YANMAR

OPERATION AND
MAINTENANCE MANUAL

# CRAWLER CARRIER

## C50-R3C

Original manual

MU660ENMA00100
29/10/2014

**Read this manual** carefully to learn how to operate and service your machine correctly.
Failure to do so could result in personal injury or equipment damage

**This manual should be considered** a permanent part of your machine and should remain with the machine when you sell it.

**This machine is of metric** design, and consequently the measurements in this manual are also metric.
Use only metric hardware and tools as specified.

**Right-hand and left-hand** sides are determined by facing in the direction of forward travel.

**Warranty** is provided as a part of Yanmar's product support program for customers who operate and maintain their equipment as described in this manual. Should the equipment be abused, or modified to change its performance beyond the original factory specifications, the warranty will become void and field improvements under warranty may be denied. Setting fuel delivery above specifications or otherwise overpowering machines will result in such action.

*All information, illustrations and specifications in this manual are based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice.*

# REFERENCE INFORMATION

Write the correct information for your YANMAR Crawler Carrier in the spaces bellow.

Always use these numbers when referring to your YANMAR Crawler Carrier.

Model name : _____

Serial Number : _____

Engine Serial Number : _____

Your YANMAR Crawler Carrier Dealer : _____

Address : _____

Phone : _____

## California Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.

## California Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.
Wash hands after handling.

# 1. Introduction

This Operation and Maintenance Manual for the YANMAR C50R-3C Crawler Carrier is designed to provide you with important information and suggestions necessary for using the machine with safety and efficiency. Please be sure to read through the manual before using the machine, to make yourself familiar with the procedures and instructions for operating, inspecting and servicing. Keep in mind that failure to observe the precautions given in the manual or using any procedures not prescribed in the manual may cause a serious accident.

## ⚠ WARNING

**Improper use of the machine may lead to hazards which can result in death or serious injury. Personnel engaged in operating and maintaining the machine are required to familiarize themselves with the contents of the manual before setting about their job.**

- **Do not attempt to operate the machine before making yourself familiar with the contents of the manual.**
- **Personnel responsible for using the machine must keep the manual at hand and review it periodically.**
- **If the manual should be lost or damaged, promptly order a new copy from the dealer.**
- **When you transfer the machine to another user, always transfer the manual as well.**
- **We at YANMAR provide customers with products in compliance with all applicable your country's regulations and industrial standards. If you are using a YANMAR machine purchased abroad, the machine may lack some safety devices. Please consult your dealer to confirm whether or not that machine is in compliance with all applicable regulations and industrial standards in your country.**
- **Some machine specifications may differ from those which are described in this manual because of improvements in its design and performance. If you have any questions about the contents of the manual, don't hesitate to contact your dealer.**
- **Important safety instructions have been presented throughout this manual, and have been summarized in PART ONE : SAFETY. Be sure to review these pages and pay heed to those safety instructions before proceeding to operate the machine.**

# 2. Safety Information

- The following Signal Words have been used in this Manual and on the Safety Signs to indicate the seriousness of the hazards that could be encountered by failing to comply with the applicable Product Warnings, as follows:

| | |
|---|---|
| **⚠ DANGER** | Could result in death or catastrophic bodily injury. |
| **⚠ WARNING** | Could result in bodily injury. |
| **⚠ CAUTION** | Could result in property damage. |
| **IMPORTANT** | The signal Word “IMPORTANT” has been utilized in this Manual to denote those User Directions that must be followed to assure the safe operation and maintenance of the Crawler Carrier. |

- **WARNING** : Never attempt to operate or service this Carrier until you have first read and understood all of the applicable Product Warnings and User Directions that are set forth in this Manual and on the Safety Signs that are affixed to this Carrier.

  The failure to comply with all relevant Safety Instructions could result in bodily injury.

- **WARNING** : Never modify the design of this Carrier or its engine; never remove or disable any of the installed safety guards or devices; and never use any unauthorized attachments in the operation of this equipment.

  The implementation of any unauthorized design modifications or the use of unauthorized attachments could result in bodily injury.

  Furthermore, since those actions would expressly violate the terms of Yanmar's Product Warranty, the applicable Warranty would also be voided.

# 3. Product Overview

## 3-1. Intended use

The C50R-3C Crawler Carrier is intended mainly for the materials carrying operation on rough terrain.

**The machine should not be used for unintended tasks**

## 3-2. Break in period

The machine should not be subjected to severe stresses and loads during the initial break in period although it has been prepared well and stringently inspected before shipping. Otherwise the machine's performance may be affected and its service life shortened. Thus it is essential to break in the machine for the first approx. 100 service hours (reading of the hourmeter).

In breaking in the machine:

- You should warm up the engine by idling for 5 minutes before starting operations.
- You should not operate the machine under heavy loads or at high speed.
- You should not start and accelerate the engine too abruptly, or stop it too abruptly.
- You should not change travel direction too abruptly.

The safety instructions for operation and maintenance that are presented in this Manual are applicable to the intended task. Never misuse this machine by violating the applicable safety instructions or by attempting to perform unintended tasks, because of the danger of serious bodily injury.

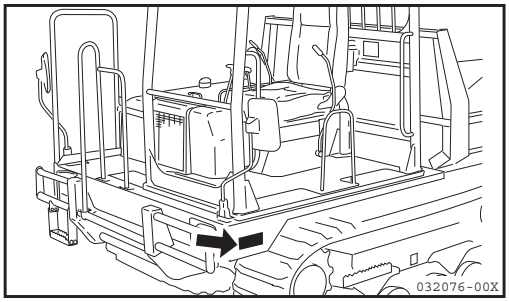
# 4. Operation License

Before you operate this machine, confirm the licensing requirements that are applicable to the operation of this machine.
Comply with all applicable laws.
Ask your dealer about licensing requirements.

# 5. Ordering Replacement Parts and Service Calls

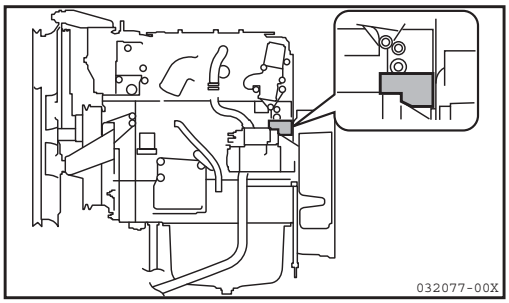
## 5-1. Location of machine serial number plate

Located on the right-hand side of the left direction indicator lamp.




## 5-2. Location of engine serial number plate

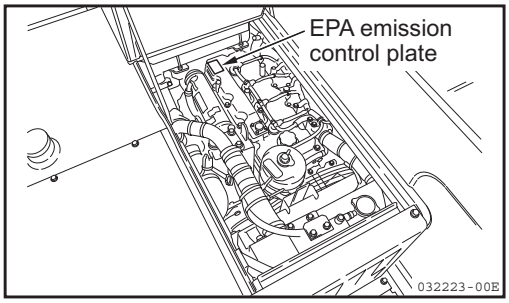
The engine serial number plate is located on the top of the cylinder head cover. Never remove the plate for any reason.




## 5-3. Location of EPA emission control plate
*Localisation de la plaque signalétique EPA*

The EPA emission control plate is located on the engine and engine hood as illustrated at the right.
Never remove the plate for any reason.

*La plaque signalétique est fixée sur le moteur (voir illustration à droite).*
*En aucun cas ne retirer cette plaque.*

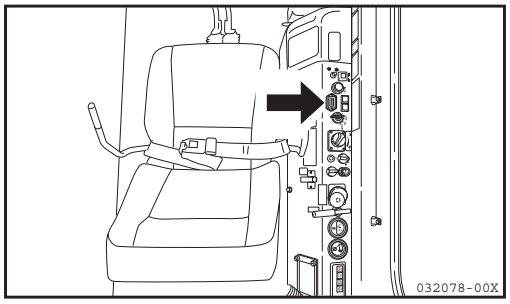


## 5-4. Ordering replacement parts and service calls

When ordering replacement parts or calling for service, let your dealer know the model designation, the machine serial number, and the engine serial number as well as the reading of the hourmeter.

- Machine serial number plate


- Hourmeter



# 6. Contents

**MAINTENANCE**



**SPECIFICATIONS AND DIMENSIONAL DIAGRAMS**



**OPTIONAL PARTS AND ATTACHMENTS**

**NOTES**

# SAFETY

**⚠ WARNING**

**Never attempt to operate or service this Carrier until you have first read and understood all of the applicable Safety Instructions that are set forth in this Manual.**

**The failure to comply with all relevant Safety Instructions could result in bodily injury.**

# 7. Basic Precautions

⚠ WARNING **These instructions should be strictly followed for the safety of you, others and your machine.**

## Follow safety rules at your workplace

- The operation and servicing of this machine is restricted to qualified persons.
- When operating or servicing the machine, follow all the safety rules, precautions and procedures.
- Any work performed by a team or with a signal person should be conducted in accordance with signals agreed on beforehand.

## Install safety devices

- Make sure that all guards and covers are installed in their correct position. If any of them are damaged, repair them immediately.
  **For their correct position, refer to Section "13-1-1. Walking check (visual inspection) around the machine".**
- The proper use of all safety devices, such as the lock levers, dump lock lever and wagon stopper, should be well understood by the machine operator.
- Never remove the safety devices. Always make sure that they operate properly.
  **For the lock levers, refer to Section "12-3. (1) Lock levers (for the travel operation)".**
  **For the dump lock lever, refer to Section "12-3. (2) Dump lock lever".**
  **For the wagon stopper, refer to Section "12-12. Wagon stopper".**
- Incorrect operation of the safety devices could cause serious bodily injury.

## Wear proper clothing and safety items

- Do not wear loose clothing or jewelry that can be caught on the control levers and other machine parts. Also avoid wearing working clothes stained with oil as they can ignite.
- Be sure to wear a helmet, safety goggles, safety shoes, a mask, gloves and other protective items, as appropriate.
  Take particular precautions when generating metal debris, when striking metal objects with a hammer or when cleaning components with compressed air.
  Also make sure there are no persons near the machine.


**For cleaning the fuel, oil and air filter elements, refer to Section "25-4. Nonperiodic services".**

## Alcohol

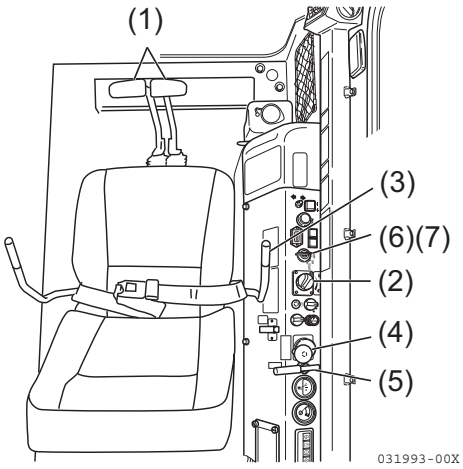
- Never operate the machine after consuming alcoholic beverages, or while you are under the influence of alcohol or if you feel ill or unwell, as that could result in accidental bodily injury to yourself or others.

## Avoid unauthorized modifications

- Modifications not recommended by YANMAR may cause safety hazards.
- When you wish to modify your machine, contact your dealer. The implementation of unauthorized modifications or the use of unauthorized attachments could result in bodily injury. Since those actions would also violate the terms of YANMAR's Warranty, it would be voided.

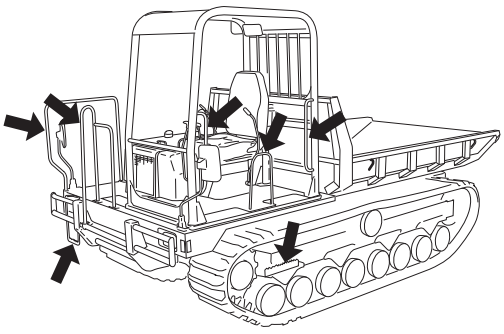
## Always lock up your machine when leaving the operator's seat

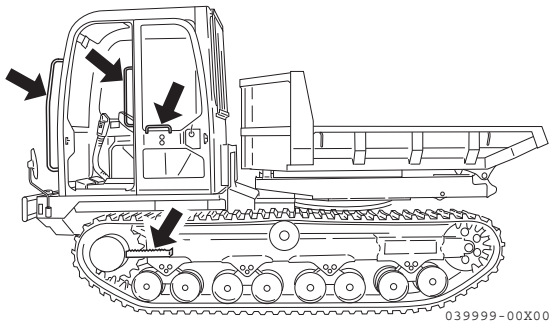
- When leaving the operator's seat, be sure to place the lock levers in the lock position, to prevent accidental machine movement which could result in bodily injury.
- When you leave the machine:
  (1) Place the travel levers in the neutral position.
  (2) Run the engine at low idling speed.
  (3) Place the lock levers in the lock position.
  (4) Lower the wagon completely.
  (5) Lock the dump lever.
  (6) Stop the engine.
  (7) Be sure to take the starter switch key out of the starter switch.
  **For information on parking the machine, refer to Section "13-11. Parking the machine".**




## Use handrails and steps when getting on and off

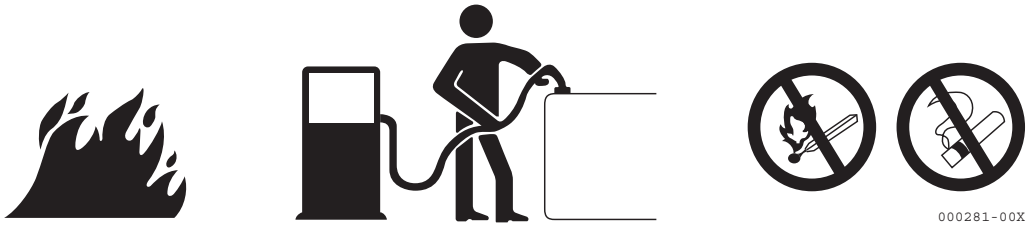
- Do not jump on or off the machine. Never get on or off the machine in motion as it may result in bodily injury.
- When getting on and off the machine, face the machine and use the handrails and the steps.
- Do not use control levers as handrails.
- Make sure that you maintain three point contact with the handrails or the steps.
- If the handrails and the steps are soiled with oil or dirt, clean them off immediately.
  Repair any damaged parts and retighten any loose bolts.





## Keep fuel and oil away from sources of ignition

- Open flames can ignite fuel, oil, hydraulic oil or antifreeze solutions, which are flammable and dangerous. Special attention must be paid to the following matters:
  - Keep flammable materials away from lighted cigarettes or matches, or any other sources of ignition.
  - Never refuel while the engine is running. Smoking during refueling must be strictly prohibited.
  - Firmly tighten the caps on the fuel and oil tanks.
  - Store fuel and oil in a cool and well-ventilated place where they are not subjected to direct sunlight.
  - Fuel and oil must be stored in a place which meets all applicable safety regulations. Unauthorized persons should not be allowed entry.




## Avoid removing filler caps while temperatures are high

- The engine coolant, engine oil and hydraulic oil are hot and under pressure immediately after the machine stops operation.
  Removing caps, draining coolant or oil, or replacing a filter at such a time may cause burns. Allow temperatures to cool down and follow the procedures in this manual.
- When removing the radiator cap, stop the engine and allow the coolant to cool down, then turn the cap slowly to relieve all pressure.
- Before removing the cap from the hydraulic oil tank, stop the engine and turn the cap slowly to relieve all pressure to prevent oil from spouting out.


## Avoid harmful asbestos dust

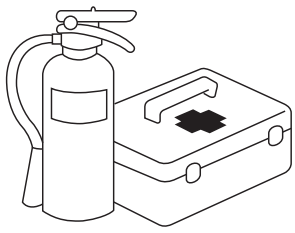
- Air containing asbestos dust is carcinogenic and is hazardous to humans. Inhalation of the air may cause lung cancer. When handling materials that may contain asbestos, keep in mind that:
  - Compressed air must not be used for cleaning.
  - Water must be used to clean the machine to prevent asbestos from scattering in the air.
  - You must work on the windward side when operating the machine in a place where there may be asbestos dust.
  - You should wear an appropriate respirator as necessary.

## Prevent crush injuries by the wagon

- Keep hands, arms and all other parts of your body away from all the moving parts, particularly between the wagon and the machine and between the hydraulic cylinder and the wagon, as pinch points are created in those areas.


## Keep a fire extinguisher and first aid kit handy

- The workplace must be provided with a fire extinguisher. Read instructions on the label to familiarize yourself with how to use it.
- Keep a first aid kit in a prescribed place.
- Know what to do in the event of a fire or an accident.
- Know who to contact in an emergency and keep emergency telephone numbers in a prominent place.




## Precautions for installing optional parts and attachments

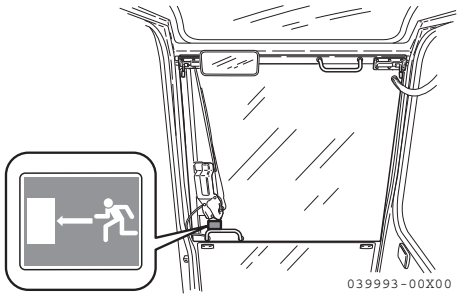
- When installing or using optional attachments, read the operating instructions for the attachments and the Manual Sections relating to the installation of attachments.
- Use only attachments authorized by YANMAR. The use of unauthorized attachments may affect not only the safety of the machine but also the proper operation and life of the machine.
- The use of unauthorized attachments would also violate the terms of YANMAR's Warranty, so that it would be voided.

## Caution for broken cabin glass

- If the glass in a cabin window should be broken by accident, the jagged edges pose a danger to the operator.
  Immediately stop working and remove the broken glass, and replace it as soon as possible.

## Emergency exit

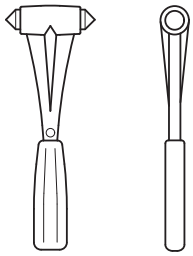
- If the door of the cabin should not open, open the front windshield to escape from the operator's cab.




## Emergency escape from operator's cab

- If the door of the cabin should not open, break the window glass with a hammer which is provided inside the cabin to escape from the operator's cab in an emergency.
- Remove the broken pieces of the window glass from the window frame to prevent any injury by those broken pieces. Besides, watch your step not to slip on the broken pieces of the window glass which dropped around your feet.

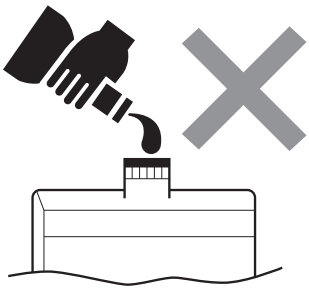
**For instructions on how to escape, refer to Section "12-7-7. Hammer for emergency escape from operator's cab".**


Hammer


## Precautions for the common rail engine

This machine has a common rail engine. Please obey the following precautions.

- Use commercial diesel fuel. Do not add any additives. Additives can clog the fuel injection nozzle and decrease the engine output.
- To comply to exhaust gas standards, the engine of this machine uses precision parts in the fuel injection mechanism. Do not use zinc-plated containers to store the engine fuel. Use containers made of resin or stainless materials. Zinc or lead particles in the fuel can cause the engine to malfunction.
- Consult with your dealer in case the common rail engine malfunctions. Fuel passes with high pressure between the supply pump and the injector. If you think that a part is defective, do not disassemble and repair it by yourself, but contact your dealer. If you do not obey this precaution, incorrect maintenance can damage the engine and the high-pressure fuel can cause personal injury.




# 8. Operating Precautions

⚠ WARNING **These instructions should be strictly followed for the safety of you, others and your machine.**

## 8-1. Precautions before starting the engine

### Ensure the safety of your workplace

- Before starting the machine, check to see if there are any hazards in your working area.
- Examine the terrain and soil, and decide the best way to do the work.
- When working on the street, provide a signal person or fence for the safety of vehicles and pedestrians.
- Before operating the machine in water, or crossing a creek, confirm the condition of the submerged ground, the water depth and the water flow speed, and make sure that the depth is within the allowable level.
  **For allowable water depth, refer to Section "13-9. Precautions for working".**

### Prevent fire

- Wood chips, dead leaves, trash and other flammable materials in proximity to the engine are hazardous as they may cause fire. Always check and keep your machine clear of these flammable materials.
- Check for any leaks from fuel, lube oil or hydraulic oil lines. Repair faults and clean spilled oil as necessary.
  **For additional information, refer to Section "13-1. Checking before starting the engine".**
- Check to see where fire extinguishers are located and know how to use them.
- Do not operate the machine near any flames or flammables.


### Inspect around the operator's seat

- Dirt, oil and snow on the floor, levers, handrails or steps are slippery and hazardous. Remove them all completely.
- Keep parts and tools away from the operator's seat as they may damage the control levers or switches or create other hazards.

## Provide adequate ventilation when working in an enclosed area

Engine exhaust fumes are harmful to the human body and their inhalation is extremely hazardous. When starting the engine in an enclosed area, open the windows and doors for ventilation. Also do not idle the engine unnecessarily or leave the engine running while the machine is not in use.


## Keep the cabin window clean

- Keep the surface of the cabin windows and the headlights clean for clear view.
- Adjust the rearview mirrors to appropriate positions where you can get the best view from the operator's seat, and keep their surface clean. Replace any broken mirror glass with new glass.
- Make sure that your machine is equipped with headlights and all required working lamps, and that they all work properly.

### Fasten the seatbelt

- For your safety, ROPS (Roll-Over Protective Structure)/FOPS (Falling Objects Protective Structures) and a seatbelt have been provided.
- Always fasten the seatbelt across the pelvic region and adjust it snugly before you operate the machine.
- The seatbelt must be replaced if the machine is involved in an accident.
- In addition, the seat and the seat mounting must also be checked by your dealer after an accident has occurred.
- If the seat and the seat mounting are damaged, they must be replaced immediately.

### ROPS/FOPS

- Never modify a structural member of the ROPS/FOPS.
- If the ROPS/FOPS is damaged, replace it immediately to prevent bodily injury.
  Never repair or modify it.

### Caution for the protection of plants from hot wind and exhaust gases

The wind and exhaust gases from the radiator and the muffler respectively are very hot.
Plants directly exposed to hot wind or exhaust gases may die.
Erect a barrier to protect plants from hot wind and exhaust gases, when working near them.

## 8-2. Precautions for starting the engine, working and parking

### Signal before starting the engine

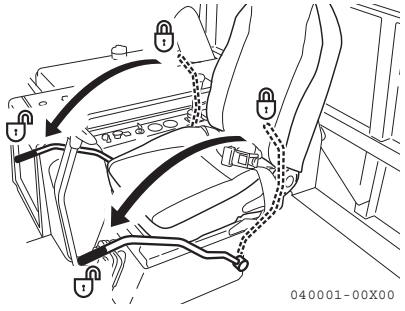
- Check the machine carefully before initial start up for the day.
- Make sure there are no persons near the machine before getting on it.
- Never start the engine when the "SERVICING IN PROGRESS" tag is attached to the starter switch.
- Place the control levers in the neutral position, check that the lock levers are in the lock position, and sound the horn to alert people nearby, before starting the engine.
- Be sure to start the engine and operate the machine from the operator's seat only.
- Adjust the rearview mirrors to such positions as you can get a good view around and in the rear of the machine from the operator's seat.
- Do not allow any other persons to get on the machine.

### Precautions for operating the machine

- Make sure again that there are no persons or obstacles near the machine, before operating it.
- Sound the horn to alert people nearby before operating the machine.
- Do not allow any other persons to get on the machine or to get into the operator's cab.
- Be sure to check that the door of the operator's cab is closed and that the door lock is in the lock position.

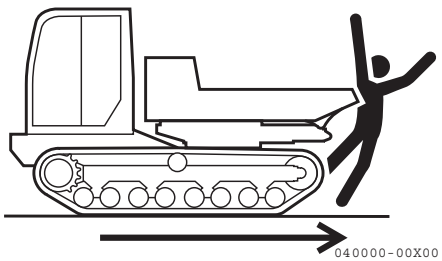
### Operate the travel levers after unlocking the lock levers

- Place the lock levers in the unlock position before operating the travel levers.
  **For instructions on how the machine travels, refer to Section "13-4. Traveling".**




### Make sure there are no persons nearby when dumping the wagon or reversing the machine

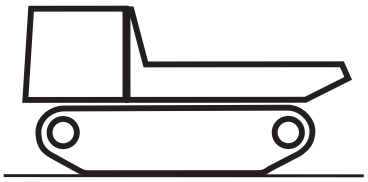
- A signal person should be provided for safety when the work site is hazardous or when visibility is poor.
- Keep all other persons away from the work site or the traveling path of the machine.
- Alert persons nearby with a horn or any other signal before starting the machine.
- The machine permits a limited range of vision toward the rear. Make sure there are no persons behind the machine before reversing.

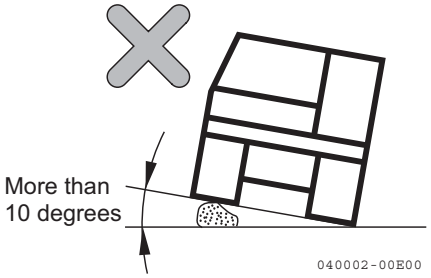


## Precautions for traveling

- When traveling with the machine, keep the wagon lowered. If the machine travels with the wagon in the dump position, the machine will be unstable.
- When traveling with the machine, keep the wagon parallel to the crawlers. If the machine travels with the wagon swung to the right or the left, the machine will be unstable. (For the swing wagon type.)
- If you need to operate the dump lever while traveling, never move it abruptly.
- Run the machine at low speed and slow down it when turning on rough terrain.
- Avoid running over obstacles if possible. If unavoidable, run the machine at low speed. Never run over obstacles that may cause the machine to tilt more than 10 degrees.

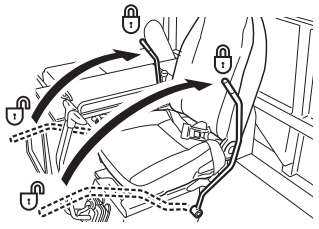
Traveling figure

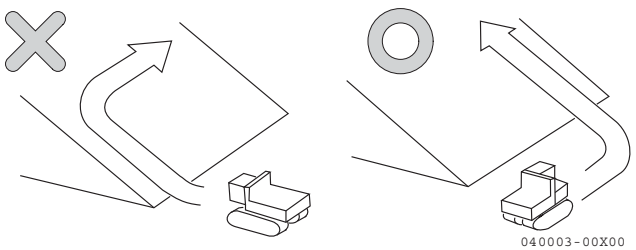





## Running the machine on a slope

- Run the machine carefully on a slope to avoid overturning or skidding sidewards.
- Run the machine at low speed on a slope of 9 to 10 degrees or more, with the automatic speed change switch turned off (for traveling at low speed) and the engine throttled down to medium speed or lower.
  If the machine goes down a slope at high speed, the engine speed will be increased excessively and overrun may be caused, which may cause the machine to go out of control.
- Do not brake the machine suddenly, as that could cause the machine to lose its balance, resulting in an overturn of the machine.
- Never turn the machine on a slope or run it across the slope.
  Move down to flat ground and then make a turn.
  **For instructions on how to run the machine on a slope, refer to Section "13-10. Precautions for going up and down a slope".**
- On grasses, dead leaves or a wet metal plate, even with a slight gradient, the machine will easily skid. Under those circumstances, run the machine carefully at low speed to prevent it from skidding.





### Working on a slope

- Be aware that the machine body may be raised suddenly and tip over due to its momentum when dumping the wagon on a slope.
- For work on a slope or a road shoulder, level off the work area to maintain the machine in a horizontal position before starting the work.
- Do not dump the wagon while swinging it. This will make the machine unstable. (For the swing wagon type.)

### Precautions for loading

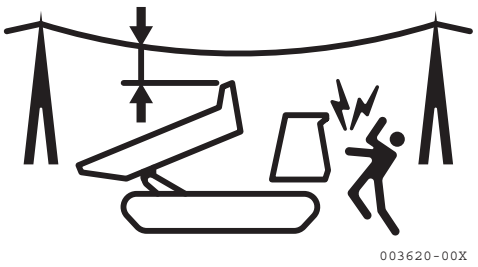
- Overloading may cause an accident.
- Loading on one side of the wagon will reduce the stability of the machine.
- Put a load onto the wagon horizontally so that the load is not placed on front, rear, right or left side only.

## ⚠ DANGER

### Keep away from electric power lines

- Working in the vicinity of overhead electric power lines presents a very serious hazard and special precautions must be taken. For purposes of this manual you are considered to be working in the vicinity of overhead power lines when the wagon or load of your carrier, in any position, can reach to within the minimum safe distances shown below.
- The following procedures are effective in preventing accidents or injuries.
  1) Wear shoes with rubber or leather soles.
  2) Use a signal person to warn the operator when the machine is getting too close to a power line.
- If the machine should contact a wire, the operator must not leave the operator's seat.
- When working near power lines, caution all ground personnel to stand clear of the machine.
- To determine the transmission voltage at the working site, contact the electric utility concerned.

| | Transmission voltage (V) | Minimum safe distance [ft. (m)] |
|---|---|---|
| Power distribution | 100/200 or less | 7 (2) or more |
| | 6600 or less | 7 (2) or more |
| Transmission line | 22000 or less | 10 (3) or more |
| | 66000 or less | 13.5 (4) or more |
| | 154000 or less | 16.5 (5) or more |
| | 275000 or less | 23 (7) or more |



### Prevent bumping the wagon

- When traveling through tunnels or under bridges, or working at a site near other overhead obstacles, operate the machine carefully so as not to bump the wagon against those overhead obstacles.

### Work only where visibility as good

- When working in a dark place, light up the area with the headlights, and prepare extra lighting equipment as necessary.
- Stop working when fog, snow or rain impedes your view.

### Work carefully in a snow-covered area

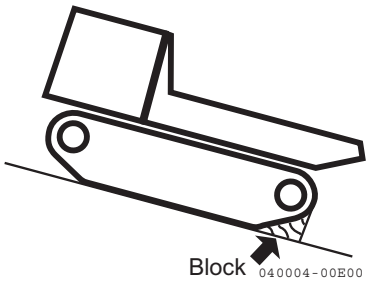
- Snow-covered ground and icy roads are dangerous as they may cause the machine to skid even on a slight slope. Run the machine at low speed, and never start, stop or turn abruptly on such ground or under such road conditions.
- Be careful removing snow as road shoulders or other hazards may be buried under snow.

### Unstable ground creates a high possibility of overturn

- Keep away from cliffs, road shoulders or trenches if possible as the ground near them is unstable. The ground may crumble due to the weight or vibrations of the machine, resulting in an overturn or fall of the machine. Be particularly careful when working immediately after a rainstorm or after blasting as the ground may be unstable.
- Ground-fills or ground near a ditch may be unstable and may crumble due to the weight or vibrations of the machine, causing the machine to tilt. Much caution must be taken in working in these areas.
- When working in an area where there is a high possibility of falling rocks, wear a hard-hat and stay under the canopy.

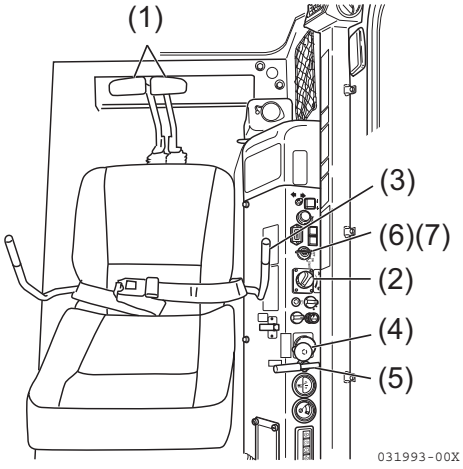
## Parking the machine

- Park on level ground. If parking on a slope is unavoidable, place the lock levers in the lock position and block the tracks with solid pieces of wood. (See the illustration at right.)




- If necessary to park the machine on the side of a road, set up a warning flag, fence, or lamp that can be easily recognized by passing cars and pedestrians but does not impede them.
  **For parking procedures, refer to Section "13-11. Parking the machine".**

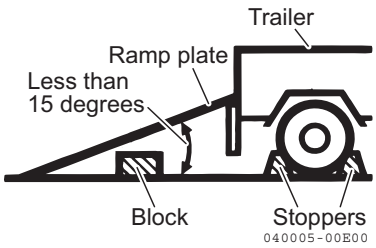
- When leaving the operator's seat, do the following:
  (1) Place the travel levers in the neutral position.
  (2) Run the engine at low idling speed.
  (3) Set the lock levers in the lock position.
  (4) Lower the wagon completely.
  (5) Lock the dump lever.
  (6) Stop the engine.
  (7) Be sure to take the starter switch key out of the starter switch.
  **For information about parking procedures, refer to Section "13-11. Parking the machine".**



## 8-3. Precautions for transportation

### Precautions for loading and unloading the machine

- Be careful in loading and unloading the machine, because it is a job of high hazard potential.
- Load or unload the machine at low engine speed, and low travel speed.
- Load or unload the machine on the level, solid ground away from the shoulder of the road.
- Use ramp plates of adequate strength with hooks on their ends.
  Check to see that the ramp plates are wide, long, and thick enough to sustain the load so that you can load or unload the machine safely. Support the ramp plates with blocks, to provide additional strength.




- Securely hook the ramp plates to the deck of the trailer so that they will not come off.
- Remove grease, oil, and other slippery deposits from the ramp plates, and remove mud from the tracks to prevent the machine from skidding on the ramp plates.
- Do not load or unload the machine if the ramp plates are slippery because of rain, snow or ice.
- Never change travel direction while on the ramp plates. If you need to change travel direction, go down the ramp plates, and change direction on the ground.
- Do not dump the wagon or swing it (for the swing wagon type) on the ramp plates, as the machine may turn over.
- After loading the machine, be sure to set the lock levers in the lock position before stopping the engine.
- Block the machine with lumber and secure the machine with a chain or a wire rope so that the machine will not move during transit.

  **For instructions on loading and unloading the machine, refer to Section "14-1. Loading and unloading the machine".**

  **For instructions on securing the machine, refer to Section "14-2. Precautions for loading the machine".**

### Precautions for transporting

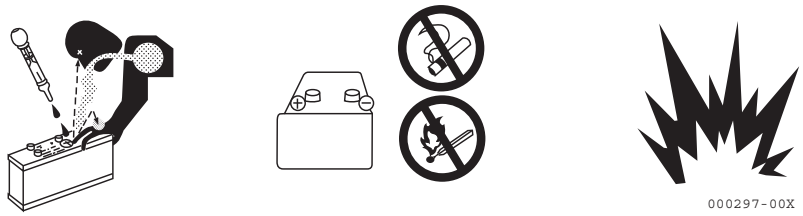
- Transport the machine safely in accordance with local regulations and applicable law.
- Select a travel route consistent with the width, height and weight of the machine loaded on the trailer.

## 8-4. Precautions for the battery

### ⚠ DANGER

**Be careful in handling the battery**

- The battery electrolyte contains dilute sulfuric acid, which can severely burn the eyes or skin. Always wear safety goggles and protective clothing when servicing the battery. If contact with the eyes or skin should occur, flush with a large amount of water and obtain prompt medical treatment.
- Because flammable hydrogen gas is produced by the battery, ignition and explosion may occur. Keep flames and sparks away from the battery.
- If you swallow battery electrolyte by mistake, drink a large amount of water, milk, or fresh eggs, and obtain medical treatment immediately.
- Before checking or handling the battery, be sure to stop the engine and turn the starter switch to the "OFF" position.
- Be careful not to cause a short circuit by placing a tool across the terminals of the battery.
- If a terminal connection is loose, sparks may be generated due to contact failure, causing possible ignition and explosion. Be sure to connect the terminals securely.
- Do not use the machine with the battery which is short of battery electrolyte. The shortage of battery electrolyte not only will reduce the life of the battery but also could cause an explosion.




### ⚠ WARNING

**Observe the procedures for starting the engine using booster cables**

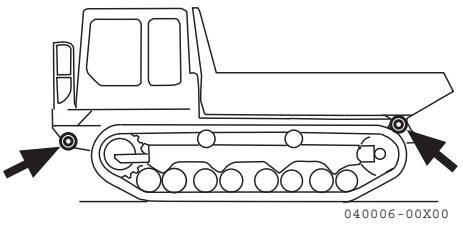
- When you start the engine using booster cables, wear safety goggles.
- If you start the engine by taking electric power from another machine, do not allow your machine to contact the other machine.
- To connect the booster cables, begin with the positive terminal, and to disconnect them, begin with the negative terminal (ground side).
- If a tool simultaneously touches the positive terminal and the machine, potentially hazardous sparks may be generated.
- Do not connect the booster cables to the terminals in reverse polarity. In other words, never connect the negative terminal on one machine to the positive terminal on the other machine.
- As the last step, connect the negative booster cable terminal to the upper frame. At that time, sparks will be generated. Consequently, connect the terminal to a point as far away from the battery as possible.

  **For information about starting the engine using booster cables, refer to Section "17-3. If the battery is overdischarged".**

## 8-5. Precautions for towing

### Hook the wire rope on the frame when towing

- Improper towing procedures can cause death or serious injury.
- When towing a machine with another machine, use a wire rope strong enough to sustain the machine weight.
- Never tow a machine on a slope.
- Do not use a towing rope that is kinked, distorted or damaged.
- Do not ride on the towing cable or on the wire rope.
- When connecting an object to be towed, make sure that no person enters the space between the machine and the object.
- Align the connection of an object to be towed and the towing part of the machine, and fix them before towing.




**For information about towing the machine, refer to Section "17-1. Towing".**

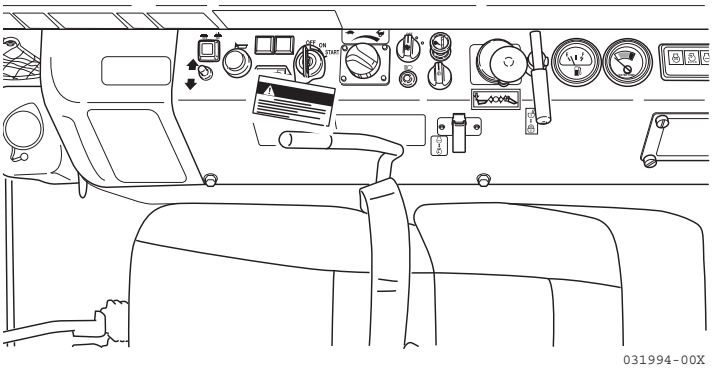
# 9. Precautions for Servicing

**⚠ WARNING** **Neglecting these instructions may cause extreme hazards.**

## 9-1. Precautions before servicing

### Attach the "SERVICING IN PROGRESS" tag to the starter switch

- If another person should start the engine or operate the control levers while service is in progress, the service personnel can sustain serious bodily injury.
  Always attach the "SERVICING IN PROGRESS" tag to the starter switch, while service is in progress.
  The "SERVICING IN PROGRESS" tag is enclosed with the Operation & Maintenance Manual, (Article number : 172660-03810).


### Use appropriate tools

- Using damaged or worn tools or using tools inappropriate for the required application is very dangerous, and may also cause damage to the machine. Make sure to use the tools that are appropriate for the specific job.
  **For information about tools, refer to Section "22-1. Required tools".**

### Periodically replace the parts essential to safety

- Aging or damage to the parts listed below can cause a fire.
  Make sure that they are replaced periodically.
  - Fuel system : Fuel hose and fuel tube cap
  - Hydraulic system : Outlet hose of main pump and suction hose
- The parts listed above must be replaced periodically even if no abnormality is found in them.
  (They age with time.)
- If any abnormality is found in them, replace or repair the parts even though the suggested replacement time has not been reached.
  **For information about replacing essential safety parts, refer to Section "23. Replacing Essential Parts Periodically".**

### Stop the engine before beginning inspection and servicing

- Be sure to stop the engine before performing inspection and servicing.
- If necessary to perform service while running the engine, as when cleaning the inside of the radiator, be sure to set the lock levers to the lock position, lock the dump lever and do the job together with a partner.
  (One should take the operator's seat so that he or she can stop the engine at any time.)
  That person must be careful not to touch any levers in the operator’s cab.
- Be extremely careful not to contact the moving fan or fan belt, or any hot surfaces.

## 9-2. Precautions during servicing

### Keep unauthorized persons away

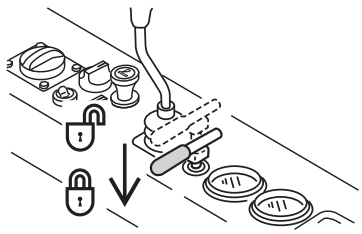
- Never admit any persons into the work area who are not taking part in the work. Be conscious of the safety of other persons.
  Be especially careful when grinding, welding, or using a large hammer.

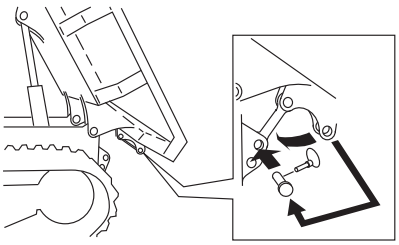
### Removed wagon

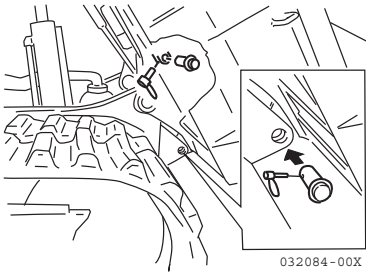
- When a wagon is placed on the ground or against a wall after removing it or prior to reinstalling it, be sure that it is stable to prevent it from falling down.


### Working under the machine

- Never perform service underneath the machine if it is not completely stable.
- Before performing service or repairs underneath the machine, be sure to apply blocks to the tracks to lock the tracks securely.
- To perform service or repairs with the wagon in the dump position, lock the dump lever and lock the wagon with the wagon stopper.

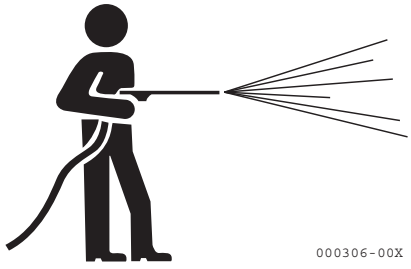







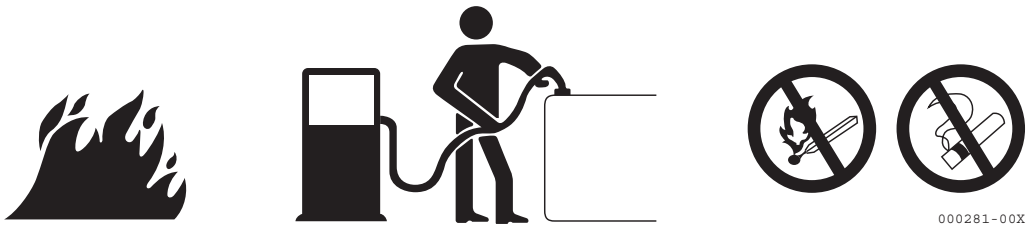

### Keep the machine clean

- Spilled oil or grease, or scattered parts are dangerous and can cause falls. Keep the machine clean.
- Getting water into the electrical system may cause it to malfunction, resulting in faulty operation of the machine. Also it may permit electrical leaks that could cause a fire or electric shocks.
- Never clean the sensors, connectors or the operator's seat with water or steam.



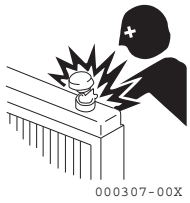
## Precautions for fueling and oiling

- Spilled fuel and oil could cause a fire and they are dangerously slippery. Wipe up spills immediately.
- Close the fuel cap and oil cap securely.
- Never use fuel for cleaning.
- Provide good ventilation when replenishing fuel or oil.




## Radiator cooling water level

- Before checking the radiator cooling water level, stop the engine and wait until the engine and the radiator have cooled down.
- Slowly loosen the cap to relieve the inner pressure before removing the cap.

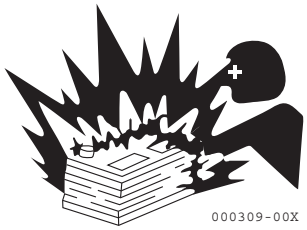



## Use an explosion-proof lighting source

- Use an explosion-proof lighting source when checking the fuel, the oil, the cooling water, or the battery electrolyte. Failure to use an explosion-proof lighting source may cause ignition to occur, inducing an explosion.


## Precautions for handling battery

- When welding or repairing the electrical system, disconnect the negative terminal of the battery to interrupt the electric circuit.



## Handling high-pressure hoses

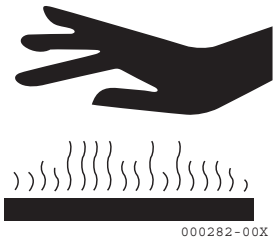
- Leaks of fuel and oil could cause a fire.
- Do not bend a high-pressure hose forcibly, or strike it with a hard object. Because abnormally bent or damaged piping, tubes, and hoses easily burst under high pressure, never use them.
- Be sure to retighten or repair any loosened or damaged fuel hoses and hydraulic hoses. If oil or fuel leaks, a fire could be caused.

## Be careful of hot oil under high-pressure

- The hydraulic system for the wagon operates under high pressure.
  When replenishing or draining hydraulic oil, or performing inspection or service, be sure to first relieve the high pressure.
- The emission of hot oil under high-pressure from a small leak could result in serious bodily injury.
  Wear safety goggles and thick gloves when checking for leaks. Use a piece of cardboard or a plywood block to detect emissions of hot oil.
  If the hot oil should contact your body, obtain prompt medical treatment.


## Be careful when servicing systems under high temperature and high pressure

- The engine cooling water and various lube oil systems are still under high temperature and pressure immediately after the engine has stopped. Removing caps, draining oil and water, or replacing filter elements at that time may cause a burn. Wait until the temperature drops, then begin servicing in accordance with the procedures described in this manual.
  **For cleaning the inside of the cooling system, refer to Section "25-4. Nonperiodic services".**
  **For checking the level of the cooling water and the hydraulic oil, refer to Section "25-5. Checking before start-up".**
  **For checking the oil levels in various systems and replenishing the oil, refer to Sections "25-5. Checking before start-up" to "25-6. Periodic services".**
  **For replacing the oils in various systems and replacing the filter elements, refer to Sections "25-6 to 8. Periodic services".**

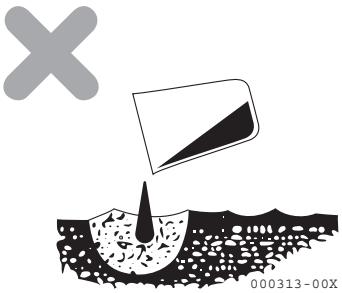


## Rotating radiator fan and fan belt

- Never contact the rotating radiator fan or fan belt with any object.
- Contacting the rotating radiator fan or fan belt with any object can result in serious bodily injury.


## Processing wastes

- Do not dispose of waste oil in the sanitary sewer system.
- Always drain the oil from the machine into a secure container, and never directly to the ground.
- When disposing of toxic wastes such as fuel, oil, cooling water, solvent, filters, and spent batteries, comply with all applicable disposal regulations.



