated store house where only authorized personnel can go in.
- After refueling and refilling oil, wipe off spilled fuel and/or greases and oils immediately.
- Remove flammable materials in the site before carrying out the grinding and welding works of machine.
- Do not use combustible materials to wash parts such as light oil nor gasoline. Use non-combustible oil as washing liquid.
- Do not weld the pipes and tubes containing combustible liquid and do not perform gas cutting.

REFUELING

USE ANTI-EXPLOSION WORKING LIGHTS

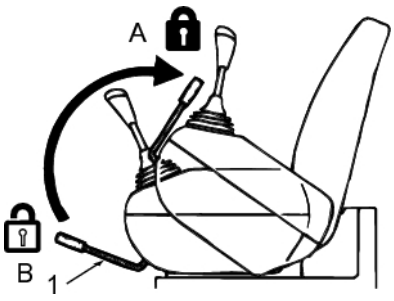
Use only working lights with anti-explosion specifications when performing inspection and maintenance procedures on fuel, oil, battery electrolyte, coolant and wind washer fluid to prevent a fire or explosion. These flammable materials may catch a fire and then explode and result in severe injury.

1.4.6 GETTING ON AND OFF THE MACHINE

PRECAUTIONS FOR LEAVING THE OPERATOR'S SEAT

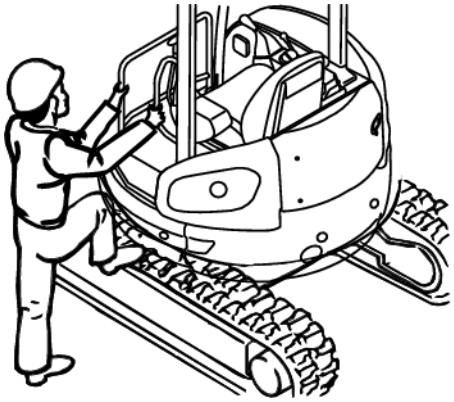
Before leaving the operator's seat, lower the attachment to the ground, place pilot control shut-off lever (1) in the "LOCKED" position, and stop the engine. If the pedal or control lever is touched accidentally, the machine may move suddenly, resulting in severe injury.

A. "LOCKED" position
B. "UNLOCKED" position



PRECAUTIONS OF GETTING ON AND OFF THE MACHINE

- Getting on and off the machine from the side where the step and handrail are provided.
- Before getting on and off the machine, inspect the installation parts of the steps and handrails 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 handrails if adhesion of any of them is found.
- When getting on and off the machine, do not fail to use the handrail, step and track shoe, facing to the machine and support the body at three points.
- There are many people injured by jumping off the machine. Do not jump off the machine.
- Never get on and off the moving machine.
- Do not get on and off the machine by using the pilot control shut-off lever nor control levers.
- Do not get on and off the machine with tools in hand.



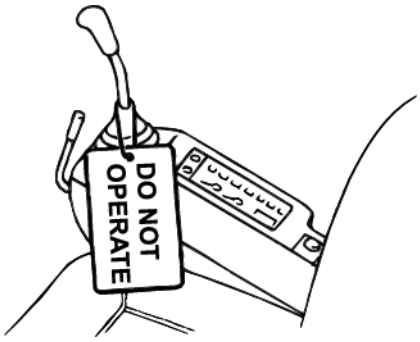
1.4.7 INSPECTION AND MAINTENANCE ON THE MACHINE

PRE-START INSPECTION

Before starting the machine, perform a pre-start inspection and repair any abnormality.

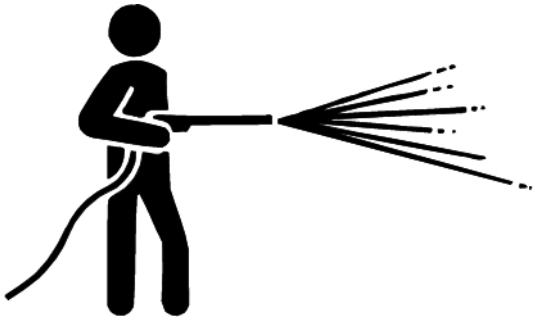
PUT THE TAG DURING INSPECTION AND MAINTENANCE

If tags "DO NOT START ENGINE !", "DO NOT OPERATE", and "UNDER INSPECTION/MAINTENANCE" are put on the door or a control lever, do not start the engine or operate the machine before the person who put it or a person who knows well about the situation takes it off.
If necessary, display tags around the machine.
Parts number of the warning tag:
LC20T01001P1



ALWAYS KEEP THE MACHINE CLEAN

Spilled oil, grease or mess of debris is danger. Always keep the machine clean.



IMPORTANT **Water Intrusion into Electrical System**

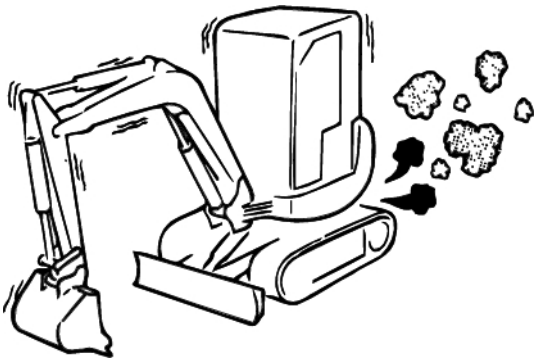
Any water intrusion into the electric system may cause a short circuit or operation failure, resulting in a malfunction or fire. Never clean inside of the operator's station and the electrical components such as sensors and connectors with pressurized water or steam.

KEEP THE AREA AROUND THE OPERATOR'S SEAT CLEAN

- Remove mud, greases and oils from the soles of your shoes when entering the operator's station to avoid slippery pedals during operation, which may cause severe accidents.
- Do not leave parts and tools in the operator's station.
- Do not leave plastic bottle in the operator's station nor put suction cups on the window glass. They may act like a lens generating a fire.
- Do not bring explosive materials nor combustible materials into the operator's station.
- Do not use a radio or mobile phone in the operator's station during traveling or operating.
- Do not leave a cigarette lighter in the operator's station.? It may explode when inside the cab becomes very hot under sunshine.

DO NOT USE THE MACHINE IN BAD CONDITION

Using the machine in bad condition may cause an unexpected accident or failure. If you detect any abnormality during operation, immediately stop the machine and repair it.



1.5 SECURE VISIBILITY

1.5.1 PRECAUTIONS FOR SECURING VISIBILITY

When operating or traveling the machine in a poor visibility area, the operator may not recognize people and/or obstacles in the working site and it will result in severe injury or damage to the machine. Strictly follow the instructions below.

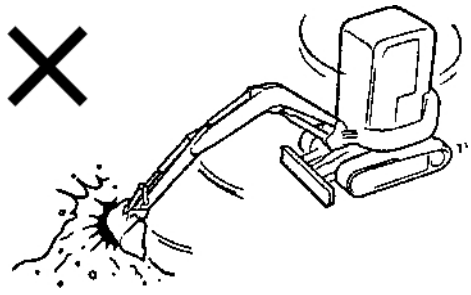
- Move the equipment/attachment if the right hand side visibility is disturbed by the equipment/attachment.
- Place the signal person in case of poor visibility to direct the operator with his/her directions, signals and signs.
  Place the only one signal person at the working site.
- When working in dark places, turn on the working light. Whenever necessary, set lighting facilitys to make the working site bright enough.
- Stop working in case of poor visibility due to fog, rain or snow. After the visibility becomes clear, restart working.

1.6 PROHIBITED WORKS

1.6.1 PROHIBITED WORKS IN MACHINE OPERATION

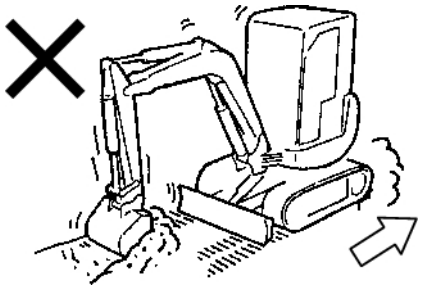
DO NOT APPLY SWINGING FORCE TO THE FOLLOWING OPERATIONS

Never apply swinging force to a rock slide or breaking work. It would exert excessive force to the machine structure and equipment/attachment, and could cause severe damage to them to shorten the service life of the swing system.



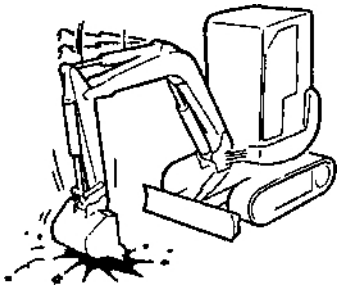
DO NOT APPLY TRAVEL FORCE TO DIGGING OR LEVELING

Never apply travel force to digging with the bucket being wedged into the ground. It would exert excessive force to machine parts and could cause severe damage to them.
Never apply travel force to leveling the ground. It could result in damage to the machine.



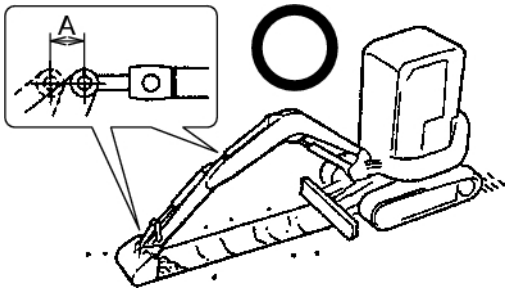
DO NOT PERFORM "HAMMERING" OPERATIONS WITH THE BUCKET

Never use the bucket for hammering and piling. It may cause severe damage to machine parts.



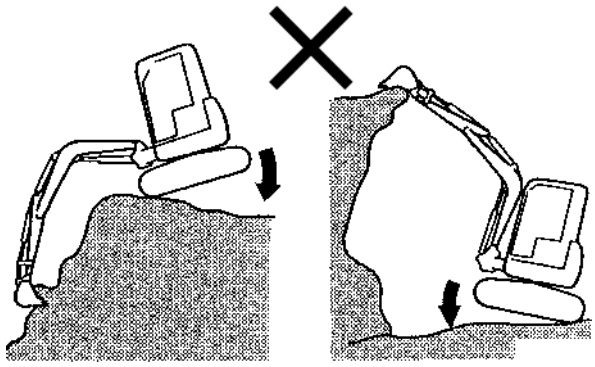
DO NOT OPERATE THE CYLINDERS TO THE STROKE END

Operate the bucket, boom and arm cylinders to leave some clearance (as clearance A in the figure) 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.



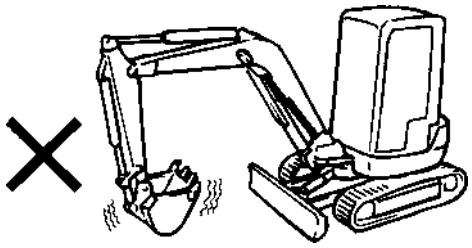
DO NOT USE THE MACHINE WEIGHT FOR DIGGING OPERATION

Do not tip or raise the machine to obtain power to dig. Before digging a hard bedrock, crack it into pieces by another method and then dig it. It will not damage the machine and be more economical.



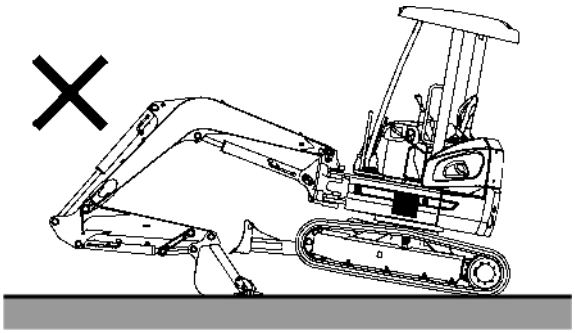
REMOVING DIRT OF BUCKET

Do not operate the bucket to the stroke end of the bucket in position in order to generate impact to remove dirt. It may cause damage to the equipment/attachment and cylinders.



DO NOT LIFT UP THE MACHINE WITH ARM CYLINDER STROKE END

Never lift up the machine with arm cylinder stroke end. It may cause damage to the equipment/attachment and cylinder.

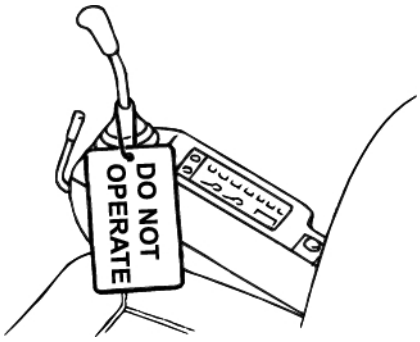


1.7 PRECAUTIONS FOR OPERATIONS

1.7.1 STARTING

STARTING ENGINE

Do not start the engine or touch the control levers when the warning tags "DO NOT START ENGINE!", "DO NOT OPERATE" or "UNDER INSPECTION/MAINTENANCE", or a tag with the same kind of description is put on a control lever or around the machine.



ONLY ONE OPERATOR IS ALLOWED TO ENTER THE OPERATOR'S STATION.

Only one operator should be in the operator's station while operation. Allowing another person to ride in the operator's station hinders your operation and may cause personal injury. Do not allow another person to ride in the operator's station as well as on the machine body.

SEAT BELT

Fasten the seat belt securely to prevent hitting heavily to inside the cab, being thrown out of the cab and being crushed under the machine when the machine tips/rolls over. If the seat belt is not fastened, it may cause severe injury or death. Fasten it without fail whenever taking the seat.

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

•Replace the seat belts with new ones every 3 years even when damage or deterioration is not found.

PRECAUTIONS OF STARTING THE ENGINE

- Move the pilot control shut-off lever to the "LOCKED" position.
- Be sure to start the engine from the operator's seat.
- Sound the horn before starting the engine to warn surrounding personnel that the machine is being started.
- Do not start the engine by short-circuit across the starter terminals or the battery. The machine might move unexpectedly and the electric system might be damaged.

CHECK AFTER STARTING ENGINE

After starting the engine, check the performances of devices such as the bucket, arm, boom and dozer (if equipped) and the performances of traveling and swinging.

Perform the check in a large space where there are no other persons and obstacles.

Failing to perform the check after starting the engine may cause late detection of a defect, resulting in severe injury and damage to the machine.

When a failure is found, repair it immediately.

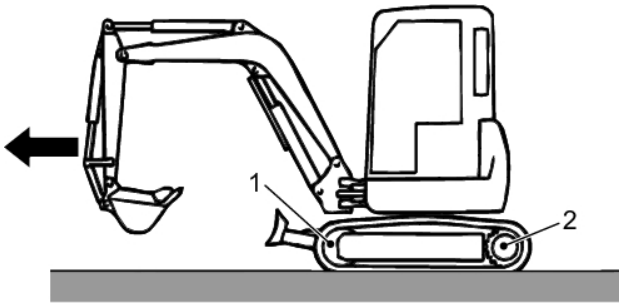
WARM UP

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 injury. Do not fail to warm up the machine. Especially in cold weather, the sufficient warming-up is necessary.

1.7.2 TRAVELING

CONFIRM THE TRAVEL DIRECTION

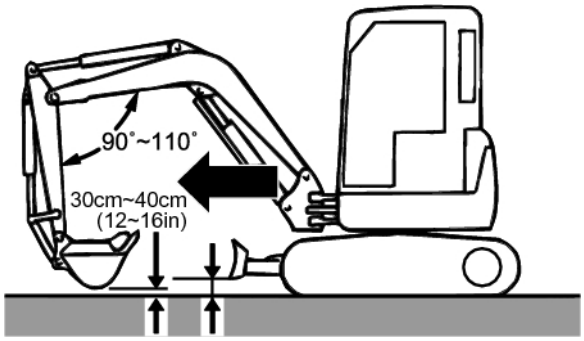
Check the position of the front idlers (1) before starting operation. The proper travel position is the position that the front idlers (1) are at the forward of the undercarriage and the travel motors (2) are at the backward of the undercarriage.



PRECAUTIONS IN TRAVELING

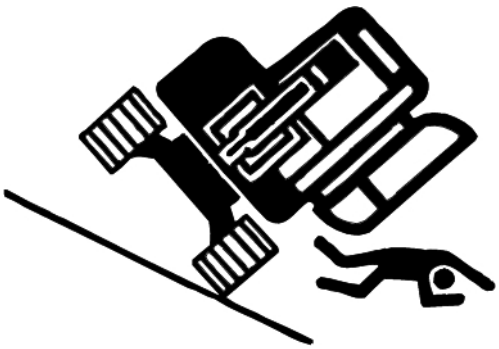
Travel on the level and firm ground as much as possible. Travel in straight and large radius curve as much as possible. Do not perform an abrupt pivot turn or spin turn. In narrow area, turn the machine in the opposite direction as many times as possible.

- Keep the attachment at 30 to 40 cm (12 to 16 inch) high above the ground when traveling, as the figure shown to the right.
- Raise the boom if the right hand side visibility is disturbed.
- Abrupt operations of the control lever and pedal are not allowed.
- Travel slowly on rough terrain.
- Do not go over obstacles if possible. When going over obstacles unavoidably, go slowly with the attachment positioned close to the ground as much as possible.



PRECAUTION OF TRAVELING ON THE SLOPE

When traveling on slopes, be careful of tipping/rolling over and skidding. Keep the bucket at the height of 30 to 40 cm (12 to 40.64 cm) above the ground to enable the bucket touch the ground immediately in case of stopping the machine in an emergency. Do not turn or go across on a slope. Go down to a flat space and take a detour-route for safety.

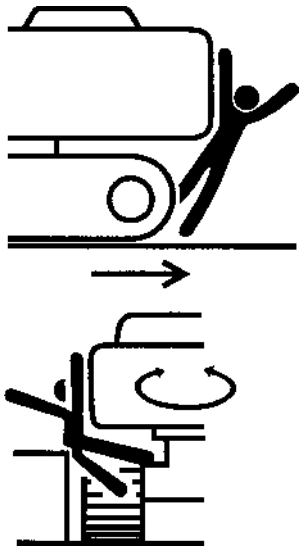


TRAVELING ON FROZEN OR SNOW COVERED GROUND

- The frozen or snow covered ground is extremely slippery and the machine can skid further by even a small slope. Do not perform the dash 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 and 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

- Keep people clear of the swing area.
  Make sure that the areas on and under the machine and surroundings are clear of obstacles and personnel before beginning operation and sound the horn or send signals to warn surrounding personnel to keep away from the area around the machine before starting operation.
- Place the signal person at the dangerous area or poor visibility area.



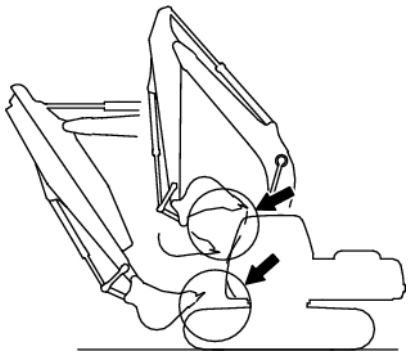
1.7.3 PRECAUTIONS OF OPERATIION

CONTROL PATTERNS OF THE CONTROL LEVERS

Before operation, be sure to pay attention to the surroundings and operate each control lever and confirm that 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.

BUCKET INTERFERENCE

Check clearance between the attachment and the operator's station before starting operation because a certain kinds of attachment and a certain combination of the option and the machine may cause the interference of the attachment and the operator's station or some other parts of the machine.
Check for interference before operation.
Use extreme caution when operating the attachment near the operator's station or machine.

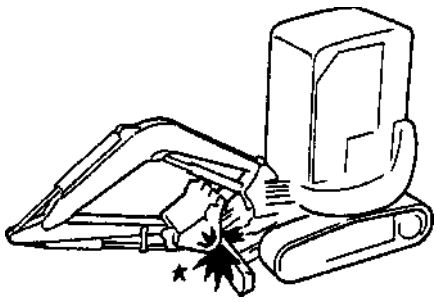


OPERATING MACHINE

Getting hit by the operating machine may cause personal injury. Do not get close to the operating machine. Always pay attention to those around the machine.

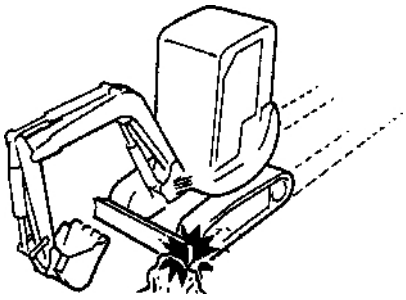
BUCKET/ARM IN OPERATION WITH DOZER POSITIONED AT FRONT

Be careful not to hit the dozer with the bucket when operating the arm in or bucket in for travel/transport position.



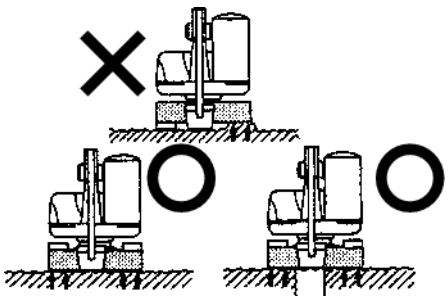
DOZER COLLISION

Be careful not to strike the dozer against large rocks, etc. It may cause a premature damage of the dozer or cylinder.



Offset Load of Dozer

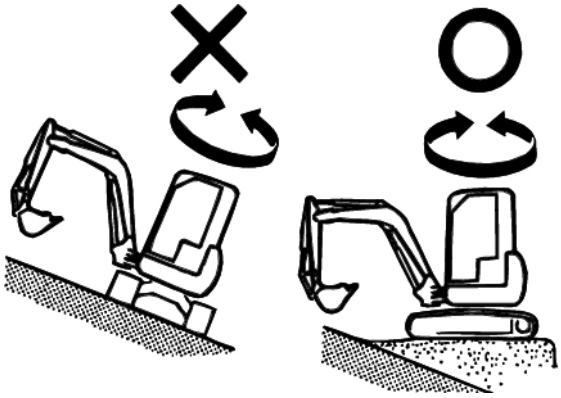
If the machine is supported by the dozer, be sure to ground the dozer bottom evenly, avoiding an offset or concentrated load.



1.7.4 PRECAUTIONS OF WORK

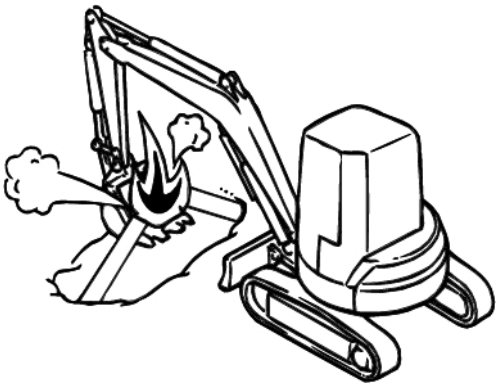
OPERATING ON A SLOPE

- There is a risk of the machine losing the balance to tip/roll over when operating on a slope. Pay attention to the operation.
- It is dangerous to swing downhill with the bucket filled with soil.
- If swinging is unavoidable, make an embankment for the machine to be as level as possible to swing on a slope.



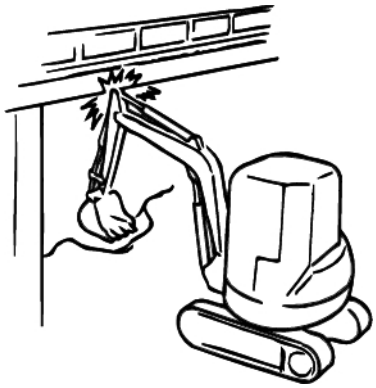
BURIED UTILITY LINES

In locations where there may be utility lines such as buried water/gas lines, check with the local utility companies, perform test digging, confirm their existence/location, and carefully carry out the operation.



RESTRICTED WORKING SITE

Use extreme caution not to hit the attachment in working sites with limited height such as tunnels, bridges, or under electrical power lines, etc.

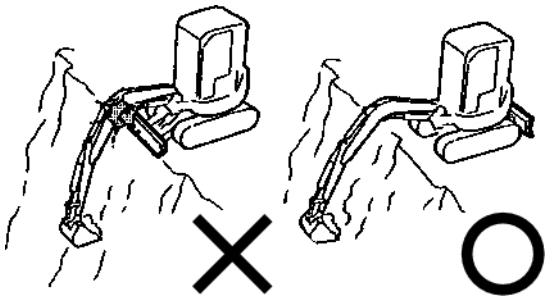


UNDER PRECIPICE/OVERHANG OPERATION

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

When performing deep excavation with the dozer at the front, be careful not to hit the boom cylinder against the dozer. If not necessary, do not set the dozer at the front.



GROUND CONDITIONS

Put the crawler 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 the 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.

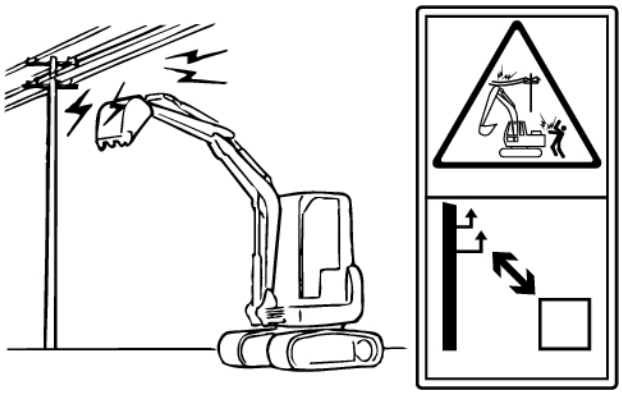
AVOID LIFTING WORK

This machine is designed and manufactured for digging, loading and ground leveling operations only. Any other use can exert excessive force to the machine, its components, and its systems and result in severe injury or death to the operator and other personnel working in the area of the machine.

ELECTRICAL POWER LINES

When pipes and lines for utilities such as gas, water, telephone and electricity may exist in the working site, check with the utility companies for their locations before working in that area. Use extreme caution around electrical power lines during operation. Keep a sufficient working distance from them. See the following table.

LINE VOLTAGE	Minimum Distance - M (FEET)
0 ~ 50,000	3.0M (10) OR MORE
50,000 ~ 200,000	4.5M (15) OR MORE
200,000 ~ 350,000	6.0M (20) OR MORE
350,000 ~ 500,000	7.5M (25) OR MORE
500,000 ~ 750,000	10.5M (35) OR MORE
750,000 ~ 1,000,000	13.5M (45) OR MORE



Keep a safe distance from electrical power lines

CHECK WORKING SITE AND SET UP APPROPRIATE PROCEDURES

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

WORKING SITE IN URBAN AREA

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

LIGHTING

When working in dark places, turn on the working light. Whenever necessary, set lighting facilitys to make the working site bright enough. Stop working in case of poor visibility due to fog, rain or snow. After the visibility becomes clear enough to work, restart working.

SLIPPERY ON BOARDS OR STEEL PLATES

- Boards become slippery when wet due to rain or water. Use extreme caution to them on a slope. Piled up leaves or branches are slippery too.
- Apply non-slip to such boards.
- Piled up leaves or branches are slippery too.

OPERATION ON SOFT GROUND

Put logs or lumbers horizontally beneath the crawler belts when working on the soft ground or the marsh to prevent the machine from getting stuck in mud. As the ambient temperature rises, the surface conditions of the frozen ground may become marshy.

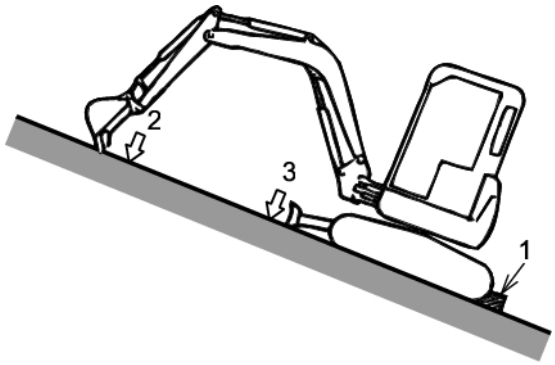
LOOSE/UNSTABLE GROUND

Ground may be loose around precipices, shoulders or trenches. Do not travel or work there. The weight or vibration of the machine may cause a collapse of such ground, resulting in tipping/rolling over of the machine. Especially, it often occurs after a rain, blast, or earthquake.

1.7.5 PRECAUTIONS OF PARKING

There are risks of creeping, barbarous act or unexpected movement at the time of next start if the machine is not parked properly. Park the machine following the safety parking procedure shown below.

Find the level ground when parking. If you park the machine on a slope unavoidably, block the crawlers (1) and lower the bucket (2) and dozer (3) to the ground.
If you park it on a road, ensure safety of pedestrians-by and cars by flags, barriers, lights and other warning labels.



1.8 PRECAUTIONS OF INSPECTION & MAINTENANCE

1.8.1 BEFORE INSPECTION & MAINTENANCE

READ CAREFULLY OPERATION/MAINTENANCE PROCEDURES

Improper maintenance may cause not only personal injury (being caught or burned) but also damage to the machine.

Fully read and understand the maintenance procedures (preparation for safety work, tools, qualifications, important parts, designation of the supervisor and wearing of the protective gears, etc.) described in this manual before inspecting and maintaining the machine. And then safely and carefully perform the inspection and maintenance.

CONFIRM THE JOB PROCEDURES

Confirm all working procedures before starting work to prevent accidents caused by lack of the understanding of procedures. If the signal person is placed, fully confirm the signal person and the signals.

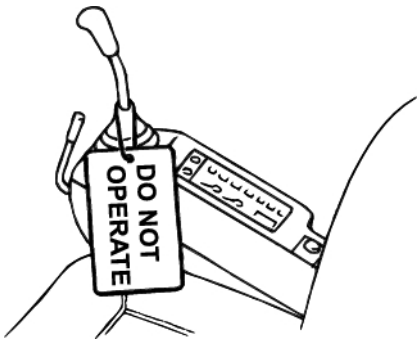
ORGANIZE AND CLEAN UP THE WORKING SITE

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

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

PUT THE TAGS "DO NOT START ENGINE!", "DO NOT OPERATE" AND "UNDER INSPECTION/MAINTENANCE"

If unauthorized personnel start the engine or touch control levers without care during the inspection and maintenance, it may cause severe injury. Put the tags "DO NOT START ENGINE!","DO NOT OPERATE" and "UNDER INSPECTION/MAINTENANCE" on noticeable places or where people can easily notice such as around the operator's seat before performing the inspection and maintenance. If necessary, display tags around the machine.



USE PROPER TOOLS

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

1.8.2 DURING INSPECTION & MAINTENANCE

HOT PARTS

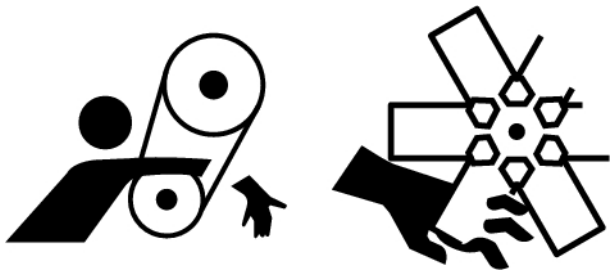
- Do not remove the radiator cap immediately after stopping operation when the coolant is to be inspected or drained. The high temperature coolant or steam may spout and cause burn. Wait until the temperature of the radiator cap goes down enough to touch it with a bare hand and after confirming it, slowly 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 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.

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 oil from even a pin hole can penetrate the skin or eyes and cause severe injury or blindness. Use a cardboard and plate and wear a face shield, protective glasses and gloves when inspecting the leakage location. If the high pressure oil contacts or penetrates body, see a special doctor immediately.

ROTATING PARTS

Rotating parts such as the fan and belts could catch your body part and result in severe injury. Stop rotation completely before maintenance. Place another person at the operator's seat when you run the engine unavoidably during the engine inspection or maintenance.

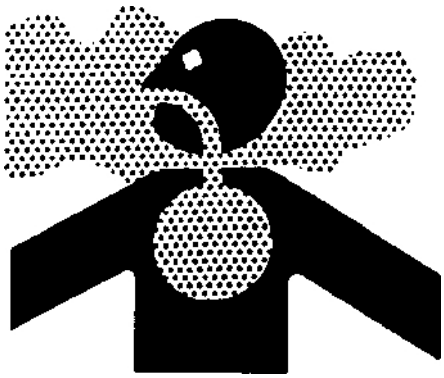


•The other person sitting on the operator's seat should be ready to stop the engine at any time while communicating with the person inspecting or maintaining the engine.

VENTILATION PRECAUTIONS

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

- Adequate ventilation is needed when inspecting, maintaining or running the machine indoor.
- 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.



DETACHING, INSTALLING AND STORING THE EQUIPMENT/ATTACHMENTS

- Designate the supervisor beforehand and follow his/her instruction to detach and install the equipment/attachment.
- An attachment in danger of falling should be supported stably not to fall during storage. Entry into the stored area of unauthorized personnel should be prohibited.

INSPECTION & MAINTENANCE IN HIGH PLACES

Do not get close to the edge to avoid falling.

- Put things in order around the scaffolding before inspection and maintenance in a high place.
  - •Avoid spillage of any oil or grease
  - •Avoid scattering tools
  - •Avoid slipping
- Never jump on or off the machine. When getting on and off the machine, do not fail to use a ladder, step and handrail, and support the body with the hands and feet.
- Use protective gears such as safety belt as needed.

DO NOT DROP TOOLS AND PARTS

Dropping of any tools or parts in the working site may cause damage to the machine or unexpected machine motion which may result in personal injury. When inspecting the machine with the access panel or fuel inlet opened, do not drop tools and parts into the inside.
Be sure to pick them up immediately in case they are dropped.

GENERAL GUIDELINES FOR WELDING

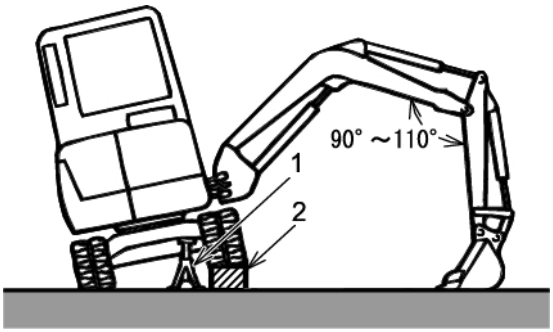
Welding work must be performed by a certified welder at a facility where welding devices are properly equipped. Damage of electric parts, poisonous gas from paint due to heat of welding or a fire may occur.

Basic Precautions for Welding

- Turn the starter switch to the "OFF" position.
- Disconnect the cable at the negative (-) terminal of the battery to cut off the current.
- Attach welder ground cable within 1 m {3.3 ft.} from the part to be welded. If the welder ground cable is attached to the area near electric parts/connectors, these electric parts/connectors may be damaged.
- Attach the welder ground cable directly to the area near the part to be welded and on the same parent material.
- Make sure that neither the bearing nor seal is positioned between the welder ground and the part to be welded.
- Do not attach the welder ground cable near the attachment pin or cylinder. It will damage plating.
- Remove paint from any surface to be welded to avoid generating poisonous gas.
- Always wear protective gears appropriate for welding.
- Perform work in a well-ventilated areas.
- Clear of combustible materials and provide a fire extinguisher in preparation for a fire.

SUPPORT WHEN JACK-UP

Accident may occur without support. When lifting up the machine for inspection of the undercarriage, operate the boom and arm to form an angle of 90 to 110 degrees between them, and lower the bucket to let its bottom touch the ground to lift the machine body up, and support the machine with safety strut (1) and safety block (2).



USE CAUTION WHEN ADJUSTING THE TRACK TENSION

Grease cylinder is under high pressure. It is dangerous to loosen the grease nipple rapidly because grease will splash. Loosen the grease fitting within one turn while relieving pressure gradually.

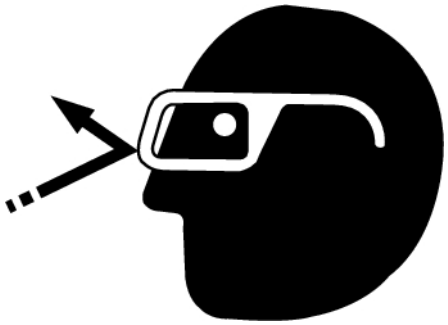
Keep a face, hands and legs away from the grease nipple.

For adjusting track shoe tension, see "INSPECTING AND MAINTAINING TRACK SHOE TENSION" in Chapter 4.

PAYING ATTENTION TO BROKEN PIECES WHEN HAMMERING

When hammering, popping up pins or flying metal chips may cause severe injury. Strictly follow the instructions below.

- A flying metal piece may cause severe injury when hammering a hard metal part such as pin, edge, tooth and bearing. Wear protective gears such as protective glasses, gloves, hard hat and protective shoes to avoid injury.
- When hammering a pin, tooth or other, a flying metal piece or others may cause injury. Confirm no one is around the working site before hammering.



1.8.3 PROHIBITED IN INSPECTION & MAINTENANCE

DO NOT HEAT NEAR PRESSURIZED HYDRAULIC EQUIPMENT NOR PIPING

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 combustible steam or gas and result in a fire or severe burns.

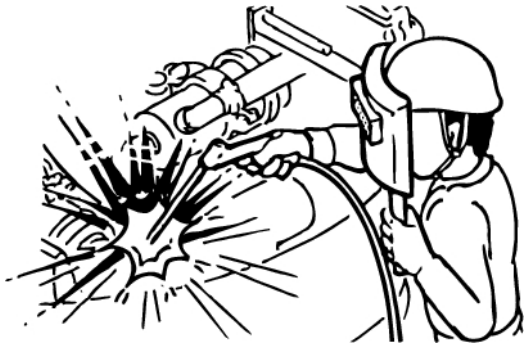
- Do not heat the section close to the tube and hose contained pressurized oil or other combustible materials by welding, soldering and torch.
- If the pressurized tube and hose is heated directly, they may be suddenly cut. When carrying out the welding and soldering works, cover the tube, hose and other combustible materials with fire-proofed covers.

DO NOT HEAT PIPING CONTAINING COMBUSTIBLE OIL

- Do not employ gas cutting for the pipes and tubes containing combustible oil.
- Wash combustible oil completely with non-combustible solvent before welding and gas cutting.

MODIFICATION IS PROHIBITED

- Personal injury or failures of the machine caused by unspecified modification voids our liability for the machine.
- Consult KOBELCO authorized dealer/distributor for any modification to the machine beforehand.



1.8.4 AFTER INSPECTION & MAINTENANCE

AFTER COMPLETION OF MAINTENANCE

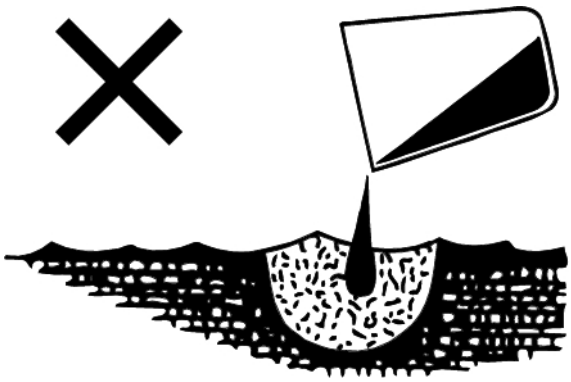
- Run the engine at low idle, and check oil or water leakage from the maintained part.
- Slowly operate each control lever to confirm its operation performance.
- Increase the engine speed, and again check oil or water leakage.
- Manipulate each control lever carefully to confirm that it functions properly.

Inspection and maintenance will not be finished until the proper machine performance is confirmed.

PROPER WASTE LIQUID

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

- Put waste liquid into containers such as oil cans.
- Never drain it on the ground or dispose of it into river, drain, sea and lake.
- Observe any applicable federal, state and local codes and regulations regarding the hazardous material disposal when disposing of hazardous material such as waste oils, fuel, coolant, brake fluid, solvent, filters and batteries.



1.9 HANDLING BATTERY

1.9.1 PREVENTION OF BATTERY 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.

1.9.2 PREVENT BATTERY EXPLOSIONS

- Batteries give off hydrogen gases that can explode and cause personal injury. Definitely keep open flames and cigarettes away from batteries.
- Keep all ventilation caps tightly secured.
- Be sure to connect the terminals securely.
- When charging the battery, remove it from the machine and remove the ventilation 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, heat it up until the battery temperature becomes 16 degrees C or higher.
- Do not use or charge the battery of which the battery electrolyte level is lower than the lower limit. This might cause explosion. Check the battery electrolyte level periodically, and make up the loss with distilled water to the proper limit of the electrolyte level.

1.9.3 REPLACING THE BATTERY

- 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 mistake in the jumper cable connection.
  Never connect the positive (+) terminal to the negative(-) terminal. Finally, connect the negative (-) terminal to the upper frame of the machine.
  See "USING JUMPER CABLES" in Chapter 3 for the starting procedures of using jumper cables.

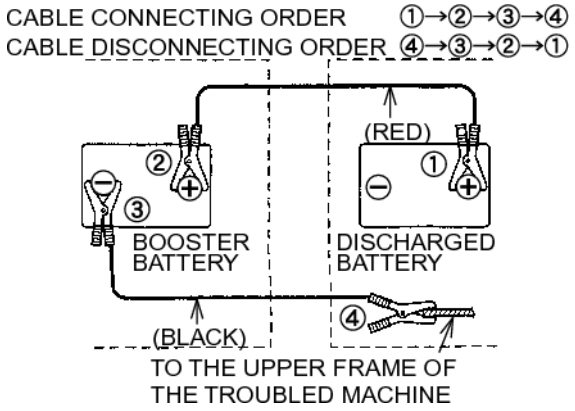
1.9.4 USING JUMPER CABLES TO START THE ENGINE

CAUTION

1. Use the same capacity battery of disabled battery for the boosting battery.
2. Connect the clip of jumper cables securely.
3. Check that the pilot control shut-off lever is in the "LOCKED" position.
4. Check that each control lever is returned to the neutral position.
5. Turn off the both starter switches of the normal machine and the disabled machine. When the machine is powered on, the machines may unexpectedly start and it may cause an accident.

Procedure:

1. Put attachment on the ground, return all control levers to the neutral position and then set the pilot control shut-off lever to the "LOCKED" position.
2. Turn the starter switch to "OFF" for both normal machine and disabled machine.
3. Remove the terminal cover of the battery and connect the jumper cable (red) clip to the positive (+) terminal on the battery of disabled machine.
4. Connect the clip from the other end of the positive (+) jumper cable (red) to the positive (+) terminal on the battery of normal machine.
5. Connect the jumper cable (black) clip to the negative (-) terminal on the battery of normal machine.
6. Finally, connect the clip from the other end of the negative (-) jumper cable (black) to the upper frame of disabled machine, away from the battery.
7. Start the engine of normal machine, 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 jumper cables in the reverse procedure of the connection.
10. Check and repair the cause of the problem of the starting/charging system on the disabled machine.

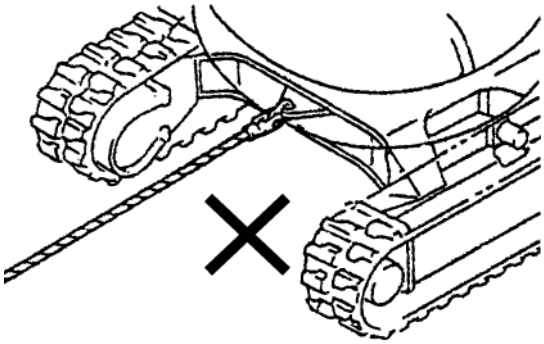


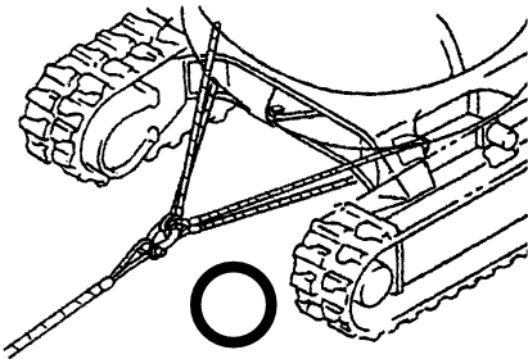
1.9.5 BATTERY DISPOSAL

Observe any local rules when disposing of a waste battery.

1.10 HOW TO TOW THE MACHINE

If the machine gets stuck in the soft ground, attach a wire rope with proper length to the position of the track frame shown to the right to tow the machine by another machine.





WARNING **TOWING THE MACHINE**

Improper towing may cause severe injury. Pay attention when towing the machine.
•Confirm that the wire rope for towing has sufficient strength resistant to the mass of the machine to be towed.
•Never use a kinked, twisted, or damaged wire rope, which may result in break.
•Never tow the machine on a slope.
•Never climb onto the towing wire rope.
•Never stand between the towing machine and the machine (or thing) being towed during the towing operation.
•Be careful not to apply a load suddenly to the wire rope.

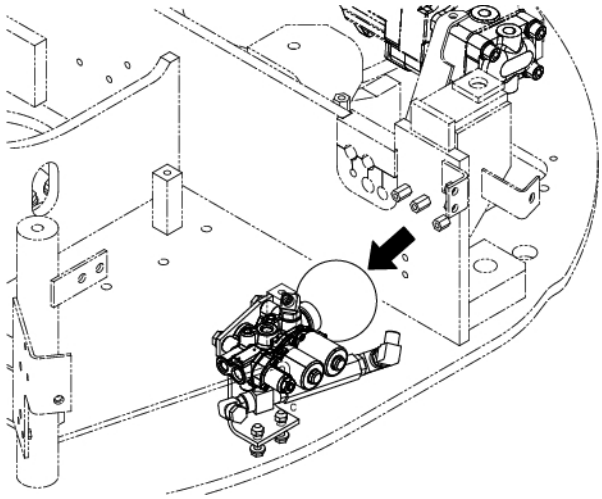
IMPORTANT

Shackles must be used for towing.
Keep the wire rope horizontally and straight to the track frame.
Tow the machine slowly in the LOW speed mode.
Pad the corners of the track frame to avoid damaging the wire rope and track frame.

1.11 HANDLING ACCUMULATOR

Improper handling of the accumulator containing high pressure nitrogen gas may cause severe injury due to explosion. Follow the instructions below without fail when handling it.

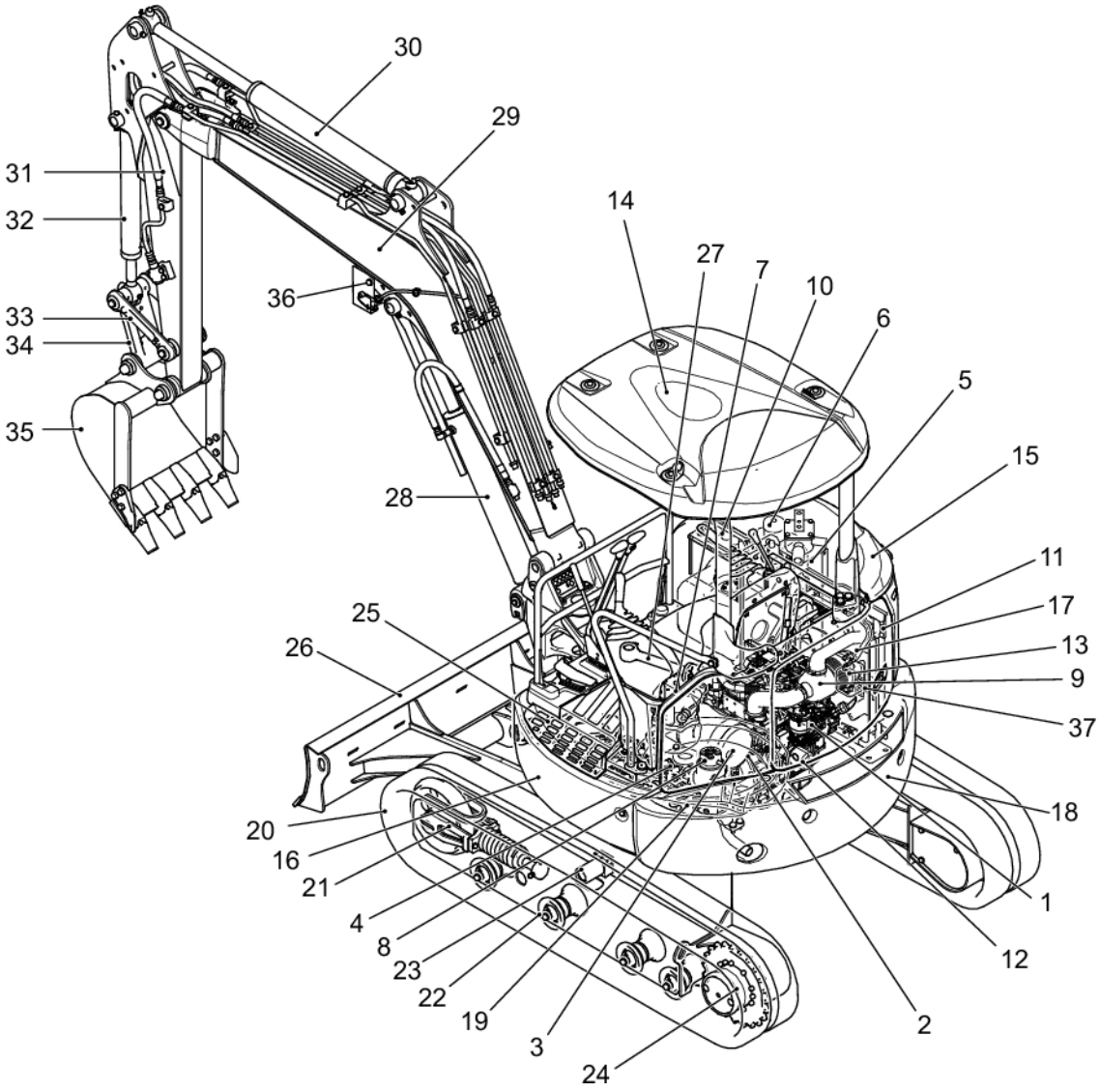
- Do not disassemble it.
- Do not bring a fire near it, or throw it into a fire.
- Do not perform drilling, welding, or gas cutting on it.
- Do not shock it by striking or rolling it.
- The charged gas must be removed before disposal. Contact KOBELCO authorized dealer/distributor.



For more information about handling the accumulator, contact KOBELCO authorized dealer/distributor.

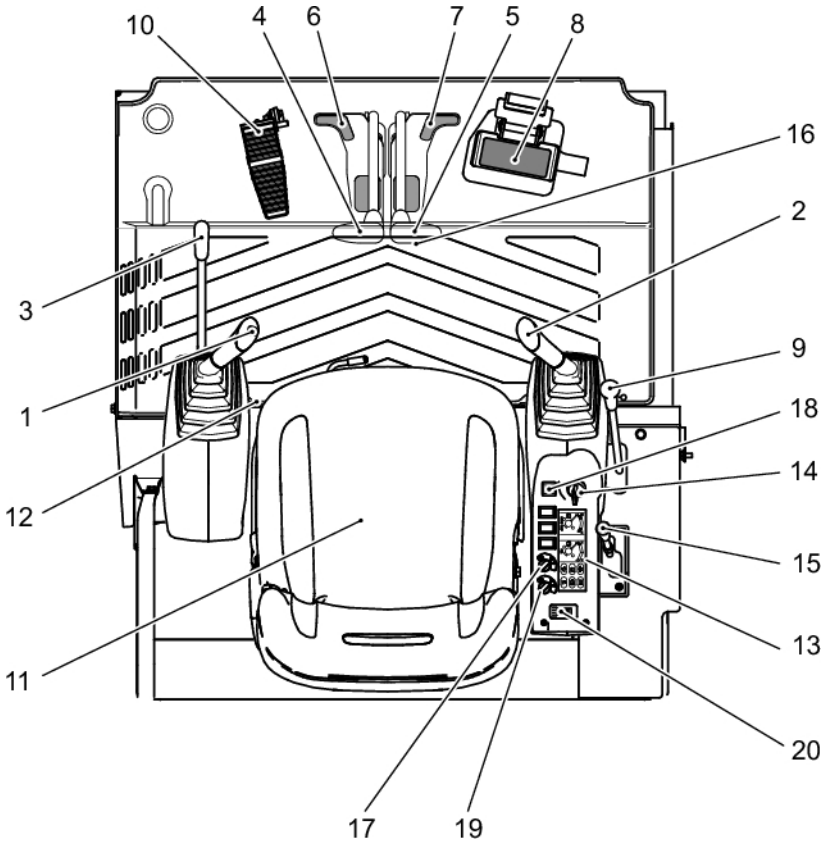
2. MACHINE FAMILIARIZATION

2.1 BASIC COMPONENTS OF THE MACHINE



Item	Name	Item	Name	Item	Name
1	Engine	14	Canopy	27	Swing cylinder
2	Hydraulic pump	15	Right side cover	28	Boom cylinder
3	Muffler	16	Guard	29	Boom
4	Control valve	17	Engine hood	30	Arm cylinder
5	Hydraulic oil tank	18	Counterweight	31	Arm
6	Fuel tank	19	Swing bearing	32	Bucket cylinder
7	Swing motor	20	Rubber track shoe	33	Idler link
8	Swivel joint	21	Idler Assembly	34	Bucket link
9	Air cleaner	22	Lower roller	35	Bucket
10	Battery	23	Upper roller	36	Light
11	Radiator	24	Travel motor	37	Fuel cooler
12	Oil filter	25	Dozer cylinder		
13	Reserve tank	26	Dozer		

2.2 CAB NOMENCLATURE



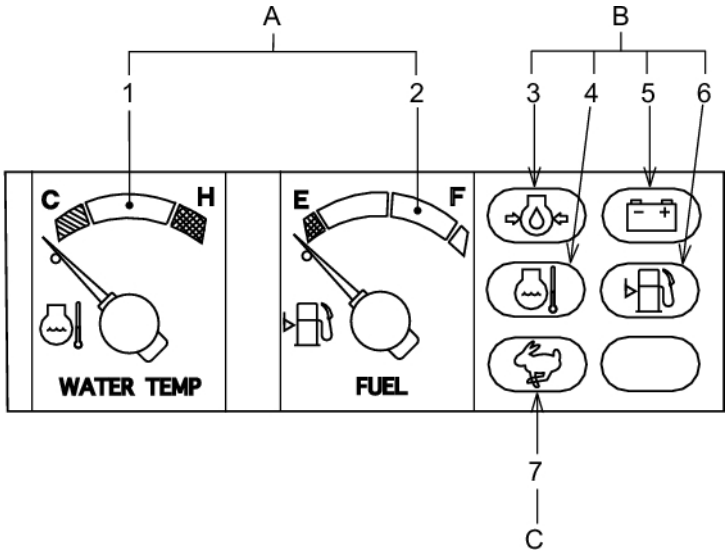
Item	Name	Item	Name
1	Left control lever (Horn switch)	11	Operator's seat
2	Right control lever	12	HOUR METER
3	Pilot control shut-off lever	13	MONITOR PANEL
4	Left travel lever	14	Starter switch
5	Right travel lever	15	ENGINE THROTTLE LEVER
6	Left travel pedal	16	Travel speed select switch
7	Right travel pedal	17	WORKING LIGHT SWITCH
8	Boom swing foot pedal	18	Deceleration switch
9	Dozer control lever	19	Wiper switch (Cab)
10	Optional Pedal (Breaker/Nibbler)	20	QUICK HITCH OPERATION SWITCH

Notice

For the color multi-display, see Chapter 8 "OPTIONAL EQUIPMENT".

2.3 MONITOR PANEL

The monitor consists of the following three parts.



CAUTION

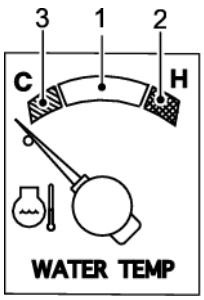
When the warning lamp is lit, stop the work immediately, and inspect and maintain the failure part. For inspection and maintenance, see the section for inspection and maintenance.

Symbol	Item	Name
A	1	Engine coolant temperature gauge
	2	Fuel level meter
B	3	Engine oil pressure lamp
	4	Engine coolant temperature lamp
	5	Battery charge lamp
	6	Fuel level lamp
C	7	Travel in HIGH (2nd) speed lamp

2.3.1 ENGINE COOLANT TEMPERATURE GAUGE

This indicates the temperature of the engine coolant. The operating temperature is normal if it falls within the white range. If the pointer enters the red range, let the engine run at low idle until the water cools down and the pointer returns to the white range.

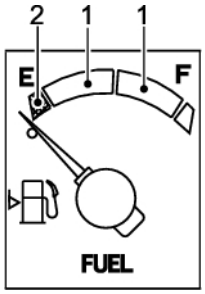
1. White
2. Red
3. Blue



2.3.2 FUEL LEVEL METER

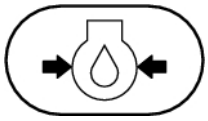
This indicates the amount of fuel. When there is very little fuel left, the pointer points E. Check the fuel level and refill. For fuel to use, see "LUBRICANT, FUEL & COOLANT SPECIFICATIONS" in Chapter 4.

1. White
2. Red



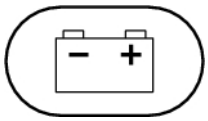
2.3.3 ENGINE OIL PRESSURE LAMP (LIT IN RED)

This warns of abnormal reduction of the engine lubricating oil pressure. If it is lit, stop the engine and check the engine oil level. See "CHECKING ENGINE OIL LEVEL AND REFILLLING" in Chapter 3.



2.3.4 BATTERY CHARGE LAMP (LIT IN RED)

This warns of abnormalities in the charging system while the engine is running. It is lit when you turn the starter switch ON. The system is normal if it goes off after the engine starts. If it does not go off after a while, it means that the battery is not properly charged. In that case, inspect the charging system. See "INSPECTING AND MAINTAINING BATTERY" in Chapter 4.

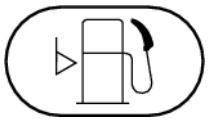


2.3.5 ENGINE COOLANT TEMPERATURE LAMP (LIT IN RED)

This warns of temperature abnormalities of the engine coolant. If it is lit, stop the operation immediately and run the engine at the idle speed to cool it. Wait for the water to cool down, stop the engine, and then check the coolant level, tension of the fan belt and the radiator core for clogging.
See "CHECKING COOLANT LEVEL FOR SHORTAGE AND MAKING UP"in Chapter 3, "CLEANING RADIATOR, OIL COOLER AND FILTER", and "ADJUSTING FAN BELT TENSION" in Chapter 4.

2.3.6 FUEL LEVEL LAMP (LIT IN RED)

This warns that there is very little fuel in the fuel tank. If it is lit, stop the engine immediately and refill.



2.3.7 TRAVEL IN HIGH (2ND) SPEED LAMP (LIT IN YELLOW)

This is lit when the travel speed is changed to HIGH (2nd) speed. The travel speed select switch is located on the grip of the right travel lever. When you turn the starter switch "OFF", the travel speed is changed back to travel in LOW (1st).

2.4 HANDLING OF SWITCHES AND METERS

2.4.1 STARTER SWITCH

This switch is used to start or stop the engine.

HEAT (Preheating):
When it is difficult to start the engine due to cold weather, turn the starter key to this position to start preheating. After preheating of about 15 seconds, the engine can be started more easily. Then, turn the starter key to the "START" position to start the engine.

OFF:
At this position, you can insert or remove the starter key. The electrical system switch is turned off and the engine is stopped.

ON:
Electricity flows in all circuits. During operation, the starter key should be in this position.

START:
To start the engine, turn the starter key to the "START" position. After the engine is started, release the starter key. The starter key will return to the "ON" position by itself.
When the electric circuit related to quick hitch operations is normal, the alarm (same alarm sound that sounds when the quick hitch is at the "UNLOCK" side) sounds for about 1 second at a time of engine start.
If this alarm does not sound at engine start, the electric circuit is abnormal. Contact KOBELCO authorized dealer/distributor for inspection and maintenance.

IMPORTANT

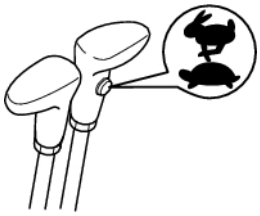
When the pilot control shut-off lever is not at the "LOCKED" position, the engine cannot be started.

2.4.2 TRAVEL SPEED SELECT SWITCH

WARNING

The travel speed should be set to LOW when the machine is running on the downhill, or loading on/unloading from a truck or trailer. A sudden change of the machine stability may cause tipping/rolling over.

The switch located on the grip of the right travel lever can be used to select HIGH (2nd) or LOW (1st) travel speed. Turning the starter switch "OFF" from "ON" automatically sets the travel speed to LOW.



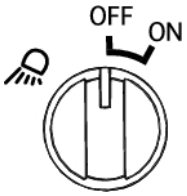
Set to LOW (turtle) when traveling on soft surfaces, slopes, or in a narrow place, or when powerful drawbar pull is required.

Set to HIGH (rabbit) when traveling on the level and firm ground.

For travel speed, see Chapter 6 "GENERAL SPECIFICATIONS".

2.4.3 WORKING LIGHT SWITCH

This switch is used to turn on the working lights on the boom and canopy.



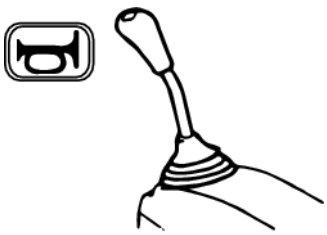
"OFF" position:
"ON" position:
The working lights on the boom and canopy are lit.

2.4.4 HORN SWITCH

CAUTION

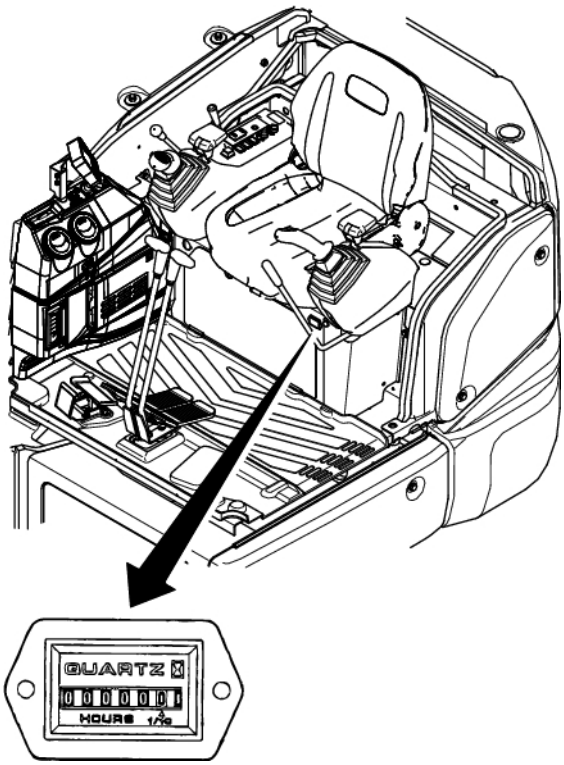
Be sure to sound the horn before starting this machine to warn surrounding personnel.

The horn sounds while the switch located on the top of the left control lever grip is being pressed.



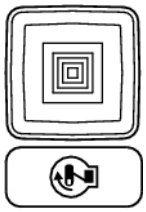
2.4.5 HOUR METER

This indicates the total time the engine has run. As long as the engine is running the hour meter continues to count, even if the machine is not traveling. While the engine is running, the operation indicator lamp on the meter blinks, indicating that the meter is counting. The meter counts 1 every hour, regardless of the engine speed. Use the count as the reference for inspection and maintenance.



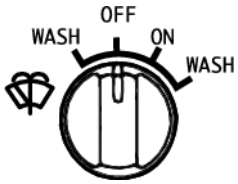
2.4.6 Deceleration switch

When you press the deceleration select switch while the engine is running, the engine speed drops. Pressing this switch again turns off the deceleration function. You can reduce the fuel consumption and noise while waiting for a dump truck or workers. Turning the starter switch "OFF" from "ON" automatically turns off the deceleration function.



