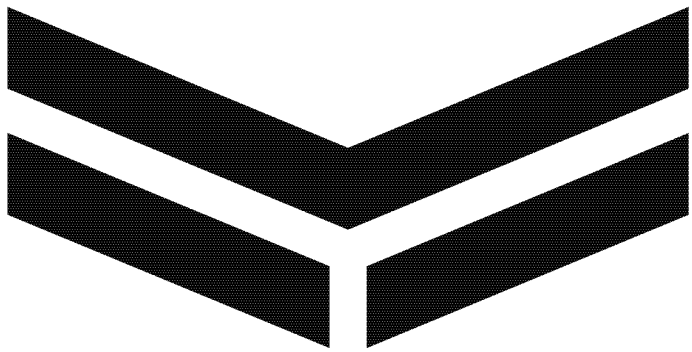


OPERATION & MAINTENANCE MANUAL

CRAWLER CARRIER

C12R-C

(S/N 2C001)

YANMAR

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 below.
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 : _____

In case of exporting this product and providing the related technical material to non-residents in Japan or residents overseas, it is required to comply with the export and trade control laws and regulations of Japan and other relevant countries.
Please be sure to follow the necessary procedure.

1. Introduction

This Operation and Maintenance Manual for the YANMAR C12R-C 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 your country's regulations and industrial standards.**
- **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

The word "DANGER" indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. "DANGER" is limited to the most extreme situations.

⚠ WARNING

The word "WARNING" indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

The word "CAUTION" indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

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 C12R-C 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.

3-3. Conditions to use

- The surrounding conditions should be as follows.

(1) Ambient temperature : -4 to 104°F (-20 to 40°C)

(2) Relative humidity : 80% or lower

- The fuel and lube oil used should be as follows.

(1) Fuel : Diesel light oil ASTM D975 No.1D S15 or No.2D S15 (ISO 8217 DMX)

- The fuel cetane number should be equal to 45 or higher.
- The sulfur content must not exceed 15 ppm by volume.
  In general, using a high sulfur fuel may possible result in corrosion inside the cylinder.
  Especially in U.S.A. and Canada, Ultra Low Sulfur fuel should be used.

(2) Lube oil : Engine lubricating oil with quality of API service classification CD or higher

- Do not remove the seals limiting the amount of fuel injected and the speed.
- Be sure to carry out inspections.
  Follow the basic guidelines outlined in Section "24. Maintenance Table" of this manual, and keep a record of the results. Pay particular attention to these important points: replacing the lube oil and lube oil filter, cleaning the air cleaning the air cleaner element and the radiator fins.

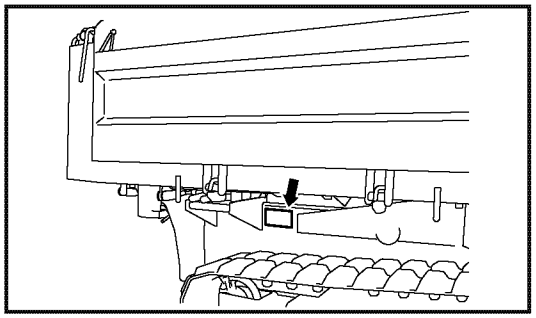
4. Operation License

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

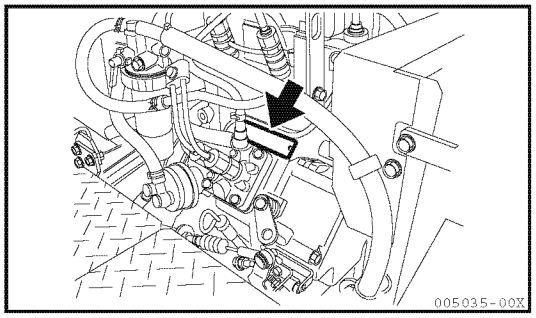
5-1. Location of machine serial number plate

The machine serial number plate is located on the right of the operator's seat as illustrated at the right. Never remove the plate for any reason.



5-2. Location of engine serial number plate

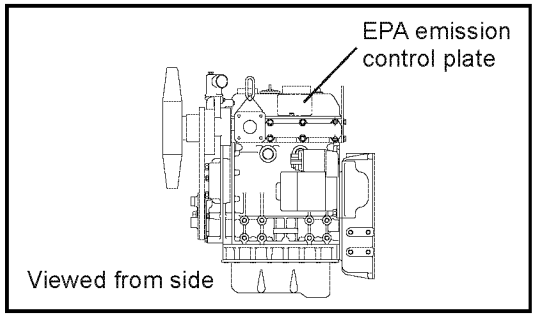
The engine serial number plate is located on the top of the cylinder block. Never remove the plate for any reason.