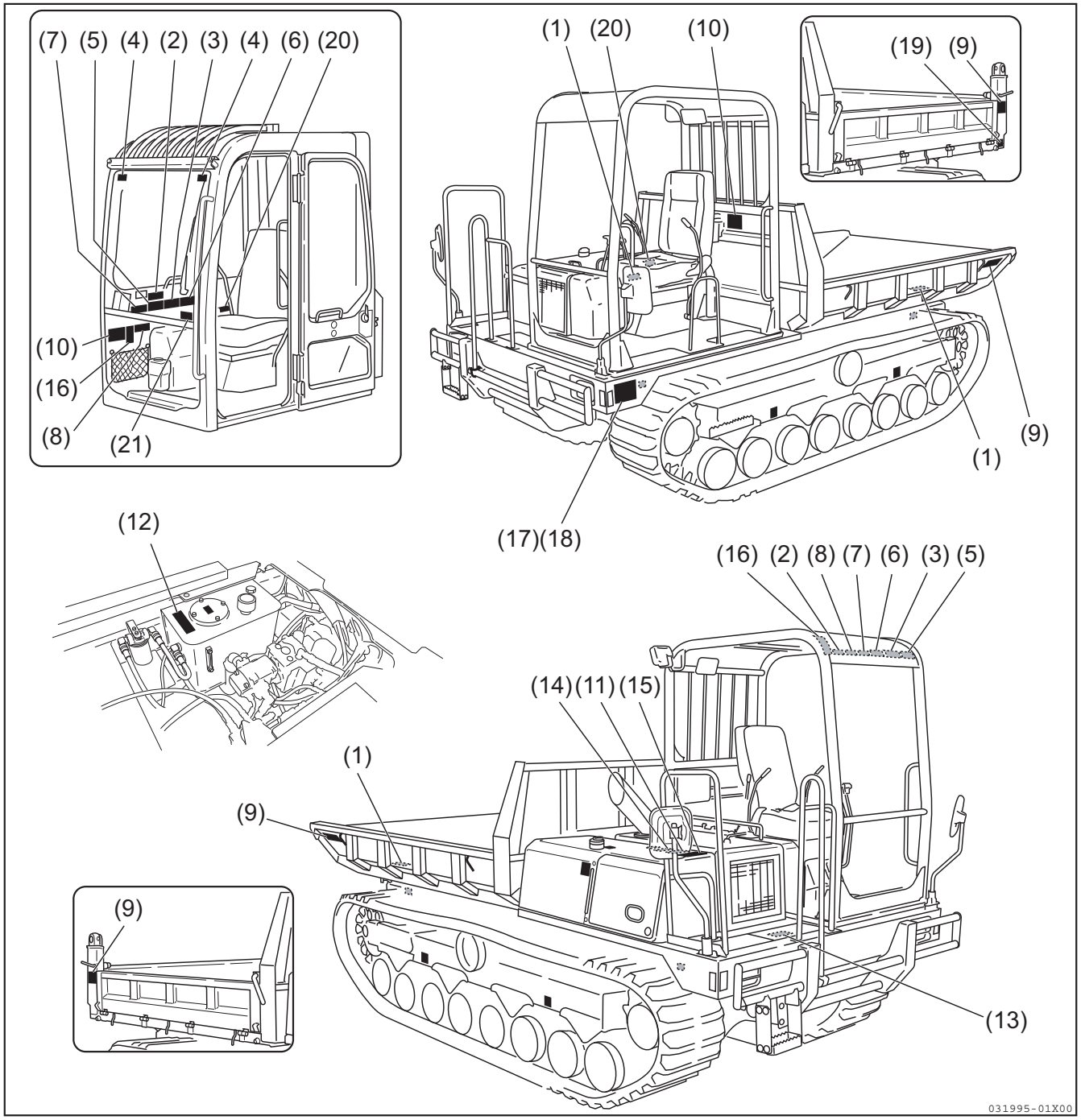
# 10. Safety Messages (Warning Labels)

There are a number of Warning Labels on the machine. Full descriptions of all Warning Labels and their locations are reviewed in this section. Periodically confirm whether all Warning Labels are still mounted in their correct locations and can be easily read.

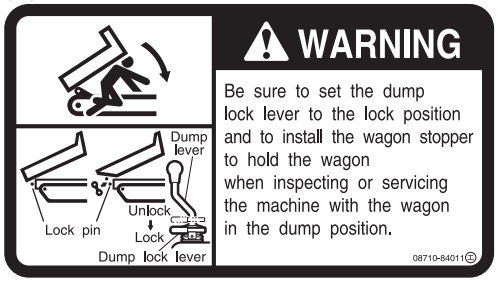
If a warning label is missing, damaged or cannot be read, it must be promptly replaced. Also, if a warning label was mounted on a part which is replaced, a new warning label must be installed on the replaced part.

Contact your dealer to obtain new labels. The part code number is shown on each warning label as well as on the reproductions in this manual.

## 10-1. Location of warning labels

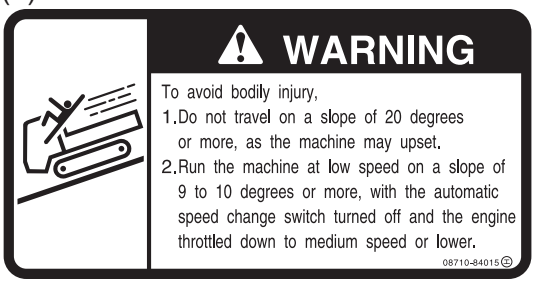


(1) 172660-03760



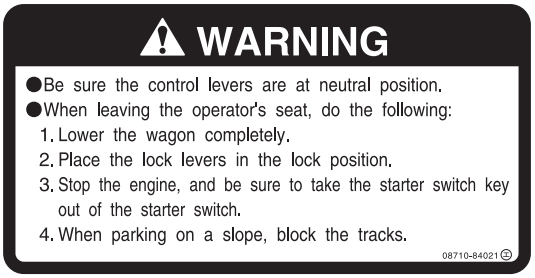

(2) 172660-03780


(3) 172660-03790

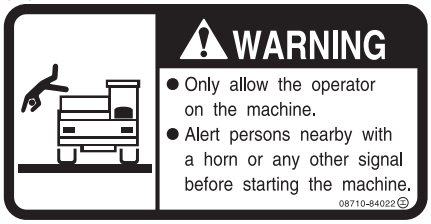



(4) 172660-03950


(5) 172660-03830




(6) 172660-03840

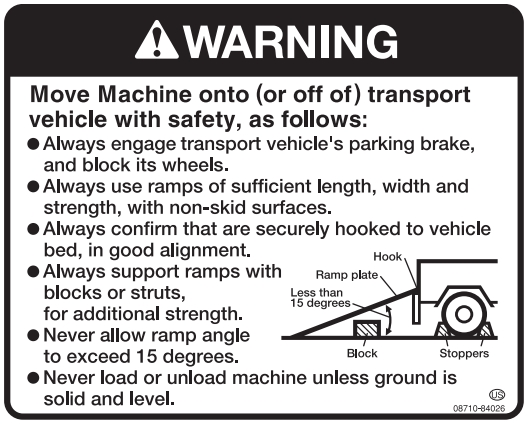



(7) 172660-03850


(8) 172660-03860

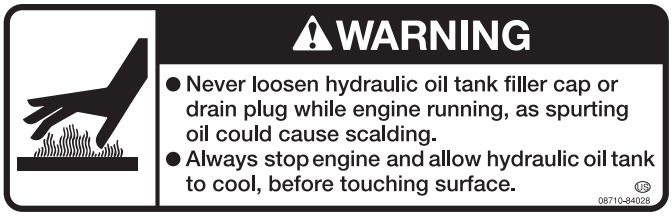

(9) 172660-03870


(10) 172660-03880

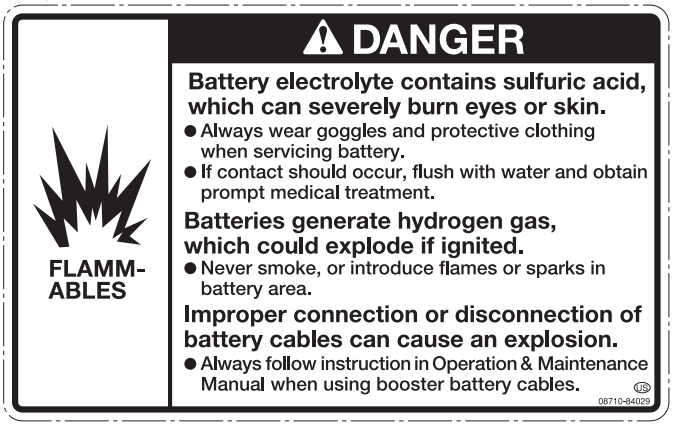


(11) 172660-03890

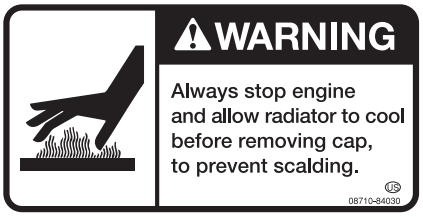

(12) 172660-03900



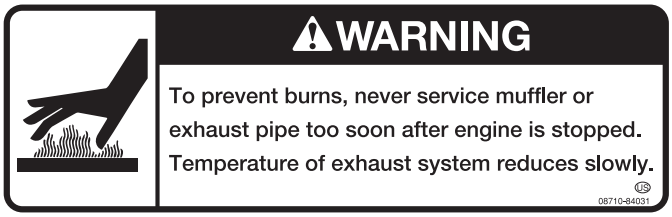

(13) 172660-03910




(14) 172660-03920



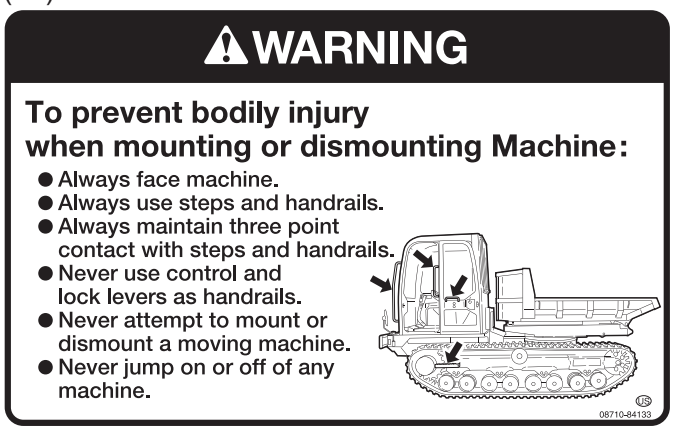

(15) 172660-03930



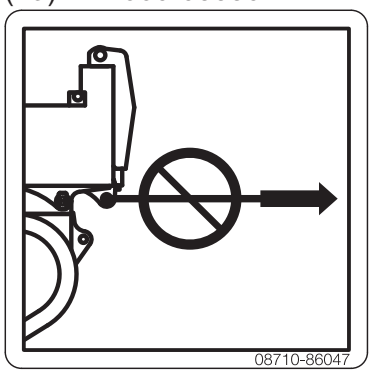
(16) 172660-03940


(17) For canopy 172660-03960


(18) For cabin 172660-03970

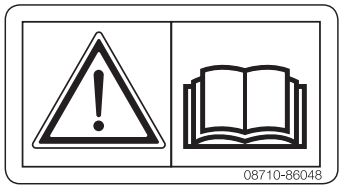



(19) 172660-03350



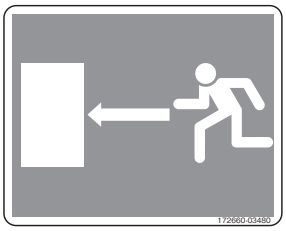

(Never use the wagon stopper hole for towing)

(20) Warning for operation and maintenance 172660-03390




Read and understand Operation Manual before operating, maintaining, disassembling, reassembling or transporting the machine.

(21) Emergency exit 172660-03480

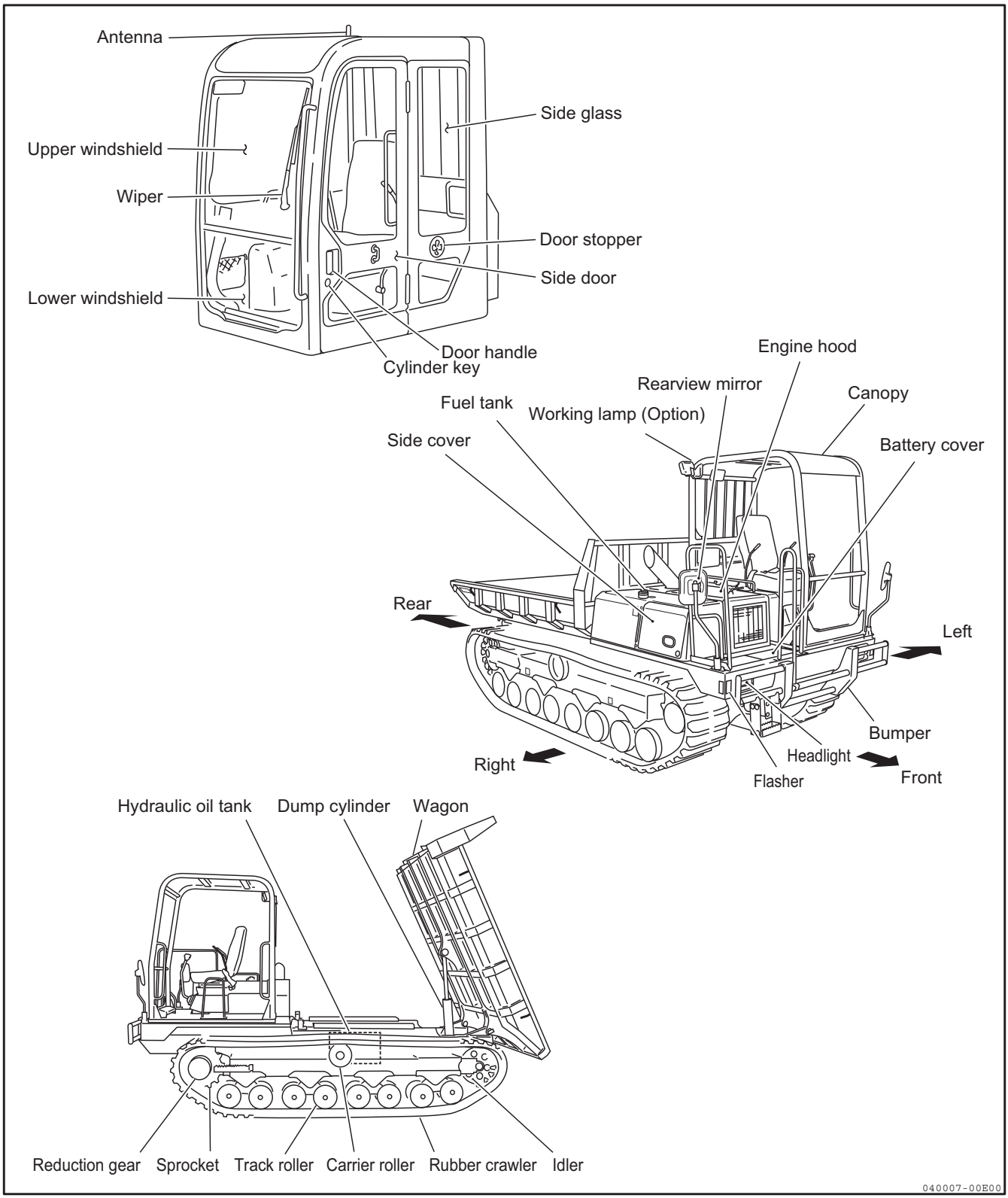


# OPERATION

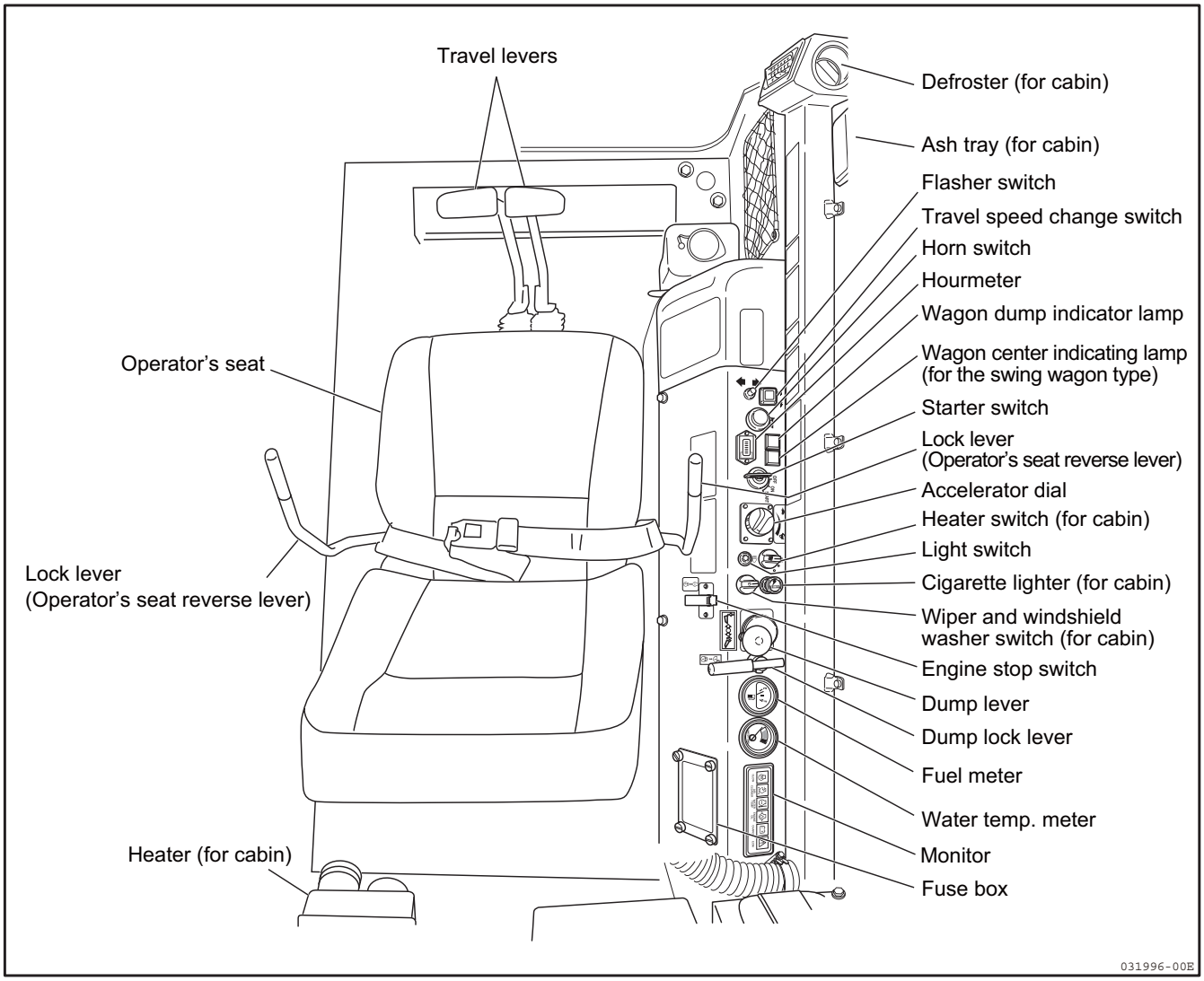
# 11. Identification of Important Parts

## 11-1. Overview of the machine

The directions are as indicated by the arrows in the figure below.



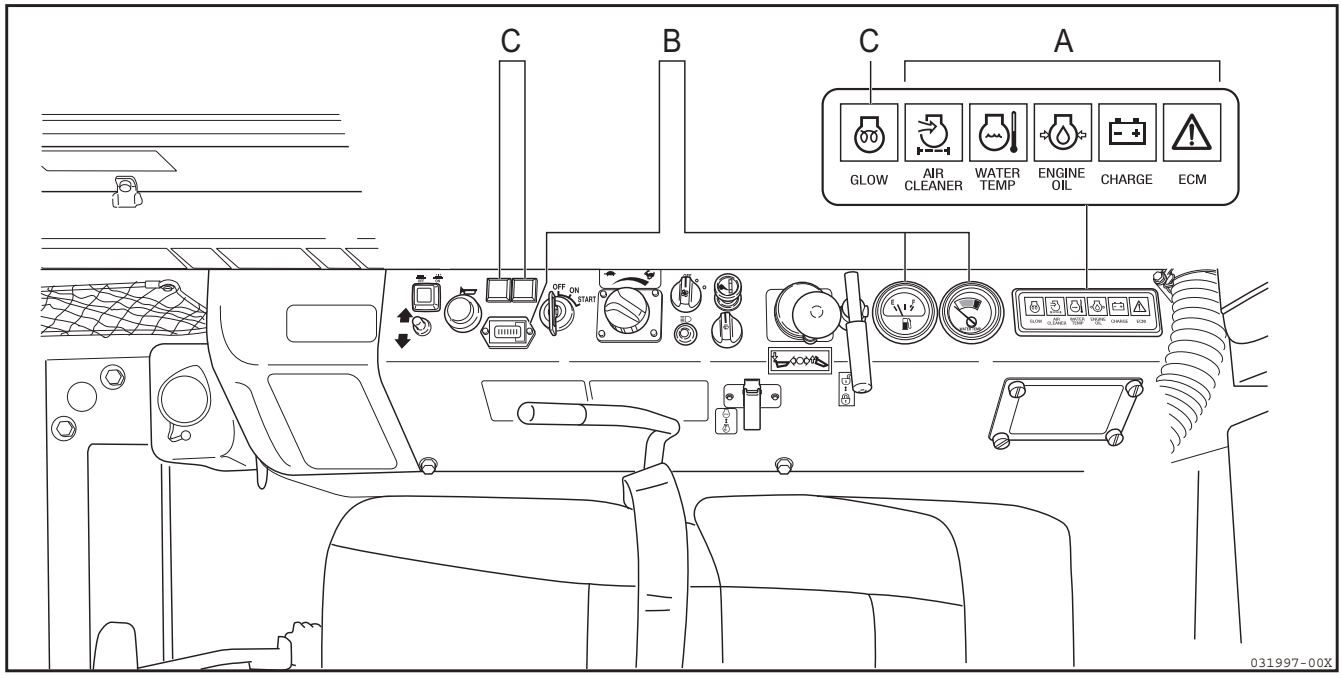
## 11-2. Controls and switches



# 12. Description of Control Devices

This section describes several of the control devices necessary to operate the machine. In order to ensure safety and comfort in working with the machine, it is imperative for you to fully understand how to operate and interact with these devices.

## 12-1. Monitors




**IMPORTANT**

**For start-up inspection, be sure to refer to PART THREE: MAINTENANCE, or Section "13. Operating Instructions" as well as the monitor messages as shown above.**

**(A) Emergency stop items**

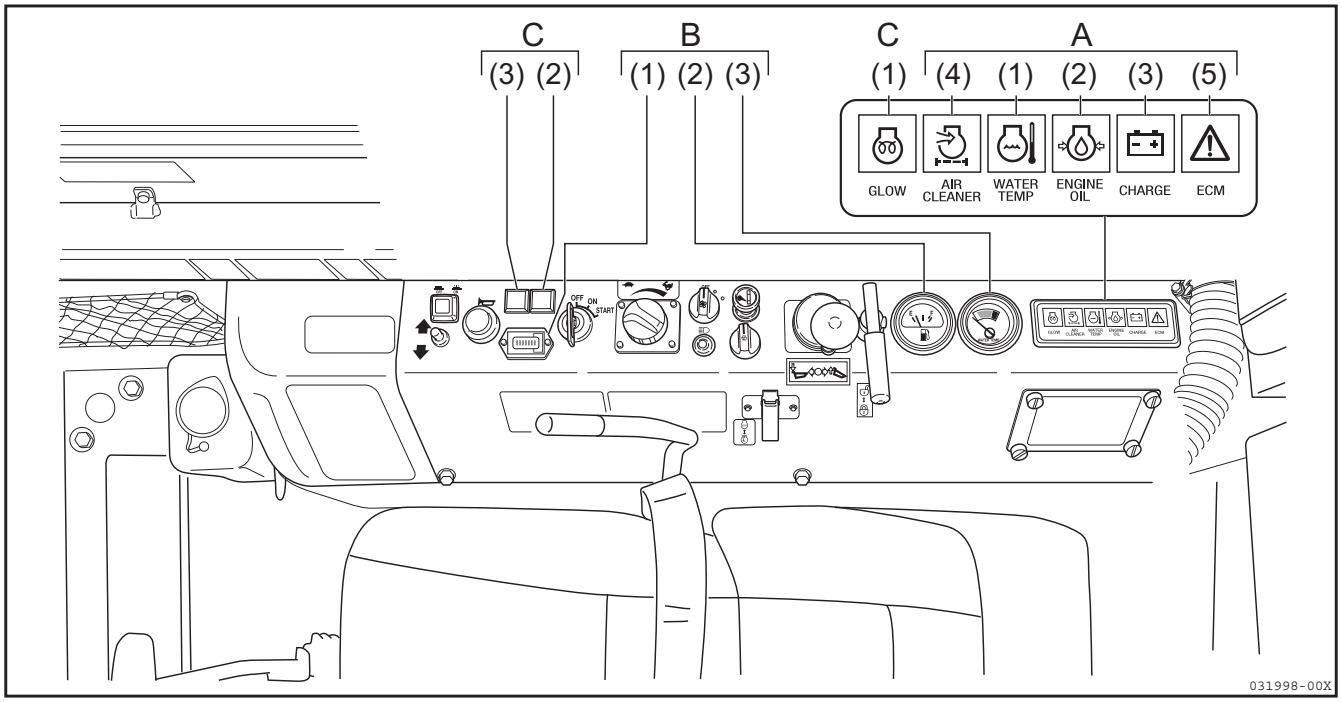
Attention must be paid to these items while the engine is running. The item requiring treatment would be displayed immediately. When there is any failure, the alarm lamps light and a buzzer sounds.

**(B) Meters**

These indicate the cooling water temperature for the engine, the fuel amount in the fuel tank, and the service hours for the machine.

**(C) Indicator lamps**

Indicates the engine preheating status, wagon lower/dump status, and wagon swing position (for swing wagon type).




**12-1-1. (A) Emergency stop items**

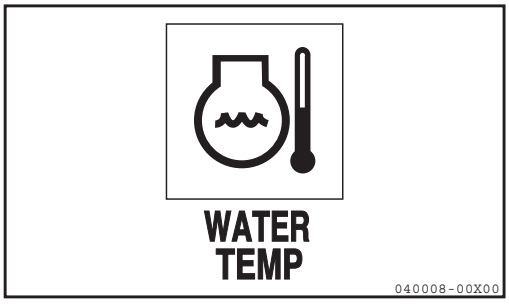
## ⚠ WARNING

**When an indicator lamp lights and a buzzer sounds during operation, immediately stop operation and check and service the abnormality.**

When the starter switch key is in the “ON” position, the monitor lamps (1), (2), (3) and (4) light and a buzzer sounds.
(The water temperature alarm lamp (1) and air cleaner alarm lamp (4) go off in a few seconds.)
Normally, all monitor lamps go off after the engine starts. When there is any failure during operation, a lamp lights and a buzzer sounds. (If the starter switch key is in the “ON” position and a monitor lamp does not light, its bulb must be burnt out.)

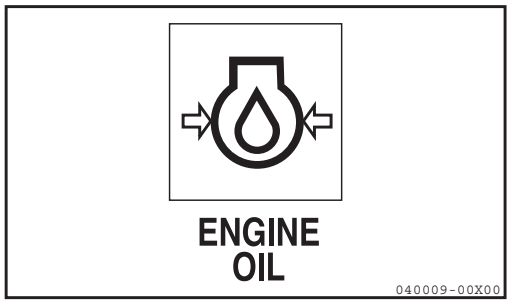
**(1) Water temp. alarm lamp**

When the cooling water temperature rises abnormally during operation, the alarm lamp will light and the buzzer will sound. Idle the engine at low speed for a while, and stop it. After the engine has cooled, take corrective actions by referring to Section “17-4. Troubleshooting”.



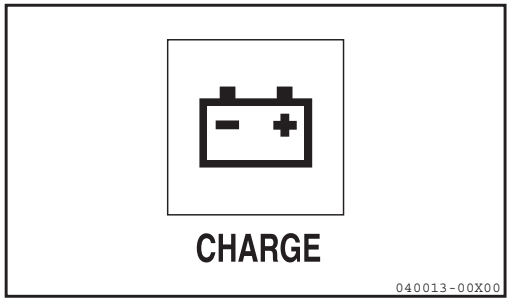
**(2) Engine oil pressure alarm lamp**

If engine oil pressure falls below the normal level, the alarm lamp will light and the buzzer will sound. In this event, stop the engine and inspect it according to Section "17-4. Troubleshooting".




**(3) Battery charge alarm lamp**

If the battery is not charged properly while the engine is running, the alarm lamp will light and the buzzer will sound. In this event, stop the engine and inspect the V-belt for slack and the battery charging circuit. If you find something abnormal with it, take corrective action by referring to Section "17-4. Troubleshooting".




**(4) Air cleaner alarm lamp**

If the air cleaner filter is clogged while the engine is running, the alarm lamp will light and the buzzer will sound. Stop the engine and clean the filter of the air cleaner.

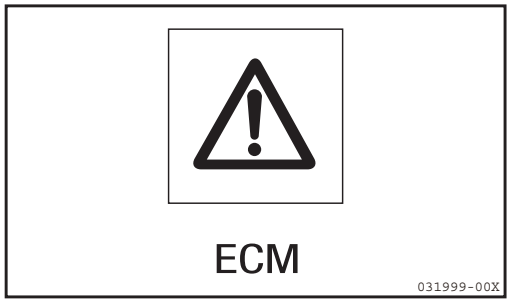

**(5) Engine trouble alarm lamp**

When the engine controller detects an engine trouble with the starter switch ON, the alarm buzzer will sound and the alarm lamp will light.

If this alarm lamp has turned ON, contact your dealer.

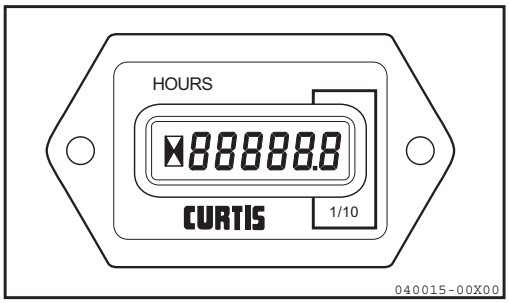
After you turn ON the starter switch with the engine stopped, this lamp will lit till the engine starts up, but this is normal behavior.

ECM: Engine Control Module



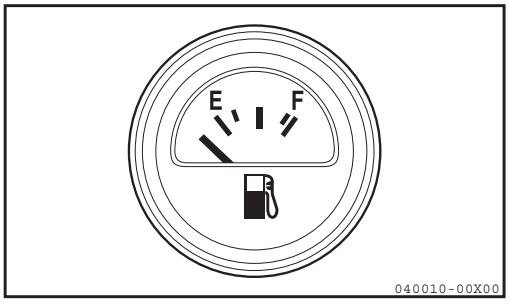
### 12-1-2. (B) Meters

#### (1) Hourmeter




The hourmeter starts operating after the engine starts.
It indicates the accumulated service hours for the machine. The reading of the hourmeter helps you set time intervals for periodic servicing of the machine. While the engine is running, the hourmeter will continue registering even if the machine is not being operated.

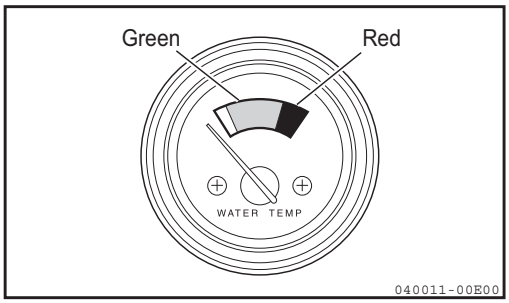
#### (2) Fuel meter




This indicates the fuel amount in the fuel tank. When the meter pointer indicates close to E (empty) during operation, refill fuel tank soon.

- The reading on the fuel meter scale is affected by how much the machine is slanted.
- The fuel meter indicates the fuel amount regardless of whether the starter switch key is in the “ON” or “OFF” position.

#### (3) Water temp. meter

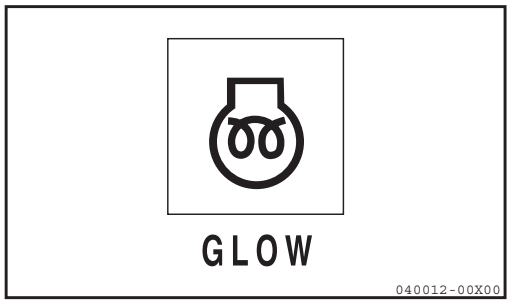



This indicates the cooling water temperature for the engine.
During the normal operation, the water temperature is within the green portion of the scale. When the cooling water temperature rises to the red portion of the scale, idle the engine at low speed until the water temperature cools down. Stop the engine and inspect it after the engine has cooled.

### 12-1-3. (C) Indicator lamps

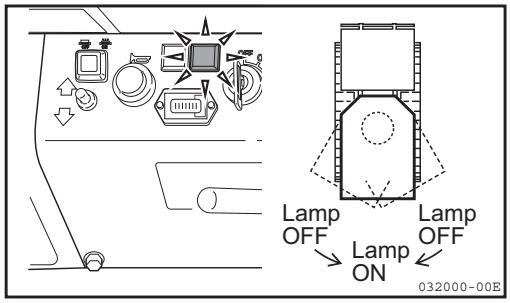
**(1) Glow lamp**

This indicates the required time for the engine preheating when starting the engine in the cold weather. The indicator lamp lights when the preheating starts and goes off in 15 seconds to indicate the end of the preheating.
The preheating time varies between 1 and 15 seconds depending on the cooling water temperature.



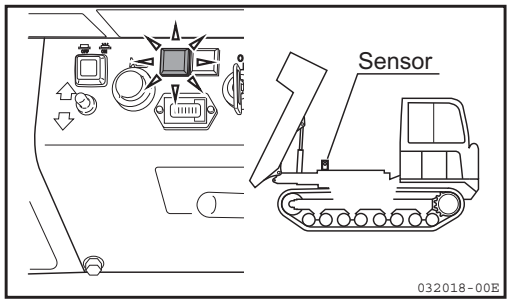

**(2) Wagon center indicating lamp**
**(for the swing wagon type)**

The indicator lamp lights when the wagon is in parallel to the crawlers and goes off when it swings to the right or the left.

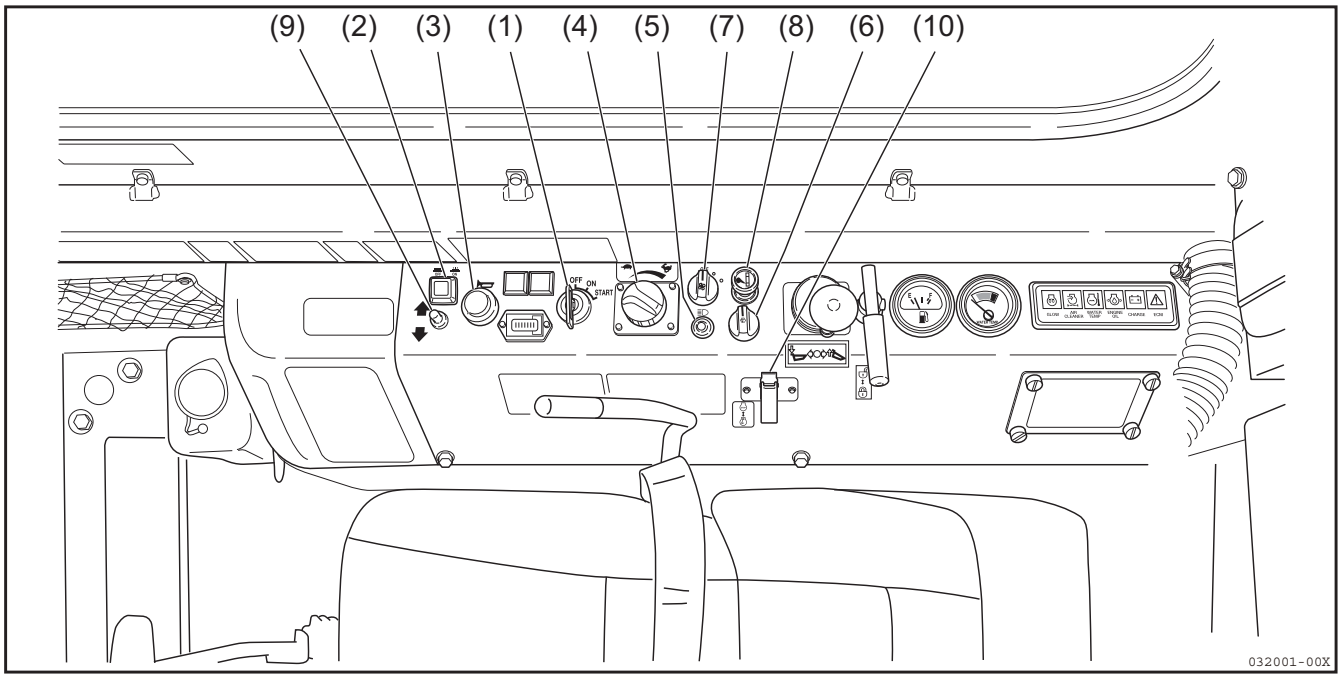



**(3) Wagon dump indicator lamp**

This lamp turns ON when the wagon is dumped and moves away from the sensor, and turns OFF when the wagon is lowered to the lowest position.



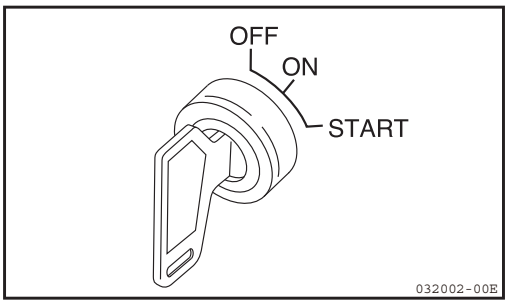
## 12-2. Switches




### (1) Starter switch

Use this switch to start and stop the engine.

Cover the starter switch with a waterproof cover when the starter switch key is removed.




- OFF position

  Turn the starter switch key to "OFF" to stop the engine and disconnect electrical circuit or remove the starter switch key.

- ON position

  Turn the starter switch key to "ON" to connect the electrical fuel solenoid circuit, the electrical charging circuit and the lamp circuit. (Keep the starter switch key in this position while running the engine.)

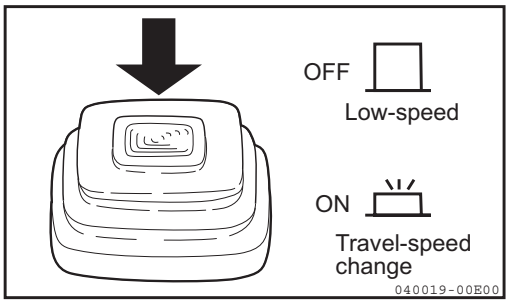
  When the cooling water temperature is low, the glow lamp will turn on and the engine preheating process starts automatically.

  As soon as the glow lamp turns OFF, turn the starter key into the "START" position to start up the engine.

- START position

  Turn the starter switch key to "START" to start the engine. Release the starter switch key after the engine is started and it will return to the "ON" position.

**(2) Travel speed change switch**




**⚠ WARNING**

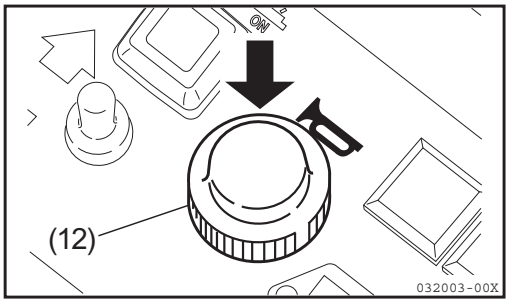
**When the load exceeds the specified level while the machine is traveling at high-speed, the travel speed of the machine is automatically switched to the low-speed. When the load becomes lighter, the travel speed is automatically returned to the high-speed. Be careful in traveling with the machine as the travel speed changes depending on the load condition.**

Press the switch button down to switch between the automatic speed change and the fixed low speed.

- ON (Lamp ON) : Automatic speed change between high and low speed
- OFF (Lamp OFF) : Fixed low speed

**(3) Horn switch**

A horn sounds by pressing the horn switch regardless of the position of the starter switch key.

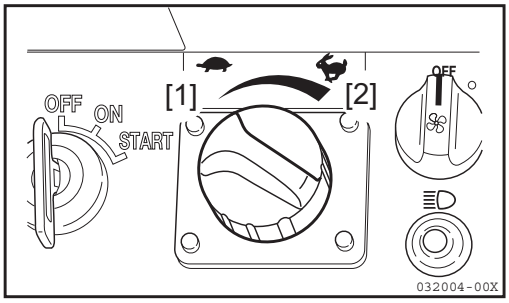



**(4) Accelerator dial**

This dial controls and maintain the engine speed and output to a constant level.

[1] Low idling : Turn the dial fully counterclockwise.

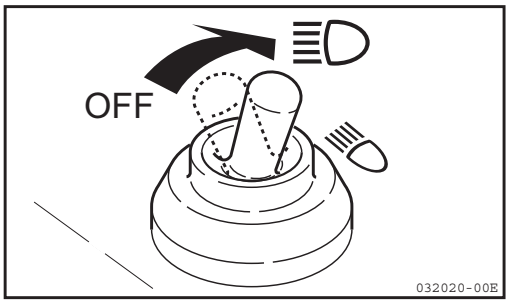
[2] High idling: Turn the dial fully clockwise.



**(5) Light switch**

It operates when the starter switch is in the “ON” position. The headlights and the indicator box light go on.

- ≣D position : The headlights and the indicator box light go on.
- OFF : The lights go off.



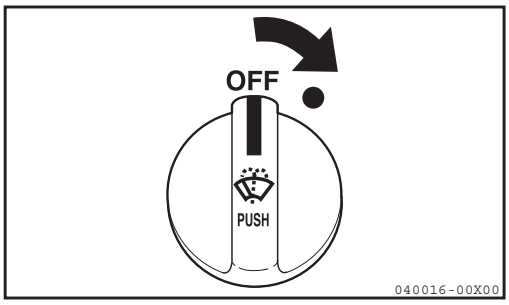

**IMPORTANT**

**Do not keep the lamps on for a long time while the engine is not running. The battery will run down and the engine may not start.**

**(6) Wiper and windshield washer switch (for cabin)**

It operates when the starter switch is in the “ON” position.

- ● position : Wiper works.
- OFF : Wiper stops.
- PUSH : The windshield will be sprayed with washer fluid.



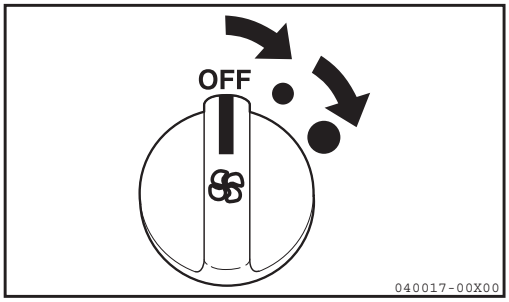

**IMPORTANT**

- **Do not push the wiper switch when the washer fluid tank is empty, as it could cause pump failure.**
- **Wiping a dry windshield could damage the glass. Use the wiper only when the windshield is wet.**
- **The wiper blade may freeze in cold weather. Do not attempt to move it; otherwise the wiper motor will sustain damage.**

**(7) Heater switch (for cabin)**

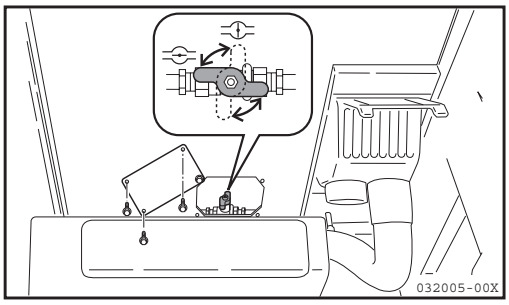
Use this switch to warm up the air in the cabin or canopy. Move the switch to set the fan speed at either of the two levels.

- ● position : Low fan speed.
- ● position : High fan speed.
- OFF : Fan stops.

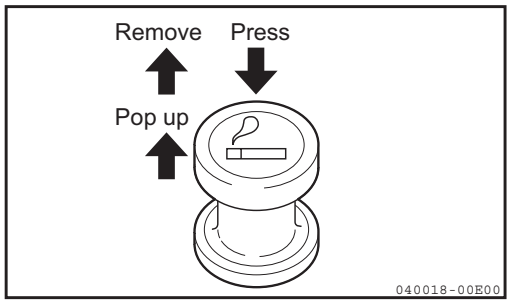



Operate the heater switch after the cooling water has warmed up.

Open and close the circulation valve for the cooling water at the beginning and the end of the season when the heater is used, respectively.



**(8) Cigarette lighter (for cabin)**




**⚠ WARNING**

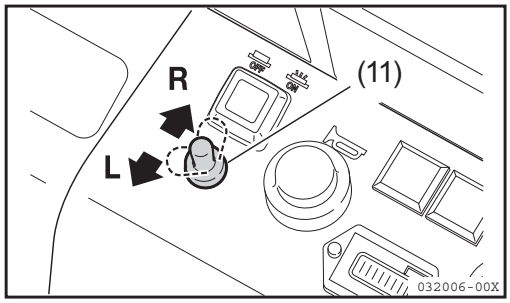
**Do not keep the lighter knob pressed down. The wire may burn out, and it could cause a fire.**

It operates when the starter switch is in the “ON” position. Use it to light a cigarette. Press down the lighter and release it. After a while the lighter will automatically pop up. Pull it out of the socket when using it. Clear cigarette from the lighter before putting it back in the socket.

**IMPORTANT**

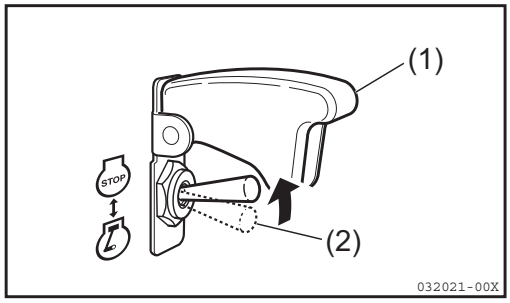
**If the lighter does not pop up within 30 seconds after pressing it down, there is something wrong with it. Pull it out of the socket.**

**(9) Flasher switch**




It operates when the starter switch is in the “ON” position. When the flasher switch is set to the “L” or “R” position, the left or right flasher will flash, respectively.