2.4.7 WIPER SWITCH (CAB SPECIFICATION)

You can rotate this switch to move the wiper on the front windshield or to spray washer fluid.



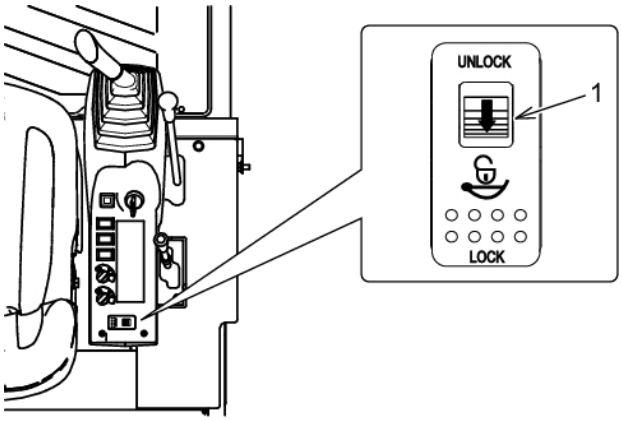
"WASH" position (left side):
Washer fluid is sprayed.
"OFF" position: The wiper stops.
"ON" position: The wiper moves.
"WASH" position (right side):
Washer fluid is sprayed and the wiper moves.

IMPORTANT

Do not use the washer function for more than 20 seconds or without washer fluid, which may cause damage to the motor equipped with the washer fluid reservoir.

2.4.8 QUICK HITCH OPERATION SWITCH

Use this switch to install and remove the front attachment. It has sliding mechanism (1) for preventing erroneous switch operation. Slide sliding mechanism (1) in the direction of the arrow to allow locking or unlocking the quick hitch to be possible.



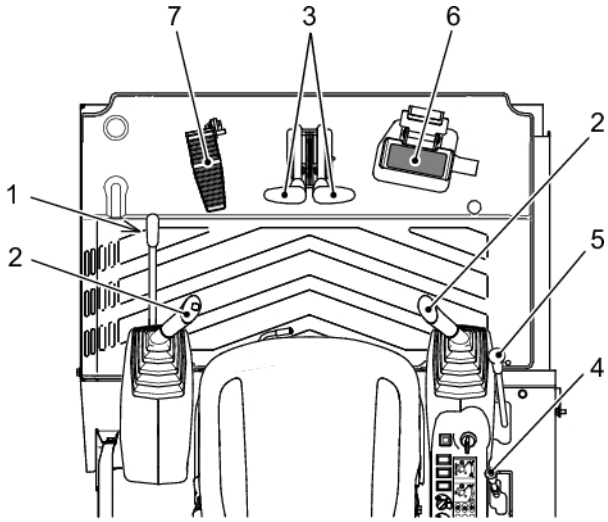
Notice

・The alarm sound will not stop until the quick hitch operation switch is set to the "UNLOCK" side.
・For detailed operations, see "REMOVING FRONT ATTACHMENT" and "INSTALLING FRONT ATTACHMENT" sections in Chapter 8.

2.5 HANDLING OF LEVERS AND PEDALS

2.5.1 LOCATION OF LEVERS AND PEDALS

1. PILOT CONTROL SHUT-OFF LEVER
2. Operator Control Levers (ISO Operating Pattern) Standard
3. Travel levers
4. Engine Throttle Lever
5. Dozer Control Lever
6. Boom Swing Foot Pedal
7. Optional Pedal (Breaker/Nibbler)



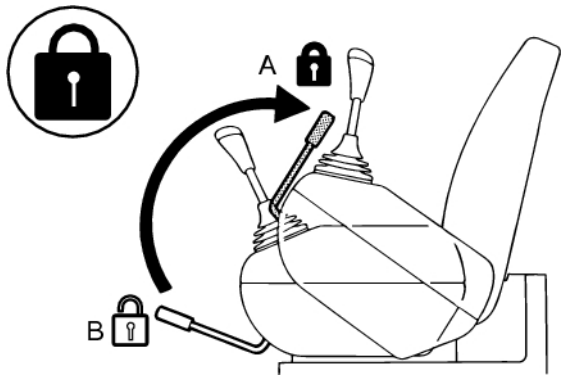
2.5.2 PILOT CONTROL SHUT-OFF LEVER

The pilot control shut-off lever is provided to prevent any unexpected operation due to unexpected contact with the left/right control levers or travel levers.

WARNING HANDLING OF PILOT CONTROL SHUT-OFF LEVER

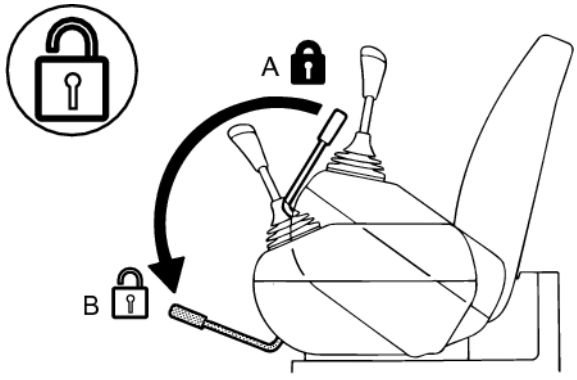
•Do not stand up and move during operation or unexpected contact with the control levers may cause a sudden movement of the machine. Be sure to raise the pilot control shut-off lever to the "LOCKED" position and set the boom swing foot pedal to the "LOCKED" position before standing up or moving.
•Setting the pilot control shut-off lever to the "LOCKED" position does not lock the boom swing foot pedal.
•Set the pilot control shut-off lever to the "LOCKED" position securely, or it may not be locked. Make sure that the pilot control shut-off lever is held to the "LOCKED" position shown in the figure below.
•When unlocking, do not touch other levers unintentionally. Touching other levers may cause danger due to unexpected machine movement.
•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 to the "LOCKED" position, the hydraulic system is shut down.



"LOCKED" position

Unlocking hydraulic system (B)
When the lever is set to the "UNLOCKED" position, the hydraulic system is unlocked.



"UNLOCKED" Position

IMPORTANT

•When the pilot control shut-off lever is set to the "LOCKED" position, the attachment, swing motor and dozer do not work.
•The pilot control shut-off lever is installed only on the left side.

2.5.3 CONTROL LEVER

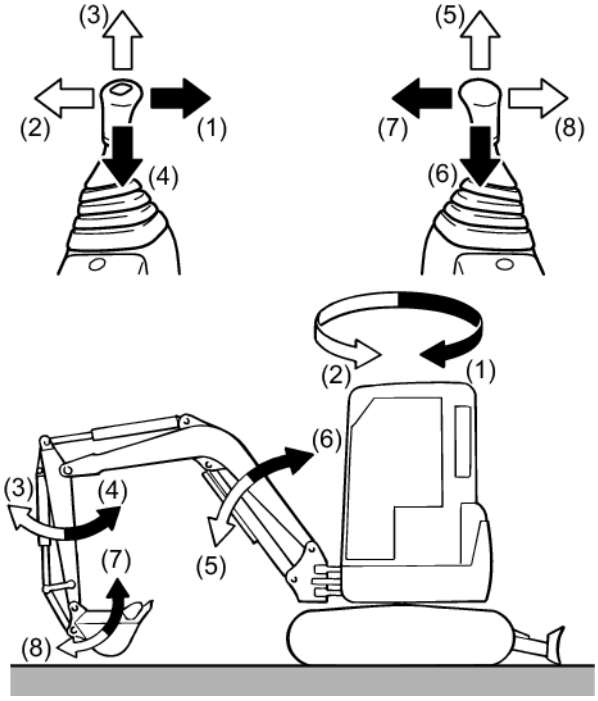
WARNING **CONTROL PATTERN OF LEVERS**

•Before operation, be sure to pay attention to the surroundings and operate each lever to ensure that the machine movement is in accordance with the control pattern indicated on the control pattern labels.
•If you operate the machine while the control pattern labels do not match the actual machine movement, it may cause severe accident resulting in severe injury.
•When the labels do not match the actual machine movement, replace them with proper ones.

These two levers activate operations as illustrated in the right. Release the hands to return the levers to the neutral positions and stop the attachment moving. It is possible to perform various operations at the same time.

ISO Pattern

•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 they are.
•Right control lever
(5)Boom down
(6)Boom up
(7)Bucket in
(8)Bucket out
N (Neutral): Boom and bucket are held in the position where they are.



BHL Pattern

•Left control lever

(1)Swing right

(2)Swing left

(3)Boom down

(4)Boom up

N (Neutral): Upper structure and boom are held in the position where they are.

•Right control lever

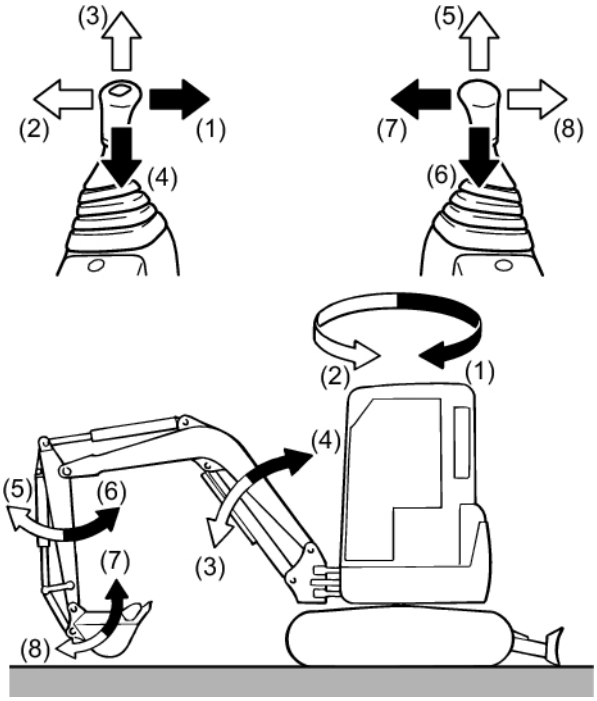
(5)Arm out

(6)Arm in

(7)Bucket in

(8)Bucket out

N (Neutral): Arm and bucket are held in the position where they are.



2

Notice

•The operations of the boom and arm are different between the ISO and BHL patterns.

•For how to switch the rotary multi-control valve (ISO/BHL), see Chapter 3 "MACHINE OPERATION".

•For how to switch the rotary multi-control valve, see Chapter 8 "OPTIONAL EQUIPMENT".

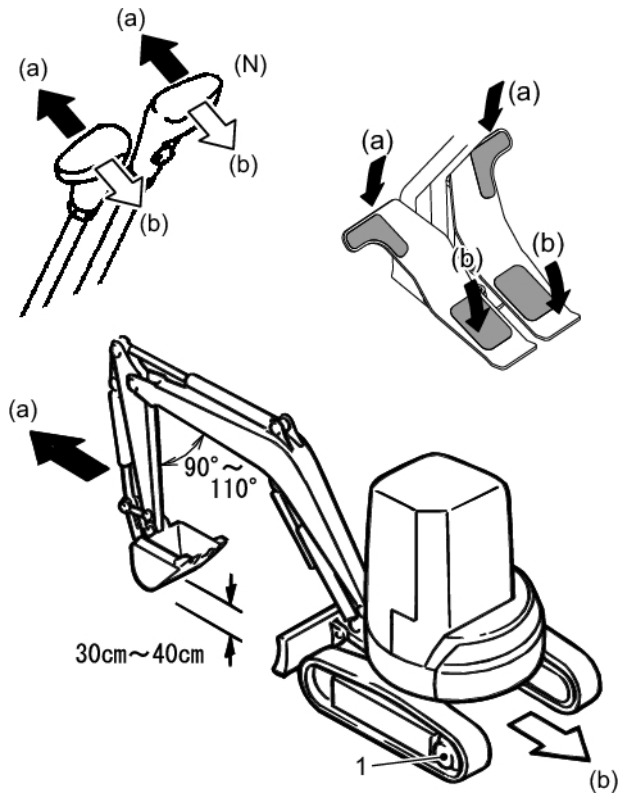
2.5.4 TRAVEL LEVER & PEDAL

WARNING **HANDLING OF THE TRAVEL LEVER & PEDAL**

•Use caution 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 travel motor (1) is located on the front side, the travel lever functions will be opposite.
•If you put your foot on a pedal during work, there is a possibility of severe injury because the machine will start abruptly if the pedal is depressed unintentionally.
Do not put your foot on a pedal, except for driving or turning with pedals.
•Pay attention when driving and operating with pedals.

The manual levers and travel pedals are used for the travel operation of this machine.

Use these travel levers to switch the travel direction forward or backward.
・(a) Forward: Push travel levers toward front (Depress the forward of travel pedals)
・(b) Reverse: Pull travel levers toward yourself (Depress the backward of travel pedals)
・(N) Neutral: The machine stops traveling.



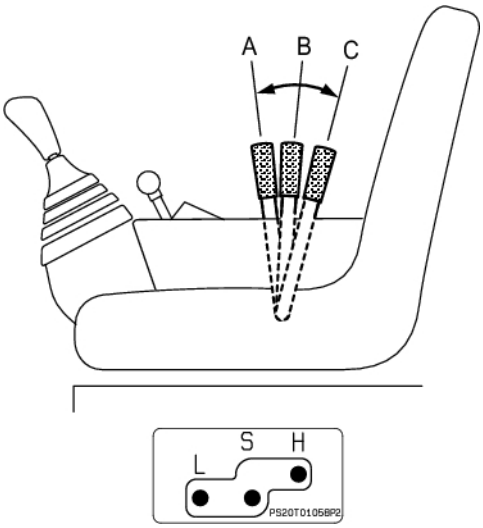
TRAVEL ALARM
While traveling, the travel alarm sounds to inform surrounding workers of the machine movement.

CAUTION

If the travel alarm does not sound when travel levers (or pedals) are operated, stop the engine immediately and contact KOBELCO authorized dealer/distributor near you for repair.
If you continue working with the broken travel alarm, it may cause severe injury.

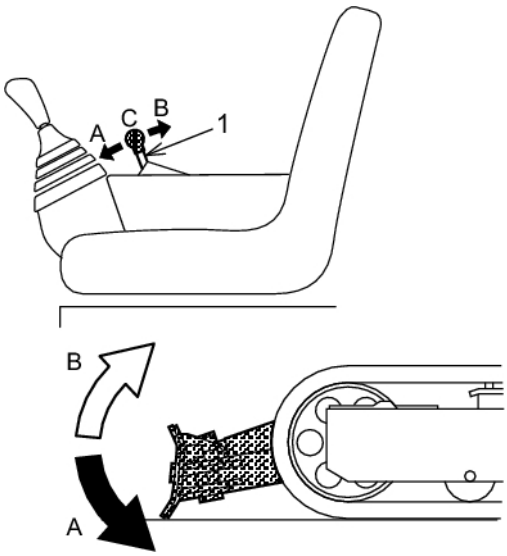
2.5.5 ENGINE THROTTLE LEVER

This lever is used to adjust the engine speed (output).
A: L (Low idle)
The lever is in the L position.
(The speed drops.)
B: S (S mode)
The lever is in the "S" position.
S mode focuses on the low fuel consumption operation.
C: H (High idle)
The position where the lever is fully pulled backward.
From the S mode position, pull the lever to the right and then backward.
(The speed is maximized.)



2.5.6 DOZER CONTROL LEVER

The dozer can be operated by using the dozer (1)control lever on the right side of the operator's seat.
Dozer control lever (1) returns to the neutral position if it is released and the dozer can be kept at the same position at that time.



Dozer Operation

Operation	Movement
Push the lever (A)	Dozer blade down
Pull the lever (B)	Dozer blade up
Neutral (C)	Hold

Precautions for Dozer Operation

This dozer is dedicated to a hydraulic excavator.

Comply with the following precautions and take enough care to handle it.

1. This dozer is designed for simple dozing operation. Do not use it for extreme digging. It could cause damage on the dozer as well as the travel system.
2. Do not apply concentrated or offset load on the dozer. Be sure to avoid collisions during traveling because they can damage the dozer and travel system.
3. When using this dozer to lift up the machine, make sure that the supporting ground is strong enough.
   Such operation may increase the ground contact pressure locally to weaken the ground. Be sure to ground the dozer bottom evenly, avoiding offset or concentrated load.
4. If you perform digging at the dozer size (or front side), the bucket may interfere with the dozer. Take enough care in that case.

WARNING

•Do not touch the lever unless you perform the dozer operation. Touching it accidentally may cause severe injury.

•If you stop the engine with the dozer raised and then push the dozer control lever, the dozer will fall.

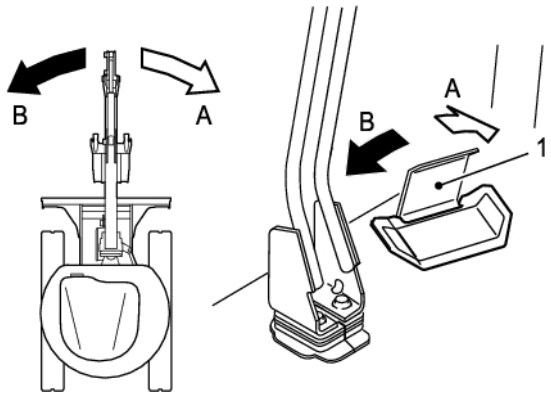
2.5.7 BOOM SWING FOOT PEDAL

This pedal is used for boom swing operation.

WARNING

When you do not perform the boom swing operation, lock the pedal. If you touch the unlocked pedal accidentally, it may cause severe accident.

A: Right swing (Depress the right side)
B: Left swing (Depress the left side)



IMPORTANT

To lock the pedal, pull down cover (1) above the pedal toward yourself.

2.6 HANDLING OF FUSE BOX

2.6.1 ABOUT FUSE & RELAY BOX

The fuses protect the wiring and electrical components from burn out due to excess current. If the electrical system does not work properly, check to replace any blown fuses with new ones.
If there is a corroded fuse generating white powder on it, or if some looseness exists between a fuse and its fuse holder, replace it as well.

2.6.2 REPLACING FUSES

IMPORTANT

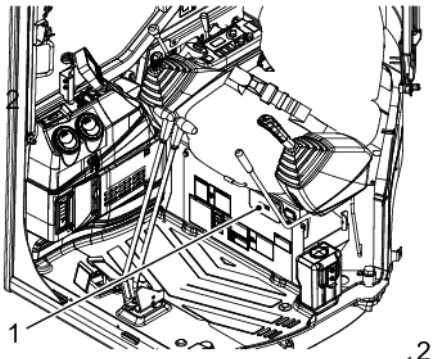
•The spare fuses are stored in the fuse & relay box.
•A fuse must be replaced with a one of the same type and of the blown fuses. If the capacity is different, it may cause damage to the electrical system. If fuse replacement is frequently required, it may be due to a failure in the electrical system. Please contact KOBELCO authorized dealer/distributor.

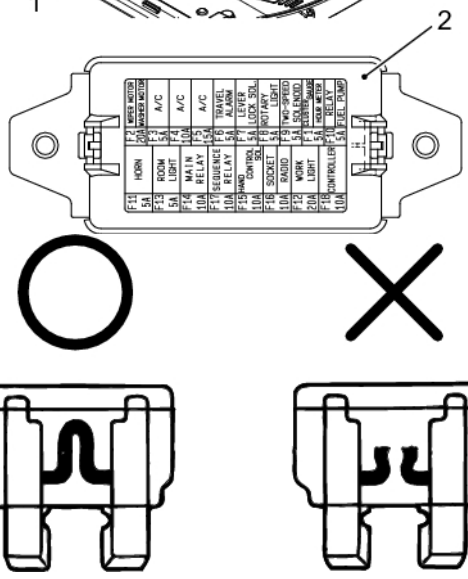
CAUTION

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

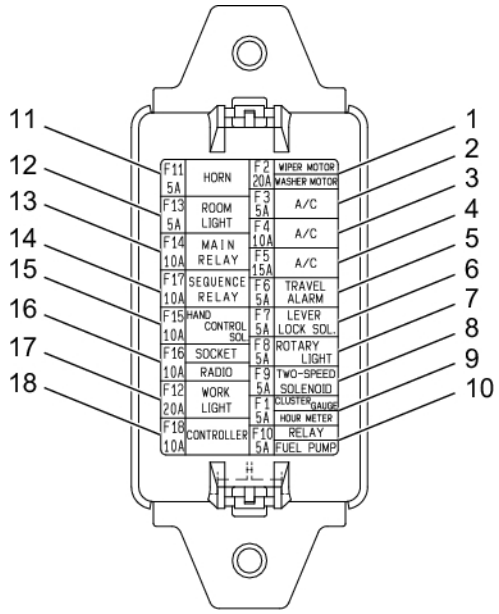
The main fuse box is positioned inside the seat stand cover.

1. Lower the bucket to the ground.
2. Move the pilot control shut-off lever to the "LOCKED" position.
3. Turn the starter switch "OFF" to stop the engine.
4. Remove grommet (1).
5. Fuse box cover (2) can be locked. If it is locked, unlock to remove it.
6. If a fuse looks like the figure below (right), it is blown. Replace it with a spare fuse stored in the fuse box.
7. After fuse replacement, be sure to push the lock of the fuse box cover until it clicks.





2.6.3 FUSE CAPACITY AND CIRCUIT NAME



No.	Capacity	Circuit Name	No.	Capacity	Circuit Name
1	20A	Wiper motor, washer motor	10	5A	Relay, fuel pump
2	5A	Air conditioner	11	5A	Horn
3	10A	Air conditioner	12	5A	Room lamp
4	15A	Air conditioner	13	20A	Main relay
5	5A	Travel alarm	14	10A	Sequence relay
6	5A	Lever lock solenoid	15	10A	Hand control solenoid
7	5A	Rotating beacon	16	10A	Socket, radio
8	10A	Travel in HIGH (2nd) speed, solenoid	17	20A	Working light
9	5A	Gauge cluster, hour meter	18	10A	Controller

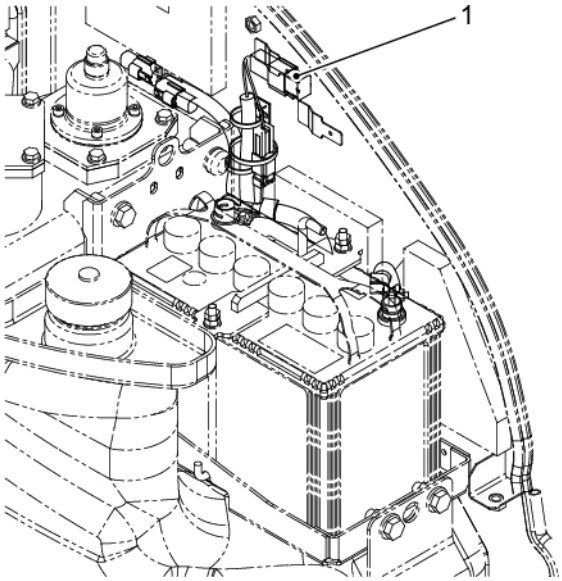
2.7 HANDLING OF FUSIBLE LINK (FOR STARTER)

IMPORTANT

The fusible link is a fuse wiring of big size provided in a large capacity circuit.
As with normal fuses, it protects electrical components and wiring from burn out due to excess current.

In case the starter does not work when the starter switch is turned "ON", disconnection of the fusible link is suspected. Check and replace it as needed.

1. Fusible link



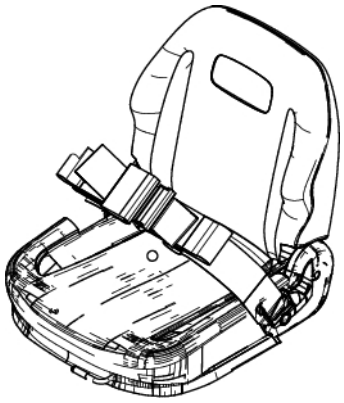
2.8 HANDLING OF SEAT BELT

WARNING **INSTALLATION 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 seat belt.
•Check attaching bolts which are used to secure the belt to the seat for loosening and tighten loose bolts again.
•Change the seat belt every three years, even if there is no abnormality in the appearance. The manufacturing date is woven into the back side of the belt.
•Do not fail to fasten the seat belt during operation.

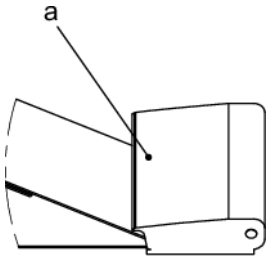
2.8.1 HOW TO FASTEN SEAT BELT

1. Check that the seat belt is not twisted, and insert it into buckle until it clicks.
2. Adjust the seat belt to remove excess slack.



2.8.2 HOW TO UNFASTEN SEAT BELT

- To unfasten the seat belt, pull "a" of the buckle.

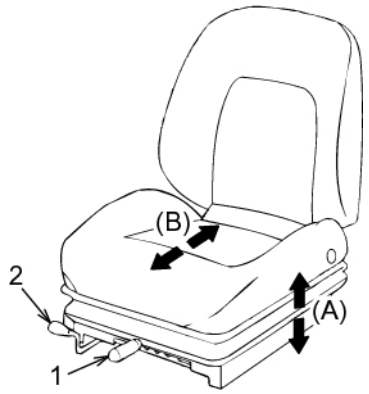


2.9 HANDLING OF OPERATOR'S SEAT

The position of operator's seat can be adjusted back and forth/up and down. Adjust them to the position at which you can operate the control levers and pedals easily.

CAUTION

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



2.9.1 WEIGHT ADJUSTMENT (A)

To ensure a comfortable ride and protect from vibration, it is important to set the suspension according to your own weight.
There are five weight adjustment levels to select from. Pull up and slide the handle (1) horizontally, release it in the position that matches your weight, and then check that the seat is locked securely.

2.9.2 SEAT FORE AND AFT ADJUSTMENT (B)

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

2.10 OPERATOR CAB

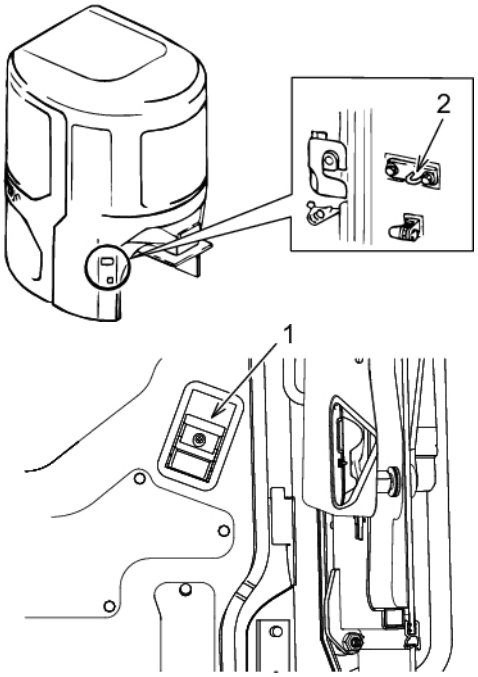
WARNING **LEAVING OPERATOR'S SEAT**

When necessary to leave from the operator's seat, lock the pilot control shut-off lever.
If the control lever is unexpectedly touched without the pilot control shut-off lever locked, it may cause severe accident resulting in severe injury.

2.10.1 CAB DOOR LOCK

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

1. To lock an open door, fully open it until it is locked into catch (2) in the rear of the cab.
2. To close the door, pull lever (1) inside the door to release the catch.

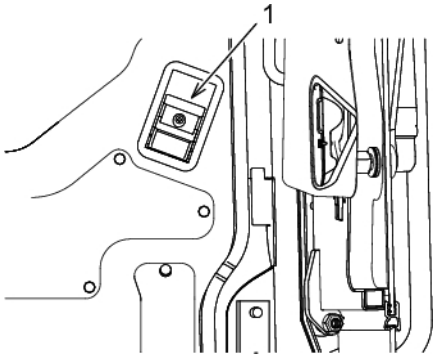


CAUTION

In operation, lock the door securely either open side or close side. If not locked, the door may open or close unexpectedly and this may cause danger and failure of the machine.

2.10.2 OPENING DOOR FROM INSIDE OF CAB

To open the door from the inside of the cab, pull lever (1) to open the door.



2.10.3 RETRACTING UPPER FRONT WINDOW

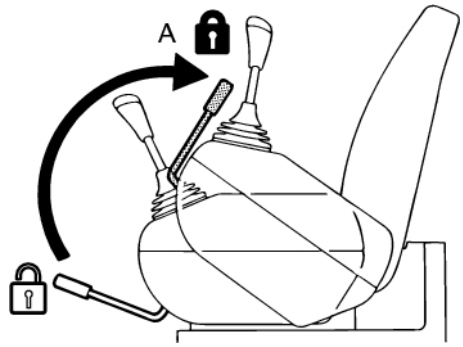
WARNING **RETRACTING UPPER FRONT WINDOW**

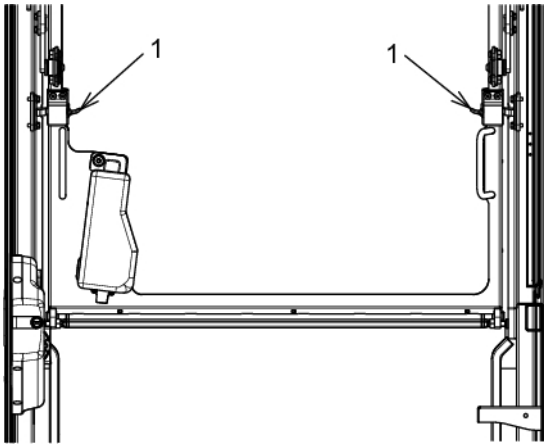
•The front window should be opened and closed in the condition where the machine is parked in level and locked securely. If the lock is released in the forward tilting position of machine there is a possibility of falling of the front window.
•When closing the front window, the closing speed increases due to the weight of front window. Hold and close it by both hands securely.
•When retracting the front window in, pull up the pilot control shut-off lever to the "LOCKED" position and stop the engine.

CAUTION

To prevent from catching your hand between windows, open and close the front window slowly. It is dangerous to work with the front window not or incompletely locked. Confirm that the front window is surely locked.

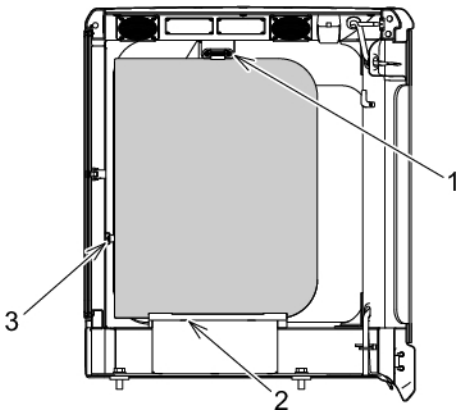
1. Park the machine on the level ground, put the bucket on the ground, pull up the pilot control shut-off lever to the "LOCKED" position and stop the engine.
2. Push down lock lever (1) on the both sides of the upper front window to release the lock.
3. Hold the left and right handles, and pull up and move the upper front window to the end on the rear side of the roof until it is locked.
4. To close the upper front window, perform the reverse procedure of the above steps 2 and 3.





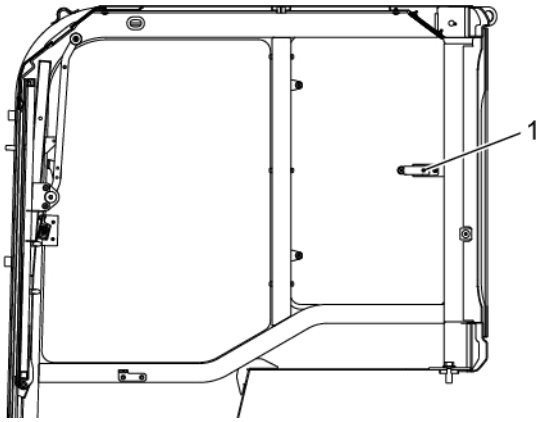
2.10.4 RETRACTING LOWER FRONT WINDOW

1. After retracting the upper front window in ceiling, hold the lower front window by hands and remove it from the window frame.
2. Securely retract the removed lower front window by applying the glass to stopper (3), inserting the glass into holder (2) in the rear of the cab, and fixing it with lock (1) in the upper part of the window frame.



2.10.5 OPENING/CLOSING WINDOW ON RIGHT SIDE

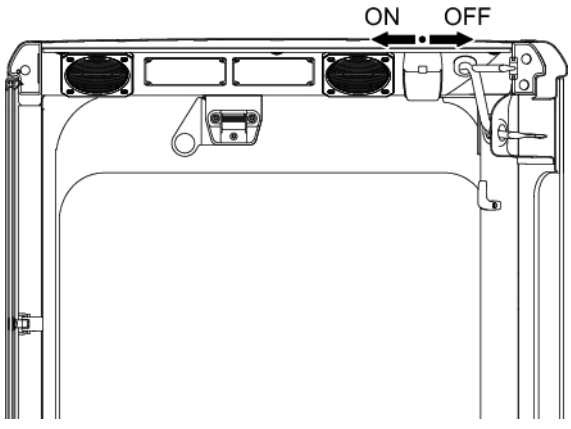
1. Release lock (1) to open the window.
2. Move lock (1) to the "LOCKED" position to close the window.



2.10.6 CAB ROOM LAMP

Operate the switch in accordance with the purpose.

- ON : The lamp turns on.
- Neutral : The lamp turns on when the door opens and turns off when the door closes.
- OFF : The lamp does not turn on.



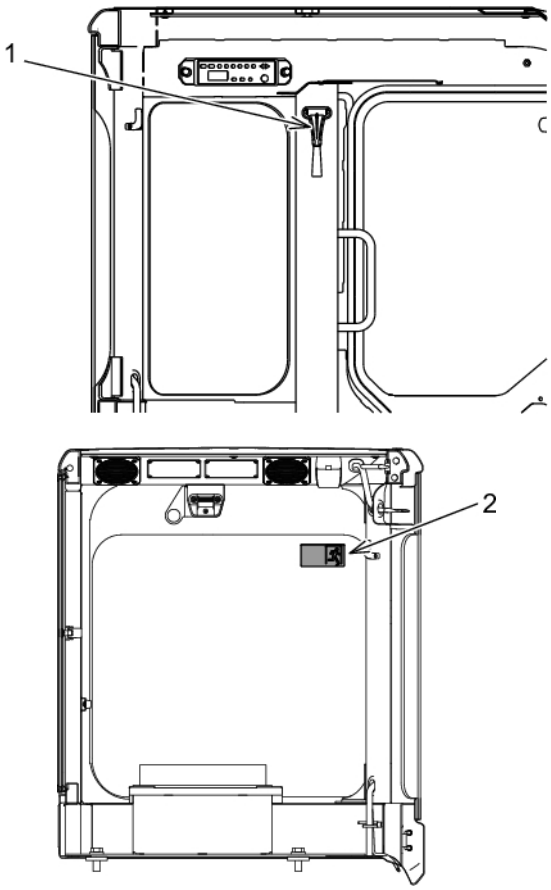
2.11 EMERGENCY ESCAPE FROM OPERATOR'S STATION.

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

Notice

For how to open the front window, see "RETRACTING UPPER FRONT WINDOW".

1. Open the front window and escape through the front window.
2. If the front window cannot be opened, break the front window glass by using hammer for emergency exit (1) placed on the left of the cab.
3. If the front window is unavailable to escape, break the rear window glass by using hammer for emergency exit (1).



Rear Window of Cab (Inside)

CAUTION

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

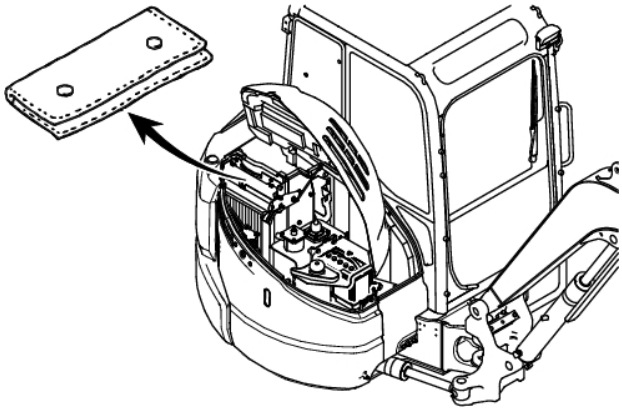
IMPORTANT

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

2.12 OTHER EQUIPMENT (ACCESSORY)

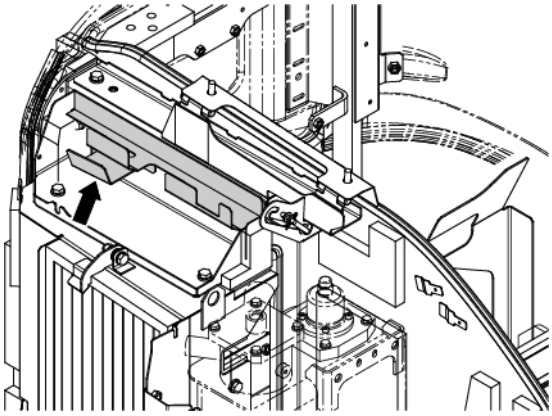
2.12.1 TOOLS

The tools are stored inside of the right side cover. For the introduction of each tool, see "NECESSARY TOOL" in Chapter 4.



2.12.2 GREASE GUN HOLDER

The grease gun holder is positioned inside of the right side cover. When the gun is not used, put it on this holder.



2.12.3 GUARD AND SIDE COVER (WITH LOCK LEVER)

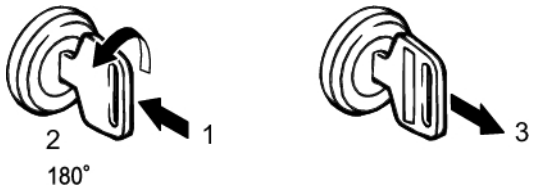
CAUTION

Be sure to stop the engine before opening the engine hood or side cover.

The engine hood, fuel inlet, right side cover and cab door (option) are provided with the lock mechanism. To open/close them, use the starter key.
When using the starter key, fully insert it and then turn it. If it is not fully inserted, it may be broken.

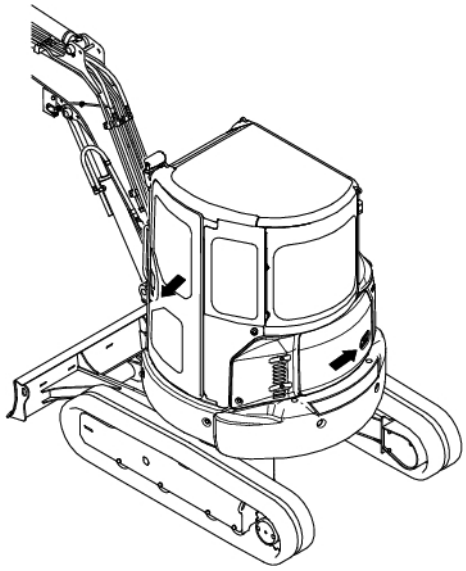
HOW TO UNLOCK AND OPEN GUARD

1. Insert the starter key into the keyway.
2. Turn the starter key counterclockwise and pull the door handle to open the door.
3. If the door is provided with a stay, support the door securely using the stay.



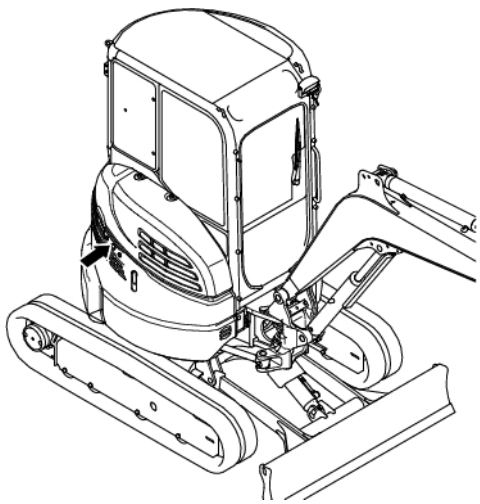
HOW TO LOCK GUARD

- If a stay is provided, return the stay to the original position.
- Close the door.
- Turn the starter key clockwise and remove it.



HOW TO OPEN/CLOSE SIDE COVER

- When you turn the starter key clockwise, the lock is released and you can open the side cover.
- When you close the side cover, it is automatically locked.



3. MACHINE OPERATION

3.1 EVERYDAY CHECK-UP

The check-up should be done before starting the engine.
Before starting the engine, look around this machine to check for any loose nuts and bolts, any hydraulic oil, fuel or coolant leakage, and the condition of the attachment and hydraulic system.
Check for any looseness in the electrical wiring and for any accumulated material (leaves, dirt, etc.).

WARNING MACHINE FIRE PREVENTION

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 KOBELCO authorized dealer/distributor.

- Check the engine for any oil, fuel or coolant leakage. Repair as required.
- Check the area around the engine and radiator for any accumulated material and remove as required.
- Check the hydraulic device, hydraulic oil tank, hoses and joints for oil leakage, and repair as required.
- Check the travel system, such as the crawler, front idlers and sprockets, for any damage or wear, and the bolts for looseness.
- Check the attachments, dozers, cylinders, linkages and hoses for any crackings, wear or looseness, and repair as required.
- Check the guards, steps and handrails for damage, and the bolts for looseness. Repair and tighten them as required.
- Verify that the gauges and the monitor panel function properly, and replace them as required.

3.2 CHECK BEFORE STARTING ENGINE

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

3.2.1 CHECKING COOLANT LEVEL FOR SHORTAGE AND MAKING UP

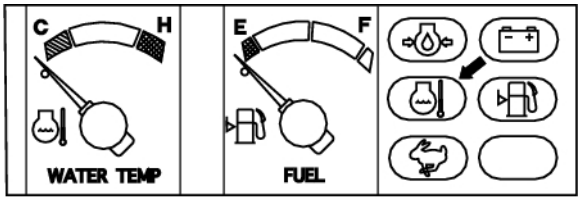
WARNING **HANDLING OF RADIATOR**

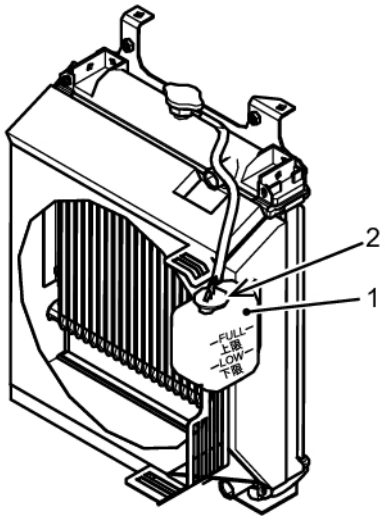
•Do not open radiator cap if not required.
Check coolant level of the reserve tank (1) when engine is cooled down.
•After the engine stops, the coolant is hot and the high pressure is accumulated in the radiator. Removing the radiator cap under this condition may cause burns.
Allow the engine to cool down before removing the radiator cap.
•If the water level in the reserve tank drops frequently, immediately contact KOBELCO authorized dealer/distributor for assistance.

CAUTION

If the engine coolant temperature lamp is lit on the monitor panel when the engine is running or when the engine switch is turned ON, loosen the radiator cap and pour coolant water to the neck of the radiator cap. Then contact KOBELCO authorized dealer/distributor for assistance.

1. Coolant water reserve tank (1) is located on the right rear side of the machine.
2. Open the engine food with the starter key and check that the coolant level falls within the range of FULL - LOW of reserve tank (1). If the water level is low, remove filler cap (2) of the reserve tank and pour coolant water to FULL level.
3. After supply, tighten the cap securely.
4. If the reserve tank is empty, check it for water leaks and 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. Then immediately contact KOBELCO authorized dealer/distributor for assistance.
5. Close the engine food and lock it with the starter key.





IMPORTANT

Be sure to check the coolant level on the cold engine before starting it. While the engine is warmed, an accurate water level cannot be get since the radiator water moves to the reserve tank due to a rise in water temperature. As the engine is cooled, the water level returns to normal.

3.2.2 CHECKING ENGINE OIL LEVEL AND REFILLLING

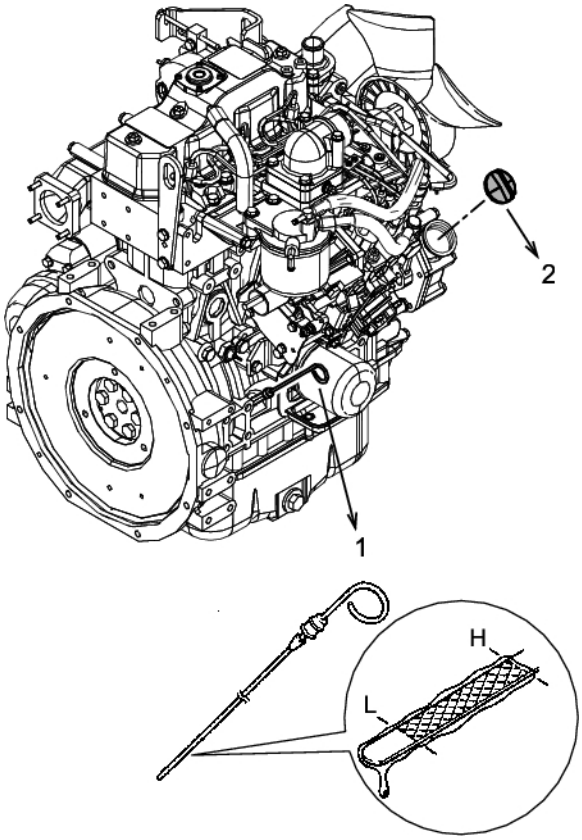
WARNING **TEMPERATURE AFTER STOPPING ENGINE**

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.

IMPORTANT

•Make sure the machine is on firm level when checking engine oil level.
•Always be 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.

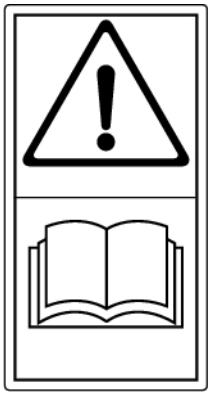
1. Use the starter key to open the engine hood.
2. Pull out oil level gauge (1) and wipe oil with a clean cloth. Then insert and pull out it again. If the oil level falls within the range of "H (Upper Limit)" - "L (Lower Limit)" on the oil level gauge, it is normal. If the oil is contaminated or deteriorated, change it ahead of the periodic change. For engine oils to use, see "LUBRICANT, FUEL & COOLANT SPECIFICATIONS" in Chapter 4.
3. If the level is under the L level, remove oil filler cap (2) to make up the engine oil for the shortage. After refuel, check the oil level again.
4. Wipe filler cap (2) with a clean cloth and attach it in place.
5. Close the engine food and lock it with the starter key.

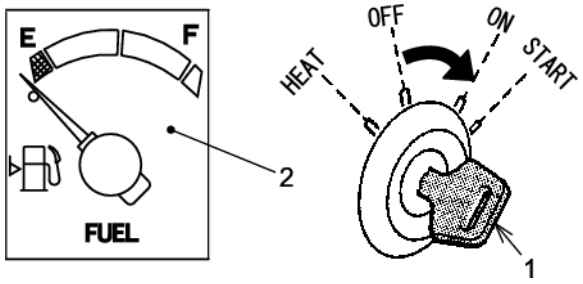


3.2.3 CHECKING FUEL LEVEL AND MAKING UP

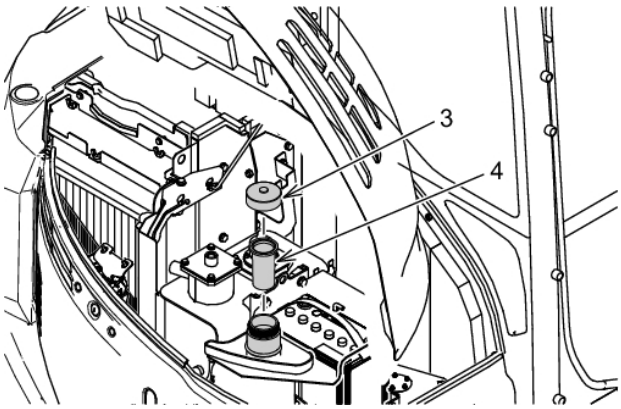
WARNING **MAKING UP**

•Use the light oil only. Check the fuel type again before refilling.
•Be sure to stop engine before refilling.
•Do not overflow fuel while refilling. Wipe off spilled fuel to prevent a fire.





1. When the engine is not running, turn starter switch (1) to the "ON" position to turn on the monitor panel.
2. Check fuel level meter (2) for shortage. If shorted, open the right side cover and then remove filler cap (3) of the fuel tank.
3. Fill the fuel tank with the fuel through the filler port.
   For fuel (capacity) to use, see "LUBRICANT, FUEL & COOLANT SPECIFICATIONS" in Chapter 4.
4. When dirt is adhered on strainer (4), take out the strainer, wash it with light oil or clean it with air gun, and then fit it to the filler port again.
5. After refilling, tighten filler cap (3) securely. Close the hydraulic oil tank cover and lock it with the starter key to finish the work.

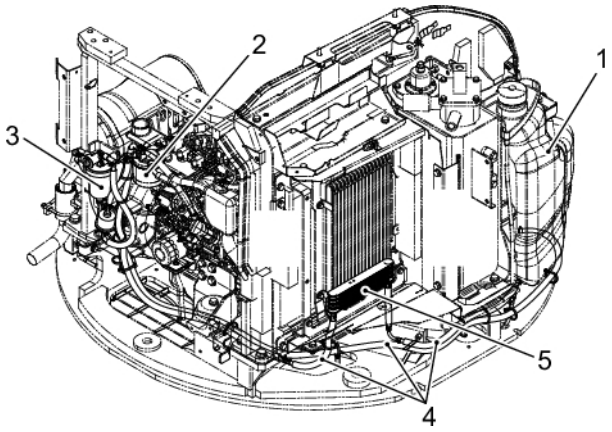


Refill the fuel tank to the maximum after finishing work for a day.

3.2.4 CHECKING FUEL LEAKAGE

Fuel leakage could be caused by a failure of drain plug, a cracking of fuel system hoses, or looseness of hose clips. Check the fuel tank and the surrounding of the engine. If a fuel leakage is detected, be sure to stop the engine and contact KOBELCO authorized dealer/distributor.

1. Fuel tank
2. Fuel filter
3. Water separator
4. Fuel hoses
5. Fuel cooler



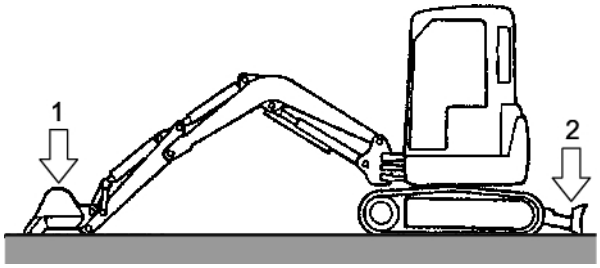
3.2.5 CHECKING HYDRAULIC OIL LEVEL AND MAKING UP

WARNING **PRESSURE WITHIN HYDRAULIC OIL TANK**

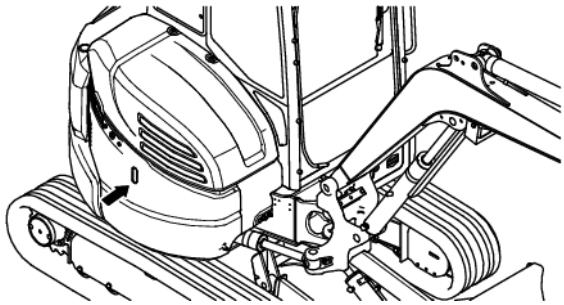
There is a danger because the inside of hydraulic oil tank is heated and pressurized. Before removing the filler port plug, stop the engine and then press the valve head on top of the rubber cap to release the pressure in the hydraulic oil tank.

1. Select the level and firm ground and place the machine in the hydraulic oil inspection position (shown to the right), and then stop the engine.
   1. Bucket
   2. Dozer
2. Check the oil level through the sight level gauge provided on the side of the hydraulic oil tank. If the reading falls within the range of "H" - "L", the oil level is normal.
   The oil level varies depending on the oil temperature. Use the following rough indications.

   Before operation: Near the "L" level (oil temp. 10 to 30 degrees C)
   During normal operation: Near the "H" level (oil temp. 50 to 80 degrees C)



Hydraulic oil inspection position



IMPORTANT

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

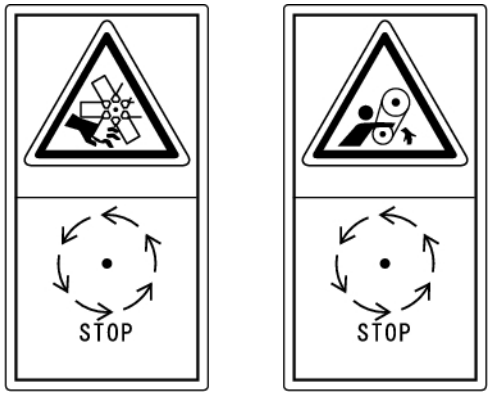
Notice

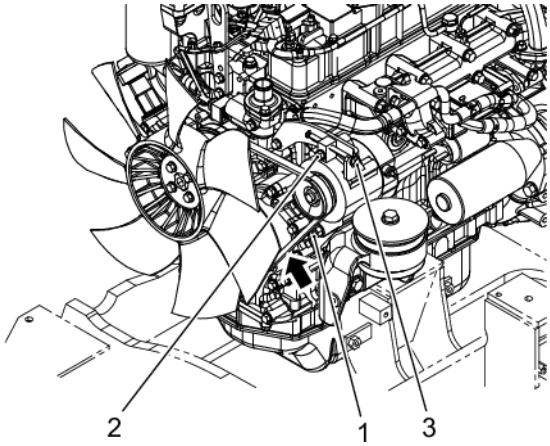
For make up procedure of the hydraulic oil, see "5000 HOUR INSPECTION & MAINTENANCE PROCEDURES" in Chapter 4.

3.2.6 CHECKING FAN BELT

WARNING INSPECTING AND MAINTAINING THE BELT

Rotating parts such as the fan and belt could catch your body part, resulting in severe injury.
Stop rotation completely before maintenance.





Check the fan belts for their tension, wear and damage.
Insufficient belt tension may cause a battery charge failure, engine overheating, or early wear of the belt. On the other hand, excess belt tension may cause damage to the bearing or belt.
To check the belt tension, press on the center of the belt with your thumb. If the deflection falls within the range shown in the table, it is normal.

For inspection and adjustment procedure for each belt, see "250 HOUR (3-MONTH) INSPECTION & MAINTENANCE PROCEDURES" in Chapter 4.

1. Attaching nut
2. Adjusting bolt
3. Adjusting bolt

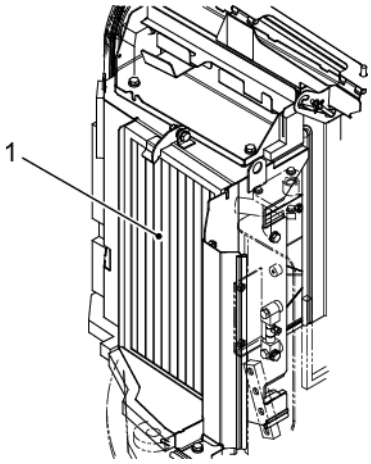
Belt	Tension of new belt	Tension of belt in use	Pushing force
Fan	8 to 12 mm (0.32 to 0.47 inch)	10 to 14 mm (0.39 to 0.55 inch)	98 N (22 lbf)

IMPORTANT

"Belt in use" refers to the belt that has been used for five or more minutes since it is attached to the engine and the engine starts running.

3.2.7 CHECKING RADIATOR, OIL COOLER CORE AND FILTER

1. Open the side cover at the right side of the machine.
2. Check filter (1) visually for mud, dust, and leaves.



IMPORTANT

If the filter is extremely dirty, cooling performance is decreased. Clean it referring to "CLEANING RADIATOR, OIL COOLER CORE AND FILTER" in Section "250 HOUR (3-MONTH) INSPECTION & MAINTENANCE PROCEDURES" in Chapter 4 "MAINTENANCE"

3.3 CHECKING LAMP

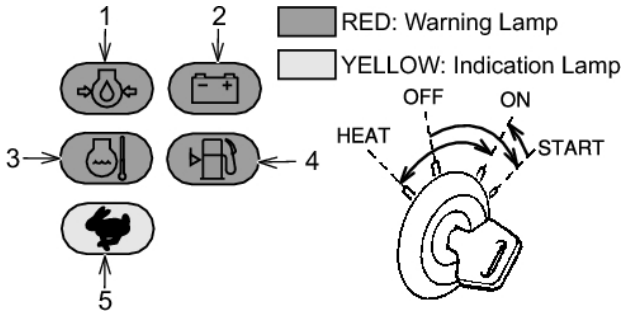
3.3.1 Checking Function of Warning Lamps

WARNING

Touching any control levers unintentionally may cause unexpected movement of the machine. Set the pilot control shut-off lever to the "LOCKED" position before standing up or moving.

Before starting the engine, check the operation of the warning and display lamps according to the following procedures.
For the description for each lamp, see "MONITOR PANEL" in Chapter 2.

1. Make sure the pilot control shut-off lever is in the "LOCKED" position.
2. Make sure all control levers are in the "NEUTRAL" position.
3. Insert the starter key into the starter switch and turn it to each of the "HEAT", "ON" or "START" position. If each warning lamp operates as shown in the table below, it works properly at each position.
4. If any warning or display lamp does not operate properly, the engine or electrical circuit components may be broken. Stop using the machine and immediately contact KOBELCO authorized dealer/distributor for repair.

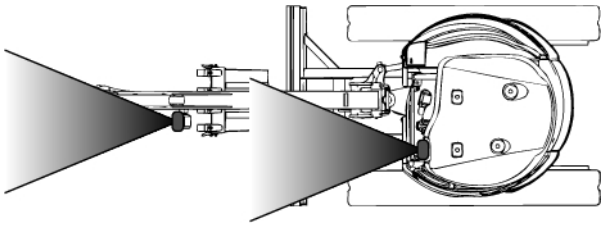


Starter key / Operation / Lamp		OFF→HEAT Preheat	OFF→ON Before start	START→ON Just after start
1	Engine oil pressure lamp	Unlit	Lit	Unlit
2	Battery charge lamp	Unlit	Lit	Unlit
3	Engine coolant temperature lamp	Unlit	Unlit	Unlit
4	Fuel level lamp	Unlit	Unlit	Unlit
5	Travel in HIGH (2nd) speed lamp	Unlit	Unlit	Unlit

IMPORTANT

Be sure to check that the warning and display lamps operate properly before operation.

3.3.2 CHECKING WORKING LIGHT



While the starter switch is in the "ON" position, press the working light switch to turn on the working lights on the boom and on the left side of the front (cab only).
If they do not light, presumably light bulbs are burned out or electrical wire is broken. Contact KOBELCO authorized dealer/distributor for repair.

3.4 STARTING ENGINE

WARNING

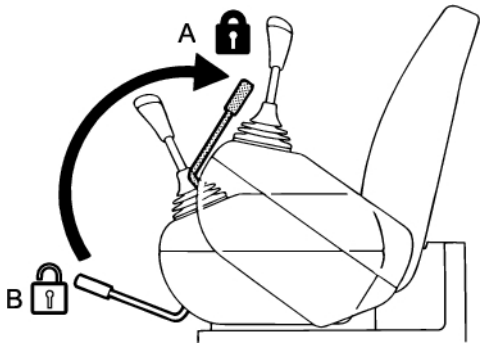
After making sure that no one is stayed and no obstacle is left around the machine, sound horn and start the engine.

IMPORTANT

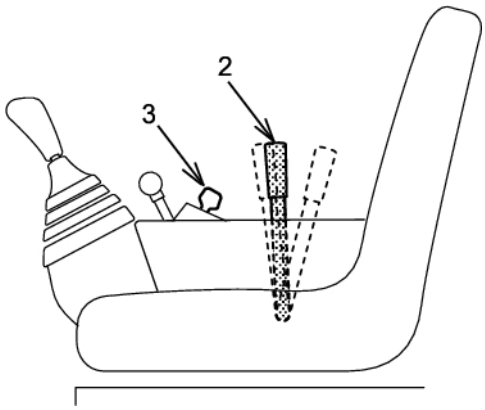
Do not hold the starter switch in the START position for more than 15 seconds. If the engine does not start, return the starter switch to the "OFF" position, wait at least 30 seconds, and then try it again. If this procedure is not followed, it will cause a starter failure and battery discharge.

3.4.1 START-UP UNDER NORMAL CONDITIONS

1. Make sure the pilot control shut-off lever (1) is in the "LOCKED" position (A).
2. Make sure all control levers and pedals are set to the "NEUTRAL" positions.
3. Move engine throttle lever (2) to a "position slightly higher than the low idle position".
4. Turn starter switch (3) to the "START" position to start the engine.
   Release the hand from the starter key immediately after the engine starts. The starter key will return to the "ON" position by itself.



"LOCKED" position

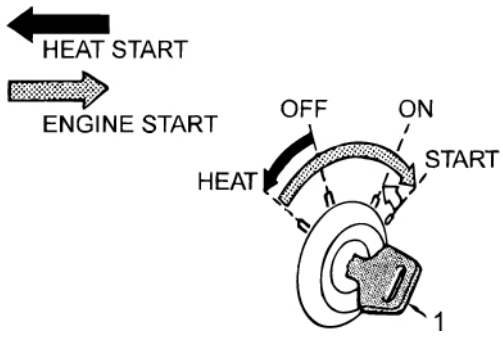


Position slightly higher than the low idle

3.4.2 START UP IN COLD CONDITIONS

In cold weather, due to 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. Perform the steps 1 to 3 described above in Paragraph "START-UP UNDER NORMAL CONDITIONS".
2. Turn starter switch (1) to the "HEAT" position to start preheating. After preheating of about 15 seconds, the engine can be started more easily.
3. Turn starter switch (1) to the "START" position to start the engine.
4. When the engine starts, release the hand from starter switch (1). The starter key will return to the "ON" position by itself.
5. After the engine speed is stabilized, move the engine throttle lever to the low idle position to warm up the engine.



IMPORTANT

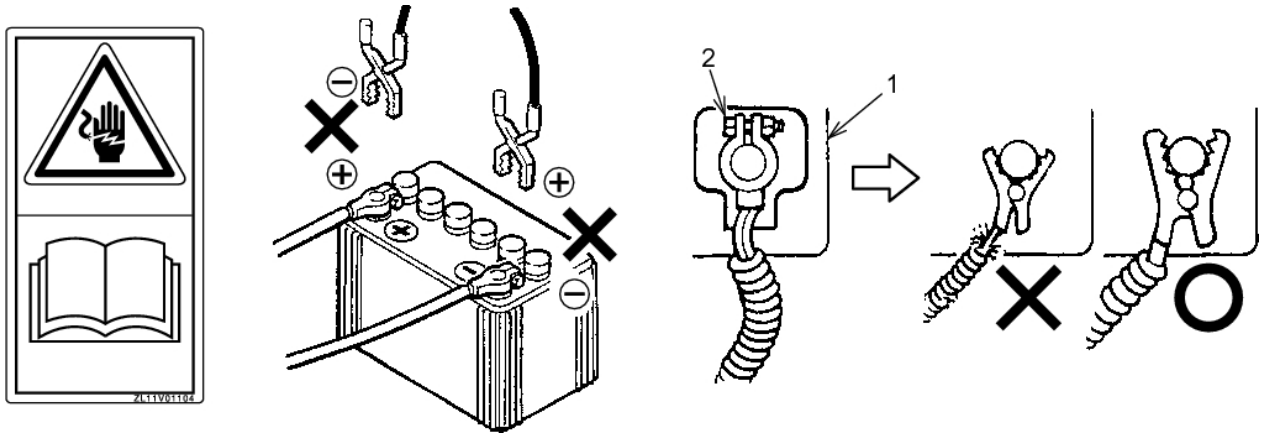
In cold weather, a white smoke may appear immediately after the engine starts. It is normal and it disappears after a little while.