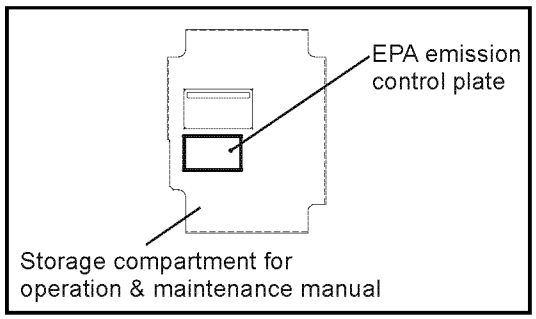


5-3. Location of EPA emission control plate
Localisation de la plaque signalétique EPA

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.

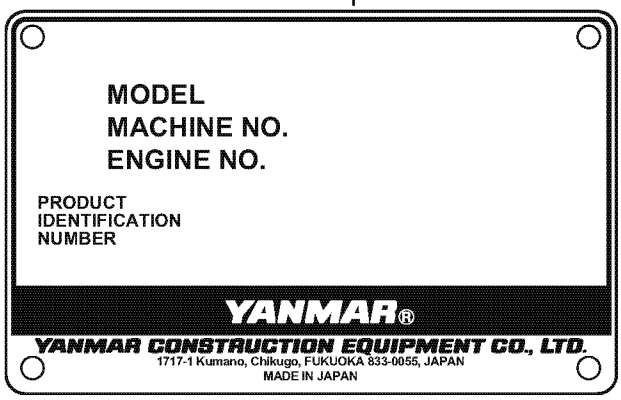




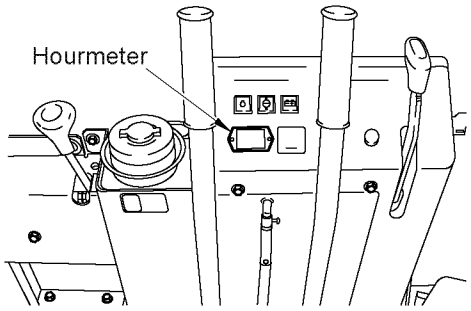
5-4. Ordering replacement parts and service calls

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

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.**

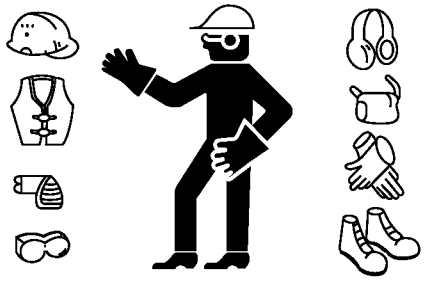
Follow safety rules at your workplace

- 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 brake lock lever, dump lever stopper and wagon support, should be well understood by the machine operator.
- Never remove the safety devices. Always make sure that they operate properly.
  For the brake lock lever, refer to Section "12-3. (1) Brake lock lever".
  For the dump lever stopper, refer to Section "12-3. (9) Dump lever stopper".
  For the wagon support, refer to Section "12-8. Wagon support".
- 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 filter and air cleaner elements, refer to Section "25. Procedures for Maintenance".

Alcohol

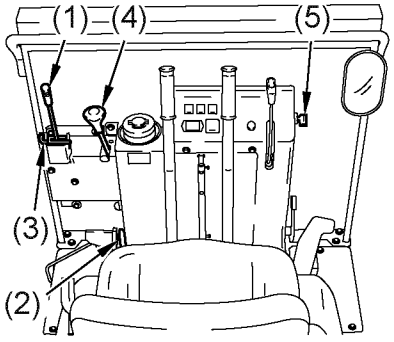
- Never operate the machine after consuming alcoholic beverages, or while you are under the influence of alcohol or if you feel ill or unwell, as that could result in accidental bodily injury to yourself or others.

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

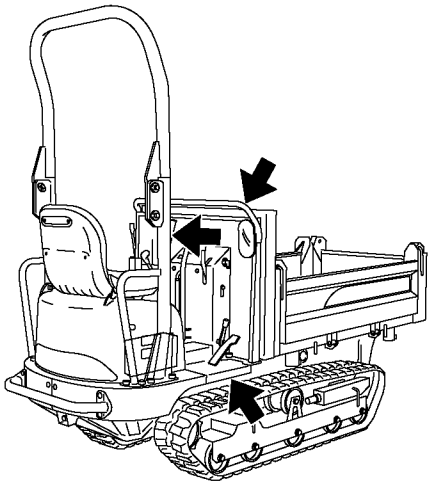
- When leaving the operator's seat, be sure to place the lock levers in the lock position, to prevent accidental machine movement which could result in bodily injury.
- When you leave the machine:
  (1) Lower the wagon completely.
  (2) Press down on the brake pedal and move the brake lock lever to the lock position to lock the brake pedal.
  (3) Lock the dump lever with the dump lever stopper.
  (4) Turn the starter switch key to the “OFF” position to stop the engine.
  (5) 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".