**(10) Engine stop switch**



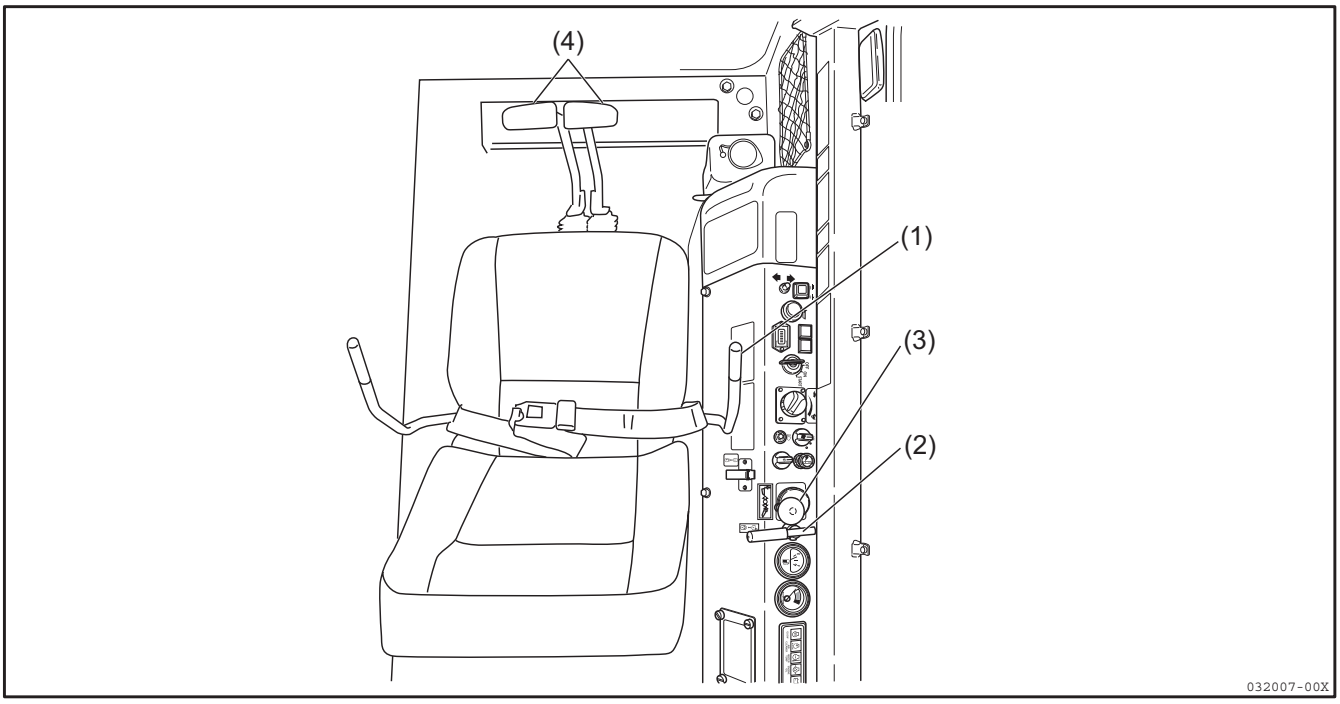

If the engine is not stopped by turning the starter switch to the "OFF" position due to mechanical failure or breakage, use this switch to stop the engine.

[1] Open the cover (1).

[2] Pull up the switch lever (2).

[3] After using the switch, return the lever (2) and the cover (1) to the original position.

## 12-3. Control levers

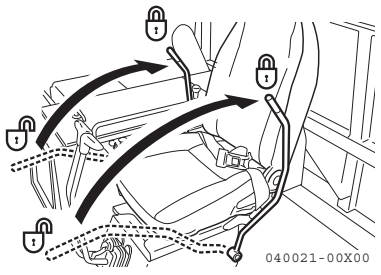



**(1) Lock levers (for the travel operation)**

The lock levers locks the travel operation. When the lock levers are pulled back, the parking brake is applied to lock the travel operation.

### ⚠ WARNING

- **When leaving the operator's seat, be sure to lower the wagon fully and move all lock levers to the lock positions. Keep in mind that if you should touch an unlocked lever inadvertently, a serious accident could occur.**
- **Do not operate the lock levers while the machine is traveling. If the lock levers are pulled back during the machine travel, the parking brake will be applied, and the machine could make a hazardous sudden stop.**

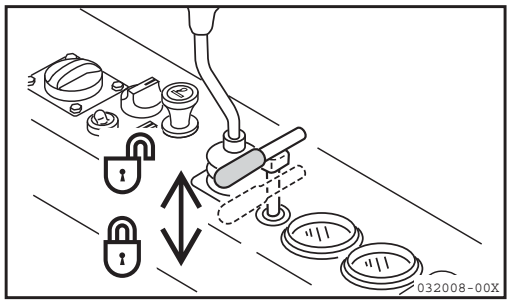



- **Be sure to place the lock levers securely in the lock position. If not, they could slip out of the lock position. Thus always make sure that the lock levers are in the lock position as illustrated in the figure at the right.**
- **When operating the lock levers, be careful not to touch the travel levers.**
  **Remember that if the lock lever is not pulled back fully, the implement will not be locked.**
- **Note that even if the lock levers are in the lock position, the dump operation of the wagon is not locked.**

**IMPORTANT**

**The machine uses the hydraulic lock system. If the lock lever is in the lock position, the travel motors will not operate although the travel levers are free to move. To reverse the operator's seat, also use the lock levers. Refer to Section "12-10. Operator's seat".**

**(2) Dump lock lever**




**⚠ WARNING**

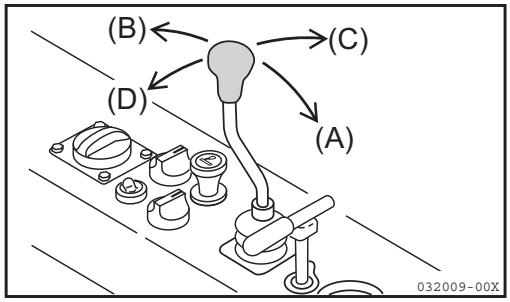
**Be sure to set the dump lock lever to the lock position before inspecting, servicing or storing the machine.**

Use this lever to lock the dump lever. When dump lock lever is pushed down, the dump lever is locked.

**(3) Dump lever**

**⚠ WARNING**

- **Be aware that the machine body may be raised suddenly and tip over due to its momentum when dumping the wagon on a slope.**
- **It is dangerous to run the machine with the wagon in the dump position, because the machine will be unstable.**
- **When traveling with the machine, keep the wagon parallel to the crawlers. If the machine travels with the wagon swung to the right or the left, the machine will be unstable. (For the swing wagon type.)**
- **Make sure there are no persons near the machine before dumping the wagon.**




Use this lever to dump and lower the wagon. For the swing wagon type, the dump lever is also used for the swing operation of the wagon.

(A) Dump : The wagon is raised.
(B) Lower : The wagon is lowered.

For the swing wagon type
(C) Left swing : The wagon rear is turned to the right.
(D) Right swing : The wagon rear is turned to the left.

Neutral position : The wagon is stopped and kept in the position.

**(4) Travel levers**

## ⚠ WARNING

- **Never turn the machine on a slope or run it across the slope. Move down to flat ground and then make a turn to travel safely.**
- **Run the machine longitudinally on a slope. Never run the machine diagonally on a slope or across a slope to prevent it from overturning or skidding.**
- **Be sure to turn at low speed. Making a turn at high speed or a spin-turn may cause a load shift or falling load.**
- **Do not return the travel levers to neutral position quickly while the machine is traveling at high speed.**
  **Return the travel levers to neutral position slowly.**

**IMPORTANT**

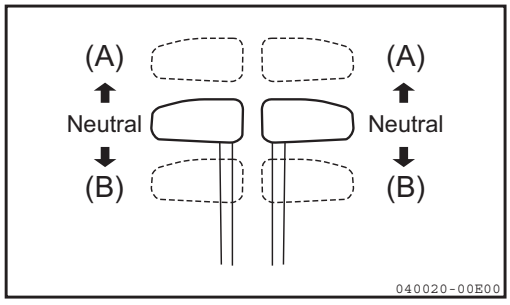
**Note that the center of turn of the machine varies depending on whether the wagon is in loaded or unloaded state.**

The travel levers control the traveling of the machine.

(A) Forward : Push the travel levers forward together.

(B) Reverse : Pull the travel levers backward together.

Neutral position : The machine stops.



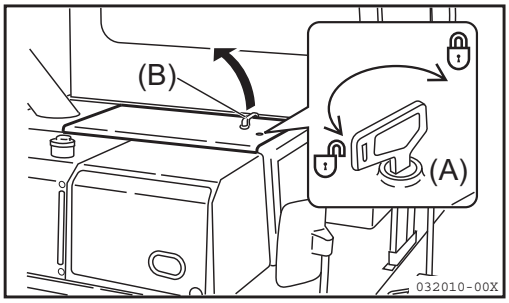
## 12-4. Engine hood

**⚠ WARNING**

- **Do not open the engine hood while the engine is running. Check and service the engine after it has been stopped and temperatures have cooled.**
- **Be extremely careful in windy weather as the engine hood may be closed by a strong wind.**

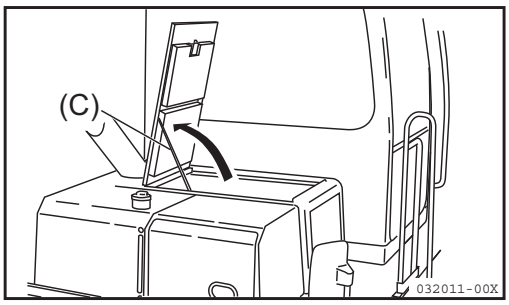
**(1) Opening the engine hood**

1) Insert the starter switch key into the cylinder key (A) and turn it counterclockwise to unlock the engine hood.
2) Turn the handle (B) to the right and lift the engine hood.
3) Set the stay (C) up and insert it into the stay hole in the engine hood to hold it.

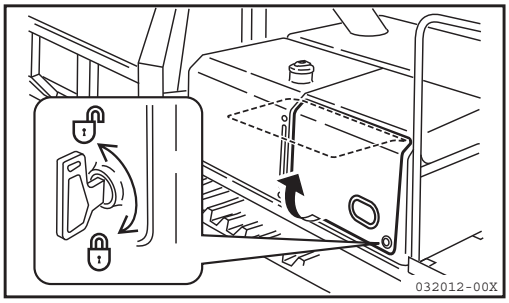



**(2) Closing the engine hood**

1) Remove the stay (C) while supporting the engine hood by hand and put it back in the holder.
2) Close the engine hood softly and press it down holding the handle (B) in your hand.
3) Insert the starter switch key into the cylinder key (A) and turn it clockwise to lock the engine hood.



## 12-5. Side cover




The air cleaner, the pre fuel filter and the main fuel filter are stored in the cover.

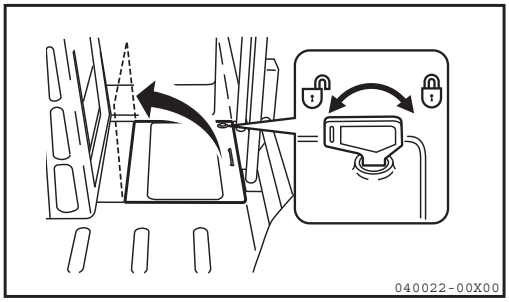
**(1) Opening of the side cover**

1) Insert the starter switch key and turn it counterclockwise to unlock the side cover.
2) Fully open the cover, and the cover is locked.

**(2) Closing of the side cover**

1) Hold the side cover by hand and disengage the stay to release the lock.
2) Close the side cover softly.
3) Insert the starter switch key and turn it clockwise to lock the side cover.

## 12-6. Battery cover




The battery is stored in the battery cover.

**(1) Opening of the battery cover**

1) Insert the starter switch key and turn it counterclockwise to unlock the battery cover.
2) Fully open the cover, and the cover is locked.

**(2) Closing of the battery cover**

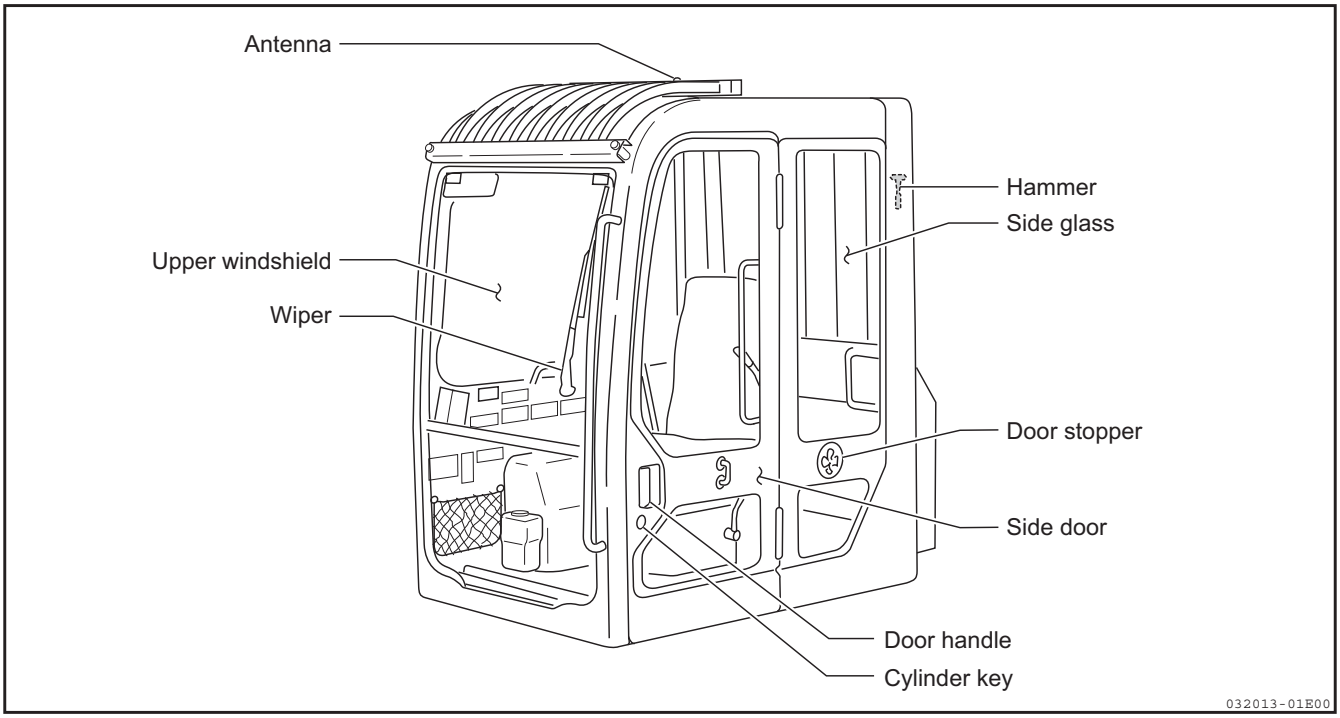
1) Hold the battery cover by hand and disengage the stay to release the lock.
2) Close the battery cover softly.
3) Insert the starter switch key and turn it clockwise to lock the battery cover.

## 12-7. Cabin

### 12-7-1. Handling the cabin

**⚠ WARNING**

- **To avoid bodily injury while operating the machine, make sure the side door and upper windshield are securely locked in either the open or shut position.**
  **If they are not securely locked, they may open or close unexpectedly.**
- **Never stick your hands or your head out of an open side door or windshield.**



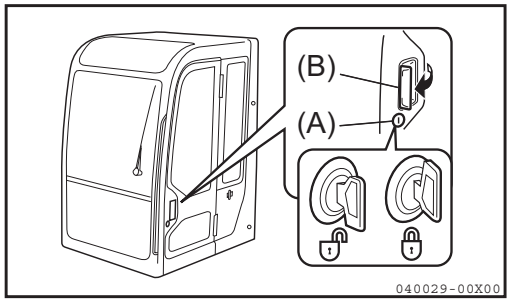

**⚠ WARNING**

**Both the upper and lower windshields can be opened and closed.**
**Securely lock the upper and lower windshield with the locks when storing or closing them.**

### 12-7-2. Opening and closing the cabin side door

■ **From outside**

1) Insert the starter switch key into the cylinder key (A).

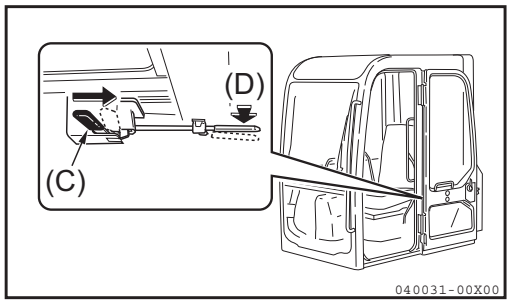



2) Turn the key clockwise to unlock the side door.

3) Pull the door handle (B) to the side to open the side door.

4) Fully open the side door and press it on the cabin until the latch clicks, and the side door can be latched with it open.

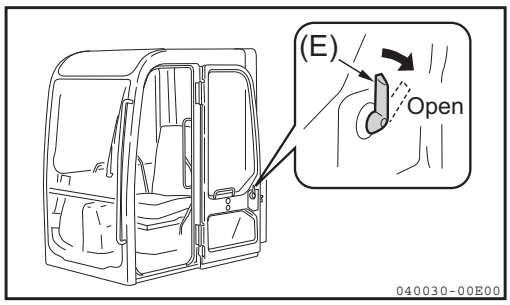
5) When closing the side door latched with it open, push forward the release lever (C) or push down the release lever (D) inside the cabin.




6) Close the unlatched side door and turn the starter switch key counterclockwise to lock the side door.

■ **From inside**

1) Turn the inner handle (E) forward, and the side door opens.

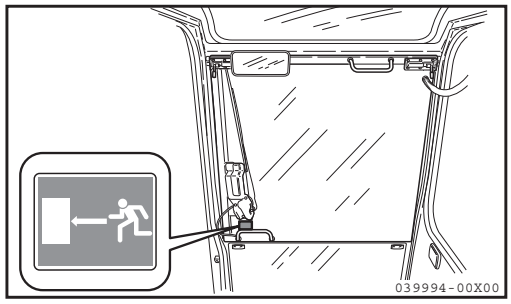



2) When closing the side door latched with it open, push forward the release lever (C) or push down the release lever (D) inside the cabin to unlatch the side door.

3) Close the side door grasping the door handle.

### 12-7-3. Emergency exit

If the door of the cabin should not open, open the front windshield to escape from the operator's cab.

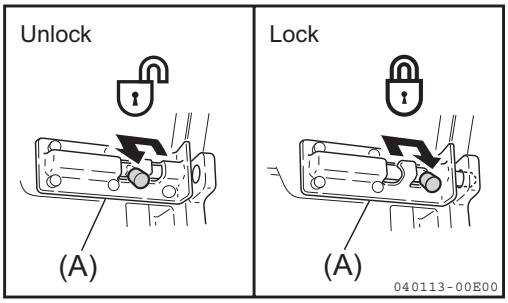


### 12-7-4. Opening and closing the upper windshield

**⚠ WARNING**

- **To avoid bodily injury, securely grasp the handles with both hands when opening and closing the windshield.**
- **To avoid bodily injury while operating the machine, make sure the upper windshield is securely locked when it is in the open position. If it is not securely locked, it may close unexpectedly.**
- **Never stick your hands or your head out of an open windshield.**

The upper windshield can be opened and closed from inside and housed under the ceiling. When opening and closing the upper windshield, follow the steps below.



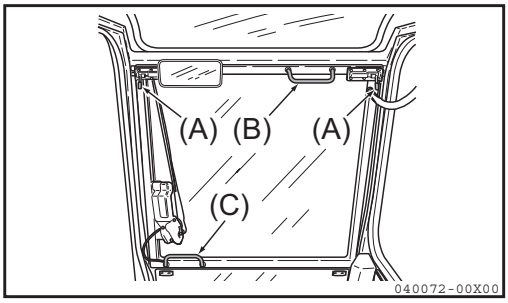

■ **Opening the upper windshield**

1) Set the lock lever of the right and left stoppers (A) to the unlock position to unlock the upper windshield.

2) Grasp the lower handle (C) and the upper handle (B) with your left and right hands, respectively.

3) Raise the upper windshield and then slide it backwards.

4) Set the right and left stoppers (A) in position to lock the upper windshield securely while it is housed under the ceiling.

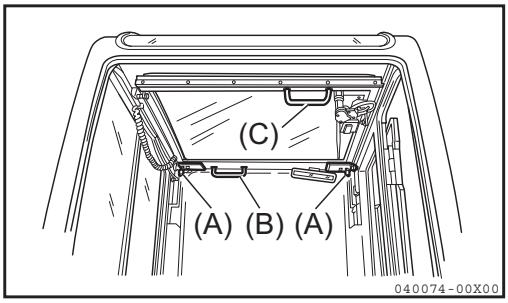



■ **Closing the upper windshield**

1) To close the upper windshield, set the lock lever of the right and left stoppers (A) to the unlock position.

2) Grasp the handles (B) and (C) to lower the upper windshield slowly.

3) Set the right and left stoppers (A) in position to lock the upper windshield securely.



### 12-7-5. Opening and closing the lower windshield

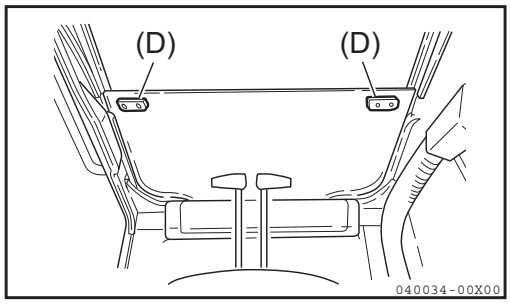
**⚠ CAUTION**

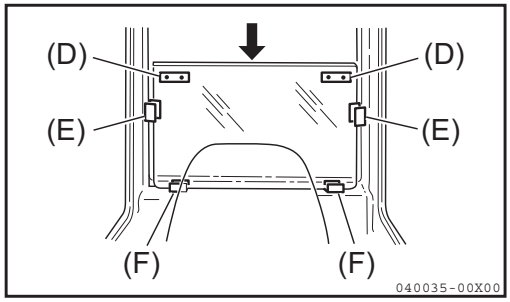
**Open and close the lower windshield only after the upper windshield is housed under the ceiling.**

1) Open and house the upper windshield under the ceiling.

2) Hold the lower windshield by the right and left projected parts (D) with your fingers to pull it out slowly.

3) Hold the lower windshield securely and put it on the supports (F) through the guides (E) at the rear of the cabin so that it is fixed.



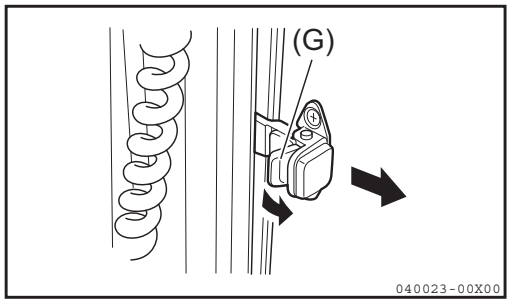




### 12-7-6. Opening and closing the right window glass

The windows on the right can be slid to the right and left directions.

1) Unlock the window by taking the stopper (G) with your fingers.

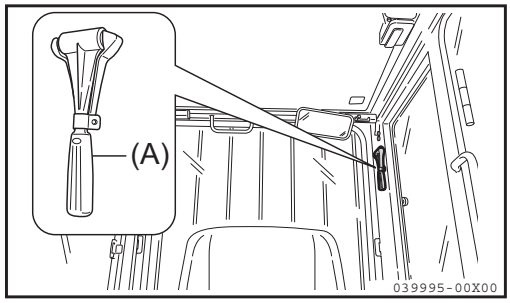
2) Slide the window to the rear side of the machine.




### 12-7-7. Hammer for emergency escape from operator's cab

If the door of the cabin should not open, hammer (A) is provided inside the cabin to escape from the operator's cab in an emergency.

Break the window glass with the hammer (A) to escape from the operator's cab.




**IMPORTANT**

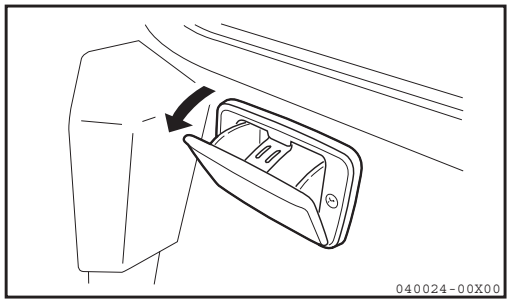
- **Remove the broken pieces of the window glass from the window frame to prevent any injury by those broken pieces.**
- **Watch your step not to slip on the broken pieces of the window glass which dropped around your feet.**

**12-7-8. Ash tray**

**⚠ CAUTION**

- **Be sure to completely put your matches and cigarettes out before placing them in the ash tray.**
- **Do not place any combustible matter in the ash tray.**
- **Be sure to close the ash tray when it is not in use, or it may cause a fire.**
- **Do not pile too much cigarette butts in the ash tray.**

Pull the ash tray toward you when using it. To empty and clean the ash tray, lift it up while pressing the metal part for knocking ash.



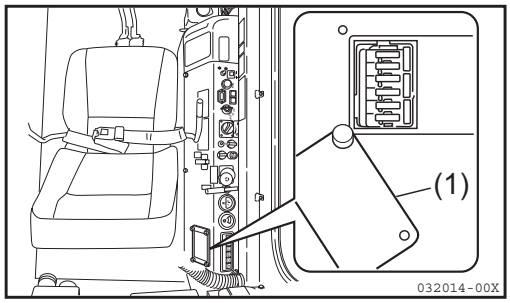
## 12-8. Fuse box

### 12-8-1. Fuse box

**⚠ CAUTION**

- **When replacing a fuse, be sure to turn off the power by turning the starter switch key to the OFF position.**
- **Using the wrong fuse or shorting out a fuse holder could damage the gauges, the electrical equipment and the wiring due to overheating.**
- **If a new fuse blows out immediately after replacement, there may be a problem with the electrical system. Ask your dealer for assistance.**

The fuses protect the electrical equipment and the wiring from a burnout.
If a fuse is corroded with white deposits or if a fuse is loose in the holder, it must be replaced with a new one.




■ **Replacing the fuses**

1) Turn the starter switch key to the "OFF" position.
2) Turn the knob to the left to remove the cover (1).
3) Replace fuse with a spare fuse of rated capacity.
   A spare fuse for each capacity of 10A, 15A, and 20A is attached beside the fuses.

There are two fuse boxes, one each at the Indicator box and near the battery.

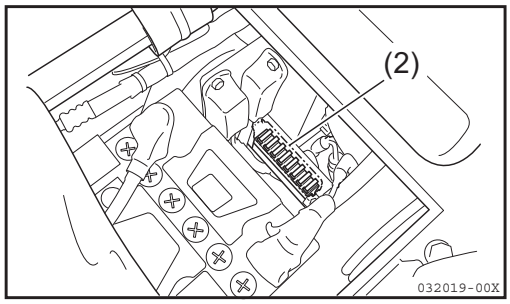
Fuse capacity and circuit name
The fuses are arranged in the order shown in the list below.

**Fuse box #1 (indicator box)**

| Fuse capacity | Circuit name |
|---|---|
| 10A | Meter unit |
| 10A | Startup control, controller |
| 15A | Wipers and washer, radio, cigar lighter, room lamp |
| 10A | Winker lamps, reverse buzzer |
| 10A | Horn, radio backup |
| 10A | Starter |
| 20A | Spare fuse |
| 10A | Spare fuse |
| 15A | Spare fuse |

**Fuse box #2 (battery)**

With the battery cover removed, open the fuse box cover (2) on the right-hand side of the battery.

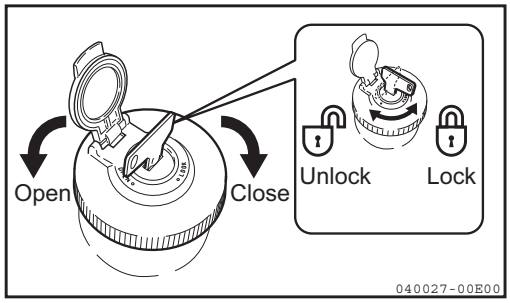



| Fuse capacity | Circuit name |
|---|---|
| 10A | Feed pump |
| 20A | Lights |
| 10A | Heater (option) |
| 20A | Air conditioner (option) |
| 10A | Solenoid |
| 20A | ECM |
| 10A | Option |
| 20A | ECM |

## 12-9. Fuel supply port cap

The fuel supply port cap is equipped with a locking system.
Open and close it with the starter switch key.

### 12-9-1. Locking and unlocking the fuel supply port cap




**■ Unlocking the fuel supply port cap**

1) Open the fuel supply port cap cover and insert the starter switch key.

2) Turn the starter switch key clockwise to unlock the fuel supply port cap.

3) Turn the fuel supply port cap counterclockwise to remove it.

**■ Locking the fuel supply port cap**

1) Install the fuel supply port cap and turn it clockwise.

2) Turn the starter switch key counterclockwise to lock the fuel supply port cap.

3) Pull out the starter switch key, and close the fuel supply port cap cover.

## 12-10. Operator's seat

**⚠ WARNING**

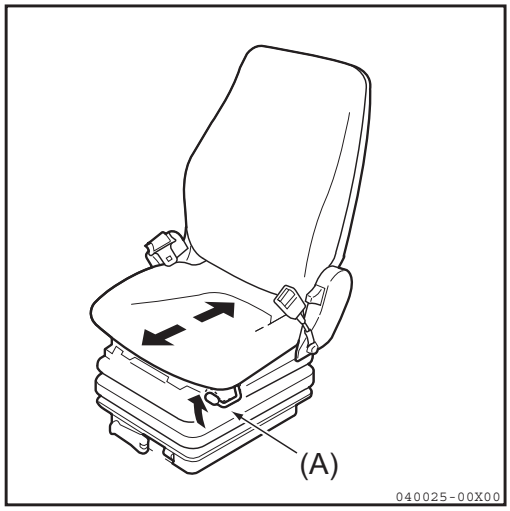
- **Be sure to adjust the seat slide to obtain the best operating position whenever a new operator begins work.**
- **Do not place any objects within the moving area of the operator's seat.**
- **Do not adjust the operator's seat while operating the machine.**

Adjust the seat so that the operator can easily operate the control levers in good posture.

### 12-10-1. Seat position control

■ **Fore/aft adjustment**

1) Pull lever (A) upward to slide the seat forward and backward.
   (Adjustable amount : 3.93 in. (100 mm))

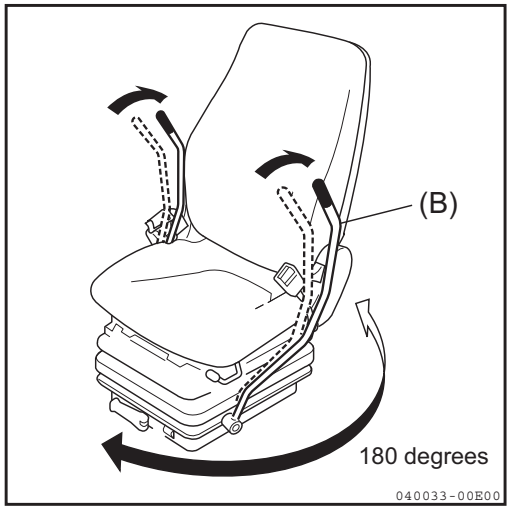



■ **Reversing operator's seat**

**⚠ WARNING**

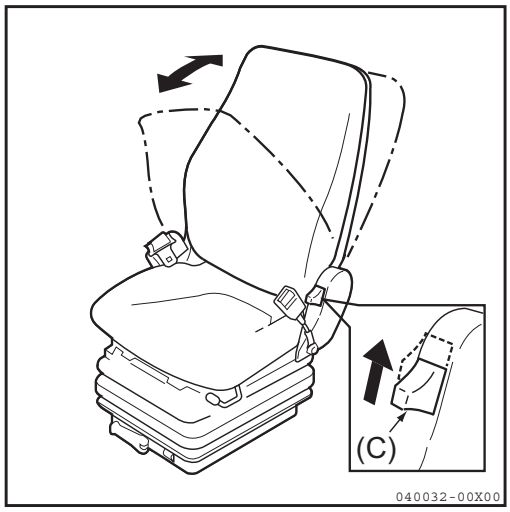
**Be sure to stop the engine when reversing the operator's seat, to avoid bodily injury.**

1) Pull the lock levers (B) back from their lock position to unlock the operator's seat, and turn the seat 180 degrees. After reversing the seat, check that the seat is locked. When the seat is locked, the lock levers (B) automatically return to their lock position.



■ **Backrest angle adjustment**

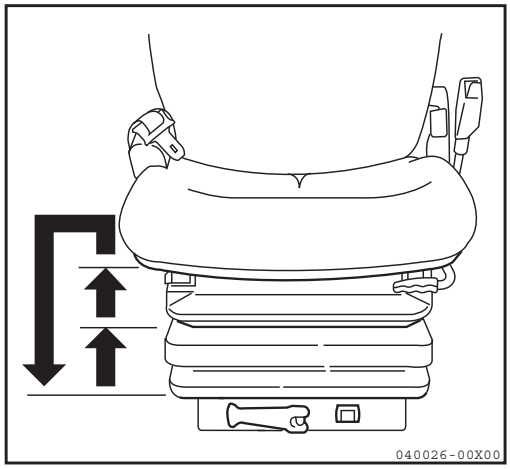
1) Pull lever (C) upward to latch into the desired position.
   (Adjustable amount : 90 degrees)




**12-10-2. Suspension part control**

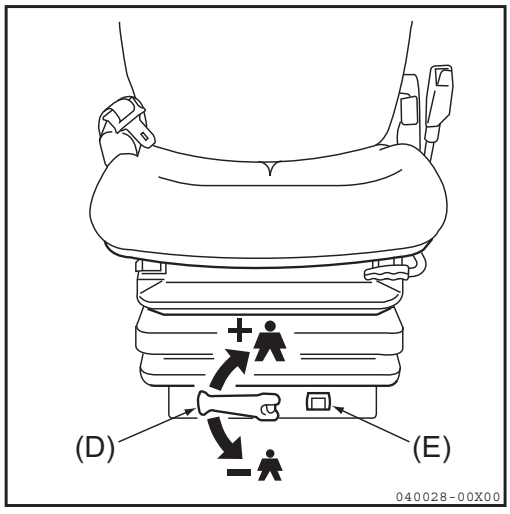
■ **Height adjustment**

1) Raise the operator's seat to the required height until it audibly latches into place.
2) When the operator's seat is raised above the highest setting, it drops back down to the lowest position.
   (Adjustable amount : 3 positions)
   (Suspension stroke : 3.94 in. (100 mm))



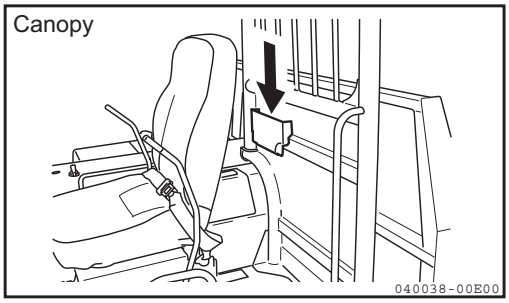

■ **Weight adjustment**

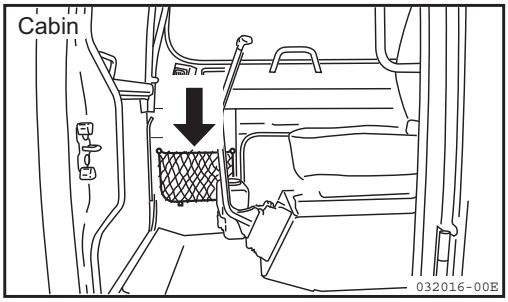
1) The seat can be adjusted for the operator's weight by turning the weight adjuster lever (D) with the seat empty.
   The setting weight can be read at the indicator (E).
2) Turn the weight adjuster lever (D) clockwise, the setting weight is increased.
3) Turn the weight adjuster lever (D) counterclockwise, the setting weight is decreased.
   (Adjustable weight : 110 to 287 lbs. (50 to 130 kg))



## 12-11. Storage pocket for the operation & maintenance manual

The storage pocket have been provided at the positions shown in the figure at the right. Keep the operation & maintenance manual in a nylon bag and store it in either of the storage pocket so that you can refer to it whenever you need.



## 12-12. Wagon stopper

**⚠ WARNING**

**Be sure to install the wagon stopper to hold the wagon when inspecting or servicing the machine with the wagon in the dump position.**

The wagon stopper is the lock device to prevent a fall of the wagon. To install and remove the wagon stopper, follow the procedures below.

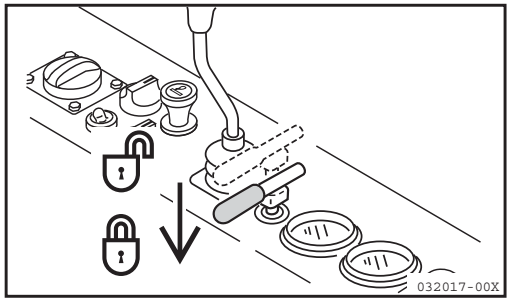
### ■ Installation of the wagon stopper

1) Start the engine and idle it.

2) Set the dump lever to the dump position, and dump the wagon fully.

3) Lock the dump lever and stop the engine.

4) Install the wagon stopper to the wagon.



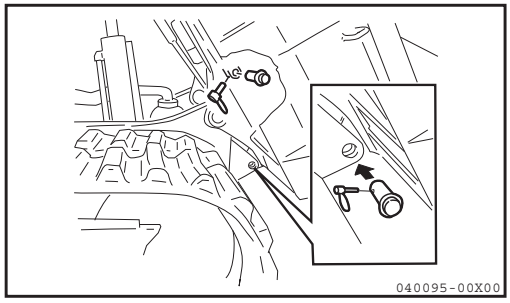

### ■ Removal of the wagon stopper

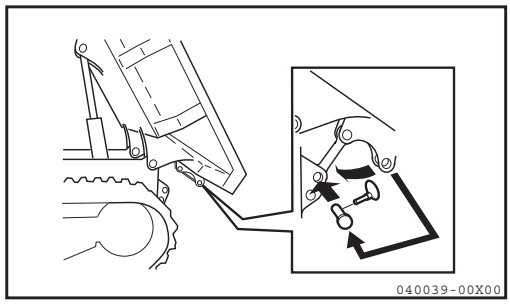
1) Unlock the dump lever and slightly move it to the dump side to remove the wagon stopper.

2) Remove the wagon stopper.

3) Lower the wagon fully.

4) Store the wagon stopper in the specified position.



# 13. Operating Instructions

## 13-1. Checking before starting the engine

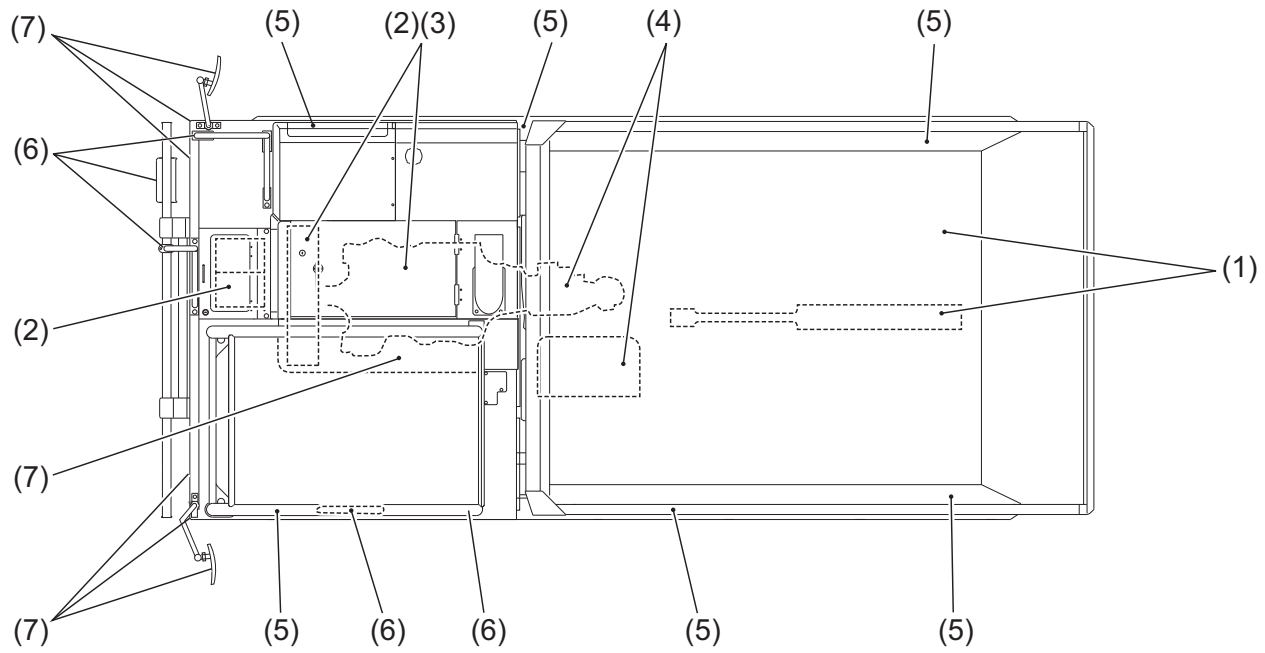
### 13-1-1. Walking check (visual inspection) around the machine

Before starting the engine, visually check the outside and underside of the machine as follows:
Check bolts and nuts for loose connections; check the fuel, oil, and water for leaks; and also check the wagon and the hydraulic system to see that they are operating properly. In addition, check the electrical wiring for loose connections and for dust deposits in the heat build-up areas.

**⚠ WARNING**

- **If there are any combustibles in any heat build-up areas, or if there are any fuel and/or oil leaks, a fire can result.**
- **Check for possible fire causes carefully. If there is anything abnormal, be sure to take corrective action or contact your dealer.**

Check the following points before initial start-up for the day.



**(1) Checking the wagon, hydraulic cylinder, pins, and hoses for damage, wear and loose connections**

Check the wagon, hydraulic cylinder, pins, and hoses for damage, excessive wear and loose connections. If any abnormality is found, take corrective action.

**(2) Removing dust deposits from around the engine, battery, and radiator**

Check to confirm that there are no dust deposits or other combustibles around the engine, on the radiator, or in other heat build-up areas, such as the muffler. If there are any, remove them.

**(3) Checking the engine and its accessories for oil or water leakage**

Check the engine for oil leakage and the cooling system for water leakage.
If oil or water leakage is found, take corrective action.

**(4) Checking the hydraulic system, hydraulic oil tank, hoses, and joints for oil leakage**

Check for oil leakage. If oil leakage is found, take corrective action.

**(5) Checking the undercarriage (crawlers, sprockets, rollers, and idlers) for breakage, wear, loose bolts, and oil leakage around the rollers**

If any breakage or wear is found, correct it. Retighten the bolts if necessary.
If oil leakage is found, take corrective action.

**(6) Checking the handrails and safety guards for breakage and loose bolts**

If any breakage is found, take corrective action. Retighten the bolts if necessary.

**(7) Checking the gauges, monitor, switches, flashers, headlights, and rearview mirror for breakage and loose bolts**

Check the gauges, monitor, switches, flashers, headlights, and rearview mirror for breakage and loose bolts. If any abnormality is found, replace the gauge, monitor, switch, flasher, headlight, or rearview mirror with a new one, or retighten the bolts if necessary. Clean the surface of the gauges, monitor, switches, flashers, headlights, and rearview mirror.

**(8) Checking whether the windows have been on their groove and have no breakage (for cabin)**

Check whether the windows have been on their groove and have no breakage. If any breakage is found, replace the window with a new one. If the window gets off the groove or broken during operation, stop the operation and repair the window immediately.

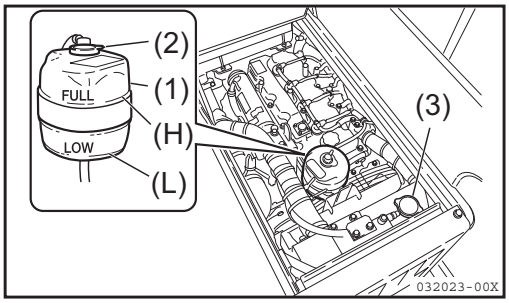
### 13-1-2. Checking before start-up

Check the following points before initial start-up for the day.

■ **Checking and replenishing the cooling water**

**⚠ WARNING**

- **Do not remove the fill cap from the radiator unless supplying the cooling water.**
- **Check the cooling water level in the sub-tank when the engine is cool.**



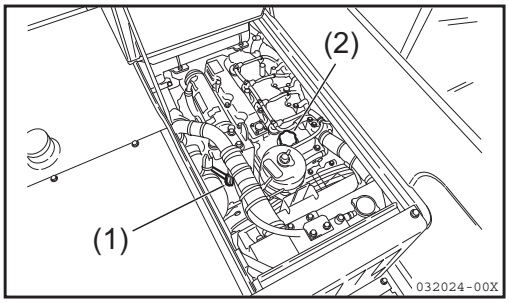

1) Open the engine hood. Then check whether the cooling water level in the sub-tank (1) (illustrated in the figure at the right) is between the H (FULL) and L (LOW) marks. If the water level is below the L mark, refill the sub-tank up to the H mark through the water supply port of the sub-tank (1).
   For the cooling water to be used, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".
2) After replenishing, securely tighten the cap (2).
3) If the sub-tank is empty, check it for water leakage, and then, check the water level in the radiator (3).
   If the water level is low, refill the radiator (3) first, then refill the sub-tank (1).
4) If the cooling water level is proper, close the engine hood.

■ **Checking and replenishing the engine oil**

**⚠ WARNING**

- **At operating temperature, the oil and dipstick areas are hot.**
  **Do not allow hot oil or hot components to contact the skin, to prevent bodily injury.**
- **Check the oil level and replenish oil after the engine has cooled down sufficiently.**

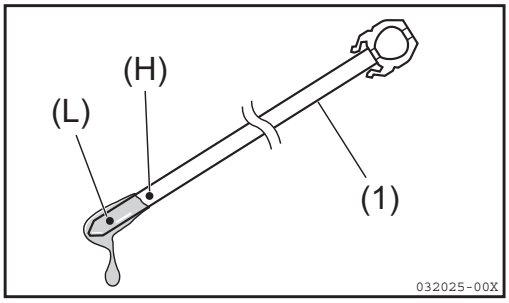
1) Open the engine hood and securely hold it in that position with stay.



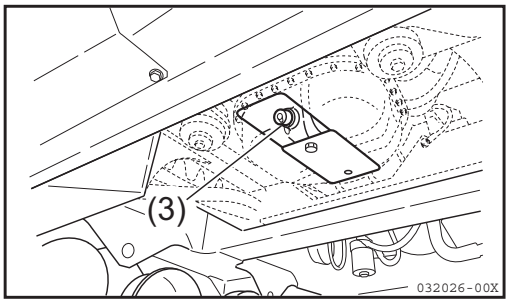

2) Pick up the dipstick (1) and wipe it with a rag to remove oil deposits.

3) Fully insert the dipstick (1) into the dipstick tube, then draw it out.

4) If the oil level is between the H (upper limit) and L (lower limit) marks, the engine oil level is appropriate. If the oil level is below the L mark, add engine oil through the oil supply port (2). For the quality of the engine oil to be used, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".




5) If the engine oil level is above the H mark, drain the excessive amount of oil through the drain plug (3), then recheck the engine oil level.
   Refer to Section "25-5-2. Checking and replenishing the engine oil".




6) After verifying that the amount of engine oil is appropriate, securely retighten the oil supply port cap and close the engine hood.