3.4.3 USING JUMPER CABLES

Observe the following precautions when using jumper cables to start a disabled machine.

WARNING **USING JUMPER CABLES**

・Combustible gas (hydrogen gas) is generated in the battery. Do not allow sparks or flames to come in contact with the battery to avoid catching a fire and triggering an explosion.
・Do not allow the normal machine to come in contact with the disabled one.
・Wear protective glasses and rubber gloves when using jumper cables to start the engine.
・Do not allow the jumper cable clips to come in contact with each other once connected to a battery.
・Do not mistake positive (+) for negative (-) in the jumper cable connection. The negative cable, when finally connected to the engine body (hook, etc.) of the disabled machine, may arc causing sparks. Connect the jumper cable to a ground surface as far as possible from the battery.
・If the battery electrolyte is frozen, do not attempt to start the the engine with another power supply.



1. Battery
2. Bolt

IMPORTANT

・Use the battery of which the capacity is equivalent to that of the disabled machine for the normal machine.
・Select the suitable size for the jumper cables and clips according to battery size.
・Do not use jumper cables that are damaged, i.e., broken insulation, damaged clamps or damaged by corrosion.
・Connect the clip securely.
・Check that the pilot control shut-off lever is in the "LOCKED" position.
・Check that each control lever is returned to the neutral position.
・The starter switches on both boost and disabled machines must be held in "OFF" condition. When the power was connected, it may cause unexpected move of machines and cause accident.

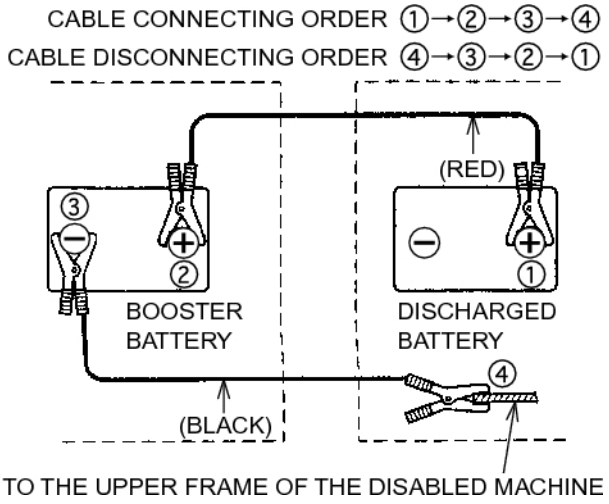
3.4.4 CONNECTING/DISCONNECTING JUMPER CABLES

Turn the starter switch to the "OFF" position (engine stop) and connect the jumper cables according to the procedure below.

WARNING CONNECTING/DISCONNECTING JUMPER CABLES

•Wrong connection of jumper cables may cause explosion of the battery.
•The starting system of this machine is 12 volts. Therefore the boost battery voltage in use should be 12 volts.
The application of high voltage employed for welding machine, etc. may cause damage to the electrical system.

1. Put attachment on the ground, return all control levers to the neutral position and then set the pilot control shut-off lever to the "LOCKED" position.
2. Set the starter switch to the "OFF" position for both the normal machine and the disabled machine.
3. Remove the terminal cover of the battery, and connect the jumper cable (red) clip to the positive (+) terminal on the battery of the disabled machine.
4. Connect the jumper cable (red) clip to the positive (+) terminal on the battery of the normal machine.
5. Connect the jumper cable (black) clip to the negative (-) terminal on the battery of the normal machine.
6. Finally, connect the jumper cable (black) clip (-) to the engine body (hook, etc.) of the disabled machine.
7. Start the engine of the normal machine, and run it for about 10 minutes at high idle. The battery of the disabled machine is partially charged.
8. Start the engine of the disabled machine.
9. Soon after the starting of the engine of the disabled machine, remove the jumper cables in the reverse procedure of the connection.
10. Check and repair the cause of the problem of the charging system on the disabled machine.



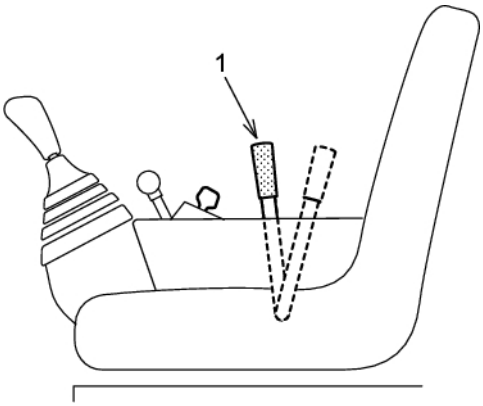
3.5 STOPPING MACHINE ENGINE

To protect the engine, be sure to run the engine for 5 minutes with no load and low speed before stopping the engine.

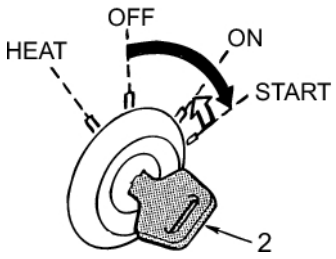
CAUTION

If the engine is stopped when it is running at high speed, the engine temperature rapidly rises, which may cause a failure such as oil deterioration and seal adhesive.

1. Except for special cases, place the attachment on the ground before stopping the engine.
2. Place the pilot control shut-off lever in the "LOCKED" position.
3. Move engine throttle lever (1) back to the "low idle position" to idle the engine for about 5 minutes.
   Be sure to idle the engine which is hot after operation to cool down the coolant temperature.
4. Turn starter key (2) to the "OFF" position to stop the engine.
5. Remove starter key (2).



Low idle position



3.6 CHECK AFTER STARTING ENGINE

Before operation, check and ensure the following items after starting the engine.

WARNING

•Touching any control levers unintentionally may cause unexpected movement of the machine. Set the pilot control shut-off lever to the "LOCKED" position before leaving the cab.
•There is a danger in the inspection after starting the engine. Be sure to confirm the safety of the surroundings.
•When the maintenance or repair is necessary, be sure to stop the engine and put the warning tags "DO NOT START ENGINE!", "DO NOT OPERATE" and "UNDER INSPECTION/MAINTENANCE" on noticeable places.

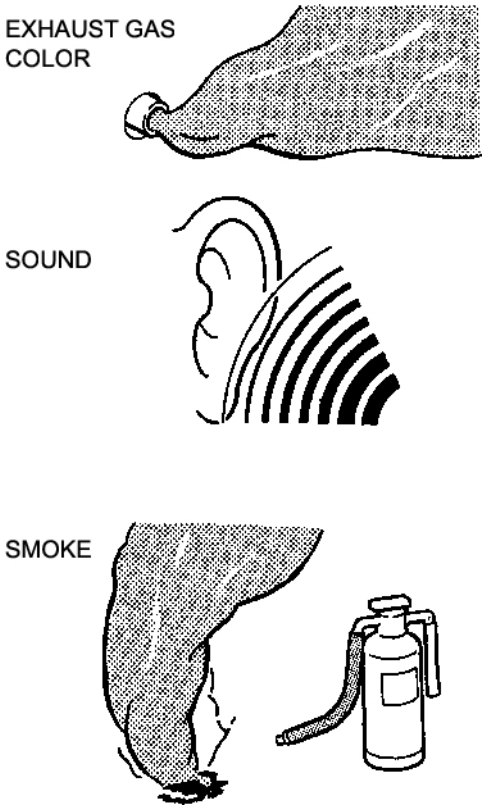
IMPORTANT

•Never apply an excessive load on the new engine for the first 50 hours of operation.
•Confirm that all warning lamps are not lighted.
•Carefully check for any abnormal sound.
•Check the engine for oil or water leakage.
•Warm up the machine for about 5 minutes with no load. It warms up the engine and supply oil to every part.

3.6.1 CHECKING EXHAUST COLOR, SOUND AND ODOR

Perform the following inspections while engine is running.

1. Check that the exhaust color is good during operation.
   Avoid operations with the machine emitting a black smoke continuously. A black smoke means an excessive load on the engine. It may reduce the engine life. Engine adjustments are required if the engine emits a black smoke even under low idle (no load) conditions.
2. Immediately stop and check the engine if you hear an abnormal sound during operation.
   If the operation is continued, it will cause a severe damage. Check the source and cause of the abnormal sound to repair it.
3. Do not operate in a speed generating the sympathetic vibration.
   Vibration may abruptly become large by resonance at a certain speed. Do not use the machine with around that speed to protect parts from being damaged.
4. Immediately stop the engine when a burnt odor or smoke occurs.
   In case of ignition, fight a fire with a chemical fire extinguisher.



IMPORTANT

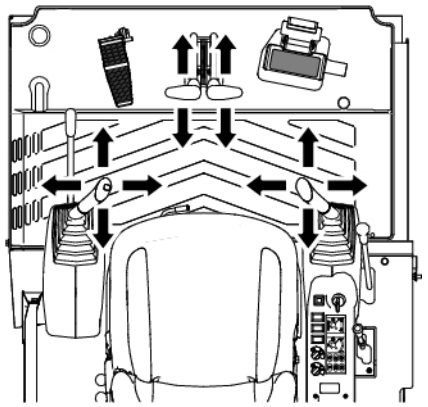
If any abnormalities are found at the inspection, park the machine in a safe area, stop the engine and contact KOBELCO authorized dealer/distributor for inspection and repair.

3.6.2 PILOT CONTROL SHUT-OFF LEVER

IMPORTANT

The proper hydraulic oil temperature for this machine is about 50 to 80 degrees C. Warm up the hydraulic oil to 20 degrees C at minimum before starting the work if the work in a low temperature is unavoidable. It extends the service life of the machine.

1. With the engine running, set the pilot control shut-off lever to the "LOCKED" position.
2. After confirming the safety around the machine, move all control levers.
3. Make sure that the attachment is not operated and swing and travel operations are not performed when the safety control lever is in the "LOCKED" position.

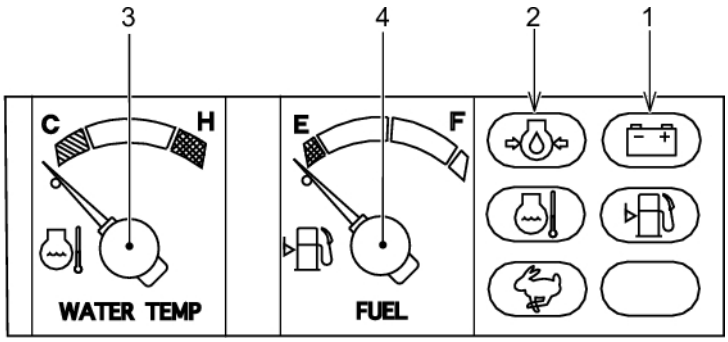


IMPORTANT

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

3.6.3 CHECKING MONITOR PANEL OPERATION

Check that warning lamps of battery charge (1) and engine hydraulic pressure (2) are not lighted.
Check that the pointer of engine coolant temperature gauge (3) and fuel level meter (4) are proper.



3.7 WARMING-UP

3.7.1 ENGINE WARMING-UP

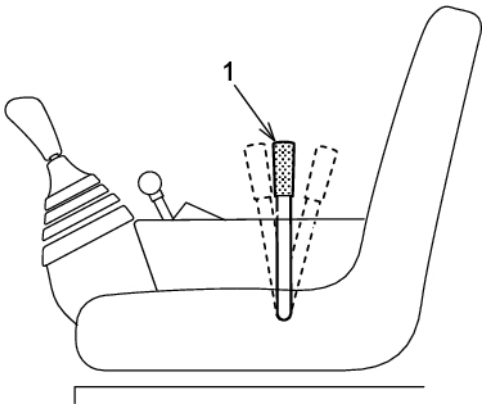
WARNING

•Avoid a dash acceleration of the engine before the warming-up is finished.
•Do not continuously idle the engine for 20 minutes or longer with no load. It may cause a failure and trouble to the engine.

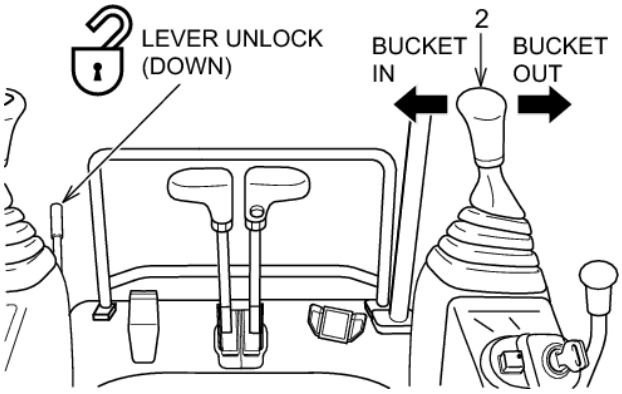
Allow the engine to run for 5 minutes with no load at middle speed by setting the engine throttle lever to the middle between the low and the high idle positions.

3.7.2 WARMING UP HYDRAULIC OIL

The proper hydraulic oil temperature for this machine is about 50 to 80 degrees C. Warm up the hydraulic oil to 20 degrees C at minimum before starting the work if the work in a low temperature is unavoidable.



Middle speed position



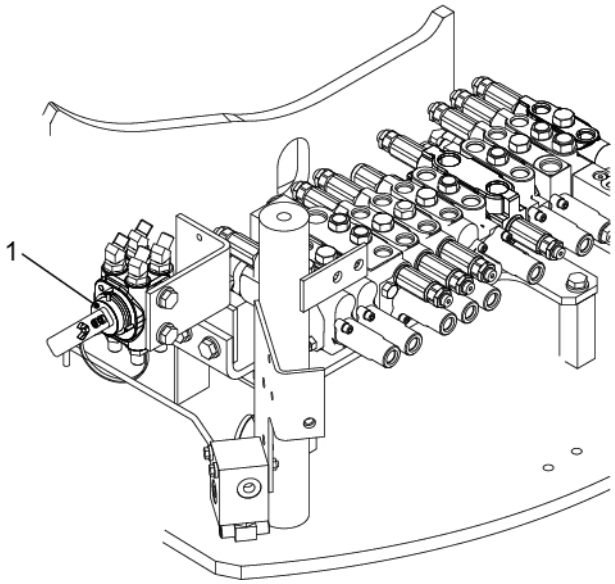
1. Move engine throttle lever (1) to the "middle speed position" to accelerate the engine speed.
2. Make sure that the pilot control shut-off lever is set to the "UNLOCKED" position.
3. Raise the boom to make a sufficient ground clearance.
4. Fully move right control lever (2) to the bucket digging or dumping side and hold the position for about 5 minutes.
5. At the end of warming-up of the hydraulic oil, slowly extend and retract the rod of each cylinder several times, and swing and travel the machine lightly.

IMPORTANT

After warming up the engine, it is also necessary to warm up the hydraulic oil for the best performance.

3.8 ROTARY MULTI-CONTROL VALVE (ISO/BHL)

The control pattern of this machine can easily be switched between two types by the lever of the rotary multi-control valve.

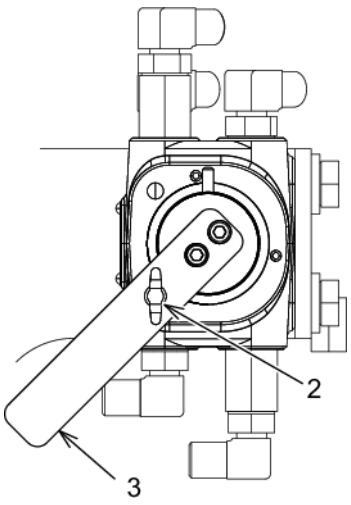


CAUTION

Before switching the rotary multi-control valve, lower the bucket to the ground, place the pilot control shut-off lever in the "LOCKED" position, and stop the engine.

3.8.1 HOW TO SWITCH CONTROL PATTERNS

1. Place the machine in the parking position, stop the engine, and move the pilot control shut-off lever to the "LOCKED" position.
2. Open the cover at the front of the machine to access rotary multi-control valve (1).
3. Remove wing bolt (2), and switch lever (3) to the position of the desired control pattern.
4. Tighten wing bolt (2) to fix lever (3) after setting the control pattern. Firmly tighten wing bolt (2) by your fingers without tools.
5. Close the cover.
6. Operate the attachment to make sure that the desired control pattern is used.



CONTROL PATTERN LABEL

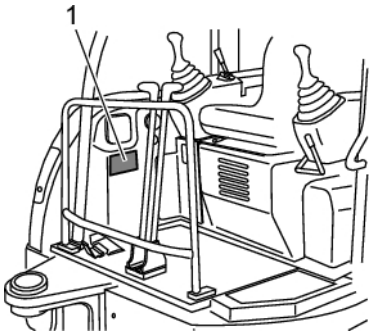
WARNING

•If you do not check the control lever pattern before operation, it is dangerous because it causes an unexpected machine movement. Be sure to check the movement of each control lever before operation.
•If you operate the machine while the control pattern labels do not match the actual machine movement, it may cause severe accident resulting in severe injury.
•Replace the control pattern label with the one matching the actual machine movement, or change the lever pattern by the rotary multi-control valve to match the control pattern label.

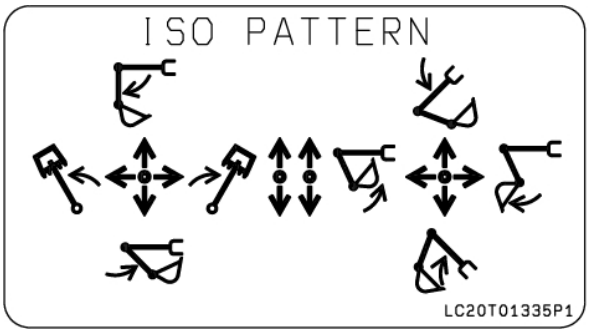
IMPORTANT

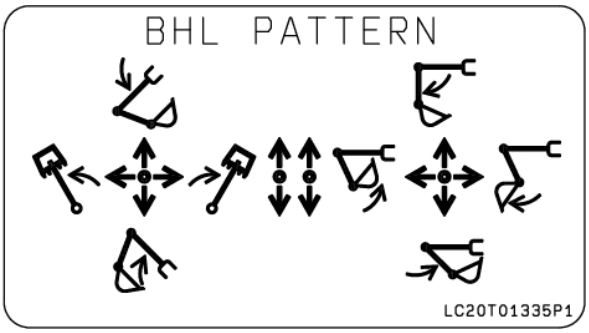
The control pattern labels are magnetic.
They are needed when changing the control pattern. Keep them in a safe place.

Affix a control pattern label (1) on the following position.
•Canopy specification: Guard divider to the right of the operator's seat
•Cab specification: Inside the cab door



Pattern labels





3.9 MACHINE OPERATION

The machine operation procedures described below provide operators with basics which should be learned thoroughly. You can further improve your operational skill by throughly learning the performance and structure of this machine.

3.9.1 MACHINE TRAVEL

WARNING

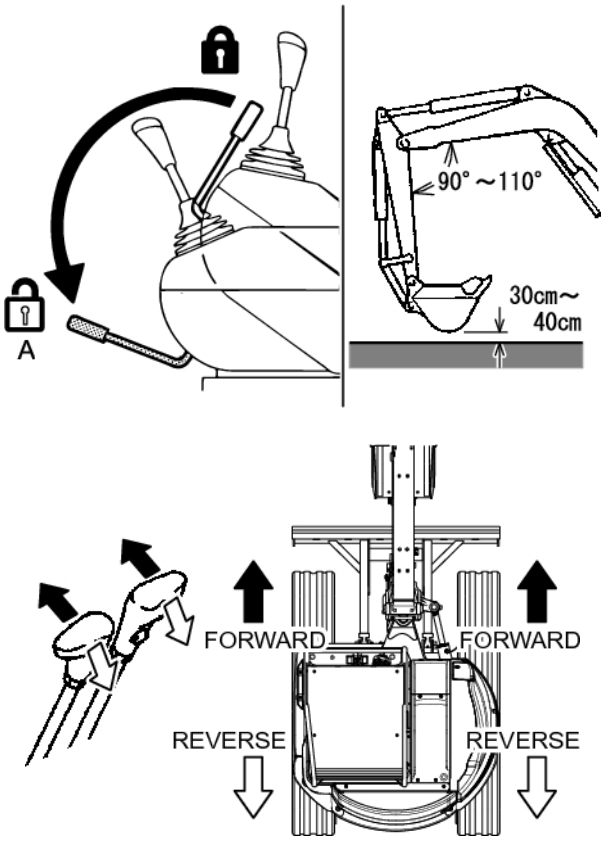
•Confirm the travel motor position before traveling. When the travel motor is positioned on the front side, the traveling operation reverses.
•Sound the horn to warn persons in the working site.
•Keep the machine and its attachment at a safe distance from surrounding persons or facilities before moving them.

CAUTION

When abnormality was detected in operation, stop the machine immediately and investigate the cause of abnormality to take proper measures.

Forward/Reverse Travel

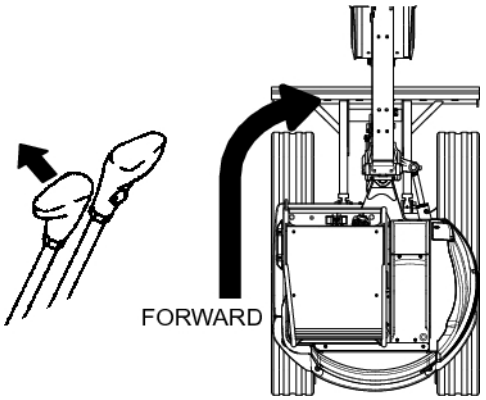
1. Move the pilot control shut-off lever to "UNLOCKED position (A)" and keep the bucket at a height of 30 to 40 cm (12 to 16 inch) above the ground.
2. Pull the dozer control lever to raise the dozer.
3. To travel the machine forward, push both the right and left travel levers forward. To travel the machine backward, pull both the levers back.
   Both the forward and reverse travel speed can be changed by how far you push or pull the levers.



Forward/Reverse Travel

PIVOT TURN

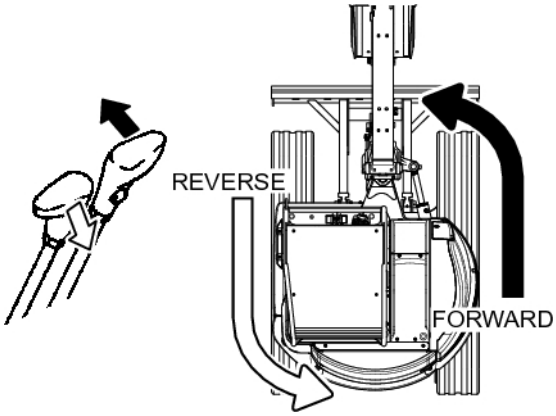
This drives only one crawler to turn the machine. Operate one of the two travel levers.



Pivot turn

SPIN TURN

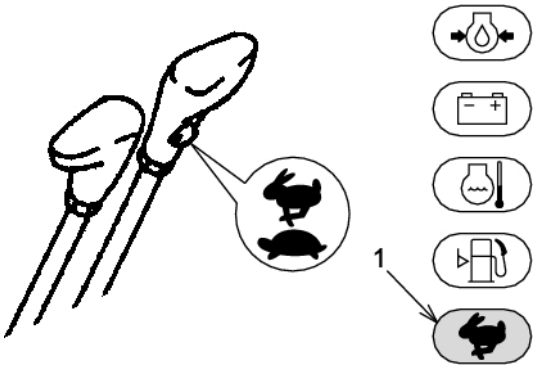
This drives the right and left crawlers in opposite direction each other to turn the machine on the spot. Use one of the two travel levers for the forward traveling and the other for the backward traveling.



Spin turn

3.9.2 CHANGING TRAVEL SPEED (1ST, 2ND)

1. Take the travel position while the engine is running and press the travel speed select switch. Display lamp (1) is lit.
2. Use the travel levers to travel the machine.
3. Press the travel speed select switch again after stopping the machine. Display lamp (1) is unlit.
4. Operate as with the step 2.
   Check that the travel speed has been changed from high to low.

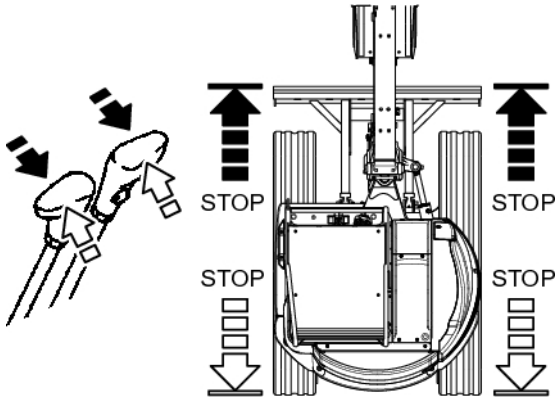


3.9.3 STOP TRAVELING

CAUTION

When the attachment or swing operation is unavoidably required during traveling, do not perform the operation rapidly.

Return the right and left travel levers to the neutral position. The machine stops traveling. Do not stop the machine suddenly, but stop it after slow traveling as much as possible.



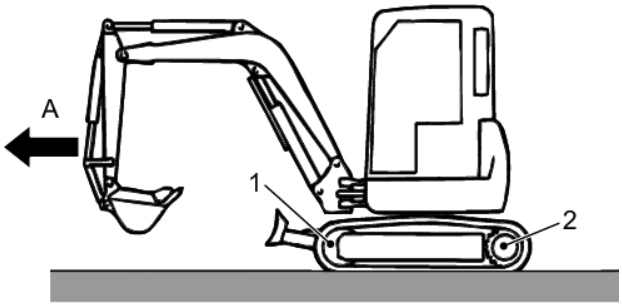
Stopping the Machine

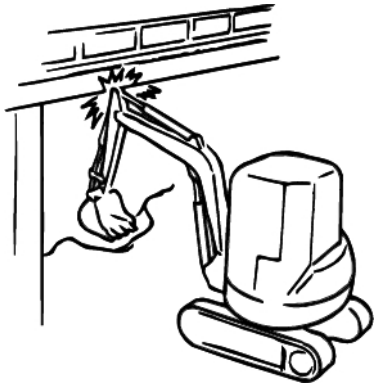
3.9.4 PRECAUTIONS IN TRAVELING

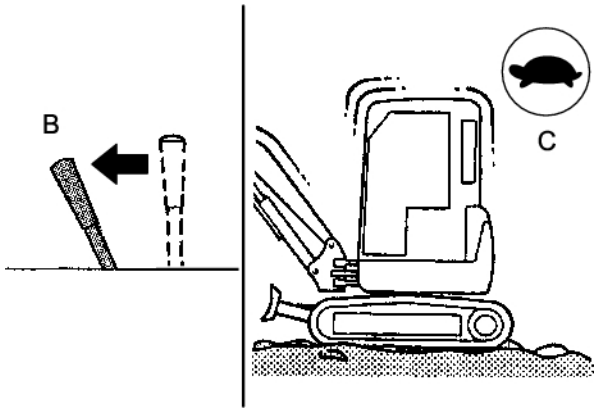
WARNING

•When traveling the machine on a shoulder or in a narrow place, place the signal person to direct operations.
•Do not load other persons on the machine.

1. Front idler
2. Travel motor
A. Traveling direction
B. Low idle position
C. LOW (1st) speed





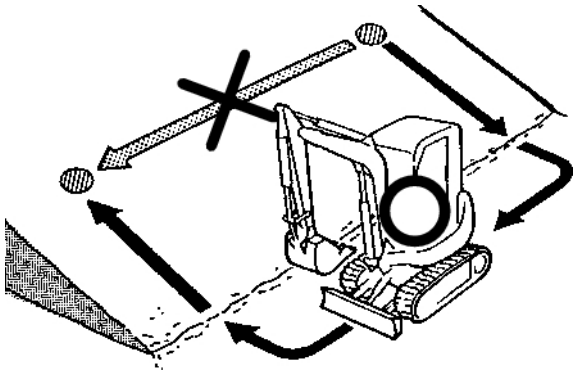


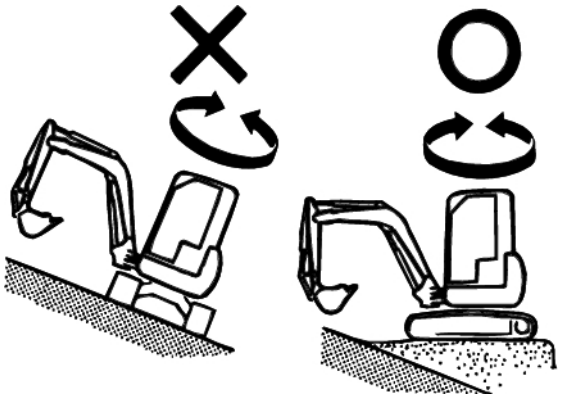
1. Check the position of travel motor (1) before operating the control levers to start traveling.
2. Travel on the level and firm ground as much as possible. Also travel in straight and large radius curve as much as possible, avoiding an abrupt pivot turn.
   In a narrow area, turn the machine in the opposite direction as many times as possible.
3. Survey the strength of bridges and shoulders, and strengthen them if necessary.
4. Be careful not to touch a bridge beam and electrical power line.
5. Traveling on a rough road has a great impact on the machine. Reduce the engine speed and use the LOW (1st) speed.
6. Be careful not to hit travel motor (1) with a boulder or run on a boulder to add an excessive load to the crawlers.
7. On a snowy or icy road, travel slowly and avoid an dash start, stop and turn.
8. Before loading and unloading the machine from a truck or trailer for transportation, remove mud and dirt of the undercarriage to prevent a skid due to shoe clogging on the ramps.
   For how to use ramps, see "TRANSPORTATION of "HYDRAULIC EXCAVATOR"in Chapter 5.

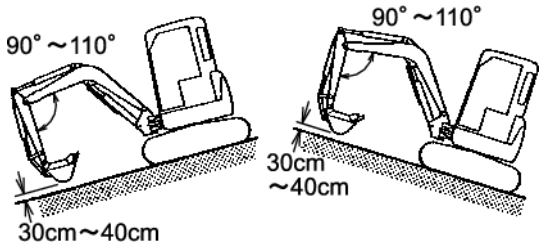
3.9.5 GOING UPWARD SLOPE OR DOWNWARD SLOPE

WARNING

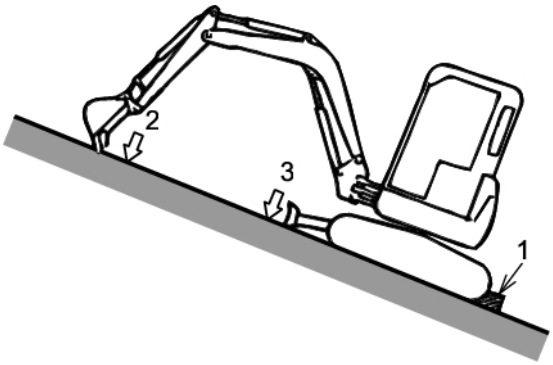
•Never turn or go across on a slope. Go down to a flat space and take a detour-route for safety.
•When traveling, keep the bucket at a height of 30 to 40 cm (12 to 16 inch) above the ground. Do not go downward slope with the reverse travel.
•When the machine becomes slipped or unstable, immediately lower the bucket and put on the brake.
•There is a risk of the machine losing the balance to tip/roll over during swinging when operating on a slope. It is dangerous to swing downhill with the bucket filled with soil. Make an embankment for the machine to be as level as possible to swing on a slope.
•The traveling up and down on a slope of 30 degree or more is not allowed because there is a risk of tipping/rolling over.
•When parking on a slope is unavoidable, be sure to lower the bucket to the ground and chock the crawlers.







Downward slope/Upward slope



1. The maximum gradeability of this machine is 58% (30 degrees).
2. Operate the travel levers slowly when going downhill.
3. Use the low (1st) speed when going downhill and uphill.
4. When traveling on a slope, keep the bucket at a height of 30 to 40 cm (12 to 16 inch) above the ground and the low speed.
5. When the engine was stalled, put down the bucket on the ground and return every lever to the neutral position, and then start the engine again.
6. When the machine cannot go uphill with the crawlers (travel motor) due to slip of the shoes, you can pull the arm to utilize the machine power for assistance.
7. When parking or stopping the machine on a slope, be sure to lower bucket (2) and dozer (3) to the ground even if it is a short time, set all levers to the "neutral position", set the pilot control shut-off lever to the "LOCKED" position, and then chock crawlers (1).

IMPORTANT

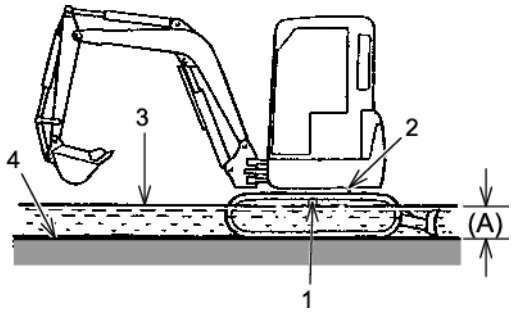
If the hydraulic oil is not warmed up, sufficient gradeability may not be acquired. Warm up the machine sufficiently before going uphill.

3.9.6 MACHINE OPERATION IN WATER

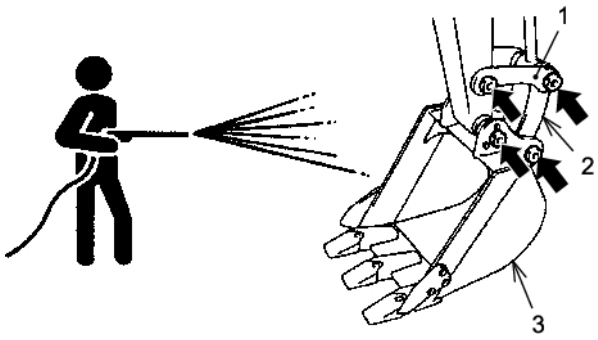
CAUTION

Take enough care not to immerse the swing bearing, swing pinion and swivel joint into the water or mud.
If the machine is sunk to the swing bearing in the water or mud, the swing bearing and others may be worn abnormally. Put grease in the slewing bearing unit with a grease gun.

1. Upper roller
2. Swing bearing
3. Water surface
4. Bottom of river



1. If the bottom of a river is flat and it flows slowly, the machine can travel in the water up to the depth of upper roller (A).
2. When crossing a river, use the bucket to check the bottom of the river carefully. Never enter in the water over the depth of (A).
3. On the soft ground, the machine may sink gradually. Be careful not to get stuck in the soft ground.
4. After traveling in seawater, wash the machine carefully to remove salt.
5. On parts soaked in the water for a long time, use a grease gun to apply grease until the old grease comes out from the inside.
   1. Idler link
   2. Bucket link
   3. Bucket



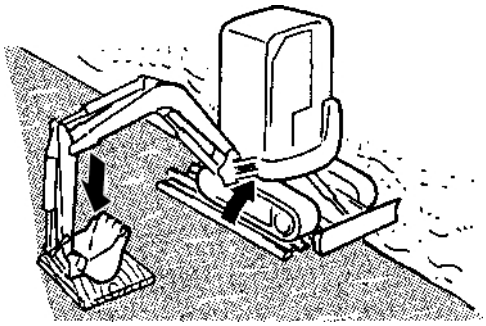
Greasing Point

3.9.7 GETTING OUT OF SOFT GROUND

Avoid traveling on the soft ground if possible.
Be careful not to get stuck in the mud.
In case of being stuck in the mud, get out of it using the procedure below.

WHEN ONE SIDE OF MACHINE GETS CAUGHT IN SOFT GROUND

When one side of the machine gets caught in the soft ground, use the bottom of the bucket to push a plank or others laid on the ground to lift up the caught shoe, and put logs or lumbers beneath the crawler belt to escape from the soft ground.



IMPORTANT

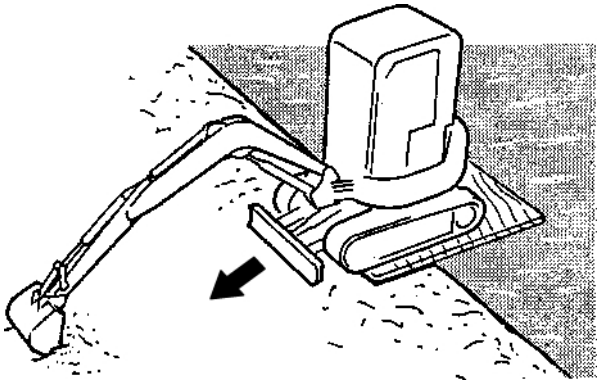
When using the boom and arm to lift up the machine, use the bottom of the bucket, not the teeth, to push the ground. Raise the dozer and keep the crossing angle of the boom and arm 90 to 110 degrees.

When Both Sides of Machine Get Caught in Soft Ground

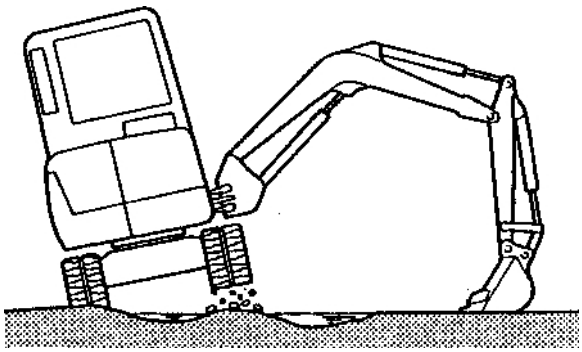
CAUTION

Operate the machine at the operator's seat. Do not permit for people to gain access to the machine.

When both sides of the crawlers get caught in the mud and the machine does not move due to slip, put logs or boards as described above, wedge the bucket into the escape side ground, and then operate the travel levers to move to the escape side while pulling the arm just like digging to pull out the machine.



If the machine cannot travel due to the clogged mud and gravel in the crawlers after traveling on the soft ground, lift each crawler off the ground by pushing the boom and arm to the ground and shake the mud or gravel off the crawler.
Gravel, or mud clogged in a crawler can be cleared by lifting the crawler up and moving it forward and reverse.

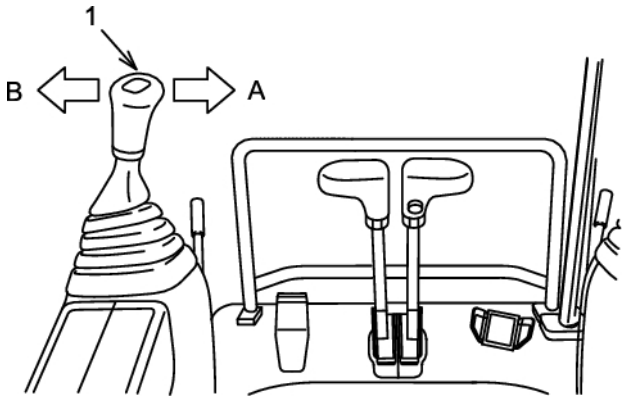


3.9.8 SWING PROCEDURE

WARNING

•There may be a risk of the machine losing the balance to tip/roll over during swinging when operating on a slope.
•Keep the machine and its attachment a safe distance from surrounding persons or facilities before swinging the machine.

1. Left control lever
A. Swing right
B. Swing left



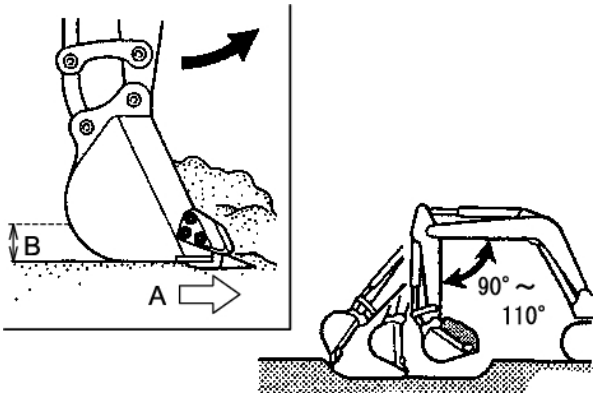
1. Move the pilot control shut-off lever to the "UNLOCKED" position.
2. Raise the bucket to a proper height from the ground.
3. Operate left control lever (1) to swing the machine.
4. While you are not swinging the machine, keep the attachment and crawler frame parallel to each other before stopping or traveling the machine. Except for special cases, keep them parallel during traveling.

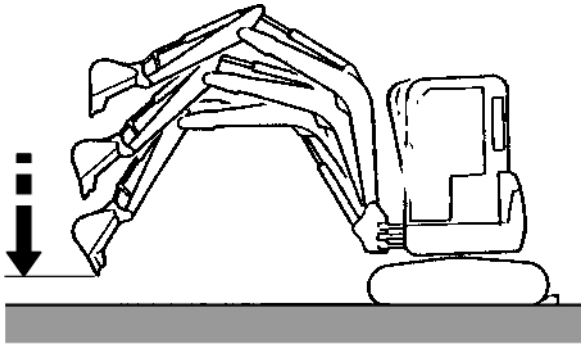
3.10 WORK PROCEDURES OF THE MACHINE

WARNING

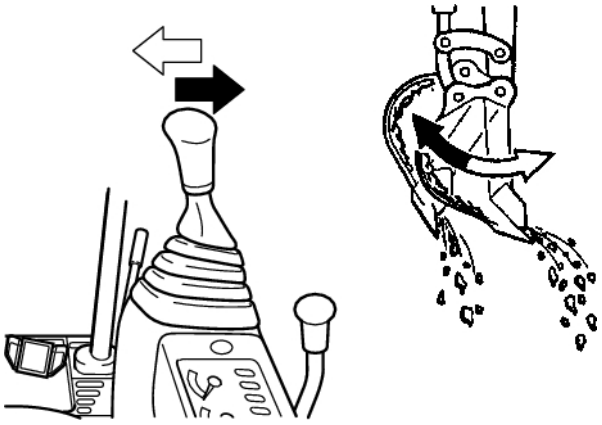
There is a risk of the machine losing the balance to tip/roll over during swinging when operating on a slope. It is dangerous to swing downhill with the bucket filled with soil. Make an embankment for the machine to be as level as possible to swing on a slope.
Confirm for safety around the working area before swinging the machine.

3.10.1 DIGGING WORK





1. For digging work, mainly the arm crowding force is used, and the bucket scooping force may be used if necessary.
2. When a strong digging force is required, dig slowly while keeping the crossing angle of the boom and arm 90 to 110 degrees.
3. Point the bucket tooth tips in the digging direction (A) as much as possible, and dig using the bucket at shallow depth (B) and with full stroke.
   This will reduce the digging resistance and the possibility of damage on tooth tips.
4. When lowering the boom, avoid rapid operations.
   Especially, urgent stop during boom "DOWN" has a great impact on the machine, resulting in adverse effects on parts.
5. If soil does not fall out easily, set the bucket in the bucket out position and move the bucket lever a few times.

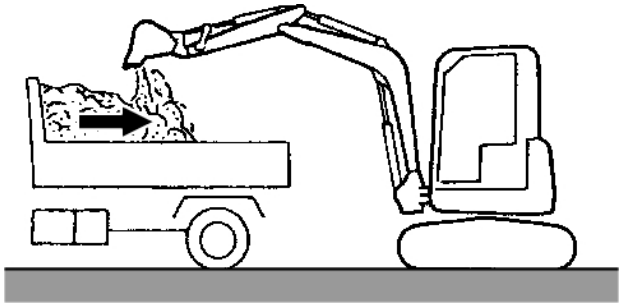


IMPORTANT

In addition, you can use the machine for a wider range of purposes by using various optional attachments.
For replacement of the bucket, see "WHEN REQUIRED" in Chapter 4.

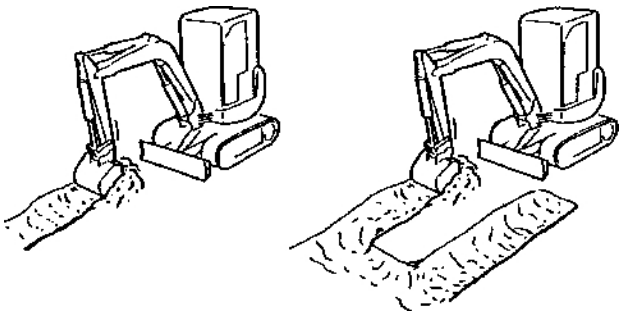
3.10.2 LOADING WORK

1. For more efficient loading work, place the dump truck where the operator can easily view it and the swing angle is smaller.
2. It is easier to load more soil onto the dump truck from the front side of the back than from the side.



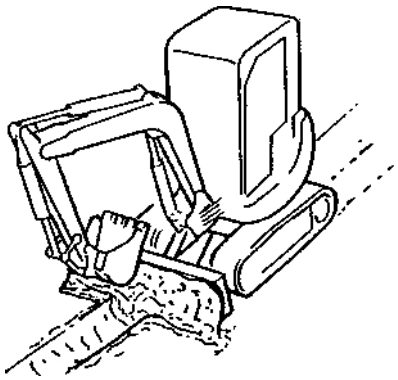
3.10.3 TRENCHING WORK

To improve the efficiency, attach a bucket suitable for trenching and place the crawlers parallel to the trench to dig. When digging a wide trench, dig both sides of it first and dig the center last.



3.10.4 DOZING WORK

1. For backfilling and leveling work after digging, use the dozer.
2. Scrape the embankment from the top or side surface. If the load on the machine is too much, adjust the dozer height by using the dozer control lever to move the dozer up and down.



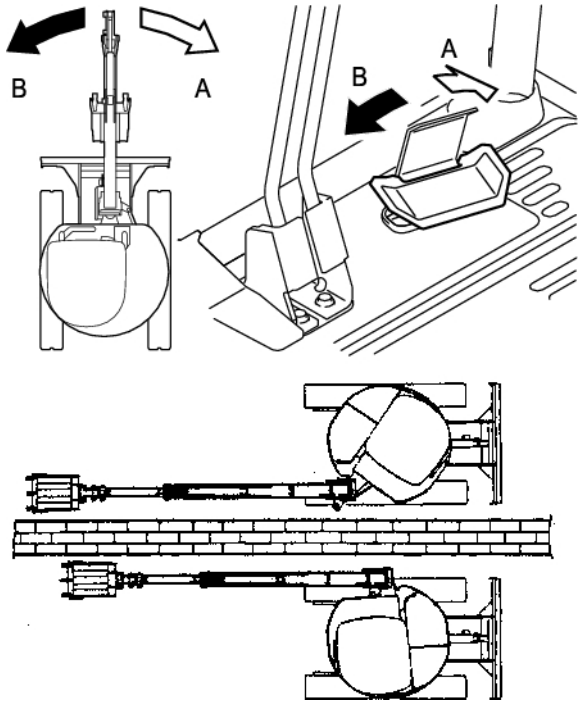
3.10.5 SIDE DITCH DIGGING WORK

WARNING

As the boom swing operation especially has a wide working area, always pay attention to the surroundings when operating the attachment.

Depressing the left and right side of the boom swing foot pedal makes the boom swing to the left/right, allowing you to perform the side ditch digging in a narrow place.
Depress the left and right side of the pedal to swing the boom to the left and right respectively. You can perform the side ditch digging as shown in the right figure.

A. Right swing
B. Left swing

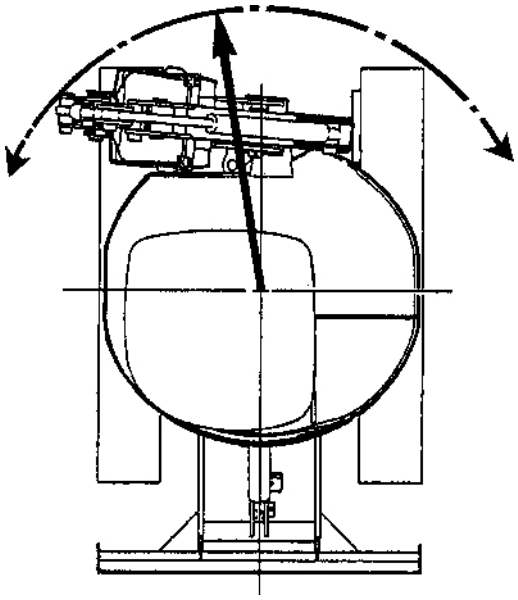


3.10.6 WORK IN NARROW PLACE

When working in a narrow place, the position as shown in the figure below enables swing in a relatively narrow place.

MINIMUM SWING POSITION

1. Fully extend the arm and bucket cylinders, and fold the bucket.
2. Fully extend the boom cylinder.
3. Depress the right foot pedal to swing the boom.
4. Use the control lever to swing the machine.



IMPORTANT

During swing, pay attention to the interference with the attachment.

Minimum Swing Radius with Boom Swing

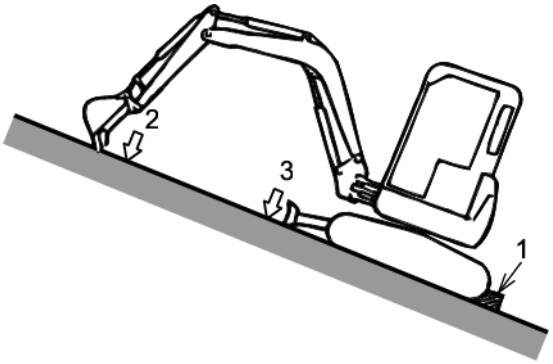
	Canopy	Cab
Minimum swing radius with boom swing in mm (ft-in)	1,980 (6'6") (left 70 degrees)	1,980 (6'6") (left 70 degrees)
Minimum swing radius without boom swing in mm (ft-in)	2,380 (7'10")	2,380 (7'10")

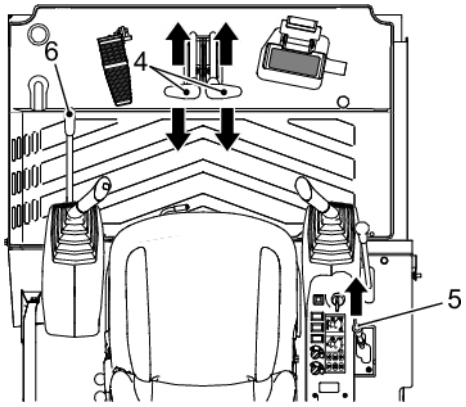
* These values are for the standard arm specification.

3.11 PARKING THE MACHINE

WARNING

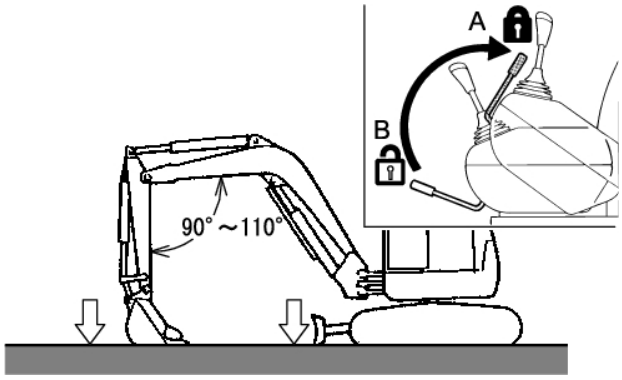
•Park the machine on a level and firm surface.
•Avoid parking on a slope.
When it is unavoidable, wedge the bucket teeth into the ground and chock the crawler (1) so that the machine does not move.
•Set the pilot control shut-off lever to the "LOCKED" position to avoid any unexpected machine movement being caused by touching levers, and stop the engine.





1. Put both travel levers (4) in the "NEUTRAL" position.
2. Move engine throttle lever (5) to the "low idle position".
3. Put bucket (2) on the ground.
4. Put dozer (3) on the ground.
5. Move pilot control shut-off lever (6) to the "LOCKED" position.

A. Lock
B. Unlock

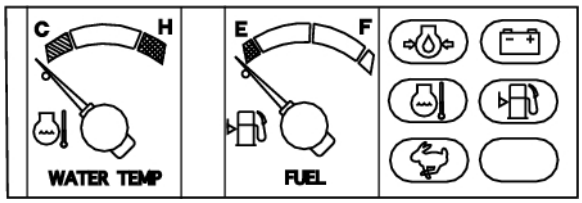


3

3.12 PRECAUTIONS AFTER OPERATION

Check the engine coolant temperature, engine oil pressure and fuel level for shortage on the monitor panel.

1. If the fuel level is insufficient, stop the engine and then refill the fuel tank to the maximum.
2. If there is any abnormality in the engine coolant temperature or engine oil pressure warning lamp, move the machine to a safe place and stop the engine immediately. Then repair the machine according to applicable procedures described in "INSPECTION AND MAINTENANCE CHART" in Chapter 4.



3.13 INSPECTION AND MAINTENANCE AFTER ENGINE STOP

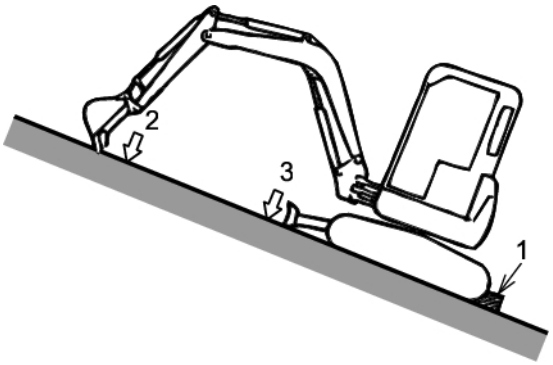
1. Check oil or water leakage, attachments, exterior and travel system components. If leakage or damage is found, repair it immediately according to applicable procedures in "INSPECTION AND MAINTENANCE CHART" in Chapter 4.
2. Refuel the tank to the maximum.
   Refuel the tank to the maximum after finishing work for a day. Be careful not to refuel with fuel to a 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.
3. Remove mud, etc., stuck to the traveling components.

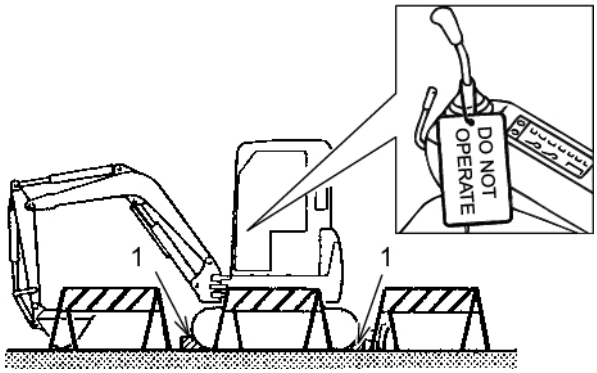
3.14 MEASURES AFTER EMERGENCY ENGINE STOP

- Be careful not to make an engine urgent stop for the sake of protecting the engine. Before stopping the engine, be sure to run the engine for about five minutes under no load conditions and low speed. Also, take enough care to the safety to avoid an emergency stop.
- If you made an emergency stop unavoidably when there was an imminent danger or when a failure occurred in this machine, take preventive measures as described below to avoid damage to the machine and personal injury.
- Wait for the engine and coolant to cool down, and then restart the engine.

CAUTION

If you stop the engine suddenly when it is running at high speed, the engine temperature rapidly rises, which may cause a failure such as oil deterioration and seal adhesive.

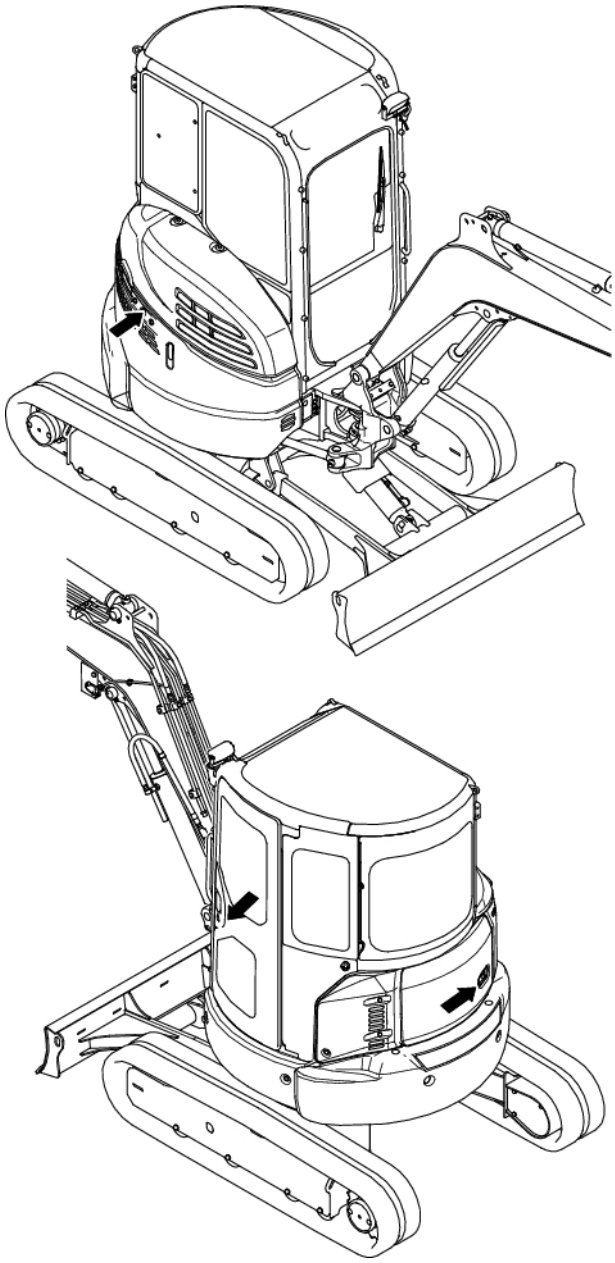




1. After an emergency stop, set the pilot control shut-off lever to the "LOCKED" position.
2. If you made an emergency stop without putting the attachment or bucket on the ground, support bucket (2) by placing a safety block under it and chock the crawlers (1).
3. If you made an emergency stop on a slope, place chock blocks (1) at the lower side of each crawler.
4. Until you can restart the engine or move the machine, make the working site off-limits and set barricades for preventing third parties from coming into the working site to ensure the safety of surroundings.
5. When the cause of emergency stop is unknown or when repair is required, contact KOBELCO authorized dealer/distributor for repair.
6. Restart the engine after the engine coolant temperature cools down.

3.15 LOCKING

Be sure to lock the following:
- Right side cover (Auto lock)
- Engine hood
- Cab door (Cab specification)



3.16 HANDLING OF RUBBER TRACK SHOE (STANDARD)

3.16.1 HOW TO TAKE ADVANTAGE OF RUBBER TRACK SHOE

The rubber track shoe has excellent features that iron track shoe does not have. using it same as the iron track shoe can not make full use of the characteristics of it. Avoid an excessive load on it considering the field conditions and works.
The rubber track shoe has the disadvantage of low strength while it has many advantages due to its properties specific to the material. By fully understanding the characteristics of rubber track shoe and complying with prohibitions and precautions for handling it, you can extend the service life of rubber track shoe and take its full advantages. Be sure to read "PRECAUTIONS FOR USE OF RUBBER TRACK SHOE" before using it.

	Rubber belt	Iron shoe
Less vibration	◎	△
Smooth run	◎	○
Low noise	◎	△
Harmless for paved road	◎	△
Easy handling	◎	△
Not damageable	△	◎
Large traction force	◎	◎

◎ : Excellent ○ : Good △ : Ordinary

Comparison between rubber and iron crawler belt

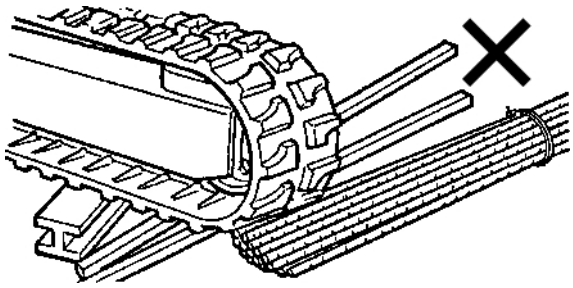
3.16.2 WARRANTY ON RUBBER TRACK SHOE

Our warranty does not cover damage caused by prohibited works, such as work in a site where the rubber track shoe may be cut by edges of steel plate/U-shaped gutter/blocks, and sharp edges of crushed stones/rocks and reinforcing steel bars/iron scraps.

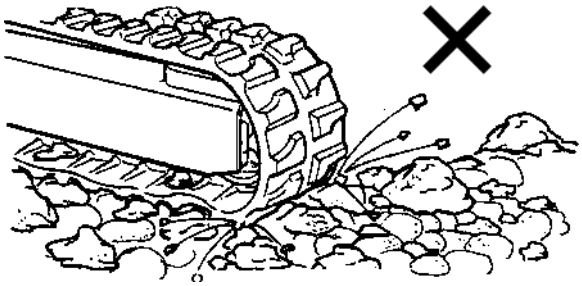
3.16.3 PROHIBITIONS ON USE OF RUBBER TRACK SHOE

Avoid the following works:

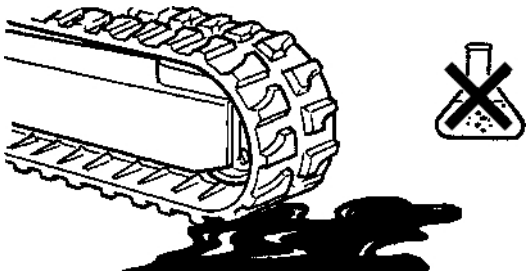
1. Work and swing on a crushed-stone ground, rugged and hard bedrock, reinforcing steel bars, iron scraps or edge of steel plate will cause damage on rubber track shoes.



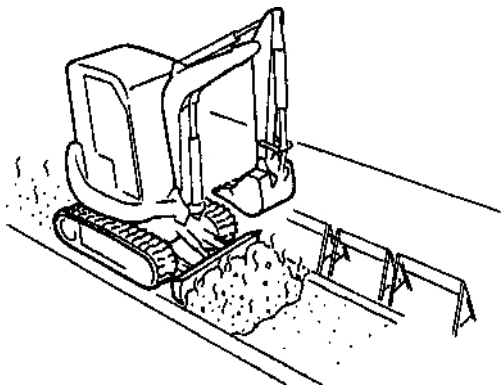
2. Where there are many stones of various sizes (for example, riverbed), the rubber track shoes may be damaged or easily come off due to biting of stones. If you perform dozing operation forcibly with skidding shoes, it will shorten the service life of the rubber track shoes.



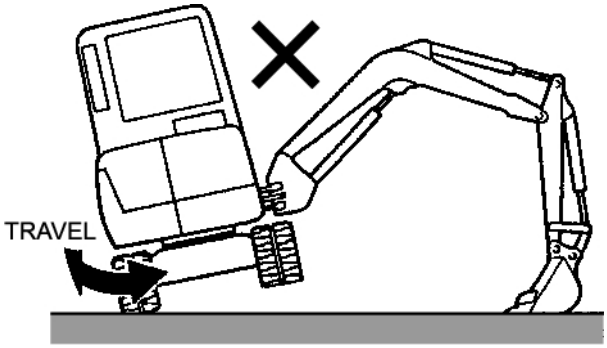
3. Prevent oil, fuel or chemical solvent from attaching the rubber track shoes. If such substance is attached, wipe it off immediately. Do not travel over an oil puddle on the ground.



4. Do not enter a place with high temperature due to fire or steel plate under the blazing sun. Also, do not perform the ground leveling of asphalt.
5. When storing the machine for a long period (three months or longer), store it indoors away from direct sunlight and rain. For storing, see "PRECAUTIONS FOR LONG-TERM STORAGE" in Chapter 3.