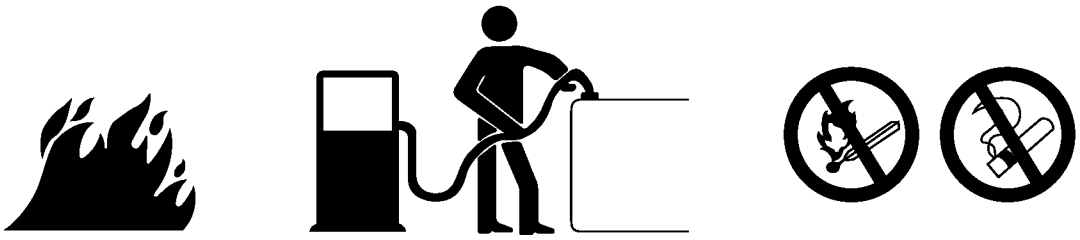
Use handrails and steps when getting on and off

- 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.

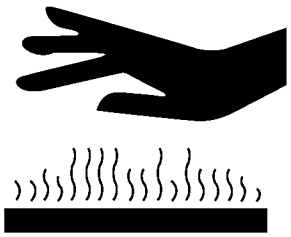


Keep fuel and oil away from sources of ignition

- 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

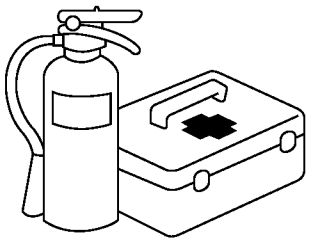
- Air containing asbestos dust is carcinogenic and is hazardous to humans. Inhalation of the air may cause lung cancer. When handling materials that may contain asbestos, keep in mind that:
  - Compressed air must not be used for cleaning.
  - Water must be used to clean the machine to prevent asbestos 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.

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 "13-8. 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 headlight (option) clean

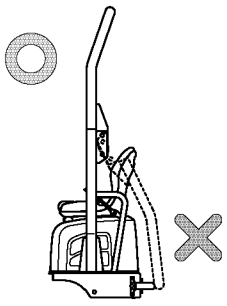
- Keep the headlight clean for clear view.
- Always check that the headlight works properly, before you operate the machine.

Fasten the seatbelt

- For your safety, ROPS (Roll-Over Protective Structure) 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

- Never modify a structural member of the ROPS.
- If the ROPS is damaged, replace it immediately to prevent bodily injury. Never repair or modify it.
- Never operate the machine with the ROPS bar folded down or removed.



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

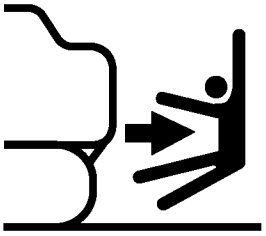
- Check the machine carefully before initial start up for the day.
- Make sure there are no persons near the machine before getting on it.
- Never start the engine when the "SERVICING IN PROGRESS" tag is attached to the starter switch.
- Place the steering levers, the F/R lever and the travel pedal in the neutral position, and the accelerator lever in the run 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 mirror to such a position 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.

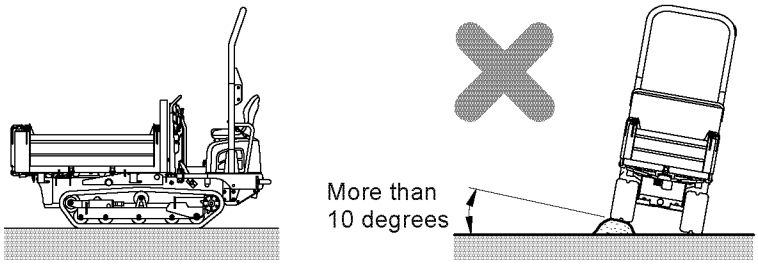
Make sure there are no persons nearby when dumping the wagon or reversing the machine

- 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.



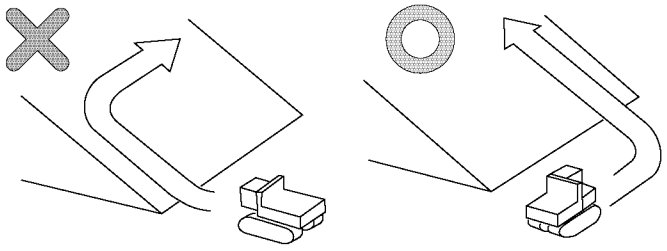
Precautions for traveling

- 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.
- 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.



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 travel speed select lever in the low speed position 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 "13-9. 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.

Precautions for loading

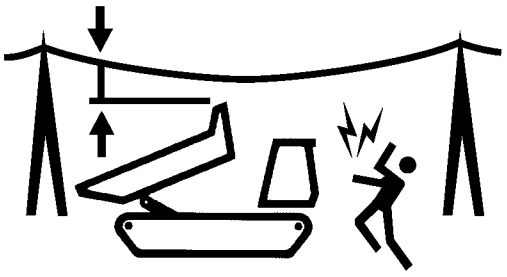
- Overloading may cause an accident.
- Loading on one side of the wagon will reduce the stability of the machine.
- Put a load onto the wagon evenly so that the load is not placed on front, rear, right or left side only.