***Note :***

*When checking the engine oil level after starting up the engine, stop the engine and allow more than 15 minutes for the engine to cool down.*

*If the machine is slanted, reposition the machine to ensure it is level before checking the engine oil level.*

*Keep in mind that the excess engine oil must not be disposed of on the ground or the road.*

■ **Checking and replenishing the fuel in the fuel tank**

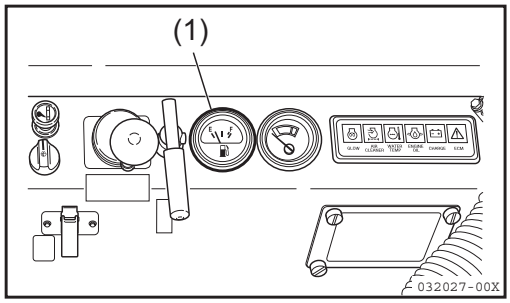
**⚠ WARNING**

**Be careful not to overfill the fuel tank because it could cause a fire. If the tank is overfilled, completely wipe off the spilled fuel.**

**⚠ CAUTION**

- **Do not remove the strainer from the fuel supply port of the fuel tank when supplying fuel.**
- **Be careful not to allow any water that may be in the fuel container or dirt on the refueling equipment to enter the fuel tank.**

1) Check the fuel level with the fuel meter (1). If the fuel level is low, add necessary fuel.



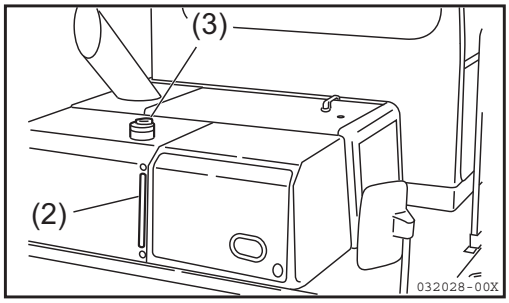

2) Turn the starter switch key to the "ON" position.

3) Remove the fuel supply port cap (3), and supply fuel to the fuel supply port, checking the fuel level with the fuel level gauge (2).

   When the fuel meter pointer (2) is at “E”, approximately 1.3 Gals. (5 L) of fuel is left in the tank.

   Fuel tank capacity : 25.1 Gals. (95 L)

   For the quality of the fuel to be used, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".



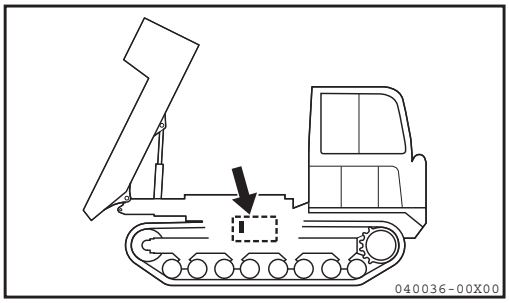

4) After refueling, securely retighten the fuel supply port cap (3).

■ **Checking and replenishing the hydraulic oil in the hydraulic oil tank**

**⚠ WARNING**

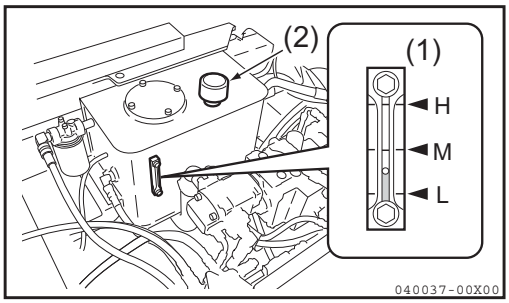
**Be sure to install the wagon stopper to hold the wagon when inspecting or servicing the machine with the wagon in the dump position.**

1) Park the machine on the level ground. Dump the wagon, set the dump lock lever to the lock position and stop the engine.




2) Hold the wagon with the wagon stopper.

3) Check the oil level gauge (1). If the oil level is between M and L mark on the level gauge, the hydraulic oil level is proper.




**IMPORTANT**

**Do not replenish hydraulic oil above the midpoint between M and L mark on the level gauge with the wagon in the dump position. It may cause the hydraulic oil to spout out. (When the wagon is lowered, the oil level reaches close to the M mark.)**

4) If the hydraulic oil level is below the L mark, remove the air breather (2) and refill the hydraulic oil tank until the oil level reaches the midpoint between M and L mark (specified level) on the oil level gauge.

For the hydraulic oil to be used, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".

## ■ Greasing

**⚠ WARNING**

**Be sure to install the wagon stopper to hold the wagon when inspecting or servicing the machine with the wagon in the dump position.**

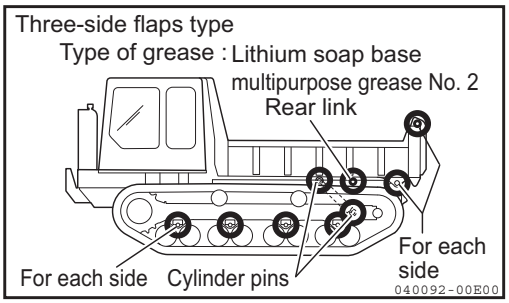
• Prepare a grease gun.

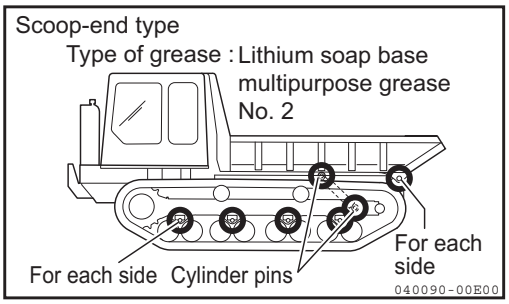
1) Clean the grease nipples indicated by circles in the figures at the right, and grease them with a grease gun.

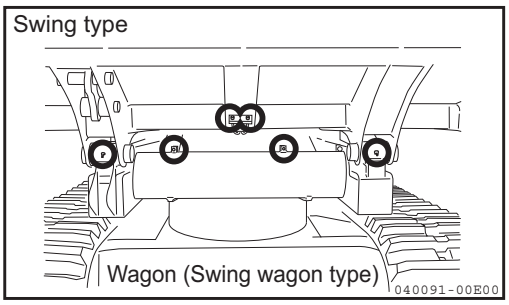
2) After greasing, wipe off any excess grease that remains.

Number of grease nipples:

• Wagon :
  • Three-side flaps type : 7
  • Scoop-end type : 4
  • Swing type : 6
• Crawlers : 8



■ **Checking and replenishing the battery electrolyte**

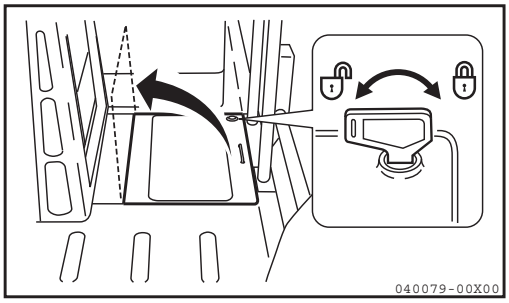
**⚠ DANGER**

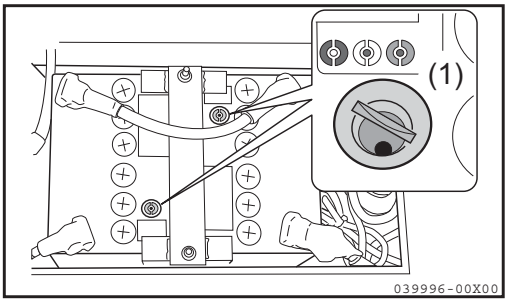
- **The battery generates flammable gas and can cause a fire and an explosion.**
  **Keep sparks, flames and lit cigarettes away from the battery.**
- **Battery electrolyte is strong acid. To avoid serious injury, do not allow the electrolyte to contact your skin or splash into your eyes.**
- **Always wear safety goggles and protective clothing, when adding electrolyte.**
- **Do not use the machine with the battery which is short of battery electrolyte. The shortage of battery electrolyte not only will reduce the life of the battery but also could cause an explosion.**

**IMPORTANT**

**If distilled water is used, add it to the battery electrolyte in the battery before operating the machine on the day to prevent it from freezing.**

1) Open the battery cover and check the indicator (1) on the battery for the electrolyte level and the amount of charge.



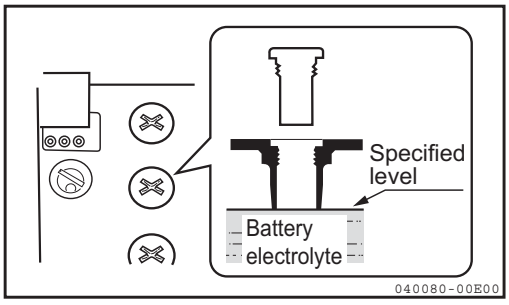




**How to check the indicator:**

◉ (Blue) : Normal

◉ (Red) : Low battery charge.
Recharge the battery.

◎ (White) : Shortage of battery electrolyte.
Replenish distilled water.



■ **Checking the electrical equipment**

**⚠ CAUTION**

**If a fuse blows out frequently or if the electrical wiring shows a sign of having been short-circuited, contact your dealer for assistance.**

Check the fuses for damage, the wiring for poor connections or short-circuits, and the battery terminals for corrosion and loose connections. If any connections are loose, retighten the connectors.

Especially, check the wiring for the following items carefully:

- Battery
- Starter motor
- Generator

**⚠ WARNING**

**If there are any combustibles in the heat build-up area around the battery, a fire can result. Be sure to remove any combustibles.**

Check the following items after the starter switch is turned to the "ON" position.

1) Check the monitor function

- Check the hourmeter, fuel meter and water temp. meter functions.
- Check the water temp. alarm lamp, engine oil pressure alarm lamp, battery charge alarm lamp and air cleaner alarm lamp.

2) Check that all switches function correctly and all lamps light correctly.

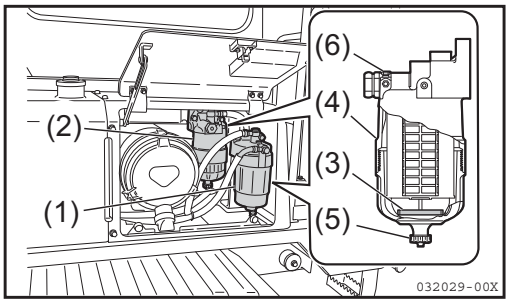
- Check the headlight.
- Check the horn.
- Check the flasher function.
- Check the wiper function (for cabin).

Check the heater function (for cabin).

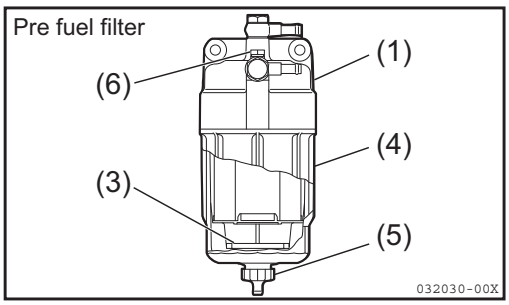
## ■ Inspecting/draining the fuel filter

If the red ring (3) has sunk down at the bottom of the case (4), it means that no water has mixed.
If the red ring (3) is floating in the cup, water is mixed into the oil under the red ring. In this case, to remove the water through the following steps.

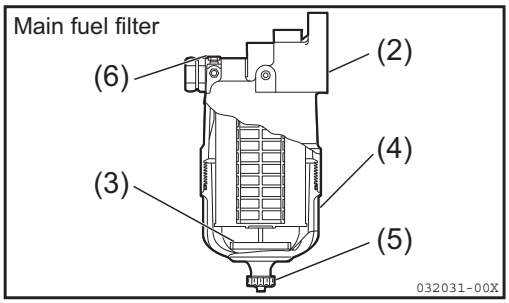
1) Open the side over.
2) Put a container for oil under the drain plug (5) of the pre fuel filter (1).
3) Loosen the air bleed plug (6).
4) Loosen the drain plug (5) to drain water.




5) Tighten the air bleed plug (6) and drain plug (5).
   Drain plug (5) tightening torque:
   1.5 to 2.5 N•m (0.15 to 0.25 kg•m)
   Air bleed plug (6) tightening torque:
   7.9 to 11.7 N•m (0.8 to 1.2 kgf•m)
6) Repeat the above steps for the main fuel filter (2).

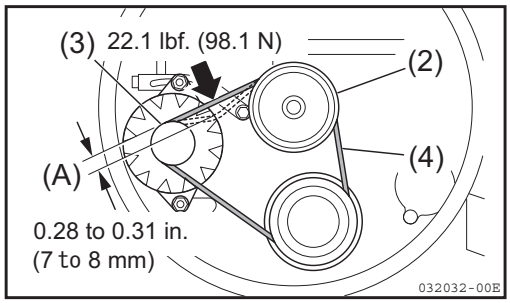



7) Bleed air from the fuel system.
   For instructions, see "Bleeding air from the fuel system" on page 3-50.
8) Drain the water and deposits in the fuel tank. For instructions, see "25.4.3 Draining the water and deposits in the fuel tank".




**IMPORTANT**
**After servicing the fuel system, check again for fuel leakage.**

## ■ Checking the fan belt tension




1) Open the engine hood.

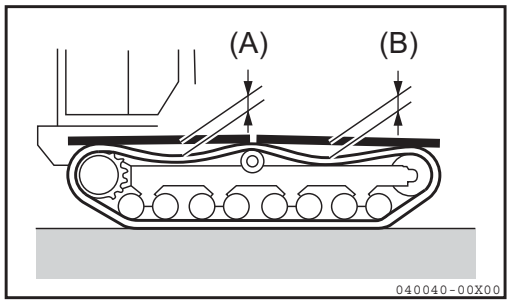
2) Press down on the fan belt between the fan pulley (2) and the generator pulley (3) with a finger, to check the fan belt tension.
Check the fan belt for cracks and peeling.

- Pressing force : Approximately 22.1 lbf. (98.1 N)
- Correct slack for (A) : 0.28 to 0.31 in. (7 to 8 mm)

3) If the tension is proper, close the engine hood.

## ■ Checking the crawler tension

Park the machine on the level ground and gather slack on the upper side of the rubber crawler. Place straight rods on the rubber crawler as illustrated in the figure at the right and check the slacks (A) and (B).




- Correct slack for (A) and (B) : 0.20 to 0.59 in. (5 to 15 mm)

### 13-1-3. Operating and checking instructions before starting up the engine

**⚠ WARNING**

- **Accidentally setting the lock levers to the unlock position can cause the machine to move suddenly, possibly causing a serious accident.**
- **When leaving the operator's seat, be sure to place the lock levers securely in the lock position.**

1) Confirm that the “SERVICING IN PROGRESS” tag is not attached.

2) Check that the travel levers are in neutral, that the lock levers (1) are in the lock position, and that the dump lever (2) is locked.

3) Fasten the seatbelt snugly.

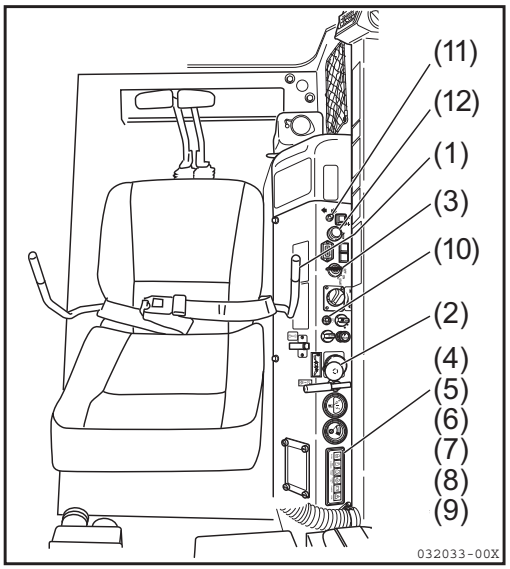
4) Insert the starter switch key into the starter switch (3) and set it to the “ON” position.

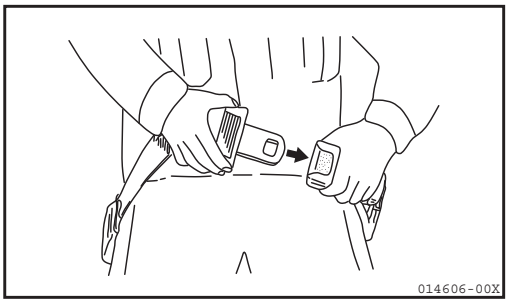
5) Then check the following points:

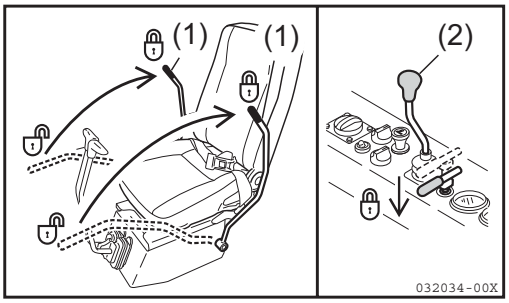
[1] The alarm lamps (4) and (5) on the monitor will keep lighting until the engine starts.

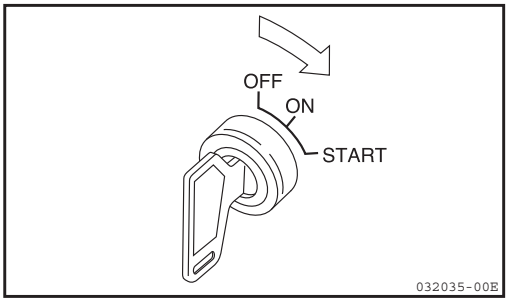
- Engine oil pressure alarm lamp (4)
- Battery charge alarm lamp (5)
- Engine trouble alarm lamp (6)
- Air cleaner alarm lamp (7) (It will goes off in 1 second)
- Water temperature alarm lamp (8) (It will goes off in 1 second)
- Glow lamp (9) (It will goes off in 1 second)

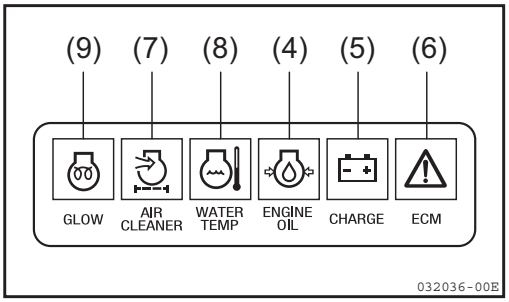
If any of the alarm lamps do not go on, it may mean that an alarm lamp has blown out or is broken. Take corrective action, or consult your dealer for assistance.



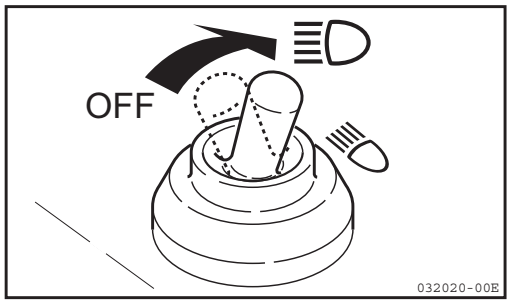



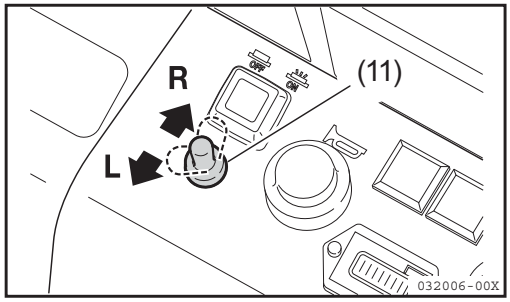



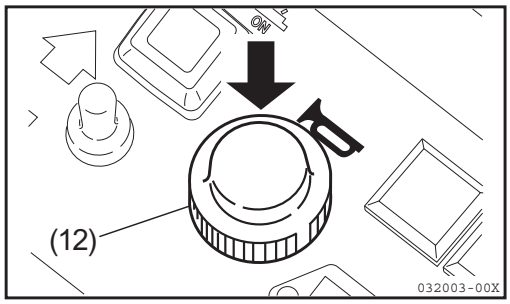
[2] Turn the light switch (10) to the " " position to see whether the headlights will go on. If either or both of them do not go on, the lamp(s) might have blown out or might be broken. Take corrective action, or consult your dealer for assistance.




[3] Operate the flasher switch (11) to see whether the flasher will flash. If either or both of them do not go on, the lamp(s) might have blown out or might be broken. Take corrective action, or consult your dealer for assistance.




[4] Press the horn switch (12) to see whether the horn will sound. If the horn does not sound, the horn might be defective or the wire might be broken. Take corrective action, or consult your dealer for assistance.

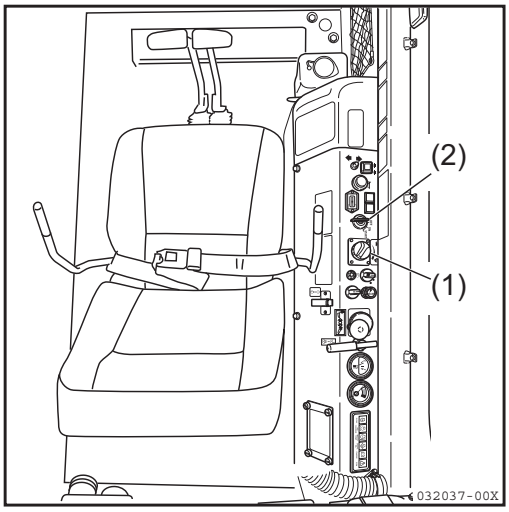


## 13-2. Starting up the engine

### 13-2-1. Normal start-up

**⚠ WARNING**

- **First check that there are no people or obstacles around the machine.**
  **Then sound the horn and start the engine.**
- **Be sure that you are seated on the operator's seat when starting the engine.**
- **When starting the engine in an enclosed place, be sure that there is adequate ventilation so that the exhaust gases can escape.**

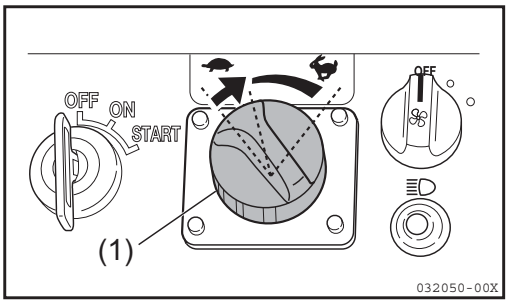



**IMPORTANT**

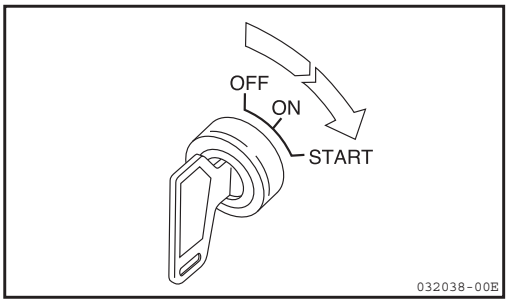
**To protect the starter motor and the battery:**

- **Do not keep the starter switch key in the "START" position for more than 10 seconds.**
- **If the engine fails to start, do not attempt to start the engine immediately again, but set the switch to the "OFF" position and wait for approximately 30 seconds, then start the engine again.**

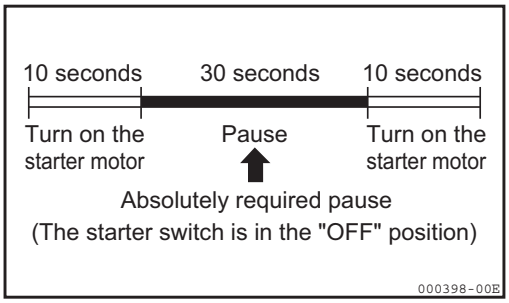
1) Turn the accelerator dial (1) clockwise slightly.




2) Set the starter switch key in the starter switch (2) to the "START" position. The engine will start.



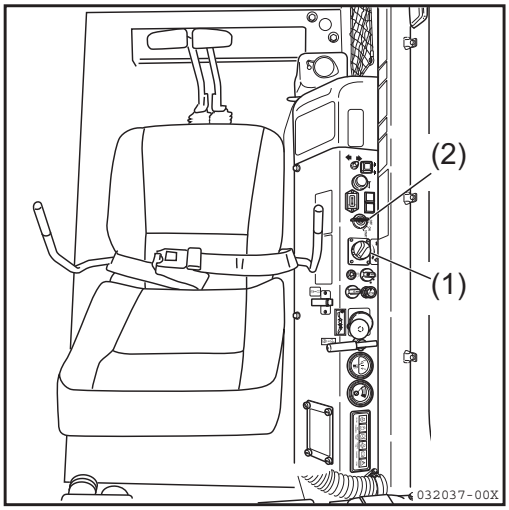

3) After the engine has started, let go of the starter switch key.
   The starter switch key will return to the "ON" position by itself.



### 13-2-2. Starting the engine in cold weather

**⚠ WARNING**

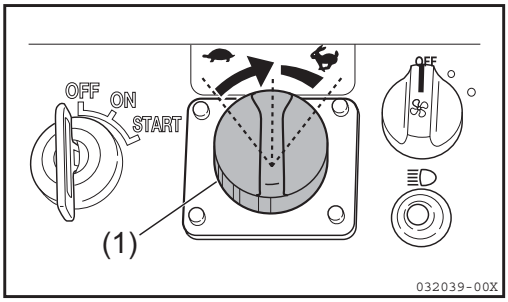
- **First check that there are no people or obstacles around the machine.**
  **Then sound the horn and start the engine.**
- **Be sure that you are seated on the operator's seat when starting the engine.**
- **When starting the engine in an enclosed place, be sure that there is adequate ventilation so that the exhaust gases can escape.**




**IMPORTANT**

**To protect the starter motor and the battery:**

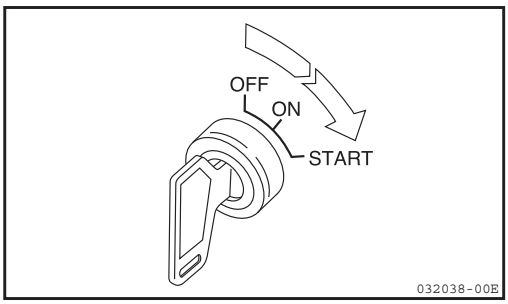
- **Do not keep the starter switch key in the "START" position for more than 10 seconds.**
- **If the engine fails to start, do not start the engine immediately again, but set the switch to the "OFF" position and wait for approximately 30 seconds, then start the operation from step 2).**
- **Traveling or operating the machine without adequate warming in cold weather may adversely affect the machine performance.**




To start the engine when the outside air temperature is low, follow the steps below:

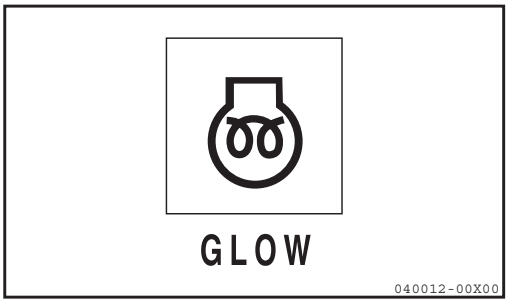
1) Turn the accelerator dial by half turn.

2) With the starter switch (2) key in the ON position, check if the glow lamp is lit.If the lamp is lit, wait till it turns OFF.



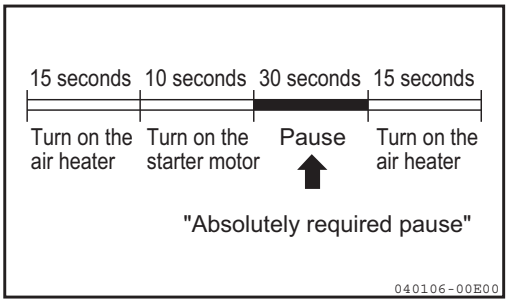

***Note :***

*The preheating time varies between 1 and 15 seconds depending on the cooling water temperature.*




3) Turn the starter switch key in the starter switch (2) to the "START" position to start the engine after the glow lamp goes off.

4) After the engine has started, let go of the starter switch key. The starter switch key will return to the "ON" position by itself.



## 13-3. Operating and checking instructions after starting the engine

**⚠ WARNING**

- **Emergency stop.**
  **If abnormal operation occurs, turn the starter switch key to the "OFF" position, to shut off the electrical system and the engine. Then ask your dealer to check the machine.**
- **Be sure to warm up the engine. If you operate the wagon without full warm-up, the wagon may not respond or operate properly, especially in cold weather.**

**IMPORTANT**

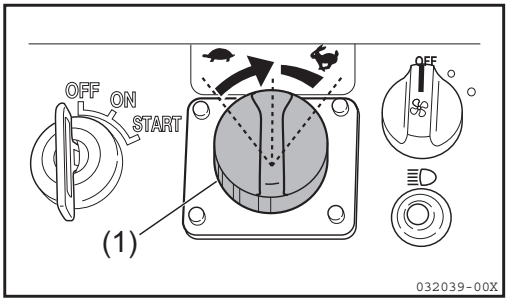
- **The proper hydraulic oil temperature is between 122°F and 176°F (50°C and 80°C).**
  **If you have to operate the machine at a low hydraulic oil temperature, increase the hydraulic oil temperature to about 68°F (20°C) before operating the implement.**
- **In the event that you have to operate any control lever at a temperature lower than 68°F (20°C), operate it gently.**
- **Do not accelerate the engine rapidly until the engine warms up.**
- **Do not keep idling at low or high speed for more than 20 minutes.**
  **When idling the engine is necessary, sometimes apply load or idle the engine at medium speed.**

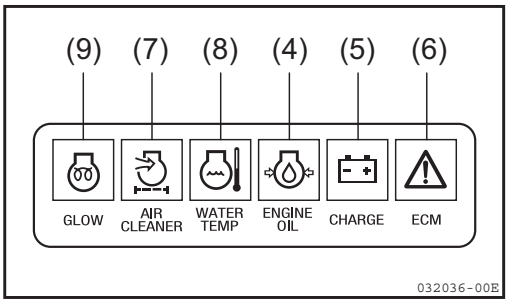
After starting the engine, do not start operating the machine immediately but follow this procedure:

1) Idle the engine, to check that the engine oil pressure alarm lamp (4) is off.
2) Turn the accelerator dial by half turn. Run the engine at medium speed for about 5 minutes under no load.
3) After warming up the engine, check that the gauges and the monitor are in the following status. If there is anything abnormal, take corrective action.

- Engine oil pressure alarm lamp (4) ..... Off
- Battery charge alarm lamp (5)..... Off
- Engine trouble alarm lamp (6)..... Off
- Air cleaner alarm lamp (7)..... Off
- Water temperature alarm lamp (8) ..... Off
- Glow lamp (9)..... Off

4) Check the exhaust gas color, the machine noise, and the vibration level for abnormality. If something is abnormal, take corrective action.



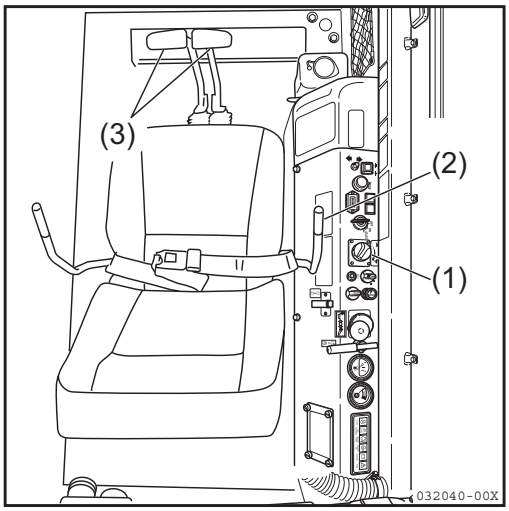



## 13-4. Traveling

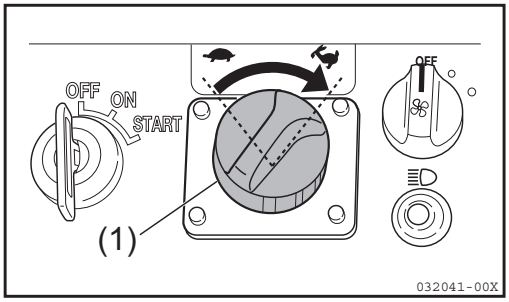
### 13-4-1. Traveling forward

**⚠ WARNING**

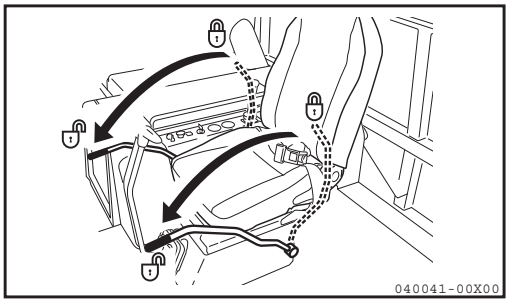
- **A signal person should be in attendance to give signals at sites which are dangerous or not clearly in view of the operator.**
- **Set the operator's seat to the desired direction and securely lock it.**
- **Sound the horn before beginning travel, to alert the people near the machine.**
- **Clear all people from the working area.**
- **Clear obstacles from the path of the machine.**
- **Do not operate the travel levers rapidly while the engine is running at high speed. Otherwise, the machine may move unexpectedly, causing a serious accident.**



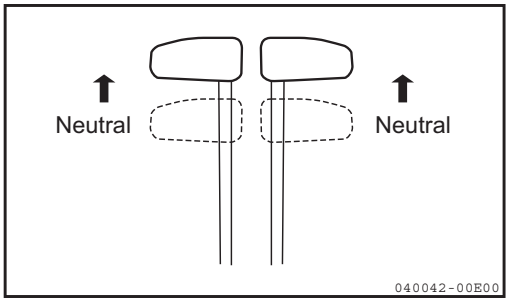

1) Turn the accelerator dial (1) fully clockwise, and increase the engine speed.




2) Push the lock levers (2) down to unlock the travel operation.



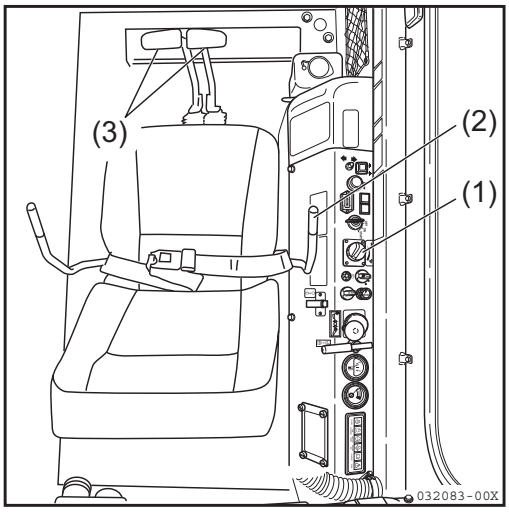

3) Slowly push the travel levers (3) forward to move the machine forward.



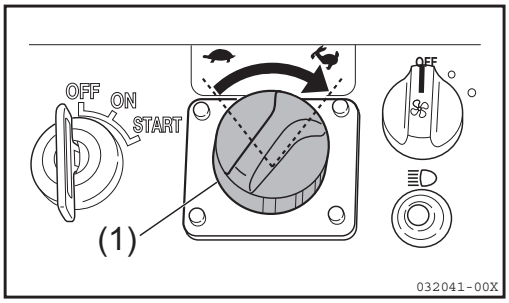
### 13-4-2. Traveling in reverse

**⚠ WARNING**

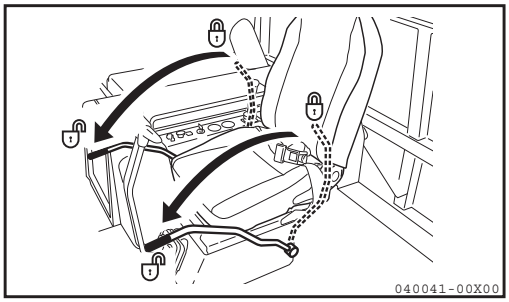
- **A signal person should be in attendance to give signals at sites which are dangerous or not clearly in view of the operator.**
- **Set the operator's seat to the desired direction and securely lock it.**
- **Sound the horn before beginning travel to alert the people near the machine.**
- **Clear all people from the working area.**
- **Clear obstacles from the path of the machine.**
- **There is a blind spot behind the machine. Make sure that no people are in the blind spot before traveling backwards.**
- **Do not operate the travel levers rapidly while the engine is running at high speed. Otherwise, the machine may move unexpectedly, causing a serious accident.**



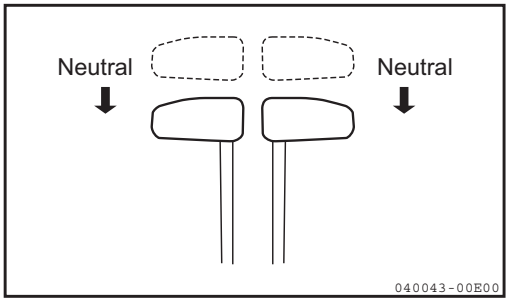

1) Pull the accelerator dial (1) to the "RUN" position to increase the engine speed.




2) Push the lock levers (2) down to unlock the travel operation.

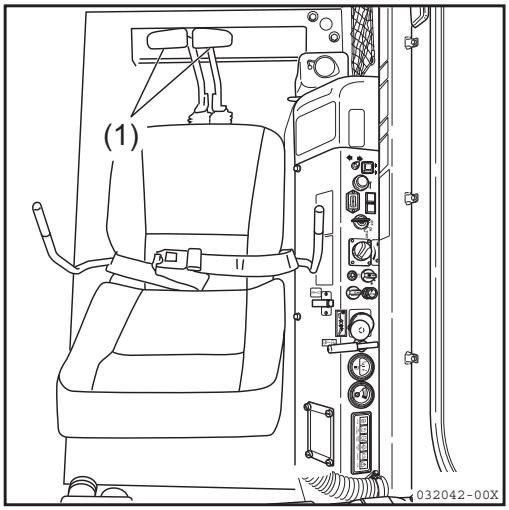



3) Slowly pull the travel levers (3) back to move the machine backwards.



## 13-5. Steering

### 13-5-1. Steering (turning the machine)




**⚠ WARNING**

- **Never turn the machine on a slope to prevent it from overturning or skidding.**
- **Never turn at high speed and spin-turn on concrete or asphalt roads to prevent machine hunting.**
- **Never turn at high speed on rough terrain.**

To steer the machine, operate the travel levers.

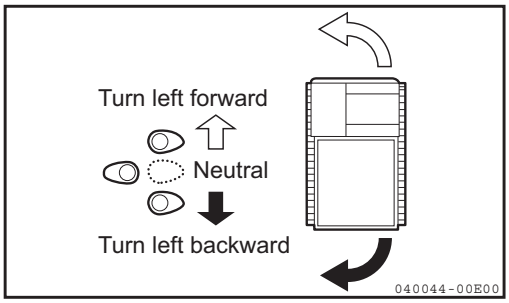
**IMPORTANT**

- **Be extremely careful that the turning radius of the machine varies depending on whether the wagon is in loaded or unloaded state, and on the road surface condition.**
- **Do not turn the machine too sharply.**

Operate the two travel levers (1) as follows:

■ **Steering the machine when it is not traveling**

To turn left, push the right travel lever forward and start traveling forward to the left. Pull the right travel lever back and start traveling in reverse to the left.

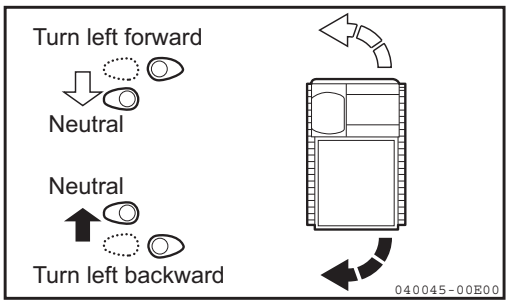



***Note :***

*To turn right, operate the left travel lever in the same manner as above.*

■ **Steering the machine while traveling (the left and right travel levers are both tilted in the same direction)**

To turn left, return the left travel lever to the neutral position.

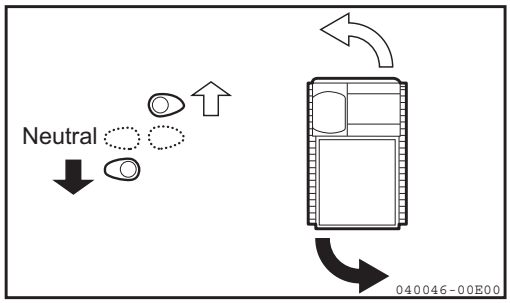



***Note :***

*To turn right, return the right travel lever to the neutral position.*

■ **Spin-turning the machine when it is not traveling**

To spin-turn left, push the right travel lever forward while pulling the left travel lever back.




***Note :***

*To spin-turn right, push the left travel lever forward while pulling the right travel lever back.*

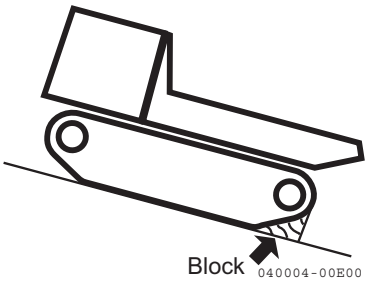
## 13-6. Stopping the machine

**⚠ CAUTION**

**Do not stop the machine suddenly but provide a safety margin.**

**⚠ WARNING**

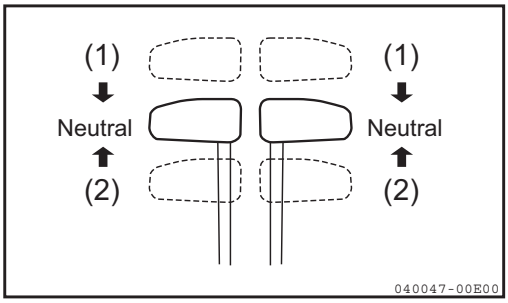
- **Park on solid, level ground.**
- **Do not park on a slope. If it is unavoidable to park on a slope, place solid blocks of wood behind the crawlers.**



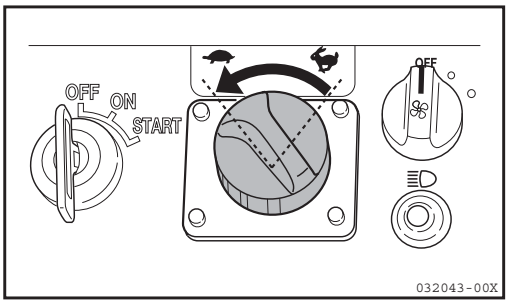

**⚠ WARNING**

- **Do not touch the control levers accidentally. Otherwise, the implement or the machine may move unexpectedly, causing serious bodily injury.**
- **Whenever leaving the operator's seat, be sure to place the lock levers securely in the lock position and remove the starter switch key.**

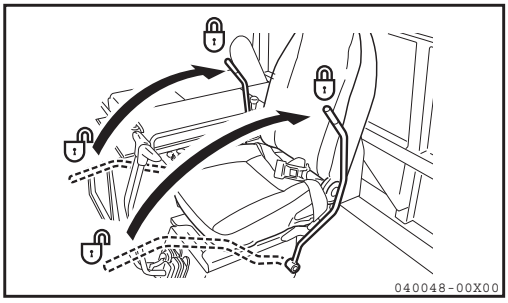
1) Set the right and left travel levers to the neutral position to stop the machine.




2) Return the accelerator dial to the “LOW IDLING” position.




3) Set the lock levers to the lock position.



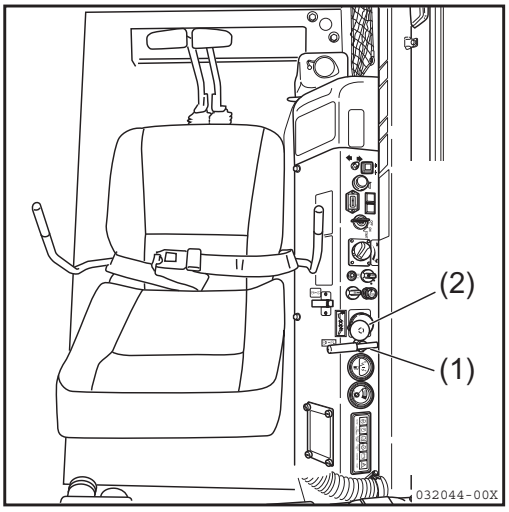
## 13-7. Dumping the wagon

**⚠ WARNING**

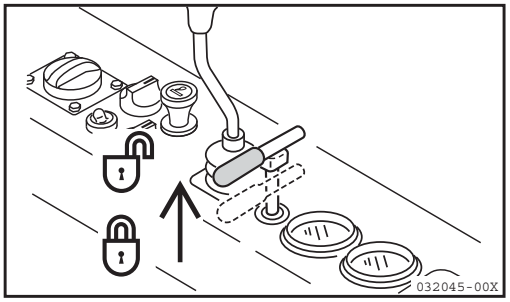
- **Check the area around the machine for safety before beginning to dump the wagon.**
- **Do not operate the dump lever while traveling.**

**⚠ CAUTION**

**When traveling with the machine, keep the wagon completely lowered. If the machine travels with the wagon dumped halfway, the machine could be damaged.**

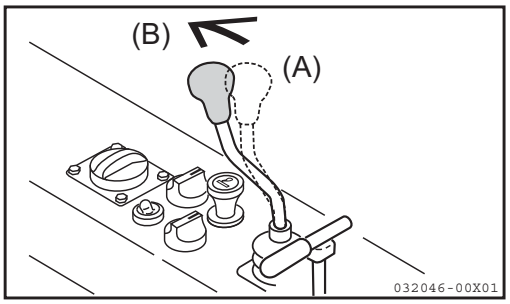



1) Pull up the dump lock lever (1) to set it to the unlock position before dump operation.




2) Operate the dump lever (2) to dump the wagon. To control the dump speed, operate the accelerator dial.

3) After completing the dump operation, set the dump lever to the lower position to lower the wagon completely.
   (A) : Dump
   (B) : Lower



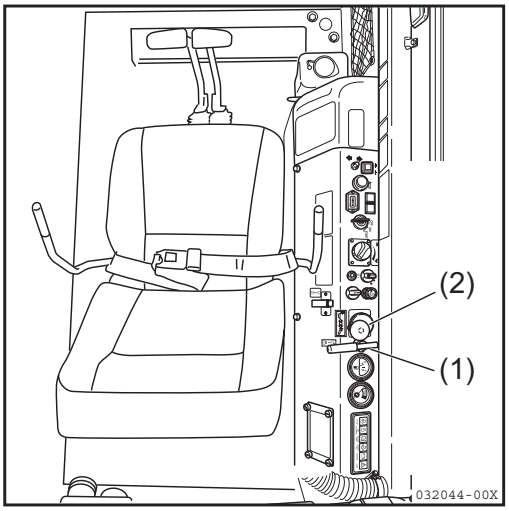
## 13-8. Swinging the wagon (for the swing wagon type)

### ⚠ WARNING

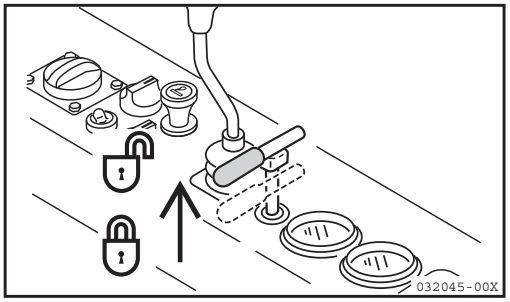
- **Before swinging, make sure that there are no people or obstacles within the swing range of the wagon.**
- **Do not operate the dump lever while traveling.**

### ⚠ CAUTION

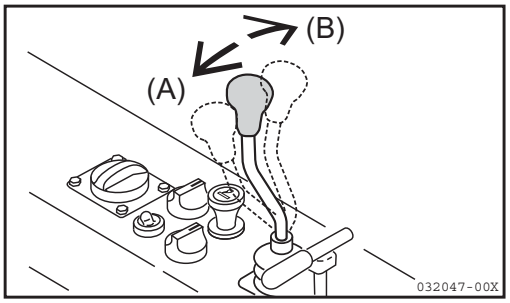
**When traveling with the machine, keep the wagon parallel to the crawlers. If the machine travels with the wagon swung to the right or the left, the machine will be unstable.**




1) Pull up the dump lock lever (1) to the unlock position before swing operation.