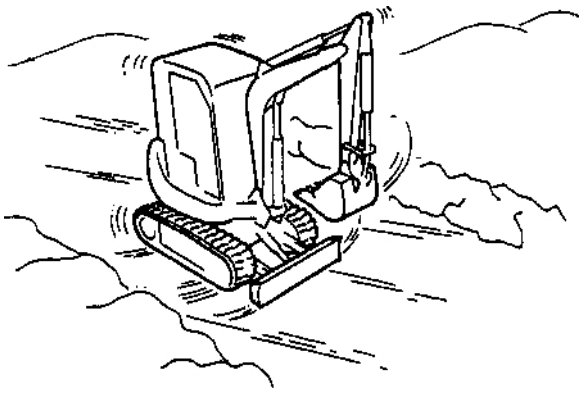
6. If you move the machine with one crawler while the other is raised by the attachment, the rubber track shoe may come off or be damaged.



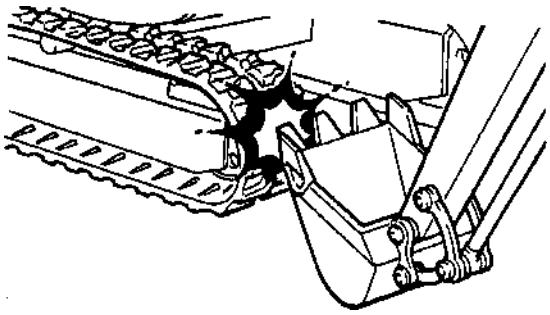
3.16.4 PRECAUTIONS FOR USE OF RUBBER TRACK SHOE

Note the followings during the work:

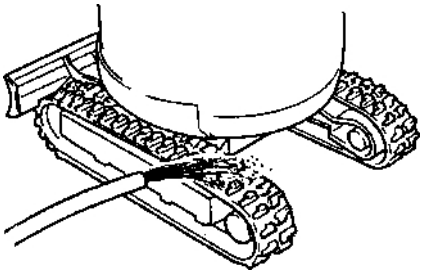
1. On a snow or icy road, rubber track shoes can skid very easily. Do not use rubber track shoes on a snow or icy slope.
2. Avoid a spin turn on a concrete road.
3. Do not make an rapid turn, which causes early wear or damage to the rubber track shoes.



4. Be careful not to damage the rubber track shoes with the bucket during the work.
5. Do not operate the machine while rubbing the rubber track shoes against a concrete or wall.
6. Slowly lower the machine which was raised using the attachment.



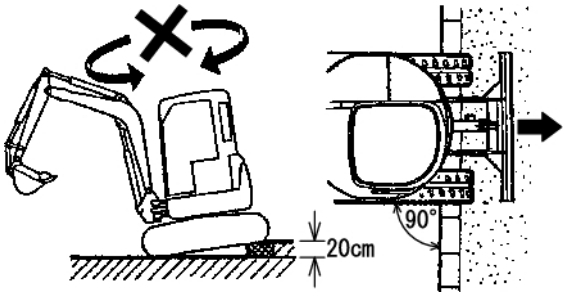
7. Work in a salty or corrosive environment affects the adhesive applied to core metal. Avoid such locations or wash the rubber track shoes after use.
8. Use the rubber track shoes at a temperature between -25 to +55 degrees C because of physical properties of rubber.



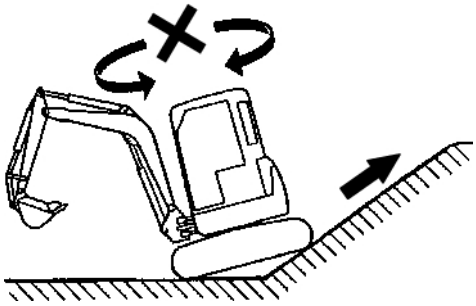
⚠CAUTION

Use the rubber track shoes with a proper tension to prevent them from coming off. If the tension is loose, it causes coming off of rubber track shoes under the conditions below. Use extreme caution during the operation even when the tension is proper.

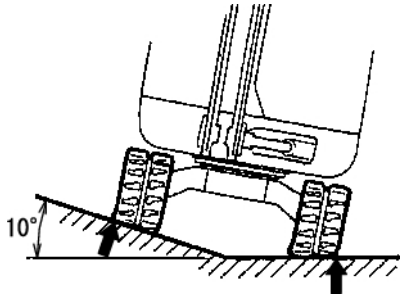
9. Do not turn on an uneven surface (about 20 cm) such as curbs or rocks. To travel across an uneven surface, go over it in the right angle.



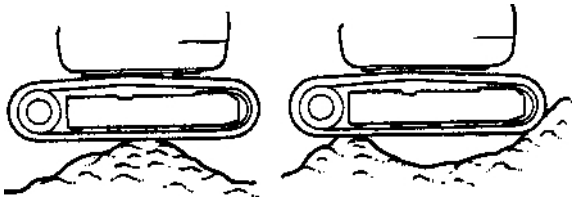
10. While climbing a slope in reverse, do not turn at the point of moving from the flat ground to the slope.



11. Traveling with one side of the machine on a slope or hillock causes damage on the rubber track shoes. Travel with the both sides on the same flat surface.



12. Do not turn with a position as shown in the figure. It causes coming off or damage of the rubber track shoes.



3.17 MACHINE OPERATION IN ADVERSE CONDITIONS

3.17.1 OPERATION IN EXTREME COLD

CAUTION

When the ambient temperature is low, starting the engine may be difficult due to decrease of oil liquidity, and the radiator may be damaged due to coolant freezing.

Handling of Fuel/Oil in Extreme Cold

Use good low-viscosity fuel/oil for each device. For optimum viscosity, see "LUBRICANT, FUEL & COOLANT SPECIFICATIONS" in Chapter 4.

Handling of Coolant in Extreme Cold

When operating or storing the machine in cold climates, the additive rate of the cooling system should match the expected minimum outdoor temperature.

If the coolant is frozen, it may cause damage to the radiator, cylinder block and cylinder head. When being shipped from the factory, the coolant mixed with "Long Life Coolant" is used to prevent rust and freezing of the cooling system.

When operating or storing the machine in extreme cold, check the coolant frequently to keep an appropriate concentration.

Handling of Battery in Extreme Cold

When the ambient temperature is low, the battery capacity may decrease and the battery electrolyte may freeze. Keep the charging rate close to 100% as much as possible and pay full attention to thermal insulation by covering the battery.

The charging rate can be calculated roughly by measuring the specific gravity and using the table below.

Specific Gravity of Battery Electrolyte

Charging rate	Battery electrolyte temperature		
	-20 degrees C (-4 degrees F)	0 degrees C (32 degrees F)	20 degrees C (68 degrees F)
100%	1.31	1.29	1.28
90%	1.29	1.28	1.26
80%	1.28	1.26	1.25
75%	1.27	1.25	1.24

Measure the specific gravity of battery electrolyte after its temperature becomes almost the same as the outdoor temperature, instead of immediately after starting the operation.

TREATMENT AFTER WORK IN EXTREME COLD

To prevent malfunctions of travel system components due to freezing of mud and water stuck to the machine, follow the precautions below.

- Remove mud and water stuck to the machine. Especially, be sure to drain off the water from the travel system, and then park the machine on the dry and firm ground to prevent the travel system from freezing.
- If frozen mud or water is stuck to cylinder rod surfaces, the seal may be damaged when retracting the cylinders. Retract each cylinder to the minimum size to minimize the exposed area of the rod. For the storing position, see "PRECAUTIONS FOR LONG-TERM STORAGE" in Chapter 3.

3.17.2 OPERATION AT SEASHORE

BEFORE OPERATION AT SEASHORE

- Check the tightness of each plug, valve, cover, etc.
- Apply grease to the required parts of electrical components to prevent corrosion.

AFTER OPERATION AT SEASHORE

Wash the machine carefully to remove salt, and apply anti-rust treatments with oil and grease, if necessary.

3.17.3 HANDLING OF ELECTRICAL COMPONENTS

Electrical components are weak in water. Be careful to keep water away from them when washing the machine or performing maintenance in the rain.
Particularly use extreme caution on the operator's seat section, where the electric parts (relays and fuses) are mounted.

3.17.4 OPERATION IN SANDY AND DUSTY AREAS

HANDLING OF AIR CLEANER IN SANDY AND DUSTY AREAS

Clean and change the element earlier than the specified time.

HANDLING OF RADIATOR IN SANDY AND DUSTY AREAS

Clean the radiator earlier than the specified time to prevent the radiator core from being clogged with dust.

HANDLING OF FUEL IN SANDY AND DUSTY AREAS

- Be careful to prevent dust entering when refilling. Inspect the element and filter earlier than the specified time.
- Especially, clean the starter and generator earlier than the specified time to prevent deposit of dust on them.

HANDLING OF ELECTRICAL COMPONENTS IN SANDY AND DUSTY AREAS

Especially, clean the starter and alternator earlier than the specified time to prevent deposit of dust on them.

3.18 PRECAUTIONS FOR LONG-TERM STORAGE

When storing the machine for a long period (one month or longer), maintain the machine with attention to the following points, so that decrease in function does not occurs at the next operation.

3.18.1 WASHING

Wash the machine thoroughly, inspect and maintain the travel system components and put grease to the greasing points.

3.18.2 REFILLING/GREASING

Check the level and contamination of the fuel oil and hydraulic oil. Refill the oil if the level is low, and replace the oil if the oil is contaminated.

IMPORTANT

Lubricant gets deteriorated while the machine is not in use. Use extreme caution when starting to use the machine at the next time.
Apply a sufficient quantity of anti-rust oil to any parts which rust easily, especially to the exposed area of each cylinder piston rod.

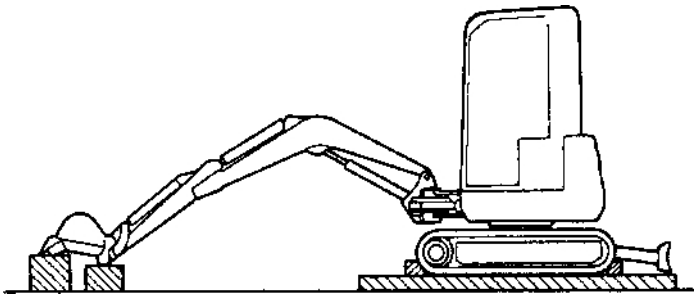
3.18.3 BATTERY

Remove the negative (-) terminal from the battery, and cover the battery, or remove the battery from the machine for storage.
To compensate the self-discharge during storage, perform the auxiliary charge at least once a month.

3.18.4 COOLANT

If there is a possibility of freezing, mix the antifreeze (non-amine type) into the radiator.
However, it is usually not necessary because long life coolant is already mixed.

3.18.5 PREVENTION OF DUST AND MOISTURE



Store the machine in a dry indoor location. If you place the machine outside unavoidably, lay lumbers on flat ground and cover the machine with a sheet.

- When parking the machine, fully retract the exposed area of each cylinder rod.
- Be sure to put the bucket on the ground and block the crawlers.

3.18.6 PERIODICAL LUBRICATING OPERATION (DURING STORAGE)

If the oil film shortage occurs and rust is formed on parts, it may cause abnormal wear at the next operation.
Once a month, start the engine to operate the machine and also move the working devices to supply lubricant to each part.

- Check the engine oil level and coolant level before starting the engine. Refill engine oil or coolant if its level is low.
- Wipe off the rust preventive oil from the cylinder rods. After the lubricating operation, apply the rust preventive oil again.
- After starting the engine, fully warm up the machine and repeat the traveling, swing and digging operations several times to prevent oil film shortage of lubricant.
- If the machine is stored indoors, adequate ventilation is required during warming-up.

3.18.7 TREATMENT AFTER LONG-TERM STORAGE

When starting to use the machine after a long-term suspension, perform the following treatments.

- Wipe off the rust preventive oil from the cylinder rods.
- Refill oil and grease to all necessary parts.

4. INSPECTION AND MAINTENANCE

4.1 GENERAL

WARNING

Thoroughly read and understand the safety precautions contained in this manual before performing any inspection or maintenance procedures on systems or components of this machine.

- Regular inspection and maintenance enable this machine to achieve the full function and extend the service life of each part.
- The information contained in this chapter 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, see "INSPECTION AND MAINTENANCE CHART" for general service interval recommendations.

- As a general rule, the period of the lubrication and maintenance is determined by the hour meter. If the hour meter reading is roughly in accordance with the calendar day, and if you would like to schedule them based on the calendar day, take whichever comes first. For items which do not have a certain service time, see "WHEN REQUIRED".

IMPORTANT

"INSPECTION AND MAINTENANCE CHART" provided in this chapter gives general time intervals. Operation in sites under hostile work conditions or with a lot of dust and moisture may need more frequent lubrication and maintenance than the service times specified there.

- 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 an appropriate location. This will prevent contamination from dust, and water, etc.

Dispose of Waste Properly

4.2 INSPECTING AND MAINTAING THE MACHINE

4.2.1 GENERAL SAFETY & PRECAUTIONS

Do not use inspection and maintenance procedures other than ones described in this manual. Park the machine on the level and firm ground before inspection and maintenance.

IMPORTANT

For the adjustment, disassembling and repair of the engine, reduction unit, hydraulic component and electronic devices (controller, etc.), contact KOBELCO authorized dealer/distributor.

WEAR PROTECTIVE GEARS

Wear protective gears to avoid injury.

WARNING

Wear a hard hat, protective glasses or face shield, work gloves, protective shoes and well-fitting working clothes when performing inspection and maintenance procedures on this machine.

ALWAYS KEEP THE MACHINE CLEAN

Thoroughly clean the 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.

CHECK THE HOUR METER

Read the hour meter every day to check for items which get to the next inspection and maintenance time.

STOP THE ENGINE BEFORE INSPECTION AND MAINTENANCE

Be sure to stop the engine before inspection and maintenance.
Inspecting and maintaining the running engine may cause injury by being caught in the cooling fan or fan belts. When running the engine is unavoidable during the inspection or maintenance, it should be done by at least two persons communicating each other, of which one can stop the engine at any time.

PUT THE WARNING TAGS

Put the tags "DO NOT START ENGINE!", "DO NOT OPERATE" and "UNDER INSPECTION/MAINTENANCE" on noticeable places such as around the operator's seat as well as the starter switch or control levers before inspection and maintenance.

COMPLY WITH THE PRECAUTIONS

Read and understand the warning labels on the machine before starting the inspection and maintenance.

TEMPERATURE OF WATER AND OIL

It is dangerous to drain hot oil or water or replace filters immediately after the engine is stopped. Wait for them to cool down. On the other hand, if oil is cold, warm it for about 5 minutes to about 20 - 40 degrees C (68 - 104 degrees F) with low idle before draining it.

USE OUR GENUINE PARTS

- For replacement of parts, grease and oil, be sure to use KOBELCO genuine parts. Use grease and oil with the specified viscosity depending on the ambient temperature.
- Store containers for greases and oils in a clean room to keep them away from dust and water.

BE CAREFUL WITH INTERNAL PRESSURE

Release the internal pressure before removing the piping, coupling or other parts of the hydraulic system, air system, fuel system or cooling system to which internal pressure is applied.
For removing the internal pressure of the hydraulic oil tank, see "CHECKING HYDRAULIC OIL LEVEL AND MAKING UP" in Chapter 3.

KEEP OUT DUST

Attach a plug or cap to the lubrication hole of a removed hydraulic hose or hydraulic component to keep out foreign materials.

INSPECT DRAIN OIL AND FILTERS

When replacing oil or filter, check the drain oil or old filter for metallic powder or other foreign materials mixed. Contact the person in charge and take appropriate measures if any foreign materials are found.

HANDLING OF WASTE OIL AND ANTIFREEZE

Be sure to drain waste oil and antifreeze in containers and ask a public service company for disposal of them as the industrial waste.

CLEAN THE SEALING SURFACE

After removing the O-ring or gasket seal, clean the sealing surface to replace it with a new one. Apply thin oil to the O-ring or seal to attach it into the groove.

DO NOT MIX OILS

Never mix different kinds of oil. When using another kind of oil, replace the total amount of old oil.

LOCK THE INSPECTION DOOR

When performing the maintenance with the inspection door open, be sure to lock the door. Sudden door close by a blast, etc. may cause injury if the door is left open and unlocked during the maintenance.

CLEANING AND REPLACING THE RADIATOR CAP

- The radiator cap is an important part which pressurizes coolant to avoid overheat.
- Remove any dirt or water scale adhered on the gasket surface.
- It is not capable of pressurizing due to steam leakage if an aged groove on the gasket surface is created. Replace it with a new one.
- Replacing it every year is a guideline.

PRECAUTIONS IN REFILLING

Do not remove the strainer at refill if it is fitted to the filler port.

INSTALL LOCK DEVICE

When inspecting or maintaining the machine under the attachment, install a safety block and/or safety strut to avoid its move and fall.
Change of clearance could lead to severe injury.

PRECAUTIONS IN REPLACING THE BUCKET

Do not insert your fingers into a pin bore.
When aligning the pin with a pin bore, never insert your fingers, hands, or arm into it.
Align the pin with a bore visually.

IN DUSTY WORKING SITE

Pay attention to the followings in dusty sites.

- Check the air cleaner for clogging. Clean the air cleaner element earlier.
- Clean the radiator core earlier to prevent the clogging.
- Clean and replace the fuel filter earlier.
- Clean the electrical components, especially the starter and generator, to prevent the accumulation of dust.

4.3 LUBRICANT, FUEL & COOLANT SPECIFICATIONS

The following table provides information on the specification of oils, greases, fuels and coolants to be used in various climates and working conditions.

Component / System	Type	Capacity	Temperature Range –22˚ –4˚ 14˚ 32˚ 50˚ 68˚ 86˚ 104˚F –30˚ –20˚ –10˚ 0˚ 10˚ 20˚ 30˚ 40˚C	Specifications
Hydraulic tank	Hydraulic oil	20.4 liters {5.4 gal} 44.8 liters {11.8 gal} (hydraulic system)	* ISO VG 46 *	Genuine parts Long life hydraulic oil KW5046 (20 L) P/No. KAP YN01T01066D3
			ISO VG 32	Genuine parts Long life hydraulic oil KW5032S (20 L) P/No. KAP YN01T01066D1
Engine *1	Engine oil	H level : 5.5 liters {1.5 gal} L level : 3.6 liters {1.0 gal}	SAE 40 SAE 30 SAE 10W * SAE 10W-30 *	A.P.I. classification for "service CD"
Fuel tank	Diesel fuel	42 liters {11.1 gal}	ASTM D-975 No.2	ASTM D-975 Grade 2-D
Radiator *1	Antifreeze /Coolant	1.8 liters {0.48 gal} 3.6 liters {1.0 gal} [total system]	30% LLC mixture * 50% LLC mixture	L.L.C specification *2
Travel motor	Gear oil	0.6 liters {0.16 gal} X 2	EXTREME GEAR OIL SAE #90	Genuine parts A.P.I classification for "service GL-4" P/No. KAPSP90020
Upper rollers		55 cc {3.4 cu·in} X 2	EXTREME GEAR OIL SAE #90	
Idlers		80 cc {4.8 cu·in} X 2	EXTREME GEAR OIL SAE #90	
Lower rollers	Engine oil	65 cc {4.0 cu·in} X 10	SAE 30	A.P.I. classification for "service CD"
Boom, Arm, Linkage, /attachment	Grease	15-places		Genuine parts Extreme pressure multipurpose grease No.2*3
Dozer blade Cylinder		4-places		
Boom Swing Cylinder pin		2-places		
Slewing bearing		1-place		
Slewing gear		1-place		
Belt/Track tension adjust see adjustment procedure in section		2-places		
Control levers & Pedals		As needed disassembly is required		

Notice

*1 : New machines contain * marked grease.

*2 : L.L.C means "Long Life Coolant".

*3 : Cartridge part number KAPG0420D1 (400 g × 20), Pail can part number KAPG1601D1

WARNING **AVOID ANTIFREEZE / COOLANT FIRE HAZARD**

Antifreeze/coolant is combustible. Direct contact with hot surfaces parts may cause the antifreeze/coolant to burn. Repair leakage immediately and dispose of used antifreeze/coolant promptly in accordance with government environmental regulation.

IMPORTANT

The cooling system for this machine is filled with LLC (long life coolant), which is KOBELCO genuine antifreeze/coolant. 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 KOBELCO genuine antifreeze/coolant is not recommended and may result in poor machine performance and damage to the engine and cooling system. Our genuine antifreeze/coolant is specified for all machines operating in all regions including areas where low temperatures or freezing is not normally expected.

BIO-DEGRADABLE OILS

IMPORTANT **USE OF BIO-DEGRADABLE OILS**

When using Bio-degradable Oil (BIO OIL), refer to the following information.
1. There are two types of BIO OIL available; vegetable-based and synthetic-based. You are recommended to use the synthetic-based type, because the vegetable-based oil has a maximum usage temperature of 80 degrees C {176 degrees F}. Because of this, the degradation of vegetable-based oil occurs more rapidly, and causes reduced service life.
2. Do not mix either type of BIO OIL with the original factory-filled mineral oil, in the case that you do use BIO OIL, it is required to flush the hydraulic system that was filled with BIO OIL oil three times.
3. If you use BIO OIL, slewing and propel parking brake performance will be reduced, because of the lower friction factor of BIO OIL compared to that of mineral oil.
4. For further information about recommended Bio-degradable oil, please contact our dealer/distributor.

4.4 MAINTENANCE PARTS

Replace parts, such as filters and elements, during the periodical maintenance or before the end of the service life.
The machine can be used economically if the maintenance parts are changed properly and timely.
When you place an order of parts, confirm the parts number on the parts manual.

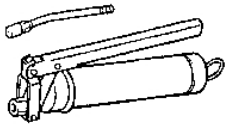
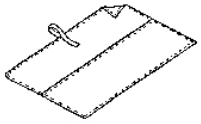
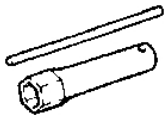
Filter and Element List

Item	Part number	Part name	Q'ty	Replacement interval
Hydraulic oil tank	PW52V01001R100	Return filter element kit (STD, Breaker)	1	Replace at 50 hours for the first time, then every 1000 hours (Every 250 hours for breaker specification)
	(ZD11G11000)	(O-ring)	1	
Hydraulic oil tank	PW50V00015F6	Suction strainer	1	Clean every 2000 hours
	(ZD11G11500)	(O-ring)	1	
Air breather	YN57V00002S010	Element	1	Replace every 1000 hours Every 1000 hours replacement is just a guideline. If the machine is operated in very dusty conditions, replace the element earlier.
Air cleaner	PM11P00012S006	Element (Outer)	1	Replace every 6 times cleaning or every 1 year
	PW11P01038P1	Element (Inner)	1	
Engine oil filter	129150-35153	Cartridge	1	Replace at 50 hours for the first time, then every 250 hours
Fuel filter	119802-55801	Cartridge	1	Replace every 500 hours
Water separator	119802-55730	Element	1	When required
	24321-000650	(O-ring)	1	
Radiator	PM05P00013S002	Radiator cap	1	Replace every 1000 hours
Bucket (STD)	PV69B00002P1	Side cutter (right)	1	When required
	PV69B00003P1	Side cutter (left)	1	
	ZS13C16040	Bolt	6	
	ZN13C16013	Nut	6	
	YJ69B00002S001	Teeth	4	
	YJ69B00002S002	Locking pin	4	
	YJ69B00002S003	Rubber lock	4	

IMPORTANT

Parts enclosed in parenthesis ( ) are to be changed at the same time.

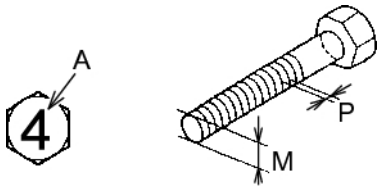
4.5 NECESSARY TOOL

No.	TOOL NAME	PART No.	REMARKS
1	GREASE GUN	PW01T01007F1	 • Cartridge 400 cc {24.4 cu·in}
2	LABEL	LC20T01001P1	
3	TOOL CASE	PW01T01005P1	
4	WRENCH	YJ23H00001P1	 For engine oil filter
5	WRENCH	PW01T01006P1	 For fuel filter
6	PIPE	PM01T01003P1	 For grease fitting of idler adjuster

4.6 TORQUE SPECIFICATIONS FOR BOLTS & NUTS

Follow the table in the next page when tightening or retightening bolts or nuts in every part.
Check for any loose or missing bolts or nuts before daily operation and during the periodical inspection. Retighten a loose portion or supply new parts for missing ones as required. Inspection and retightening are needed in first 50 hours for a new machine. When replacement of the bolts or nuts is required in the maintenance and inspection, be sure to use KOBELCO genuine parts of the same size as them.
Follow the table in the next page when tightening or retightening bolts or nuts.

- The tightening torque for plastic covers is different from the torque values in the table. Contact KOBELCO authorized dealer/distributor for tightening and retightening for them. Tightening of bolts and nuts with excessive torque may cause damage to parts to be tightened.
- Follow a tightening torque value in the text if it is specified.
  (It may be different from the one in the table in the next page.)
- Strength classification (A) is identified by the number stamped on the head of the bolt.
  (Example: 4=4.8T) M5 and smaller bolts have no stamp.



METRIC COARSE THREAD (NOT PLATED)

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}

METRIC FINE THREAD (NOT PLATED)

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}

4.7 TORQUE SPECIFICATIONS FOR JOINTS & HYDRAULIC HOSES

IMPORTANT

These tightening torques are available in the case of tightening without lubricant.

Nuts & Sleeve

Tube size Outer diameter x thickness (mm)	Wrench (mm)	Tightening torque N·m {lbf·ft}
10x1.5	19	39.1 to 48.9 {29 to 37}
15x2.0	27	127 to 167 {96 to 124}
18x2.5	32	157 to 197 {116 to 144}
22x3.0	36	196 to 236 {146 to 174}
28x4.0	41	246 to 304 {178 to 222}
35x5.0	55	397 to 485 {297 to 363}

Joints for piping

Screw diameter (PF)	Wrench (mm)	Tightening torque N·m {lbf·ft}
1/8	14	15 to 19 {11 to 13}
1/4	19	34 to 38 {26 to 28}
3/8	22	69 to 79 {50 to 58}
1/2	27	98.2 to 117.8 {73 to 87}
3/4	36	152.2 to 171.8 {112 to 126}
1	41	245.2 to 264.8 {181 to 195}

Hydraulic hoses

Screw diameter (PF)	Wrench (mm)	Tightening torque N·m {lbf·ft}
1/8	14	13 to 17 {10 to 12}
1/4	19	24.1 to 33.9 {18 to 26}
3/8	22	44.1 to 53.9 {32 to 40}
1/2	27	73.1 to 82.9 {54 to 62}
3/4	36	108.2 to 127.8 {80 to 94}
1	41	122 to 152 {90 to 112}

4.8 CONNECTING HYDRAULIC HOSES AND PIPING JOINT

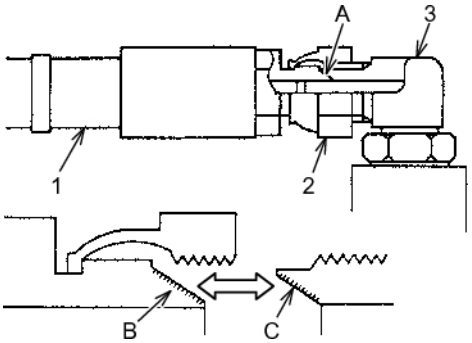
The following 2 types of fitting part are used for hose piping.

4.8.1 METAL JOINT

The openings of a connector (tee or elbow) and a hose are crimped for metallic sealing. Be careful not to damage the seating surface during disassembling or assembling.

1. Hose
2. Union nut
3. Connector

A. Seating surface
B. Crimping surface of hose cap
C. Crimping surface of connector



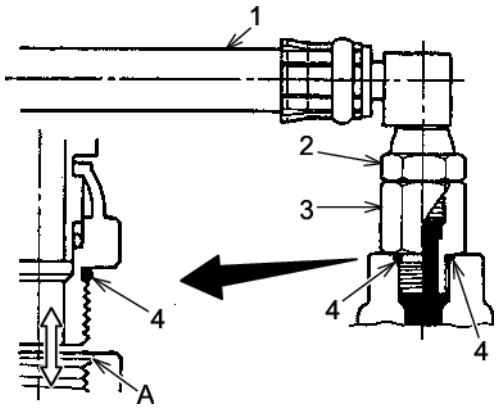
METAL JOINT

4.8.2 O-RING SEAL JOINT

An O-ring equipped with the hose mouth fitting seals the hydraulic pressure of the fitting part to prevent the oil leakage.
The tightening torque for the piping joint of a hydraulic hose is determined by the screw diameter of the hose mouth fitting. When a failure is found in a hose piping joint, pay attention to the following points to repair and replace it even before the periodic inspection of the hydraulic component unit.

1. Hose
2. Union nut
3. Connector
4. O-ring

A. Crimping surface of O-ring



O-RING SEAL JOINT

O-RING PART

1. Be sure to replace the O-ring with a new one at reassembly.
2. If oil leakage occurs due to union loosening, replace the O-ring with a new one instead of retightening, confirm that it is in contact with the sealing surface properly, and then tighten it.
3. Do not use a new O-ring which has damage or deterioration. Also, it may cause oil leakage or markedly decrease the service life of the hydraulic components to use an O-ring other than the specified parts even if it has the same size because the material or hardness can be different.

JOINT PART

1. Take enough care not to damage the O-ring groove surface and sealing surface of hoses, pipes and other hydraulic components when connecting them. Using damaged parts causes oil leakage.
2. Be sure to keep out dust or other foreign materials. Foreign materials caught in the fitting part causes oil leakage.

HOSE PART

1. Do not twist a hose or bend it with a small radius to connect it. It shortens the service life of them.
2. After cleaning the fitting parts and around them of the hoses, pipes and other hydraulic components, remove and dry the cleaning solvent completely before connecting these parts. Wipe away all grease on the screw parts before assembling and tightening them.

4.9 RELEASING INTERNAL PRESSURE IN HYDRAULIC OIL AND HYDRAULIC SYSTEM

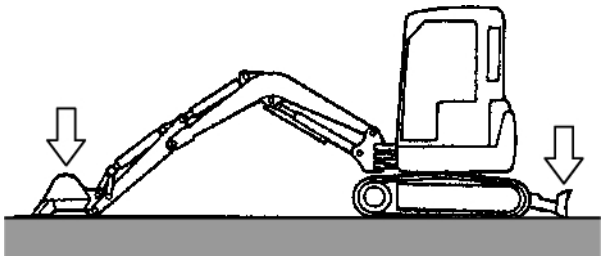
Release the internal pressure in the hydraulic system before the maintenance including attachment and detachment of the hydraulic components such as hydraulic oil, return filter, suction strainer and cylinder.

4.9.1 RELEASING INTERNAL PRESSURE IN HYDRAULIC SYSTEM

WARNING

Inside of the hydraulic oil tank is dangerous because it is a high temperature and pressurized. Before removing the filler port plug, stop the engine and then press the top of the rubber cap or loosen the flange slowly to release the pressure.

1. Select the level and firm ground, retract the arm cylinder and bucket cylinder to the stroke end, and lower the boom to place the bucket and dozer on the ground, placing the machine in the "hydraulic oil inspection position" as shown to the right figure.
2. For the hydraulic pilot type, move the control lever for the circuit to release the internal pressure immediately before stopping the engine with low idle.

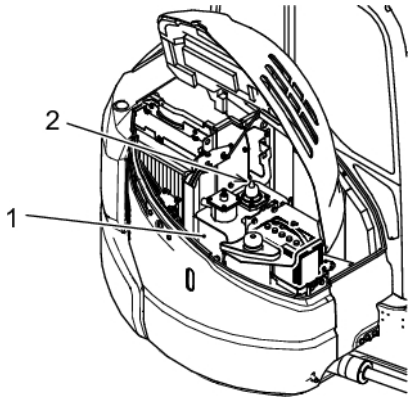


Hydraulic Oil Inspection Position

IMPORTANT

Internal pressure of the hydraulic system cannot be released without using the above procedures.

3. For the manual type, internal pressure can be released by operating the control lever after stopping the engine.
4. Move the pilot control shut-off lever to the "LOCKED" position.
5. Stop the engine.
   (Turn the starter switch to the "OFF" position.)
6. Open the right side cover and support it with the stay.
7. Press the rubber cap of air breather (2) on the top of hydraulic oil tank (1) several times (5 - 7 times) to release the internal pressure of the hydraulic oil tank.
8. Now the pressures in the hydraulic system and hydraulic oil tank is released. You can start the inspection and maintenance of the hydraulic system.



4.10 INSPECTION AND 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 in the Table

	:	Indicates a required periodic inspection or maintenance with the hour meter interval.
*1	:	Indicates a first one time maintenance interval.
○	:	Indicates a required periodic inspection or maintenance interval.
*2	:	See "LUBRICANT, FUEL & COOLANT SPECIFICATIONS" for the detailed specifications of lubricant, coolant, and fuel, etc.
LLC	:	Our genuine antifreeze/coolant
*3	:	Contact KOBELCO authorized dealer/distributor for inspection and adjustment.

Engine (1/2)

Item/Interval		When required	Start-up inspection	Weekly 50H	Every 3 months 250H	Every 6 months 500H	Every year 1000H	1500H	2000H	5000H	Oil (replacement part) *2	Procedure described in
Engine oil	Inspection of oil level		○								Engine oil	3.2.2
	Replacement			*1 (First time)	○							4.14.4
Replacing oil filters				*1 (First time)	○						Cartridge	4.14.5
Water separator	Water drainage		○									4.12.5
	Cleaning					○					Element	4.15.2
Fuel filter	Replacement					○					Cartridge	4.15.1
Air cleaner element	Inspection, cleaning				○						Element	4.14.3
	Replacement					○					Element	
Radiator coolant	Inspection of water level		○									3.2.1
	Replacement						○				Tap water (LLC)	4.16.5
	Inspection of leakage		○									3.2.1
Fan belt	Inspection		○									3.2.6
	Regulation			*1 (First time)	○							4.14.1
Checking Radiator, Oil Cooler Core and Filter		○			○							4.14.10
Cleaning and replacing radiator cap	Cleaning				○							4.14.9
	Replacement						○					
Inspecting radiator hoses for cracks or damages					○							4.14.2

CAUTION

When using in dusty environments, the filters and cores need more frequent cleaning. Check their contamination levels and clean them accordingly.

Engine (2/2)

Item/Interval	When required	Start-up inspection	Weekly 50H	Every 3 months 250H	Every 6 months 500H	Every year 1000H	1500H	2000H	5000H	Oil (replacement part) *2	Procedure described in
Inspecting exhaust color, abnormal sound and odor		○									3.6.1
Inspecting and adjusting valve clearance *3						○					4.16.3
Adjusting intake and exhaust valves *3								○			4.18.5
Inspecting, adjusting and cleaning fuel injection valves *3							○				4.17.1
Inspecting and adjusting fuel injection timing *3							○				4.17.1
Inspecting and adjusting starter and generator *3						○					4.16.4

Fuel system

Item/Interval		When required	Start-up inspection	Weekly 50H	Every 3 months 250H	Every 6 months 500H	Every year 1000H	1500H	2000H	5000H	Oil (replacement part) *2	Procedure described in
Fuel tank	Inspection of oil level and refill		○									3.2.3
	Removal of moisture and sediment			○								4.13.2
	Inspection of leakage		○									3.2.4

Hydraulic system

Item/Interval			When required	Start-up inspection	Weekly 50H	Every 3 months 250H	Every 6 months 500H	Every year 1000H	1500H	2000H	5000H	Oil (replacement part) *2	Procedure described in
Hydraulic oil tank	Hydraulic oil	Inspection of oil level		○								Hydraulic oil	3.2.5
		Cleaning, replacement						○ (Breaker)			○		4.19.1
	Suction strainer	Cleaning, replacement								○		Strainer	4.18.2
	Replacing return filters				*1 (First time)	○ 200H (Breaker)		○				Element	4.16.1
Replacing air breather element								○				Element	4.16.2
Inspecting cylinders, pipes and hoses for oil leakage and damage				○								Element	4.12.3
Cleaning pilot line filter										○			4.18.3

Upper frame

Item/Interval	When required	Start-up inspection	Weekly 50H	Every 3 months 250H	Every 6 months 500H	Every year 1000H	1500H	2000H	5000H	Oil (replacement part) *2	Procedure described in
Greasing swing bearing				○						EPG lithium added extreme-pressure grease	4.14.7
Greasing swing pinion		○ (To 50H)	○								4.13.4

Lower frame

Item/Interval		When required	Start-up inspection	Weekly 50H	Every 3 months 250H	Every 6 months 500H	Every year 1000H	1500H	2000H	5000H	Oil (replacement part) *2	Procedure described in
Motor with travel reduction unit	Oil change					*1 (First time)			○		Gear oil	4.18.1
Inspecting and adjusting rubber track shoe tension				○								4.13.3
Inspecting rubber track shoes for wear and damage		○										4.11.5
Lower roller idler	Inspection		○									4.12.4
	Oil change								○		(Lower roller) Engine oil (Idler) Gear oil	4.18.4
Inspecting sprocket and motor with travel reduction unit for oil leakage and wear			○									4.12.4

Attachment

Item/Interval		When required	Start-up inspection	Weekly 50H	Every 3 months 250H	Every 6 months 500H	Every year 1000H	1500H	2000H	5000H	Oil (replacement part) *2	Procedure described in
Greasing pins	Boom, arm, bucket (cylinder)		○ (To 50H)	○							EPG lithium added extreme-pressure grease	4.12.6
	Dozer (cylinder)				○							4.14.8
Replacing bucket		○										4.11.3
Adjusting and inspecting bucket-clatter adjustment mechanism		○										
Inspecting teeth and side cutters for wear and damage		○										4.11.4

Electricity

Item/Interval	When required	Start-up inspection	Weekly 50H	Every 3 months 250H	Every 6 months 500H	Every year 1000H	1500H	2000H	5000H	Oil (replacement part) *2	Procedure described in
Inspecting electric wiring	○										4.11.8
Inspecting and maintaining batteries			○							Distilled water	4.13.1
Checking function of warning lamps		○									3.3.1
Checking gauge monitor panel operation		○									3.6.3
Safety lock lever		○									3.6.2
Replacing working lights	○									12V 55W (Halogen lamp)	4.11.2

Other equipment

Item/Interval		When required	Start-up inspection	Weekly 50H	Every 3 months 250H	Every 6 months 500H	Every year 1000H	1500H	2000H	5000H	Oil (replacement part) *2	Procedure described in
Visually inspecting machine for deformation and damage			○									4.12.1
Inspecting for loose or missing bolts and nuts			○									4.12.2
Control lever	Inspection		○									4.11.7
	Greasing	○									EPG lithium added extreme-pressure grease	4.11.7

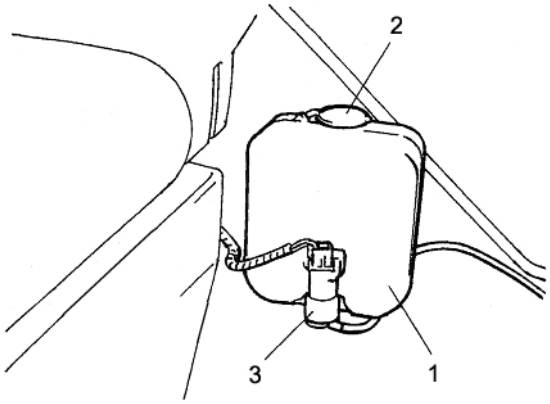
4.11 WHEN REQUIRED

Thoroughly read and understand "1. SAFETY PRECAUTIONS" of this manual before operating, inspecting or maintaining the machine.

4.11.1 MAKING UP WASHER FLUID

The washer fluid reservoir is located on the left rear side in the cab.

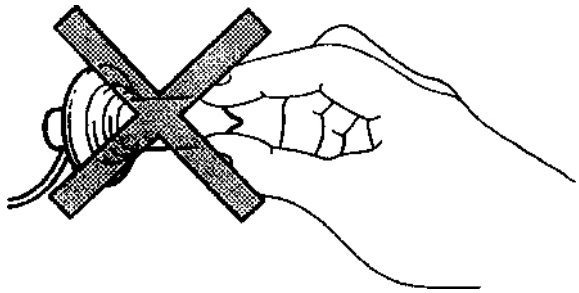
1. Check washer fluid reservoir (1) for the washer fluid level.
2. When the washer fluid level is low, remove cap (2) and make up the washer fluid.



1) Washer fluid reservoir
2) Cap
3) Electromotor

4.11.2 REPLACING WORKING LIGHT

A halogen lamp (55W) is used for the working lights of this machine.
This section describes the replacement of a lamp. If no abnormality is found in the lamp, see "HANDLING OF FUSE BOX" in Chapter 2 to check the fuse.

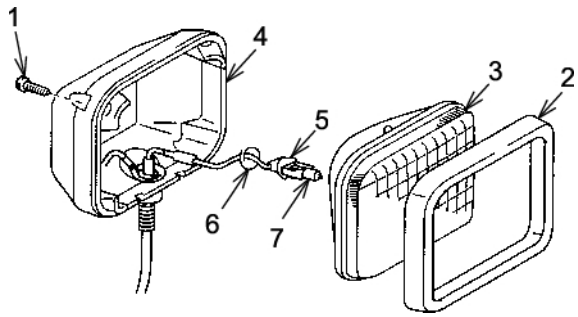


CAUTION

Because a lighted lamp becomes hot, its life may be shortened if grease or other oil is adhered on it. When replacing the lamp, hold the flange part so as not to touch the glass part with fingers.

ATTACHMENT MOUNTING PART

1. Remove screw (1) (4 pieces), and remove rim (2) and lens part (3) from housing (4).
2. Remove spring (6) that fixes socket (5).
3. Remove lamp (7) from socket (5) and install a new lamp.
4. Tighten and fix the removed parts in the reverse procedure of the step 1.



Working light on the attachment

IMPORTANT

Be careful not to damage the lens when replacing the lamp. Hold the lens when removing screw (1), or it will come off to be damaged.

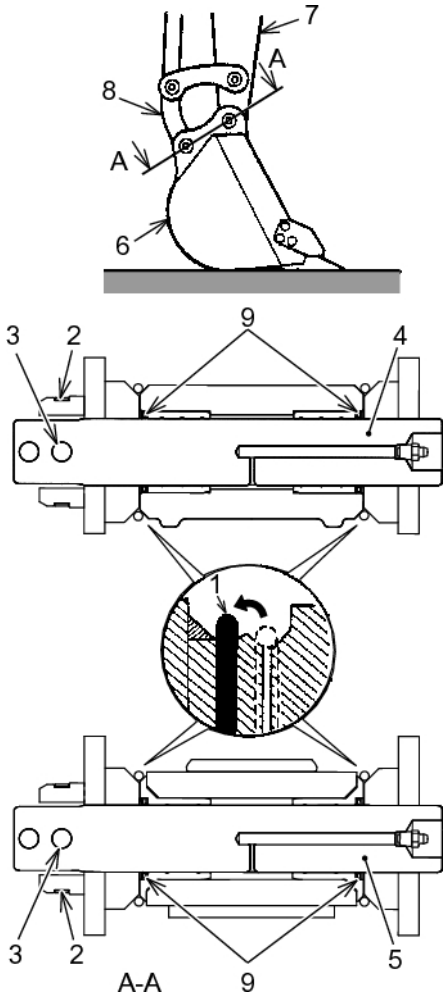
4.11.3 REPLACING BUCKET

CAUTION

・Park the machine on the level and firm ground. When working as a group work, surely send and receive signals to each other and use extreme caution to ensure the safety.
・An abrupt operation of the front attachment is strictly prohibited because it may cause danger.
・When aligning the pin with a pin bore, never insert your fingers into the bore.
・Place the removed bucket in the stable condition.

REMOVING BUCKET

1. Put the bucket bottom on the level ground and stabilize it at the position where the load is not applied on the pins of bucket and arm.
2. Move O-rings (1) from the specified position to the bucket boss.
3. Remove retaining ring (1) by using a flat-head screwdriver, remove pin (3), pull pins (4) and (5) out, and then remove bucket (6).

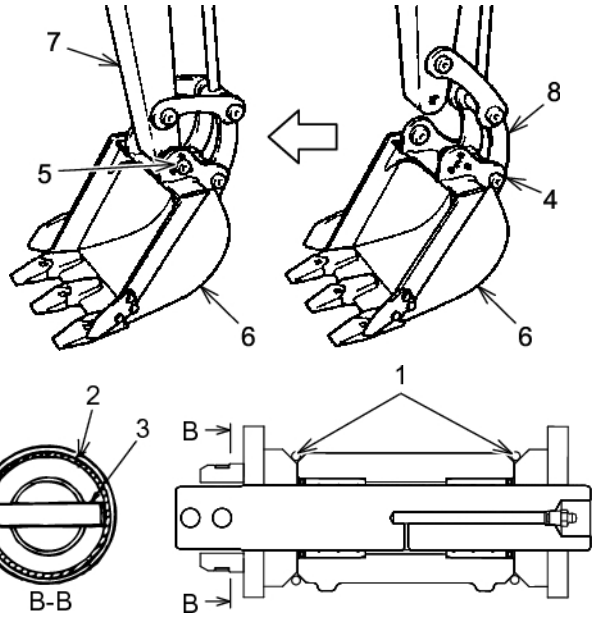


IMPORTANT

•Use caution to prevent sand or mud from attaching the removed pin.
•The both ends of arm (7) and bucket link (8) have the dust seals (9). Use caution to avoid damaging them.

INSTALLING BUCKET

1. Clean each pin and pin bore and grease sufficiently.
2. Move the bucket cylinder to align the pin bores of bucket (6) and bucket link (8) with each other, and then insert pin (4).
3. Raise the boom and slightly raise the bucket from the ground.
4. Move arm (7) to align the pin bores of bucket (6) and arm (7) with each other, and then insert pin (5).
5. Insert pin (3) and install retaining ring (2). Fit O-ring (1) in place.
6. Apply grease to the grease nipples for each pin until the grease comes out through the gap between pins and bore.



IMPORTANT

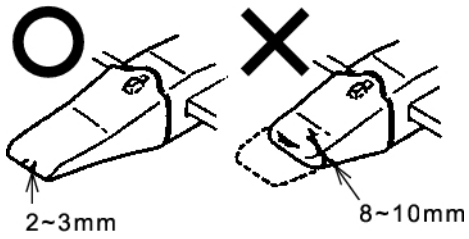
If O-ring (1) is cracked or has lost elasticity, replace it with a new one.

4.11.4 REPLACING TOOTH POINT AND SIDE CUTTER

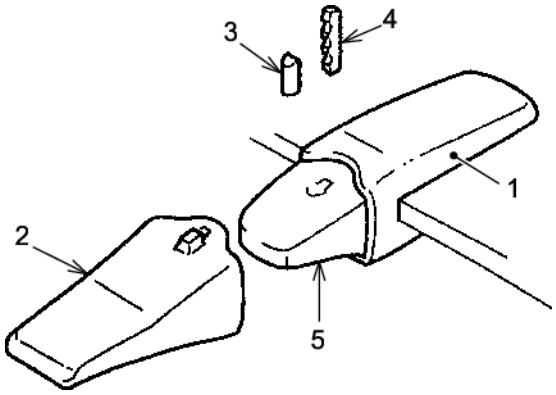
CAUTION

When replacing a tooth point or side cutter, apply a safety block to the bottom face of the bucket.

Check the bucket tooth points and side cutters for wear. A tooth point with holes or crackings should be replaced before adapter (1) begins to be worn.
A side cutter with severe wear should be replaced soon after it is found. If the replacement is delayed, the body of the bucket will be damaged.



1. Adapter
2. Tooth point
3. Rubber lock pin
4. Locking pin
5. Adapter nose



REPLACING THE TOOTH POINTS

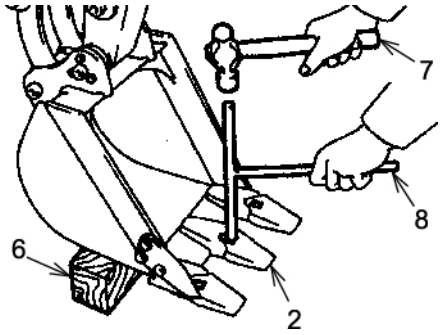
When replacing the tooth points or the side cutters, contact KOBELCO authorized dealer/distributor.

CAUTION

When hammering, metal chips can fly. If it flies into the eye, it may result in severe injury. Wear protective gears such as protective glasses, hard hat and gloves.

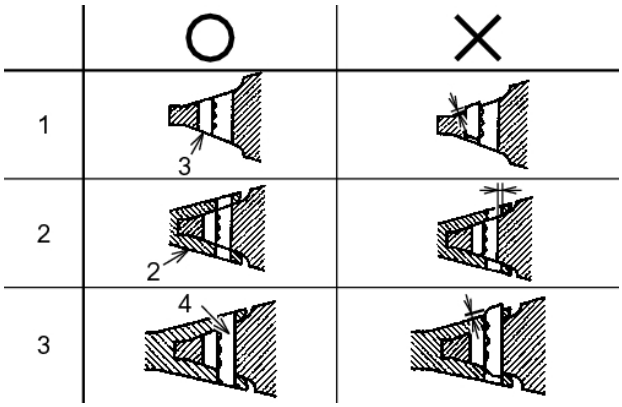
REMOVING THE TOOTH POINT

1. To hammer out the tooth pin, place the bucket on safety block (6), making the tooth parallel to the ground.
2. Using hammer (7) and punching tool (8), hammer out locking pin (4). Be careful not to break rubber lock pin (3).
3. Inspect locking pin (4) and rubber lock pin (3). If locking pin (4) is too short or rubber lock pin (3) is in poor condition as shown to the right, replace it with a new one.



INSTALLING THE TOOTH POINT

1. Push rubber lock pin (3) into the hole of the adapter nose.
2. Fit tooth point (2) onto adapter nose (5).
3. Hammer locking pin (4) until it is aligned with the point surface.

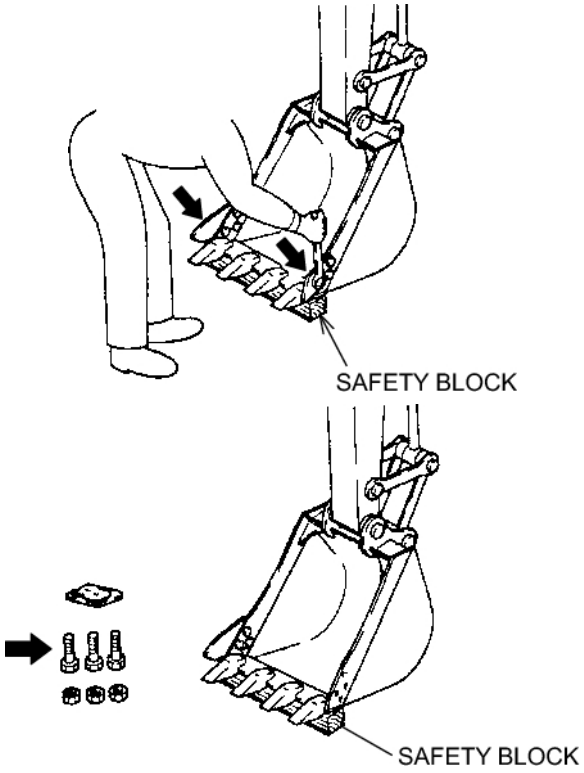


IMPORTANT

Align the rear face of the pin bore on the tooth point with that on on the adapter nose or insert the tooth point more deeply.

REPLACING THE SIDE CUTTERS

1. Remove any sand and soil around the attaching bolts, use an acetylene torch to cut off the bolts, and then remove the side cutters.
2. Clean the mounting surfaces and install new side cutters.
   When replacing the side cutters, replace the bolts and nuts with new ones.
   Tightening torque:
   249.6 to 308.4 N·m (184 to 227 lbf·ft)
3. After tightening the nuts, spot-weld them.



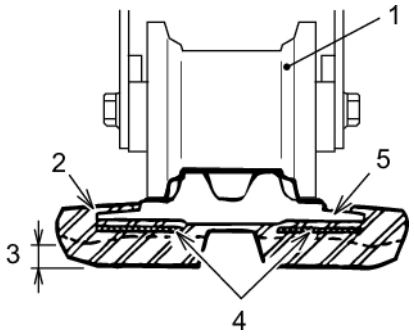
IMPORTANT

If the replacement is delayed, the body of the bucket will be damaged.
Early replacement is recommended.

4.11.5 CHECKING RUBBER TRACK SHOE

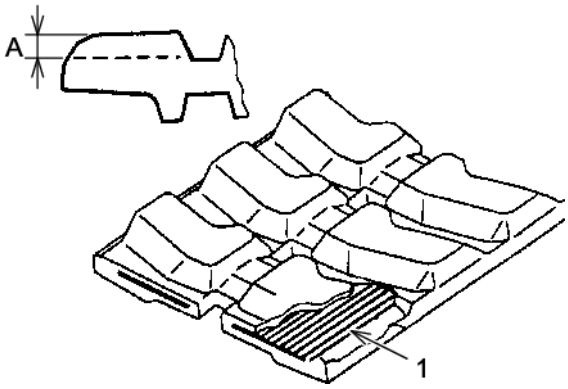
Repair or replacement of the rubber track shoes is required if the following conditions are observed. Contact KOBELCO authorized dealer/distributor for repair or replacement.

1. Lower roller
2. Rubber track shoe
3. Lug
4. Steel cord
5. Core metal



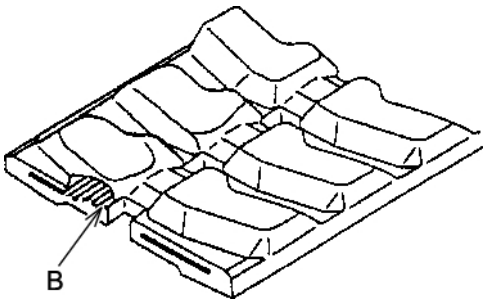
LUG HEIGHT

1. As lug height (A) decreases due to wear, the drawbar pull is reduced. When (A) is 5 mm (0.2 inch) or less, replace the shoes with new ones.
2. When lugs are worn and steel cord (1) inside the shoe is exposed across two links or more, replace the shoe with a new one.



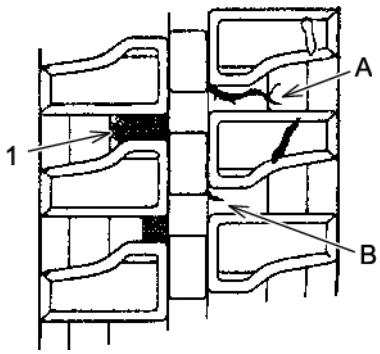
BREAK OF STEEL CORD

If lugs are worn and more than half of one steel cord (B) is broken, replace the shoe with a new one.



CRACKING OF RUBBER TRACK SHOE

If cracking (A) of 60 mm (2.4 inch) or longer occurs between lugs of the rubber track shoe, repair it. In addition, if a shorter cracking (B) occurs and inner steel cord (1) is exposed, immediately repair it.



IMPORTANT

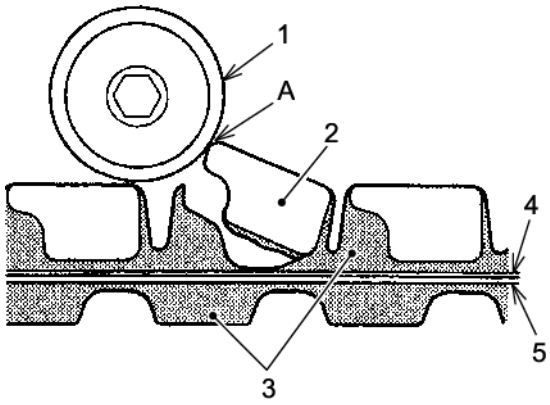
Contact KOBELCO authorized dealer/distributor for judgement of replacement or repair of the rubber track shoe.

DETACHMENT OF CORE METAL OF RUBBER TRACK SHOE

Even if no damage or wear is found on the lug side (outside) of the rubber track shoe, the core metal side (inside) can be worn by interference or rubbing with roller, idler, or sprocket in some usage condition, finally resulting in detachment of core metals.

1. Lower roller
2. Core metal
3. Rubber
4. Canvas
5. Steel cord

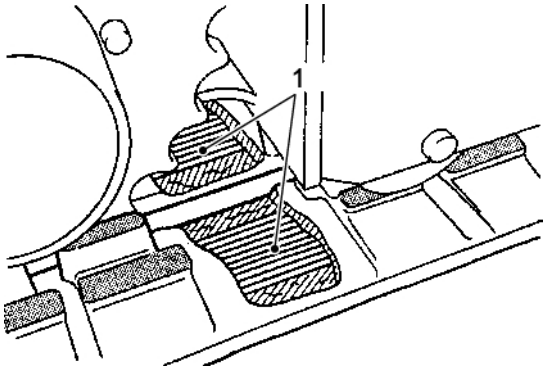
A. Damage due to interference



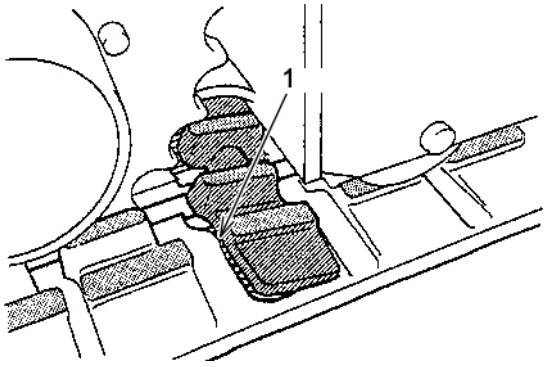
IMPORTANT

Our warranty does not cover damage caused by prohibited use of the rubber track shoes or use of them with an improper shoe tension.

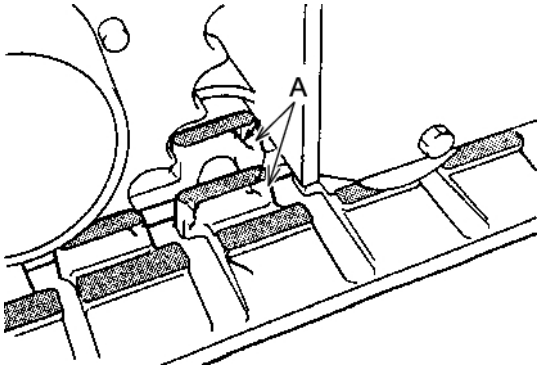
1. If any one of the core metals (1) on a rubber track shoe is detached, replace it with a new one.



2. If a cracking occurs on a rubber track shoe and a core metal (1) stands out, replace it with a new one.



3. Crackings (A) which occur where core metals contact with the roller do not need repair.



IMPORTANT

•Prohibited use of the rubber track shoe can easily cause detachment of core metals.
•See "HANDLING OF RUBBER TRACK SHOE (STANDARD)" in Chapter 3 to understand the prohibitions on use of the rubber track shoe.

4.11.6 REPLACING RUBBER TRACK SHOE

WARNING

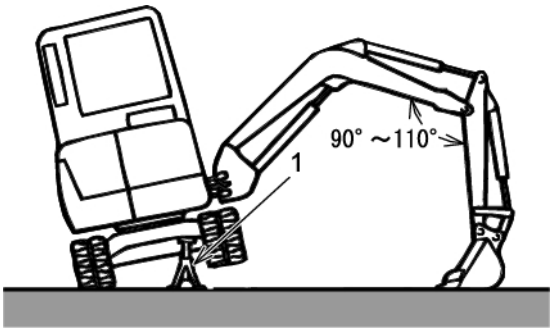
•Perform the work in pairs and the operator should operate the machine according to signals from the other worker. The replacement of rubber track shoe is performed after raising up the machine. It is dangerous for the machine to fall unintentionally when replacing it. Do not move anything other than the rubber track shoe to be replaced during the replacement work.
•Grease cylinder is under high pressure. It is dangerous to loosen the grease nipple rapidly because grease will splash. Loosen the grease nipple gradually with your face kept away from around the grease nipple. The grease nipple can pop out due to the inner high pressure. Loosen it gradually within one turn.
•Make sure that the grease inside the grease cylinder is completely drained and then turn the sprocket before removing the rubber track shoe.
•It is very dangerous to splash the grease in other than the procedure described in "Removing Rubber Track Shoe" in the next page. Contact KOBELCO authorized dealer/distributor for repair if the rubber track shoe is not loosened.

IMPORTANT

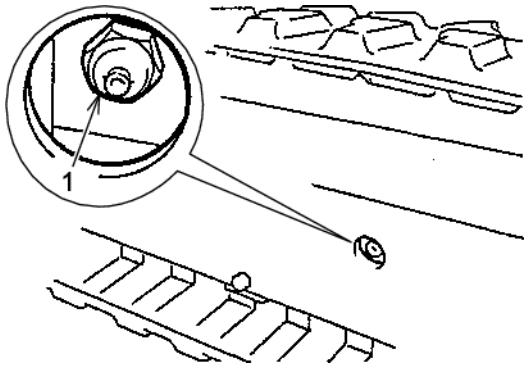
•Wash to remove any sand and soil around the tracks before replacement, inspection and adjustment.

Removing Rubber Track Shoe

1. Use the boom or arm to lower the bottom of the bucket to the ground to lift the machine body up. Be sure to perform the lever operation slowly.
2. Support the undercarriage with safety strut (1) or other means.

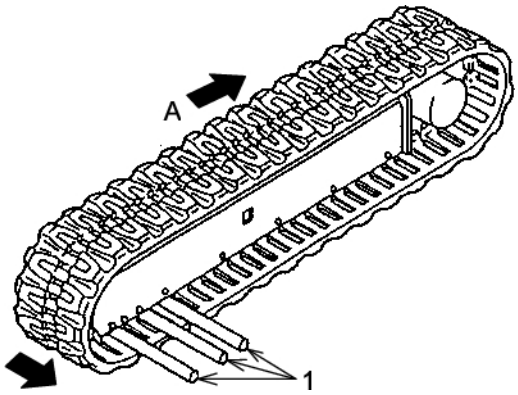


3. Loosen grease nipple (1) of the grease cylinder slowly to drain the grease.
4. Loosen grease nipple (1) gradually within one turn at most.



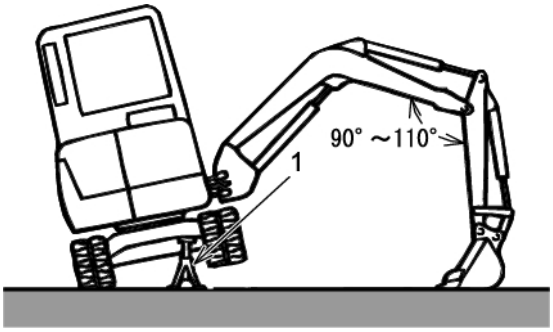
5. Put in iron pipes along the rubber track shoe and slowly rotate the sprocket in the reverse direction. If the rubber track shoe comes off from the iron pipes, slide it horizontally to remove it.

   1. Iron pipe
   A. Rotation direction

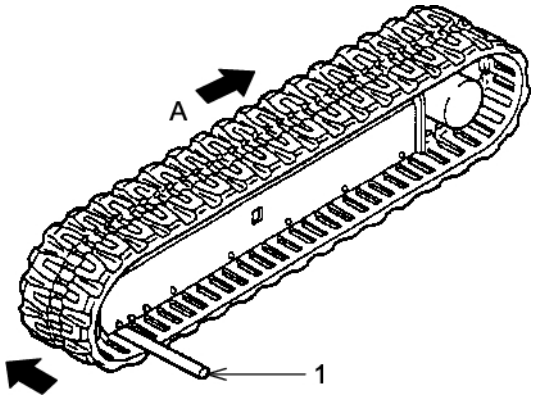


Installing Rubber Track Shoe

1. Use the boom or arm to lower the bottom of the bucket to the ground to lift the machine body up.
   Be sure to perform the lever operation slowly.
2. Support the undercarriage with safety strut (1).