⚠ 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 headlight (option). If no headlight is provided, prepare 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.

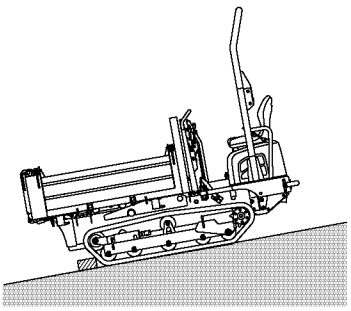
Braking

- Do not rest your foot on the brake pedal unless necessary.
- Do not pump the brake pedal more than required.
- Always use both the engine brake and the mechanical brake on a downward slope.

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.

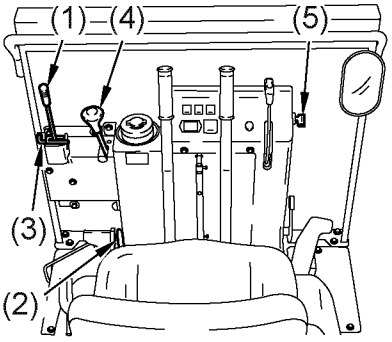
Parking the machine



- Park on level ground. If parking on a slope is unavoidable, place the brake lock lever in the lock position to apply the parking brake 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".



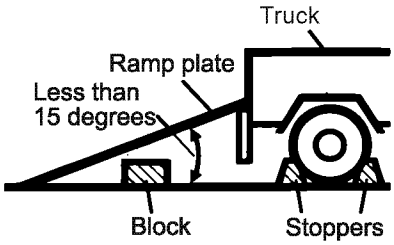
- When leaving the operator's seat, do the following:
  (1) Lower the wagon completely.
  (2) Press down on the brake pedal and move the brake lock lever to the lock position to lock the brake pedal.
  (3) Lock the dump lever with the dump lever stopper.
  (4) Turn the starter switch key to the “OFF” position to stop the engine.
  (5) 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 level, solid ground away from the shoulder of the road.
- Use ramp plates of adequate strength with hooks on their ends.
  Check 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 truck 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 on the ramp plates, as the machine may turn over.
- After loading the machine, be sure to place the brake lock lever and the dump lever stopper 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 "14-3. Precautions for loading the machine".

Precautions for transporting

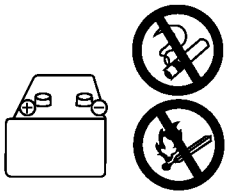
- Transport the machine safely in accordance with local regulations and applicable law.
- Select a travel route consistent with the width, height and weight of the machine loaded on the truck.

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. If contact with the clothing or skin should occur, flush with a large amount of water.
- Because flammable hydrogen gas is produced by the battery, ignition and explosion may occur. Keep flames and sparks away from the battery.
- Do not use or charge the battery if the battery electrolyte level is below the lower limit. Doing so may cause the battery to explode. Always check the battery electrolyte level before starting the engine. If the electrolyte level is low, add distilled water to the upper limit.
- If contact with the eyes should occur, flush with a large amount of water and obtain prompt medical treatment.
- If you swallow battery electrolyte by mistake, drink a large amount of water, milk, or fresh eggs, and obtain medical treatment immediately.
- Always wear safety goggles when servicing the battery.
- 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.


⚠ 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 structure 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".

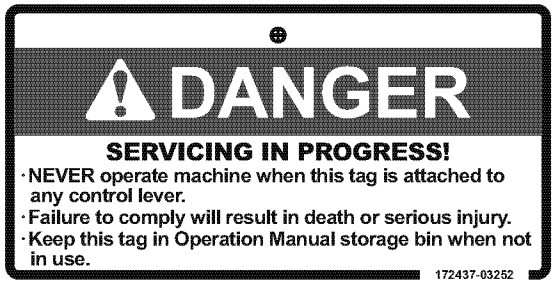
9. Precautions for Servicing

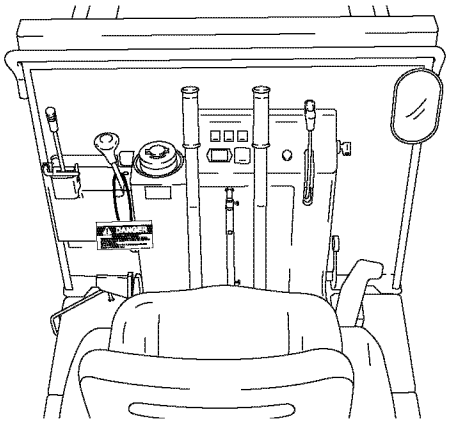
⚠ WARNING **Neglecting these instructions may cause extreme hazards.**

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 : 172437-03252).