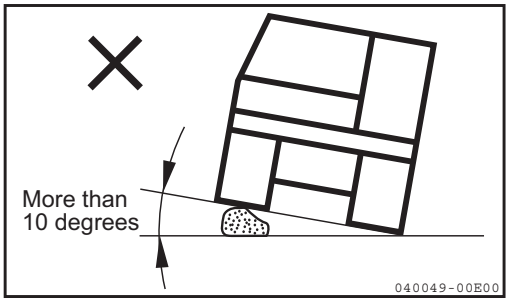



2) Operate the dump lever (2) to swing the wagon. To control the swing speed, operate the accelerator dial.
   (A) : Right swing
   (B) : Left swing



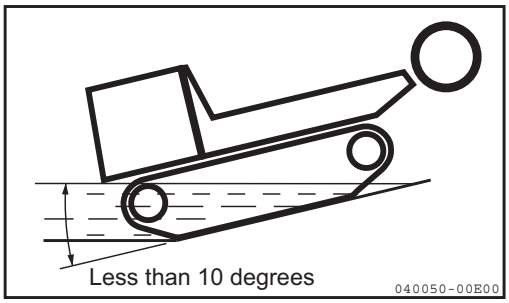
## 13-9. Precautions for working

### ■ Precautions for traveling



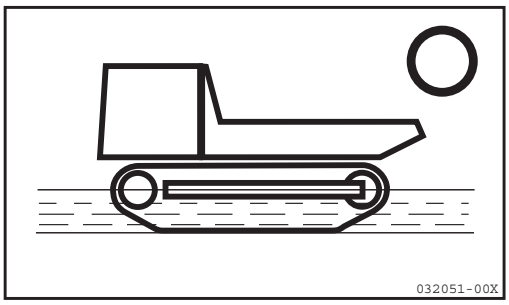

Driving over a stone or a stump subjects the machine (especially undercarriage) to a shock, which may cause damage to the machine.
Avoid such obstacles by driving around them, or removing them.
If driving over them is unavoidable, reduce speed, and drive over the obstacles with the center of the track shoes.

### ■ Allowable water depth




**IMPORTANT**

**When driving out of water, if the machine goes up a slope at an angle of more than 10 degrees, the front frame may submerge too deeply in the water, which may damage the radiator fan. Avoid this if possible when driving out of water.**

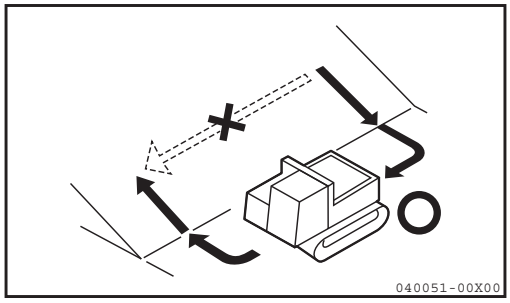



The limit of the water depth in which the machine can be used in is up to the center of the travel reduction gear.
Apply a generous amount of grease to the parts (especially the portions listed below) that have been submerged in the water for a long time until the used grease is extruded out of the bearings.

- Track roller vibrating plate portion
- Wagon support pins
- Dump cylinder support pins

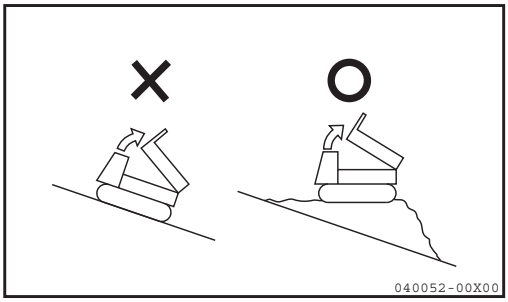
## 13-10. Precautions for going up and down a slope

■ **Going up and down a slope**



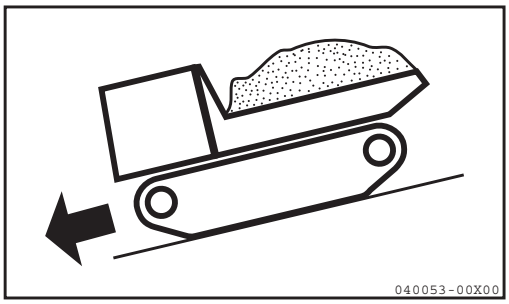

**⚠ WARNING**

- **Run the machine at low speed on a slope of 9 to 10 degrees or more, with the automatic speed change switch turned off (for traveling at low speed) and the engine throttled down to medium speed or lower.**
- **When driving over obstacles such as foot paths, drive the machine slowly.**
- **Never turn on or traverse a slope.**
  **Descend to flat ground to make a course change.**
- **Recognize that the machine may roll over when dumping the wagon on a slope.**
  **Do not dump the wagon toward the downward side of the slope.**
  **If dumping is unavoidable, first lay earth on the slope to maintain the machine as horizontal as possible, then dump the wagon.**
- **Do not travel on a slope of 20 degrees or more, as the machine may upset.**




1) To go down a steep slope, run the machine at low speed with the automatic speed change switch turned off, the travel levers placed slightly forwards and the engine throttled down to medium speed or lower with the accelerator dial.
   To go up or down a slope of 15 degrees or more, run the machine at low engine speed if the wagon is unloaded.

2) When the wagon is loaded, run the machine in the posture as shown in the figure at the right.



### ■ Braking when going down a slope

When going down a slope, you can automatically brake the machine by setting the travel levers to the neutral position.

### ■ When the crawler is slipping

If the crawler is slipping while the machine is going up a slope, stop traveling, descend the slope and take the other route.

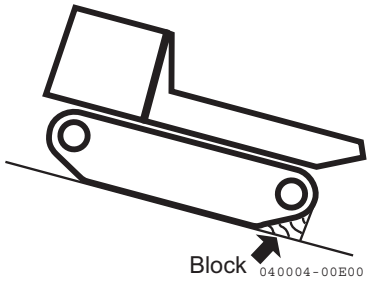
## 13-11. Parking the machine

**⚠ CAUTION**

**Do not stop the machine suddenly but provide a safety margin.**

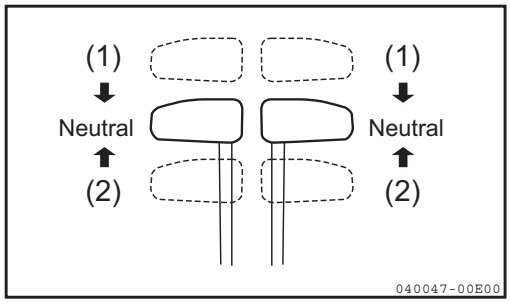
**⚠ WARNING**

- **Park on solid, level ground.**
- **Do not park on a slope. If it is unavoidable to park on a slope, place solid blocks of wood.**



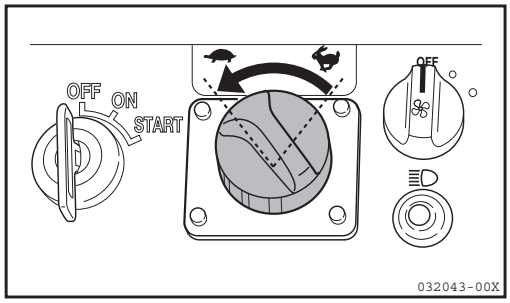

**⚠ WARNING**

- **Be careful not to set the lock levers to the unlock position accidentally. Otherwise, the machine may move unexpectedly, causing a serious accident.**
- **When leaving the operator's seat, be sure to place the lock lever securely in the lock position and remove the starter switch key.**



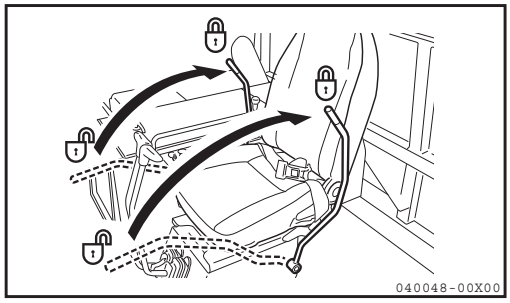

1) Set the travel levers to the neutral position.

2) Return the accelerator dial to the “LOW IDLING” position to idle the engine at low speed.



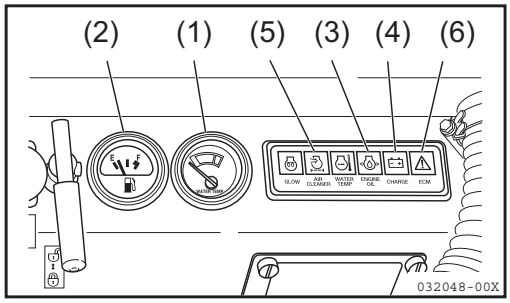

3) Set the lock levers to the lock position.

4) Lower the wagon and lock the dump lever.



## 13-12. Inspection requirements after completing operation

Check the engine water temperature (1), remaining fuel level (2), engine oil pressure (3), charge level (4), air cleaner (5), and engine trouble (6).

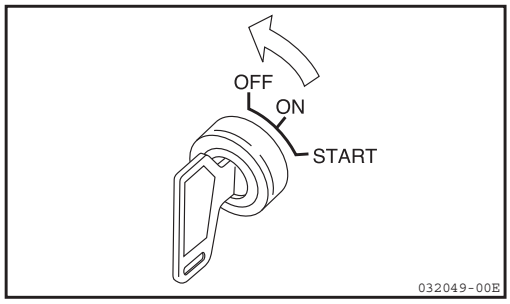



## 13-13. Stopping the engine

**IMPORTANT**

- **Stopping the engine after rotation at high speed may shorten the engine life. Do not stop the engine suddenly except in case of emergency.**
- **If the engine is overheated, do not stop the engine immediately. Gradually lower the engine temperature by rotating the engine at medium rotational speed before stopping the engine.**

1) Idle the engine for approximately 5 minutes with no load.
   (The engine temperature gradually lowers.)




***Note :***

*Stopping a turbo-charged engine immediately after running it could cause the lubricated portions of the turbo charger to dry up due to high temperatures, possibly resulting in a failure of the turbo charger.*

2) To stop the engine, turn the starter switch key to the "OFF" position.

3) Take the starter switch key out of the starter switch.

## 13-14. Inspection requirements after stopping the engine

1) Check oil and water for leaks, and visually inspect the wagon, the machine, and the undercarriage by walking around them.
   If there are any leaks of oil or water, or any observed abnormality, take corrective action.

2) Completely fill the fuel tank.

3) Confirm that the engine compartment is free of any foreign matter.
   Combustibles or dust in the engine compartment may cause a fire. Remove them, if any.

4) Remove mud adhering to the undercarriage of the machine.

## 13-15. Locking

Make sure that you lock the following parts :

(1) Fuel supply port cap
(2) Side door (for cabin)
(3) Engine hood
(4) Side cover
(5) Battery cover

***Note :***
*The starter switch key is used to lock all of the items mentioned above.*

## 13-16. Handling the rubber crawlers

### 13-16-1. Using the rubber crawlers properly

Rubber crawlers have some advantages over steel crawlers.

However, you cannot take full advantage of them if you use them in the same manner as steel ones. Use care in operating with rubber crawlers in accordance with the conditions of the work site and the type of work.

**Comparison Table of Rubber and Steel Crawlers**

| | Rubber | Steel |
|---|---|---|
| Low vibration | ◇ | □ |
| Smooth travel | ◇ | ○ |
| Silent travel | ◇ | □ |
| Less damage to paved roads | ◇ | □ |
| Simple handling | ◇ | □ |
| Susceptibility to damage (strength) | □ | ◇ |
| Tractive force | ◇ | ◇ |

◇ : Excellent
○ : Good
□ : Ordinary

Rubber crawlers have many advantages inherent in the unique properties of the material. On the other hand, however, they are low in strength. It is essential that you fully understand the properties of rubber crawlers, and observe the precautions for operating and handling them to prolong their life and get the most out of them. Be sure to read Section "13-16-3. Precautions for using the rubber crawlers" before using them.

### 13-16-2. Warranty for rubber crawlers

The rubber crawlers are not warranted for free repair or replacement if they are damaged because of misuse by the customer, including the failure to comply with the prohibitions and the instructions for safe operation; (for example, the failure to check the tension of the rubber crawlers or service the rubber crawlers properly, or "using the rubber crawlers on surfaces and terrains which could physically damage them".)

### 13-16-3. Precautions for using the rubber crawlers

**■ Prohibitions**

Observe the following prohibitions:

- Do not operate or turn on surfaces or terrains that have sharp stones, a hard, uneven rock base, or that expose the crawlers to steel rods, scrap iron, or edges of iron plates. Failure to observe these prohibitions may damage the rubber crawlers.

- Do not operate the machine on a stony surface like a riverbed. Doing this may damage the rubber crawlers by catching gravel in the crawlers or may cause the crawlers to come off. Forcibly traveling or turning will also shorten the life of the rubber crawlers.

- Prevent the rubber from getting exposed to oil, fuel, or chemical solvents. If they are exposed, immediately wipe them. Also, do not travel on roads which have oily surfaces.

- When storing the rubber crawlers for a long time period (more than three months), avoid placing them in a place subject to direct exposure to sunlight or rain.

- Do not operate the machine when the crawlers will be exposed to heat, (i.e., near an open-air fire, on a steel plate that has been exposed to the blazing sun, or on a hot asphalt road.)

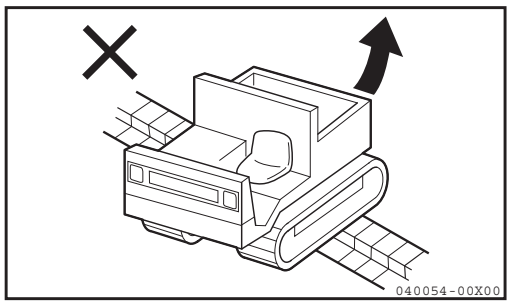
**13-16-4. Other precautions for using the rubber crawlers**

Observe the following precautions when operating the machine:

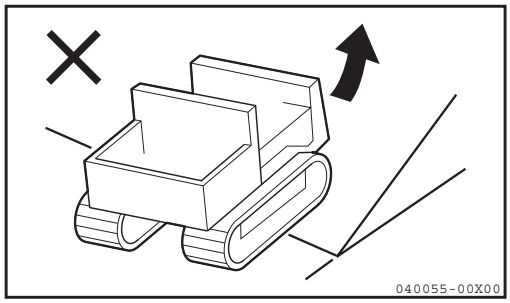
- Never spin-turn on concrete or asphalt roads.
- Do not change course suddenly. Doing this will cause the rubber crawler to wear early or be damaged.
- Do not turn the machine across a large level gap while traveling. Remember that running over a level gap at a right angle will prevent the crawler from coming off.
- It is not recommended that the machine be used to handle any materials that become oily after being crushed (e.g., soybeans, corn, rapeseed oil seeds, etc.). After unavoidably using the machine to handle such materials, clean the crawlers with water.
- It is not recommended that the machine be used to handle materials such as salt, ammonium sulfate, potassium chloride, potassium sulfate, or double superphosphate of lime. Handling these materials may affect the core metal adversely. After using the machine to handle such materials, clean the crawlers with water.
- Do not operate the machine at the seashore. Doing this may affect the core metal adversely due to the salt content.
- If a rubber crawler is cracked, it could be easily damaged when exposed to salt, sugar, wheat, or soybeans. Be sure to repair any cracks in the rubber crawler to prevent the materials being handled from getting into the cracks in the rubber crawler.
- Do not allow the rubber crawler to rub against a concrete boundary, wall or the like.
- The rubber crawlers are prone to slipping on snow or on a frozen road. Be careful of skidding when traveling or operating on a slope in cold weather.
- Operating the machine in extremely cold weather will deteriorate the rubber crawlers, shortening their life.
- Use the rubber crawlers between -13°F to +131°F (-25°C to +55°C) because of the physical characteristics of rubber.

• Keep the crawlers in appropriate tension to prevent them from coming off.
If the tension is too low, the rubber crawlers may come off under the following conditions.
(Even if the tension is adequate, take care when operating the crawlers under these conditions.)

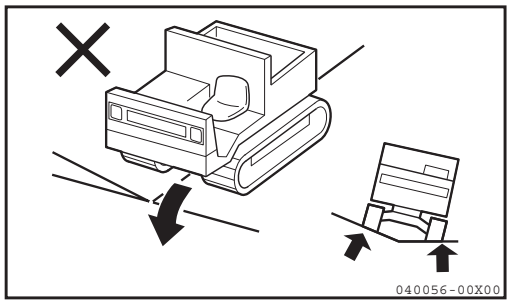
1) Do not steer the machine at an angle other than 90 degrees across a large level gap created by a curbstone or a rock [approximately more than 8 in. (20 cm)]. Run over a level gap at a right angle only to prevent the crawlers from coming off.



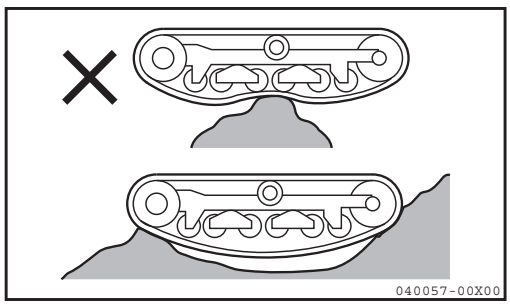

2) Do not steer the machine across a boundary between flat ground and a slope, while moving forwards.
If such travel is not avoidable, slow down the speed.




3) Do not travel with the crawler on one side on a slope or on convex ground (causing a machine angle of more than 10 degrees), and with the crawler on the other side on flat ground, to prevent the rubber crawler from being damaged. Be sure to travel with the crawlers on both sides on the same level surface.

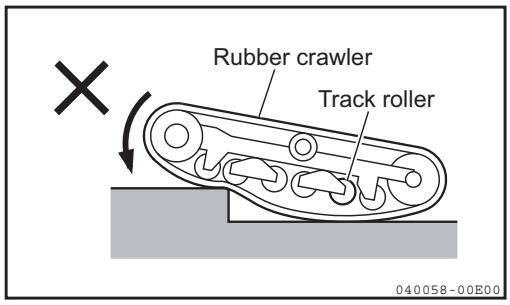



4) The three cases illustrated above are those which could cause the rubber crawlers to loosen. In addition, do not subject the machine to such ground conditions as are illustrated in the figure at the right.

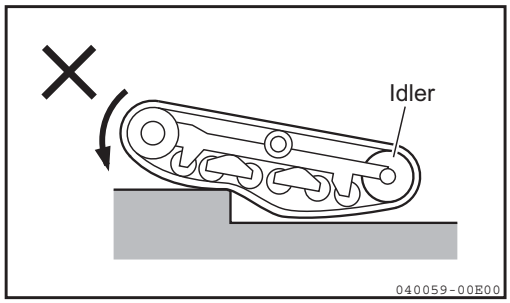



**[How the rubber crawlers come off]**

1) When running over a level gap, a clearance is created between the crawlers and the track rollers. At this point, the crawlers tend to come off.

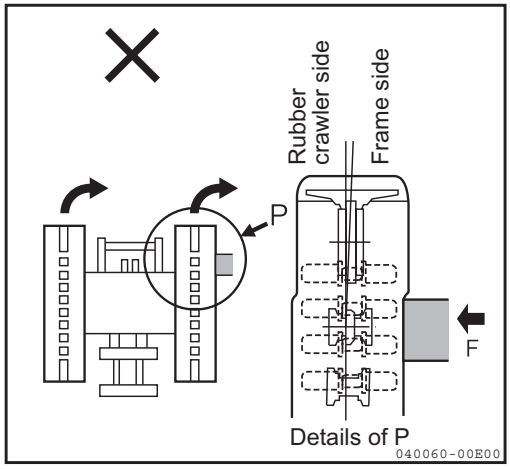


2) If the machine is traveling forward, clearance may also be created between the track rollers and the rubber crawlers, and between the idlers and the rubber crawlers, causing the rubber crawlers to come off.



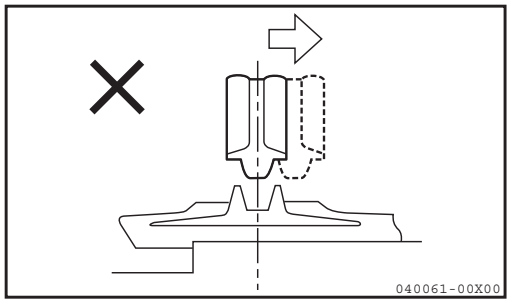

3) Other situations to be avoided.

- When the machine changes the travel direction while the rubber crawlers are blocked sideways by an obstacle or the like.

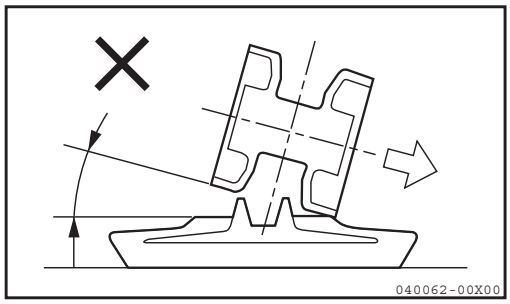



- When the idler and the track rollers are misaligned from the core metal, due to rubber crawler misalignment.

- Traveling in reverse under the condition illustrated will cause the rubber crawlers to come off.




- Changing the travel direction of the machine under the condition illustrated will cause the rubber crawlers to come off.




**13-16-5. Checking and servicing the machine with rubber crawlers**

To check and service the machine with rubber crawlers, refer to and follow Section "24-1. Table of service time intervals".

## 13-17. Removal of wagon flaps

**⚠ WARNING**

**Special care must be taken in handling a wagon flap, as it is heavy in weight.**

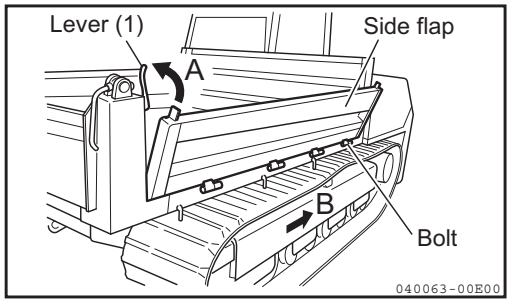
Place the machine on a solid, level ground when removing a flap. Any work performed by a team should be conducted surely in accordance with signals, taking much care about safety.

The three-side flaps wagon has the right, left and rear flaps, which can be removed.

### ■ Removal of the side flaps

1) Remove the bolts (8×20) from the side flap of the wagon.
2) Set the lever (1) to the open position [in the direction indicated by the arrow (A) in the figure] to open the side flap.
3) Move the side flap in the direction indicated by the arrow (B) in the figure to remove it. (For both side flaps).

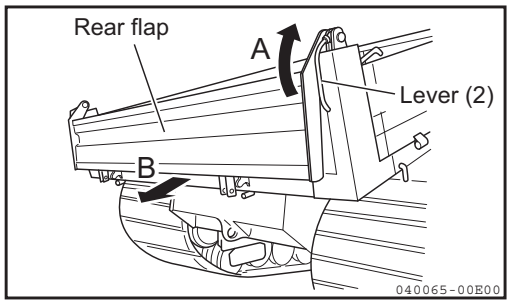
• Side flap mass : 92.6 lbs. (42 kg)




### ■ Removal of the rear flap

1) Start the engine.
2) Open the dump lever to slightly dump the wagon and get off the hooks for the rear flap.
3) Move up the lever (2) in the direction indicated by the arrow (A) in the figure. Remove the rear flap while lifting it up in the direction indicated by the arrow (B) in the figure.

• Rear flap mass : 123.5 lbs. (56 kg)



# 14. Transportation

For safety in transporting the machine, comply with all applicable regulations and laws.

## 14-1. Loading and unloading the machine

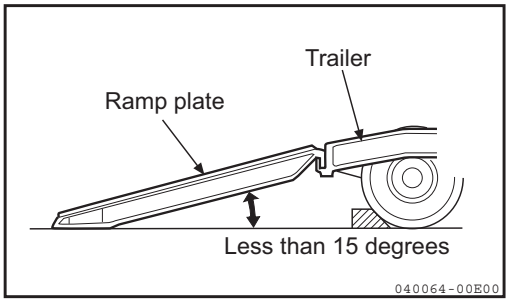
**⚠ WARNING**

- **Be careful when loading and unloading the machine, because it is a job of high hazard potential.**
- **Use ramp plates of adequate strength having hooks. Check to see that the ramp plates are wide, long, and thick enough to safely sustain the machine so that you can load or unload safely. To prevent the ramp plates from bending too much, support them with blocks.**
- **Load or unload the machine on level, solid ground far away from the shoulder of the road.**
- **Securely hook the ramp plates to the deck of the trailer so that they will not come off.**
- **Remove mud, grease, and other slippery deposits from the track shoes, and grease, oil, and ice deposits from the ramp plates to prevent the machine from skidding.**
- **Never change the travel direction on the ramp plates. If you need to change the travel direction, go back down the ramp plates, then do this.**
- **Load or unload the machine at a low engine speed.**
- **Turn slowly when on the trailer bed, if it becomes necessary to do so, since the machine's position will be unstable.**
- **Make sure that the side door of the cabin is locked, whether in the open or closed position. Never open or close the side door on the ramp plates, to prevent it from swinging violently.**

To load or unload the machine, be sure to use the ramp plates and follow the procedures outlined below.

1) Firmly brake the trailer and apply wheel stoppers to the tires. Securely install the ramp plates on the bed of the trailer in a position where the center of the truck aligns with the center of the machine. Make sure that the left and right ramp plates are at the same level.

   The ramp plates should be set at an angle of less than 15 degrees.
   Determine the span between the ramp plates on the basis of the centers of the track shoes.




2) Return the accelerator dial to reduce engine speed.

3) Turn off the automatic speed change switch.

4) Travel toward the ramp plates at a low speed, and load or unload the machine according to the leader's signals.
   Load the machine front first.
   Do not operate any levers other than the travel levers while driving on the ramp plates.

5) Load the machine in a safe position on the trailer.

## 14-2. Precautions for loading the machine

**⚠ WARNING**

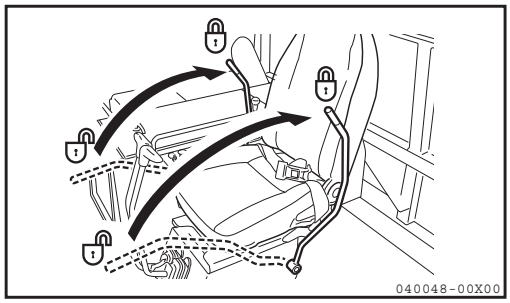
**Load or unload the machine on level, solid ground far away from the shoulder of the road.**

After loading the machine in a safe position on the trailer, secure the machine as follows:

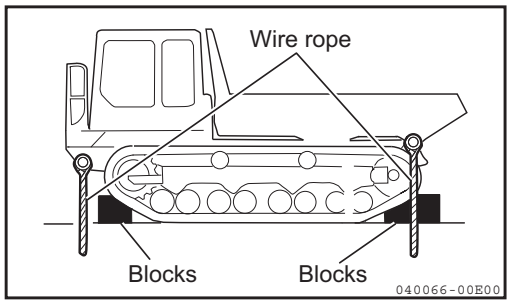
1) Set the lock levers to the lock position.

2) Lock the dump lever.

3) Stop the engine to take the key out of the starter switch.




4) Provide wood blocks in front and back of the crawlers and secure the machine with chain or wire rope so that the machine will not move during shipping. In particular, be sure to secure it to prevent sideward motion.



## 14-3. Precautions for transporting the machine

**⚠ WARNING**

- **Select a route for transporting the machine based on the road width and clearance, and the height and weight of the machine.**
- **Make sure that the side door of the cabin is closed and locked before shipping.**

For safer transportation, comply with all local regulations and laws.

## 14-4. Suspending the machine

**⚠ WARNING**

- **Never suspend the machine if any person is on the machine.**
- **Use wire ropes strong enough for the weight of the machine.**
- **Do not suspend the machine in any way other than that explained on the following page. Failure to suspend the machine as prescribed will throw the machine off balance.**
- **Do not tie wire ropes to the bumper and the wagon. They are not strong enough to support the weight of the machine for suspending or towing.**
- **When suspending the machine, keep the machine in balance taking note of the center of gravity of the machine.**
- **Never stand near or under the suspended machine.**

For safety in suspending the machine, comply with all applicable regulations.

Suspend the machine on the level ground as follows:

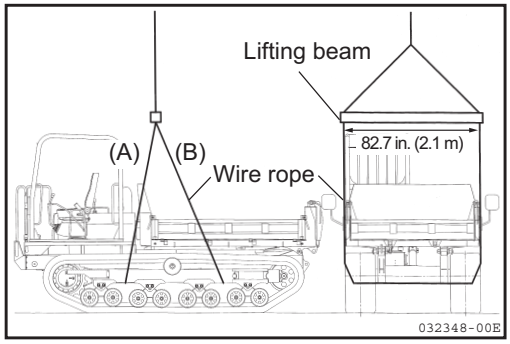
1) Lower the wagon to lowest position, and make sure that the crawler frame and the wagon parallel to each other.

2) Set the lock lever to the lock position.

3) Stop the engine and remove the starter key. Then get out of the machine.

4) Install wire ropes and lifting beam as the right figure. Make sure not to contact wire ropes with the machine.

5) Suspend the machine above the ground, wait until the machine is stable and then suspend it slowly.



***Note :***

- *Use wire ropes strong enough to support the machine weight.*
- *Length of wire ropes:*
  *(A) 267.7 in. (6.8 m), (B) 279.5 in. (7.1 m)*

**IMPORTANT**

- **Place the lock lever and the dump lock lever in the lock position.**
- **Take care when suspending the machine. The machine will be slanted.**

# 15. Care and Service in Cold Weather

## 15-1. Preparing for cold weather

In cold weather, you may have difficulty in starting the engine or the cooling water may freeze. So take measures as follows:

### 15-1-1. Fuel and lube oil

Use low viscosity fuel and lube oil. For the specified viscosities, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".

### 15-1-2. Cooling water

**⚠ WARNING**

**Anti-freeze is flammable. When handling anti-freeze, keep away from any sources of ignition and do not smoke.**

**IMPORTANT**

**Never use an anti-freeze containing methanol, ethanol, or propanol.**

**For the timing of cooling water change and the mixing ratio of the anti-freeze, refer to Section "25-4. Nonperiodic services".**

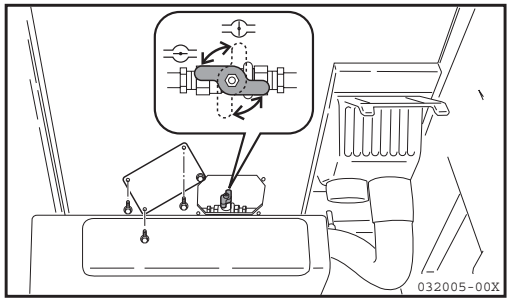
***Note :***

*Because a YANMAR genuine long-life coolant (LLC) is added to the cooling water, you need not change it until the temperature falls below -31°F (-35°C).*

*If the temperature falls below -31°F (-35°C), refer to Section "25-4. Nonperiodic services" to control the density of the cooling water.*

### 15-1-3. Heater

With the heater side cover open, fully open the hot water circulating valve of the heater.



**15-1-4. Battery**

**⚠ WARNING**

- **The battery generates flammable gas and it can cause a fire and an explosion. Keep sparks or flames away from the battery.**
- **Battery electrolyte contains dilute sulfuric acid which is a strong acid. To avoid serious injury, do not allow the electrolyte to contact skin or splash into eyes.**
  **If the electrolyte contacts your skin or gets in your eyes, flush immediately with large amounts of water, and obtain medical treatment at once.**

Battery performance deteriorates as the temperature goes down. When the battery voltage is low, battery electrolyte will easily freeze. Keep the charging rate close to 100% (full charging) and keep the battery warm for easy start the next day.

***Note :***

*Measure the specific gravity of the electrolyte to determine the charge ratio using the conversion table given below.*

| Electrolyte temperature / Charging rate | 68°F (20°C) | 32°F (0°C) | 14°F (-10°C) | -4°F (-20°C) |
|---|---|---|---|---|
| 100% | 1.28 | 1.29 | 1.30 | 1.31 |
| 90% | 1.26 | 1.27 | 1.28 | 1.29 |
| 80% | 1.24 | 1.25 | 1.26 | 1.27 |
| 75% | 1.23 | 1.24 | 1.25 | 1.26 |

The specific gravity of the electrolyte varies with its temperature and recharged condition.

## 15-2. Precautions after a day's work

To prevent the machine from getting stuck in the morning due to frozen mud or water deposits on the undercarriage, be sure to observe the following precautions.

- Remove any mud or water adhering to the machine. If mud or water droplets adhering to the hydraulic cylinder rod should get into the seals, the seals could be damaged.

- Park the machine on solid, dry ground.
  If no solid, dry ground is available, lay plates on the ground and park the machine on the plates to prevent the frozen tracks from sticking to the ground.

- Drain the water accumulated in the fuel system by opening the drain cock, to prevent freezing.

- As battery performance deteriorates in low temperatures, cover the battery or move it to a warm place, and reinstall it in the machine on the next morning.
  If the level of the battery electrolyte is low, add distilled water before starting operation on the next morning. To prevent the battery from freezing at night, do not add distilled water after completing operation.

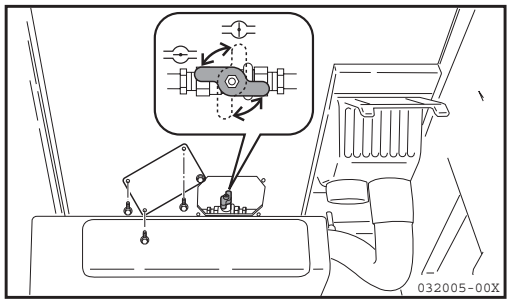
## 15-3. After cold weather ends

When the temperature rises, do the following:

- Replace the lube oil and fuel with the specified viscosities according to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".

- If you have added an AF-PT anti-freeze (for one winter season only), fully drain the cooling system, flush the inside of the cooling system well, and fill the sub-tank with tap water.

- With the heater side cover open, close the hot water circulating valve of the heater.

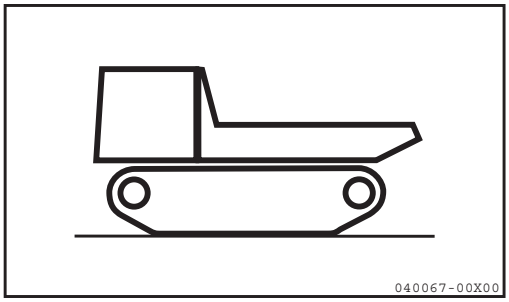


# 16. Long-term Storage

## 16-1. Before storing

**IMPORTANT**

**When storing the machine, lower the wagon as illustrated in the figure at the right, to protect the hydraulic cylinder rod from becoming corroded.**




When storing the machine for a long period, do the following:

- Clean all parts and store the machine indoors. If you have to store the machine outdoors, park the machine on level ground and cover it with a protective sheet.
- Apply lube oil and grease to the machine and replace the engine oil.
- Apply a small amount of antirust and grease to exposed parts of the hydraulic cylinder rod.
- Fill the battery with distilled water up to the upper level mark. After the battery has fully recharged, disconnect the negative terminal, and cover the battery or remove the battery from the machine to store it.
- Add an anti-freeze to the cooling water if the air temperature can fall below 32°F (0°C).
  Because a YANMAR genuine long-life coolant (LLC) is added to the cooling water, you need not change it until the temperature falls below -31°F (-35°C).
  If the temperature falls below -31°F (-35°C), refer to Section "25-4. Nonperiodic services" to control the density of the cooling water.
- Set the dump lock lever and the lock levers to the lock position, respectively.
- Antirust
  When stored near the sea or in a place exposed to sea breezes, the machine easily becomes rusty. Carefully apply an antirust to all exposed parts of the piston rod and cover the machine with a polyethylene sheet or oil paper.

| Recommended antirust | Manufacturer |
|---|---|
| P-1300 (Solvent cutback rust preventive oil) | Nippon oil |
| P-3 (Solvent cutback rust preventive oil) | Japan Energy |
| P-300 (Solvent cutback rust preventive oil) | Cosmo oil |

  Some antirust solvent damages rubber materials. Be sure to use the recommended antirust or its equivalent.
- To prevent condensation inside the fuel tank, either drain the fuel tank or fill the tank completely.

## 16-2. Storing

**⚠ WARNING**

**When you have to operate the machine indoors for the antirust procedure, be sure to ventilate the area well by opening windows and doors to prevent asphyxiation.**

Move the machine at least once a month to form new oil films on all the moving parts during long-term storage, and recharge the battery at the same time.

## 16-3. Using the machine again

**IMPORTANT**

**When reusing a machine that has been stored for a long time without receiving antirust treatment once a month, consult your dealer.**

To use the machine again after a long period of storage, follow the procedure below:

- Wipe antirust off the hydraulic cylinder rod.
- Apply generous amounts of grease or oil to the moving parts.
- Drain water from the fuel tank, the engine oil pan and the hydraulic oil tank by removing the drain plugs.
- After starting the engine, warm-up the machine before use.

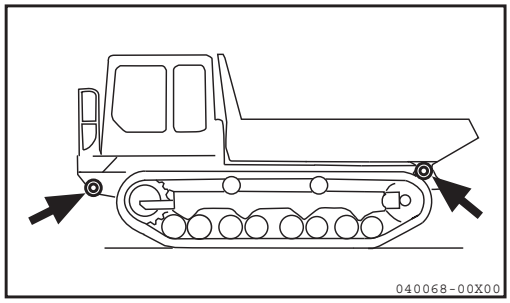
# 17. Troubleshooting

## 17-1. Towing

**⚠ WARNING**

**Always safely tow a disabled machine by using the proper equipment and procedures.**
**The use of incorrect methods or improper procedures could result in bodily injury.**
**Follow the recommendations below to properly perform the towing procedure.**
**Use the wire ropes of sufficient strength for towed weight.**
**Never use the wagon stopper hole for towing.**

If the machine becomes mired in muddy ground and must be towed out, or when it is necessary for the machine to tow a heavy object, attach the wire rope as illustrated on the right, and tow in a straight line.




***Note :***
*Towing in a diagonal direction gives excessive load to the towing hook and can cause distortion of the towing hook part.*

**IMPORTANT**

- **Check to see that the wire ropes, sling belts, and shackles to be used are of sufficient strength and are free from cracks and damage.**
- **Do not have the machine with a defective engine or the like towed, as a trouble may be caused in the hydraulic equipment. In this case, consult your dealer.**

## 17-2. Precautions in special work sites

Each time the work in the water has finished, apply grease to the pins submerged in the water.

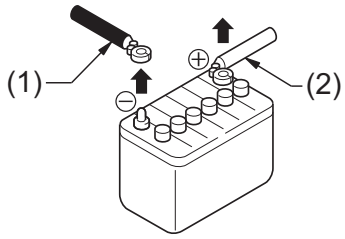
After greasing, repeat the operations for dumping and lowering the wagon and for traveling forward and backward several times, and then reapply grease.

## 17-3. If the battery is overdischarged

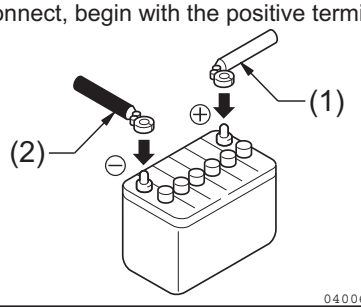
### ⚠ WARNING

- **Stop the engine and turn the starter switch key to the "OFF" position before checking or servicing the battery.**
- **Flammable hydrogen gas is produced by the battery, which may cause ignition. Keep flames, sparks and lit cigarettes away from the battery.**
- **The battery electrolyte contains dilute sulfuric acid, which is a strong acid.**
  **If the battery electrolyte contacts your clothes, they may be damaged.**
  **If the battery electrolyte gets into your eyes or contacts your skin, flush immediately with large amounts of water, and obtain medical treatment at once.**
- **Be sure to wear safety goggles when handling a battery.**
- **To disconnect the terminals, begin with the negative terminal (ground side); to connect the terminals, begin with the positive terminal.**
  **If a tool touches both the positive terminal and the machine, hazardous sparks may be generated.**
- **If a terminal is loose, hazardous sparks may be generated due to poor contact, which could cause ignition and explosion.**
  **Be sure to securely connect the terminals.**

To disconnect, begin with the negative terminal (ground side)




To connect, begin with the positive terminal

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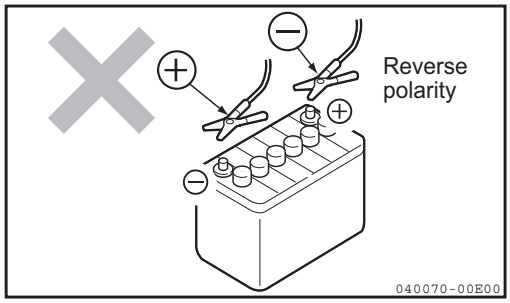
### 17-3-1. Starting the engine using booster cables

To start the engine using booster cables, do the following.

■ **Precautions for connecting and disconnecting the booster cables**

**⚠ WARNING**

- **When you connect the booster cables to the battery, never allow contact between the positive terminal and negative terminals.**
- **When you start the engine using booster cables, wear safety goggles.**
- **If you start the engine by taking electric power from another machine, do not allow contact between your machine and the other machine.**
- **Hydrogen gas is produced by the battery, which may cause ignition and explosion.**
- **To connect the booster cables, begin with the positive terminal, and to disconnect them, begin with the negative terminal (ground side).**
- **If a tool touches the positive terminal and the machine at the same time, hazardous sparks may be generated.**
- **Do not connect the booster cables to terminals of reverse polarity. That is, never connect a negative terminal on one machine to the positive terminal on the other machine.**
- **As the last step, connect the negative booster cable to the engine block. At this time, sparks will be generated. Connect the terminal to a point as far away from the battery as possible, except for on the wagon which is not a very good conductor.**
- **When disconnecting the booster cables, do not allow the booster cable clips to contact with each other or with the machine body.**




**IMPORTANT**

- **The booster cable capacity and the clip size should be suitable for the battery current. (Cable for 24 V)**
- **The battery of the normal machine should be the same capacity as that of the machine in trouble.**
- **Check the booster cables and clips for an absence of damage, cracks, and corrosion.**
- **Securely connect the clips.**

■ **Charging with the battery mounted on the machine**

- Remove the battery cables from the positive and negative terminals of the battery before charging it. If this is not done, abnormal voltage may be applied to the generator which could damage it.

- While charging the battery, remove all plugs to release the gases generated by charging.

- If the battery overheats [the temperature of the electrolyte exceeds 113°F (45°C)], interrupt charging.

- Stop charging as soon as the process has been completed.
  Overcharging could cause the following troubles:
  - Overheating of the battery
  - Decrease in battery electrolyte
  - Battery failure

- Do not reverse polarity of the cable connections to the battery (i.e., the negative cable to the positive terminal, or the positive cable to the negative terminal).
  Reversing the polarity of the connections will cause the generator to be damaged.

- Handling the battery (except for checking the electrolyte level and measuring the specific gravity of the electrolyte) should be performed after disconnecting the battery cables.

■ **Connecting the booster cables**

Turn the starter switch to the "OFF" position, and connect the booster cables as follows:

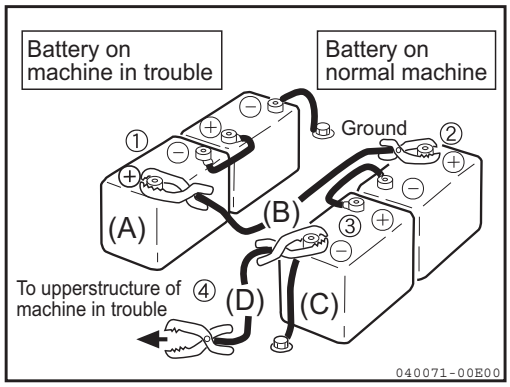
1) Turn the starter switches on both the normal machine and the machine in trouble to the "OFF" position.

2) Connect the clip of the booster cable (B) to the positive terminal of the battery (A) on the machine in trouble.

3) Connect the other clip of the booster cable (B) to the positive terminal of the battery (C) on the normal machine.

4) Connect the clip of the booster cable (D) to the negative terminal of the battery (C) on the normal machine.

5) Connect the other clip of the booster cable (D) to the engine block of the machine in trouble.



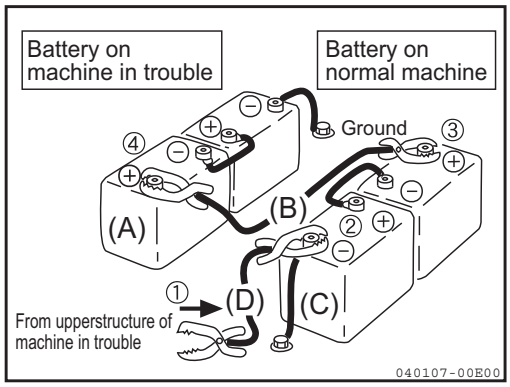

■ **Starting the engine**

1) Make sure that the clips are securely connected to the battery terminals.

2) Start the engine on the normal machine, and increase the engine speed to the maximum.

3) Turn the starter switch on the machine in trouble to the "START" position to start the engine.
   Refer to Section "13-2. Starting up the engine".

## ■ Disconnecting the booster cables




After the engine on the machine in trouble has started, disconnect the booster cables in the reverse order of the connecting procedure.

1) Remove the clip of the booster cable (D) from the engine block on the machine in trouble.

2) Remove the clip of the booster cable (D) from the negative terminal of the battery (C) on the normal machine.

3) Remove the clip of the booster cable (B) from the positive terminal of the battery (C) on the normal machine.

4) Remove the clip of the booster cable (B) from the positive terminal of the battery (A) on the machine in trouble.

## 17-4. Troubleshooting

If any abnormality or trouble occurs during operation, immediately identify the cause and perform service or adjustment. If you continue the operation, ignoring the abnormality or trouble, it may be progressed and result in a critical defect.

Therefore, when you notice an abnormality or a trouble, immediately check the machine and take corrective action referring to the list below.