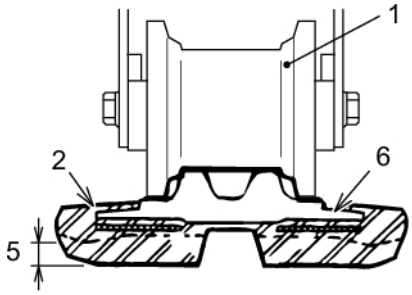


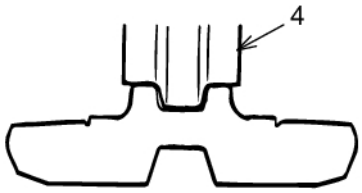
3. Engage the rubber track shoe with the sprocket and place it on the idler.
4. Rotate the sprocket in the reverse direction slowly to push the rubber track shoe and stop the rotation.
5. Put in iron pipes along the rubber track shoe and slowly rotate the sprocket in the reverse direction again to place the rubber track shoe on the idler securely.

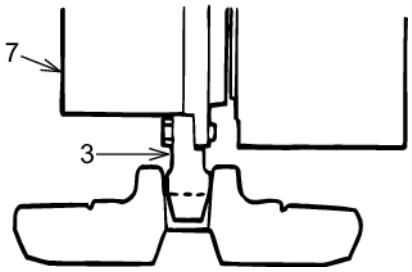


1. Iron pipe
A. Rotation direction

6. Stop the rotation and check that the rubber track shoe is securely placed on the sprocket, idler and lower roller (1).
7. Inspect and adjust the tension of rubber track shoe (2), following "INSPECTING AND MAINTAINING TRACK SHOE TENSION".
8. Place the machine on the ground after checking that tension and engagement between the rubber track shoe (2), sprocket (3) and idler (4) is sufficient.



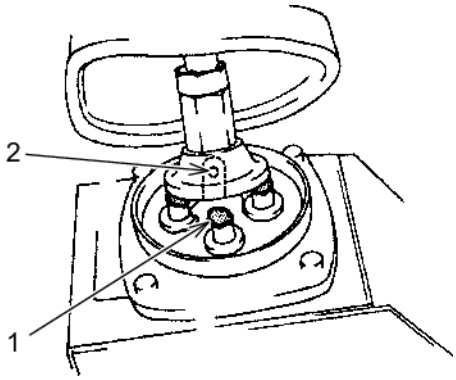




1. Lower roller
2. Rubber track shoe
3. Sprocket
4. Idler
5. Lug
6. Core metal
7. Travel motor

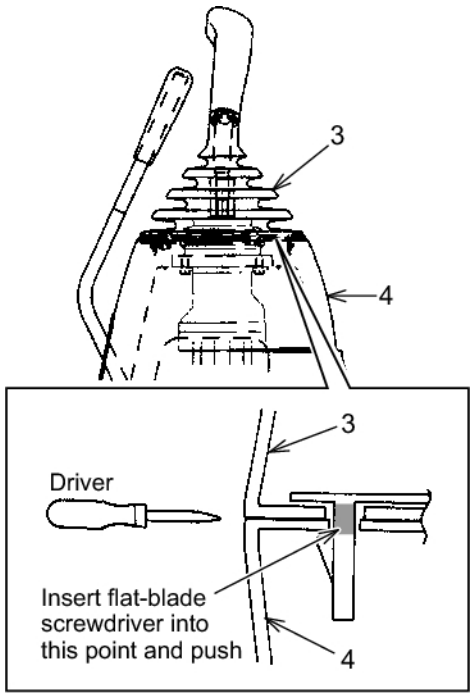
4.11.7 LUBRICATING PUSH ROD OF CONTROL LEVER

Remove the rubber boot of the pilot valve and apply a small amount of grease to the push rod and top end (2) of the rotation sliding section.



REMOVING BOOT

1. Insert a flat-head screwdriver between boot (3) and plastic cover (4) to release four clicks one by one.
2. After applying the grease, install plastic cover (4) and boot (3).

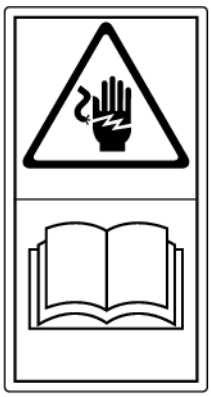


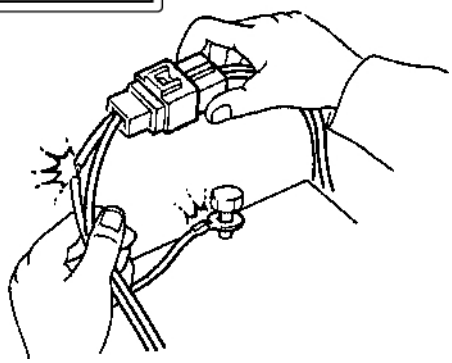
4.11.8 CHECKING ELECTRIC WIRING

WARNING

•Contact KOBELCO authorized dealer/distributor if frequent replacement of fuses is needed or a trace of short circuit is found.
•Be sure to disconnect the battery cable at the ground (-) side before checking the electrical system. Otherwise, an unintentional short circuit may occur and result in a fire.

Check the electrical wiring for disconnection or signs of short circuit, the fuses for damage, and the terminal connections for looseness or damage.
・Battery
・Starter
・Generator
Check the above wiring. Also check the operation of the monitor panel (instrument).





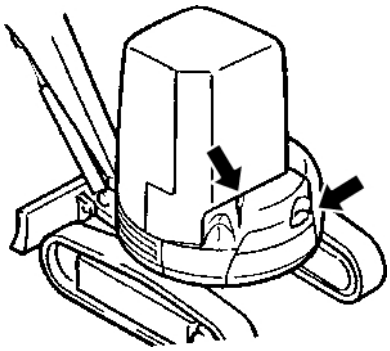
4.12 8 HOUR (DAILY) INSPECTION & MAINTENANCE PROCEDURES

For the following inspection and maintenance items, see "3. MACHINE OPERATION" and this chapter:

- Checking Coolant Level for Shortage and Making Up
- Checking for Coolant Leakage
- Machine Operation
- Checking Fuel Level and Making Up
- Checking for Fuel Leakage
- Checking Belt
- CHECKING MONITOR PANEL OPERATION
- Checking Hydraulic Oil Level and Making Up
- Checking Engine Oil Level and Making Up
- Pilot Control Shut-off Lever
- Checking Exhaust Color, Sound and Odor
- Checking Working Light
- Checking Function of Warning Lamps

4.12.1 VISUALLY CHECKING MACHINE FOR DEFORMATION AND DAMAGE

Even if deformation of a guard or cover does not seem to be a severe damage from appearance, it may interfere with internal horses and parts.
Contact KOBELCO authorized dealer/distributor for judgement of repair.



4.12.2 CHECKING FOR LOOSE OR MISSING BOLTS AND NUTS

Check the bolts and nuts for looseness or missing. Check the hose clamps similarly. If you hear an abnormal sound during the operation, tighten bolts and nuts referring to "TORQUE SPECIFICATIONS FOR BOLTS & NUTS" in Chapter 4, or it might cause oil leakage or fire.

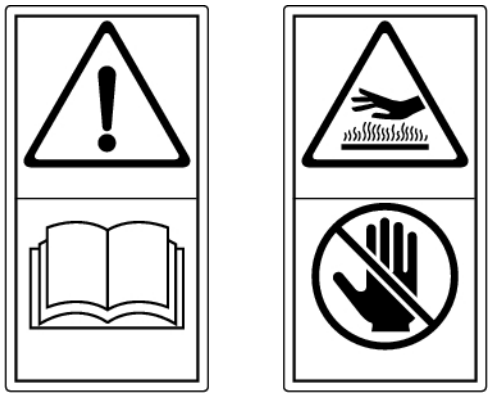
IMPORTANT

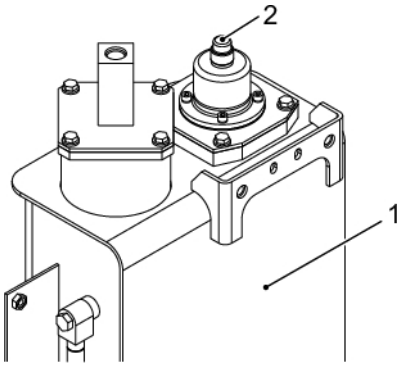
Use proper tools suited for the work place. For details of tools, see "NECESSARY TOOL" in Chapter 4.

4.12.3 CHECKING CYLINDERS, PIPES AND HOSES FOR OIL LEAKAGE AND DAMAGE

WARNING

Internal pressure always exists in the hydraulic circuit. Do not fill or drain the fuel, or inspect or maintain the machine before releasing the internal pressure. High pressure oil from even a pin hole can penetrate the skin or eyes and cause severe injury or blindness. High pressure oil leakage may be invisible. Wear protective glasses and gloves, and use a cardboard and plate to inspect the leakage location. Receive treatment by a doctor immediately if high pressure oil contacts with the body.





If leakage of hydraulic oil begins, operations of the attachment, swing and travel lack sufficient power, and will stop eventually, or only operations to one side may be disabled. If these conditions are observed, immediately park the machine at a safe place and stop the engine.

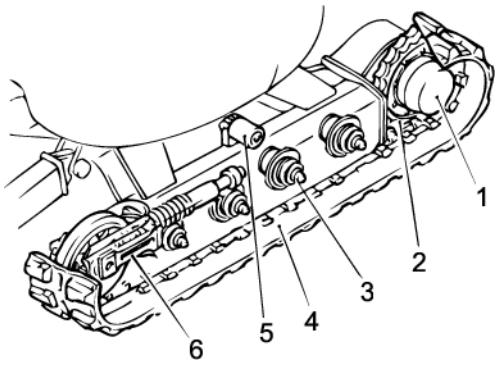
1. Move the pilot control shut-off lever to the "LOCKED" position and then stop the engine.
2. When checking for the leakage spot, wear protective glasses and gloves, and wait until the temperature of parts decreases to about 40 degrees C (104 degrees F).
3. Use the starter key to release the lock, open the right side cover of the machine and support it with the stay.
4. Press the rubber cap of air breather (2) on the top of hydraulic oil tank (1) several times (5 - 7 times) to release the internal pressure of the hydraulic oil tank.
   1. Hydraulic oil tank
   2. Air breather

IMPORTANT

If abnormality occurs, immediately stop the engine and contact KOBELCO authorized dealer/distributor for repair.
If the coolant or engine oil leakage and its quantity falls below the specified quantity, the warning lamp is lit.

4.12.4 CHECKING OIL LEAKAGE AND WEAR OF UNDERCARRIAGE

1. Check the idler and travel motor for oil leakage.
2. Check the lower roller, idler and sprocket for abnormal wear on the surface or looseness of attaching bolts.
3. Check for abnormal sound while traveling the machine slowly in a wide area.



1. Travel Motor
2. Sprocket
3. Lower Roller
4. Track Shoe
5. Upper Roller
6. Idler

IMPORTANT

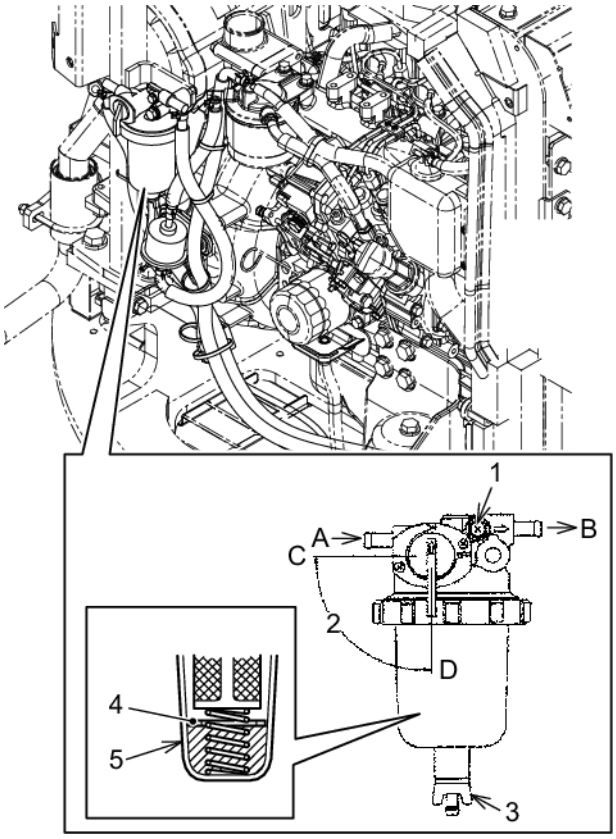
If abnormal wear, sound or oil leakage is observed, contact KOBELCO authorized dealer/distributor.

4.12.5 DRAINING WATER SEPARATOR

If red ring (4) of the water separator is sunk to the bottom of case (5), water does not enter. If red ring (4) floats, water enters under the ring. Drain the mixed water according to the following procedure.

1. Air vent bolt
2. Fuel cock
3. Drain cock
4. Ring (red)
5. Case

A. Fuel inlet
B. Fuel outlet
C. Close
D. Open



Water Separator

1. Move the pilot control shut-off lever to the "LOCKED" position and then stop the engine.
2. Open the engine food and raise cock (2) of the water separator to "Close" position (C).
3. Tighten the drain cock (3) and drain the accumulated water to a container.

CAUTION

If the water does not drain at all after tightening the drain cock (3), rotate the air vent bolt (1) two or three times to loosen it.
After draining, be sure to tighten the air vent bolt (1).

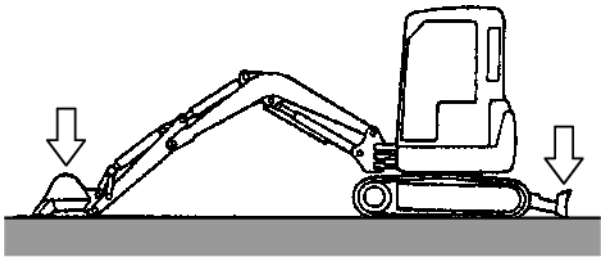
4. Tighten the drain cock (3).
5. Lower cock (2) to "Open" (D).
6. After draining, be sure to follow "BLEEDING AIR FROM FUEL SYSTEM" in Chapter 4.

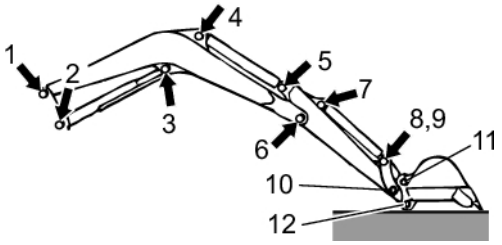
4.12.6 GREASING ATTACHMENT

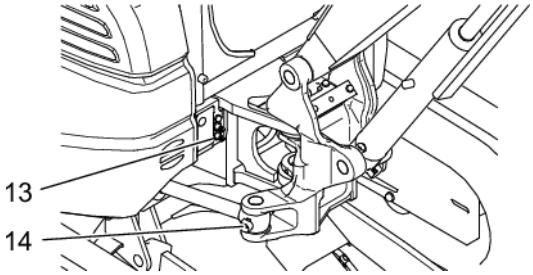
IMPORTANT **ATTENTION TO GREASING**

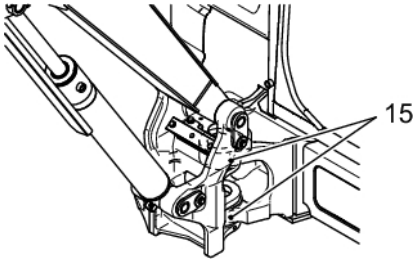
•For a new machine, grease the greasing points of the attachment every 8 hours during the first 50 hours of operation.
After that, grease them every 50 hours.
•For the work with a special attachment, grease it before work every day.
•For the digging work in the water, grease the submerged parts before and after the work every day.
•Grease the machine before the work if it has not been used for one month or longer.

1. Set the attachment in the greasing position and then stop the engine.
2. Before greasing, wipe off the grease nipples. Replace any damaged nipples with new ones.
3. Use the grease gun to apply grease to the grease nipples.
4. After applying grease, wipe off old grease which is pushed out.









No.	Greasing point	Points	No.	Greasing point	Points
1	Boom foot pin	1	9	Idler link pin	2
2	Boom cylinder foot pin	1	10	Arm and idler link connecting pin	1
3	Boom cylinder rod pin	1	11	Bucket link pin	1
4	Arm cylinder foot pin	1	12	Arm and bucket connecting pin	1
5	Arm cylinder rod pin	1	13	Swing cylinder foot pin	1
6	Boom and arm connecting pin	1	14	Swing cylinder rod pin	1
7	Bucket cylinder foot pin	1	15	Swing bracket and frame connecting pin	2
8	Bucket cylinder rod pin	1			

4.13 50 HOUR INSPECTION & MAINTENANCE PROCEDURES

Thoroughly read and understand "1. SAFETY PRECAUTIONS" of this manual before performing the inspection and maintenance.
Follow this section together with 8-hour (daily) inspection and maintenance described in Chapter 4.

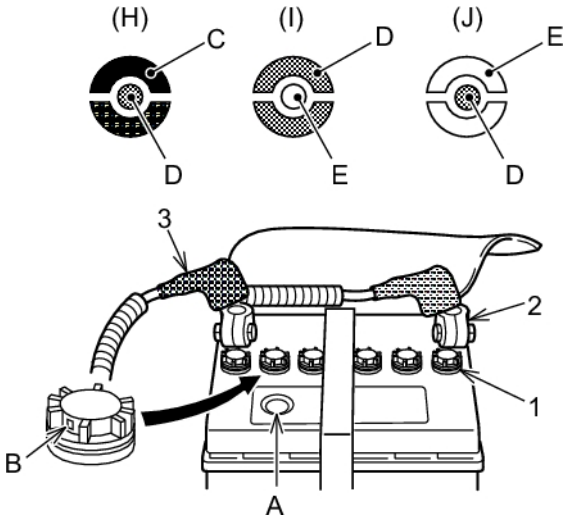
4.13.1 INSPECTING AND MAINTAINING BATTERY

Perform the inspection earlier in summertime as the battery electrolyte decreases faster due to high temperature.
If the battery with a low electrolyte level is used continuously, it will become unusable. Check the electrolyte level periodically, and if it is lower than the specified level, supply distilled water before starting the engine (before charging).

WARNING INSPECTING AND MAINTAINING BATTERY

•Wear protective glasses, long-sleeve shirt and rubber gloves when handling or servicing batteries.
•Do not bring a fire near the battery, or the combustible hydrogen gas generated by the battery may cause explosion.
•If the dilute sulfuric acid in the battery is splashed onto the skin or into the the eyes, it causes burns or blindness. At such case, immediately wash the skin or eyes with sufficient clean water, and ask a special doctor to treat it as soon as possible.
•Before performing inspection and maintenance on the battery, be sure to stop the engine.
•When removing the battery terminal, remove the ground side (negative terminal) first and conversely, when attaching the battery terminal, attach the ground side last.
•Do not put tools and hardware on the protective cover at installed on the battery upper section. It may cause a short circuit resulting in a fire or explosion.

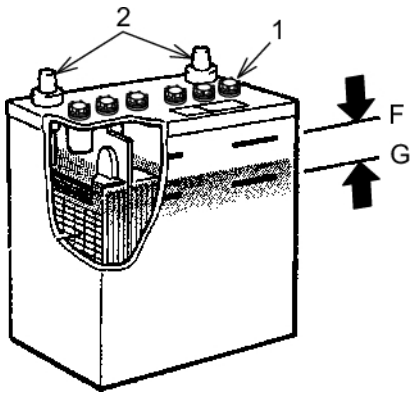
Check indicator (A) shown in the right figure. Red or white indicates a low electrolyte level or low charge. Take appropriate measures so that the indicator is displayed in blue.
1. Ventilation cap
2. Terminal
3. Terminal cover
A. Indicator
B. Vent hole
C. Blue
D. Red
E. White
F. (Upper limit)
G. (Lower limit)
H. Good
I. Low electrolyte level
J. Low charge



Indicator

Checking Battery Electrolyte Level

1. Move the pilot control shut-off lever to the "LOCKED" position, and then stop the engine.
2. Remove the floor mat and the left battery cover.
3. Remove ventilation cap (1) for each cell to check the electrolyte level.
4. If the level is low, supply distilled water to the specified level (10 to 15 mm (0.4 to 0.6 inch) above the electrode plate).
5. Clean the vent of ventilation cap (1) to prevent clogging and tighten the cap securely.
6. If terminals (2) are dirty, clean them with hot water, and then tighten them. Apply grease or spray a commercial rust preventive lubricant spray. If the terminals are oxidized, grind them with a wire brush or emery paper before attaching them.



If the engine speed does not rise at start-up and the engine fails to start, measure the specific gravity of the battery electrolyte.
If it is lower than the specified specific gravity, auxiliary charge is required.

Standard specific gravity of battery electrolyte: 1.28 {20 degrees C (68 degrees F)}

In adverse conditions such as cold weather, see the paragraph 3.1.17 to adjust the specific gravity of the battery electrolyte so that the charging rate is kept close to 100%. If the specific gravity is not increased by auxiliary charge, the battery must be replaced.

IMPORTANT

The specific gravity of battery electrolyte is measured with a hydrometer, and its value varies depending on the temperature. For measurement of the specific gravity of battery electrolyte and auxiliary charge, contact KOBELCO authorized dealer/distributor.

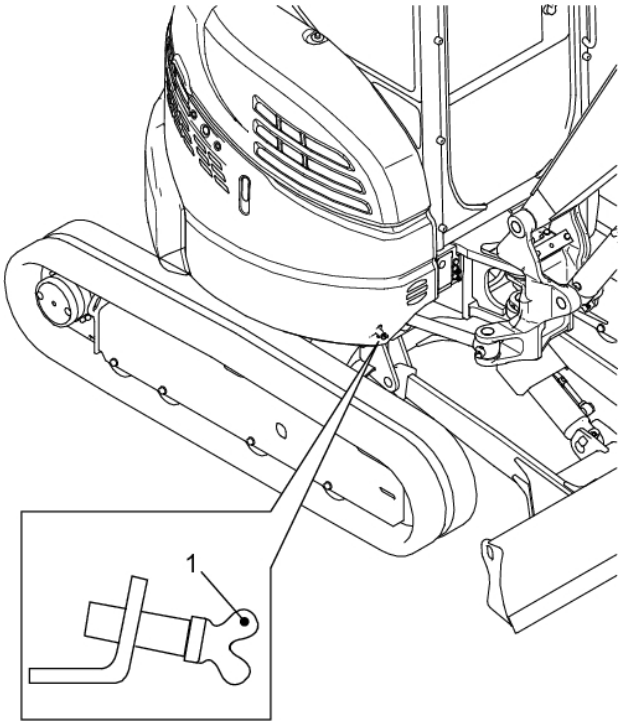
4.13.2 FUEL TANK DRAINING

Since the water is deposited during the night, drain the water and sediment before starting up the engine in the morning.

WARNING HANDLING OF LIGHT OIL

Wipe off spilled fuel to prevent a fire.

1. Swing the upper structure a little to a position where the drain valve under the fuel tank can be opened, place the bucket on the ground, stop the engine, and move the pilot control shut-off lever to the "LOCKED" position.
2. Place an empty container under drain valve (1) to catch the discharged fuel.
3. Open drain valve (1) and drain the water and sediment deposited on the bottom. Be careful not to be splashed by the flushed fuel.
4. Close drain valve (1) when the clean fuel is discharged.



4.13.3 INSPECTING AND MAINTAINING TRACK SHOE TENSION

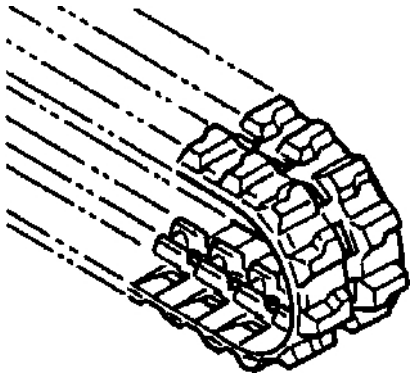
Adjusting the tension of the track shoes properly can extend the service life of them and traveling devices and prevent track shoes from coming off due to insufficient tension.

WARNING

Perform the work in pairs and the operator should operate the machine according to signals from the other worker.
The inspection of track shoe tension is performed after raising up the one side of the machine and if the machine falls accidentally, it is very dangerous. Never move the machine during the inspection.

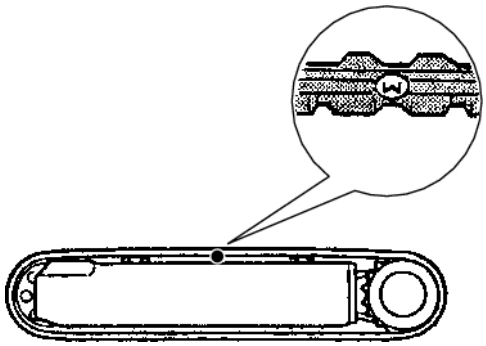
RUBBER TRACK SHOE

The wear status varies depending on the work condition and soil characteristic. Check the wear and tension as needed. Especially, when a new rubber track shoe is installed, adjust the tension frequently during the first 30 hours because of the initial elongation.

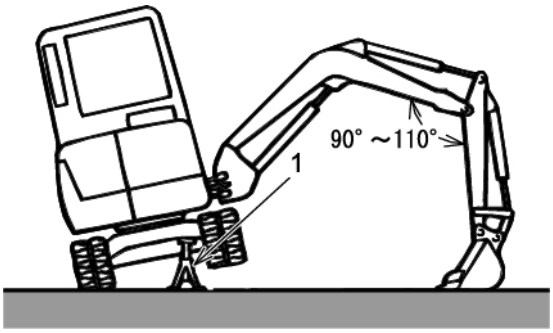


RUBBER TRACK SHOE

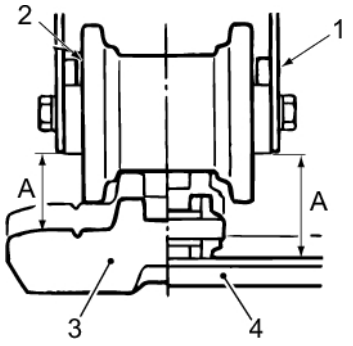
INSPECTION



For Rubber Track Shoe



1. Move the rubber joint (M mark) of the rubber track shoe to the upper center between the axles.
2. Swing the machine 90 degrees, place the bucket on the ground, and retract the boom cylinder to raise the track shoe to be checked. Then support the lower frame with safety strut (1).
3. At the center of the crawler frame, measure gap (A) between the lower surface of the crawler frame and the upper surface of the track shoe.
   1. Crawler Frame/2. Lower Roller
   3. Rubber Track Shoe/4. Iron Track Shoe
   Proper tension "A" mm (inch):
   •Rubber: 70 to 80 mm (2.8 to 7.87 cm)
   •Iron: 120 to 135 mm (4.7 to 5.3 inch)
4. If the tension is not proper, see the next section to adjust it.



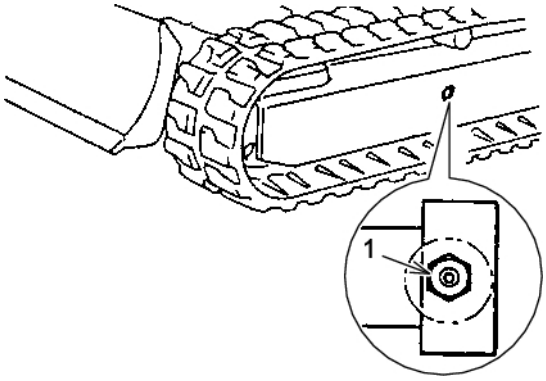
Rubber Track Shoe/Iron Track Shoe

IMPORTANT

Working with loosen track shoes causes coming off or early wear of them.

Adjustment

It is necessary to adjust the track shoe tension depending on the work condition at the working site. At the working site covered with many gravels and cobbles, loosen the track shoe tension as much as possible within the proper range. On the firm ground, increase the tension slightly within the proper range.



WARNING

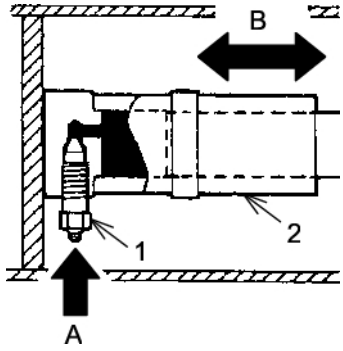
•Grease nipple (1) can pop out due to the inner high pressure grease. Do not loosen it more than 1 turn.

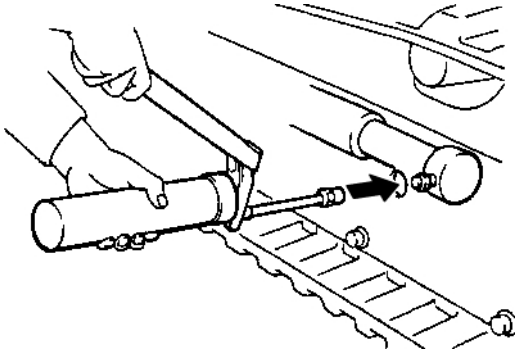
•The high pressure grease is charged in the grease cylinder of the track spring. When adjusting the shoe tension or disassembling the shoe for maintenance, loosen grease nipple (1) within one turn to discharge the grease gradually.

•Keep the face and body away from grease nipple (1) when loosening it.

Increasing Track Shoe Tension

Prepare a grease gun.





1. Use the grease gun to press grease into grease nipple (1) so that the track shoe tension becomes proper.
2. In order to make sure that the tensions of the left and right track shoes are equal and proper, travel the machine forward and backward to even out the pressure.
   1. Grease Nipple
   2. Grease Cylinder
   A. Grease Injection
   B. Pressure
3. Check the track shoes tension again, and repeat the adjustment for a proper tension as needed.

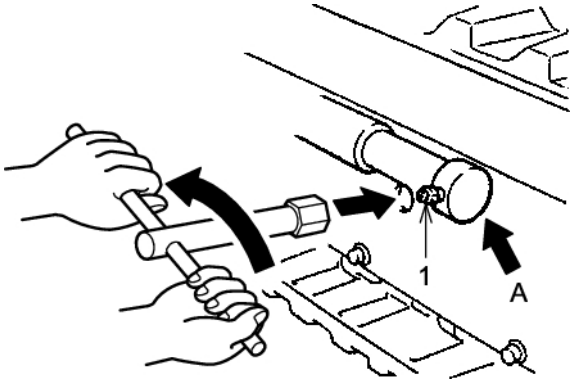
IMPORTANT

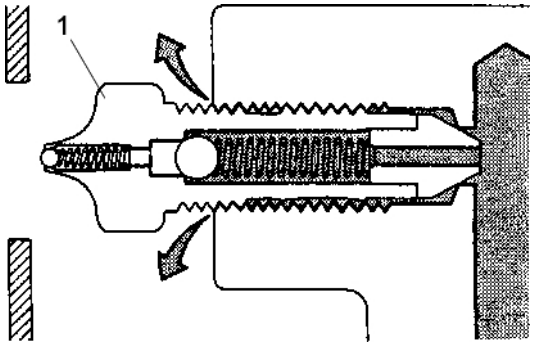
If the tension is still loose after pressing sufficient grease, replacement of the track shoe or seal in the grease cylinder may be required, or there may be a failure in the cylinder body. Contact KOBELCO authorized dealer/distributor for repair or replacement.

Loosening Track Shoe Tension

WARNING

•It is very dangerous to discharge the grease by using procedures other than the one described below.
•If the grease does not come out and the track shoe tension is not loosened after loosening the grease nipple, contact KOBELCO authorized dealer/distributor near you for repair.
•Never disassemble the grease nipples. It is dangerous.





Details of A Section (Grease Discharge)

1. Loosen grease nipple (1) of the grease cylinder gradually to drain the grease. Do not loosen grease nipple (1) more than one turn.
2. If the grease does not come out well, move the machine (track shoe) forward and backward.
3. Tighten grease nipple (1).

   Tightening Torque: 58.8 to 88.2 N·m (43.4 to 65.0 lbf·ft)

   In order to check that the tensions is proper, travel the machine forward and backward. Check the track shoes tension again, and repeat the adjustment for a proper tension as needed.

4.13.4 GREASING SWING PINION

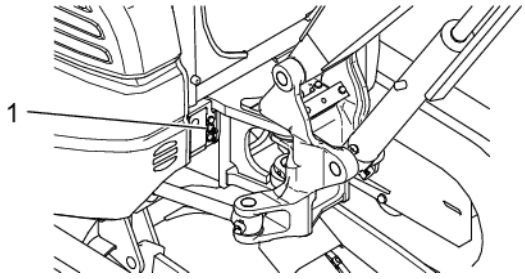
WARNING

Do not swing the machine while greasing the swing pinion.

Notice

During the first 50 hours of operation of a new machine, grease it every 8 hours.

Inject grease of 50 g (about 20 times with grease gun) from grease nipple (1) of the swing pinion for each of four directions while swinging the machine by 90 degrees.



4.14 250 HOUR (3-MONTH) INSPECTION & MAINTENANCE PROCEDURES

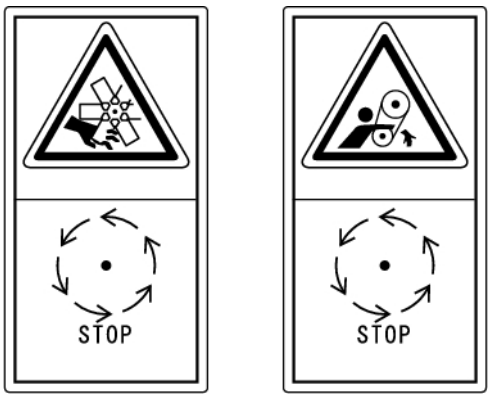
Thoroughly read and understand "1. SAFETY PRECAUTIONS" of this manual before performing the inspection and maintenance.
Follow this section together with daily and 50-hour inspection and maintenance.

4.14.1 ADJUSTING FAN BELT TENSION

WARNING

Be sure to stop the engine before inspection and maintenance. Inspecting and maintaining the running engine may cause injury by being caught in the cooling fan or fan belts.

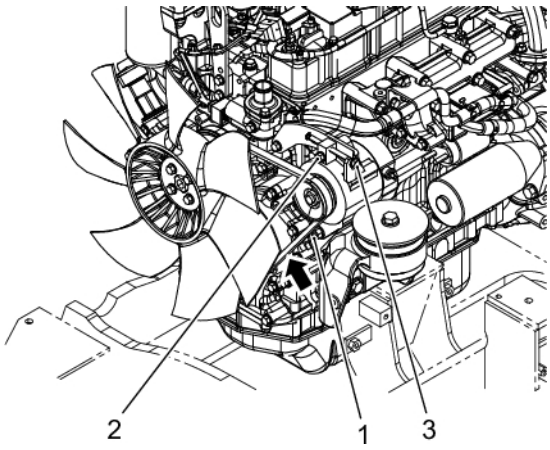
Check the belt for insufficient tension, wear and damage, and adjust it properly in order to maintain the maximum engine performance and the service life.



IMPORTANT

Be sure to check the deflection and tension after adjusting the tension and tightening screws.

1. Use the starter key to release the lock, open the right side cover of the machine and support it with the stay.
2. Loosen attaching nut (1) and adjusting bolt (2) slightly.
3. Loosen adjusting bolt (3), adjust the fan belt to the specified tension, and tighten attaching nut (1) and adjusting bolt (2).
4. After adjustment, run the engine at low idle for about 5 minutes and then check the belt tension again.
5. Step the engine and check the fan belt tension.
6. Release the support stay, close the side cover, and lock it with the starter key.



Belt	Tension of new belt	Tension of belt in use	Pushing force
Fan	8 to 12 mm (0.32 to 0.47 inch)	10 to 14 mm (0.39 to 0.55 inch)	98 N (22 lbf)

Notice

"Belt in use" refers to the belt that has been used for five or more minutes since it is attached to the engine and the engine starts running.

4.14.2 CHECKING RADIATOR HOSES

The hose should be replaced before it becomes unusable. Replacing hoses early can reduce the cost and prevent severe troubles such as engine overheat. It also can minimize the unexpected interruption of work.

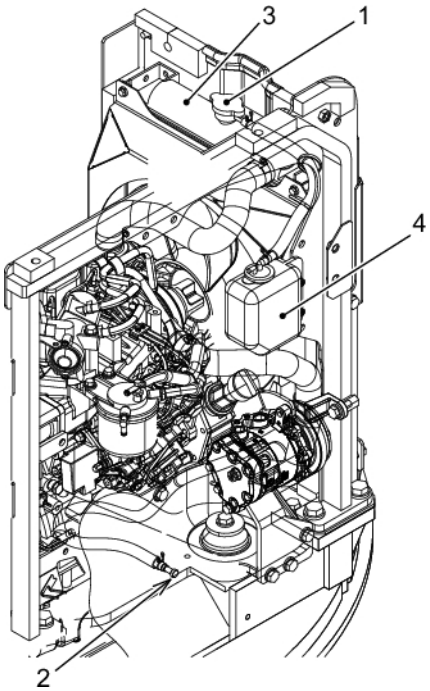
1. Check each hose for any water leakage due to looseness of clamp or cracking or permanent set of hose.
2. Tighten any loose clamps and replace hoses which have a cracking or permanent set.

REPLACING RADIATOR HOSES

WARNING **REPLACING RADIATOR HOSES**

Inside the radiator, the high pressure steam occurs and it may cause personal injury.
Do not loosen or remove the radiator cap when the coolant is under high pressure and temperature.
•Stop the engine before removing the radiator cap.
•Allow enough time for the coolant to cool down before removing the radiator cap.

1. Loosen radiator cap (1) slowly. After checking that the pressure is completely released, push the cap down, loosen it, and then remove it.
2. Remove the under cover under the drain plug, and then remove drain plug (2) to drain the coolant into a container.
3. Loosen the clamp, remove the damaged hose, and replace it with a new one.
4. Attach the drain plug.
5. Fill radiator (3) with the coolant and then fill reserve tank (4) with the coolant. See "Checking Coolant Level for Shortage and Making Up" in Chapter 3.
6. After filling up, tighten the radiator cap securely.
7. Install the under cover.



4.14.3 AIR CLEANER MAINTENANCE

CAUTION

•Wear protective glasses or respirator when using compressed air.
•Stop engine first and clean and replace the air cleaner element.

IMPORTANT

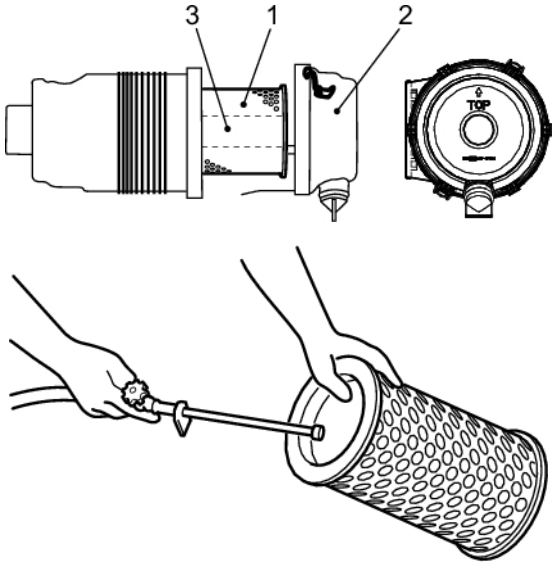
When replacing the element, cover the engine inlet with a clean cloth to prevent dust entering after removing the element.

Notice

•Cleaning: Every 6 times or 250 hours
•Replacement: After 6 times of cleaning or after 6 months whichever comes first

CLEANING OR REPLACEMENT OF OUTER ELEMENT

1. Remove two clamps (2) of the air filter.
2. Remove outer element (1) from the housing.
3. Clean the inside of the housing.
4. To remove clogged dust or dirt, blow compressed air (0.7 MPa or less) up and down along the folds on the inside and outside of element (1).
5. After cleaning, check element (1) for thinned spots, pin holes and damage on the packing, by illuminating the inside with a light. Replace the element with a new one, if necessary.
6. Install outer element (1) to the housing.
7. Install the cover using two clamps (2) with the "TOP" mark facing upward.
8. If there is a pin hole or damage on the packing, replace the outer element with a new one, even when the cleaning has not yet been performed six times.

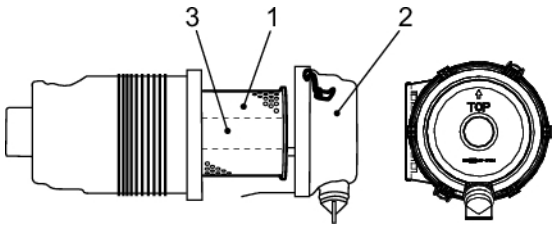


CAUTION

Be careful when attaching the O-ring. If water enters inside, an engine failure occurs.

REPLACING INNER ELEMENT

1. Remove the outer element (1), and then remove the inner element (3).
2. Install new inner element (3) and outer element(1). Install the intake side cover using two clamps (2) with the "TOP" mark facing upward.



CAUTION

•Be careful when attaching the O-ring. If water enters inside, an engine failure occurs.
•For machines with double element specifications, do not clean and reuse the inner element.
•The inner element and the outer element must be replaced at the same time.

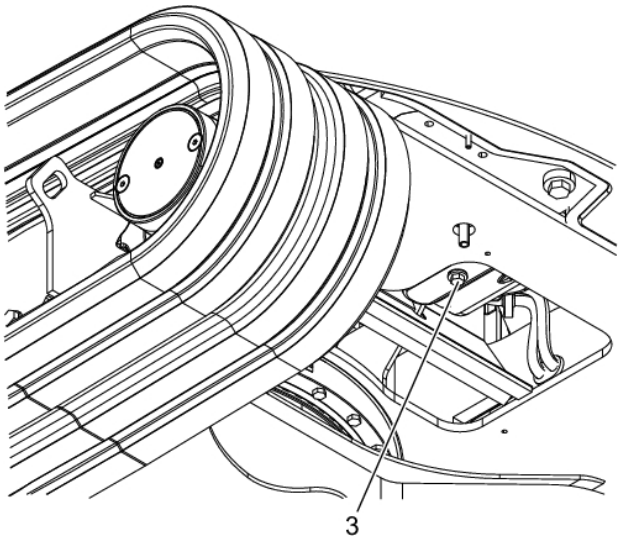
4.14.4 ENGINE OIL CHANGE

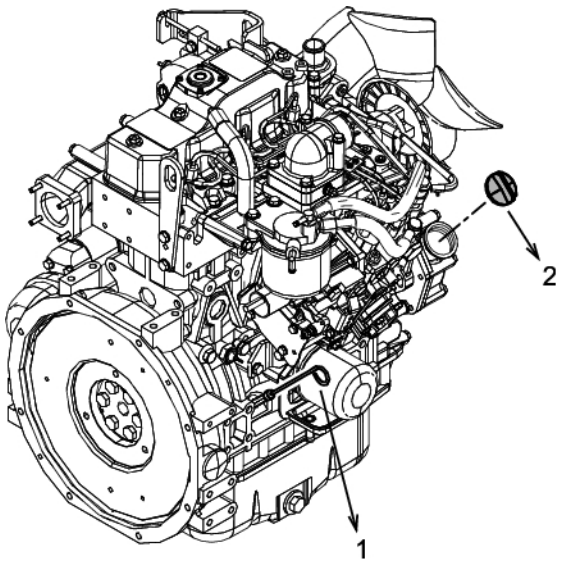
WARNING

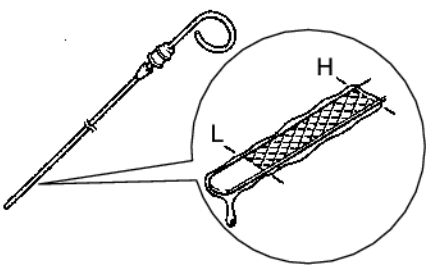
•Do not perform oil change immediately after stopping the engine, as the parts are heated. Wait for the oil to cool down to prevent burns.
•Replace the engine oil filter after 50 hours of operation for the first time.

Drain oil container: 6.0 L (6.06 l.) or more
Changing oil quantity: 5.5 L (1.5 gal.) (Upper limit of the reference oil level)

1. Set a container for drain oil under drain plug (3) at the bottom of the engine.
2. Remove the under cover under the drain plug.
3. Loosen drain plug (3) slowly to drain the engine oil into the container. Be careful not to be splashed by the oil. Clean up any oil around the engine.
4. Check the drain oil, and if many metallic powder or foreign materials are contained, contact KOBELCO authorized dealer/distributor.
5. After the oil is fully drained, tighten drain plug (3) to the original position.
6. Open the engine hood, remove yellow oil filler cap (2), and fill the specified engine oil. For recommended oil, see "LUBRICANT, FUEL & COOLANT SPECIFICATIONS" in Chapter 4.
7. Start the engine, run it at idle for several minutes, and then stop the engine. Check that the oil level is in the range of "H" and "L" of oil level gauge (1), referring to "CHECKING ENGINE OIL LEVEL AND REFILLLING" in Chapter 3.







4.14.5 REPLACING ENGINE OIL FILTER

WARNING

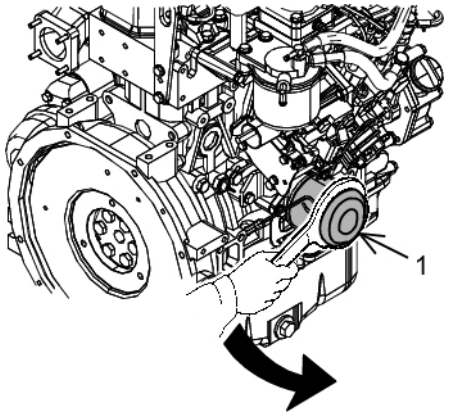
Immediately after the engine is stopped, the parts are heated. Wait for them to cool down.

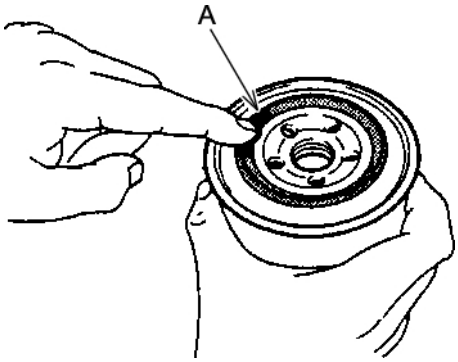
IMPORTANT

•The oil filter cannot be reused because it is a cartridge type. Also, it cannot be disassembled for internal cleaning. Replace it by the set.
Change the engine oil after 50 hours of operation for the first time.
•Use the attached filter wrench to remove the engine oil filter.

Replace the engine oil filter with a new one after 50 hours of operation for the first time.

1. Stop the engine, open the engine hood, and remove the under cover.
2. By using the filter wrench, turn filter cartridge (1) to the left to remove it.
3. Wipe the sealing surface of the filter base with a clean cloth to prevent dust and foreign materials from being seized.
4. Apply a thin film of clean engine oil to packing (A) of new filter cartridge (1), tighten it by hand, and then tighten an additional two-thirds of a turn.
5. Start the engine, run it at idle for several minutes, and then check the filter cartridge mounting surface for oil leakage.
6. Close the engine hood and attach the under cover.





IMPORTANT

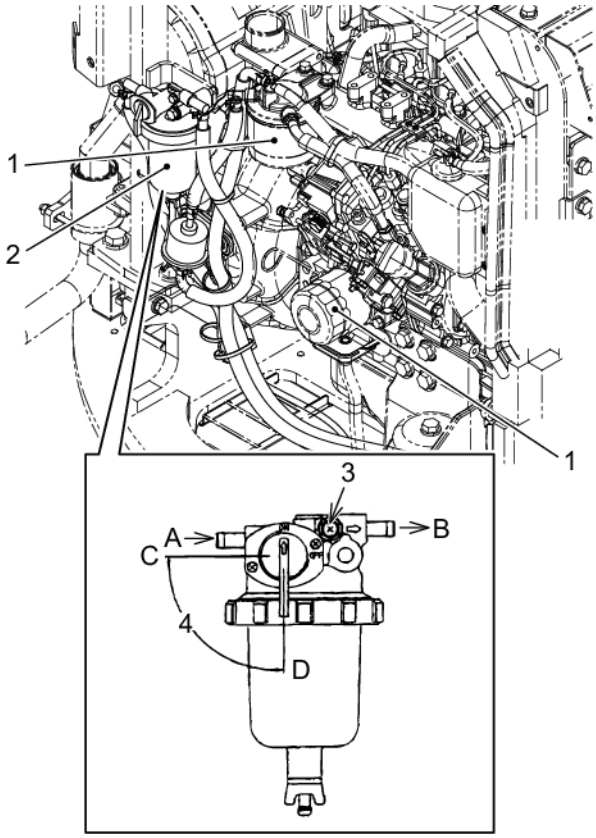
•When using the machine in sandy or dusty places, shorten the replacement cycle.
•Check the removed element, and if metal powder is attached, consult KOBELCO authorized dealer/distributor.

4.14.6 BLEEDING AIR FROM FUEL SYSTEM

If air enters or remains in the fuel system, fuel cannot be sent to the fuel injection pump. When the fuel tank is emptied or when the fuel filter is replaced, be sure to bleed the remaining air.

Air Bleeding Procedure

1. Move the pilot control shut-off lever to the "LOCKED" position and stop the engine.
2. Refill the fuel tank to the maximum.
3. Confirm that the valve of water separator (2) is set to "OPEN" position (D).
4. Turn the starter key to the "ON" position and wait for 15 to 20 seconds to send oil to the fuel system using the fuel supply pump.
   (If the entire piping is emptied due to running out of gas, wait for 60 seconds after turning the starter key to the "ON" position.))



1. Fuel filter
2. Water separator
3. Fuel cock
4. Drain cock

A. Fuel inlet
B. Fuel outlet
C. Close
D. Open

IMPORTANT

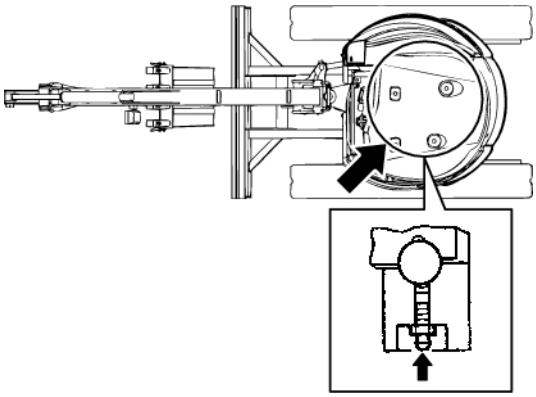
•Do not continue to run the starter for 15 seconds or longer to send oil to the fuel system. It could heat the starter and might cause damage to the coil, pinion gear, and ring gear, etc.
•Wait for 30 seconds or longer before using the starter again.

4.14.7 GREASING SWING BEARING

WARNING

Do not swing the machine while greasing the swing bearing.

Inject grease until the old grease is pushed out from the sealing surface of the swing bearing for each of four directions while swinging the machine by 90 degrees. The greasing point is one (grease nipple).

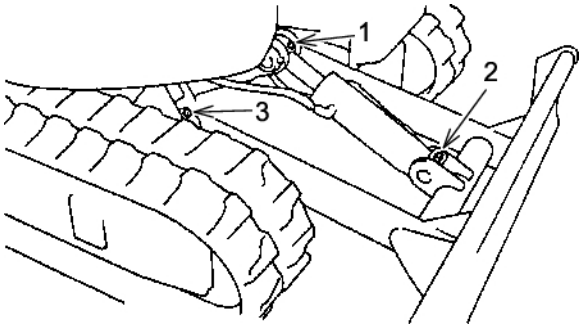


4.14.8 GREASING DOZER

IMPORTANT **ATTENTION TO GREASING**

•For the digging work in the water, grease the submerged parts before and after the work every day.
•Grease the machine before the work if it has not been used for one month or longer.

1. Set the attachment in the greasing position and then stop the engine.
2. Before greasing, wipe off the grease nipples. Replace any damaged nipples with new ones.
3. Use the grease gun to apply grease to the grease nipples.
4. After applying grease, wipe off old grease which is pushed out.



No.	Greasing point	Points	No.	Greasing point	Points
1	Dozer cylinder foot pin	1	3	Dozer foot pin	2
2	Dozer cylinder rod pin	1			

4.14.9 CLEANING AND REPLACING THE RADIATOR CAP

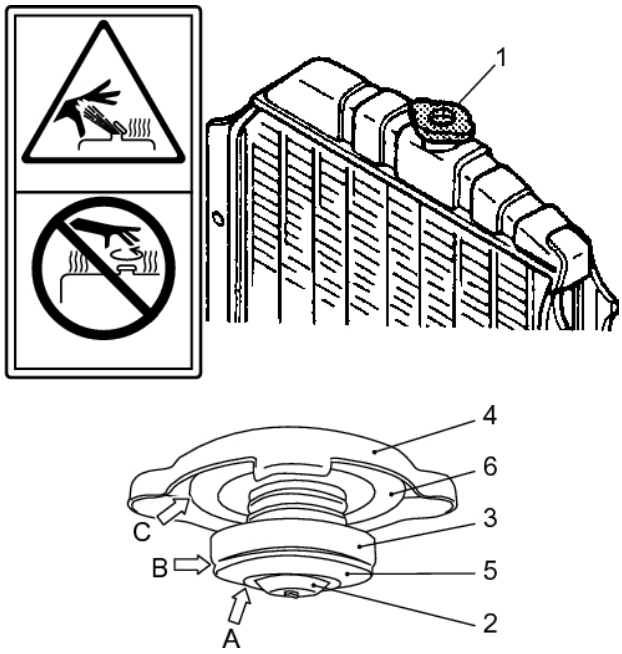
WARNING **HANDLING OF RADIATOR CAP**

Inside the radiator, the high pressure steam occurs and it may cause personal injury.
Do not loosen or remove the radiator cap when the coolant is under high pressure and temperature.
•Stop the engine before removing the radiator cap.
•Allow enough time for the coolant to cool down before removing the radiator cap.

CAUTION

A loose radiator cap will let hot steam and coolant escape from the cooling system during operation and it may cause burns.

1. After the radiator cap has cooled enough to touch with bare hands, remove cap (1). Loosen cap (1) slowly to release the pressure, then push cap (1) down and loosen it to remove it.
2. Inspect locations A through C for foreign materials and damage to cap (1). Use a clean cloth to wipe cap (1) and replace it if necessary.
   Inspection locations
   A. Contact surface between negative pressure valve (2) and gasket (5)
   B. Both surfaces of pressure valve (3) and gasket (5)
   C. Both surfaces of external lid (4) and gasket (6)
3. Securely tighten cap (1).



Radiator Cap (1)

4.14.10 CLEANING RADIATOR, OIL COOLER CORE AND FILTER

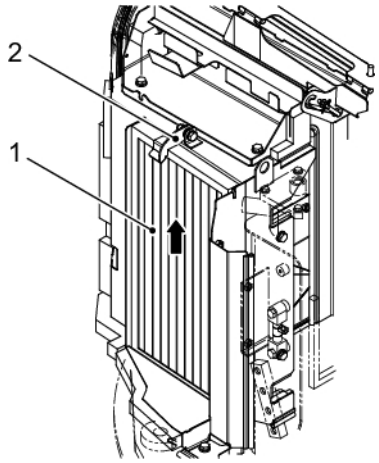
WARNING

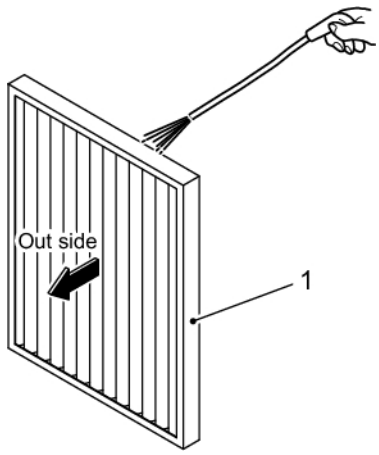
Direct strike of compressed air, steam or high pressure water on the body can cause injury. Wear protective glasses, or goggles, mask, and protective shoes, etc.

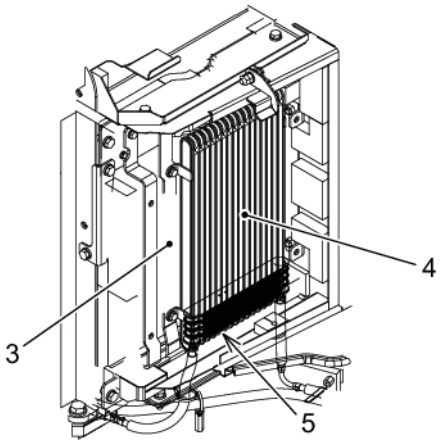
IMPORTANT

When using compressed air or high pressure water, keep a safe distance from the fin to prevent it from being damaged. If the fin is damaged, it may cause water leakage or overheating.

1. Open the side cover on the right side of the machine and remove the under cover.
2. Pull up stopper (2) to release the lock and pull out filter (1).
3. Clean filter (1) with compressed air (0.2 MPa) or water.
4. Check radiator (3), oil cooler (4), and fuel cooler (5) to clean any mud, dust or leaves off.
5. Insert filter (1) into the original position and pull down stopper (2) to lock it.
6. After cleaning, close the side cover on the right side and install the under cover.







4.15 500 HOUR (6-MONTH) INSPECTION & MAINTENANCE PROCEDURES

Thoroughly read and understand "1. SAFETY PRECAUTIONS" of this manual before performing the inspection and maintenance.
Follow this section together with daily, 50-hour and 250-hour inspection and maintenance.

4.15.1 REPLACING FUEL FILTER

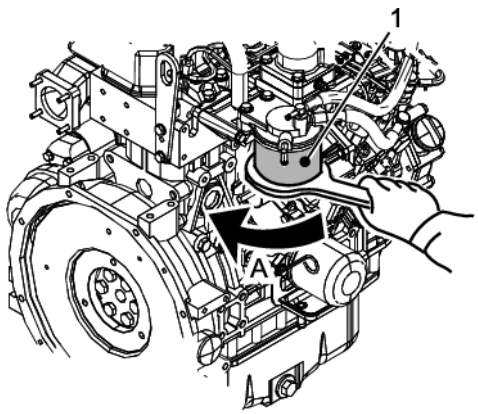
WARNING

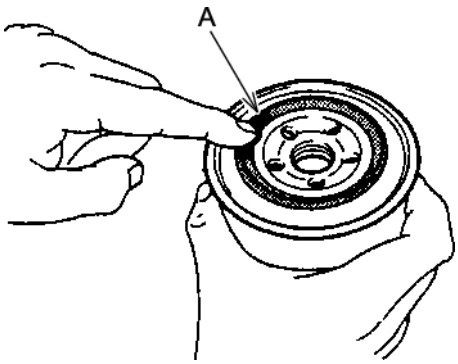
•Immediately after the engine is stopped, each part is heated. Wait for them to cool down.
•Wipe off spilled fuel to prevent a fire.

IMPORTANT

The oil filter cannot be reused because it is a cartridge type. Also, it cannot be disassembled for internal cleaning. Replace it by the set.

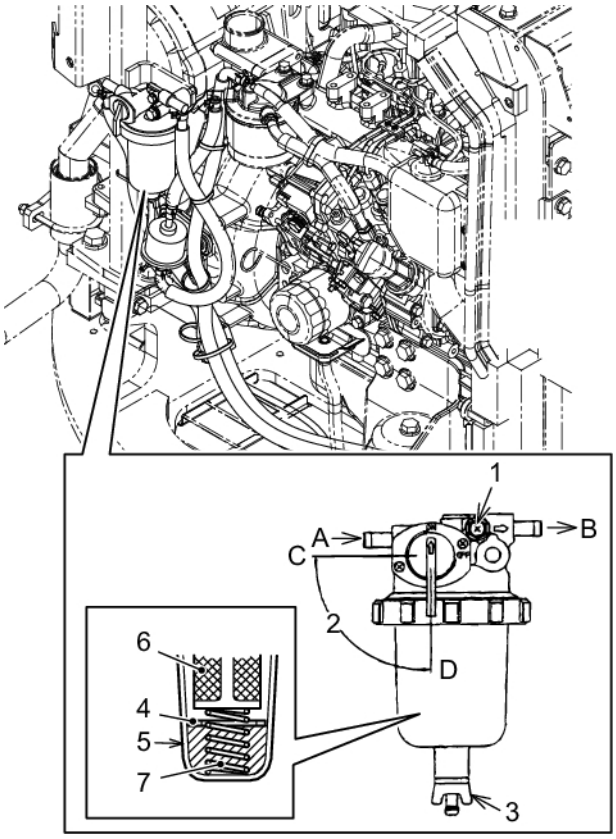
1. Stop the engine, and open the engine hood.
2. By using the fuel filter wrench, turn filter cartridge (1) to the left to remove it.
3. Wipe the sealing surface of the filter base with a clean cloth to prevent dust and foreign materials from being seized.
4. Apply a thin film of clean engine oil to packing (A) of new filter cartridge, tighten it by hand, and then tighten an additional two-thirds of a turn.
5. Bleed air according to "BLEEDING AIR FROM FUEL SYSTEM" in Chapter 4.
6. Start the engine, run it at idle for several minutes, and then check the filter mounting area for fuel leakage.



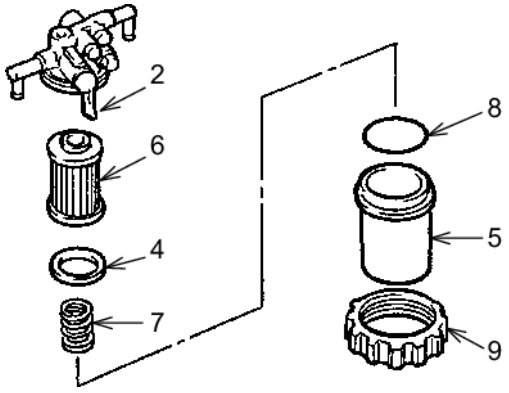


4.15.2 REPLACING WATER SEPARATOR

1. Move the pilot control shut-off lever to the "LOCKED" position and then stop the engine.
2. Open the engine hood and raise cock (2) of the water separator to "Close" position (C).
3. Loosen ring (9) to remove case (5) and drain the accumulated water to a container.
4. Check the water drained to the container. If dirt is heavy, clean element (6) and inside of case (5).
5. Remove element (6) and wash it with light oil.
6. Replace O-ring (8) with a new one. Install element (6) to the body of the water separator.
7. Attach O-ring (8) to case (5) and tighten it with ring (9).
8. Lower cock (2) to "Open" (D).
9. After draining, be sure to follow "BLEEDING AIR FROM FUEL SYSTEM" in Chapter 4.



Water separator



1. Air vent bolt
2. Fuel cock
3. Drain cock
4. Ring (red)
5. Case
6. Element
7. Spring
8. O-ring
9. Ring
A. Fuel inlet
B. Fuel outlet
C. Close
D. Open

IMPORTANT

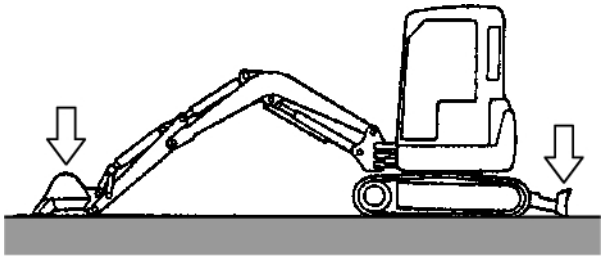
•Be careful not to lose red ring (4) and spring (7) in the case.
•Do not wash the element with gasoline.