Use appropriate tools

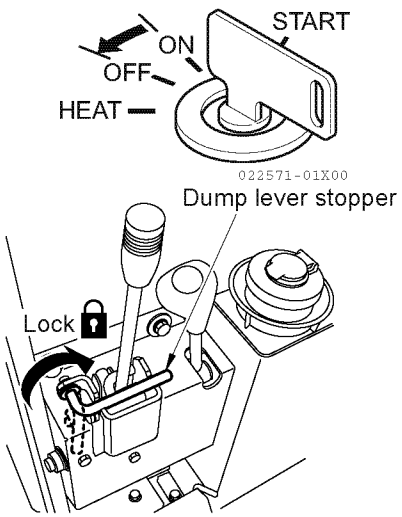
- Using damaged or worn tools or using tools inappropriate for the required application is very dangerous, and may also cause damage to the machine. Make sure to use the tools that are appropriate for the specific job.
  For information about tools, refer to Section "22-1. Required tools".

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 : Pump outlet 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 place the brake lock lever in the lock position, place the F/R lever in the neutral 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

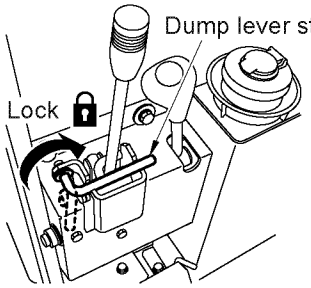
- Never admit any persons into the work area who are not taking part in the work. Be conscious of the safety of other persons.
  Be especially careful when grinding, welding, or using a large hammer.

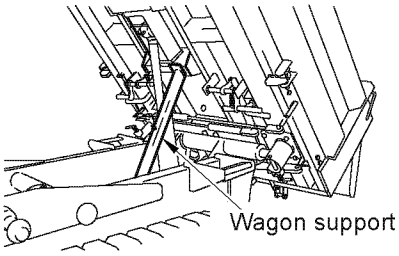
Removed wagon

- 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

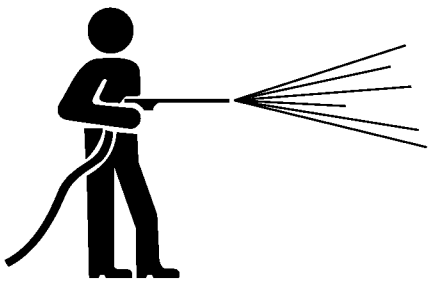
- Never perform service underneath the machine if it is not completely stable.
- Before performing service or repairs underneath the machine, be sure to apply blocks to the tracks to lock the tracks securely.
- To perform service or repairs with the wagon in the dump position, lock the dump lever and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





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.



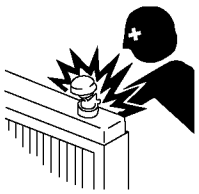
Precautions for fueling and oiling

- 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.

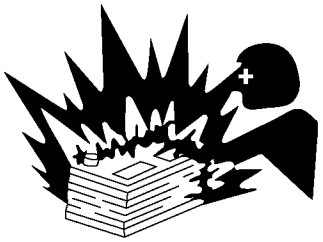


Use an explosion-proof lighting source

- 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.

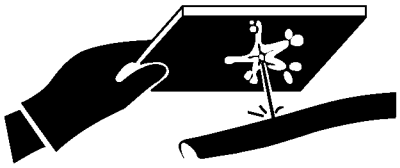


Handling hoses

- Leaks of fuel and oil could cause a fire.
  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.
- 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.

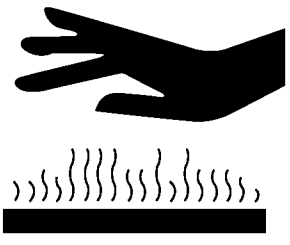
Be careful of hot oil under high-pressure

- 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.



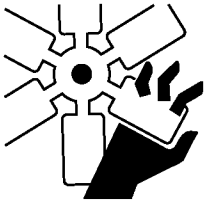
Be careful when servicing systems under high temperature and high pressure

- 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 "25-2. Nonperiodic services".
  For checking the level of the cooling water and the hydraulic oil, refer to Section "25-3. Checking before start-up".
  For checking the oil levels in various systems and replenishing the oil, refer to Sections "25-3. Checking before start-up" and "25-7. Maintenance every 250 service hours".
  For replacing the oils in various systems and replacing the filter elements, refer to Sections 25-6 to 25-10 for periodic services".



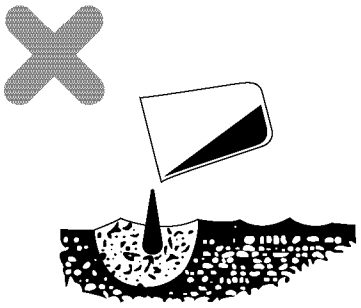
Rotating radiator fan and fan belt

- 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.