Contact your dealer for assistance, regarding the measures indicated in parentheses in the list below.

| Trouble | | Cause | Measure |
|---|---|---|---|
| Engine | Steam comes out of top of radiator. | • Shortage of cooling water | • Check cooling water level. Refill, if necessary. (Check cooling water for leak from water supply port cap and drain plug.) |
| | Water temperature meter indicates overheating pointer. | • Loose fan belt<br>• Buildup of dust and water scale on cooling system<br>• Defective thermostat<br>• Clogged radiator fin or inclined fin<br>• Defective water temperature meter<br>• Defective electrical system | • Adjust belt tension.<br>• Replace cooling water. Clean inside of cooling system.<br>(• Replace thermostat.)<br>• Clean or repair fin.<br>(• Replace water temperature meter.)<br>(• Check or replace electrical system.) |
| | Water temperature meter pointer stays left (low temperature). | • Defective water temperature meter<br>• Defective thermostat | (• Replace water temp meter.)<br>(• Replace thermostat.) |
| | Turning on starter motor does not start engine. | • Shortage of fuel<br>• Air mixed in fuel system<br>• Blown out fuse for stop solenoid<br>• Defective stop solenoid.<br>• Defective fuel injection pump or deteriorated nozzle performance<br>• Improper compression | • Refill fuel tank.<br>• Repair air leak. Release air from fuel system.<br>• Replace fuse.<br>(• Contact dealer for repair.)<br>(• Replace pump or nozzle.)<br>(• Contact dealer for repair.) |
| | Dark fumes come out of machine. | • Clogged air cleaner element<br>• Deteriorated nozzle performance<br>• Improper compression | • Clean or repair element.<br>(• Replace nozzle.)<br>(• Contact dealer for repair.) |
| | Fume color is white or bluish white. | • Too much oil in oil pan<br>• Improper fuel<br>• Worn cylinder or piston ring | • Drain oil from oil pan to specified level.<br>• Replace fuel with recommended one.<br>(• Contact dealer for repair.) |
| Electrical equipment | Turning starter switch to "START" dose not start starter motor. | • Defective wiring system<br>• Defective starter switch<br>• Insufficiently charged or deteriorated battery<br>• Defective starter motor | (• Check and repair wiring system.)<br>(• Replace starter switch.)<br>• Recharge battery or replace.<br>(• Contact dealer for repair.) |
| | Maximum engine speed does not provide enough brightness of lamps. | • Defective wiring system<br>• Defective generator or regulator | • Check terminals for looseness and disconnection. Repair terminal, if necessary.<br>(• Contact dealer for repair.) |
| | During engine operation, lamp is extremely bright, and frequently burns out. | • Defective regulator | (• Replace regulator.) |
| | Electrolyte leaks from battery. | • Defective diode | (• Contact dealer for repair.) |
| | Battery charge alarm lamp lights during operation at high speed. | | |
| | Speed of starter motor is too low. | • Defective wiring system<br>• Insufficiently charged or deteriorated battery<br>• Defective starter motor | • Check and repair wiring system.<br>• Recharge battery or replace.<br>(• Contact dealer for repair.) |
| | Turning starter switch to “OFF” does not stop engine. | • Defective fuel stop solenoid<br>• Defective wiring system | (• Check and repair or replace)<br>(• Check and repair or replace) |
| | Horn does not sound. | • Defective horn switch<br>• Defective horn<br>• Wiring failure or blown out fuse | (• Replace horn switch.)<br>(• Replace horn.)<br>(• Check and repair.) |

| Trouble | | Cause | Measure |
|---|---|---|---|
| Under carriage Crawler type | One side of sprocket tooth is worn or rubber crawler comes off. | • Abnormality of hydraulic cylinder for tension adjustment<br>• Distorted track frame<br>• Worn idler or track roller | (• Check and repair)<br>(• Repair and reinforcement or replace)<br>(• Replace) |
| | Oil leaks from idler, track roller or carrier roller | • Damaged seal<br>• Damaged bearing | (• Replace parts) |
| Hydraulic system/Wagon | Wagon does not dump or dumps too slowly when operating dump lever to the dump position.<br>(For the swing wagon type) Wagon does not swing when operating dump lever. | • Overload<br>• Insufficient amount of hydraulic oil<br>• Insufficient discharge volume of hydraulic pump<br>• Dust caught in valve<br>• Air mixed from pump suction side<br>• Too high viscosity of hydraulic oil (in extremely cold weather)<br>• Clogged filter | • Lower load<br>• Replenish hydraulic oil up to specified level<br>(Check for oil leakage)<br>(• Contact dealer for measuring oil quantity and oil pressure)<br>• Clean<br>• Check and retighten piping and joint part<br>• Replace with oil of proper viscosity<br>• Check and clean or replace |
| | Abnormal sound from pump | • Clogged filter<br>• Air mixed from pump suction side<br>• Worn or damaged internal part of pump | • Check and clean or replace<br>• Check and retighten piping and joint part<br>(• Repair or replace) |
| | Oil leakage from hydraulic pump | • Loose connector<br>• Detective seal (deteriorated)<br>• Loose pump through bolt | • Retighten<br>(• Repair or replace)<br>• Retighten |
| | Rear flap does not close. | • Distorted fulcrum pin<br>• Earth and sand, ready-mixed concrete, etc. attached to fulcrum pin part<br>• Distorted hook or rod<br>• Large play of wagon stay | • Correct<br>• Clean<br>• Correct or replace<br>• Adjust |
| | (For the swing wagon type) Wagon does not swing or does not swing smoothly. | • Insufficient grease applied to swing bearing | • Apply grease |

# MAINTENANCE

# 18. Precautions for Servicing

**Do not use any inspection or servicing procedures that are not described and recommended in this manual.**
**Park the machine on solid, level ground to inspect and service it.**

**Check the hourmeter**
Read the hourmeter every day to check if any service item has reached the time prescribed for implementation.

**Use YANMAR genuine replacement parts**
Use YANMAR genuine parts specified in the Parts Catalog.

**Use YANMAR genuine lube oil and grease**
Use YANMAR genuine lube oil and grease of specified viscosity for the operating temperature range.

**Use clean lube oil and grease**
Use clean lube oil, grease and containers and prevent dust from mixing into them.

**Clean the machine**
Clean the machine for easy isolation of faulty parts.
Particularly clean the grease nipple, breather, and the oil level gauge glass to prevent dust from entering into them.

**Be careful of high water and oil temperatures**
It is dangerous to replace the oil, the cooling water and the filter immediately after stopping the engine. Wait until their temperatures drop. When the engine oil is too cool, heat the oil to adequate temperature [approximately 68°F to 104°F (20°C to 40°C)] before draining oil to improve draining efficiency.

**Check the drained oil and the old filter element**
When replacing the engine oil, the hydraulic oil, or the filter element, check the drained oil and the old filter element for metallic dust and foreign solid deposits.

**Observe precautions for replenishing oil**
If a strainer is mounted on the oil port, do not remove the strainer to replenish oil.

**Be careful of dust**
When checking or replacing the oil, do this in a clean environment to prevent dust contamination.

**Attach the warning tag**

When the oil or the cooling water is being drained, attach the "SERVICING IN PROGRESS" tag to the starter switch so that other persons will not start the engine.

**Observe the warning labels**

Observe the warning labels affixed to the machine.

**Observe the precautions for welding**

- Make sure to disconnect the battery cables (positive and negative terminals).
- Do not apply more than 200 V continuously.
- Ground the machine within 39 in. (1000 mm) from the welded part.
- Make sure that there is no seal or bearing between the welded part and the grounded part.
- Do not ground around the pins on the wagon or the hydraulic cylinder.

**Be careful of fire**

Clean parts with noncombustible detergent.

**Clean mating surfaces before assembly**

When you have removed a part with an O-ring or a gasket seal, clean the mating surfaces before installing the new part.

At this point, do not fail to refit the O-ring or the gasket.

**Do not drop anything from your breast pocket**

When you open the cover and attempt to look down into the inside of the machine, remove loose items from your breast pocket to eliminate the risk that they may drop into the machine.

**Check the undercarriage**

After the machine is used at a rocky place, check the undercarriage for damage. Check for loose bolts and nuts, cracks, wear, and other damage.

**Observe the precautions for cleaning the machine**

- Do not spray steam directly at the connectors and on the electrical parts.
- Do not splash water on the monitors in the cabin.
- Do not spray high-pressure water directly at the radiator and the oil cooler and around the operator’s seat.

**Check before and after working**

If the machine is to be used in mud, rain, snow, or on a beach, check for loose plugs and cocks before working. After working, clean the machine and check each part for cracks and damage and check for loose or missing bolts and nuts. Apply grease earlier than usual. Particularly apply grease every day to the pins in the portions which are submerged in mud.

**Observe the precautions for working in a dusty place**

If you use the machine in a dusty place, be careful of the following:

- Check the air cleaner for clogging.
- Clean the air cleaner elements earlier than scheduled.
- Clean the radiator fin earlier to prevent it from clogging.
- Clean or replace the fuel filter element earlier than scheduled.
- Clean the electric equipment, especially the starter motor and the generator, to avoid dust deposits.

**Do not mix oils**

Never mix oils of different makes or types. If you have to replenish an oil with a different make or type than the one already in the tank, remove the remaining oil completely.

# 19. Basic Servicing Practices

- Use YANMAR genuine replacement parts.

- Do not mix oils of different makes and types when replacing or replenishing oil.

- The following types of oil, fuel and cooling water are used at the factory for shipping unless otherwise specified:

| Item | Type |
|---|---|
| Engine oil | Engine oil SAE10W30, CF-4 class |
| Travel reduction gear oil | Gear oil SAE90 (GL-4 or higher class) |
| Hydraulic oil | YANMAR SUPER HYDRO OIL (ISO VG46) |
| Fuel | Diesel light oil |
| Engine cooling water | YANMAR genuine long-life coolant (LLC), 50% added water |

## 19-1. Oils, fuel, and cooling water

### 19-1-1. Oils

- Because the oil is used in the engine and wagon under extreme conditions (high temperature and pressure), it deteriorates as time elapses.
  Be sure to use oils of the grades which are specified in the Operation & Maintenance Manual and suitable for the operating temperature range.
  Even if the oil is not contaminated, be sure to replace the oil within the specified service hours.

- Oil is equivalent to blood in a human body. Be careful in handling it so that impurities (water, metallic dust, and foreign solids) will not be mixed into it.
  Most machine failures are caused by impurities in the oils.
  Be careful not to mix impurities into the oils especially after storing the machine and replenishing oils.

- Do not mix oils of different makes and types.

- Use the specified amount of oil.
  Use of larger or smaller amounts of oil than specified may cause machine problems.

- If the oil becomes cloudy, it may suggest that water or air could have been mixed into the hydraulic system. If this event happens, ask your dealer for assistance.

- Be sure to replace the oil filter element with a new one when changing the oil.

- To know what condition the machine is in, it is recommended that you analyze the properties of the oil periodically.
  Ask your dealer for more information on this issue.

### 19-1-2. Fuel

- Because the fuel injection pump is a precision device, using a fuel containing water or dust will cause problems.
- Be careful that impurities will not be mixed into the fuel especially after storing the machine and refueling.
- Be sure to use a fuel recommended in the Operation & Maintenance Manual.
  In addition, keep in mind that you should use a fuel appropriate for the operating temperature range because it will freeze at temperatures lower than 5°F (-15°C).
- Fully refuel every day after finishing the work so that the moisture in the fuel tank will not condense and water will not mix with the fuel.
- Before starting the engine, or ten minutes after refueling, drain any deposits and water through the drain plug on the fuel tank.
- If the fuel level becomes low or the filter element is replaced, the air should be bled from the fuel system.

### 19-1-3. Cooling water

- Because unpotable water may contain much calcium and impurities, using it will cause water scale to build up in the engine or the radiator, causing poor heat exchange and overheating.
  Never use unpotable water for cooling purposes.
- When using an anti-freeze, observe the precautions described in the Operation & Maintenance Manual.
- A YANMAR machine is shipped with YANMAR genuine anti-freeze. The anti-freeze is anticorrosive to protect the cooling system. Because the anti-freeze can be used continuously over two years, you need not remove it in hot weather.

**⚠ DANGER**

**Keep sources of ignition away from the anti-freeze because it is flammable.**

- The mixing ratio of anti-freeze to water differs based on air temperature.
  For the mixing ratio, refer to Section "25-4-2. Cleaning the inside of the cooling system".
- If the engine is overheated, replenish the cooling water after the engine has cooled down.
- Shortage of cooling water will cause the cooling system not only to overheat but also to corrode, due to air which comes in the system.

### 19-1-4. Grease

- Grease ensures smooth operation of moving parts such as connectors and prevents operating noises.

- The nipples not listed on the pages for periodic service are those used for overhaul purposes. Normally it is not necessary to refill them.
  Grease them if any abnormal condition arises after long term use.

- Wipe away all excess grease after greasing.
  Carefully wipe the excess grease from all moving parts which might be easily worn by adhered sand or grit.

### 19-1-5. Storing the oil and fuel

- Store the oil and fuel indoors so that they will not be contaminated by impurities such as water or dust.

- When you store oil or fuel in drums for a long period, position them so that their outlets align in a straight line (to prevent moisture absorption).
  When storing the oil or the fuel outdoors, cover the drums with a waterproof sheet.

- To avoid deterioration caused by long-term storage, use the oil on a first-in first-out basis.

### 19-1-6. Filters

- The filters are very important parts which prevent impurities from getting into critical devices through the lube oil, fuel and air systems.
  Clean or replace the filter elements periodically according to the instructions of the Operation & Maintenance Manual.
  Under difficult conditions, you need to replace the filter elements earlier than suggested in the Operation & Maintenance Manual depending on the type of oil and fuel (sulfur content).

- Never reuse the filter elements (cartridge type) by cleaning them.

- When replacing a filter element, confirm that no metallic dust or foreign solids are present on the old filter. If they are found to be present, contact the nearest dealer.

- Do not unpack the filter element before use.

- Use YANMAR genuine filter elements.

## 19-2. Electrical equipment

- If electrical equipment gets wet or wiring insulation is broken, electric leaks may occur and the machine may malfunction.
- Check the fan belt for tension and damage, and also check the battery for electrolyte level.
- Never disconnect or disassemble the electrical equipment mounted on the machine.
- Do not mount any electrical equipment other than those items provided by YANMAR.
- Be careful not to spray water on the electrical equipment when washing the machine or operating in the rain.
- After working near the sea, take necessary precautions to protect the electrical equipment from corrosion.

# 20. Consumables

Replace consumable parts such as filter elements and air cleaner elements periodically or before they reach their wear limit.
Periodic replacement prevents malfunction of the machine.
When you replace a part, be sure to use a Yanmar genuine part.
When ordering consumables, let us know the part numbers given in the parts catalog.

**List of consumables**

The parts in ( ) represent those which must be replaced at the same time.

| Item | Part number | Name | Q'ty | Replacing time interval |
|---|---|---|---|---|
| Pre fuel filter | 172660-14530 | Element (Length : 155mm. ) | 1 | Every 500 service hours |
| Main fuel filter | 165001-58210 | Element (Length : 131mm. ) | 1 | Every 500 service hours |
| Engine oil filter | 165001-58610 | Element (including packing) | 1 | Every 250 service hours |
| Hydraulic oil line filter | 172660-74590 | Element | 1 | Every 500 service hours<br>(At first 250 service hours) |
| Hydraulic oil return filter | 172660-74960 | Element | 1 | Every 1000 service hours<br>(At first 50 service hours) |
| Air cleaner | 172660-13840 | Element, outer | 1 | - |
| | 172660-13830 | Element, inner | | |

# 21. Fueling, Oiling and Greasing Based on Temperature Range

## 21-1. Fuel and oil

Select fuel and oil based on the air temperature range.
The prescribed amount of oil means the total amount of oil included in the piping and equipment. The amount of oil to be changed means the amount of oil replaced in checking and servicing.
If you start the engine at air temperatures lower than 32°F (0°C), use SAE10W, SAE10W-30, or SAE15W-40 even if the temperature in the daytime rises to 50°F (10°C) or so.

## 21-2. Cooling water

Because a YANMAR genuine long-life coolant (LLC) is added to the cooling water, you need not change it unless the temperature falls bellow -31°F (-35°C).
If the temperature falls below -31°F (-35°C), refer to Section "25-4. Nonperiodic services" to control the density of the cooling water.

| Part to be refilled | Oil type | Recommendations with regard to temperature ranges<br>(°F) -22 -4 14 32 50 68 86 104<br>(°C) -30 -20 -10 0 10 20 30 40 | Prescribed amount of oil | Amount of oil to be changed |
|---|---|---|---|---|
| Engine oil | Engine oil | SAE 30 CF-4 or higher<br>SAE 10W CF-4 or higher<br>SAE 10W-30 CF-4 or higher<br>SAE 15W-40 CF-4 or higher | 15.9 Qts. (15 L) | 15.9 Qts. (15 L) |
| Travel reduction gear | Gear oil | SAE 90 (API : GL-4 or higher) | 2.75 Qts. (2.6 L) (For right and left each) | 2.75 Qts. (2.6 L) (For right and left each) |
| Hydraulic oil system | Hydraulic oil | ISO VG46 | 15.1 Gals. (57 L) | 9.5 Gals. (36 L) |
| Fuel tank | Light oil | No. 2-D<br>No. 3-D<br>No. 3-D (S) | 25.1 Gals. (95 L) | - |
| Cooling system | Water | YANMAR genuine long-life coolant (LLC), 51% added water | 15.9 Qts. (15 L) | 15.9 Qts. (15 L) |

# 22. Standard Tightening Torque for Bolts and Nuts

## 22-1. Required tools

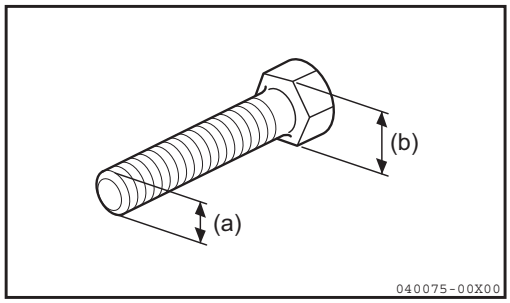
The following tools are required for servicing:

| No. | Tool | Part number | Remarks |
|---|---|---|---|
| 1 | Double ended wrench 10-12 | 28110-100120 | |
| 2 | Double ended wrench 14-17 | 28110-140170 | |
| 3 | Double ended wrench 19-22 | 28110-190220 | |
| 4 | Double ended wrench 24-27 | 172660-05180 | |
| 5 | Single ended wrench 13 | 28110-130000 | |
| 6 | Screwdriver | 104200-92350 | Replaceable head (+, -) |
| 7 | Grease pump | 172660-05160 | For greasing |
| 8 | Filter wrench | 172660-05150 | For engine oil filter |
| 9 | Tool bag | 172660-05170 | |

## 22-2. Torque table

The bolts and nuts in the metric system should be tightened at the torque described below unless otherwise specified.

| Classification | Width across flats b (mm) | Thread size ×Pitch a (mm)×p (mm) | Tightening torque | |
|---|---|---|---|---|
| | | | ft•lbf | N•m |
| Coarse threads | 10 | M6×1.0 | 6.9 to 7.6 | 9.3 to 10.3 |
| | 12, 13 | M8×1.25 | 15.9 to 17.5 | 21.5 to 23.7 |
| | 14, 17 | M10×1.5 | 33.0 to 36.5 | 44.7 to 49.5 |
| | 17, 19 | M12×1.75 | 58.5 to 64.5 | 79.3 to 87.5 |
| | 19, 22 | M14×2.0 | 94.2 to 104.1 | 127.7 to 141.1 |
| | 22, 24 | M16×2.0 | 145.7 to 161.0 | 197.5 to 218.3 |
| | 27, 30 | M20×2.5 | 288.0 to 318.2 | 390.4 to 431.4 |
| Fine threads | 12, 13 | M8×1.0 | 17.2 to 19.0 | 23.3 to 25.7 |
| | 14, 17 | M10×1.25 | 35.0 to 38.7 | 47.5 to 52.5 |
| | 17, 19 | M12×1.5 | 61.2 to 67.6 | 83.0 to 91.6 |
| | 19, 22 | M14×1.5 | 94.8 to 104.8 | 128.5 to 142.1 |
| | 22, 24 | M16×1.5 | 154.6 to 170.8 | 209.6 to 231.6 |
| | 27, 30 | M20×1.5 | 316.8 to 350.1 | 429.5 to 474.7 |




**IMPORTANT**

**If a part to be tightened is made of resin like a panel board, excessive tightening torque may damage the tightened part. Be careful when tightening.**

# 23. Replacing Essential Parts Periodically

For safe operation, the machine must be serviced periodically. To increase safety, be sure to periodically replace the parts listed in the table of safety parts on the next page. A fire could result if they deteriorate or are damaged.

These parts are vulnerable to aging and wear or deterioration and it is difficult to determine the degree to which they have deteriorated on the occasion of periodic service. To maintain their proper function at all times, therefore, replace them with new ones after using them for a specific period of time even if no abnormality is found with the parts.
If you find abnormalities in these parts before their scheduled replacement time is reached, repair or replace them immediately.
If a hose clamp is deformed or cracked, replace it immediately.
Check the hydraulic hoses, which are not periodic replacement parts. If any abnormality is found in them, retighten them or replace them immediately.

When replacing the hydraulic hoses, replace the O-rings and seals at the same time.

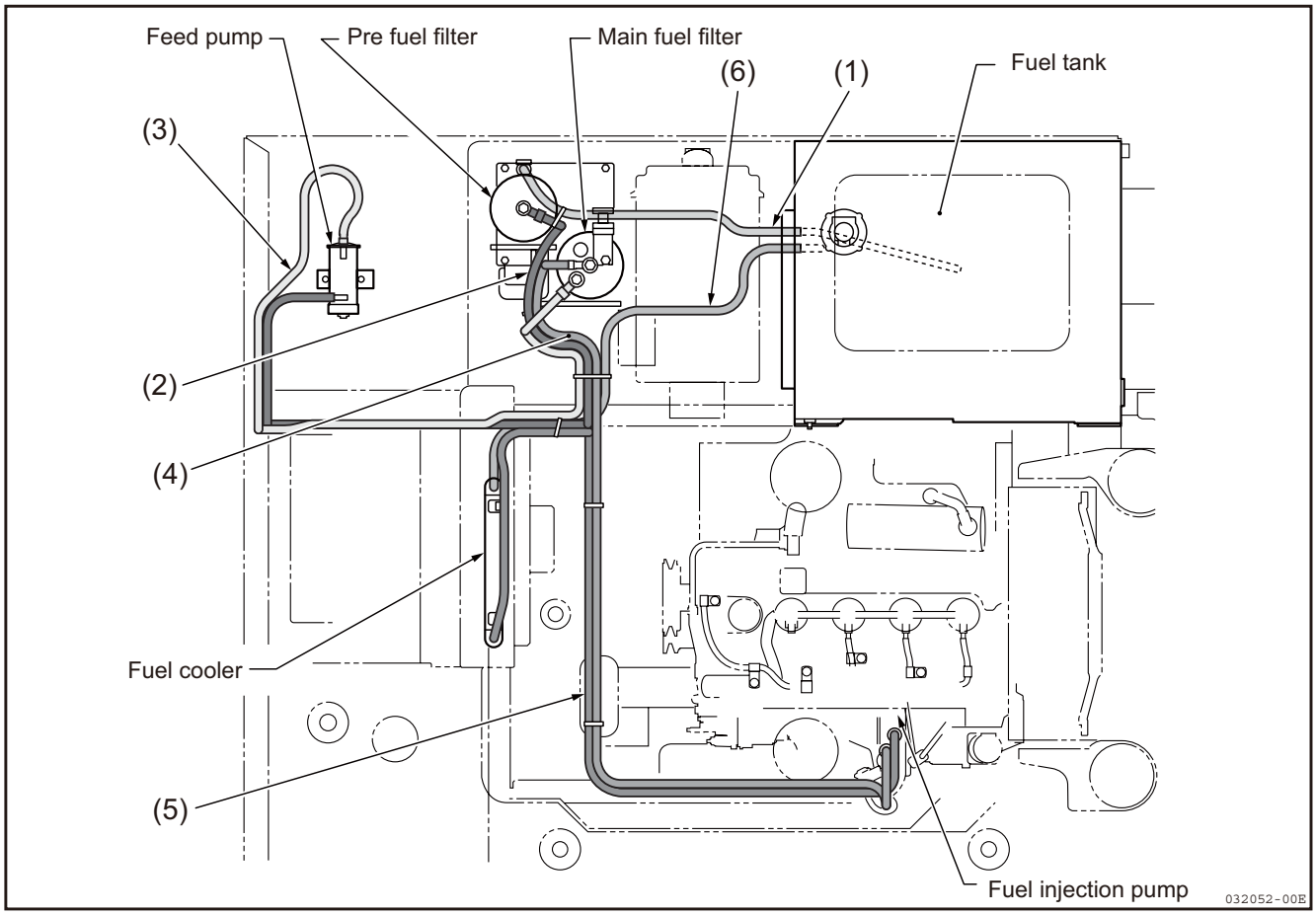
For further information about replacing the essential parts, ask your dealer.

Check the fuel and hydraulic hoses according to the periodic schedule described below.

| Check categories | Check points |
|---|---|
| Start-up check | Oil leak from the connections or bodies of the fuel and hydraulic hoses |
| Voluntary monthly check | Oil leak from the connections or bodies of the fuel and hydraulic hoses<br>Damage (crack, wear, or peeling) of the fuel and hydraulic hoses |
| Prescribed annual check | Oil leak from the connections or bodies of the fuel and hydraulic hoses<br>Interference, crushing, aging, torsion, or damage (crack, wear, or peeling) of the fuel and hydraulic hoses |

## ■ List of essential parts

| No. | Essential parts to be replaced periodically | Q'ty | Replacement time intervals |
|---|---|---|---|
| 1 | Fuel hose (fuel tank to pre fuel filter) | 1 | Every 2 years or every 4000 service hours, whichever first occurs |
| 2 | Fuel hose (pre fuel filter to feed pump) | 1 | |
| 3 | Fuel hose (feed pump to main fuel filter) | 1 | |
| 4 | Fuel hose (main fuel filter to fuel injection pump) | 1 | |
| 5 | Fuel hose (fuel injection pump to fuel cooler) | 1 | |
| 6 | Fuel hose (fuel cooler to fuel tank) | 1 | |



# 24. Maintenance Table

Daily and periodic inspection are important to keep the machine in its best condition. The following is a summary of inspection and servicing requirements by inspection interval. Periodic inspection intervals vary depending on the use, loads, fuels and lube oils used and handling conditions, and are hard to establish definitively. The following should be treated only as a general standard.
When the time for an inspection approaches, study the relevant pages in the Operation & Maintenance Manual. Keep a record of daily operation and the results of maintenance work.

## 24-1. Table of service time intervals

| Check and service points | Page |
|---|---|
| ■ **Every 250 hours** | |
| Greasing the swing bearing (for the swing wagon type) | 3-45 |
| Checking and replenishing the travel reduction gear oil | 3-46 |
| Checking and cleaning the radiator and oil cooler fins | 3-47 |
| Replacing the engine oil and the engine oil filter element | 3-48 |
| | |
| ■ **Every 500 hours** | |
| Checking and adjusting the fan belt tension | 3-50 |
| Replacing the fuel filter | 3-52 |
| Replacing the line filter element | 3-54 |
| Replacing the travel reduction gear oil | 3-55 |
| | |
| ■ **Every 1000 hours** | |
| Replacing the hydraulic oil and cleaning the suction filter element | 3-56 |
| Replacing the return filter | 3-58 |
| Checking and adjusting the engine valve clearance | Ask your dealer |
| Measuring the engine compression pressure | Ask your dealer |
| Checking and cleaning the starter and the generator | Ask your dealer |
| Checking the radiator cap | Ask your dealer |
| | |
| ■ **Every 2000 hours** | |
| Checking and replacing fuel piping, cooling water piping | Ask your dealer |

## ■ List of periodic inspection and servicing

*Applicable to models with the relevant equipment ◇ : Check ○ : Supply ● : Replace □ : Adjust (clean) ■ : Oil & grease

| Check & service items | | | Daily | Every 50 | Every 100 | Every 250 | Every 500 | Every 1000 hrs |
|---|---|---|---|---|---|---|---|---|
| General | Check falling off, breakage of parts | | ◇ | | | | | |
| | Check loosened bolts & nuts, retighten | | ◇ | | | | | |
| | Check engine condition | | ◇ | | | | | |
| | Clean | | □ | | | | | |
| Lube oil | *Swing gear case oil | Check, resupply | | | | ○ | | |
| | | Replace | | | ●1st time | | | ● |
| | Travel reduction gear oil | Check, resupply | | | | ○ | | |
| | | Replace | | | ●1st time | | ● | |
| | *Transmission oil | Check, resupply | ◇ | | | | | |
| | | Replace | | | ●1st time | | | ● |
| | *Differential gear oil | Check, resupply | | | ◇ | | | |
| | | Replace | | | ●1st time | | | ● |
| Hydraulic system | Hydraulic oil | Check, resupply | ◇ | | | | | |
| | | Replace | | | | | | ● |
| | Clean suction filter | | | | | □1st time | | □ |
| | Replace return filter | | | ● 1st time | | | | ● |
| | Replace line filter | | | | | ● 1st time | ● | |
| | Check for abnormality of hydraulic pump | | ◇ | | | | | |
| Grease | Check grease-up positions, grease | | ■ | | | | | |
| | Greasing the swing gears and the swing bearings | | | | | ■ | | |
| Undercarriage | Check, adjust track tension | | ◇ | | | | | |
| | *Check air pressure, wear, flaw in tyres | | ◇ | | | | | |
| Steering equipment | Check performance, play of steering lever | | ◇ | | | | | |
| | Check performance, play of travel lever | | ◇ | | | | | |
| | *Check performance of speed change lever | | ◇ | | | | | |
| | *Check performance of forward/reverse pedal | | ◇ | | | | | |
| | *Check performance, play of steering wheel | | ◇ | | | | | |
| | *Brake pedal | Stroke | ◇ | | | | | |
| | | Performance | ◇ | | | | | |
| | *Parking brake | Stroke | ◇ | | | | | |
| | | Performance | ◇ | | | | | |
| | Check performance of accel. lever | | ◇ | | | | | |
| Electric equipment | Check front & work lights, horn | | ◇ | | | | | |
| | Check hourmeter function | | ◇ | | | | | |
| | Check function of change, oil and pilot lamps | | ◇ | | | | | |
| | Check wire breakage, short-circuits, loosened terminals retighten | | ◇ | | | | | |
| | Check, resupply battery fluid | | ◇ | | | | | |
| | Check specific gravity of electrolyte | | | | | □ As re-quired | | |
| | Check function of OK monitor | | ◇ | | | | | |

◇ : Check ○ : Supply ● : Replace □ : Adjust (clean) ■ : Oil & grease

| Check & service items | | Daily | Every 50 | Every 250 | Every 500 | Every 1000 | Every 2000 hrs |
|---|---|---|---|---|---|---|---|
| Fuel oil | Check & supply of oil to the tank | ◇ | | | | | |
| | Drain the fuel tank | □ As required | | | | | |
| | Check the fuel filter | □ As required | | | | | |
| | Replace the fuel filter element | | | | ● | | |
| Lube oil | Check the quantity of engine oil | ◇ | | | | | |
| | Replace the engine oil | | | ● | | | |
| | Replace the engine oil filter element | | | ● | | | |
| Cooling water | Check & supply of cooling water | ◇ | | | | | |
| | Clean radiator fins | | | | □ | | |
| | Check the fan-belt tension | ◇ | | | | | |
| | Replace the cooling water | | | | | ●within one year | |
| | Clean & check the cooling water system | | | | | ●within one year | |
| Rubber hose | Check & replace fuel oil pipe, cooling water pipe | | | | | | ● |
| Intake system | Clean air cleaner & replace element | □As required | | | ● | | |
| | *Check turbocharger, adjust | | | | | □ | |
| Cylinder head | Adjust the intake and exhaust valve clearance | | | | | ◇ | |

***Note :***

*1) When machine is used at dusty worksites, clean and replace filter element twice as often as specified in the table.*

*2) Execution of periodic inspection and servicing is indispensable to assuring conformance to EPA emission control regulations.*
*Keep a record of the results.*

# 25. Procedures for Maintenance

## 25-1. First 50 hours services

Service a new machine at 50 hours as follows:

■ **Replacing the return filter element**

For this procedure, refer to Section “25-8. Maintenance every 1000 service hours”.

## 25-2. First 100 hours services

Service a new machine at 100 hours as follows:

■ **Replacing the travel reduction gear oil**

For this procedure, refer to Section “25-7. Maintenance every 500 service hours”.

## 25-3. First 250 hours services

Service a new machine at 250 hours as follows:

■ **Cleaning the suction filter element in the hydraulic oil tank**

For this procedure, refer to Section “25-8. Maintenance every 1000 service hours”.

■ **Replacing the line filter element**

For this procedure, refer to Section “25-7. Maintenance every 500 service hours”.

## 25-4. Nonperiodic services

### 25-4-1. Checking, cleaning and replacing the air cleaner

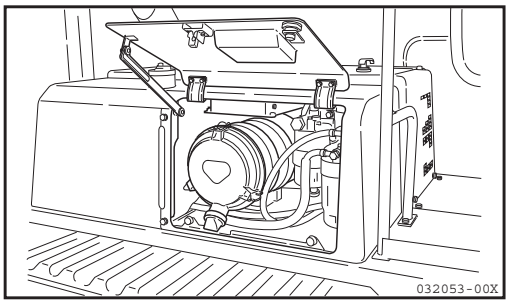
**⚠ WARNING**

- **Never attempt to clean and replace the air cleaner while the engine is running.**
  **Always stop the engine and allow it to cool first.**
- **Compressed air is used to clean the element. Always wear safety goggles to prevent injury to your eyes.**
- **The maximum compressed air pressure should be less than 45 to 70 PSI (0.3 to 0.5 MPa) for cleaning purposes.**

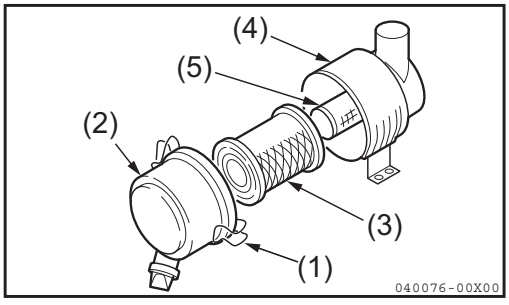
If the air cleaner alarm lamp on the monitor flashes and the alarm buzzer sounds, immediately stop the engine, and check and clean the air cleaner.

■ **Cleaning procedure for element**

1) Open the side cover and loosen the clamps (1) to remove the dust cup (2). Remove the dirt from the dust cup and clean it.




2) Remove the element (3).




**IMPORTANT**

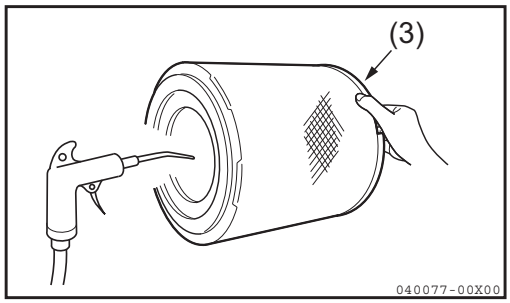
**This air cleaner is of a double element type. Normally do not remove the inner element (5).**

3) Clean the inside of the air cleaner body (4).

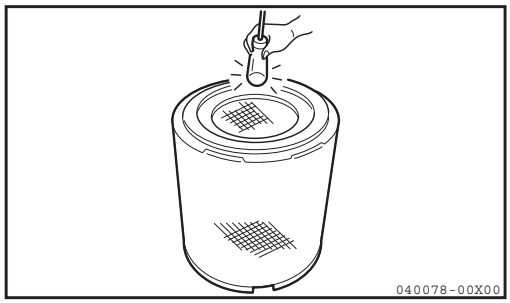
4) Blow the dry, compressed air [45 to 70 PSI (0.3 to 0.5 MPa) or less] from inside the element along the pleats to initially remove the dirt. Then blow compressed air from outside the element along the pleats to remove the dirt. Blow compressed air again from inside the element, to complete the dirt removal.

[1] Replace the outer element (3) after it has been cleaned 5 times or used for one year, whichever first occurs.

[2] Replace the inner element (5), together with the outer element (3).




5) After cleaning, illuminate the element from inside with a light bulb and check it. If there are any small holes or thin areas, replace the element with a new one.




**IMPORTANT**

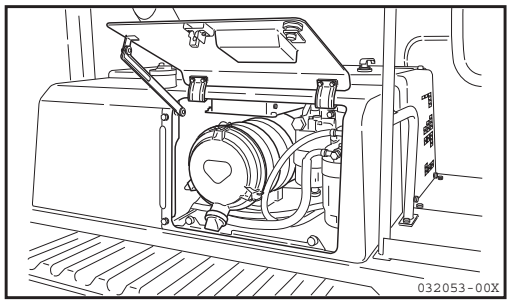
- **When cleaning the element, do not tap it or strike it against other objects. Otherwise the element may be damaged.**
- **Do not reuse the element if the pleat, gasket or seal is damaged.**
- **Replacement elements should be wrapped in clean paper and stored in a dry place.**

6) Insert the newly-cleaned element (3).

7) Install the dust cup, using the arrow mark on it to confirm proper alignment.

8) Close the side cover.

■ **Replacement procedure for elements**

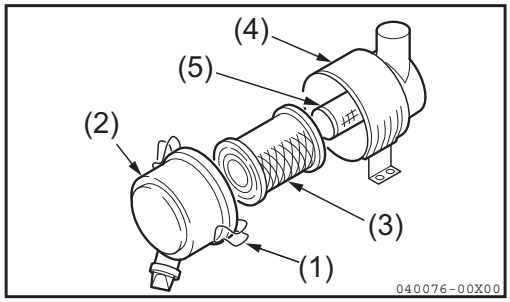



1) Open the side cover and loosen the clamps (1) to remove the dust cup (2).

2) Remove the outer element (3).

3) Clean the inside of the air cleaner body (4).

4) Remove the inner element (5).




5) Install new elements.

6) Install the dust cup, using the arrow mark on it to confirm proper alignment.

7) Close the side cover.

### 25-4-2. Cleaning the inside of the cooling system

**⚠ WARNING**

- **The cooling water is very hot immediately after the engine has stopped. Discharging the cooling water immediately after the engine has stopped may cause burns. Start cleaning the inside of the cooling system after the engine has cooled down sufficiently.**
- **Stepping into the area behind the machine to clean the inside of the cooling system while the engine is running is very dangerous, because you may not be visible from the operator's seat and the machine could start moving.**
  **Also, with the engine hood being open, contacting the radiator fan or fan belt could result in serious bodily injury.**
  **Never step into the area behind the machine while the engine is running.**
- **Do not remove the radiator cap while the water temperature in the radiator is high. Hot water may spout from the radiator.**
  **When you do remove the radiator cap after the water has cooled down, slowly turn the radiator cap to relieve the internal pressure before removing it.**

Clean the inside of the cooling system and replace the anti-freeze according to the following table.

| Anti-freeze type | Cleaning inside of cooling system and replacing anti-freeze |
|---|---|
| YANMAR Super Long-Life Coolant (LLC anti-freeze)<br>(All season type for anticorrosion) | Every 2 years (autumn) |
| LLC anti-freeze (all season type) | Every 1 year (autumn) |
| AF-PT anti-freeze (winter, one season type) | Every 6 months (spring, autumn)<br>Add anti-freeze only in autumn |
| No anti-freeze | Every 6 months |

Park the machine on level ground to clean or replace the cooling water.

The YANMAR Long-Life Coolant has anticorrosive effect as well as anti-freeze effect.

Though the mixing ratio of an anti-freeze to water differs with air temperature, at least 30% of anti-freeze by volume is required to obtain anticorrosive effect.

Determine the mixing ratio of the anti-freeze to water on the basis of the lowest past temperature, referring to the ratio table below.

Actually set the temperature 18°F (10°C) lower than the lowest temperature.

**Amount of cooling water**

| | |
|---|---|
| Radiator | 14.8 Qts. (14.0 L) |
| Sub-tank | 1.1 Qts. (1.0 L) |

**Table of mixing ratio of anti-freeze to water**

| Lowest temperature | °F | 23 | 14 | 5 | -4 | -13 | -22 | -31 | -40 |
|---|---|---|---|---|---|---|---|---|---|
| | (°C) | (-5) | (-10) | (-15) | (-20) | (-25) | (-30) | (-35) | (-40) |
| Amount of anti-freeze | Qts. | 2.4 | 4.0 | 4.7 | 5.6 | 6.3 | 7.2 | 7.9 | 8.6 |
| | (L) | (2.3) | (3.8) | (4.5) | (5.3) | (6.0) | (6.8) | (7.5) | (8.2) |
| Amount of water | Qts. | 13.4 | 11.8 | 11.1 | 10.2 | 9.5 | 8.6 | 7.9 | 7.2 |
| | (L) | (12.7) | (11.2) | (10.5) | (9.7) | (9.0) | (8.2) | (7.5) | (6.8) |

***Note :***

*At the delivery from the factory, water and anti-freeze are mixed in the ratio shown above for the -31°F (-35°C) temperature.*

**⚠ DANGER**

**Keep sources of ignition away from the antifreeze because it is flammable.**

Use tap water. If you obtain water from a river, a well or a small water-supply system, consult your dealer.

Use a densitometer to control the mixing ratio.

**⚠ WARNING**

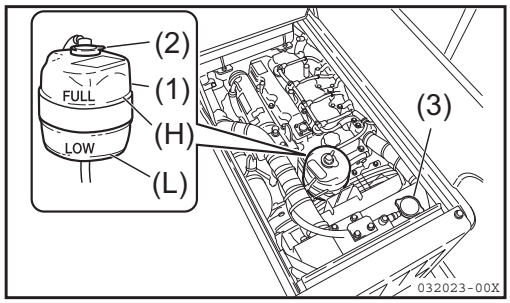
**When removing the drain plug, take care that the anti-freeze does not contact your eyes or skin.**

■ **How to clean the inside of the cooling system**

■ Things to prepare

- Container for cooling water
  Capacity : 15.9 Qts. (15 L) or more
- Hose for supplying water

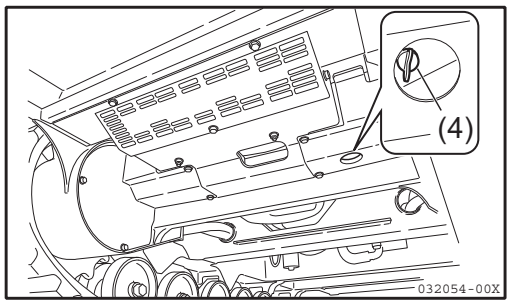
1) Remove the radiator cap (3) slowly.




2) Put the container for cooling water under the drain plug (4).

3) Remove the drain plug (4) to drain the cooling water.

4) After the cooling water is discharged, install the drain plug (4) and pour tap water.




5) After removing the drain plug (4) again, run the engine at low idling speed and flush the cooling system with running water for 10 minutes.
   While flushing with running water, always keep the cooling system completely filled with water by regulating the amounts of water to be drained out and poured in.
   Hold the water supply hose securely while flushing with running water.

6) After flushing with running water, stop the engine, drain the cooling system and then install the drain plug (4).

7) Pour in the washing agent and clean the inside of the cooling system.

**IMPORTANT**

**Washing methods vary depending on the manufacturer of the washing agent.**

**Follow the instructions of the manufacturer.**

8) After cleaning, remove the drain plug (4), drain the cooling system completely and install the drain plug (4). Then pour tap water into the water supply port of the radiator.

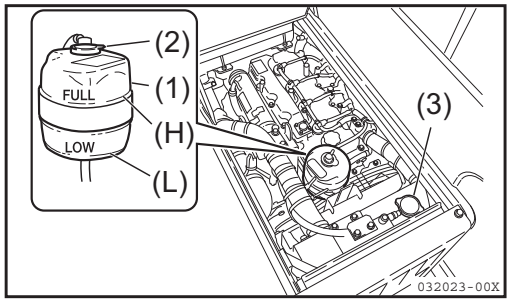
9) When the cooling system is nearly filled with tap water, remove the drain plug (4), run the engine at low idling speed and flush the cooling system with running water until clean water comes out.
   While flushing with running water, always keep the cooling system completely filled with water by regulating the amounts of water to be drained out and poured in.

10) When clean water comes out, stop the engine, drain the cooling system completely and install the drain plug (4).

11) Pour water mixed with anti-freeze into the water supply port of the radiator, to fill it up.

12) To bleed air, run the engine at low idling speed for 5 minutes and then at high idling speed for 5 minutes.
   (While running the engine, keep the radiator cap removed.)

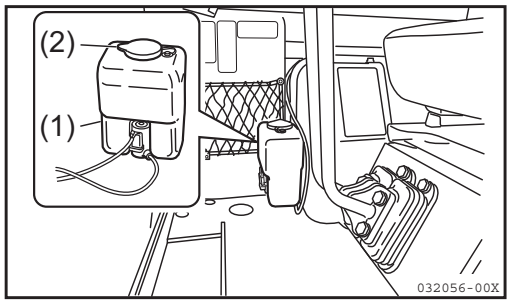
13) Stop the engine, and about 3 minutes later, pour water mixed with anti-freeze into the water supply port of the radiator, to nearly fill it up. Then install the radiator cap (3).




14) Drain the cooling water from the sub-tank (1), wash the inside of the sub-tank (1), and then pour water mixed with anti-freeze to the halfway level between the H (FULL) and L (LOW) marks.

### 25-4-3. Checking and replenishing the windshield washer fluid (for cabin)

Check the level of the washer fluid in the washer fluid tank. If the level is low, replenish windshield washer fluid for cars.




- When replenishing washer fluid, remove the cap (2) and take care not to allow any dirt to enter the washer fluid tank.

- After replenishment, securely install the cap (2).

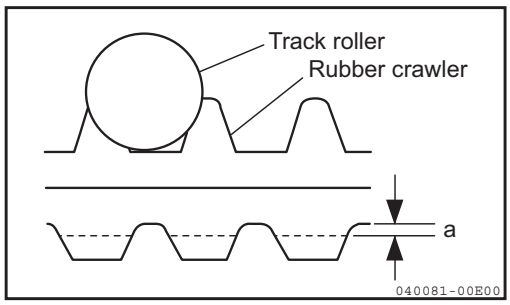
- Use washer fluid of proper density according to the air temperature. The density of the washer fluid and the handling instructions for it are indicated on the container of the washer fluid.

### 25-4-4. Checking the rubber crawlers

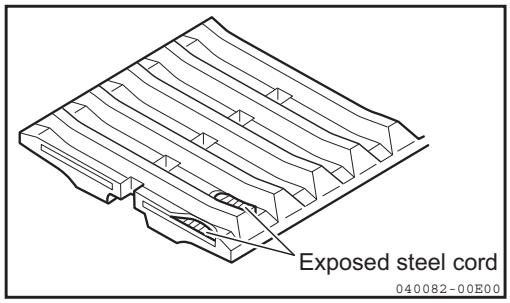
Rubber crawlers in the following condition require repair or replacement. Ask your dealer to repair or replace them.