4.16 1000 HOUR (12-MONTH) INSPECTION & MAINTENANCE PROCEDURES

Thoroughly read and understand "1. SAFETY PRECAUTIONS" of this manual before performing the inspection and maintenance.
Follow this section together with daily, 50-hour, 250-hour and 500-hour inspection and maintenance.

4.16.1 REPLACING RETURN FILTERS

The return filter needs delicate treatment because it works as an important part in removal of contaminant in the hydraulic oil to prevent failure of hydraulic components and maintain a long service life.



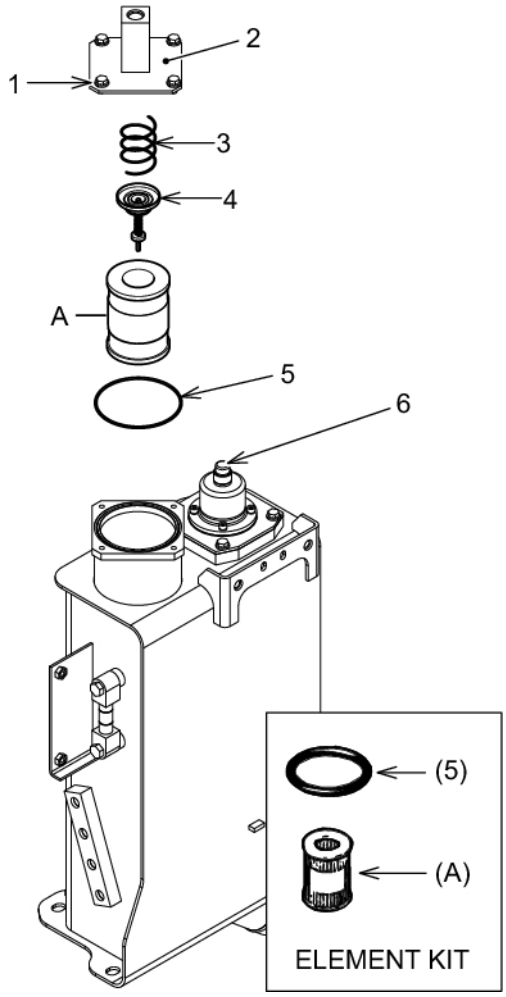
WARNING

•Immediately after the engine is stopped, the inside of the hydraulic oil tank is heated and pressurized and it is very dangerous. Before removing the return filter, stop the engine and then press the valve head on top of the breather cap to release the pressure in the hydraulic oil tank.
•Wait for the hydraulic oil to cool down before the return filter replacement.

IMPORTANT

Replace the return filter with a new one after 50 hours of operation for the first time.
When the hydraulic breaker is attached, the deterioration of the hydraulic oil is faster than that of the normal bucket digging work. Replace the return filter and hydraulic oil earlier than the specified time.
For the replacement interval (hours), see "PERIODIC INSPECTION AND MAINTENANCE CHART OF NIBBLER (CRUSHER) AND BREAKER" in Chapter 7.

1. Park the machine in the hydraulic oil inspection position on the level and firm ground, and then stop the engine.
2. Use the starter key to release the lock, open the right side cover and support it with the stay.
3. Clean around the filter mounting area to prevent foreign materials such as dust from entering into.
4. Press the valve head on top of breather cap (6) several (5 to 7) times to release pressure from the hydraulic oil tank.
5. Remove bolt (1) of the tank upper cover and then remove cover (2).
6. Remove spring (3), valve (4) and element filter (A) from the tank.
7. Replace O-ring (5) on the mounting surface of cover (2).
8. Clean the removed parts with light oil.
9. Attach the element by the reverse procedures of the above steps 5 and 6.
10. Attach cover (2).
    Tightening Torque:
    20.7 to 25.3 N·m (15.3 to 18.7 lbf·ft)
11. Start the engine, set the machine in the hydraulic oil inspection position by moving each control lever, and check the hydraulic oil level.
12. Release the support stay, close the right side cover, and lock it with the starter key.

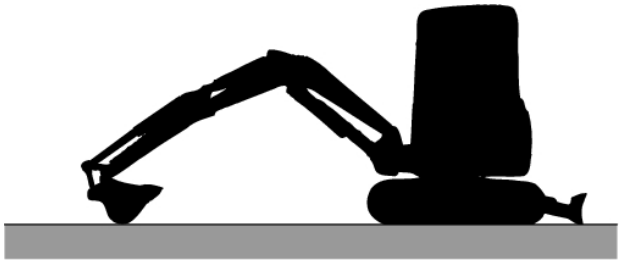


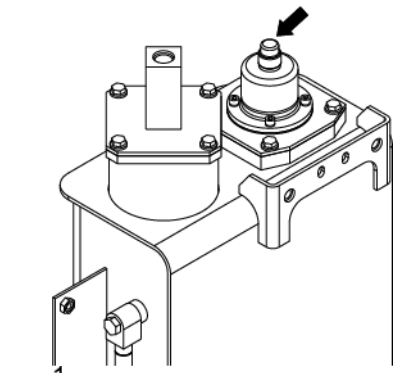
4.16.2 REPLACING AIR BREATHER ELEMENT

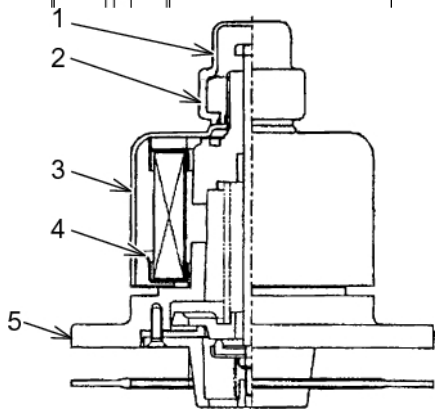
CAUTION

Immediately after operation, the oil is hot and it may result in burns. Wait until the oil temperature cools down before attempting to change the element.

1. Park the machine on the level and firm ground, extend the bucket cylinder, retract the arm cylinder, lower the bucket to the ground, and place the dozer on the ground as shown to the right figure, and then stop the engine.
2. Open the right side cover and support it with the stay.
3. Press the rubber cap of the breather on the top of the hydraulic oil tank several times (5 - 7 times) to release the internal pressure of the hydraulic oil tank.
4. Remove breather cap (1), and then remove nut (2).
5. Turn cover (3) in the counterclockwise direction, remove the cover, and then remove element (4).
6. Install new element (4) and install cover (3) along the groove.
7. Be sure to prevent water and dirt from entering the air intake and exhaust ports between cover (3) and body (5).
8. Attach cover (3), and then attach nut (2).
9. Attach breather cap (1).
10. Remove the stay and return the right side cover to the specified position.







CAUTION

To avoid the breakage of bolts, do not over-tighten nut (2).
Tightening Torque: 10 to 14 N·m (7.3 to 10.3 lbf·ft)

IMPORTANT

•To keep the hydraulic oil clean and to extend the service life of hydraulic components, replace the filter element at regular intervals.
•Every 1000 hours replacement is just a guideline. If the machine is operated in very dusty conditions, replace the oil filter earlier than the specified period.

4.16.3 INSPECTING AND ADJUSTING VALVE CLEARANCE

This is performed to correct the deviation of timing between the intake valve and exhaust valve.
Failure of the check would cause a trouble such as output shortage, abnormal exhaust color, and noise generation, etc.

4.16.4 INSPECTING AND ADJUSTING STARTER AND GENERATOR

There is the possibility that the brush is worn or the bearing is out of grease.
Adjust the starter and generator to achieve sufficient startability and a high power generation capacity.

4.16.5 CHANGING COOLANT

WARNING **HANDLING OF COOLANT**

Inside the radiator, high pressure steam is generated. Do not loosen or remove the radiator cap when the coolant is under high pressure and high temperature.
•After the coolant cools down, turn the cap slowly to release the pressure.
Engine anti-freeze/coolant liquid is flammable and can cause injury.
•Keep anti-freeze /coolant liquid away from flames and sparks.
•Avoidthe eyes and skin contacting with the coolant.
If the coolant gets into the eyes or contacts the skin, flush the eyes or skin with plenty of fresh water, and seek medical attention.

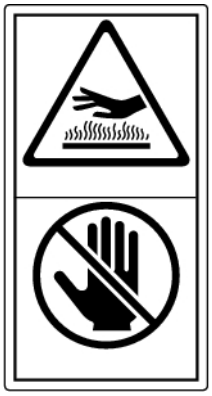
WARNING **PAY ATTENTION TO HOT PARTS**

Immediately after operation, the oil is hot and it may result in burns. Wait until the oil temperature cools down before attempting to change the element.

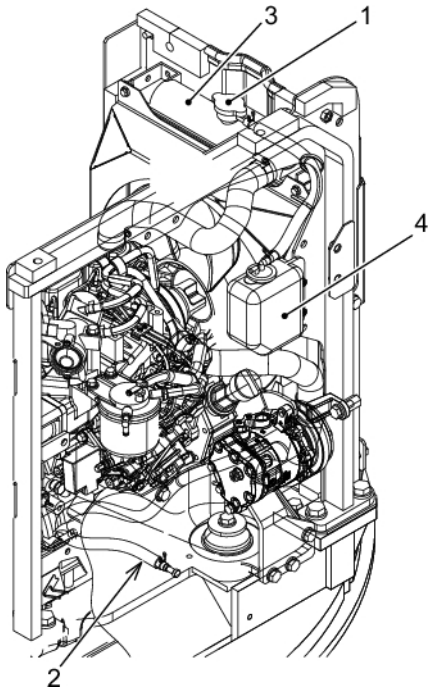
IMPORTANT

Use clean soft water for coolant in which lime deposit is not produced.
Water has corrosiveness at engine operating temperature. When being shipped from the factory, the coolant mixed with "Long Life Coolant" at the rate of 50% is used to prevent rust and freezing of the cooling system.
•Non-amine antifreeze mixture is used for this machine.
•Change the coolant earlier than the specified period when it was dirty and/or bubbling.

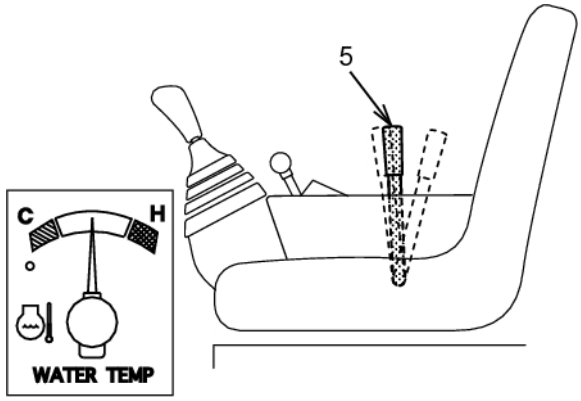
1. Stop the engine, open the engine hood, and wait until the coolant cools down before starting the work.



2. Loosen radiator cap (1) slowly. After checking that the pressure is completely released, push the cap down, loosen it, and then remove it.
3. Remove the under cover under the drain plug, and then remove drain plug (2) to drain the coolant into a container.
4. After draining the coolant, attach drain plug (2) and pour clean soft water and cleaning solution (radiator cleaner) from the coolant inlet.



5. Start the engine at a speed slightly higher than the low idle (adjusted with engine throttle lever (5)), raise the water temperature to more than 80 degrees C (176 degrees F) within the white range of the engine coolant temperature gauge, and run the engine for about 10 minutes.
6. Stop the engine, remove the drain plug, and drain the water into a container. Pour clean soft water into radiator (3) with the drain plug removed to clean the radiator until the clear water is discharged.
7. Attach the drain plug, pour clean soft water mixed with "Long Life Coolant" (50% or more) to the neck of radiator cap (1), run the engine for a while, and bleed the air of the cooling system thoroughly.
8. After the engine is stopped and the coolant cools down, check the coolant level (the coolant level of reserve tank (4) should be between FULL and LOW). See "Checking Coolant Level for Shortage and Making Up" in Chapter 3.
9. Check for coolant leakage, attach the under cover, and close the engine hood to complete the procedure.



4.17 1500 HOUR INSPECTION & MAINTENANCE PROCEDURES

Thoroughly read and understand "1. SAFETY PRECAUTIONS" of this manual before performing the inspection and maintenance.
Follow this section together with daily, 50-hour, 250-hour, 500-hour and 1000-hour inspection and maintenance.

4.17.1 INSPECTING AND ADJUSTING ENGINE

Checking, Adjusting and Cleaning Fuel Injection Valves
If the exhaust color is not good during operation and the engine output is lower than before, it may be caused by bad injection condition of the fuel injection valves.
Optimize the fluid injection condition and tune the engine for the best performance.

Checking and Adjusting Fuel Injection Timing
Adjust the fuel injection timing to achieve the best engine performance.

Cleaning EGR Cooler
On the cooling water chamber side of the EGR cooler, rust and water scale are adhered after a long-time use, which may deteriorate the cooling of EGR gas. On the exhaust passage side, too, carbon is adhered, becoming a resistance to exhaust gas circulation and deteriorating the exhaust emission value. Clean this part at least every 1500 hours.

Checking Crankcase Breather System
The crankcase breather system must work properly in order to ensure that the engine complies with the emission regulation throughout its useful life.

IMPORTANT

Contact KOBELCO or KOBELCO authorized dealer/distributor for inspection and adjustment of the engine.

4.18 2000 HOUR INSPECTION & MAINTENANCE PROCEDURES

Thoroughly read and understand "1. SAFETY PRECAUTIONS" of this manual before performing the inspection and maintenance.
Follow this section together with daily, 50-hour, 250-hour, 500-hour, 1000-hour and 1500-hour inspection and maintenance.

4.18.1 OIL CHANGE IN TRAVEL REDUCTION UNITS

WARNING **HANDLING OF OIL IMMEDIATELY AFTER OPERATION**

•Oil is hot immediately after travel. Start working after the temperature is cooled down.
•If there is residual pressure in the travel motor, oil may gush out and the plug may pop out. Slowly loosen the plug to release the inside pressure.

IMPORTANT

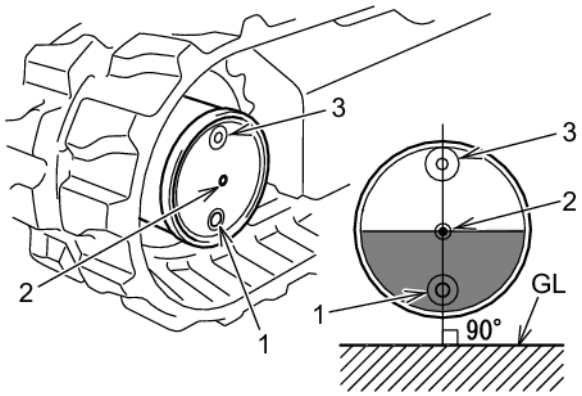
Replace the engine oil after 500 hours of operation for the first time.

Changing oil quantity	0.6 L (0.16 gal)
Drain oil container	1.0 L (0.26 gal.) or more

IMPORTANT

Replace the engine oil after 500 hours of operation for the first time.

1. Position the machine directing drain plug (1) downward and stop the engine.
2. Remove drain plug (1), level plug (2) and fill plug (3) and drain oil in the container.
3. After draining the oil completely, attach drain plug (1) in place.
4. Fill with the specified oil in the specified quantity through the hole for fill plug (3) until the oil overflows from level plug (2) referring to "LUBRICANT, FUEL & COOLANT SPECIFICATIONS" in Chapter 4.
5. Attach level plug (2) and fill plug (3).
6. Similarly, change the oil of the travel reduction unit on the other side.



IMPORTANT

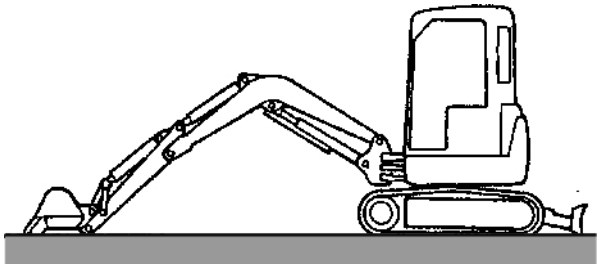
•Check the drained oil, and if metal chips or powder is found in the oil, contact KOBELCO authorized dealer/distributor.
•Dispose of the drained waste oil properly as the industrial waste.

4.18.2 CLEANING SUCTION STRAINER

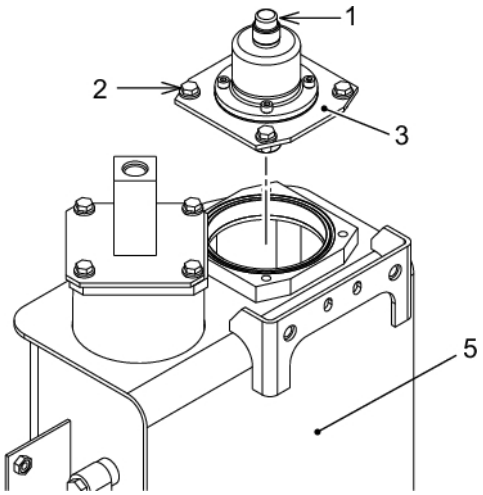
WARNING **HANDLING OF HYDRAULIC OIL TANK**

•The oil in the hydraulic oil tank is under high pressure and high temperature.
•Stop the engine first, remove the breather cap, press the valve, release the pressure from the tank, and then remove the cover.
•Immediately after operation, the oil is hot and it may cause burns. Wait until the oil temperature cools down before attempting to change the hydraulic oil.

1. Park the machine in the hydraulic oil inspection position on the level and firm ground, and then stop the engine.
2. Move the pilot control shut-off lever to the "LOCKED" position.
3. Clean the surface around the hydraulic oil tank to keep away from foreign materials.
4. Press breather cap (1) on the top of the hydraulic oil tank several times (5 - 7 times) to release the internal pressure of the hydraulic oil tank.
5. Remove bolt (2) of the tank upper cover, and remove cover (3).



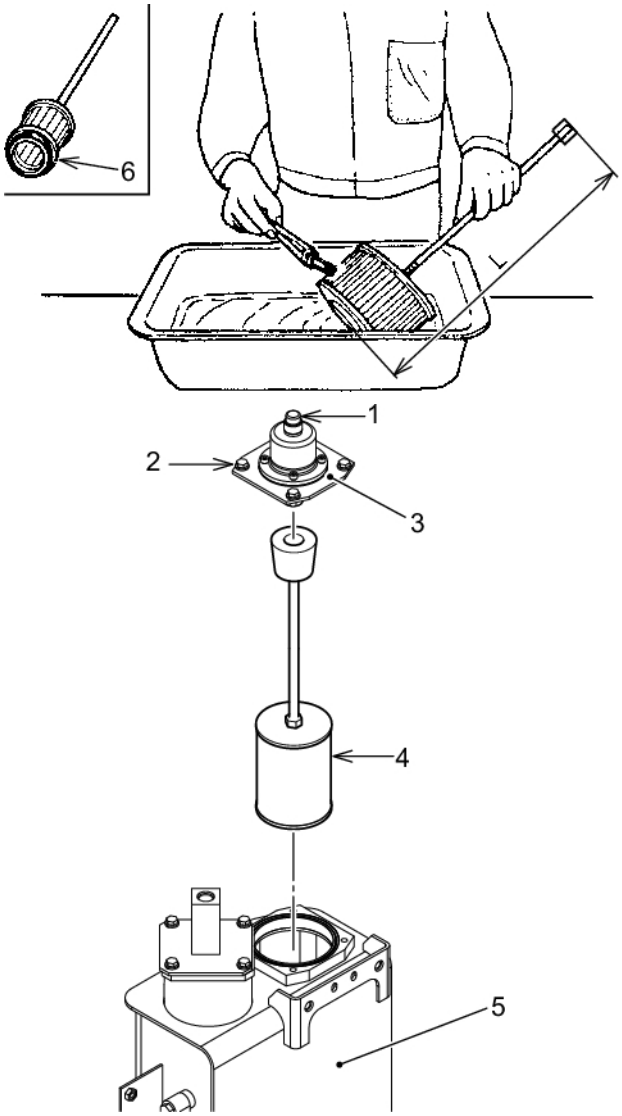
Hydraulic Oil Inspection Position



IMPORTANT

Do not drop bolts or others into the tank during the work.

6. Take out suction strainer (4).
7. Clean the strainer with light oil or cleaning solvent, dry it and check it for damage. If damaged, replace the strainer with a new one.
   L=537.5 to 539.5 mm (21.16 to 21.24 inch)
8. Check O-rings (5) and (6) on the bottom of the strainer, and if wear or damage is found, replace it with a new one.
9. Install strainer (4) by inserting it.
10. Install cover (3) with bolt (2).
    Tightening Torque:
    20.7 to 25.3 N·m (15.3 to 18.7 lbf·ft)
11. Start the engine, run it at low idle for several (5 to 7) minutes. After that, operate each cylinder extension and retraction and swing the machine to return it to the hydraulic oil inspection position. Stop the engine and check the oil level, and if it is low, add the hydraulic oil.



4.18.3 CLEANING PILOT LINE FILTER

WARNING

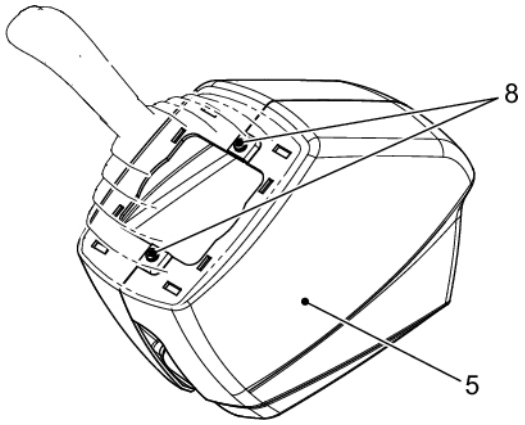
•Internal pressure always exists in the hydraulic circuit. Do not inspect or maintain the machine before releasing the internal pressure.
•To release the internal pressure of the hydraulic oil tank, press the valve on top of the breather cap to release the pressure in the hydraulic oil tank.
•Wipe off spilled hydraulic oil to prevent a fire.

On each "P port" of the pilot valves for left and right hand operator control levers, the pilot valve for travel, and the solenoid valve, the filtered connector is attached. If dust is adhered to these filters, the flow of hydraulic oil will be interrupted. If dust enters into the valves, it may cause failure. Remove them periodically to clean them.

When cleaning the pilot line filters, place the machine in the parking position, set the pilot control shut-off lever to the "LOCKED" position, and stop the engine. Then bleed the air of the hydraulic circuit, referring to "RELEASING INTERNAL PRESSURE IN HYDRAULIC OIL AND HYDRAULIC SYSTEM" in Chapter 4.

PILOT VALVES FOR CONTROL LEVERS

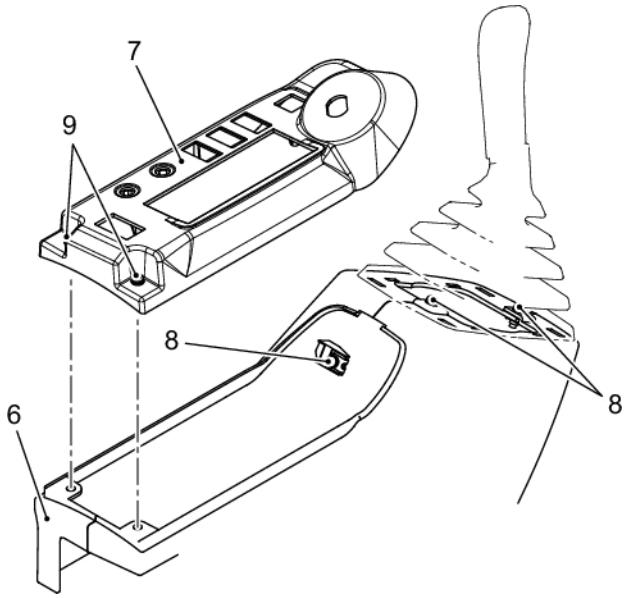
1. Remove the rubber boot of the control lever, referring to "LUBRICATING PUSH ROD OF CONTROL LEVER" in Chapter 4.
2. To remove cover (5) of the left side lever, loosen two bolts (8) and remove cover (5). To remove cover (6) of the right side lever, loosen two bolts (9) to remove cover (7), and then loosen three bolts (8) to remove cover (6).



Left Side Lever

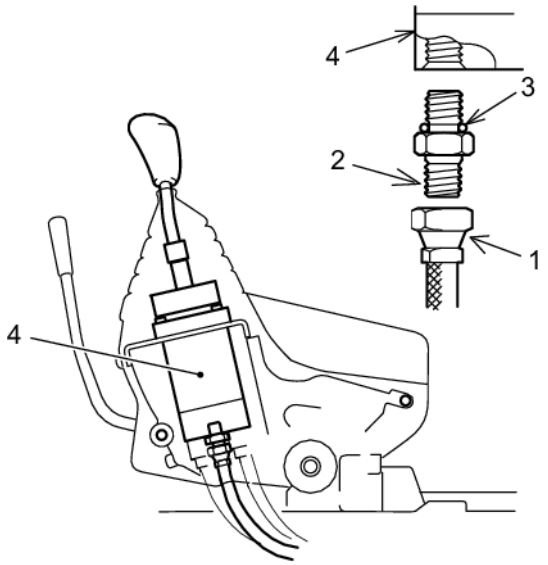
3. First remove hose (1) connected to the "P port" of pilot valve (4), and then remove filtered connector (2).
   After that, attach a plug to the lubrication hole to keep it away from foreign materials.

4. Spray light oil or air to clean the dust accumulated on the filter.
5. Check O-ring (3), and if damaged, replace it.



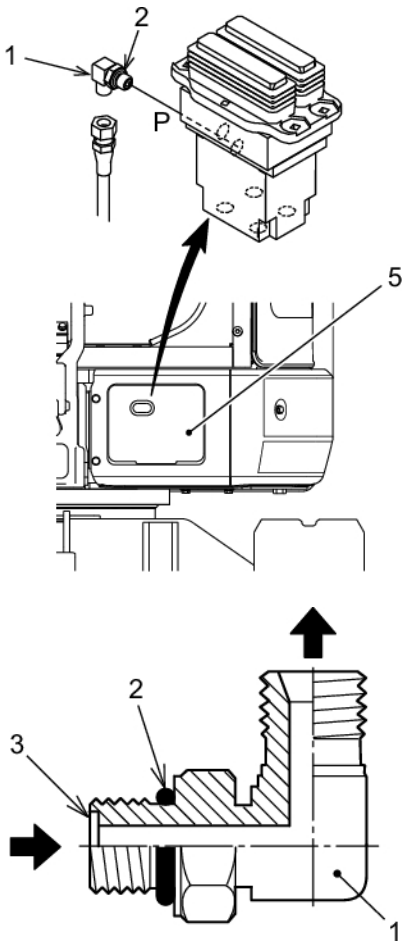
Right Side Lever

6. After cleaning, attach the connector and hose.
   For the tightening torque, see "TORQUE SPECIFICATIONS FOR JOINTS & HYDRAULIC HOSES" in Chapter 4.



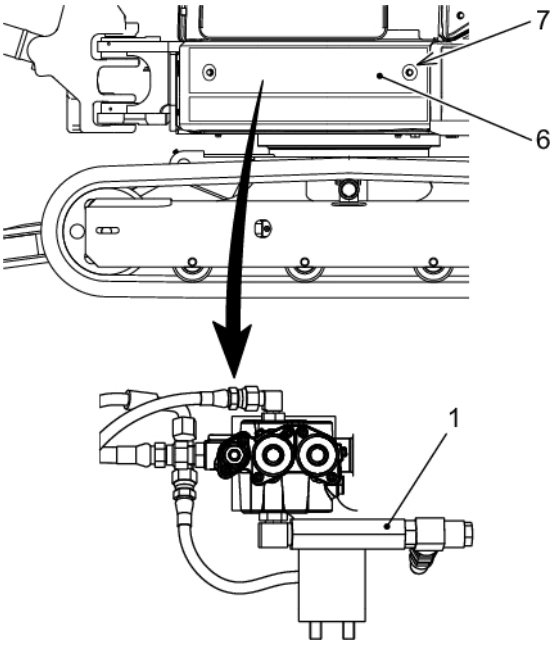
Pilot Valve for Travel

1. Open cover (5) on front of the machine.
2. First remove the hose connected to the "P port" of pilot valve (4), and then remove elbow (1). After that, attach a plug to the lubrication hole to keep it away from foreign materials.
3. Dust is accumulated inside elbow (1). Spray light oil or air to clean from the side where filter (3) is attached.
4. Check O-ring (2), and if damaged, replace it.
5. After cleaning, attach the connector and hose.
   For the tightening torque, see "TORQUE SPECIFICATIONS FOR JOINTS & HYDRAULIC HOSES" in Chapter 4.



Solenoid Valve

1. Remove cover (6) in the left side of the machine by loosening two bolts (7).
2. Remove the hose and tee connected to inline filter (1) and then remove inline filter (1). Attach a plug to the lubrication hole to keep it away from foreign materials.
3. Clean inline filter (1) with light oil.
4. After cleaning, attach inline filter (1), tee and hose.
   For the tightening torque, see "TORQUE SPECIFICATIONS FOR JOINTS & HYDRAULIC HOSES" in Chapter 4.

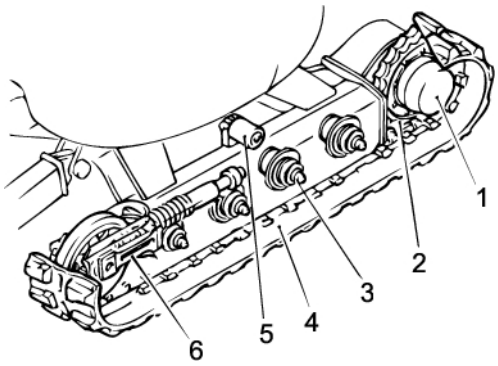


4.18.4 OIL CHANGE OF LOWER ROLLER, IDLER AND UPPER ROLLER

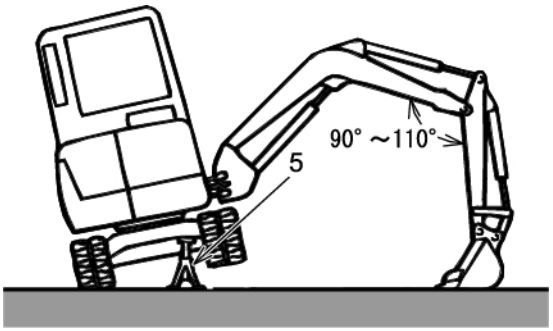
The high pressure grease is charged in the grease cylinder of the track spring. When adjusting the shoe tension or disassembling the shoe for maintenance, loosen the grease nipple within one turn to discharge the grease gradually.

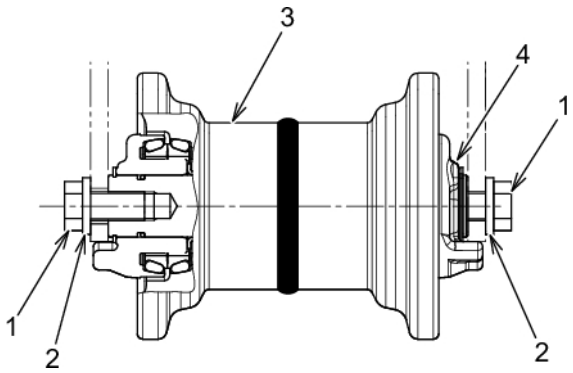
To change the oil of the lower roller and idler, remove them from the crawler frame and refill the oil. This procedure is explained below for each unit. For the name and quantity of changing oil, see "LUBRICANT, FUEL & COOLANT SPECIFICATIONS" in Chapter 4.

1. Travel motor
2. Sprocket
3. Lower roller
4. Track shoe
5. Upper roller
6. Idler



LOWER ROLLER





Lower roller

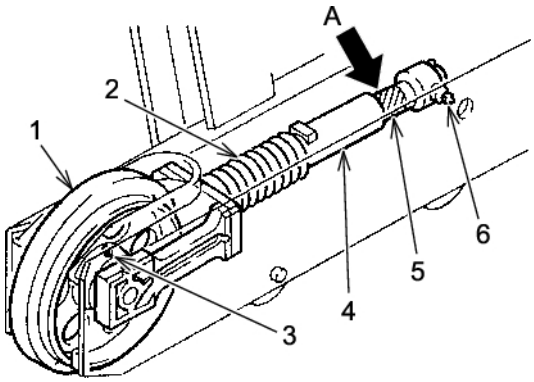
1. Loosen the rubber track shoe on the side where the oil is to be replaced, referring to "INSPECTING AND MAINTAINING TRACK SHOE TENSION" in Chapter 4.
2. Loosen lower roller tightening bolt (1) slightly (about one turn).
3. Start the engine, and use the boom and arm to lower the bucket bottom to the ground on the side of the lower roller to refill the oil, and lift up the machine.
4. Support the machine with safety strut (5), and then stop the engine.
5. On both the inside and outside of the crawler frame, remove adjusting bolts (1) and washers (2) and remove lower roller (3).
6. Remove fuel inlet plug (4) with an Allen wrench to drain old engine oil.
7. Refill the specified amount {65 cc (4.0 cu･in)} of engine oil through the fuel inlet.
8. Wind a sealing tape around plug (4) and tighten the plug securely. Clean up any oil around the engine.
9. Apply Loctite #262 to the screw of bolt (1) and temporarily tighten lower roller (3) to the crawler frame.
10. Remove the safety strut supporting the machine to lower the machine to the ground completely, and then tighten bolt (1).
    Tightening Torque: 249.6 to 308.4 N･m (184.3 to 227.7 lbf･ft)
11. Lift up the machine and adjust the shoe tension. For how to adjust it, see "INSPECTING AND MAINTAINING TRACK SHOE TENSION" in Chapter 4.

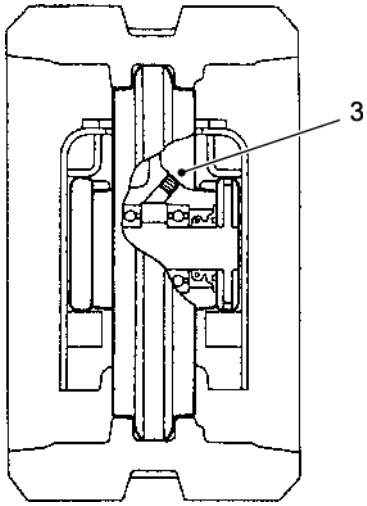
Idler

WARNING

When removing/installing the rubber track shoe, lift up the machine on the side where the shoe is to be removed/installed. It is very dangerous for the machine to fall unintentionally. Do not move anything other than the track shoe to be removed/installed.

To change the gear oil of the idler, remove the rubber track shoe on the side where the gear oil is to be changed.

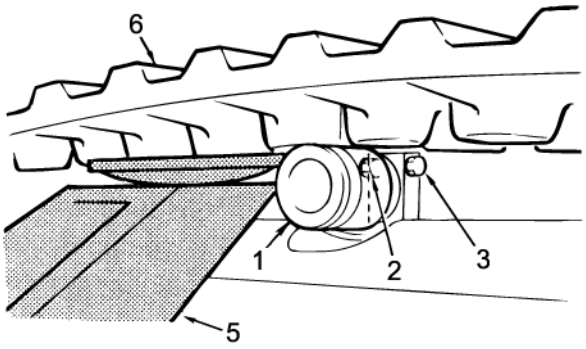


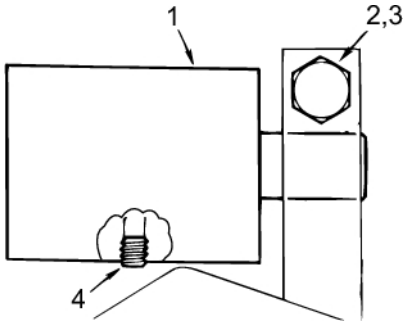


Idler

1. Remove the rubber track shoe. (See "REPLACING RUBBER TRACK SHOE" in Chapter 4. Be sure to support the machine with a safety strut.) Stop the engine.
2. Pull out idler (1) and idler adjuster (2) from the crawler frame.
   Mass: Idler + Idler adjuster = approximately 60 kg (132 lb)
3. Remove idler fuel inlet plug (3) with an Allen wrench to drain old gear oil.
4. Refill the specified amount {80 cc (4.9 cu·in)} of gear oil through the fuel inlet.
5. Wind a sealing tape around plug (3), tighten the plug securely, and then clean up any oil around the plug.
6. Apply grease to sliding surface (A) between piston (4) and cylinder (5) of idler adjuster (2).
7. Attach the idler and idler adjuster (2) to the crawler frame with fill plug (3) and grease nipple (6) facing outward.
8. Attach the rubber track shoe. For how to attach it, see "REPLACING RUBBER TRACK SHOE" in Chapter 4.
9. Adjust the rubber track shoe tension. For how to adjust it, see "INSPECTING AND MAINTAINING TRACK SHOE TENSION" in Chapter 4. Check the engagement and tension of the idler, and then remove the safety strut supporting the machine to lower the machine.

UPPER ROLLER





Upper roller

1. Stop the engine, and then confirm that the machine is in the parking position.
2. Loosen rubber track shoe (6) on the side where the gear oil is to be replaced, referring to "INSPECTING AND MAINTAINING TRACK SHOE TENSION" in Chapter 4.
3. Use hydraulic jack (5) to lift up the shoe.
4. Remove nut (2) and bolt (3) of the support for fixing the shaft of upper roller (1), and then remove the upper roller (1).
5. Remove fuel inlet plug (4) with an Allen wrench to drain old gear oil.
6. Refill the specified amount {55 cc (3.4 cu·in)} of gear oil through the fuel inlet.
7. Wind a sealing tape around plug (4) and tighten the plug securely. Clean up any oil around the engine.
8. Attach the removed parts in the reverse procedure, apply a thread locking agent (Loctite #262 or equivalent) to the screw of bolt (3) and then tighten the bolt.
   Tightening Torque: 103 to 127 N·m (76.1 to 93.9 lbf·ft)

4.18.5 INSPECTING AND ADJUSTING INTAKE AND EXHAUST VALVES

Inspect and adjust the intake and exhaust valves so that their airtightness is kept and the engine can operate with the best performance.

4.19 5000 HOUR INSPECTION & MAINTENANCE PROCEDURES

Thoroughly read and understand "1. SAFETY PRECAUTIONS" of this manual before performing the inspection and maintenance.
Follow this section together with daily, 50-hour, 250-hour, 500-hour, 1000-hour, 1500-hour and 2000-hour inspection and maintenance.

4.19.1 CHANGING HYDRAULIC OIL

WARNING **HANDLING OF HYDRAULIC OIL TANK AND OIL**

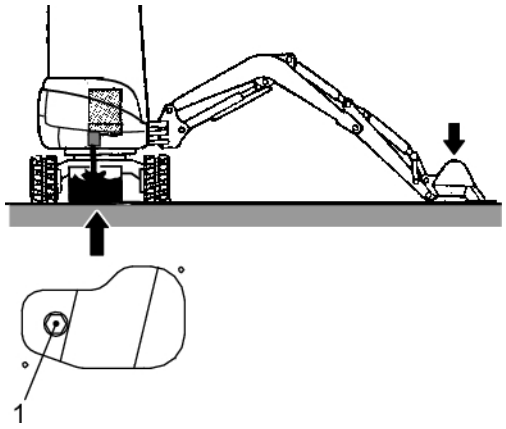
•The oil in the hydraulic oil tank is under high temperature and pressure.
Stop the engine first, remove the breather cap, press the valve, release the pressure from the tank, and then remove the cover.
•Immediately after operation, the oil is hot and it may cause burns. Wait until the oil temperature cools down before attempting to change the hydraulic oil.

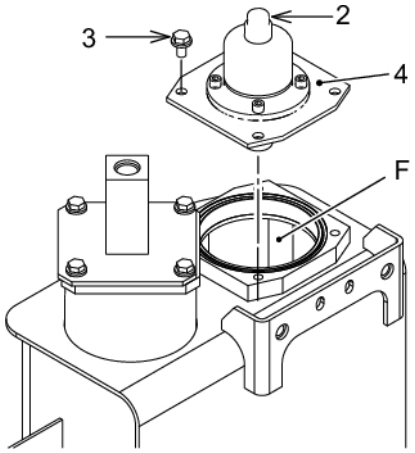
IMPORTANT

When the hydraulic breaker is attached, the deterioration of the hydraulic oil is faster than that of the normal bucket digging work. Refer to the section about the inspection and maintenance when using hydraulic breaker to maintain the hydraulic oil.

Drain oil container	30 L (7.9 gal.) or more
Changing oil quantity	20.4 L (5.4 gal)

1. Park the machine on the level and firm ground, swing the upper structure so that drain plug (1) on the bottom of hydraulic oil tank is positioned to the midpoint of right and left track shoe.
2. Retract the arm cylinder and bucket cylinder, place the bucket and dozer (when installed) on the ground and stop the engine.
3. Move the pilot control shut-off lever to the "LOCKED" position.
4. Remove the cover under the hydraulic oil tank.
5. Clean the surface around the hydraulic oil tank to keep it away from foreign materials.
6. Press breather cap (2) on the top of the hydraulic oil tank several times (5 - 7 times) to release the internal pressure of the hydraulic oil tank.
7. Remove bolt (3) of the tank upper cover, and remove cover (4).

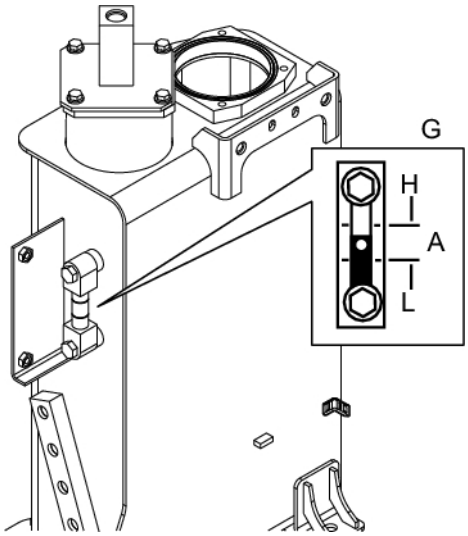




IMPORTANT

•Do not drop bolts or others into the tank during the work.
•Dispose of the drained waste oil properly as the industrial waste.

8. Place a container for drain oil under drain plug (1) on the bottom of the hydraulic oil tank.
9. Loosen drain plug (1) on the bottom of hydraulic oil tank slowly and drain hydraulic oil completely.
10. Clean drain plug (1) and install it in place. Tightening Torque: 98 to 118 N·m (72.6 to 87.4 lbf·ft)
11. Refill hydraulic oil through fuel inlet (F) on the top of the hydraulic oil tank. Pour the oil while checking the oil level with level gauge (G).
12. Attach filler port cover (4) with bolt (3). Tightening Torque: 20.7 to 25.3 N·m (15.3 to 18.7 lbf·ft)
13. Start the engine, run it at low idle for several (5 to 7) minutes. After that, operate each cylinder extension and retraction and swing the machine to return it to the hydraulic oil inspection position. Stop the engine and check the oil level, and if it is low, add the hydraulic oil.



5. TRANSPORTATION

5.1 TRANSPORTATION OF HYDRAULIC EXCAVATOR

5.1.1 PREPARATION OF TRANSPORTATION

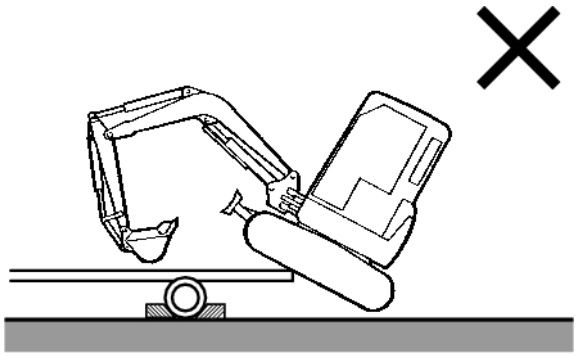
- When transporting the machine with a trailer, etc., consider the width, height, length and mass with the machine loaded. The transportation mass and dimension vary depending on the type of shoe and the specifications of the attachment.
  Refer to masses and dimensions described in "SPECIFICATIONS" in this manual to select the proper transportation method.
- Perform a previous inspection on the route such as limitations on width, height and mass (weight) of vehicles and traffic regulations, etc.
- Obtain any required permits from related government agencies for machine transportation.

5.2 LOADING/UNLOADING THE MACHINE

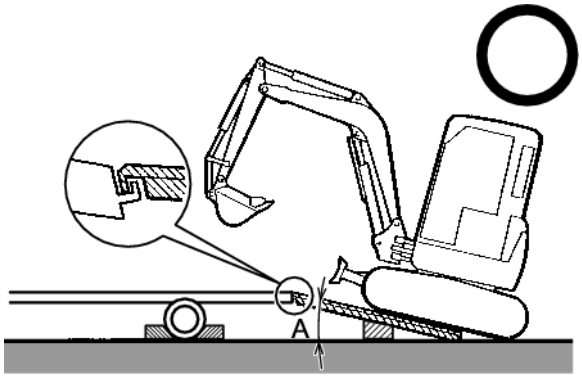
5.2.1 LOADING WITH RAMPS

WARNING

•Perform a low speed travel to load/unload the machine.
•Do not use the attachment for loading and unloading the machine to avoid danger.
•Use only the travel levers when the machine is on ramps.
•Be careful when going over the ramp top to/from a trailer because the machine center of gravity changes abruptly.



Loading and unloading with attachment



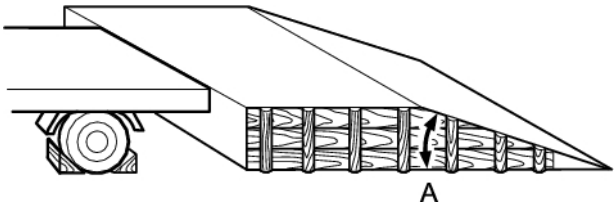
Loading and unloading with ramps

1. Load/unload the machine on the level ground as much as possible.
2. Use a ramp with sufficient length, width, strength and gradient. Angle (A) of the ramps to the ground should be 15 degrees or less.
   Apply non-slip to the slippery surface on the ramps due to rain.
3. Make sure the machine position is aligned to the ramp before going up on the ramp, and travel slowly. Raise the dozer, and load/unload the machine onto/from the trailer with the attachment lowered as much as possible but not hitting the trailer.
4. When loading the machine with the attachment, going up to the trailer from the front of machine, and when loading the machine without the attachment, going up to the trailer from the back of machine.
5. Load the machine properly on the required position of the trailer.

WARNING

Follow the procedures below to prevent damage to the arm and bucket cylinders.
Do not fully extend the arm and bucket cylinder when the center of the machine is going over the ramp top to/from the trailer. If the cylinder is extended, the machine may abruptly lean to one side (when it goes over the ramp top) and strike its arm or bucket cylinder against the trailer bed, ramp, or ground, resulting in damage to the cylinder.

5.2.2 LOADING WITH PLATFORM OR EMBANKMENT



1. Make the embankment wide enough to the machine width.
2. Solidify the embankment frame enough to prevent the collapse of the embankment slope which may lead to tipping/rolling over of the machine when loading or unloading it. Reinforce the embankment by pile driving to prevent the collapse of the embankment slope if necessary.
3. The surface of the platform or embankment must be level to that of the trailer bed.
4. Load the machine properly on the required position of the trailer.
   A. 15 degrees or less

5.3 FIXING THE MACHINE

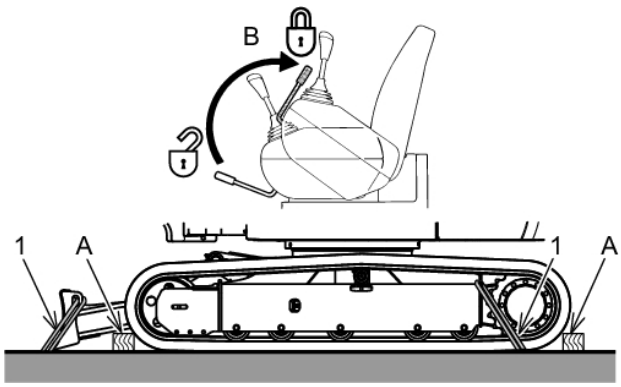
After loading the machine on the required position, fix the machine by the following procedures.

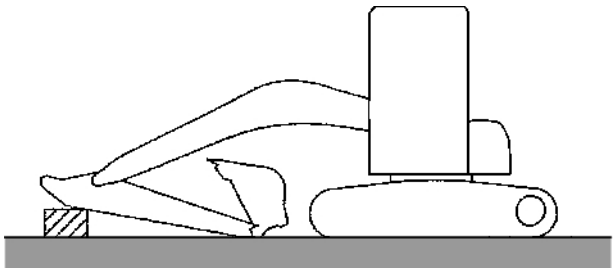
1. Lower the dozer.
2. Fully extend the bucket and arm cylinders and slowly lower the boom.

IMPORTANT

Place a wood block at the end of the bucket link to avoid contacting the ground and protect the bucket cylinder from being damaged during transportation.

3. Move the pilot control shut-off lever to the "LOCKED" position.
4. Turn all switches "OFF" and remove the starter key. In case of the cab specification, close the door and lock it.
5. Chock the front and rear of the crawlers and fix the machine securely with proper wire ropes to prevent it from moving during transportation.
   1. Wire rope
   A. Chock
   B. "LOCKED" position





Apply a wood block to the arm to prevent damage

5.4 MACHINE LIFTING PROCEDURES

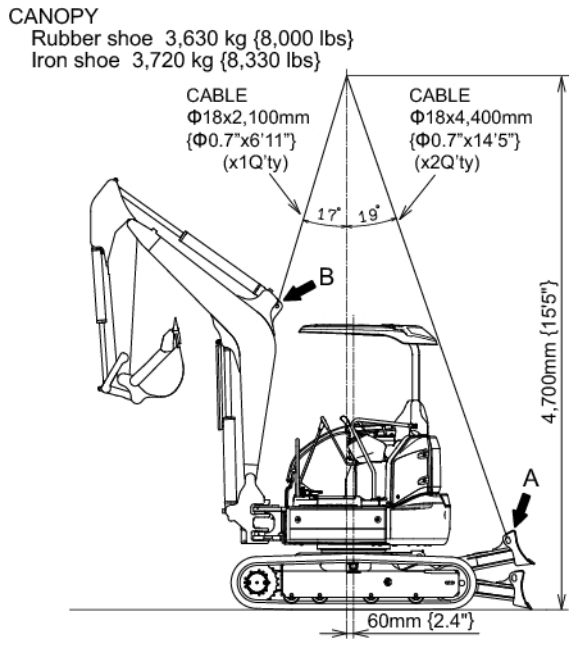
Persons who work for lifting and slinging using a crane should have the following appropriate licenses.
・Mobile crane operator's license
・Certificate of skill training course for slinging operation

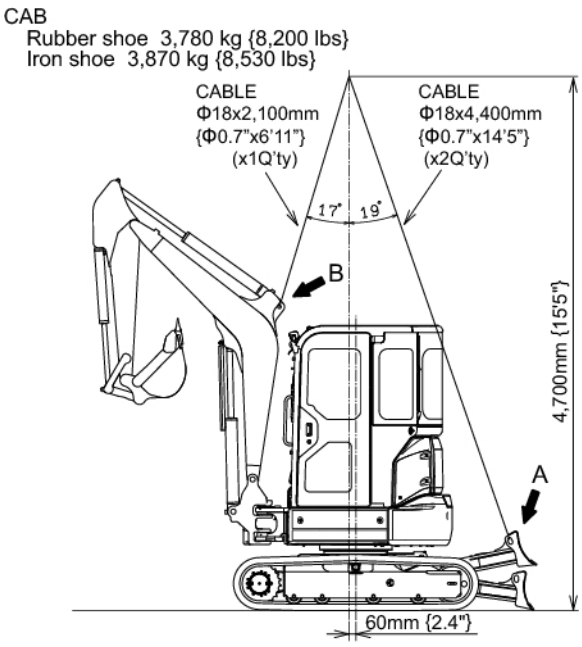
WARNING **MACHINE LIFTING**

・A wire rope or other lifting tool used should have no damage nor deterioration, with sufficient strength.
・With improper method of lifting and placing wire ropes, the lifted machine may move, causing personal injury or damage to the machine.
・Be careful not to apply a load suddenly to the wire ropes and tools for lifting.
・When lifting the machine as a group work, surely send and receive signals to each other.
・Do not lift the machine with a worker on it.
・During the machine lifting operation, keep away from the area around and under the machine.
・Keep the machine horizontal when lifting it.

IMPORTANT

This lifting procedures are applicable for machines in a standard specification.
The lifting procedures differ for each attachment type and machine with an option specification. In such cases, contact KOBELCO authorized dealer/distributor.



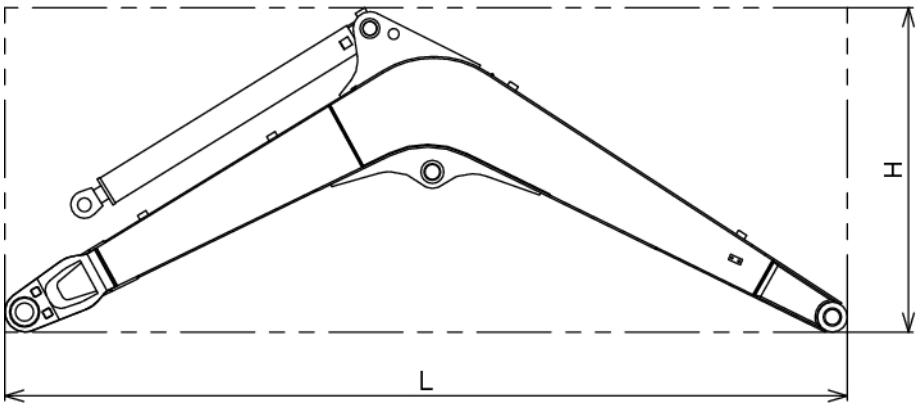


1. Operate the control levers to set the attachment in the position as shown in the figure.
2. If the boom is swung, operate the boom swing pedal to straighten it.
3. Stop the engine, check that nothing is left around the operator's seat, set the pilot control shut-off lever to the "LOCKED" position, and then get off the machine.
4. Attach shackles to two lifting holes (A) on both ends of the dozer and place the wire rope on them.
5. Attach a shackle to part (B) on the boom and place the wire rope on it.