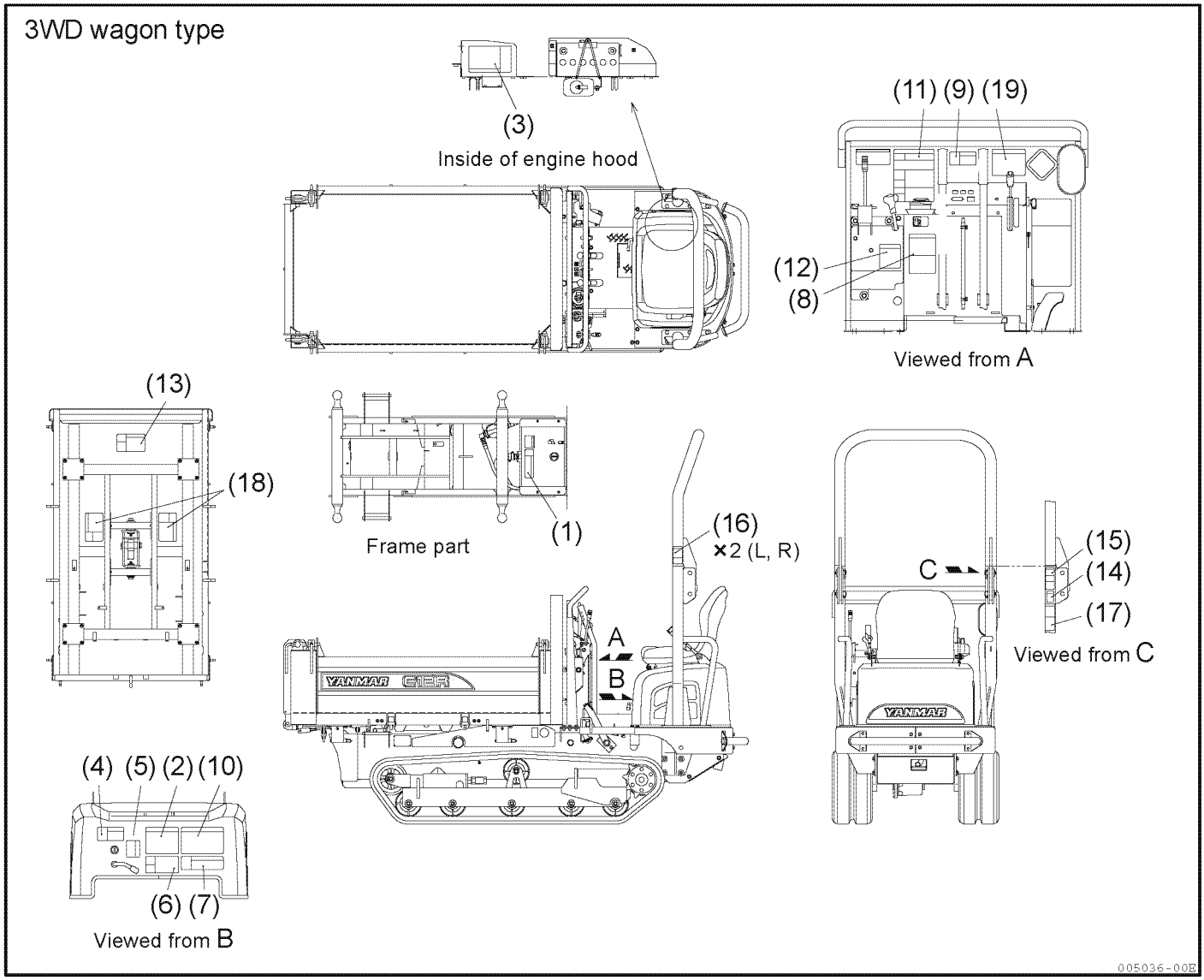
10. Safety Messages (Warning Labels)

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.