#### ■ Height of lugs

- As the lug height "a" is reduced by wear, the tractive force decreases.
  If "a" becomes 0.2 in. (5 mm) or less, replace the crawler with a new one.

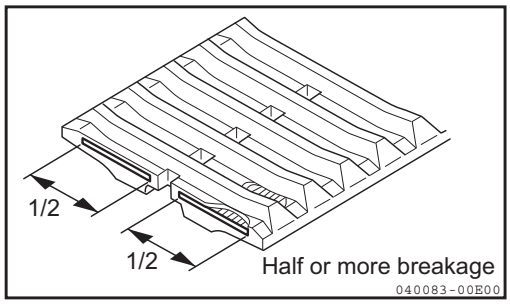



- If two or more links of the steel cord inside the crawler are exposed due to wear of the lugs, replace the crawler with a new one.



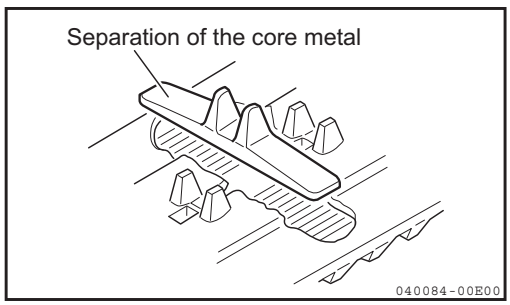

#### ■ Rubber crawler steel cord breakage

If half or more of either of the steel cords is broken, replace the rubber crawler with a new one.




#### ■ Separation of the core metal of the rubber crawler

If the core metal of the rubber crawler separates even at one place, replace the rubber crawler with a new one.



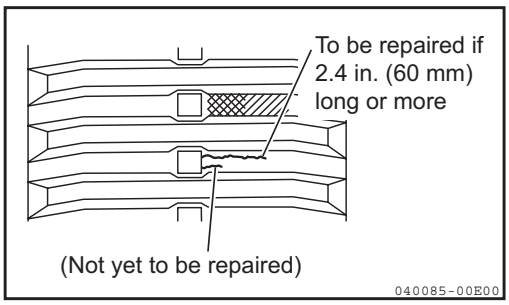
### ■ Rubber crawler tension

The rubber crawler tension is controlled by the hydraulic cylinder. It is not necessary to adjust the rubber crawler tension periodically.

If a rubber crawler is so loose that it comes off, the hydraulic cylinder is assumed to be malfunctioning. Contact your dealer for assistance.

### ■ Crack in the rubber crawler

If a crack occurs between any lugs of the rubber crawler, repair it if the crack length reaches approximately 2.4 in. (60 mm). If the inside steel cord is exposed even though the crack is small, repair the rubber crawler immediately.
If the crack length is less than 1.2 in. (30 mm) or the crack depth is less than 0.4 in. (10 mm), you do not need to repair the rubber crawler.
For a decision on whether the rubber crawler should be replaced, repaired or should continue to be used, ask your dealer.



### 25-4-5. Checking the rubber crawler tension

**⚠ WARNING**

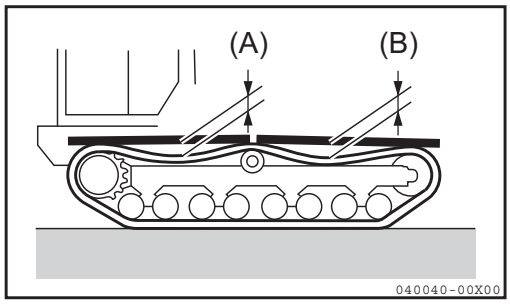
**When two persons check the rubber crawler tension, one must operate the machine in response to signs from the other. Never operate the machine while actually checking the rubber crawler tension.**

How a rubber crawler wears out depends on the working conditions and the nature of the ground. Be sure to check the rubber crawlers for wear and tension from time to time. When a new rubber crawler is mounted, perform the first check after 30 hours operation.

■ **Checking the rubber crawler tension**

1) After moving the machine forward and backward two or three times on level ground, reverse the machine and gather slack on the upper side of the rubber crawler.

2) Place a straight rod on the rubber crawler between the carrier roller and the sprocket, and another straight rod between the carrier roller and the idler. If the slacks (A) and (B) are 0.2 to 0.6 in. (5 to 15 mm), the rubber crawler tension is proper.




■ **Adjustment of the rubber crawler tension**

If the amount of slack is large, contact your dealer for assistance.

**25-4-6. Replacing the rubber crawler**

**⚠ WARNING**

- **Be sure to do the replacement work on level ground.**
- **To replace the rubber crawler with a new one, work with a partner. You must operate the machine in response to signs from your partner.**
- **Because the rubber crawler is replaced with the machine in a raised position, there is a danger that the machine may accidentally fall. Do not move any parts other than the rubber crawler to be replaced in doing the job.**
- **When jacking up the machine, support it with safety blocks of sufficient strength to keep the balance of the machine body.**
- **The oil temperature is very high immediately after the machine stops operating. Be sure to do the work after the oil temperature lowers sufficiently.**
- **When removing the hydraulic hose, oil may spout out due to the high internal pressure. Loosen the hydraulic hose slowly to prevent high pressure oil from contacting your eyes or skin.**
- **If the tension of the rubber crawler cannot be loosened by the procedure described here, ask your dealer to repair the rubber crawler.**

• Prepare a bar.

■ **Removing the rubber crawler**

**⚠ WARNING**

- **It is very dangerous to loosen the rubber crawler by any procedure other than that described below.**
- **If the tension of the rubber crawler cannot be loosened, ask your dealer to repair or replace the rubber crawler.**

## ⚠ CAUTION

**Take great care in handling rubber crawlers, because they are very heavy.**

**IMPORTANT**

**Prepare two wrenches for removal and installation of hydraulic hoses. Use one of the wrenches for holding the hydraulic hose to prevent it from twisting.**

1) Dump the wagon and set the dump lock lever to the lock position. Then stop the engine.

2) Hold the wagon with the wagon stopper.

3) Change the connecting locations of the hydraulic hoses connected to the auto-tension valve (1). Changing the connecting locations of the hydraulic hoses allows the tension cylinder to be retracted and extended.

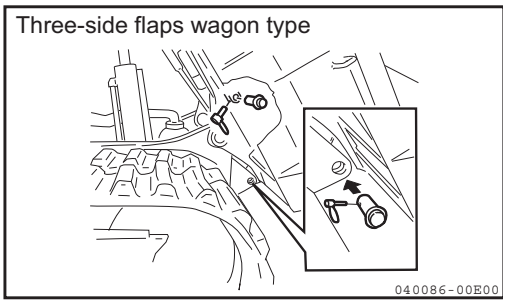
   Right rubber crawler: Change the connecting locations of the hydraulic hoses (2) and (3) for each other.

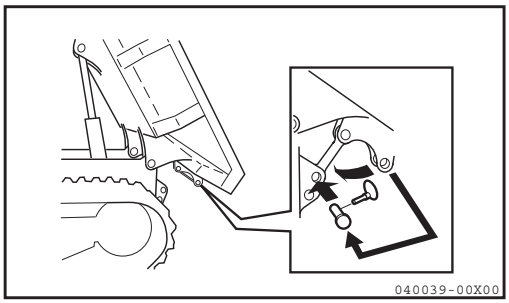
   Left rubber crawler: Change the connecting locations of the hydraulic hoses (4) and (5) for each other.

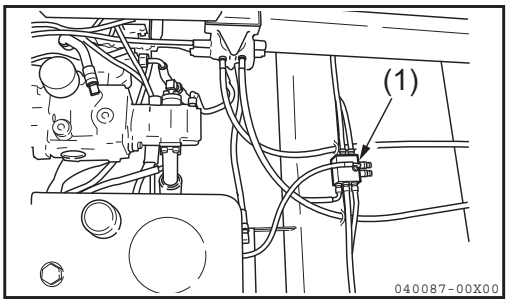
4) Start the engine and retract the tension cylinder fully. Then stop the engine.

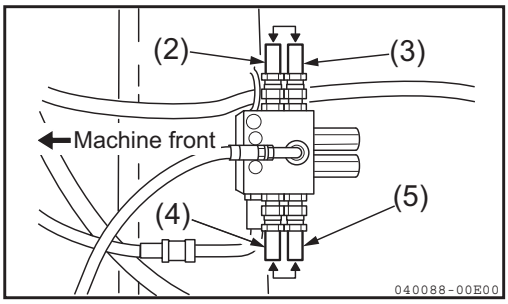
5) Jack up the machine so that a clearance can be created between the core metal protrusion of the rubber crawler and the track rollers, and put wood bases or the like between the crawler frame on its lower side and ground.

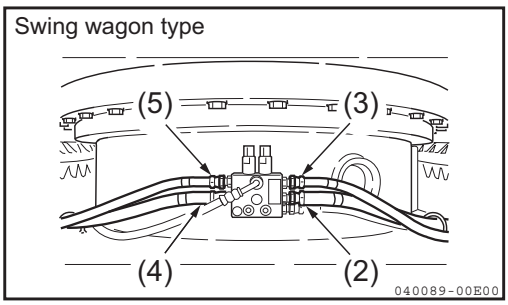
6) Remove the rubber crawler from the idler first, and then from the sprocket.



■ **Installing the rubber crawler**

1) Engage the rubber crawler with the sprocket, and place the rubber crawler on the idler.

2) Start the engine and turn the rubber crawler slowly to install the rubber crawler onto the idler securely, using a lever.

3) Stop the engine and confirm that the rubber crawler is fully engaged with the sprocket, the rollers and idler.

4) Referring to the step 3) on the previous page, change the connecting locations of the hydraulic hoses connected the auto-tension valve (1), to return those to the original state before the removal of the rubber crawler.

5) Start the engine and check that the rubber crawler tension is sufficient. Then lower the machine to the ground.

6) Check the hydraulic hoses for oil leakage.

### 25-4-7. Draining the water and deposits from the fuel tank

**⚠ WARNING**

**Keep sparks, flames and lit cigarettes away.**

■ **Things to prepare**

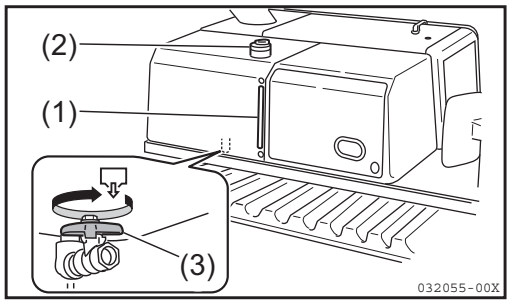
• Container for fuel waste

1) Put the container under the drain cock (3) on the bottom of the fuel tank.

2) Open the drain cock (3) to discharge the water and dirt deposits in the fuel tank.

3) Take care that the fuel does not contact your body.

4) When clean fuel starts coming out, close the drain cock (3).



## 25-5. Checking before start-up

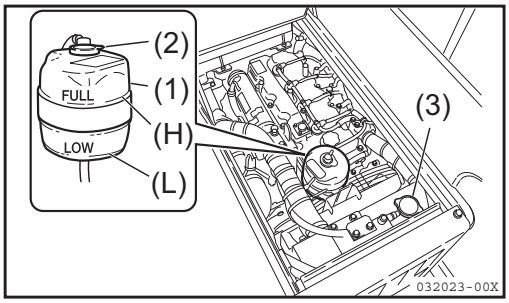
Check the items described here every day, before starting the engine for the first time.

### 25-5-1. Checking and replenishing the cooling water

**⚠ WARNING**

**Normally do not open the radiator cap.**
**Check the cooling water in the sub-tank when the engine is cool.**

1) Open the engine hood to check to see that the cooling water level is between the H (FULL) and L (LOW) marks on the sub-tank (1) (illustrated at the right). If the cooling water level is low, add cooling water to the H (FULL) mark through the port of the sub-tank (1). For the cooling water to be used, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".




2) Securely close the cap (2) after replenishing.

3) If the sub-tank (1) is empty, check the sub-tank for leaks and then check the cooling water level in the radiator (3). If the cooling water is insufficient, refill the radiator (3) and then the sub-tank (1) with cooling water.

4) If the cooling water level is proper, close the engine hood.

### 25-5-2. Checking and replenishing the engine oil

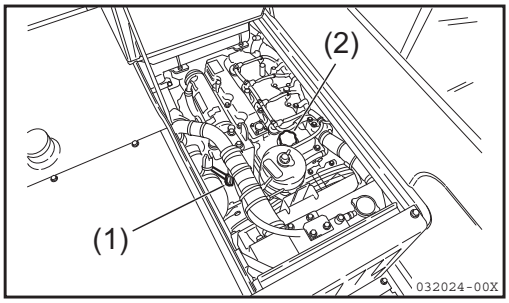
**⚠ WARNING**

- **At operating temperature, the oil and dipstick areas are hot.**
- **Do not allow hot oil or hot components to contact the skin, to prevent bodily injury.**
  **Check the oil level and replenish oil after the engine has cooled down sufficiently.**

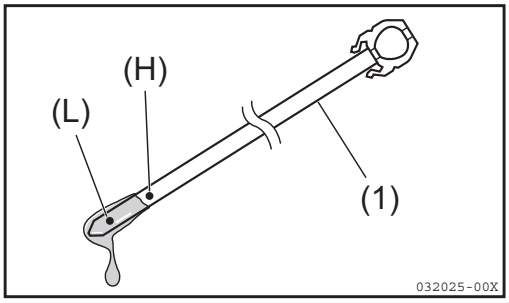
1) Open the engine hood.

2) Pull out the oil dipstick (1) and wipe oil off it with a cloth.

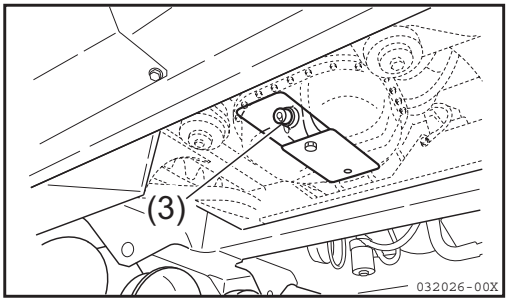
3) Insert the oil dipstick (1) fully again and pull it out.




4) Check whether the oil level is between the H (upper limit) and L (lower limit) marks on the oil dipstick (1).
   Remove the oil supply port cap (2) and replenish engine oil if the oil level is below the L mark.
   Refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range" for the engine oil to be used.




5) If the engine oil level is above the H mark, drain the excess engine oil through the drain plug (3), and check the engine oil level again.
   See "25.6.4 Replacing the engine oil and the engine oil filter element".




6) If the engine oil level is proper, securely close the oil supply port cap (2) and close the engine hood.

***Note :***

*When checking the engine oil level after the engine has been running, stop the engine and wait at least 15 minutes before checking.*

*If the machine is on an incline, make it level before checking the engine oil level.*

*Do not discard the excess engine oil onto the ground or the road.*

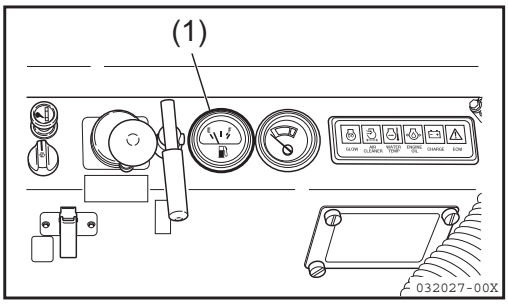
**25-5-3. Checking and replenishing the fuel in the fuel tank**

## ⚠ WARNING

**Be careful not to overfill the fuel tank because it could cause a fire. If the fuel tank is overfilled, completely wipe off the spilled fuel.**

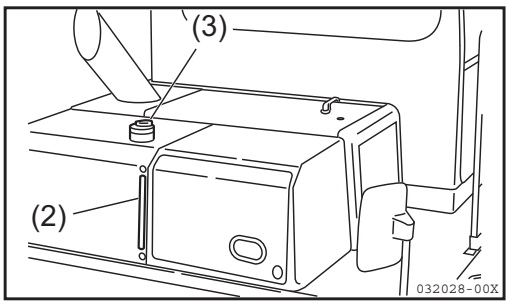
## ⚠ CAUTION

- **Do not remove the fuel filter from the fuel supply port of the fuel tank when supplying fuel.**
- **Be careful not to allow any water that may be in the fuel container or dirt on the refueling equipment to enter the fuel tank.**




1) Check the fuel level with the fuel meter (1) or the fuel gauge (2). If the fuel level is low, add necessary fuel. When the fuel meter pointer is at “E”, approximately 1.1 Gals. (4 L) of fuel is left in the tank.

2) Turn the starter switch key to the "ON" position.




3) Remove the fuel supply port cap (3), and add fuel through the fuel supply port, checking the fuel level with the fuel meter (1) or the fuel level gauge (2).

   Fuel tank capacity : 25.1 Gals. (95 L)

   Refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range" for the fuel to be used.

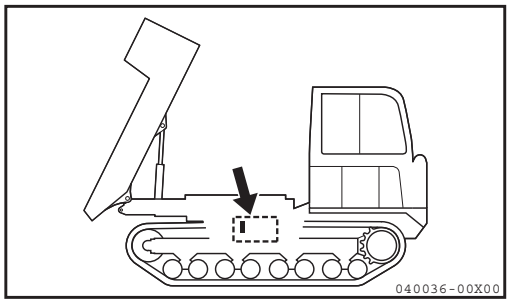
4) After refueling, securely retighten the fuel supply port cap (3).

**25-5-4. Checking and replenishing the hydraulic oil in the hydraulic oil tank**

**⚠ WARNING**

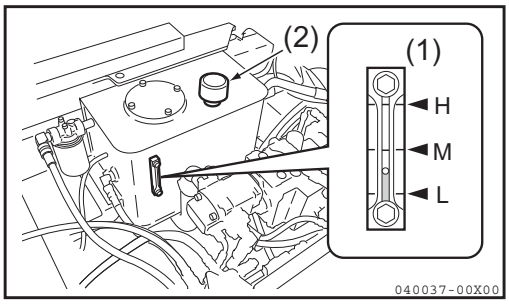
**Be sure to install the wagon stopper to hold the wagon when inspecting or servicing the machine with the wagon in the dump position.**

1) Park the machine on the level ground. Dump the wagon, set the dump lock lever to the lock position and stop the engine.




2) Hold the wagon with the wagon stopper.

3) Check the oil level gauge (1). If the oil level is between M and L mark on the level gauge, the hydraulic oil level is proper.




**IMPORTANT**

**Do not replenish hydraulic oil above the midpoint between M and L mark on the level gauge with the wagon in the dump position. It may cause the hydraulic oil to spout out. (When the wagon is lowered, the oil level reaches close to the M mark.)**

4) If the hydraulic oil level is below the L mark, remove the air breather (2) and refill the hydraulic oil tank until the oil level reaches the midpoint between M and L mark (specified level) on the oil level gauge.

   For the hydraulic oil to be used, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".

### 25-5-5. Greasing

**⚠ WARNING**

**Be sure to install the wagon stopper to hold the wagon when inspecting or servicing the machine with the wagon in the dump position.**

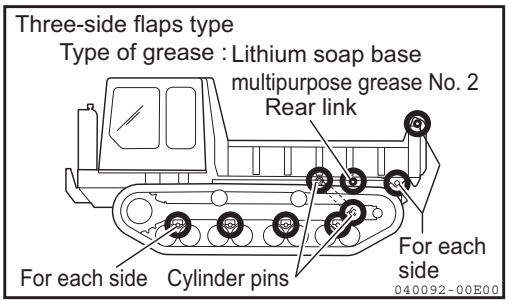
- Prepare a grease gun.

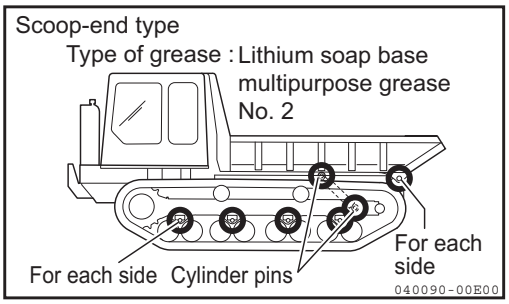
1) Clean the grease nipples indicated by circles in the figures at the right, and grease them with a grease gun.

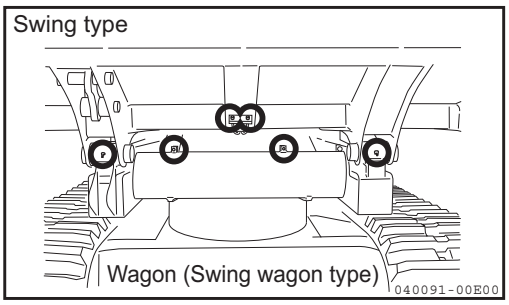
2) After greasing, wipe off any excess grease that remains.

Number of grease nipples:

- Wagon :
  - Three-side flaps type : 7
  - Scoop-end type : 4
  - Swing type : 6
- Crawlers : 8



### 25-5-6. Checking and replenishing the battery electrolyte

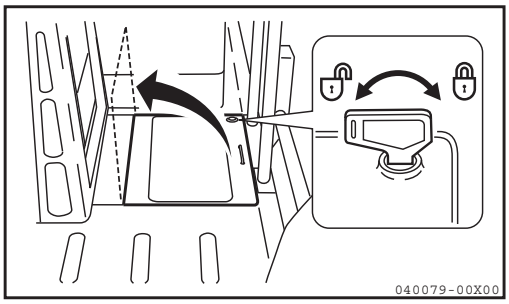
**⚠ DANGER**

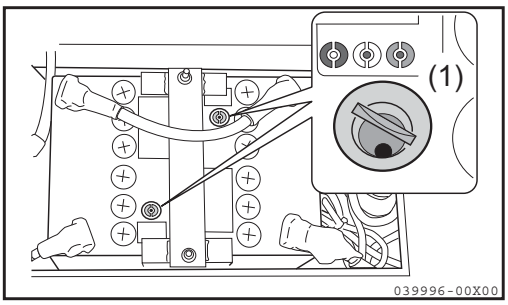
- **The battery generates flammable gas and can cause a fire and an explosion.**
  **Keep sparks, flames and lit cigarettes away from the battery.**
- **Battery electrolyte is strong acid. To avoid serious injury, do not allow the electrolyte to contact your skin or splash into your eyes.**
- **Always wear safety goggles and protective clothing, when adding electrolyte.**
- **Do not use the machine with the battery which is short of battery electrolyte. The shortage of battery electrolyte not only will reduce the life of the battery but also could cause an explosion.**

**IMPORTANT**

**If distilled water is used, add it to the battery electrolyte in the battery before operating the machine on the day to prevent it from freezing.**

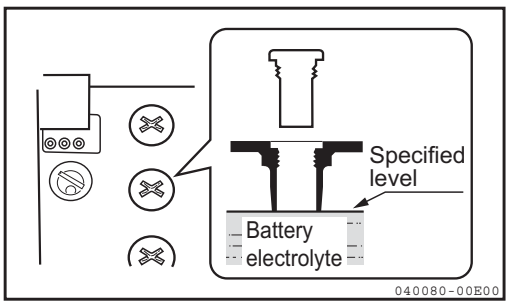
1) Open the battery cover and check the indicator (1) on the battery for the electrolyte level and the amount of charge.




**How to check the indicator:**

- (Blue) : Normal
- (Red) : Low battery charge.
  Recharge the battery.
- (White) : Shortage of battery electrolyte.
  Replenish distilled water.



### 25-5-7. Checking the electrical equipment

**⚠ CAUTION**

**If a fuse blows out frequently or if the electrical wiring shows a sign of having been short-circuited, contact your dealer for assistance.**

Check the fuses for damage, the wiring for poor connections or short-circuits, and the battery terminals for corrosion and loose connections. If any connections are loose, retighten the connectors.

Especially, check the wiring for the following items carefully:

- Battery
- Starter motor
- Generator

**⚠ WARNING**

**If there are any combustibles in the heat build-up area around the battery, a fire can result. Be sure to remove any combustibles.**

Check the following items after the starter switch is turned to the "ON" position.

1) Check the monitor function

- Check the hourmeter, fuel meter and water temp. meter functions.
- Check the water temp. alarm lamp, engine oil pressure alarm lamp, battery charge alarm lamp and air cleaner alarm lamp.

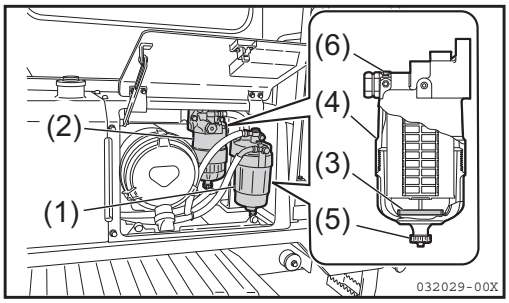
2) Check that all switches function correctly and all lamps light correctly.

- Check the headlight.
- Check the horn.
- Check the flasher function.
- Check the wiper function (for cabin).
- Check the heater function (for cabin).

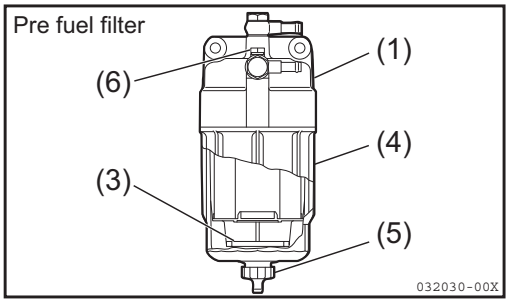
### 25-5-8. Inspecting/draining the fuel filter

If the red ring (3) has sunk down at the bottom of the case (4), it means that no water has mixed.
If the red ring (3) is floating in the cup, water is mixed into the oil under the red ring. In this case, to remove the water through the following steps.

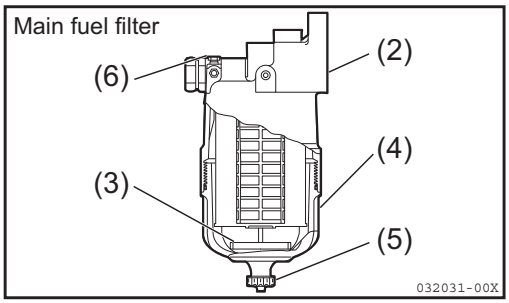
1) Open the side over.
2) Put a container for oil under the drain plug (5) of the pre fuel filter (1).
3) Loosen the air bleed plug (6).
4) Loosen the drain plug (5) to drain water.




5) Tighten the air bleed plug (6) and drain plug (5).
   Drain plug (5) tightening torque:
   1.5 to 2.5 N•m (0.15 to 0.25 kg•m)
   Air bleed plug (6) tightening torque:
   7.9 to 11.7 N•m (0.8 to 1.2 kgf•m)
6) Repeat the above steps for the main fuel filter (2).



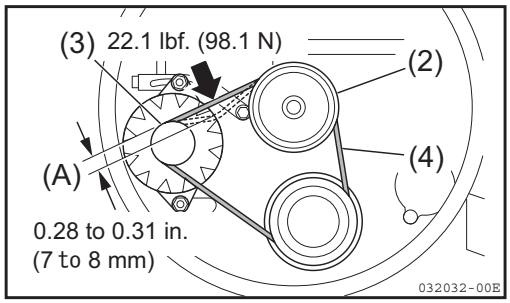

7) Bleed air from the fuel system.
   For instructions, see "Bleeding air from the fuel system" on page 3-50.
8) Drain the water and deposits in the fuel tank. For instructions, see "25.4.3 Draining the water and deposits in the fuel tank".




**IMPORTANT**

**After servicing the fuel system, check again for fuel leakage.**

### 25-5-9. Checking the fan belt tension



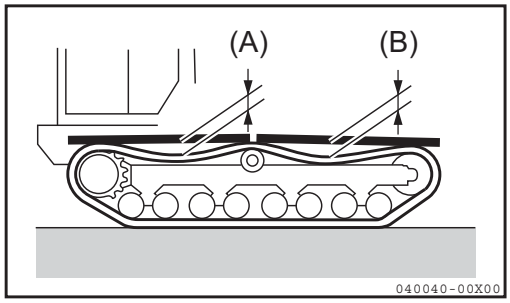

1) Open the engine hood.

2) Press down on the fan belt between the fan pulley (2) and the generator pulley (3) with a finger, to check the fan belt tension.
   Check the fan belt for cracks and peeling.

- Pressing force : Approximately 22.1 lbf. (98.1 N)
- Correct slack for (A) : 0.28 to 0.31 in. (7 to 8 mm)

3) If the tension is proper, close the engine hood.

### 25-5-10. Checking the crawler tension




Park the machine on the level ground and gather slack on the upper side of the rubber crawler. Place straight rods on the rubber crawler as illustrated in the figure at the right and check the slacks (A) and (B).

- Correct slack for (A) and (B) : 0.20 to 0.59 in. (5 to 15 mm)

## 25-6. Maintenance every 250 service hours

Also perform the maintenance every 50 service hours.

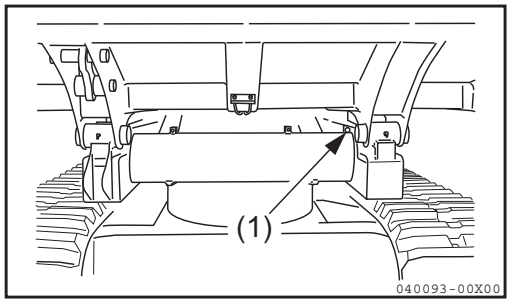
### 25-6-1. Greasing the swing bearing (for the swing wagon type)

**⚠ WARNING**

**Do not swing the wagon while greasing.**
**Swing the wagon after each stage of greasing is completed to avoid serious bodily injury.**

1) Grease the swing bearing through the grease nipple (1), using a grease gun.

2) Swing the wagon in small increments and grease after each stop, until the wagon has made a full revolution.



### 25-6-2. Checking and replenishing the travel reduction gear oil

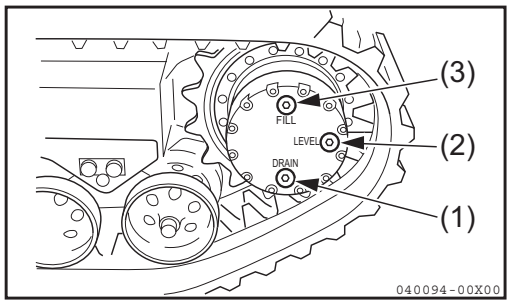
**⚠ WARNING**

- **The gear oil and casing of the reduction gearbox are hot immediately after ceasing machine operation and can cause bodily injury.**
  **Do not allow hot oil or the gearbox to contact your skin.**
  **Replace oil after the oil and the gearbox have cooled sufficiently, if necessary.**
- **At operating temperature, the reduction gearbox is hot and its contents are under pressure.**
  **In such condition, the oil or a plug may be ejected violently, causing bodily injury. Remove a plug slowly to gradually relieve the residual pressure.**

■ **Things to prepare**

- Container for oil
- Oil jug

1) Park the machine on the level ground and position it so that the plugs (1), (2) and (3) will be in the positions for checking and replenishing, as illustrated in the figure at the right.




2) Place the container for waste oil under the drain plug (1).

3) Remove the level port plug (2) and check that the oil level reaches the lower end of the level port.

4) When the oil quantity is insufficient, replenish gear oil through the oil supply port (the hole for the plug (3)) until gear oil overflows from the level port.
   Refer to Section “21. Fueling, Oiling and Greasing Based on Temperature Range” for the gear oil to be used.

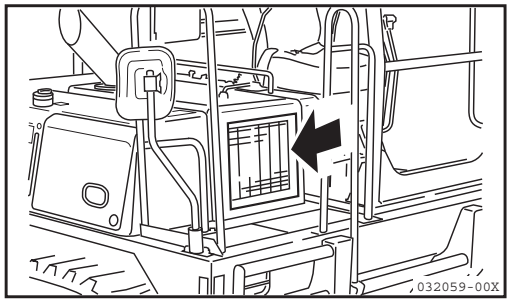
5) After checking the oil level, install the plugs.
   Tightening torque : 110 to 122 ft•lbf (149 to 165 N•m)

**25-6-3. Checking and cleaning the radiator and oil cooler fins**

## ⚠ WARNING

- **Never attempt to check and clean the radiator fin while the engine is running.**
  **Always stop the engine and allow the radiator to cool first, before checking and cleaning it.**
- **Compressed air can cause bodily injury since the objects around the radiator fin may scatter.**
- **Whenever using compressed air for cleaning, check that there are no other persons nearby, and always wear safety goggles and protective clothing and shoes.**
- **The maximum compressed air pressure should be less than 100 PSI (0.7 MPa) for cleaning purposes.**

1) Remove the radiator grille and clean it.




2) Clean off any dirt clogged in the radiator and oil cooler fins by blowing compressed air or by flushing with running water using a hose. A clogged fin will cause overheating.

3) Check that the radiator fins are straight and that all the dirt has been removed completely.

4) Install the radiator grille.

**IMPORTANT**

- **Always blow the compressed air away from the fins to prevent damage to the fins.**
- **A damaged fin will cause water leakage and overheating.**
- **The pressure of compressed air or water to clean the radiator and oil cooler fins must be less than 28 PSI (0.19 MPa).**

### 25-6-4. Replacing the engine oil and the engine oil filter element

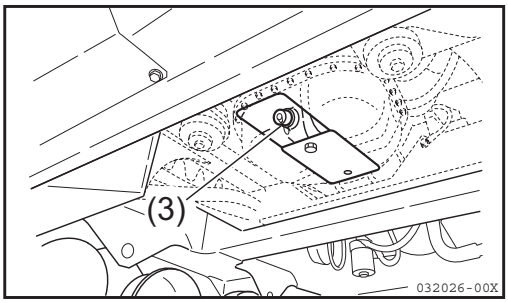
**⚠ WARNING**

**Do not replace the oil immediately after the engine stops to prevent bodily injury, because all the components are hot. Start working after the engine parts have cooled down sufficiently.**

■ **Things to prepare**

- Replacement new oil : 15.9 Qts. (15 L)
- Container for waste oil : Capacity of 15.9 Qts. (15 L) or more
- Prepare an oil filter wrench.

1) With the hood open, put the container for waste oil under the drain plug (3) on the vehicle body side.




2) Remove the cap from the oil supply port.

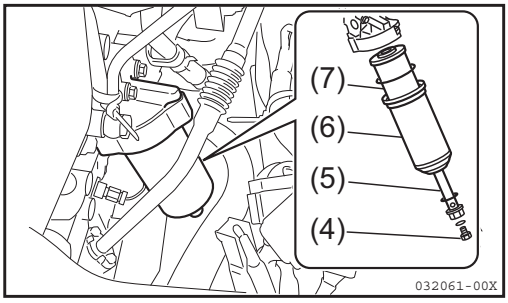
3) Loosen the bolt to remove the cover.

4) Slowly remove the drain plug (3) so that the oil should not splash your body and drain the waste oil.

5) Check the waste oil, and contact your dealer if a lot of metallic particles or foreign objects are mixed in it.

6) Install the drain plug (3).

7) Install the cover.




8) Put a container for waste oil under the engine oil filter located below the turbo charger.

9) Remove the filter drain plug (4) to drain oil out of the filter case (6).

10) Loosen the bolt (5) to remove the filter case (6).

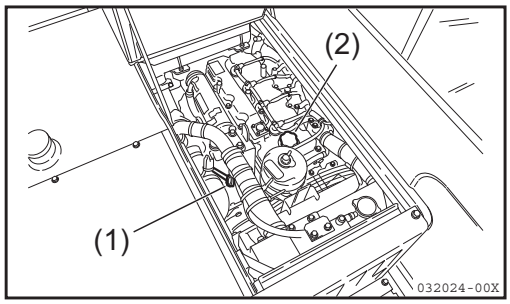
11) Wash the filter case inside (6) to insert a new element (7).

12) Clean the filter mount and apply engine oil (or a thin layer of grease) to the new packing.

13) Fasten the case (6) by tightening the bolt (5) and in-

stall the drain plug (4) as well.
Bolt (5) tightening torque: 32.5 ft•lbf (44.1 N•m)
Drain plug (4) tightening torque: 18.1 ft•lbf (24.5 N•m)

14) After replacing the filter, supply engine oil till somewhere between the H and L marks on the level gauge (1).




15) Tighten the oil supply port cap (2). Stop the engine after idling it for a while. Check that the oil level is somewhere between the H and L marks on the level gauge, as instructed in "25.5 Checking before start-up".

Replace the engine oil and the oil filter element one year after the previous replacement, even if the service hours have not reached 250 hours.

- Also, the engine oil and the oil filter element should be replaced whenever the service hours have reached 250 hours, whether or not one year has passed since the last replacement.

## 25-7. Maintenance every 500 service hours

Also perform the maintenance every 50, 100 and 250 service hours.

### 25-7-1. Checking and adjusting the fan belt tension

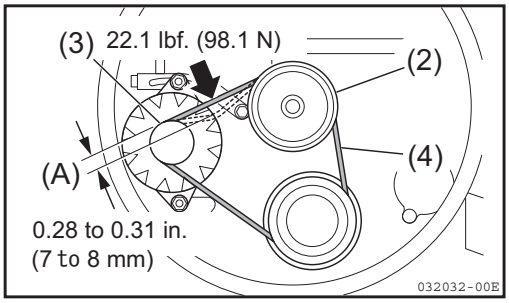
**⚠ WARNING**

- **Stop the engine, take out the starter switch key, and attach the "SERVICING IN PROGRESS" tag to the starter switch.**
- **The fan belt is hot immediately after the engine is stopped.**
  **Do not adjust the fan belt tension immediately after stopping the engine. Adjust the fan belt tension after all of the parts of the engine have cooled sufficiently.**

## ■ Checking the fan belt tension

1) Open the engine hood.
2) Press down the fan pulley (2) and the generator pulley (3) with a finger to check the fan belt tension (A).

- Pressing force : Approximately 22.1 lbf. (98.1 N)
- Correct slack for A : 0.28 to 0.31 in. (7 to 8 mm).

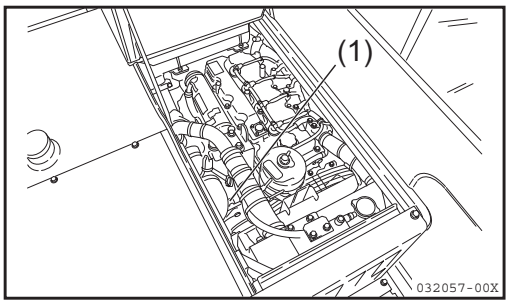



## ■ Adjusting the fan belt tension

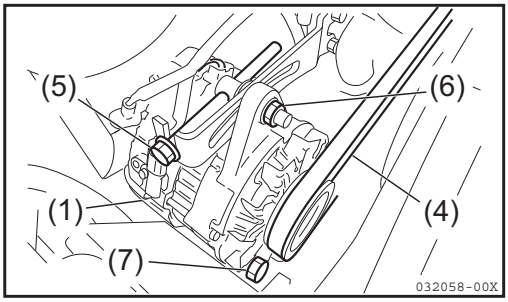
(1) Open the engine hood.

(2) Loosen the generator (1) mounting bolt (7) and nut (6). Loosen the lower bolt (7) with the backside nut locked.

(3) Turn the adjusting bolt (5) to adjust the tension.
Adjust the fan belt tension by sliding the generator (1) to such a position that the fan belt slacks by approximately 0.28 to 0.31 in. (7 to 8 mm) when pushed with a pressing force of 22.1 lbf. (98.1 N).
To increase the tension, turn the adjusting bolt clockwise.
To decrease the tension, turn the adjusting bolt counterclockwise.




(4) Tighten the bolt (7) and nut (6) to fasten the generator (1).
Nut (6) tightening torque: 18.4 ft•lbf (25 N•m)
Bolt (7) tightening torque: 37.6 ft•lbf (51 N•m)




(5) Check the pulleys, the V-groove, and the fan belt for damage, and check that the fan belt does not touch the bottom of the V-groove.

(6) If the fan belt cannot be properly adjusted because it has lost its elasticity or if it is damaged or cracked, replace the fan belt with a new one.

(7) In the case you have replaced the fan belt with new one, adjust the fan belt tension so that the belt slacks by approximately 0.16 to 0.20 in. (4 to 5 mm) when pushed with a pressing load of 22.1 lbf. (98.1 N). Run the engine for 5 minutes or longer, and then inspect and adjust the fan belt tension again so that the belt slacks by approximately 0.28 to 0.31 in. (7 to 8 mm) when pushed with a pressing load of 22.1 lbf. (98.1 N).

### 25-7-2. Replacing the fuel filter

1) Open the side over.

2) Put a container for oil under the drain plug (5) of the pre fuel filter (1).

3) Loosen the air bleed plug (6) and drain plug (5) to drain fuel.

4) Remove the case (4) using a filter wrench.

5) Replace the packing of the case (4) and drain plug (5) with new ones, and then apply fuel lightly to the packing.

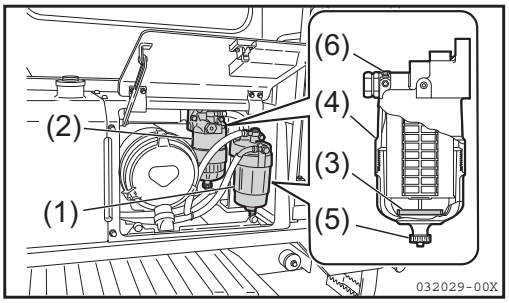
6) Insert a new element (155mm in length) into the case (4) and tighten it by hand till the packing contacts the mounting surface.

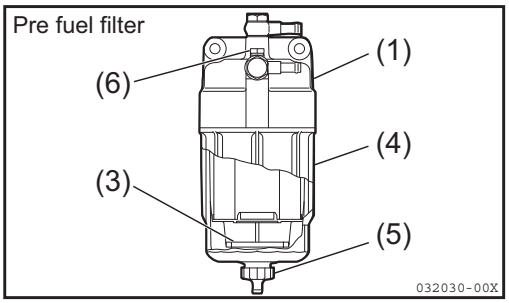
7) Using a filter wrench, tighten the case (4) by 1/3 to 2/3 turn.
   Case (4) tightening torque:
   21.7 ft•lbf (29.4 N•m)
   Drain plug (5) tightening torque:
   1.1 to 1.8 ft•lbf (1.5 to 2.5 N•m)
   Air bleed plug (6) tightening torque:
   5.8 to 8.6 ft•lbf (7.9 to 11.7 N•m)

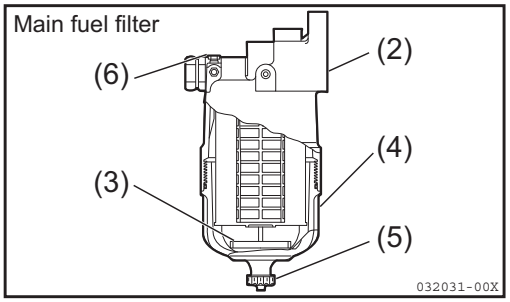
8) Repeat the above steps for the main fuel filter (2).
   For the main fuel filter, however, it is a new element (131mm in length).

9) Bleed air from the fuel system.
   For instructions, see "Bleeding air from the fuel system" on page 3-51.

10) Make sure that the mounting surface is free from fuel leakage.



**Bleeding air from the fuel system :**

If air enters the fuel system, difficulty in starting the engine or an engine trouble may be caused. Be sure to bleed air from the fuel system after you have emptied the fuel or drained water from the fuel system or replaced the filter element.

1) Fill up the fuel tank.

2) Turn the starter switch into the ON position to operate the feed pump.

3) Loosen the air bleed plug (6) of the pre fuel filter (1).

4) When the fuel filter is filled with fuel, then tighten the air bleed plug.

5) Wait for about one minute and loosen the air bleed plug (6) to bleed air from the fuel filter. Repeat this step till air is no longer bled.

6) Securely tighten the air bleed plug (6) and wipe off fuel from around.

7) Repeat the above steps for the main fuel filter (2).

8) Start the engine and maintain it at low idling speed for 5 seconds.

9) Slowly increase the engine speed till it reaches medium speed and maintain the engine at that speed for 3 minutes.

10) Increase the engine speed to the maximum speed.

### 25-7-3. Replacing the line filter element

**⚠ WARNING**

- **The hydraulic oil and the tank are hot and under pressure at operating temperature, and can cause bodily injury. Never replace the filter element immediately after operation is stopped. Wait until the hydraulic oil tank has cooled enough to permit you to touch the tank surface with your bare hand.**
- **Be sure to install the wagon stopper to hold the wagon when inspecting or servicing the machine with the wagon in the dump position.**

■ **Things to prepare**

- Container for waste oil
- Hexagon wrench

1) Park the machine on the level ground. Dump the wagon, set the dump lock lever to the lock position and stop the engine.

2) Hold the wagon with the wagon stopper.

3) Place the container for waste oil under the line filter.

4) Using the hexagon wrench, remove the case (1).

5) Take out the element (2) from the case (1) and clean the case (1).

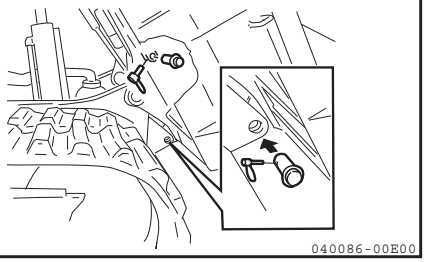
6) Insert a new element into the case (1), and then install it in the original position.
Tightening torque : 29 to 36 ft•lbf (39 to 49 N•m)

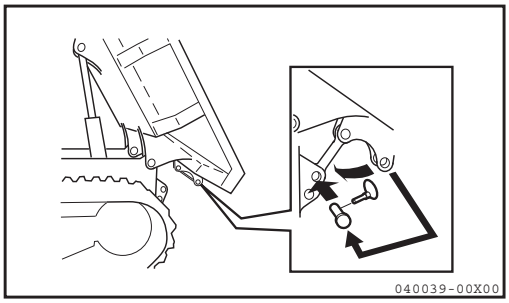
7) After installing the line filter, check the oil level with the oil level gauge. If the oil level is low, replenish the hydraulic oil tank with hydraulic oil.

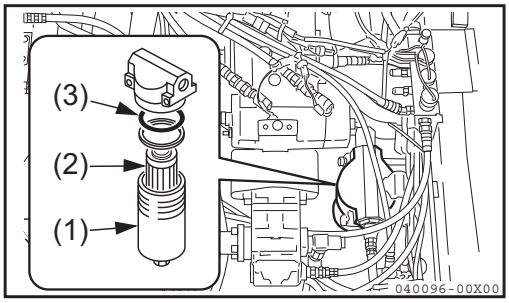
Refer to Section “21. Fueling, Oiling and Greasing Based on Temperature Range” for the hydraulic oil to be used.

Refer to Section “25-5-4. Checking and replenishing the hydraulic oil in the hydraulic oil tank” for replenishing the hydraulic oil.