5.5 GENERAL SPECIFICATIONS FOR EQUIPMENT/ATTACHMENT

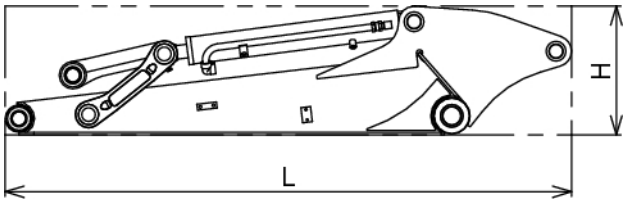
5.5.1 BOOM GENERAL SPECIFICATIONS

Overall length x Overall height x Overall width LxHxW mm (ft-in)	2,560x940x250 (8'5"x37.0"x9.8")
Mass kg (lbs)	180 (400)



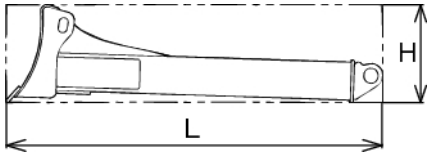
5.5.2 ARM GENERAL SPECIFICATIONS

Overall length x Overall height x Overall width LxHxW mm (ft-in)	1,800x420x220 (5'11"x16.5"x8.7")
Mass kg (lbs)	130 (290)



5.5.3 DOZER GENERAL SPECIFICATIONS

Overall length x Overall height x Overall width LxHxW mm (ft-in)	1,240x330x1,700 (4'1"x13.0"x5'7")
Mass kg (lbs)	180 (400)



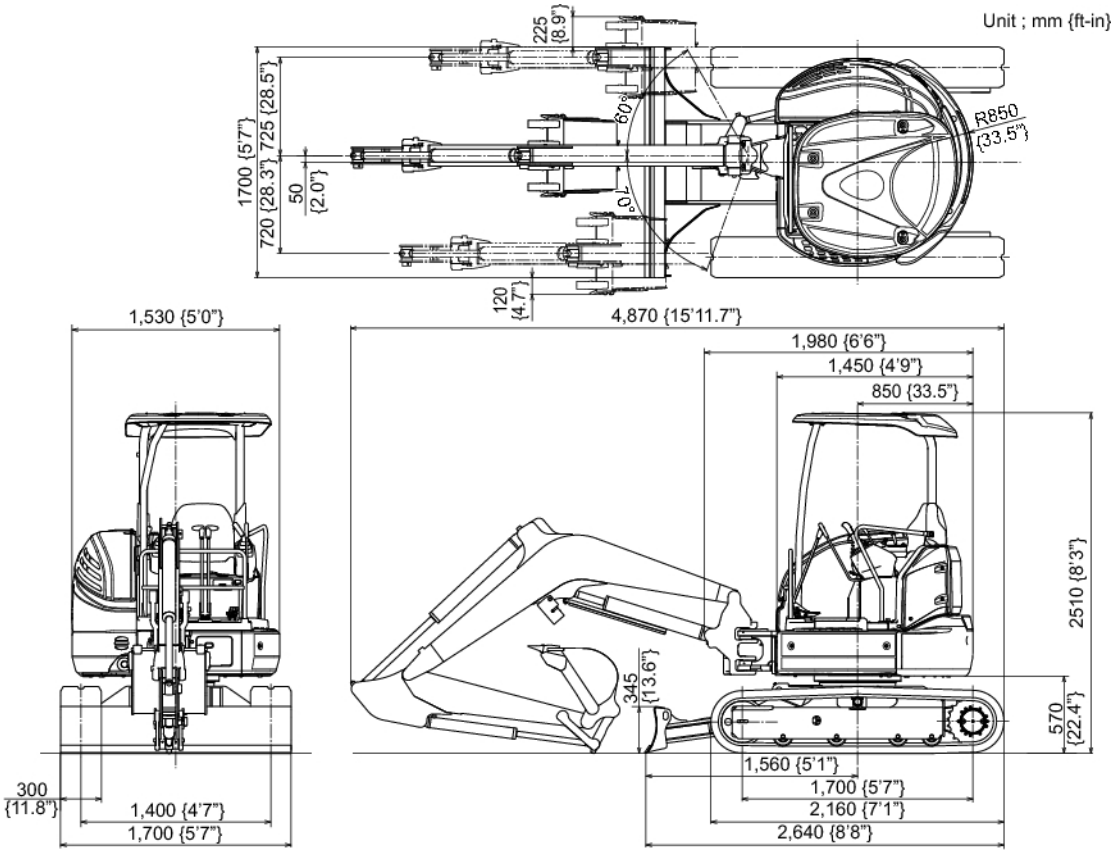
6. SPECIFICATIONS

6.1 GENERAL SPECIFICATIONS

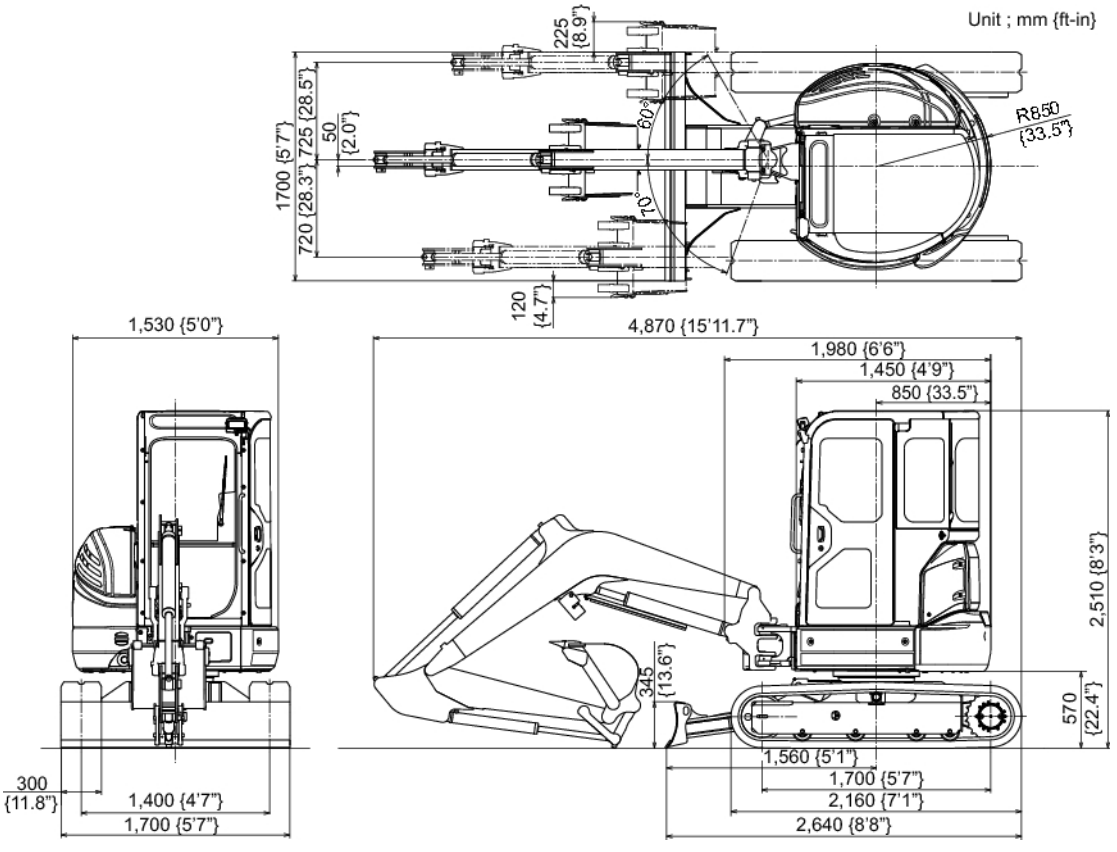
Item	Unit	SK35SR-6			
		Rubber crawler belt		Iron crawler shoe	
		CANOPY	CAB	CANOPY	CAB
COMPLETE MACHINE	kg {lb}	3,630 {8,000}	3,780 {8,330}	3,720 {8,200}	3,870 {8,530}
Slewing Speed	min^{-1}	8.4			
Travel Speed [Low (1st)/High (2nd)]	km/h	2.5 / 4.4		2.5 / 4.2	
Gradeability	% (degree)	58 (30)			
Engine Model	—	YANMAR 3TNV82A-B			
Engine Total Displacement	liters {cu·in}	1.330 {81.1}			
Engine Output Rating	kW/min^{-1} {PS/min^{-1}}	17.1 / 2,400 {23 / 2,400}			
Boom Swing Angle (Right/Left)	degree	60 / 70			
Dozer blade travel (up/down)	mm {in}	395 / 320 {15.5 / 12.6}			

6.2 MACHINE DIMENSIONS

6.2.1 CANOPY TYPE MACHINE

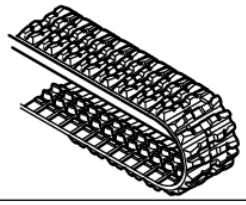
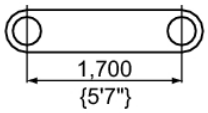
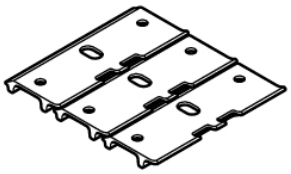
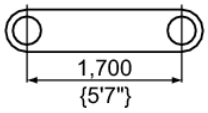


6.2.2 CAB TYPE MACHINE

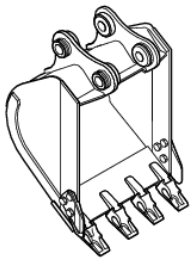


6.3 CRAWLER AND BUCKET TYPES

6.3.1 CRAWLER TYPE

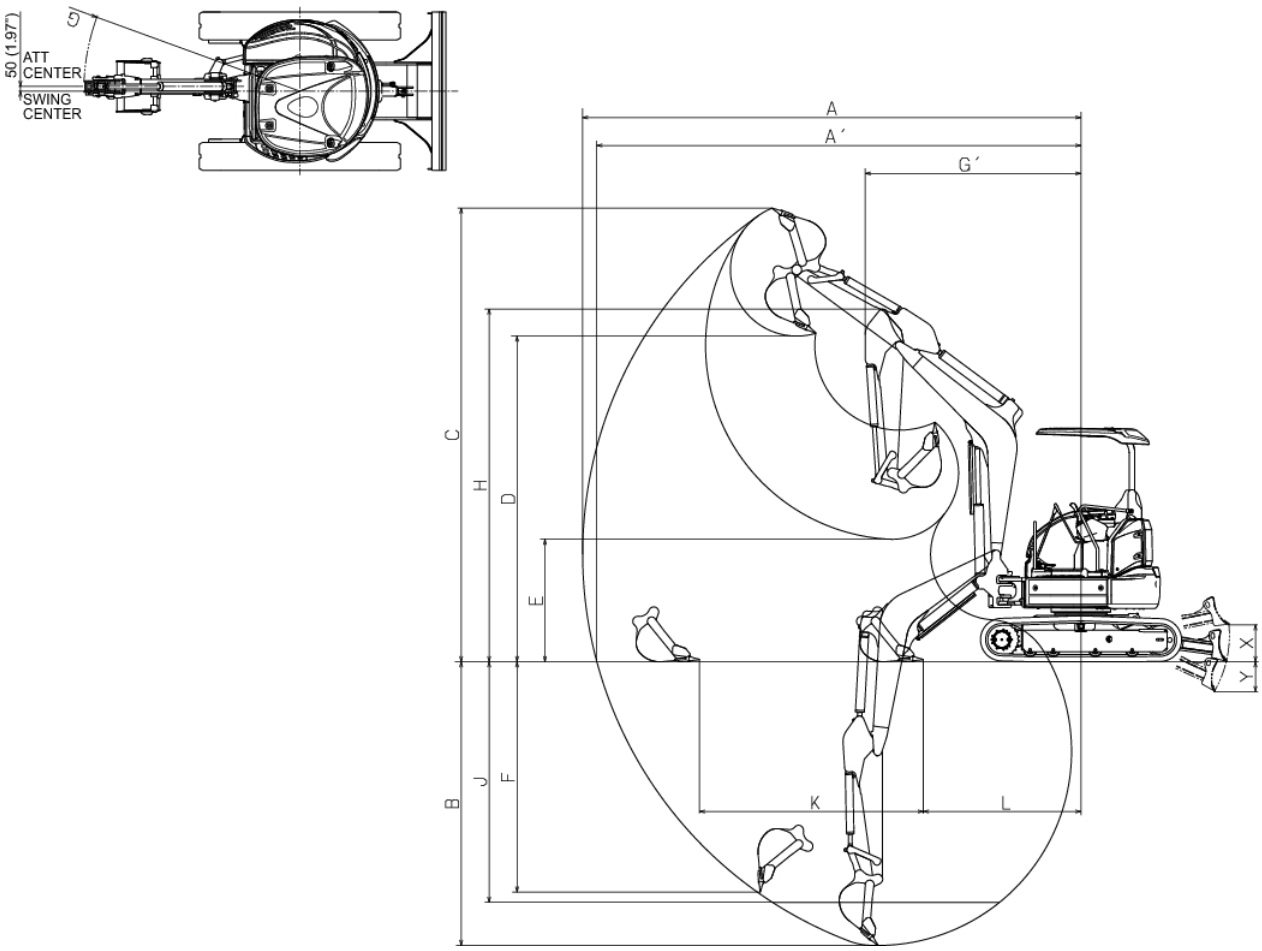
Type	Width mm {in}	Length between center of idler and center of travel motor mm {ft-in}	Ground Pressure kPa {psi}	
			CANOPY	CAB
Rubber belt 	300 {11.8"}		32.0 {4.6}	33.5 {4.9}
Iron shoe (Optional) 	300 {11.8"}		32.9 {4.8}	34.4 {5.0}

6.3.2 BUCKET TYPE

Bucket	Heaped Capacity m^3 {cu•yd}	Outer width mm {in}		Number of tooth	Weight kg {lbs}
		with side cutter	without side cutter		
	0.11 {0.14}	600 {23.6"}	560 {22.0"}	4	83 {183}

6.4 WORKING RANGES

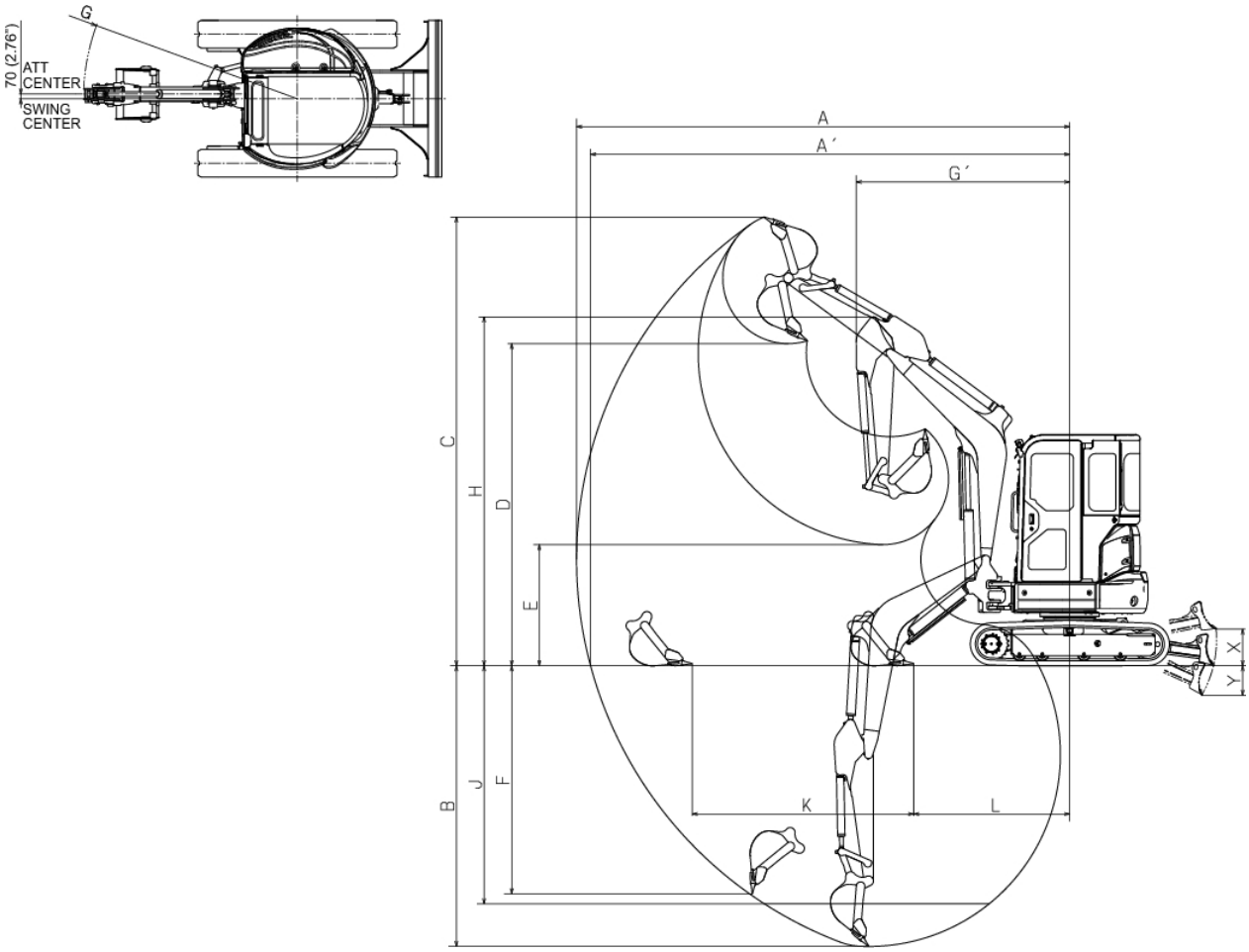
6.4.1 CANOPY TYPE MACHINE



Unit:mm {ft-in}

Item/Attachment			STD ARM 1.37 m {4'6"} BUCKET 0.11 m³ {0.14 cu·yd}
A	Max. digging reach		5,390 {17'8.2"}
A'	Max. digging reach at ground level		5,240 {17'2.3"}
B	Max. digging depth		3,050 {10'0.1"}
C	Max. digging height		4,990 {16'4.5"}
D	Max. dumping clearance		3,600 {11'9.7"}
E	Min. dumping clearance		1,330 {4'4.4"}
F	Max. vertical wall digging depth		2,620 {8'7.2"}
G	Min. front swing radius		2,380 {7'9.7"}
G'	Min. front swing length		2,380 {7'9.7"}
H	Height at min. slew radius		3,790 {12'5.2"}
J	8-feet level digging depth		2,610 {8'6.8"}
K	Horizontal digging stroke at ground level	Stroke	2,320 {7'6.8"}
L		Minimum	1,820 {5'7.3"}
X	Dozer strokes	Above	395 {15.6"}
Y		Below	320 {12.6"}

6.4.2 CAB TYPE MACHINE



Unit:mm {ft-in}

Item/Attachment			STD ARM 1.37 m {4'6"} BUCKET 0.11 m^3 {0.14 cu·yd}
A	Max. digging reach		5,390 {17'8.2"}
A'	Max. digging reach at ground level		5,240 {17'2.3"}
B	Max. digging depth		3,050 {10'0.1"}
C	Max. digging height		4,990 {16'4.5"}
D	Max. dumping clearance		3,600 {11'9.7"}
E	Min. dumping clearance		1,330 {4'4.4"}
F	Max. vertical wall digging depth		2,620 {8'7.2"}
G	Min. front swing radius		2,380 {7'9.7"}
G'	Min. front swing length		2,380 {7'9.7"}
H	Height at min. slew radius		3,790 {12'5.2"}
J	8-feet level digging depth		2,610 {8'6.8"}
K	Horizontal digging stroke at ground level	Stroke	2,320 {7'6.8"}
L		Minimum	1,820 {5'7.3"}
X	Dozer strokes	Above	395 {15.6"}
Y		Below	320 {12.6"}

7. NIBBLER (CRUSHER) AND BREAKER

7.1 OPERATION OF HYDRAULIC BREAKER AND NIBBLER (CRUSHER)

7.1.1 SELECTION OF HYDRAULIC BREAKER AND NIBBLER (CRUSHER)

When installing a hydraulic breaker or nibbler (crusher) to the machine, select the optimal breaker or nibbler (crusher) considering stability of the machine, pressure of the hydraulic system, and a required hydraulic oil volume.

7.1.2 BEFORE OPERATING HYDRAULIC BREAKER

- Consult KOBELCO authorized dealer/distributor for the additional piping work and reinforcement for the arm to install the hydraulic breaker or nibbler (crusher) to the machine.
- When using the nibbler (crusher) or hydraulic breaker, to get full performance of its function and avoid damage to the machine and nibbler (crusher) or hydraulic breaker, fully understand and read the operation manual of its manufacturer and "7.1.4 PROHIBITED WORK IN USE OF BREAKER" described later.

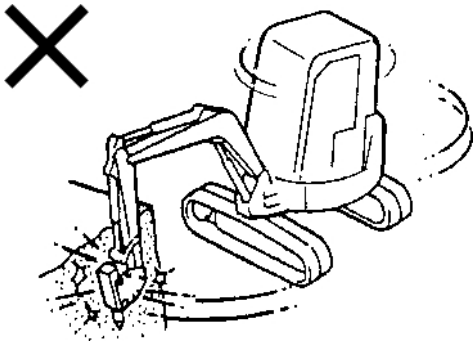
7.1.3 PRECAUTIONS FOR IMPURITY AND HYDRAULIC OIL

When the hydraulic breaker or nibbler (crusher) is removed, apply plugs to the tube end of the tip of the arm and the hose end on the hydraulic breaker or nibbler (crusher) to keep them away from dust and water.
Before operation, check for looseness of the bolts on the clamps fixing the tubes, and leakage from the connections of the tubes and hoses.

7.1.4 PROHIBITED WORK IN USE OF BREAKER

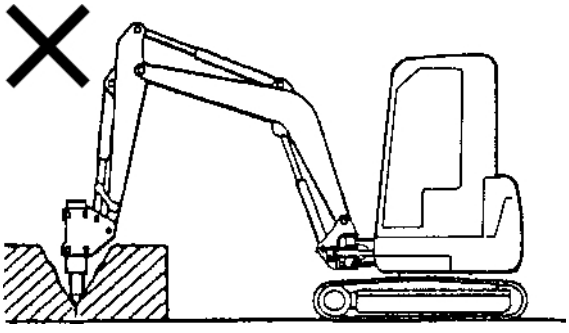
DO NOT MOVE WITH SIDE AND REAR SURFACE

Using the side or rear surface of the hydraulic breaker to move rock may damage the hydraulic breaker and put an excessive load on the boom and arm.



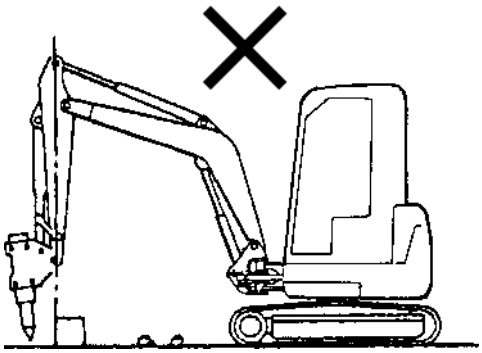
DO NOT PRY AND BREAK FORCIBLY

Do not use the breaker to pry and break rock and concrete. This may damage the hydraulic breaker, boom, arm, cylinder and link.



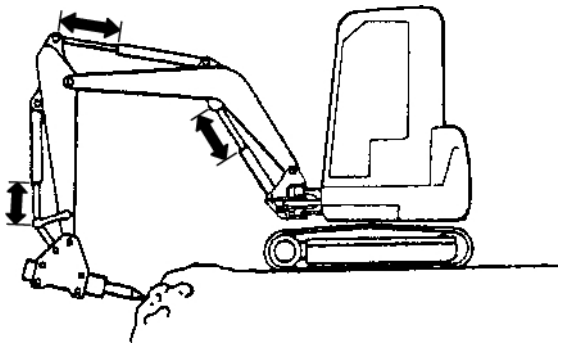
ARM IN VERTICAL POSITION

The arm should not be operated in the vertical position to prevent the arm cylinder from shaking largely.
It pries the rod packing and piston, causing oil leakage.



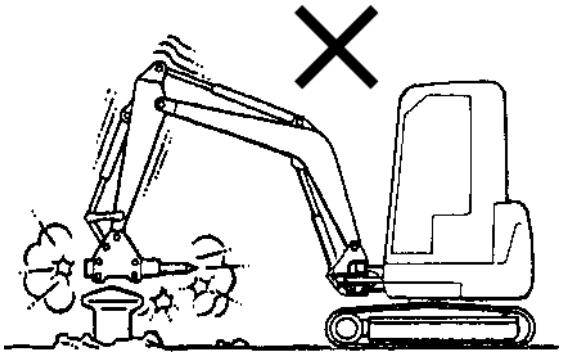
CYLINDER ROD AT STROKE END

Operate the cylinder rod with leaving some space to the stroke end.
Operating the cylinder rod at the stroke end can cause an excessive load on the cylinder and the machine and shorten the service life of them considerably.



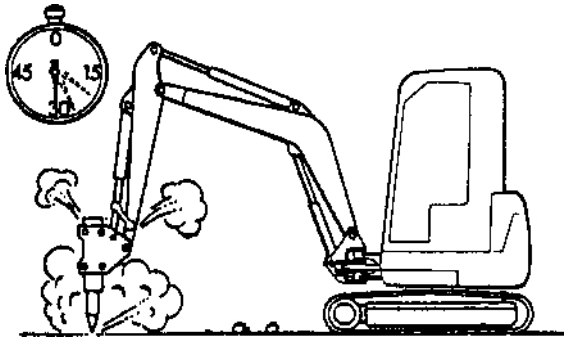
DO NOT USE OTHER THAN DEMOLITION WORK

Do not use the hydraulic breaker for other than the demolition work.



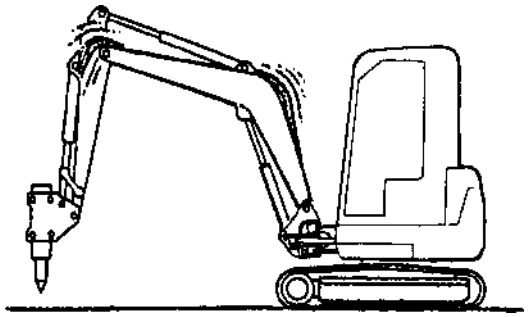
CONTINUOUS USE FOR 30 SECONDS OR LONGER

If a rock cannot be broken by hitting the same point for 30 seconds, change the target point.
If you still continue hitting, it raises the oil temperature and may cause a failure of the accumulator, deterioration of the pump and cylinder seal and abnormal wear of the chisel.



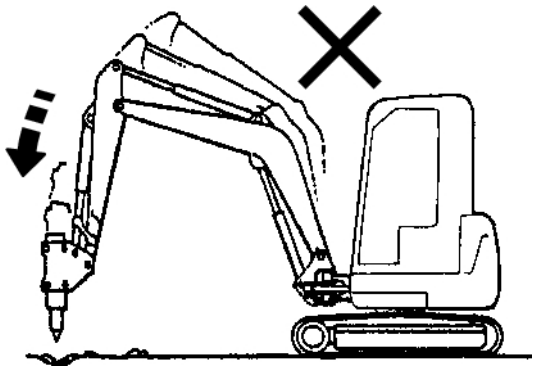
STOP WORKING WHEN HOSE SWINGS

It is caused by gas pressure reduction or damage of the accumulator.
If you continue working, impact becomes larger and it may have an adverse effect on the body, causing a failure of the pump and piping.
Immediately contact KOBELCO authorized dealer/distributor near you.



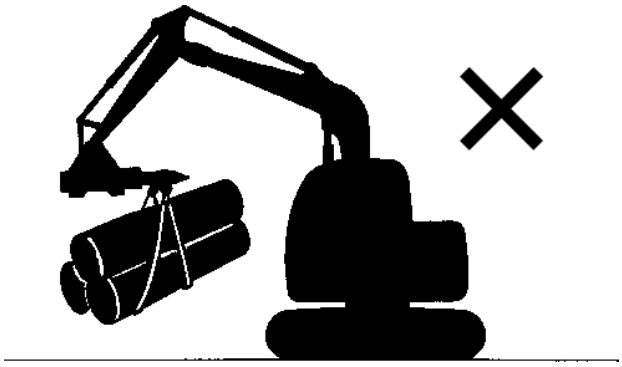
DO NOT USE DROPPING FORCE

Never use the hydraulic breaker for breaking rock by dropping it. It may cause damage to various parts.



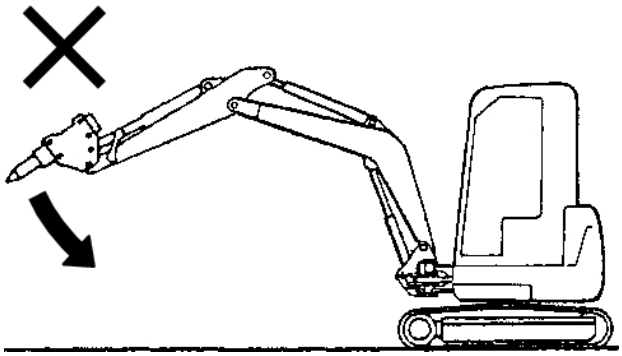
LIFTING

Never use this machine for the lifting work.
Safety must be given the first priority.



RAPID STROKE END OPERATION

If the cylinder rod reaches the stroke end when lowering the arm, the impact may cause damage to the arm cylinder. Avoid the arm cylinder from reaching the stroke end at high speed.



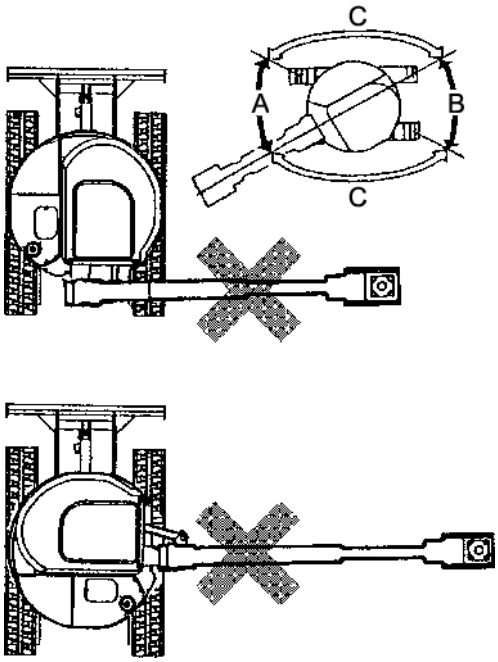
PROHIBITION OF BREAKER WORK IN A SWING OR OFFSET POSITION

WARNING **HYDRAULIC BREAKER WORK**

Use the forward-looking or rearward-looking position without swing or offset for the hydraulic breaker work.

The positions as shown in the right figure make the machine unstable and have a risk of falling. Never perform the breaker work in these positions.

A. Allowed work facing forward
B. Allowed work facing backward
C. Prohibited work facing sideways

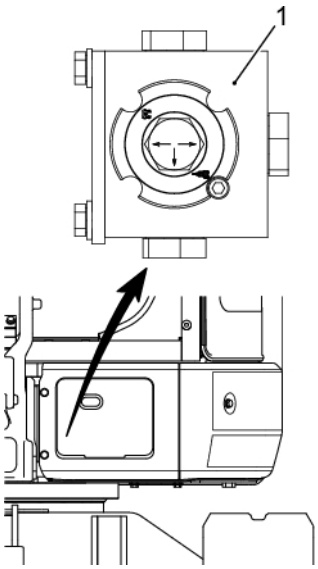


IMPORTANT

•Even if you use an attachment other than the hydraulic breaker, see "PROHIBITED WORK IN USE OF BREAKER".
•Use the reinforced arm with the hydraulic breaker. The breaker work with the standard arm may cause damage to the arm.

7.2 SWITCHING SELECTOR VALVE

For the machine with the nibbler (crusher) and breaker specifications, selector valve (1) is placed on the main circuit. Be sure to switch selector valve (1) to the position suited for the specification.



IMPORTANT

•Incorrect selector valve switching results in poor function, which decreases work efficiency and speed, and sometimes causes damage to the machine. Be sure to switch the selector valve correctly.
•Switch the selector valve once or twice a month periodically.

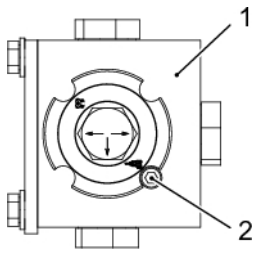
7.2.1 SWITCHING PROCEDURES OF SELECTOR VALVE

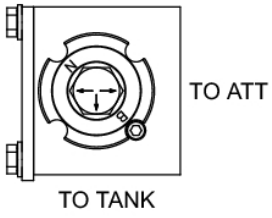
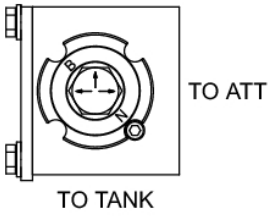
SWITCHING PROCEDURE

IMPORTANT

Before the switching work, stop the engine and place the attachment in stable condition on the ground.

1. Open the cover at the front of the machine to access selector valve (1).
2. Remove bolt (2) with the screw key (5 mm).
3. Turn the selector valve to the position suited for the specification with a wrench (width across flats 24 mm).
4. After switching the selector valve, tighten bolt (2) with the screw key (5 mm).



SELECTOR VALVE SHIFTING POSITION	
	
USE BREAKER	USE NIBBLER

7.3 CONTROL OF PROPORTIONAL HAND CONTROL SWITCH

WARNING

Read, understand and follow all safety precautions and procedures found in this manual before attempting any operation of this machine.

For proper switching between the nibbler (crusher) and breaker, see "SWITCHING SELECTOR VALVE".

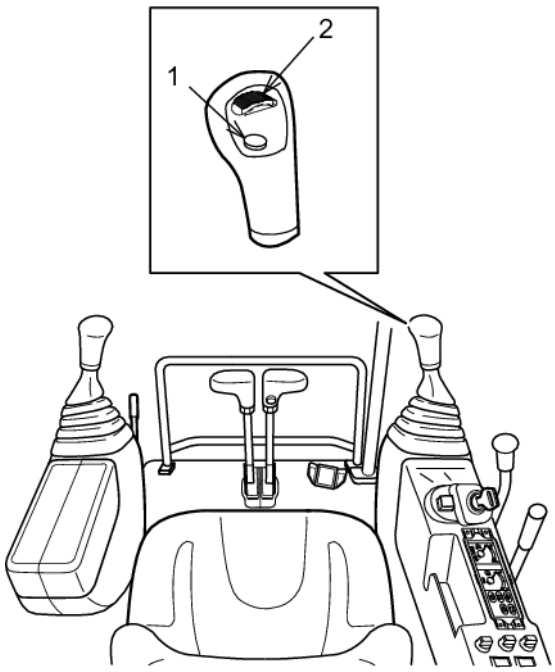
7.3.1 CONTROL LEVER SWITCH (BREAKER)

WARNING **PRECAUTIONS FOR LEAVING THE OPERATOR'S SEAT**

Do not leave the machine with the engine running.

Press switch (1) that is located on the right control lever to operate the "breaker".

1. To operate the breaker, press switch (1). Release to stop operation.
2. Operate the breaker for 30 seconds, then release the switch.



Switch depressing section	Operation
Off	Breaker stops operating.
Depress the switch	Breaker starts operating.

IMPORTANT

The breaker can be operated by sliding nibbler (crusher) control switch (2) to the left. However, use breaker control switch (button) (1) as much as possible.

7.3.2 CONTROL LEVER SWITCH (NIBBLER)

WARNING **NIBBLER OPERATION**

Do not touch breaker switch (button) (1) when operating the nibbler (crusher).

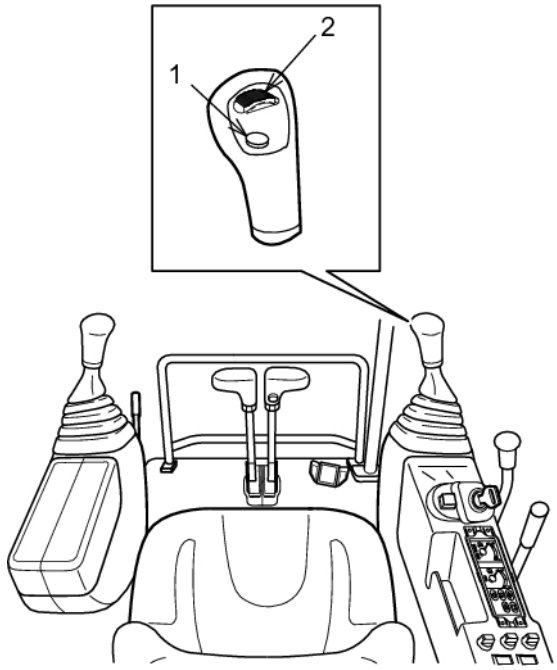
WARNING **PRECAUTIONS FOR LEAVING THE OPERATOR'S SEAT**

Do not leave the machine with the engine running.

Slide switch (2) that is located on the 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.



IMPORTANT

According to the slide distance of the nibbler (crusher) control switch, the hydraulic oil flow rate increases.

7.3.3 CONTROL LEVER SWITCH (EXTRA)

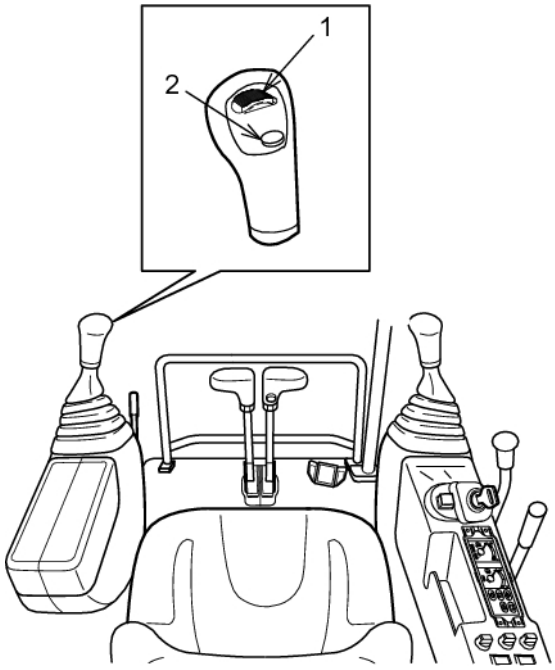
WARNING **PRECAUTIONS FOR LEAVING THE OPERATOR'S SEAT**

Do not leave the machine with the engine running.

Slide the switch (1) that is located on left control lever to actuate the "extra operation".

- Switch operation

Operation procedure of option switch (1)	Oil flow
Slide to the left	Extra (L.H)
Slide to the right	Extra (R.H)



IMPORTANT

According to the slide distance of the extra control switch, the hydraulic oil flow rate increases.

7.4 PERIODIC INSPECTION AND MAINTENANCE OF NIBBLER (CRUSHER) AND BREAKER

7.4.1 PERIODIC INSPECTION AND MAINTENANCE CHART OF NIBBLER (CRUSHER) AND BREAKER

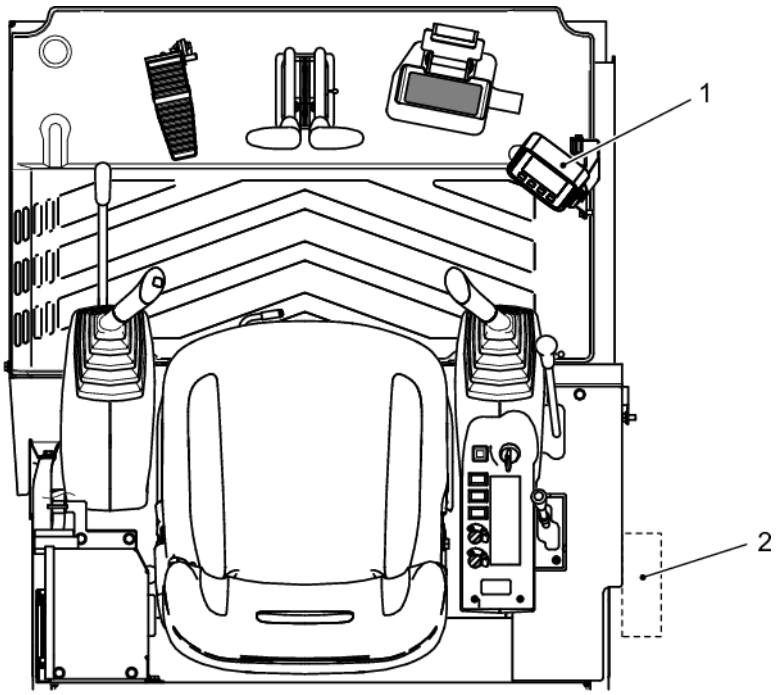
Contamination and deterioration of the hydraulic oil may cause poor function of the control valves, early wear and seizure of the hydraulic pump and failure of the whole hydraulic circuit. When the hydraulic breaker is attached, the deterioration of the hydraulic oil is faster than that of the normal bucket digging work. Replace the filters and hydraulic oil earlier as indicated in the periodic inspection and maintenance chart below.

Inspection and maintenance item	Greasing point	Replacement interval (hours)		
		First time	Second time	Periodic
Hydraulic oil	Hydraulic oil tank	—	—	Every 1000
Return filter element kit	Hydraulic oil tank	50	200	Every 200

8. OPTIONAL EQUIPMENT

8.1 Color multi-display

CAB NOMENCLATURE

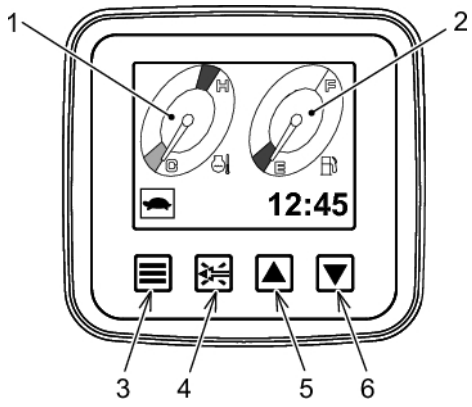


Item	Name
1	Color multi-display
2	Mechatro Controller

IMPORTANT

•Be careful not to splash water, mud and drinks on the controller. It may cause failure of the machine.
•When an error occurred on the controller, do not disassemble it by yourself, but contact KOBELCO authorized dealer/distributor for repair.

The color multi-display consists of A. gauges (fuel level and engine coolant temperature) and B. switch panels.

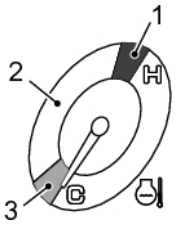


Symbol	Item	Name	Item	Name
A. Meter	1	Engine coolant temperature gauge	2	Fuel level meter
B. Switch panel	3	Menu switch	5	Up arrow switch
	4	Buzzer stop switch	6	Down arrow switch

CAUTION

•When a warning is displayed on the multi-display, stop the work immediately and inspect and maintain the failure part.
For inspecting or maintaining, see "INSPECTION AND MAINTENANCE".
•The indications on the multi-display do not assure the condition of the machine.
•The visual checking should be carried out for the maintenance and inspection of the machine, without relying on the multi-display only.

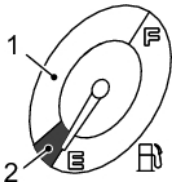
8.1.1 ENGINE COOLANT TEMPERATURE GAUGE



This indicates the temperature of the engine coolant. It is available when the starter switch is in the "ON" position. The temperature is normal if it falls within the white range. If the indicator enters the red range, let the engine low idle until the water cools down to the white range.

1. Red: Overheat
2. White: Operational
3. Blue: Cold condition (Warm up the engine)

8.1.2 FUEL LEVEL METER

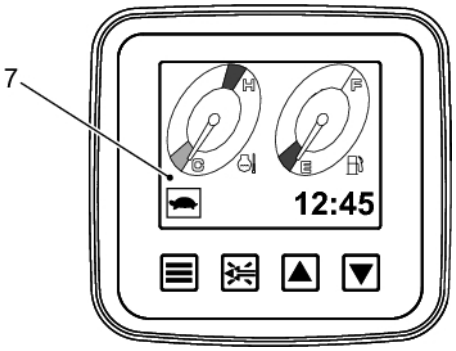


This indicates the remaining volume of fuel. When the fuel level is low, the pointer points E. For fuel to use, see "LUBRICANT, FUEL & COOLANT SPECIFICATIONS" in Chapter 4.

1. White: Operational zone
2. Red: Refill

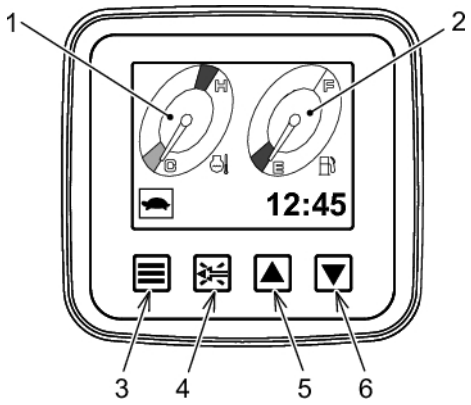
8.1.3 SWITCH PANEL

After starting the engine, usually main screen (7) is shown as in the right figure.



8.1.4 BUZZER STOP SWITCH

In case where a warning is displayed on the multi-display (LCD), press buzzer stop switch (4) to stop the buzzer sounding as described in the tables below.



Items in the Warning Display Lists
Warning Level and Its Description

Level	Description
1	This is largely-concerned with the safety and machine movement. Stop the machine immediately and perform inspection and maintenance.
2	This notifies of the mode change of the machine.
3	This may lead to the failure of the machine. Immediately perform inspection and maintenance.
4	Difficulty may occur in working. Immediately perform inspection and maintenance.
5	This notifies of the machine status and maintenance.

Buzzer Sound Type

Buzzer sound type	Sounds
Type 1	Continuous
Type 2	Sound 0.2 seconds, stop 0.3 seconds
Type 3	Sound 0.5 seconds, stop 0.5 seconds
Type 4	Sound 0.5 seconds, stop 1.0 seconds
Type 5	Sound 1.0 seconds, stop 1.0 seconds
Type 6	Sound 2.0 seconds, stop 1.0 seconds
Type 7	Sound 2.0 seconds, stop 2.0 seconds

Priority Group A

Level	L.C.D. display	Machine condition	Buzzer Sounds				
			Auto stop	Manual stop	Type	Only starter key ON	Engine Running
1		The mechatro controller does not send data.	—	O	3	O	O

Priority Group B

Level	L.C.D. display	Machine condition	Buzzer Sounds				
			Auto stop	Manual stop	Type	Only starter key ON	Engine Running
3		The engine oil pressure is at the specified value or less.	—	O	2	O	O
3		The temperature of engine coolant is at the specified value or more.	—	O	3	O	O
3		Disorder of the sensor, etc. occurs. The indications are the failure content and the error code.	—	O	3	O	O

8.1.5 MENU SWITCH

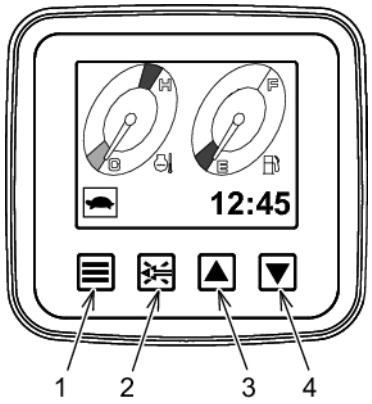
The menu switch is available for clock setting and contrast adjustment.
For information on how to use the menu switch, see "Maintenance Information" - "Brightness (Night) Adjustment" below.

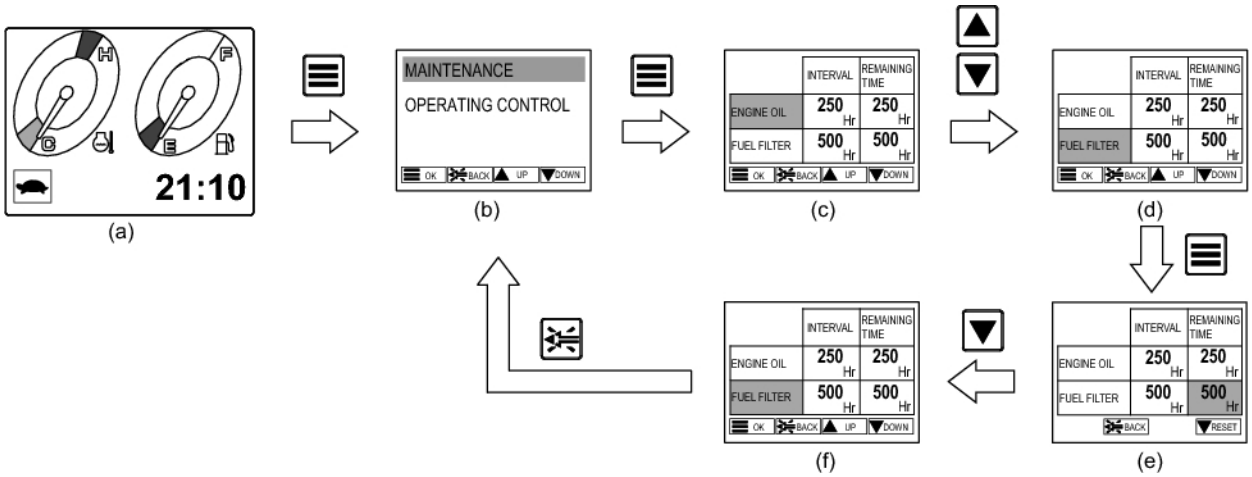
Notice

Press buzzer stop switch (2) during the adjustment or setting operation to return to the main screen.

Maintenance Information

1. Menu Switch
2. Buzzer Stop Switch
3. Up Arrow Switch
4. Down Arrow Switch

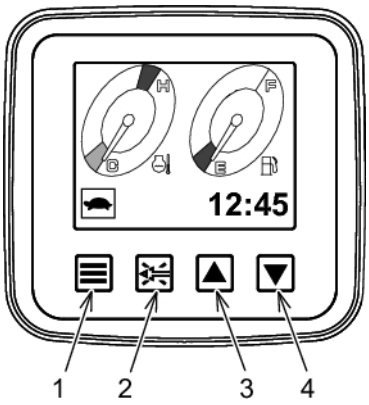


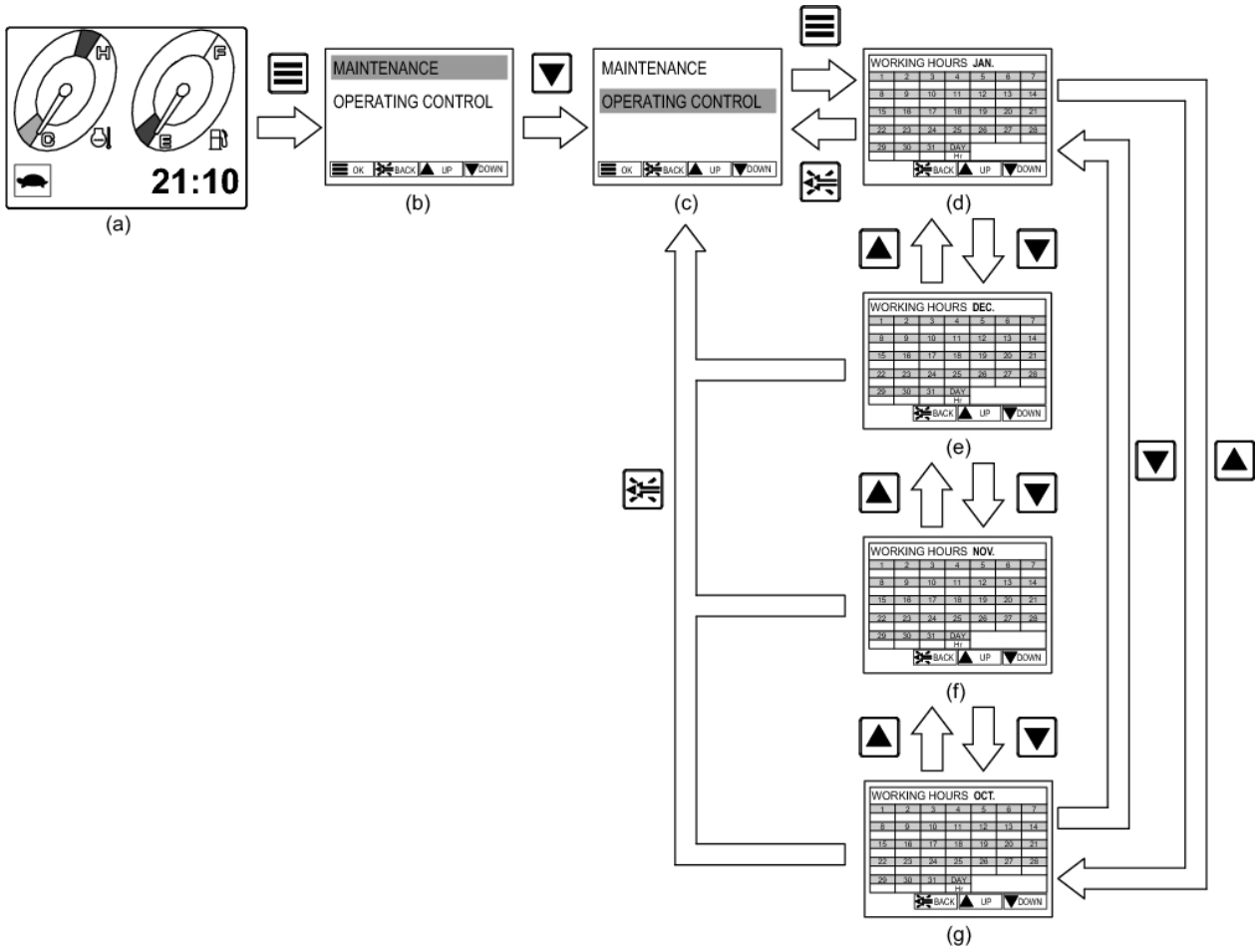


1. Turn the starter switch "ON" to display main screen (a). Press menu switch (1) to enter user menu screen (b).
2. Using the up and down arrow switches, move the cursor to "MAINTENANCE". Press menu switch (1) to enter "MAINTENANCE".
3. Using the up and down arrow switches, move the cursor to one of the items from "ENGINE OIL", "FUEL FILTER", "HYD.FILTER", "HYD.OIL" or "EXHAUST GAS FILTER".
4. Press menu switch (1) and then the background color of "REMAINDER" turns blue.
5. Press down arrow switch (4) to reset "REMAINDER".
6. Press buzzer stop switch (2) to return to user menu screen (b).

OPERATING CONTROL

1. Menu Switch
2. Buzzer Stop Switch
3. Up Arrow Switch
4. Down Arrow Switch





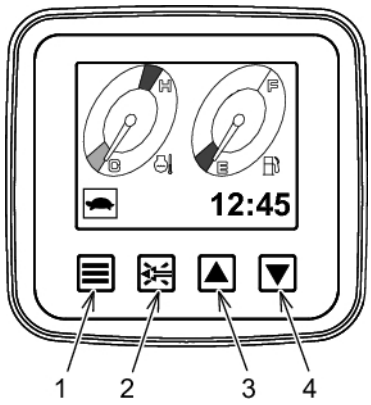
1. Turn the starter switch "ON" to display main screen (a). Press menu switch (1) to enter user menu screen (b).
2. Using the up and down arrow switches, move the cursor to "OPERATING CONTROL". Press menu switch (1) to enter "OPERATING CONTROL".
   The operating control table displays the operating time of each day for the current month.
3. Press down arrow switch (4) to show the information of the previous month.
4. When the information of three months ago is displayed, press down arrow switch (4) to return to the current month.
5. Press buzzer stop switch (2) to return to user menu screen (c).

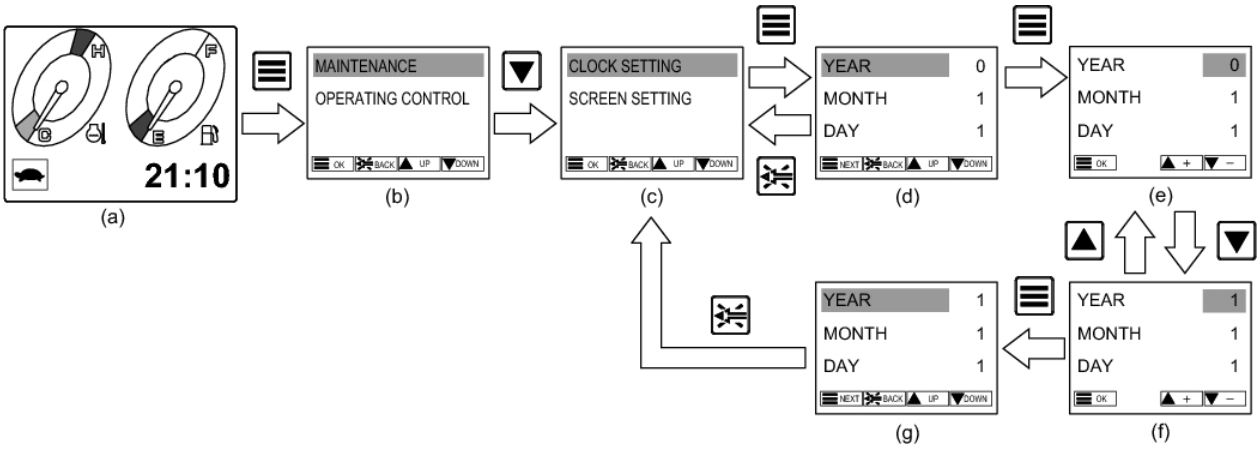
CAUTION

If you change the clock setting, the data of operating management information is cleared.

Clock Setting

1. Menu Switch
2. Buzzer Stop Switch
3. Up Arrow Switch
4. Down Arrow Switch

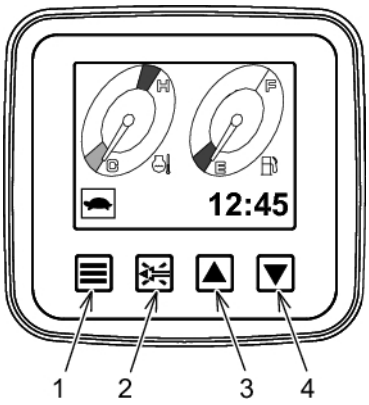


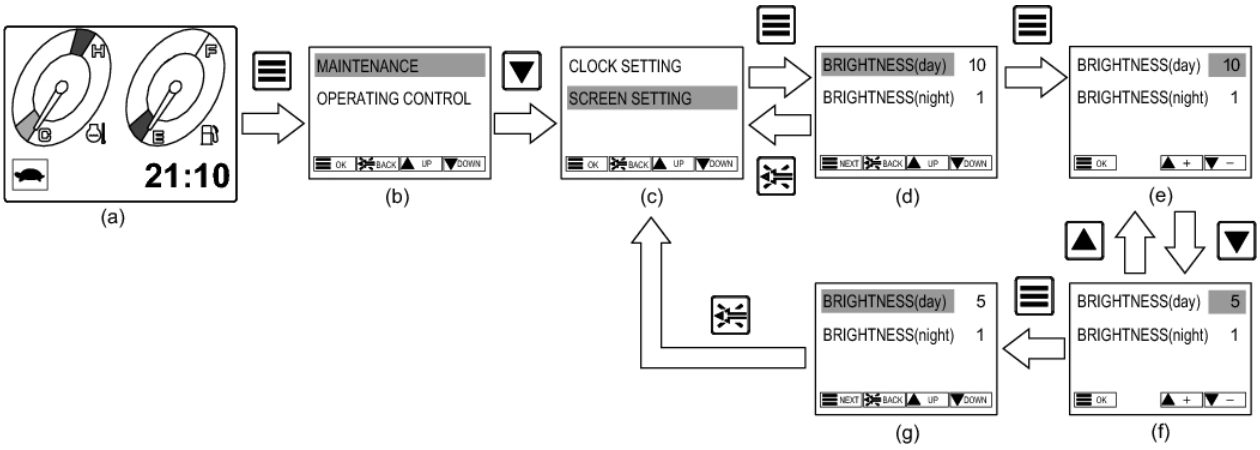


1. Turn the starter switch "ON" to display main screen (a). Press menu switch (1) to enter user menu screen (b).
2. Using the up and down arrow switches, move the cursor to "CLOCK SETTING" as display (c). Press menu switch (1) to enter "CLOCK SETTING".
3. Using the up and down arrow switches, select any of "YEAR/MONTH/DAY/HOUR/MINUTE" as display (d).
4. Press menu switch (1) to enter display (e). The background color of "value" turns blue.
5. Using the up and down arrow switches, select the desired value.
6. Press menu switch (1) to set the desired value. The background color of "value" turns black.
7. Press buzzer stop switch (2) to return to user menu screen (c).

Brightness (Day) Adjustment

1. Menu Switch
2. Buzzer Stop Switch
3. Up Arrow Switch
4. Down Arrow Switch

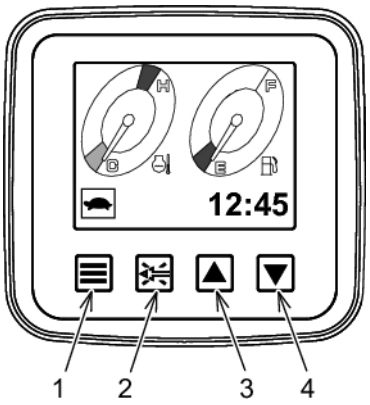


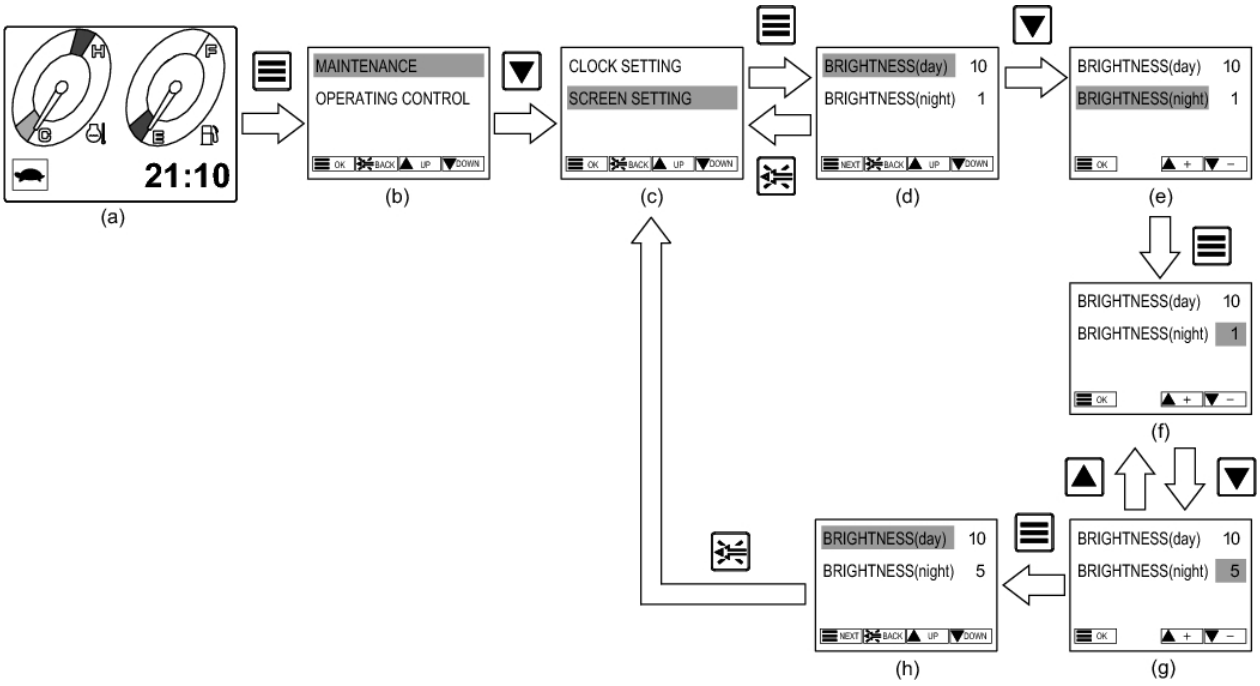


1. Turn the starter switch "ON" to display main screen (a). Press menu switch (1) to enter user menu screen (b).
2. Using the up and down arrow switches, move the cursor to "SCREEN SETTING" as display (c). Press menu switch (1) to enter "SCREEN SETTING".
3. Using the up and down arrow switches, move the cursor to "Brightness (day)" as display (e).
4. Press menu switch (1) to enter display (e). The background color of "value" turns blue.
5. Using the up and down arrow switches, select the desired values.
   Adjustable Range:1 (Dark) to 100 (Bright)
   * The default value is 10.
6. Press menu switch (1) to set the desired value. The background color of "value" turns black.
7. Press buzzer stop switch (2) to return to user menu screen (c).

Brightness (Night) Adjustment

1. Menu Switch
2. Buzzer Stop Switch
3. Up Arrow Switch
4. Down Arrow Switch





1. Turn the starter switch "ON" to display main screen (a). Press menu switch (1) to enter user menu screen (b).
2. Using the up and down arrow switches, move the cursor to "SCREEN SETTING" as display (c). Press menu switch (1) to enter "SCREEN SETTING".
3. Using the up and down arrow switches, move the cursor to "Brightness (night)" as display (e).
4. Press menu switch (1) to enter display (f). The background color of "value" turns blue.
5. Using the Up and Down arrow switches, select the desired values.
   Adjustable Range:1 (Dark) to 100 (Bright)
   * The default value is 4.
6. Press menu switch (1) to set the desired value. The background color of "value" turns black.
7. Press buzzer stop switch (2) to return to user menu screen (c).

8.1.6 DISPLAY (LCD)

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 "INSPECTION AND MAINTENANCE ".

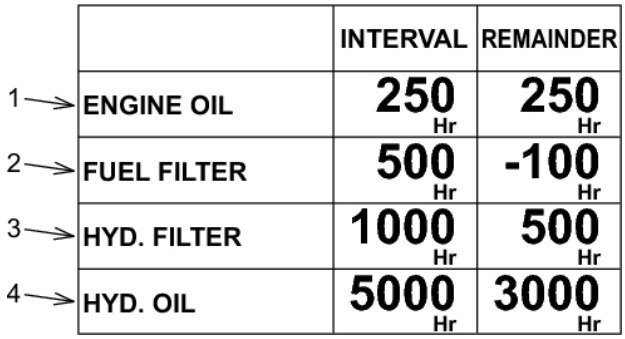
The recommended replacement interval is the accumulated time counted by the controller when the engine is running.

This menu is available for confirmation of the following items.

Replacement Interval

Item	Default
Engine oil	250 Hr
Fuel filter	500 Hr
Hydraulic oil filter	1,000 Hr
Hydraulic oil	5,000 Hr

1. Display of remaining time to next engine oil change
   This shows the remaining time of the recommended replacement time for the engine oil.
2. Display of remaining time to next fuel filter change
   This shows the remaining time of the recommended replacement time for the fuel filter.
3. Display of remaining time to next hydraulic oil filter change
   This shows the remaining time of the recommended replacement time for the hydraulic oil filter.
4. Display of remaining time to next hydraulic oil change
   This shows the remaining time of the recommended replacement time for the hydraulic oil.



SET PROCEDURE OF MAINTENANCE SCHEDULE

This machine is equipped with the multi-display which shows the remaining time to the next replacement time of the engine oil, fuel filter, hydraulic oil filter and hydraulic oil.

When the remaining time reaches zero (0), change that item and reset the time.

Notice

•For information on the default value of the maintenance time, see "8.1.5 MENU SWITCH".

•When the recommended replacement time is over, its "REMAINDER" indication turns red. When necessary to return to the initial value, reset it.

Notice

・The recommended replacement time of the engine oil is 250 hr. The multi-display warns of it without a buzzer.
・The recommended replacement time of the fuel filter is 500 hr. The multi-display warns of it without a buzzer.
・The recommended replacement time of the hydraulic oil filter is 1000 hr. The multi-display warns of it without a buzzer.
・The recommended replacement time of the hydraulic oil is 5000 hr. The multi-display warns of it without a buzzer.

OPERATING CONTROL SCREEN

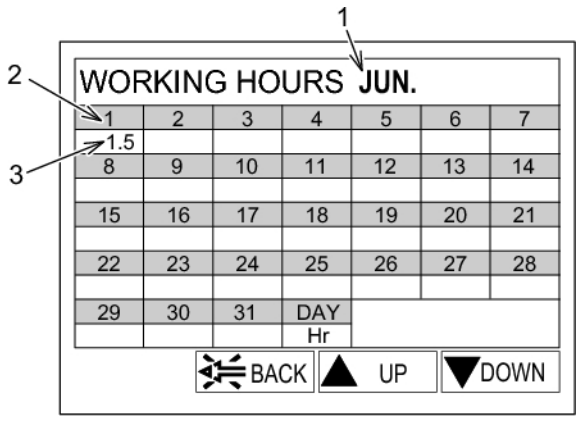
This screen displays the operating time of each day in the unit of 0.5 hr (less than 0.5 hr are rounded down).
You can see the operating information of total four months (current month and past three months).

Notice

For information on how to check the operating control, see "MENU SWITCH".

DISPLAY CONTENTS

- The operating time is accumulated only when the engine in running.
- It is displayed in the unit of 0.5 hr. If the operating time of a day is less than 0.5 hr (30 minutes), it is displayed as "0.0".
- No operation day (when the engine was not started) is displayed as a blank.
- You can see the operating information of the current month + past three months. Older operating information than that is deleted.



1. Displays the month.
2. Displays the date with the blue background.
3. Displays the operating time of the day.

* The above figure shows a case where the machine operated for 1.5 hr on June 1st.

IMPORTANT

If the battery is removed, the stored data is cleared and all operating information will be displayed as blank.
The initial state is "January 1st, 2000". Note the operating time before removing the battery or changing the clock setting, if necessary.

WARNING DISPLAY SCREEN

The warning display has the order of priority (A and B) and when many troubles occur at the same time, the priority (A) is displayed in priority to those in "PRIORITY B".

WARNING **WHEN WARNINGS ARE DISPLAYED**

These displays show the warnings that may lead to severe troubles. Stop the operation immediately, investigate the causes and take proper measures.

1. WARNING CLASSIFICATION (PRIORITY A)

Displays	Level	Warning Contents	Remedy
IMPOSSIBLE TO DISPLAY MONITOR	1	The mechatro controller does not send data.	Contact our dealer/distributor for inspection and maintenance.