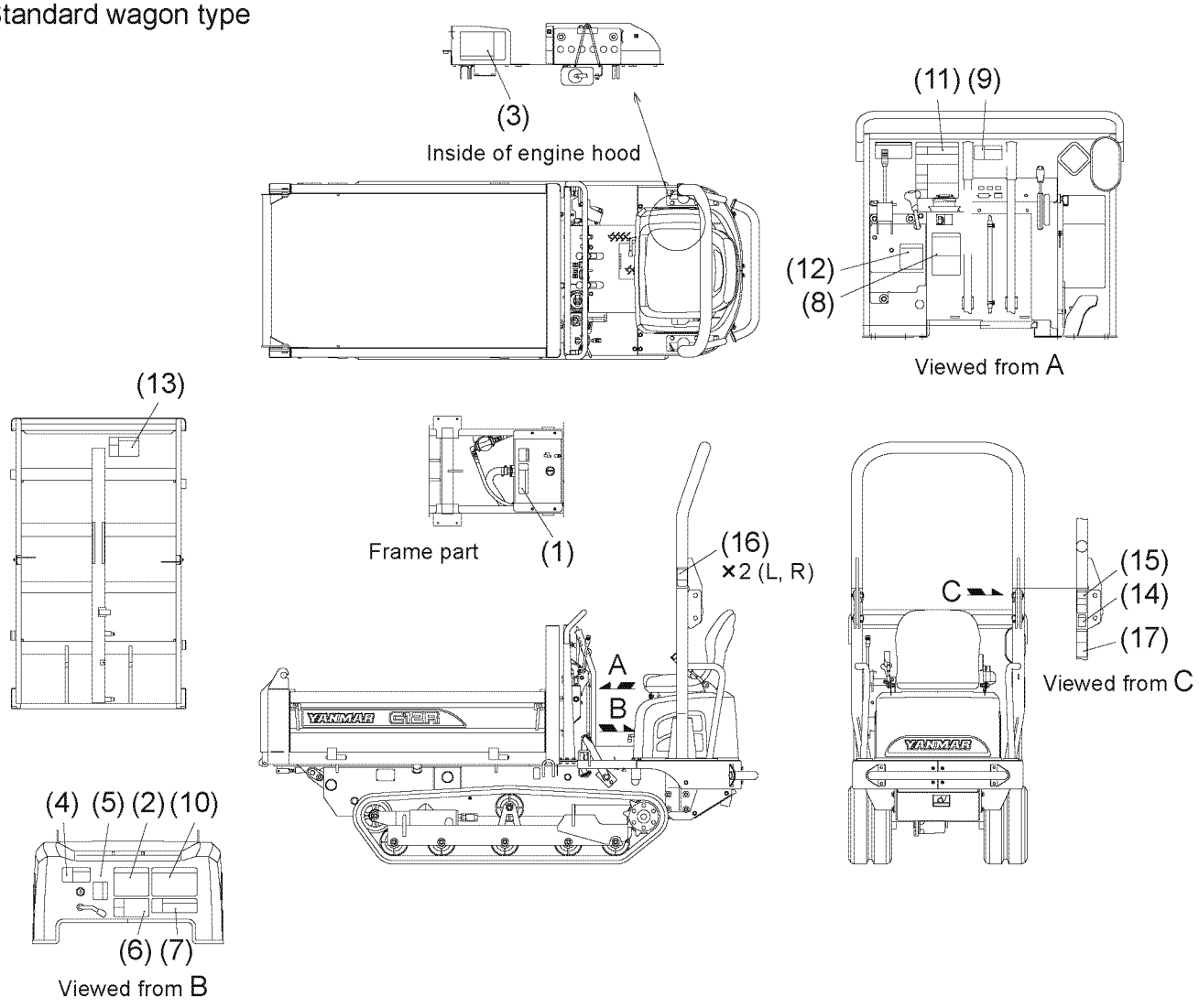
If a warning label is missing, damaged or cannot be read, it must be promptly replaced. Also, if a warning label was mounted on a part which is replaced, a new warning label must be installed on the replaced part.

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.