Three-side flaps wagon type



### 25-7-4. Replacing the travel reduction gear oil

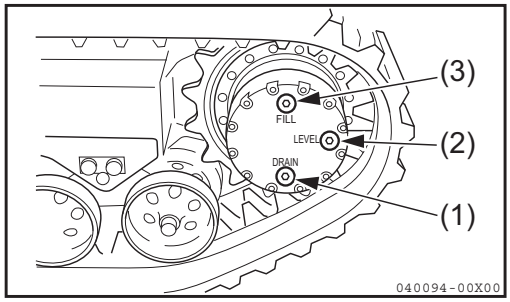
**⚠ WARNING**

- **The gear oil and casing of the reduction gearbox are hot immediately after ceasing machine operation and can cause bodily injury such as a burn. Do not allow hot oil or the gearbox to contact your skin.**
  **Replace the oil after the oil and the gearbox have cooled enough to permit touching the surface of the gearbox casing with your bare hand.**
- **At operating temperature, the reduction gearbox is hot and its contents are under pressure.**
  **In such condition, the oil or a plug may be ejected violently, causing bodily injury. Loosen a plug slowly to gradually relieve the residual pressure.**

■ **Things to prepare**

- Container for waste oil : Capacity of 2.75 Qts. (2.6 L) or more
- New gear oil : 2.75 Qts. (2.6 L) for each side
- Oil jig

1) Park the machine on the level ground and position it so that the plugs (1), (2) and (3) will be in the positions, as illustrated in the figure at the right.




2) Place the container for waste oil under the drain plug (1).

3) Remove the plugs (1), (2) and (3) and drain the gear oil.

4) Install the drain plug (1).

5) Replenish gear oil to the specified level through the oil supply port (the hole for the plug (3)).
   Refer to Section “21. Fueling, Oiling and Greasing Based on Temperature Range” for the gear oil to be used.

6) When gear oil begins overflowing from the level port (the hole for the plug (2)), install the plugs (2) and (3).
   Tightening torque : 110 to 122 ft•lbf (149 to 165 N•m)

## 25-8. Maintenance every 1000 service hours

Also perform the maintenance every 50, 100, 250 and 500 service hours.

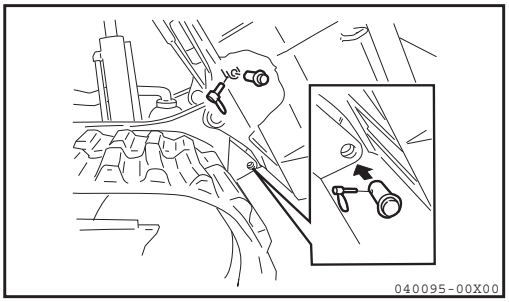
### 25-8-1. Replacing the hydraulic oil and cleaning the suction filter element

**⚠ WARNING**

- **The hydraulic oil and the tank are hot and under pressure at operating temperature. Never replace the oil immediately after operation is stopped. Wait until the tank has cooled enough to permit you to touch its surface with your bare hand.**
- **When removing the oil supply port cap, slowly loosen it to relieve the internal pressure, then remove the cap carefully.**
- **If the cover of the tank is removed too quickly, the cover may pop out due to the spring force applied to the filter. Also, the hydraulic oil may spout out if the pressure inside the tank has not been gradually relieved. Slowly loosen the four bolts diagonally to remove the cover.**
- **Be sure to install the wagon stopper to hold the wagon when inspecting or servicing the machine with the wagon in the dump position.**

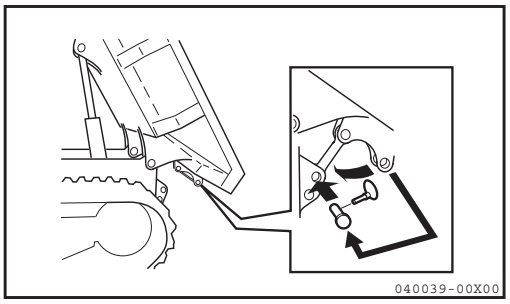
■ **Things to prepare**

- Container for waste oil : Capacity of 9.5 Gals. (36 L) or more
- New hydraulic oil : 9.5 Gals. (36 L)
- O-ring



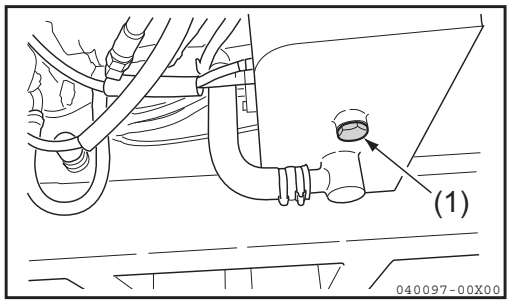

1) Park the machine on the level ground. Dump the wagon, set the dump lock lever to the lock position and stop the engine.

2) Hold the wagon with the wagon stopper.




3) Put the container for waste oil under the drain plug (1) on the underside of the hydraulic oil tank.

4) Remove the drain plug (1) to drain the hydraulic oil. Check the O-ring mounted on the drain plug (1), and if it is damaged or cracked, replace it with a new one.

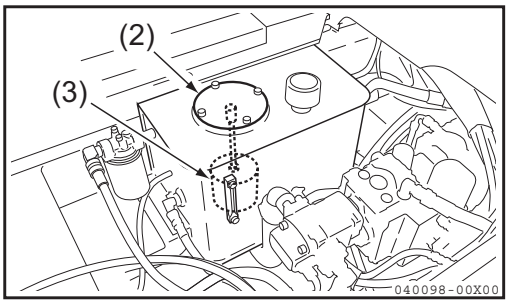



**IMPORTANT**

**Take care not to splash the waste oil on the rubber crawlers, because the waste oil will reduce the service life of the rubber crawlers.**

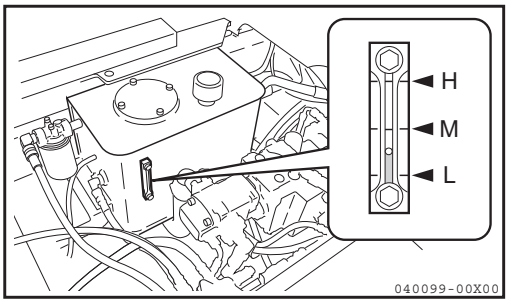
5) Remove the guard. (Swing wagon type)

6) Remove the cover (2) of the hydraulic oil tank and take out the suction filter (3) from the tank.




7) Remove the dirt from the suction filter (3) and wash it with a washing agent. Check the suction filter, and if it is damaged or cracked, replace it with a new one.

8) Install the suction filter into the hydraulic oil tank.



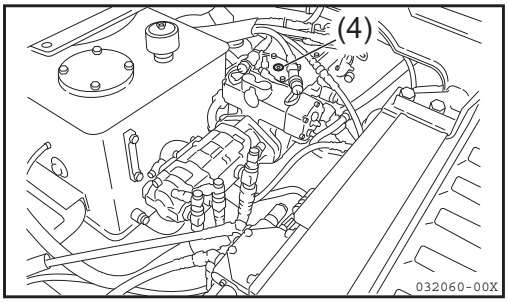

**IMPORTANT**

**Do not allow any dirt to enter the tank when installing the filter.**

9) Replenish new hydraulic oil until the oil level reaches the midpoint between M and L mark on the oil level gauge. Refer to Section “21. Fueling, Oiling and Greasing Based on Temperature Range” for the hydraulic oil to be used.

10) Install the cover (2) on the hydraulic oil tank.

11) Remove the air release plug (4) from the hydraulic pump to release air.




12) When hydraulic oil begins overflowing from the hole for the air release plug (4), install and tighten the plug (4).

13) Install the guard. (Swing wagon type)

### 25-8-2. Replacing the return filter

**⚠ WARNING**

- **The hydraulic oil and the tank are hot and under pressure immediately after the engine stops, and can cause bodily injury.**
  **Be sure to replace the filter only after the hydraulic oil tank has cooled enough to permit touching the tank surface with your bare hand.**
- **Be sure to install the wagon stopper to hold the wagon when inspecting or servicing the machine with the wagon in the dump position.**

■ **Things to prepare**

- Container for oil
- Filter wrench

1) Park the machine on the level ground. Dump the wagon, set the dump lock lever to the lock position and stop the engine.

2) Hold the wagon with the wagon stopper.

3) Place the container for oil under the filter.

4) Turn the filter cartridge (1) counterclockwise with the filter wrench to remove it.

5) Wipe off the dirt and oil from the filter mount and apply hydraulic oil (or apply grease thinly) to the seal surface of a new filter cartridge.

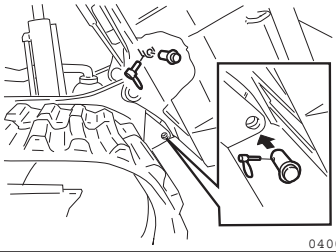
6) Install the filter cartridge by hand. Give the filter cartridge 3/4 of a turn to tighten it after the seal surface has contacted the filter mount.

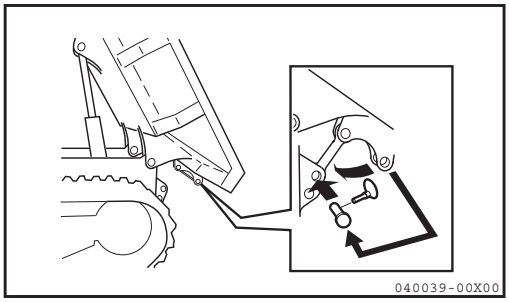
7) After installing the filter cartridge, check the oil level with the oil level gauge. If the oil level is low, replenish the hydraulic oil tank with hydraulic oil.

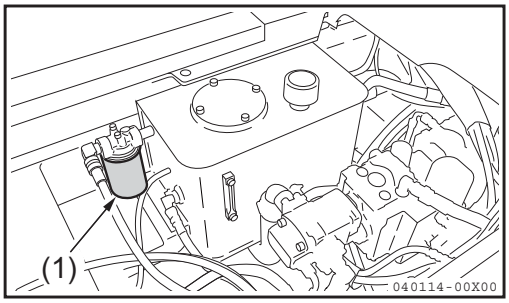
   Refer to Section “21. Fueling, Oiling and Greasing Based on Temperature Range” for the hydraulic oil to be used.

   Refer to Section “25-5-4. Checking and replenishing the hydraulic oil in the hydraulic oil tank” for replenishing the hydraulic oil.

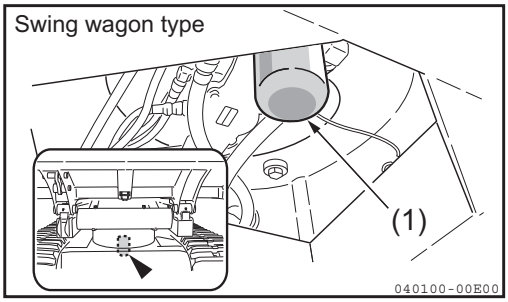
Three-side flaps wagon type




Swing wagon type



**IMPORTANT**

**Contact your dealer for the following inspection/repair tasks, which require professional skills.**

**25-8-3. Checking and adjusting the engine valve clearance**

**25-8-4. Measuring the engine compression pressure**

**25-8-5. Checking and cleaning the starter and the generator**

**25-8-6. Checking the radiator cap**

## 25-9. Maintenance every 2000 service hours

Also perform the maintenance every 50, 100, 250, 500 and 1000 service hours.

### 25-9-1. Checking and replacing fuel piping, cooling water piping

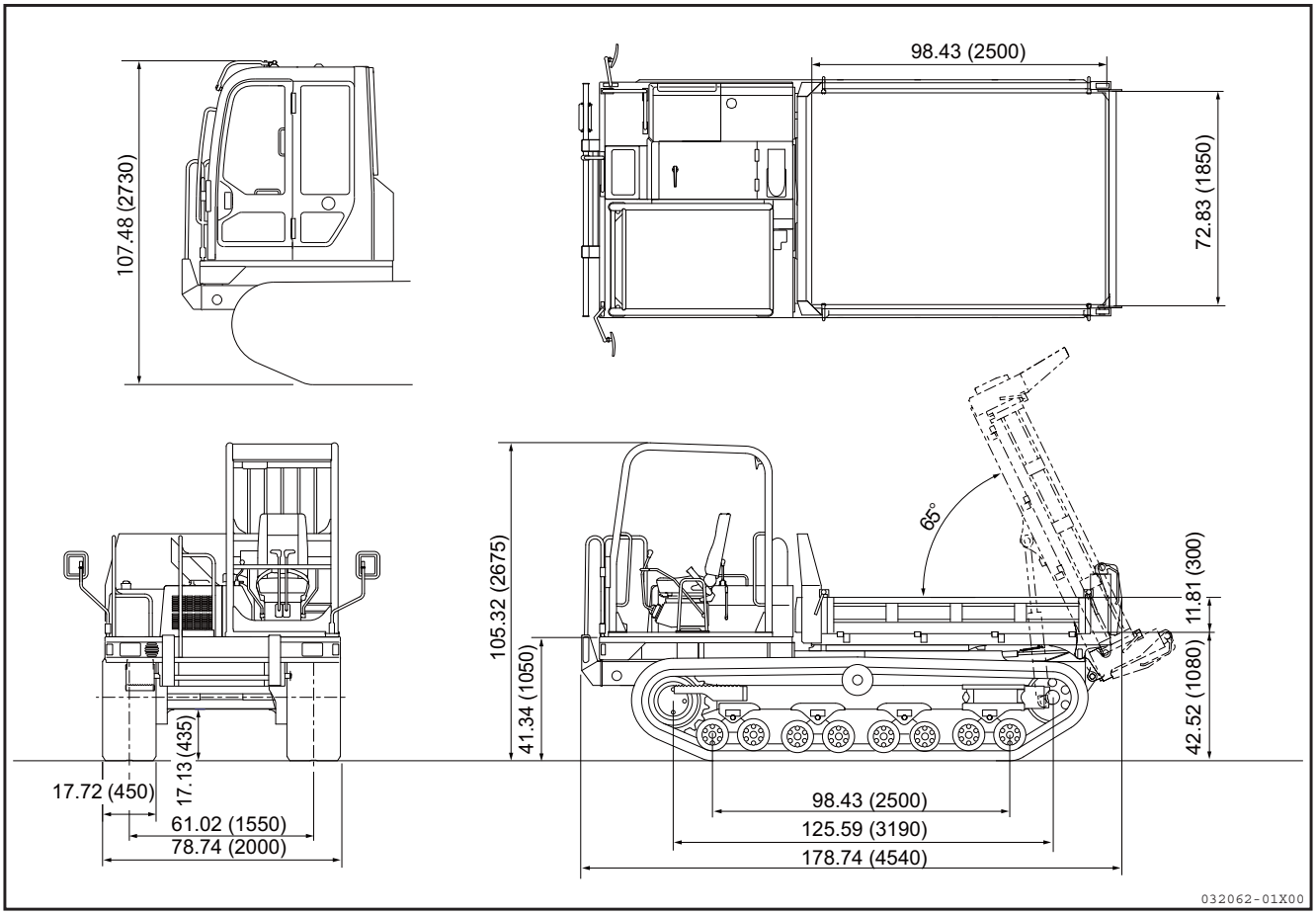
Ask your dealer.

# SPECIFICATIONS AND DIMENSIONAL DIAGRAMS

# 26. Specifications and Dimensional Diagrams

## 26-1. Three-side flaps wagon type model

### ■ Dimensional diagrams

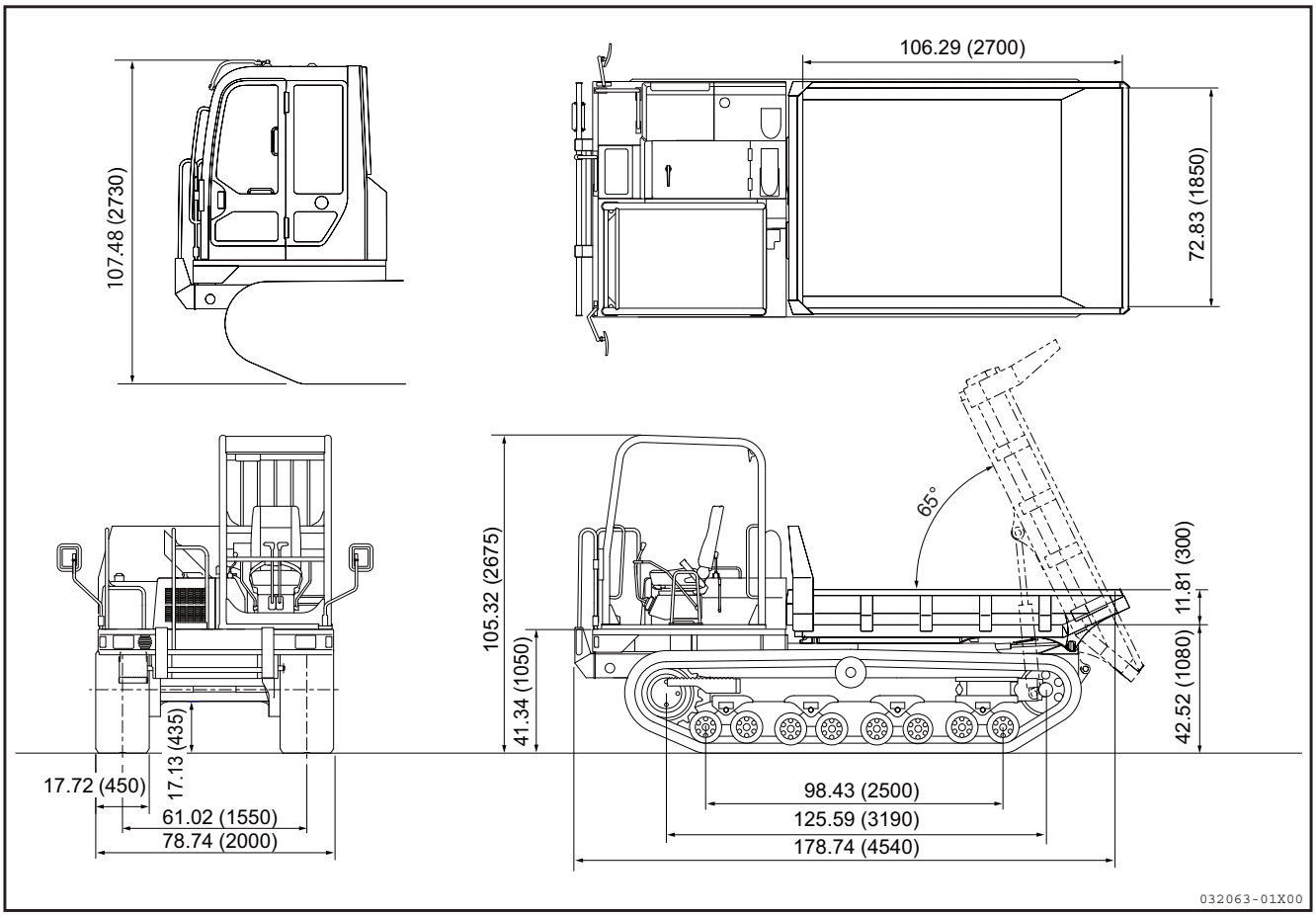



### ■ Specifications

| | | Unit | Canopy type | Cabin type |
|---|---|---|---|---|
| Overall length×Overall width×Overall height | | in. (mm) | 178.74×78.74×105.32 (4540×2000×2675) | 178.74×78.74×107.48 (4540×2000×2730) |
| Wagon dimensions (Length×Width×Height) | | in. (mm) | 98.43×72.83×11.81 (2500×1850×300) | |
| Machine mass | | lbs. (kg) | 11662 (5290) | 12037 (5460) |
| Engine | Type | - | Vertical water-cooled four-cylinder diesel engine | |
| | Designation | - | ISUZU 4JJ1X | |
| | Output / Speed | HP (kW) / rpm | 96.5 (72) / 2200 (ISO 9249) | |
| Wagon capacity | Struck | cu.ft. (cu.m) | 49.44 (1.4) | |
| | Heaped | cu.ft. (cu.m) | 81.22 (2.3) | |
| Maximum loading capacity | | lbs. (kg) | 8379 (3800) | |
| Maximum dump angle | | degrees | 65 | |
| Travel speed | Forward | MPH (km/h) | 0 to 5.72 (0 to 9.2) | |
| | Reverse | MPH (km/h) | 0 to 5.72 (0 to 9.2) | |
| Ground pressure | Loaded | PSI (kPa) | 4.5 (31.4) | 4.5 (31.4) |
| | Unloaded | PSI (kPa) | 2.6 (18.2) | 2.7 (18.8) |

## 26-2. Scoop-end wagon type model

### ■ Dimensional diagrams

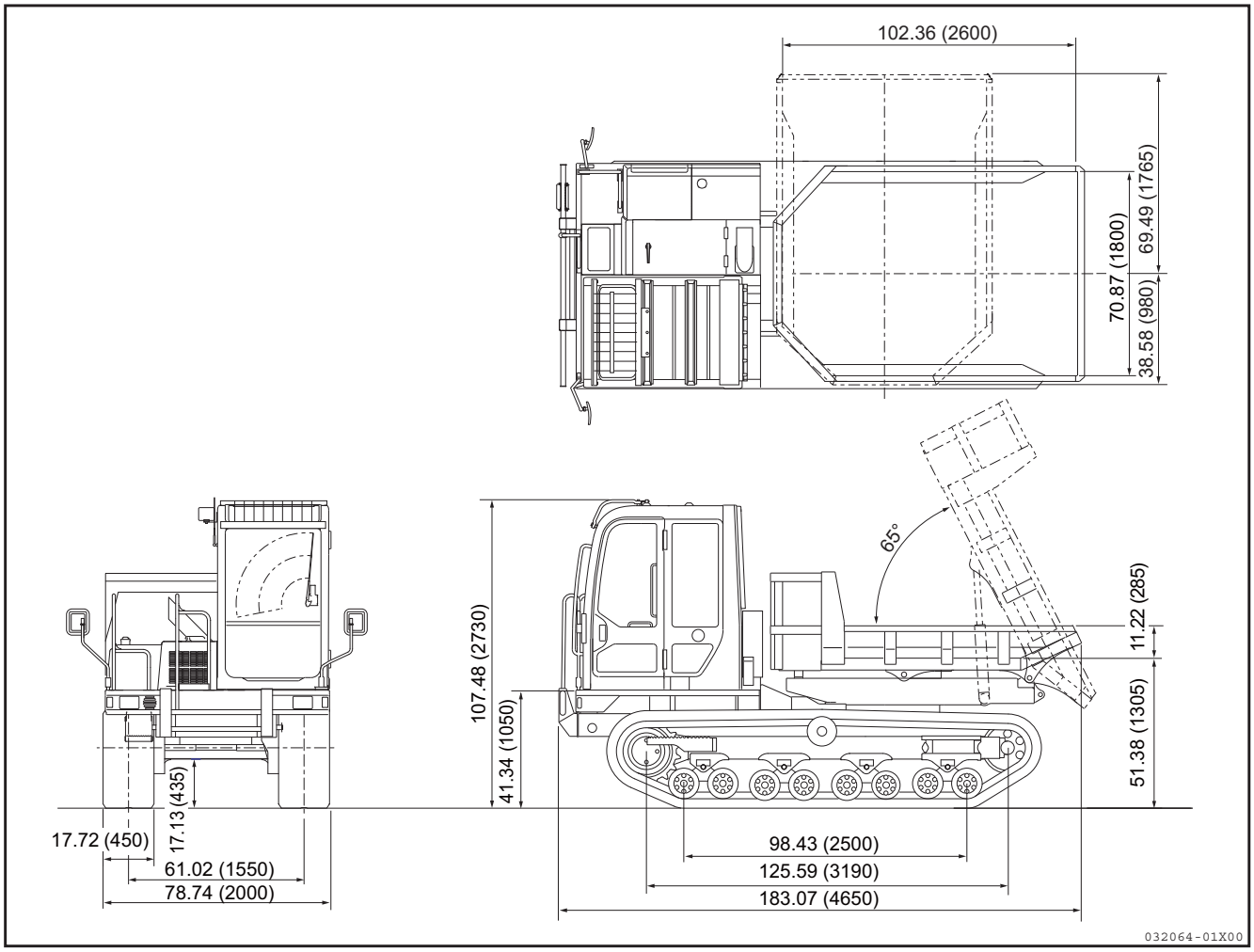



### ■ Specifications

| | | Unit | Canopy type | Cabin type |
|---|---|---|---|---|
| Overall length×Overall width×Overall height | | in. (mm) | 178.74×78.74×105.32 (4540×2000×2675) | 178.74×78.74×107.48 (4540×2000×2730) |
| Wagon dimensions (Length×Width×Height) | | in. (mm) | 107.68×72.83×11.81 (2700×1850×300) | |
| Machine mass | | lbs. (kg) | 11662 (5290) | 12037 (5460) |
| Engine | Type | - | Vertical water-cooled four-cylinder diesel engine | |
| | Designation | - | ISUZU 4JJ1X | |
| | Output / Speed | HP (kW) / rpm | 96.5 (72) / 2200 (ISO 9249) | |
| Wagon capacity | Struck | cu.ft. (cu.m) | 45.91 (1.3) | |
| | Heaped | cu.ft. (cu.m) | 81.22 (2.3) | |
| Maximum loading capacity | | lbs. (kg) | 8379 (3800) | |
| Maximum dump angle | | degrees | 65 | |
| Travel speed | Forward | MPH (km/h) | 0 to 5.72 (0 to 9.2) | |
| | Reverse | MPH (km/h) | 0 to 5.72 (0 to 9.2) | |
| Ground pressure | Loaded | PSI (kPa) | 4.5 (31.4) | 4.5 (31.4) |
| | Unloaded | PSI (kPa) | 2.6 (18.2) | 2.7 (18.8) |

## 26-3. Swing wagon type model

### ■ Dimensional diagrams




### ■ Specifications

| | | Unit | Canopy type | Cabin type |
|---|---|---|---|---|
| Overall length×Overall width×Overall height | | in. (mm) | 183.07×78.74×105.32 (4650×2000×2675) | 183.07×78.74×107.48 (4650×2000×2730) |
| Wagon dimensions (Length×Width×Height) | | in. (mm) | 102.36×70.87×11.22 (2600×1800×285) | |
| Machine mass | | lbs. (kg) | 12655 (5740) | 13029 (5910) |
| Engine | Type | - | Vertical water-cooled four-cylinder diesel engine | |
| | Designation | - | ISUZU 4JJ1X | |
| | Output / Speed | HP (kW) / rpm | 96.5 (72) / 2200 (ISO 9249) | |
| Wagon capacity | Struck | cu.ft. (cu.m) | 42.38 (1.2) | |
| | Heaped | cu.ft. (cu.m) | 74.16 (2.1) | |
| Maximum loading capacity | | lbs. (kg) | 7718 (3500) | |
| Maximum dump angle | | degrees | 65 | |
| Travel speed | Forward | MPH (km/h) | 0 to 5.72 (0 to 9.2) | |
| | Reverse | MPH (km/h) | 0 to 5.72 (0 to 9.2) | |
| Ground pressure | Loaded | PSI (kPa) | 4.6 (31.4) | 4.7 (32.4) |
| | Unloaded | PSI (kPa) | 2.9 (19.8) | 3.0 (20.4) |

# OPTIONAL PARTS AND ATTACHMENTS

# 27. General Precautions

## 27-1. Safety precautions

The mounting of attachments and optional parts that are not authorized by YANMAR may cause accidents as well as shorten the machine life.
If you need to mount any attachments other than those described in this manual, contact your dealer. If you fail to do so, the installation and use of unauthorized attachments and parts may void your Warranty.

**⚠ WARNING**

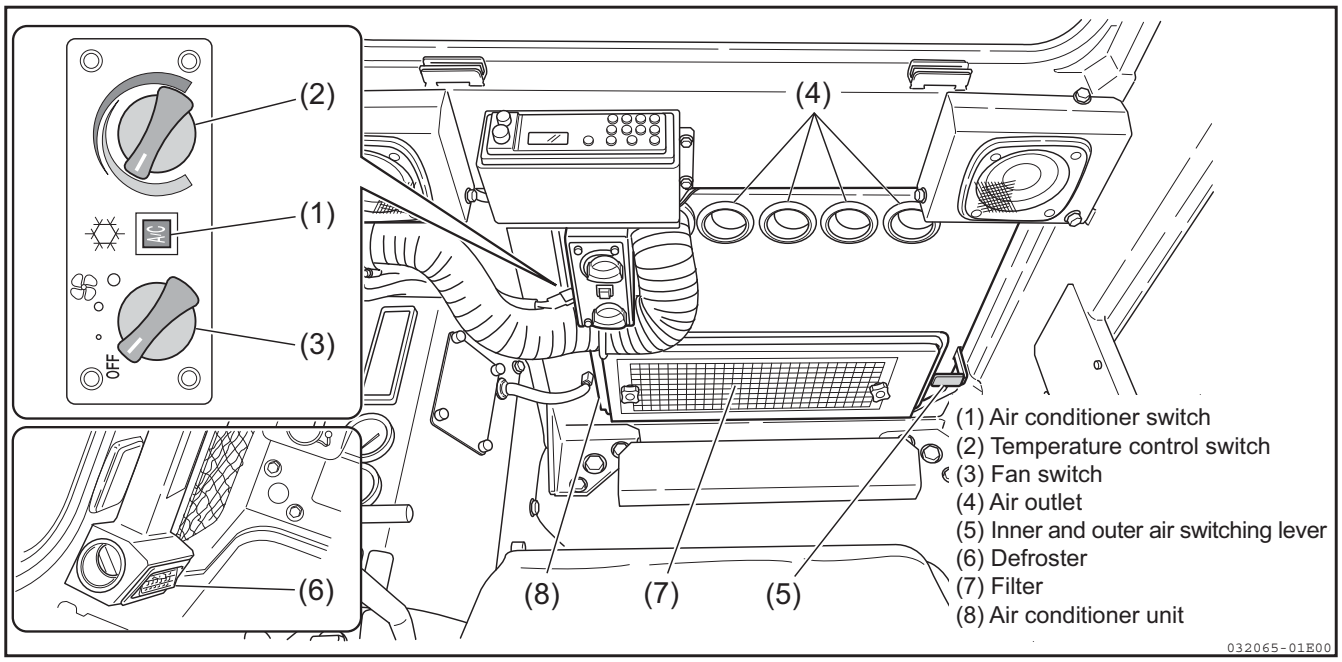
**Precautions for mounting and dismounting an attachment**
**When mounting or dismounting an attachment, observe the following precautions for safety.**

- **When mounting or dismounting a heavy wagon or attachment, place the machine on level, solid ground.**
- **When you work together with a partner, define hand signals and communicate in accordance with those signals.**
- **When moving a heavy load [more than 55 lbs. (25 kg)], use a crane.**
- **When removing a heavy part, be sure to support it adequately.**
  **When lifting such a part with a crane, take note of its center of gravity.**
- **Do not mount or dismount a heavy part while suspending it with a crane. Be sure to support it securely on a stable base.**
- **Securely support any attachment that has been removed or is to be installed, and take adequate precautions not to let it fall down.**
- **Never stand directly under a load suspended by a crane.**
  **Stand far enough away to be safe if the load should fall.**

**IMPORTANT**
**Comply with all licensing requirements before operating a crane.**
**Do not permit an unauthorized person to operate a crane.**
**For more information about the procedures for mounting and dismounting attachments, ask your dealer.**

# 28. Handling Air Conditioner (for Cabin)

## 28-1. Component parts of the air conditioner



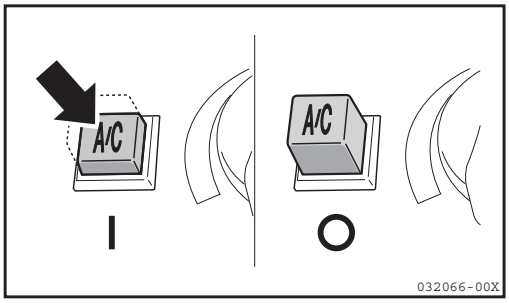

(1) Air conditioner switch

Use this switch to turn ON the air conditioner when the engine is running and the fan switch is ON.

To stop the air conditioner, press the switch again or turn OFF the fan switch.

O...OFF

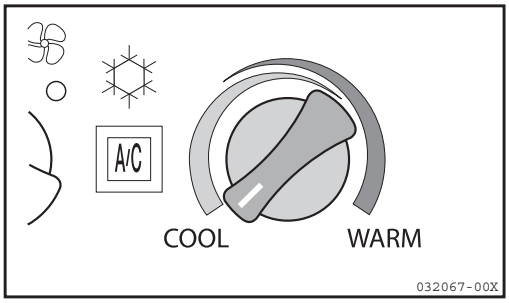
I...ON




(2) Temperature control switch

This switch is used to control the temperature of the air blown by the air conditioner.

Turn it counterclockwise to lower the air temperature



(3) Fan switch

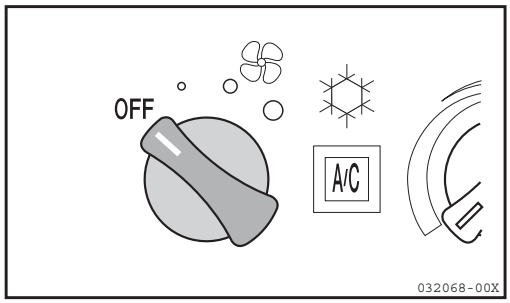
This switch is used to control the air volume.

OFF : Stop (the switch serves also as the main switch.)

● : Low

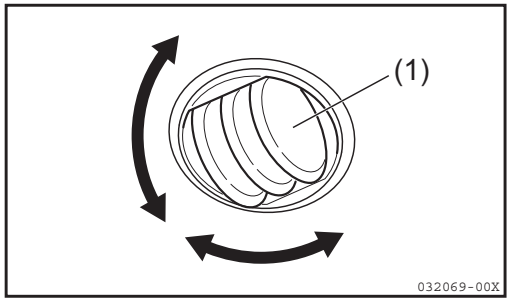
● : Medium

● : High




(4) Air outlet

The grille knob (1) of the air outlet is used to adjust the air direction.




(5) Inner and outer air switching lever

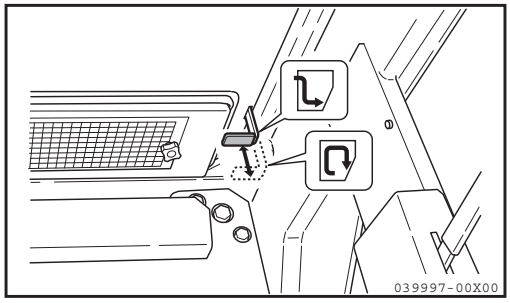
This lever is used to switch between outer air induction and inner air circulation.

...Outer air induction:

Use this position to induce the fresh air from outside or to defrost the windshield.

...Inner air circulation:

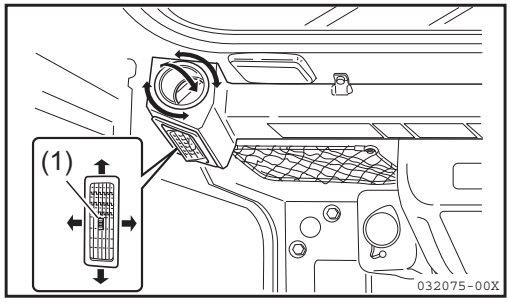
Use this position to cool or heat the cabin in a short time or when the outside air is dirty.




(6) Defroster

It is used to defrost the windshield.

Use the louver (1) to adjust the direction of air coming out of the air outlet.




(7) Filter

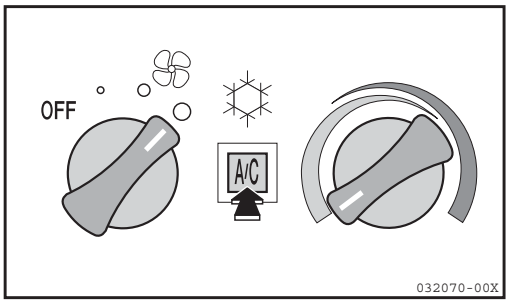
See "28-3-4. Checking and cleaning the filter".

## 28-2. How to use the air conditioner

### ⚠ CAUTION

- **The eyes might get sore from smoking when the cabin is air conditioned. Ventilate the cabin by opening the window slightly when smoking.**
- **Exposing your eyes or hands to the refrigerant could result in blindness or frostbite. Never attempt to touch the refrigerant or loosen any parts of the cooling circuit. In the event of refrigerant leakage, keep away fire.**
- **Leaving the windshield stained or fogged could be dangerous because of poor visibility. For good visibility, always keep clean the windshield using the defroster and other means.**
- **Some mist might blow off with cooled air when the cabin is air conditioned. This occurs because the water particles in the wet air are frozen and blown out. So, it is not abnormal.**
- **When using the air conditioner after parking the cabin in the hot weather, ventilate the cabin by opening the door and windows to let the hot air inside go out of the cabin so that the air-conditioning can work efficiently.**
- **Take care to adjust the temperature properly not to cool the air inside the cabin too long because it is not good for the operator's health.**
- **If the air does not blow off, the air volume is small or the cabin is not air conditioned well when the air conditioner is turned ON, turn the air conditioner switch OFF and ask your dealer to check the air conditioner. If you keep using the air conditioner in the abnormal state, it will cause damage to the fan motor or the compressor.**
- **Even in the seasons when the air conditioner is not used, operate the air conditioner for a few minutes once or twice every two or three weeks. That prevents the rotating parts such as the compressor from running out of oil, which prevents malfunction of the parts in turn.**

**28-2-1. How to used the air conditioner**




1) Press the air conditioner switch and turn the temperature control switch fully counterclockwise.

2) Turn the fan switch fully clockwise to set it to the HI position.

3) Adjust the temperature inside the cabin properly with the temperature control lever and the fan switch after the cabin is cooled off.

**IMPORTANT**

**Be sure to turn the air conditioner ON after starting the engine to prevent excessive force to the compressor etc.**

## 28-3. Maintenance, inspection and servicing of air conditioner

Daily maintenance and periodic inspection and servicing are required for the air conditioner to use it comfortably in the best condition.
Proper maintenance allows reduction in trouble and longer life of the air conditioner.
Exact inspection and servicing prevent trouble and reduce the cost for repair.
The air conditioner should also be checked and serviced at the time of a voluntary monthly inspection and a prescribed annual inspection of the machine.
It is recommended that the rubber hoses and electrical wires should be replaced every two years to use the air conditioner in the best condition.

List of inspection items for air conditioner.

| | Part | Check item | Servicing |
|---|---|---|---|
| Daily inspection | Capacitor | Check the cover and the fin for contamination and clogging. | Clean |
| | Compressor driving belt | Check the belt for tension and damage. | Repair or replace |
| | Sight glass | Check the refrigerant quantity. | |
| | Filter | Check the filter for clogging and contamination. | Clean |

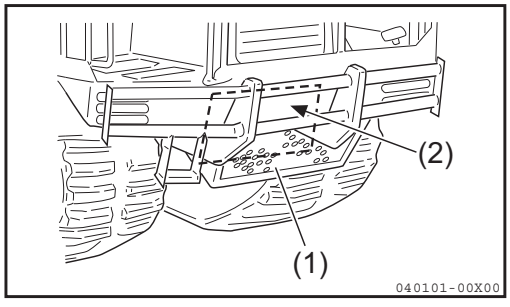
### 28-3-1. Checking and cleaning the capacitor

**⚠ WARNING**

- **Be sure to stop the engine and remove the starter switch key before checking and servicing the capacitor.**
- **Be sure to reinstall the cover and other parts, which have been removed for checking and servicing, in their original positions after completion of the work.**

Check the capacitor cover (1). If there is any mud or dirt on the cover, then remove the cover to wash it off with water.

- If there is some mud or dirt on the capacitor fin (2), it will cause degradation of the air conditioner performance. Wash it off from the fin with water, using a soft brush.
- If the capacitor fin (2) is crushed or deformed, it will also cause degradation of the air conditioner performance. Repair it with a screwdriver or the like, taking care not to damage the capacitor fin.
- If the capacitor fin (2) is flushed with high-pressure water, it may be damaged. Clean it carefully.

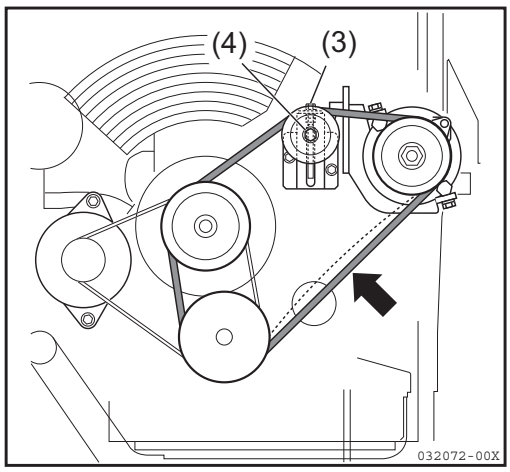


### 28-3-2. Checking and servicing the compressor driving belt

**⚠ WARNING**

**Stop the engine and remove the starter switch key before checking and servicing the compressor driving belt.**

Press the compressor driving belt in the middle to check the slack of the compressor driving belt.




Driving belt
Pressing force : Approximately 22.05 lbs. (98.1 N)
Correct slack : 0.3 in. (8 mm)

If the slack of the belt is not correct, adjust it according to the following procedure :

1) Loosen the bolt to open the cover under the instrument panel.

2) Loosen the double nut (4) and turn the bolt (3) to adjust the tension.
   To increase the tension, turn the bolt clockwise.
   To decrease the tension, turn the bolt counterclockwise.

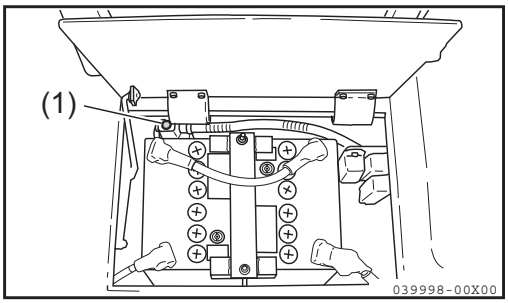
3) Tighten the double nut (4) to fasten the bolt (3).

4) Check whether each pulley or the belt is damaged, especially whether the belt is in contact with the bottom of the pulley groove.

- If there are any cuts on the belt or cracks in it, replace it with a new one.

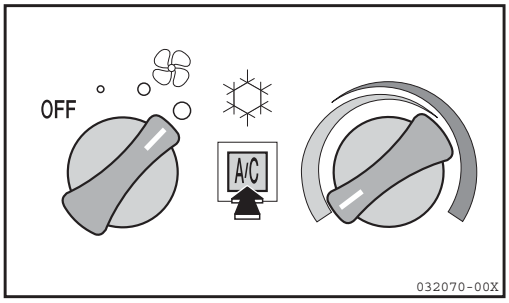
**Compressor driving belt :**
**Type : B-56**
**Effective length : 57 in. (1440 mm)**
**Yanmar part number : 172660-18940**

### 28-3-3. Checking the refrigerant quantity




Remove the rubber cap from the sight glass (inspection window) to see the flow of the refrigerant air bubbles from the sight glass (1) of the liquid tank according to the following procedure, to check the refrigerant quantity.

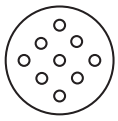
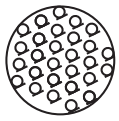
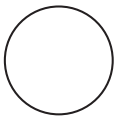
1) Start the engine and run it at the maximum speed.
2) Turn the temperature control switch counterclockwise fully.
3) Turn the fan switch clockwise up to “HI”.
4) Open the battery cover and check the refrigerant condition from the sight glass (1). Compare the condition with the check list shown below.




**IMPORTANT**

**If the refrigerant quantity is not normal, ask your dealer for check and repair.**

**Check list for the refrigerant quantity**

| Cooler condition | Normal | Abnormal | | |
|---|---|---|---|---|
| Temperatures of high and low pressure pipes | Temperature difference is big.<br>High pressure pipe : hot<br>Low pressure pipe : cold<br>Compressor discharge side temperature : 158°F (70°C)<br>Compressor intake side temperature : 41°F (5°C) | High pressure pipe is warm and low pressure pipe is rather cool.<br>Temperature difference is not so big. | There is almost no difference in temperature between high and low pressure pipes. | High pressure pipe is hot and low pressure pipe is rather warm.<br>There is some difference in temperature between them. |
| Sight glass | Almost transparent.<br>Even if air bubble flow is seen, it becomes transparent as the engine speed changes.<br>  *1 | Air bubble flow is always seen. It is sometimes transparent or white.<br>  | Flow of mist or the like is seen slightly.<br>  | No air bubble is seen even when the cabin windows are fully opened, the engine is idled and the fan is rotated to the maximum.<br>  *2 |
| Pipe connection | Normal | Some parts are contaminated by oil. | Some parts are badly contaminated by oil. | Normal |
| Refrigerant quantity | Refrigerant quantity is adequate and normal. | Refrigerant might leak in a small amount from some part. | Almost all refrigerant leaks and does not remain. | Refrigerant quantity is too large. |

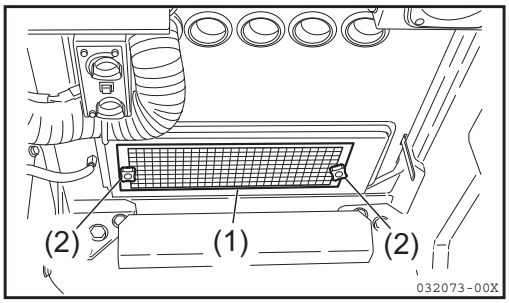
**1 : When the outside air temperature is low, air bubble might be seen even if the refrigerant quantity is adequate.*

**2 : When there is no refrigerant, no air bubble is seen, either. Therefore, be sure to check the difference in temperature between the high and low pressure pipes.*

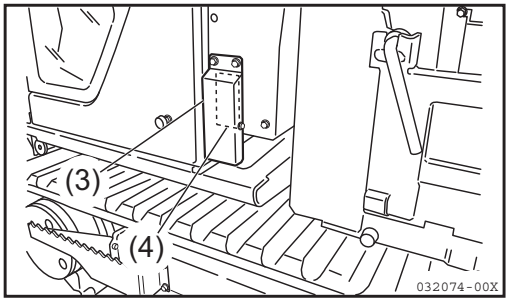
**3 : Refrigerant to be used : R134a / 3.969 lbs. (1800 g)*

### 28-3-4. Checking and cleaning the filter

1) Check the filter (1). If the filter is clogged with dirt or remarkably contaminated, remove the filter by loosening the knob (2) and clean it.




2) Loosen the bolt to remove the cover (3), and check the filter (4).
   Clean filter if remarkably contaminated.




■ **Cleaning procedure**

**⚠ CAUTION**

**Wear safety goggles when using compressed air.**

1) Blow the clean, dry compressed air of 100 PSI (0.7 MPa) directly over the filter.
   Keep an adequate distance between the nozzle and the filter.

2) If the filter is badly contaminated, wash it with a neutral detergent.
   After rinsing the filter, dry it up.

3) If the contamination of the clogged filter cannot be removed by compressed air or washing, replace the filter with a new one.

# NOTES

# 29. Maintenance Log

**Maintenance log**

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# 30. Notes

**Notes**

CRAWLER CARRIER

YANMAR

YANMAR CONSTRUCTION EQUIPMENT EUROPE S.A.S

http://www.yanmar.eu

OPERATION AND MAINTENANCE MANUAL

CRAWLER CARRIER

C50-R3C

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