2. WARNING CLASSIFICATION (PRIORITY B)

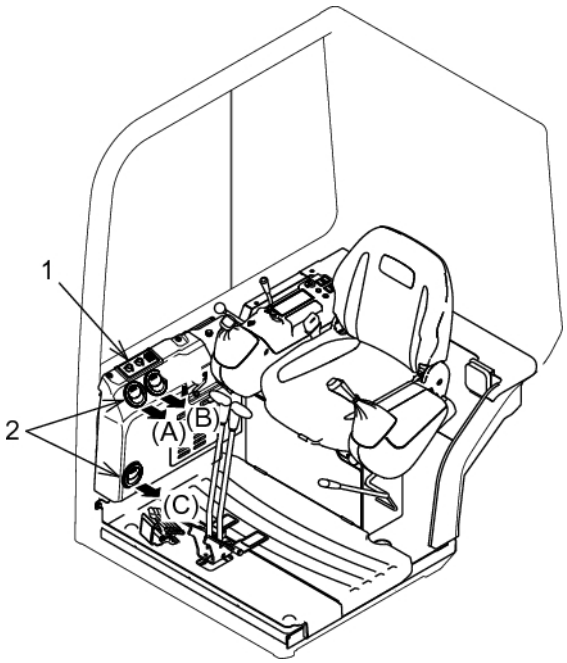
Displays	Level	Warning Contents	Remedy
LOW ENGINE PRESSURE STOP ENGINE CHECK ENGINE OIL LEVEL	3	The engine oil pressure is at the specified value or less.	Immediately stop the engine and check the engine oil level. If the level is low, supply the specified engine oil or replace the old engine oil with the new specified engine oil by referring to "LUBRICANT, FUEL & COOLANT SPECIFICATIONS".
OVER HEAT DO NOT WORK UNTIL ENGINE GETS COLD, WITHOUT STOPPING	3	The temperature of engine coolant is at the specified value or more.	Stop the operation and set the engine speed to low idling to lower the coolant temperature and cool down the engine. After few minutes, if the warning is still displayed, stop the engine and check the coolant level, tension of the fan belt, and clogging of the radiator.
FUEL LEVEL INDICATION IS NOT CORRECT PAY ATTENTION TO FUEL LEVEL	3	Disorder of the sensor, etc. occurs. The indications are the failure content and the error code.	Contact our dealer/distributor for inspection and maintenance.
CHARGE ERROR TURN STARTER SWITCH OFF	4	Disorder of the battery occurs. (High voltage/ low voltage charge error) If the warning does not disappear after a while from the engine start, or if the warning appears while the engine is running, the battery is not charged properly.	Check the electric devices for working condition, and check the charging circuit.
LOW FUEL LEVEL SUPPLY FUEL	4	The fuel level is at the specified level or less.	Supply the specified fuel.
EXCHANGE ENGINE OIL	5	The remaining time for replacement of the engine oil reaches to 0.	Supply the specified new engine oil to the specified level.
EXCHANGE FUEL FILTER	5	The remaining time for replacement of the fuel filter reaches to 0.	Replace the fuel filter with the specified new fuel filter.
EXCHANGE HYD.OIL FILTER	5	The remaining time for replacement of the hydraulic oil filter reaches to 0.	Replace the hydraulic oil filter with the specified new hydraulic oil filter.
EXCHANGE HYD.OIL	5	The remaining time for replacement of the hydraulic oil reaches to 0.	Replace the hydraulic oil with the specified new hydraulic oil.
REMAINING TIME UNTIL ENGINE OIL REPLACEMENT IS SHORT	5	The remaining time for replacement of the engine oil is little.	Contact our dealer/distributor near you for inspection and maintenance.
REMAINING TIME UNTIL FUEL FILTER REPLACEMENT IS SHORT	5	The remaining time for replacement of the fuel filter is little.	Contact our dealer/distributor near you for inspection and maintenance.
REMAINING TIME UNTIL HYD. OIL FILTER REPLACEMENT IS SHORT	5	The remaining time for replacement of the hydraulic oil filter is little.	Contact our dealer/distributor near you for inspection and maintenance.
REMAINING TIME UNTIL HYD. OIL REPLACEMENT IS SHORT	5	The remaining time for replacement of the hydraulic oil is little.	Contact our dealer/distributor near you for inspection and maintenance.

8.2 AIR CONDITIONER

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

8.2.1 GRILLE (AIR OUTLET)

Select air stream in preferable direction by hand.
(A), (B), (C): Air outlet
1. Control panel
2. Grille

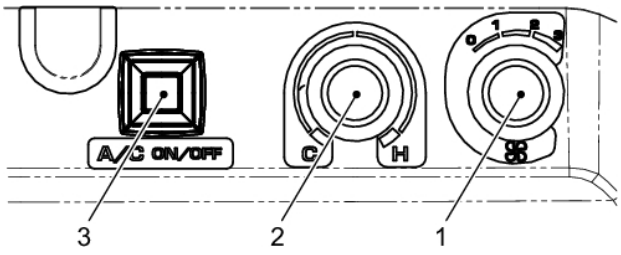


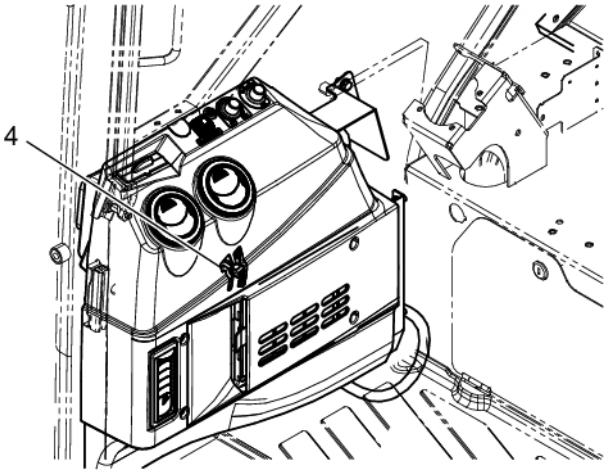
CAUTION **PRECAUTION IN USE OF AIR CONDITIONER**

Prevent water entering into the control panel because it might cause unexpected failure. And never bring fire near the air conditioner.

8.2.2 AIR CONDITIONER CONTROL PANEL

1. Fan Speed Selector Switch
2. Temperature Adjustment Switch
3. Air Conditioner Switch
4. Recirculation and Fresh Air Selector Lever





FAN SPEED SELECTOR SWITCH

Switches the fan speed of the air conditioner.

0: Stop

1: Low

2: Medium

3: High

TEMPERATURE ADJUSTMENT SWITCH

Controls the temperature for cooling and heating.

The set temperature is adjusted by turning the knob.

The temperature goes down by turning the knob left and goes up by turning the knob right.

AIR CONDITIONER SWITCH

Operates the air conditioner (compressor) when the fan speed selector switch is set to 1, 2 or 3.

The green lamp of this switch is lit when the air conditioner is running.

RECIRCULATION AND FRESH AIR SELECTOR LEVER

Switches between air recirculation and fresh air.

: Recirculation Air

: Fresh Air

8.2.3 HOW TO USE AIR CONDITIONER

1. Turn on the fan speed selector switch, and select 1, 2 or 3.
2. Turn on the air conditioner switch to operate the air conditioner.
   The dehumidification heating is enabled when the temperature setting switch is set to the heating.
3. Turn the temperature setting switch to select the desired temperature.

8.2.4 PRECAUTION IN USE OF AIR CONDITIONER

- The air conditioner should be turned on after the engine is started, avoiding an excessive load on the engine or compressor.
- Use the air recirculation if there is dust or stench in the environment around the machine.
- To avoid freezing of the evaporator, do not operate the air conditioner for a long time with the lowest temperature setting.
- If it freezes and cooled air does not come out, stop the air conditioner. Set the temperature higher, and operate it for a while in the airflow "3".
- Open the doors or windows to replace hot air in the cab with fresh air before using the air conditioner if the temperature is high.
- The engine coolant is used for heating, and it is possible to heat the air when the temperature of the coolant is high.
- For your health, do not overcool the cab and catch cool air directly on the skin for a long time. Sometimes ventilate the cab.

8.2.5 PRECAUTION IN INSPECTION AND MAINTENANCE OF AIR CONDITIONER

- Have an inspection and maintenance of the air conditioner to achieve the best performance of it and use it in good condition.
- Dedicated tools and instruments are needed for refilling the refrigerant gas and other maintenance. Contact KOBELCO authorized dealer/distributor.
- Operate the air conditioner for a few minutes about two or three times a month even in the off-season not to run out of oil in the compressor.
- Check the refrigerant gas for leakage. If the leakage is left as it is for a long time, rust will occur inside, which causes a failure.
- Keep electrical components of the air conditioner parts away from water when cleaning in the cab. If water gets through, rust will occur inside, which causes a failure.

8.2.6 INSPECTION & MAINTENANCE CHART

Have a regular inspection and maintenance of the air conditioner so that it can be used in better condition for a longer time.

Item/Interval		Start-up Inspection	Every 1 month or 100 hr	Every 6 months or 500 hr	Replacement period
Cooling medium volume	Inspection			O	
Air conditioning compressor belt	Inspection, adjustment	O			2 years
Condenser	Inspection, cleaning	O	O		

Filter	Inspection, cleaning	O			
	Replacement				2 years
Piping	Inspection			O	
Receiver dryer	Replacement				2 years

8.2.7 INSPECTION AND ADJUSTMENT OF AIR CONDITIONING COMPRESSOR BELT

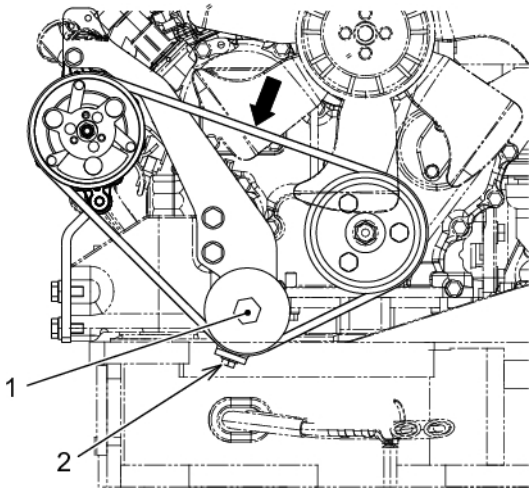
WARNING

Be sure to stop the engine before inspection and maintenance. Inspecting and maintaining the running engine may cause injury by being caught in the cooling fan or fan belts.

CAUTION

Replace the belt with a new one if flaking or breakage is found on the belt by the inspection. Keep the belt away from oils. The service life may be shortened if it slips on oil.

1. Move the pilot control shut-off lever to the "LOCKED" position, and then stop the engine.
2. Use the starter key to open the bonnet and hold it with the stay.
3. If the belt deflection is 4.7 mm when applying a force of 19 N·m to the center between pulleys, it is normal.
4. Loosen nut (1) of the idle pulley slightly and turn adjusting bolt (2) to adjust the belt tension.
5. Tighten nut (1).
   Tightening torque: 23±2.3 N·m
6. After adjustment, run the engine at low idle for about 5 minutes before checking the belt tension again.



8.2.8 CLEANING AND REPLACEMENT OF AIR CONDITIONER FILTERS

WARNING

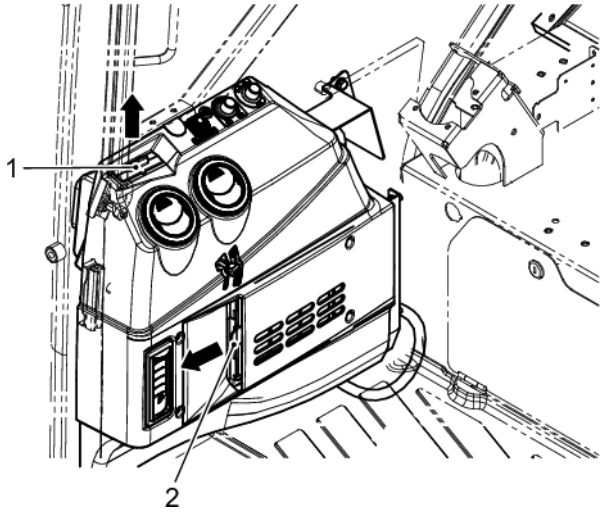
Compressed air may cause flying debris and it may cause accident resulting in injury or death. Wear protective glasses, respirator, and other protective gears when cleaning the filters of air conditioner.

IMPORTANT

The maintenance time shows the reference value. Clean them earlier than the specified time in case the machine is being used in dusty area.

REMOVING FRESH AIR FILTER

- Hold the handle grip of fresh air filter (1) at the right side in the cab and pull it out straight up.



REMOVING RECIRCULATION AIR FILTER

- Hold the handle grip of recirculation air filter (2) at the right side in the cab and pull it out straight sideways.

CLEANING

Clean the recirculation and fresh air filters by air blowing.

ATTACHING

Attach the cleaned or replaced recirculation/fresh air filters in the reverse procedures.

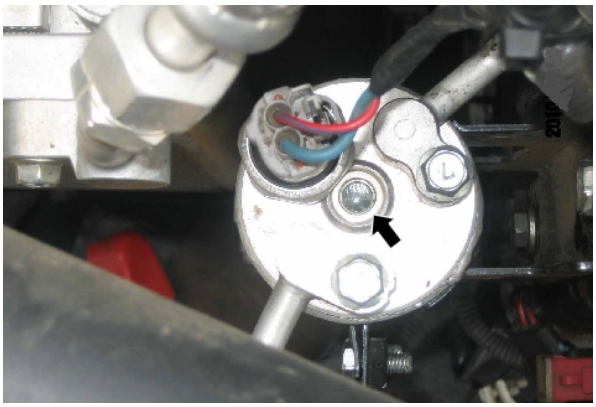
8.2.9 CHECKING THE AIR CONDITIONER REFRIGERANT

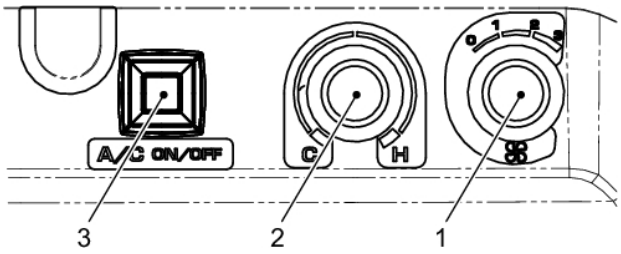
WARNING

•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.
•Inhalation of the refrigerant may result in fatal injury. Do not bring a fire near the area where refrigerant gas is produced.

IMPORTANT

When filling or changing refrigerant, confirm the type of refrigerant and use the specified refrigerant. (Refrigerant type and quantity: R-134a/590 g±50 g)
The use of unspecified refrigerant may cause damage of components.





HOW TO CHECK

1. Start the engine, and set the engine throttle lever to the middle speed position.
2. See the right table for reference.
   (1) Temperature Adjustment Switch: C (Lowest)
   Door: Closed
   Window: Closed
   (2) Fan Speed Selector Switch: 3 (High)
   (3) Air Conditioner Switch: ON
3. Determine the refrigerant volume based on the following checks by looking through the sight glass (inspection window) on the receiver dryer.
   (Figure (A): The refrigerant volume is proper.
   (Figure (B): The refrigerant is over charged. This will make both high and low pressure rise and have an adverse effect on the pressure switch operation and the air conditioning system.
   (Figure (C): The refrigerant is insufficient. Contact KOBELCO authorized

Refrigerant volume	Description
(A) Proper ○	After the air conditioner is turned ON, little bubbles appear. The refrigerant becomes transparent, then turns a light milky white.
(B) Overcharged ×	After the air conditioner is turned ON, no bubbles appear.
(C) Insufficient ×	After the air conditioner is turned ON, bubbles appear continuously.

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.

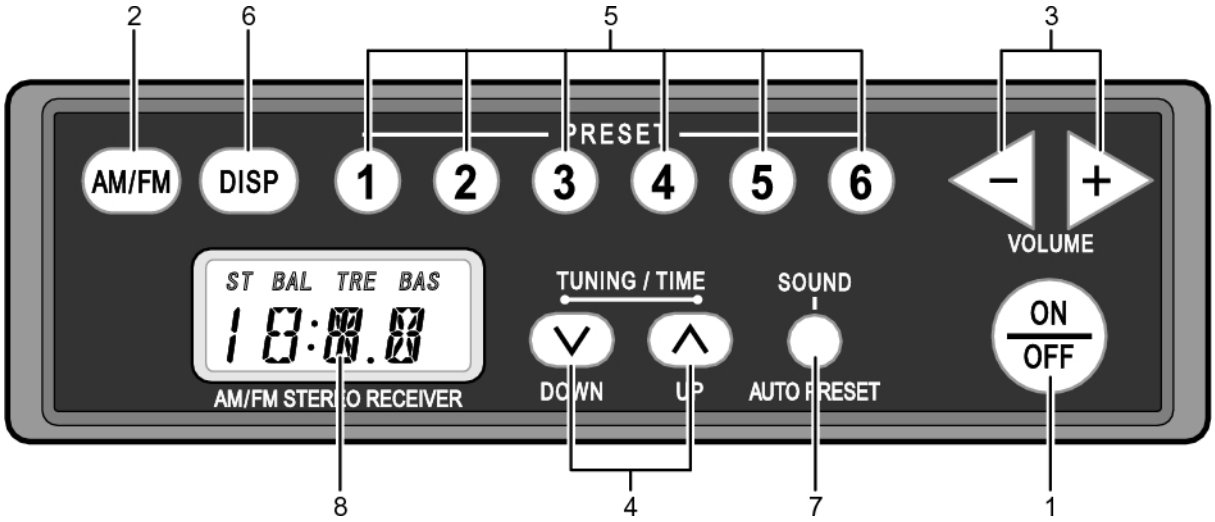
dealer/distributor for recharge of the refrigerant.

DANGER

•Operate the air conditioner at least once a week for several minutes to rotate the compressor regardless of the season.
•If an oil stain is found around a pipe joint, it is a sign of gas leakage. Contact KOBELCO authorized dealer/distributor for inspection.
•Follow the following regulations to conserve global environment.
1. Do not release the refrigerant which is sealed in this unit to the atmosphere.
2. Extract the sealed refrigerant from unit when disposing this unit.

8.3 HANDLING OF RADIO

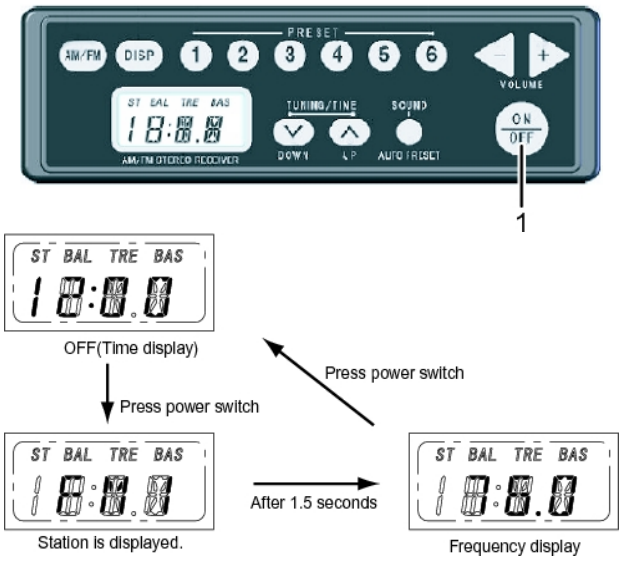
8.3.1 COMPONENTS OF RADIO



Item	Name	Item	Name
1	Power switch	5	Preset key
2	"AM/FM" switch key	6	DISP (Display Change) key
3	Volume control	7	Sound control key
4	UP/DOWN keys	8	Display (Time/Frequency)

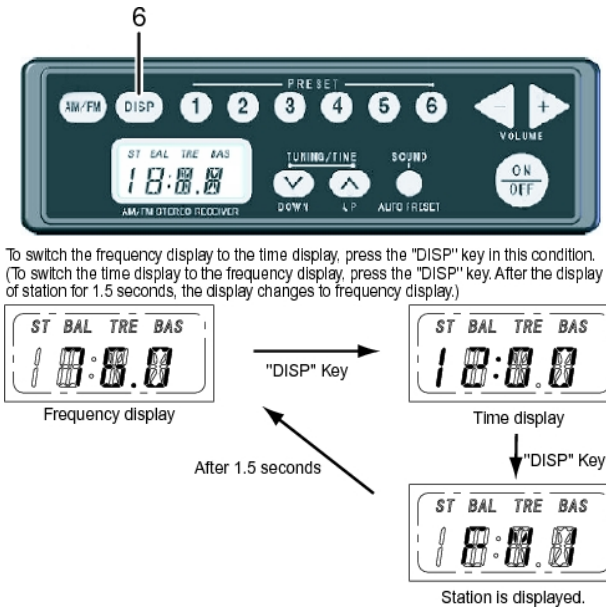
8.3.2 POWER CONTROL

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



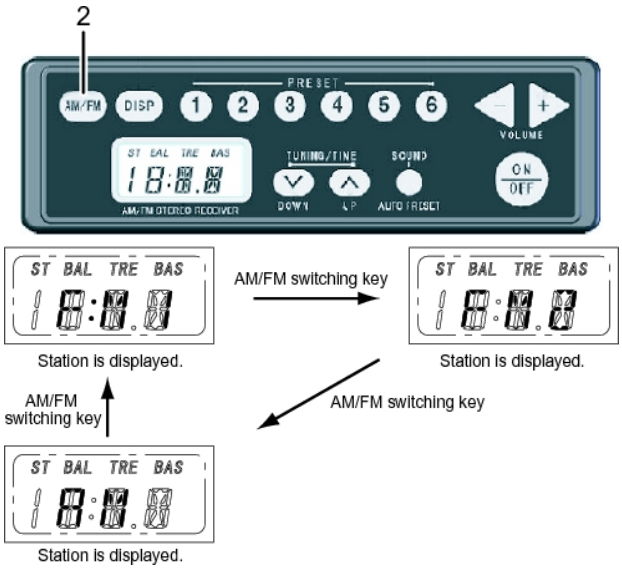
8.3.3 DISPLAY SWITCHING

1. To change between the frequency and time displays, press the "DISP" key (6). When the display is changed from the time to the frequency, first the band then the frequency are displayed.



8.3.4 BAND SWITCHING

Press "AM/FM" switch key (2) to cycle through the bands, FM1, FM2 and AM.
When the band is switched, the previous station on the new band is selected.

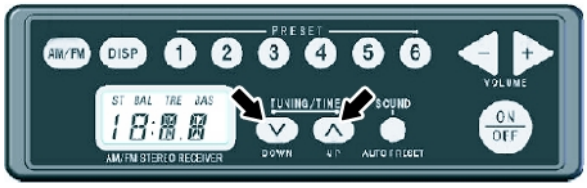


8.3.5 HOW TO SELECT STATION

With this radio, the station can selected by the following three methods.
•Manual tuning
•Auto tuning
•Preset memory
Each selection method is explained below.

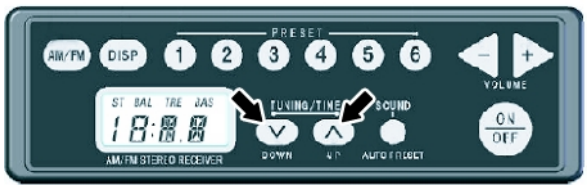
Manual tuning

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



Auto tuning

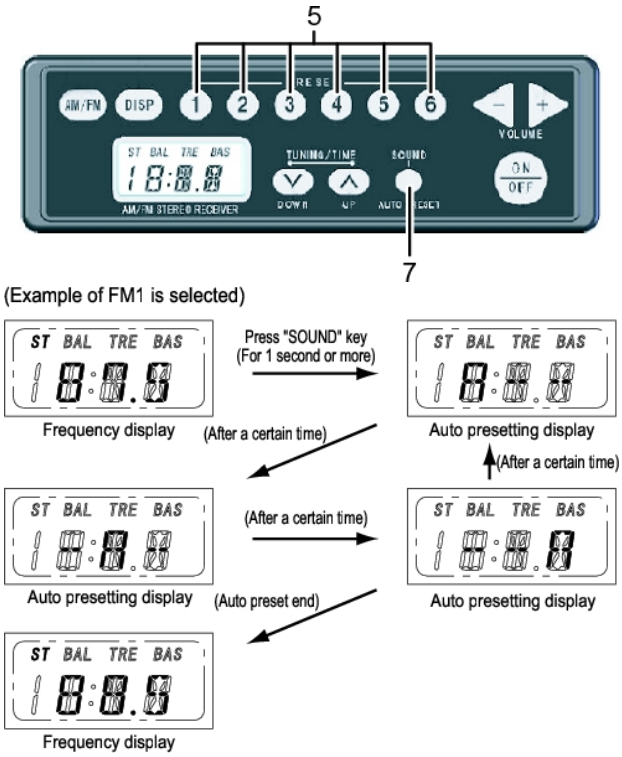
1. When pressing the "UP" or "DOWN" key (Press more than 1 second), the frequency increases or decreases by one step.
2. When the radio waves are received during auto tuning, or when pressing the "UP" or "DOWN" key, the auto tuning is interrupted, but the frequency is keeping as it is.



Preset memory: Auto Preset

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

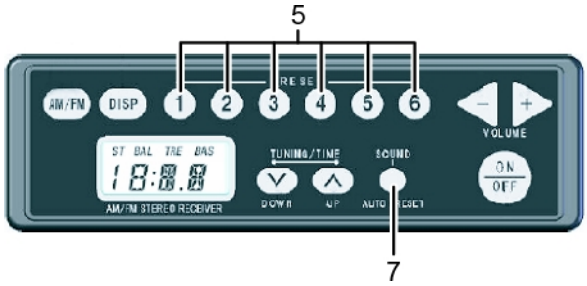
1. Press and hold the tone control key (7). The desired band starts the presetting.
2. During auto presetting, the display "A" moves from left to right.
3. After auto presetting, this function receives the memorized station on "PRESET" 1.

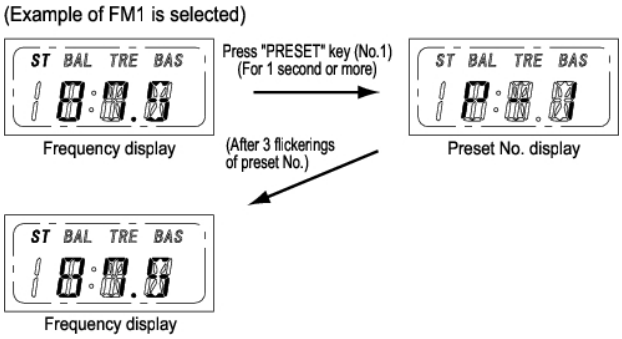


Preset memory: Manual preset

When you press and hold one of the six "PRESET" keys (5), the currently received station is memorized in the "PRESET" No. of the pressed key.

1. Press and hold one of the six "PRESET" keys (5).
2. After the memorized "PRESET" No. blinks three times, the frequency is displayed.

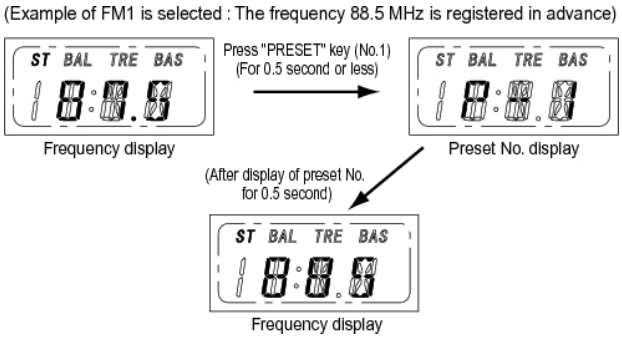




Preset memory: Calling

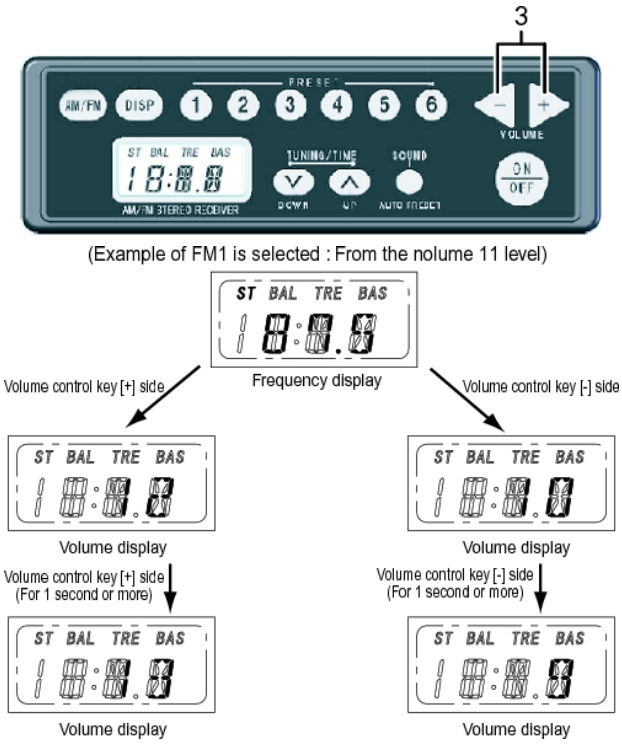
Press one of the six "PRESET" keys (5) to call and tuned to the station memorized on that "PRESET" No.

1. Press one of the six "PRESET" keys (5).
2. After the pressed "PRESET" No. is displayed, the display is changed to the frequency memorized on that "PRESET" No.
3. The tuner receives the switched frequency.



8.3.6 VOLUME CONTROL

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



8.3.7 SOUND CONTROL

The "Balance" and "Tone" are adjustable with these keys.

•Balance adjustment: "BAL"

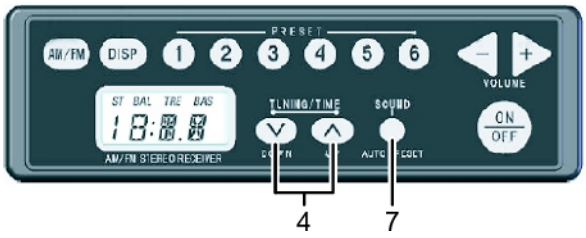
To control the volume of right and left speakers.

•Treble adjustment: "TRE"

To control the treble.

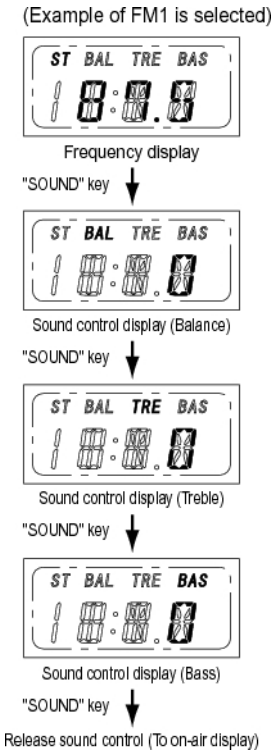
•Bass adjustment: "BAS"

To control the bass.



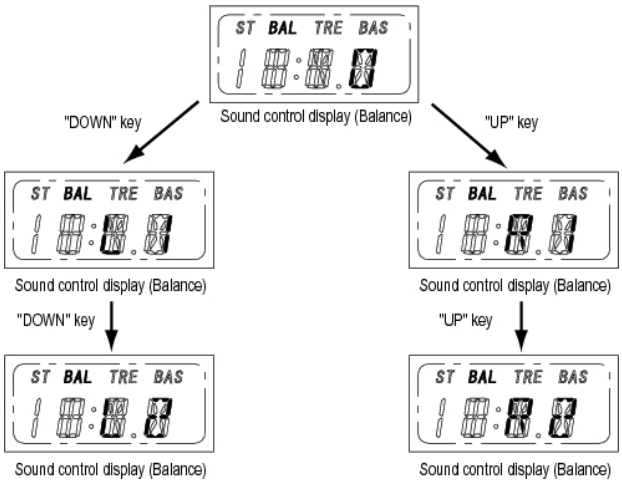
SELECTION OF ADJUSTMENT ITEM

By pressing sound control key (7), the display becomes the sound adjustment status and every time pressing sound control key (7), the item cycles through "BAL", "TRE" and "BAS" in order. Select the item to be adjusted.
When finishing the sound adjustment, select "BAS" and press sound control key (7).



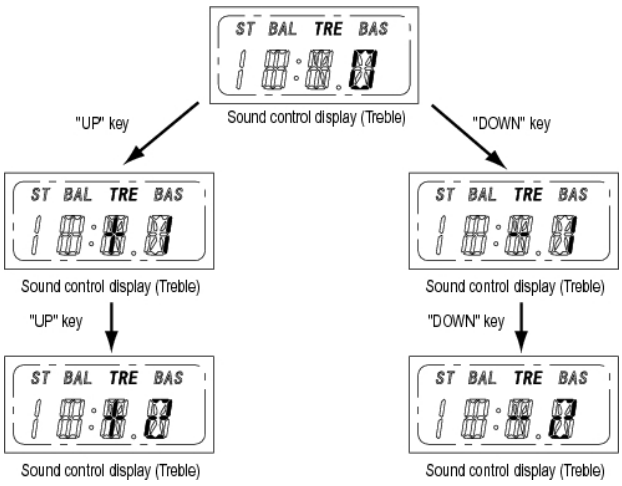
BALANCE ADJUSTMENT: "BAL"

To turn the volume up on the right speaker, press the "UP" (4) key while "BAL" is displayed.
To turn the volume up on the left speaker, press the "DOWN" key (4).



TREBLE CONTROL

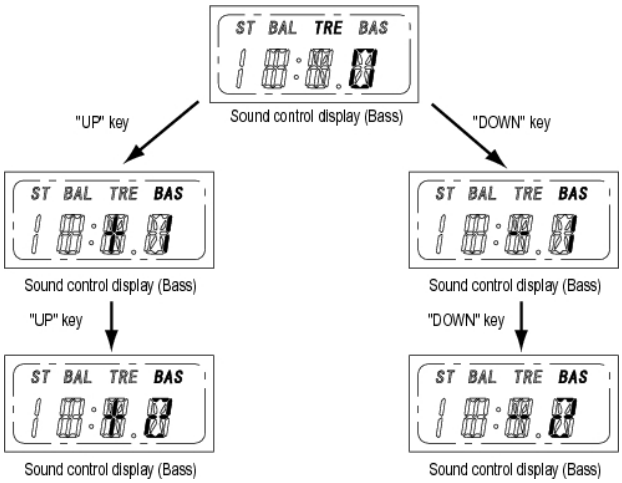
To emphasize the treble, press the "UP" key (4) while "TRE" is displayed.
To weaken the treble, press the "DOWN" key (4) while "TRE" is displayed.



BASS CONTROL

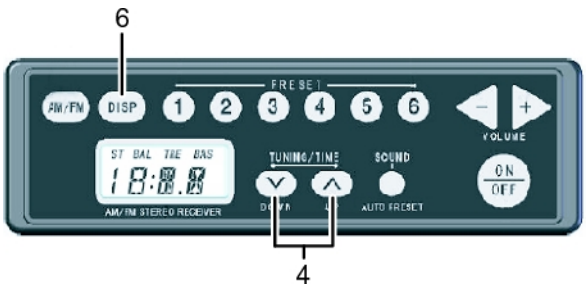
To emphasize the bass, press the "UP" key (4) while "BAS" is displayed.

To weaken the bass, press the "DOWN" key (4) while "BAS" is displayed.



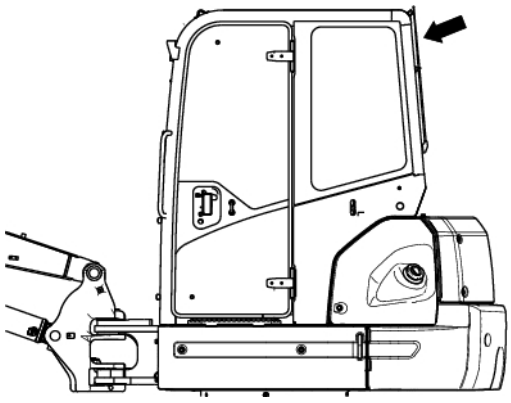
8.3.8 CLOCK ADJUSTMENT

1. Press and hold the "DISP" key (6) while the time is displaying. The "Hour" display blinks.
2. To increase "Hour", press the "UP" key (4). To decrease "Hour", press the "DOWN" key(4).
3. Press the "DISP" key (6) again, and the "Minute" display blinks.
4. To increase "Minute", press the "UP" key (4).
   To decrease "Minute", press the "DOWN" key (4).
5. Press the "DISP" key (6) again to complete the time setting.



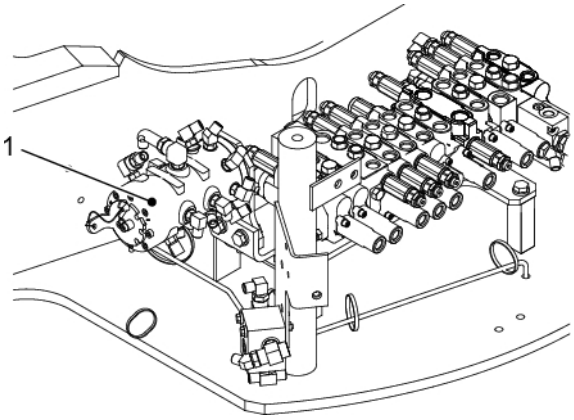
8.3.9 ANTENNA

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



8.4 ROTARY MULTI-CONTROL VALVE

The control pattern can easily be switched between four types (ISO, K, H and M) by the lever of the rotary multi-control valve.



WARNING **HANDLING OF ROTARY MULTI-CONTROL VALVE**

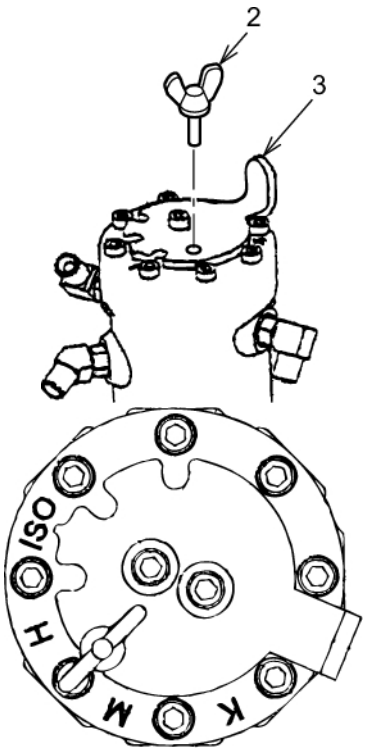
•Before operation, be sure to pay attention to the surroundings and operate each lever to ensure that the machine movement is in accordance with the control pattern indicated on the control pattern labels.
•If you operate the machine while the control pattern labels do not match the actual machine movement, it may cause severe accident resulting in severe injury.
•When the labels do not match the actual machine movement, replace them with proper ones.

CAUTION

Before switching the rotary multi-control valve, lower the bucket to the ground, place the pilot control shut-off lever in the "LOCKED" position, and stop the engine.

8.4.1 HOW TO SWITCH CONTROL PATTERNS

1. Place the machine in the parking position, stop the engine, and move the pilot control shut-off lever to the "LOCKED" position.
2. Open the cover at the front of the machine to access rotary multi-control valve (1).
3. Remove wing bolt (2), and switch lever (3) to the position of the desired control lever pattern.
4. Tighten wing bolt (2) to fix lever (3) after setting the control pattern. Firmly tighten wing bolt (2) by your fingers without tools.
5. Close the cover at the front of the machine.
6. Operate the attachment to make sure that the desired control lever pattern is used.

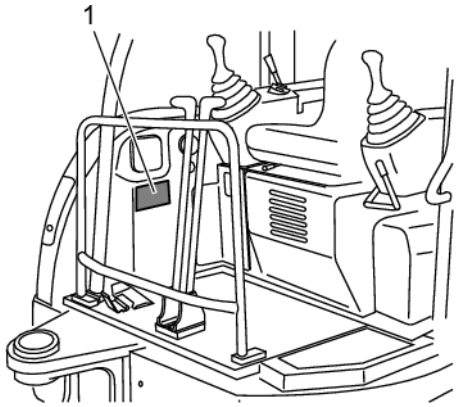


8.4.2 AFFIXING CONTROL LEVER PATTERN LABEL

Affix a control pattern label (1) on the following position.

•Canopy specification: Guard divider to the right of the operator's seat

•Cab specification: Inside the cab door

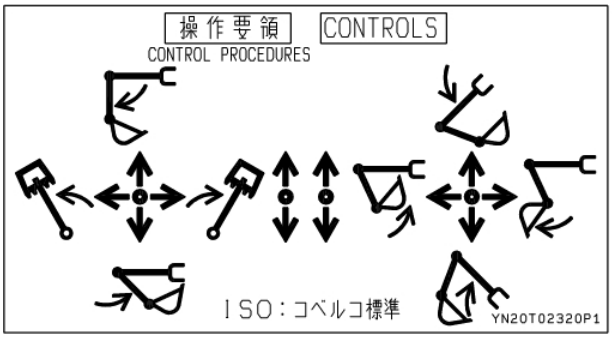


IMPORTANT

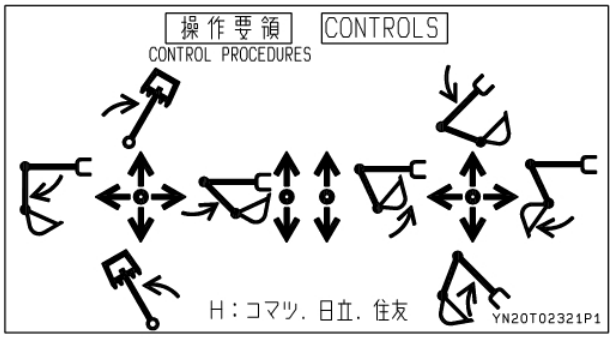
The control pattern labels are magnetic.

They are needed when changing the control pattern. Keep them in a safe place.

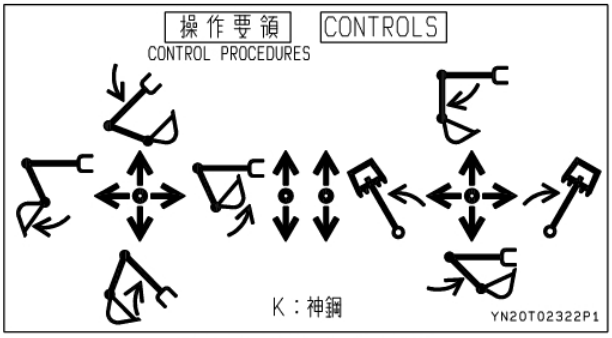
CONTROL PATTERN LABEL



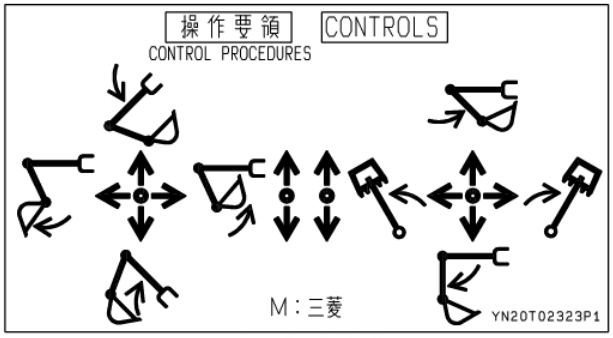
ISO PATTERNS



H PATTERNS



KOBELCO PATTERNS



M PATTERNS

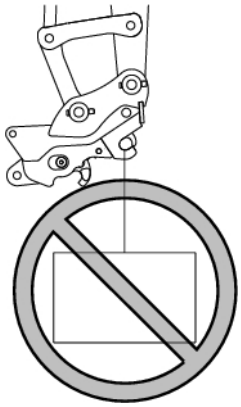
8.5 QUICK HITCH

The following precautions and descriptions about handling the quick hitch body is intended for the machines with KOBELCO standard quick hitch installed.

8.5.1 PROHIBITED WORKS

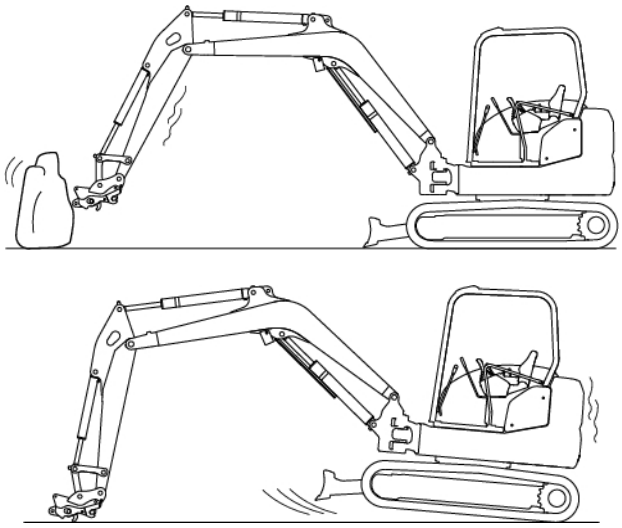
LIFTING WORK

Never perform any lifting work using quick hitch. The lifted load may come off and cause severe accidents.



WORK WITHOUT FRONT ATTACHMENT

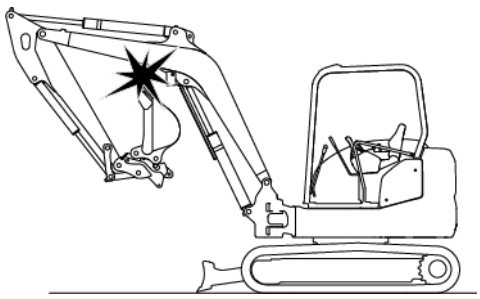
Do not move heavy loads or lift up the machine without a front attachment installed. The quick hitch may have excessive load imposed and be damaged.



8.5.2 PRECAUTIONS

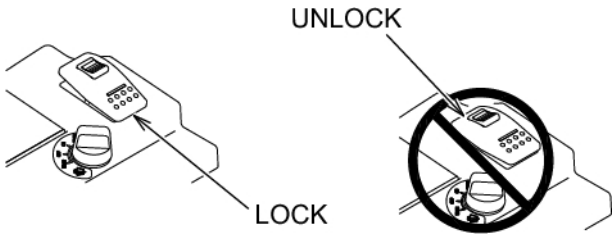
INTERFERENCE BY THE FRONT ATTACHMENT

When the quick hitch is installed, the operating range is different from when a usual front attachment is installed. Check for interference before operation.



HANDLING THE QUICK HITCH OPERATION SWITCH

When the front attachment is installed, make sure that the operation switch is in the "LOCK" side before starting the engine.

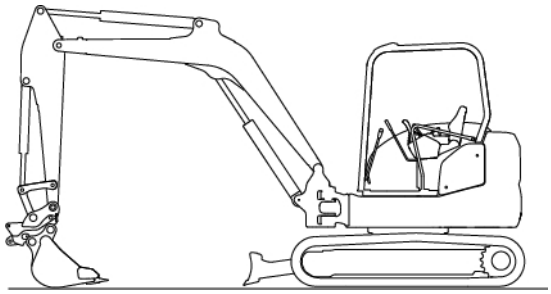


8.5.3 REMOVING FRONT ATTACHMENT

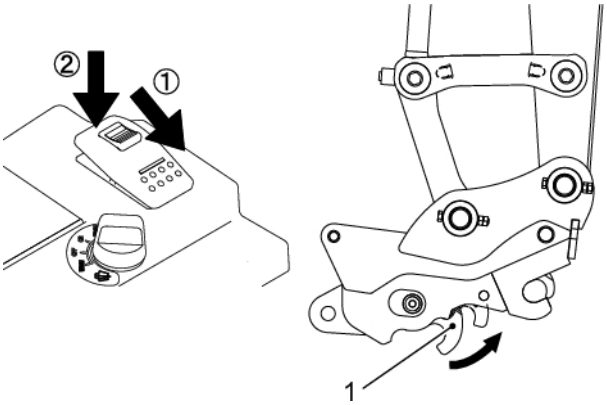
WARNING

Work on a stable and level ground to prevent the removed front attachment from tipping/rolling over. Be sure to lower the front attachment to the ground before operating the quick hitch.

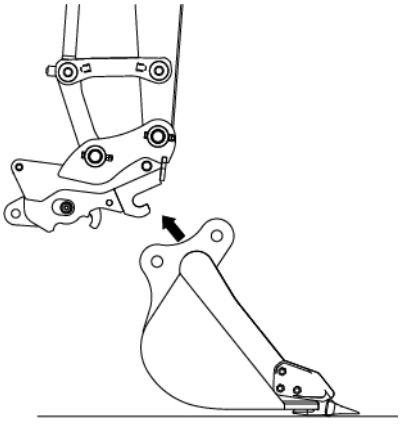
1. Move the machine to a level ground and lower the front attachment to the ground.



2. Set the quick hitch operation switch to the "UNLOCK" side.
   The quick hitch operation switch is equipped with the sliding mechanism for preventing an erroneous switch operation (See 2.4.8 "QUICK HITCH OPERATION SWITCH").
   Movable hook (1) is actuated to release the front attachment. The alarm sound starts as soon as the switch is switched to the "UNLOCK" side.
   The alarm sound will not stop until the quick hitch operation switch is at the "UNLOCK" side.



3. Remove the front attachment.

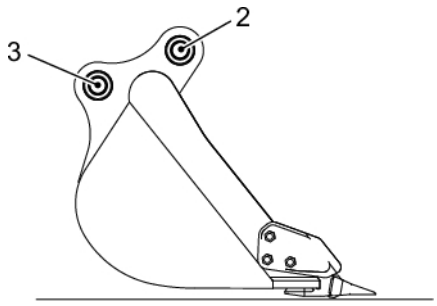


8.5.4 INSTALLING FRONT ATTACHMENT

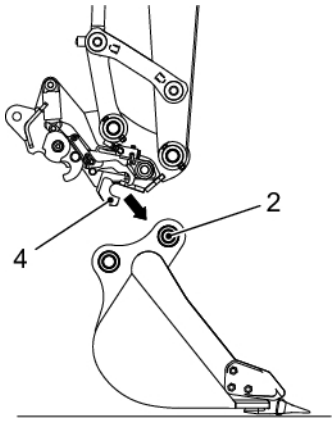
WARNING

Work on a stable and level ground to prevent the removed front attachment from tipping/rolling over. After installing the front attachment, make sure that the quick hitch is definitely holding it.

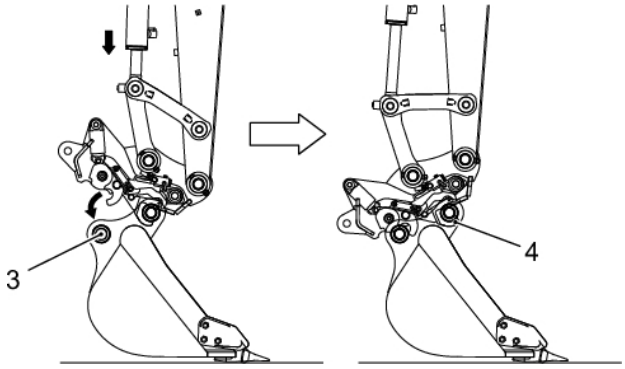
1. Place the front attachment on a level ground.
   Attach pins (2) and (3) to the front attachment.



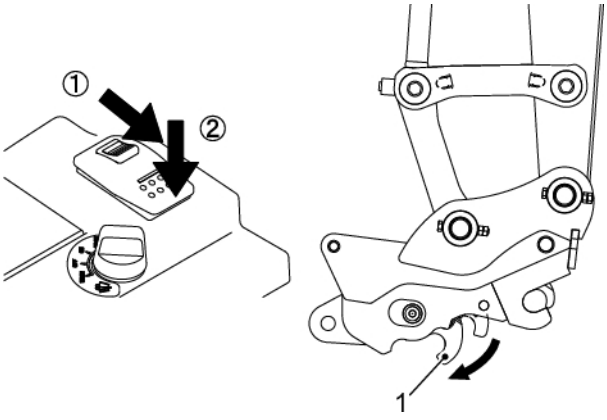
2. Operate the machine to lower the quick hitch and catch pin (2) by fixed hook (4).



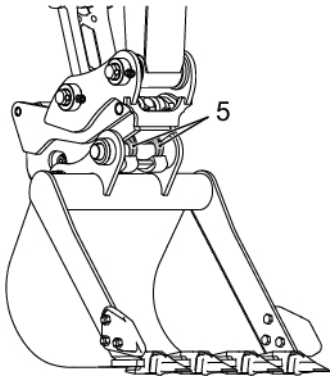
3. Extend the bucket cylinder so that the quick hitch comes in contact with pin (3). Make sure that fixed hook (4) securely clamps pin (2).



4. Set the quick hitch operation switch to the "LOCK" position.
   The quick hitch operation switch is equipped with the sliding mechanism for preventing an erroneous switch operation (See 2.4.8 "QUICK HITCH OPERATION SWITCH").
   Movable hook (1) is actuated to fix the front attachment. The alarm sound stops as soon as the switch is switched to the "LOCK" side.



5. Make sure that fixed hook (4) and lock plate (5) are firmly fixed to front attachment pin (2).



9. TROUBLESHOOTING

9.1 GENERAL TROUBLESHOOTING

This troubleshooting information covers the components and systems as described in this MANUAL. Should in depth troubleshooting, repair or replacement of components or adjustment of valves be required, contact an authorized dealer/distributor for assistance.

SYS	TROUBLE DESCRIPTION	PROBABLE CAUSE	POSSIBLE REMEDY
OPERATING	1. All operating speeds are slow or power is lost.	a. Low hydraulic oil level	Fill oil to specified level
		b. Air leaking into the suction pipe	Tighten suction pipe hose clamp or replace hose
		c. Hydraulic pump is damaged	Repair or replace
		d. Pilot gear pump is damaged	Repair or replace
		e. Main relief valve is not adjusted correctly	Adjust or replace
		f. Pilot relief valve is not adjusted correctly	Adjust or replace
	2. A specific cylinder functions improperly or loses power.	a. Cylinder seal is damaged	Repair or replace
		b. Control valve or overload relief valve functions incorrectly or there are signs of air in the cylinder	Repair or replace/Remove air from cylinder
		c. Pilot valve is damaged	Repair or replace
		d. Pilot valve piping is loose	Retighten
	3. The cylinder position will not hold with operating lever in neutral.	a. Cylinder seal is scored	Repair or replace
		b. Control valve or overload relief valve is damaged	Repair or replace
		c. Pilot valve is damaged	Repair or replace
	4. Machine does not slew.	a. Hydraulic motor (slewing) is not working or slewing gear is damaged	Repair or replace
		b. Slewing bearing is damaged	Repair or replace
		c. Pilot valve is not working	Repair or replace
		d. Slewing reduction unit is damaged	Repair or replace
		e. Solenoid valve is not working	Repair or replace
		f. Control valve is not working	Repair or replace
		g. Lever lock Solenoid valve is not working	Repair or replace
	5. Slewing speed is slow.	a. Control valve is not working	Repair or replace
		b. Hydraulic motor (slewing) is not working	Repair or replace
		c. Hydraulic pump is not working	Repair or replace
		d. Pilot valve is not working	Repair or replace
	6. Abnormal sound occurs when slewing.	a. Insufficient lubrication of slewing gear and bearings	Grease
		b. Pilot valve is not working	Repair or replace
		c. Control valve is not working	Repair or replace
TRAVEL	1. Machine does not travel smoothly.	a. Too much crawler tension	Adjust crawler tension
		b. Dirty or clogged crawler belts/shoes	Clean crawlers
		c. Brake valve is not working	Repair or replace
		d. Travel reduction unit is damaged	Repair or replace
		e. Control valve is not working	Repair or replace
		f. Travel motor damaged	Repair or replace
		g. Main relief valve pressure is set incorrectly	Adjust or replace
		h. Swivel joint is damaged	Repair or replace

SYS	TROUBLE DESCRIPTION	PROBABLE CAUSE	POSSIBLE REMEDY
TRAVEL	2. Traveling power is insufficient.	a. Hydraulic pump is damaged	Repair or replace
		b. Poor engine performance	Repair or replace
		c. Main relief valve pressure is set incorrectly	Adjust or replace
		d. Low hydraulic oil level	Fill to proper level
		e. Hydraulic motor (travel) is not working	Repair or replace
		f. Brake valve is not working	Repair or replace
		g. Seal in swivel joint is scored or oil is leaking	Repair or replace
	3. Machine does not travel in a straight line.	a. Unequal tensions on crawlers	Adjust tension.
		b. Set pressures of main relief valves unbalanced	Adjust.
		c. Performances of hydraulic travel motor has deteriorated	Repair or replace.
		d. Unbalanced flow from control valve	Repair or replace.
		e. Unbalanced discharge from hydraulic pump	Repair or replace.
		f. Unbalanced flow from brake valve	Repair or replace.
		g. Unbalanced flow between RH swivel joints	Repair or replace.
HYDRAULIC	1. Temperature rise in the hydraulic oil temp.	a. Oil cooler core clogged	Clean
		b. Engine fan belt slipping	Adjust or replace
		c. Low hydraulic oil level	Refill to specified level
		d. Wrong type hydraulic oil used	Replace with correct, new oil
		e. Hydraulic pump is not working	Repair or replace
GAUGE CLUSTER DISPLAY	1. Engine oil pressure is too low.	a. Engine oil level low	Fill to specified level
		b. Oil leaking	Repair & fill to proper level
		c. Wrong oil viscosity	Replace with proper oil
	2. Abnormal rise in the coolant temperature.	a. Low coolant	Fill to proper level
		b. Coolant leaking	Repair & fill to proper level
		c. Loose radiator cap	Tighten
		d. Radiator core clogged	Clean cooling system
		e. V-belt loose or damaged	Tighten to proper tension
		f. Rust or scale in coolant	Flush system/fill to level
		g. Faulty thermostat	Replace
	3. Battery charge.	a. Battery terminals disconnected, loose, or corroded	Clean and connect
		b. Low battery fluid	Replenish
		c. Slipping of V-belt or damaged	Adjust or replace
		d. Battery service life has run down	Replace
ENGINE	1. Starter does not turn or turns slowly which does not start the engine.	a. Battery disconnected	Connect
		b. Battery discharged	Charge
		c. Battery terminals disconnected, loose, or corroded	Clean and connect
		d. Ground cable disconnected	Connect
		e. Engine oil viscosity too thick (Cold Weather)	Change to proper oil
	2. Starter turns but engine does not start.	a. Insufficient fuel	Refuel
		b. Improper starting procedure	Refer to "section 3. MACHINE OPERATION"
		c. Air in fuel line	Remove (Refer to 4.10)
		d. Clogged fuel filter	Replace element
		e. Clogged air cleaner	Replace elements
		f. Air heater circuit malfunctioning	Check circuit

SYS	TROUBLE DESCRIPTION	PROBABLE CAUSE	POSSIBLE REMEDY
ENGINE	3. Engine tends to stop at low speed	a. Low idling RPM	Serviceman
		b. Fuel filter clogged	Replace with new element
		c. Air cleaner clogged	Replace with new elements
		d. Improper engine valve clearance	Serviceman
	4. No power	a. Fuel filter clogged	Replace with new element
		b. Air cleaner clogged	Replace with new element
		c. Improper engine valve clearance	Serviceman
		d. Loose clamps on the air inlet hose	Tighten clamps
		e. Cracked air inlet hose	Replace with new hose
	5. Engine overheats.	a. Insufficient coolant	Refill coolant
		b. Clogged radiator	Clean cooling components
		c. V-belt to loose or damaged	Adjust or replace belt
		d. Faulty thermostat	Replace
	6. Engine exhaust is black.	a. Air cleaner clogged	Replace with new elements
		b. Improper engine valve clearance	Serviceman
	7. Poor fuel consumption	a. Fuel leak	Serviceman
		b. Air cleaner clogged	Replace with new elements
		c. Loose clamps on suction hose	Tighten clamps
		d. Cracked suction hose	Replace with new hose
		e. Engine oil level is too high	Reduce to specified level
	8. Excessive oil consumption.	a. Improper oil	Replace with correct oil
		b. Oil leak	Serviceman
		c. Improper oil replacement intervals	Change at correct interval
		d. Improper warming-up operation	Refer to 3.1.4
	9. Engine oil pressure does not rise.	a. Low oil volume	Fill to specified level
		b. Oil leak	Serviceman
		c. Improper oil viscosity	Replace with proper oil
	10 Battery dies often.	a. Battery terminals disconnected loose, or corroded	Clean & tighten terminals
		b. Low battery fluid	Fill cells with distilled water
		c. V-belt loose or damaged	Adjust or replace belt
		d. Defective battery	Replace battery

WARNING **AVOID INJURY OR DEATH**

Use only genuine KOBELCO parts.

10. SPECIAL PROCEDURES

10.1 GENERAL

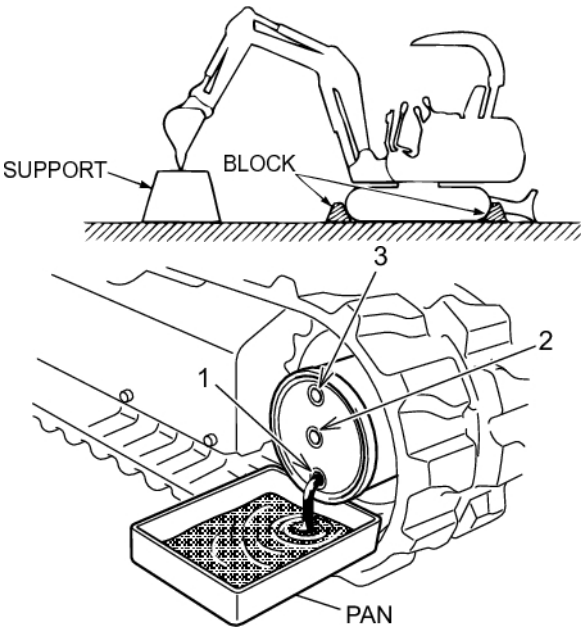
WARNING

•Read, and fully understand the safety precautions and procedures in this manual before performing any operation, inspection, maintenance or repair of this machine.
•Any procedure in this chapter should be performed by the service person who fully understand this machine and has needed skills.

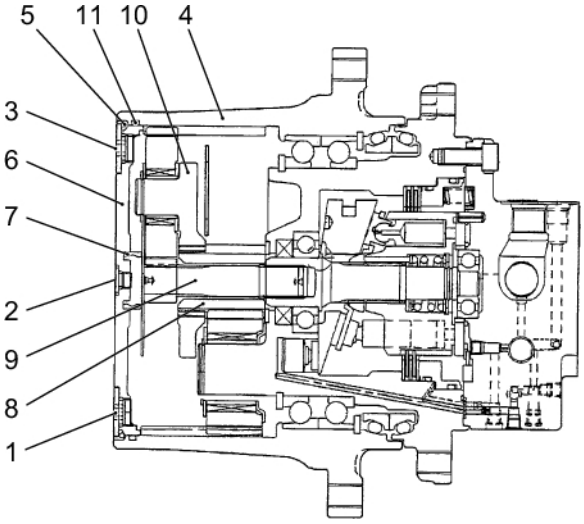
10.2 RELEASING TRAVEL MOTOR BRAKES

10.2.1 RELEASING PROCEDURES OF TRAVEL MOTOR BRAKES

1. Chock at front and rear of each crawler to prevent the machine from moving before releasing brakes.
2. See "LOWERING ATTACHMENT OF DISABLED MACHINE" in Chapter 10 to lower the attachment to the ground.
3. Turn the starter switch "OFF" to stop the engine.
4. Remove drain plug (1), level plug (2) and fill plug (3) to drain oil in a container.



5. Put a flat-head screwdriver into the cutout of body (4) to remove snap ring (5).
6. Remove cover (6) and slide ring (7).
7. Remove O-ring (11), carrier kit (10), S1 gear (8) and S2 gear (9).



CAUTION

•Be careful not to damage the lip of cover (6). It might cause oil leaks.
•Be careful not to damage removed parts during storage.

8. Install O-ring (11), cover (6) and snap ring (5) on body (4), and attach drain plug (1), level plug (2) and fill plug (3).
9. See "CHANGE OIL IN TRAVEL REDUCTION UNITS" in Chapter 4 to fill oil in the travel reduction units.
10. Move the machine to a safe place and repair it.
11. After completing repair, reinstall the removed parts in the reverse procedure.
    See Chapter 4 "CHANGE OIL IN TRAVEL REDUCTION UNITS" to fill oil in the travel reduction units.

10.3 OPERATION OF DISABLED MACHINE

10.3.1 LOWERING ATTACHMENT OF DISABLED MACHINE

WARNING

•The following procedure should be used only in case of machine failure. Always use extreme caution during operations. Keep other persons away from the bucket, attachment and boom.
•The bucket or attachment can move unexpectedly during operations due to weight of the bucket, attachment, arm or boom.
•Keep away from the space under the bucket or attachment when lowering the bucket or attachment.

CAUTION

In cases where the machine fails and the engine stops, lower the attachment by using the procedure described below.
The steps 1 to 6 should be completed in five minutes after the engine stops because the accumulator pressure gradually falls to disable the operation of lowering the attachment.

1. Move the pilot control shut-off lever to the "LOCKED" position.
2. Turn the starter switch to the "OFF" position.
3. Make sure all control levers are set to the "NEUTRAL" positions.
4. Turn the starter switch to the "ON" position.
5. Move the pilot control shut-off lever to the "UNLOCKED" position.
6. Use the left and right control levers to lower the attachment slowly until it touches the ground.
   STEP 1 : Bucket down
   STEP 2 : Arm down
   STEP 3 : Boom down
7. Contact KOBELCO authorized dealer/distributor for repair.