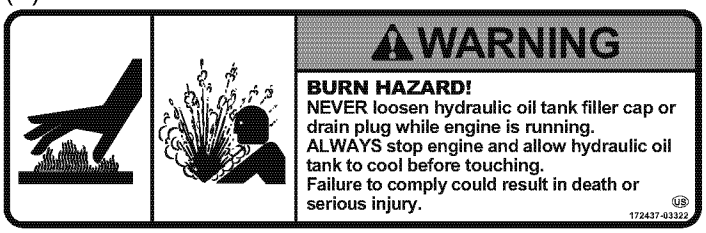
10-1. Location of warning labels



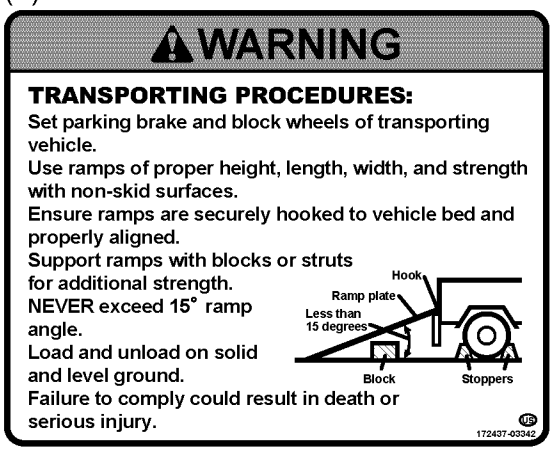
Standard wagon type



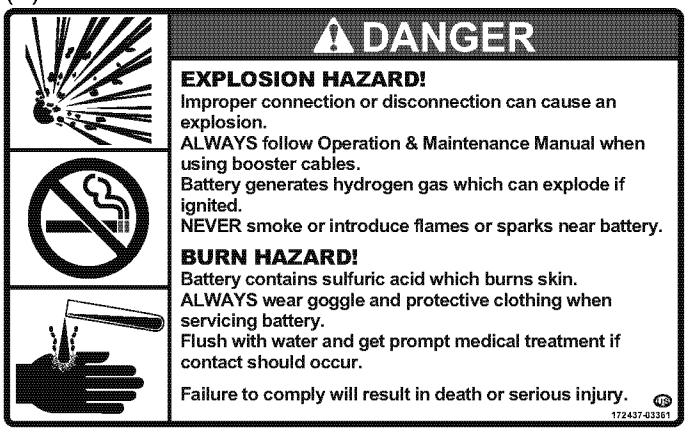
(1) 172437-03322



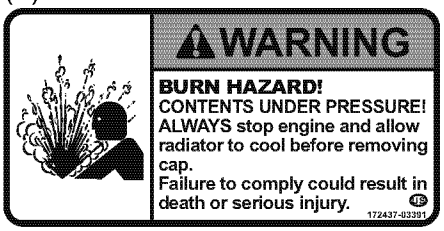
(2) 172437-03342



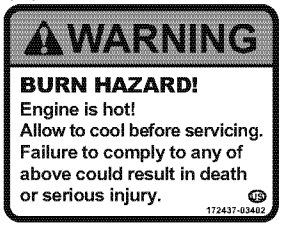
(3) 172437-03361



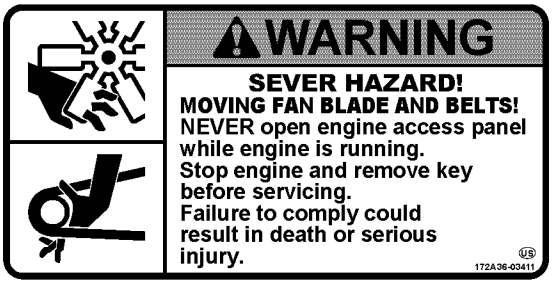
(4) 172437-03391



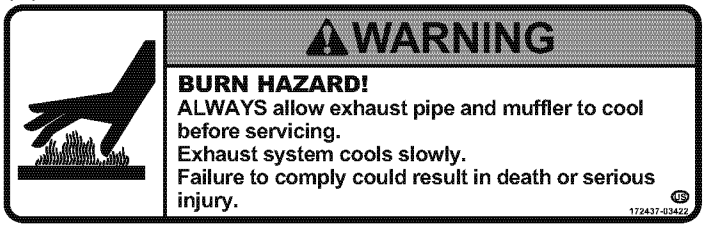
(5) 172437-03402



(6) 172A36-03411



(7) 172437-03422

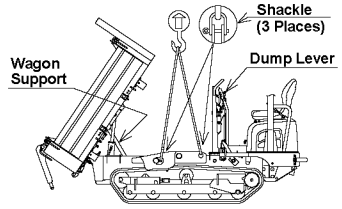


(8) 172652-03641

⚠WARNING

SUSPENDED MACHINE POSITION

FOR THIS PROCEDURE, REFER TO THE OPERATION MANUAL



CRUSH HAZARD!

Improper suspension will cause machine to fall.

To prevent carrier from falling when suspended :

- Raise wagon with lifting pins A & B and lock securely with wagon support.
- Apply stopper and lock dump lever securely.
- Use shackles and wire ropes specified to suspend weight of machine.
- Slowly lift machine vertically, never at an angle.
- NEVER draw machine horizontally.

Failure to comply could result in death or serious injury.

172652-03641

(9) 172652-03661

⚠WARNING

NO PASSENGERS ALLOWED!

Only operator is allowed on machine.

Alert bystanders with horn or other signal before starting machine.

Failure to comply will result in death or serious injury.

172652-03661

(10) 172472-03141

⚠WARNING

FALL HAZARD!

Follow proper procedures when getting on and off machine.

- Always face machine.
- Always use steps and handrails.
- Always maintain three-point contact with steps and handrails.
- Never use control and lock levers as handrails.
- Never attempt to get on or off a moving machine.
- Never jump on or off of any machine.

Failure to comply could result in death or serious injury.

172472-03141

(11) 172652-03691

⚠DANGER

Read and Understand Safety Instructions in Operating & Maintenance Manual Before Operating.

MACHINE MAY MOVE SUDDENLY!

To prevent movement :

- Place every control levers and pedal in NEUTRAL before starting engine and engage parking brake.

WHEN PARKING ALWAYS :

- Lower wagon to neutral position.
- Lock control levers.
- Engage parking brake lever.
- Stop engine and remove ignition key.
- On slopes, apply wheel chocks to front and back of tracks.

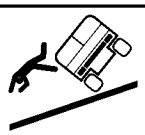
Failure to comply will could result in death or serious injury.

ROLL-OVER HAZARD!

NEVER turn on, traverse or operate machine diagonally on a slope.

Operate with wagon lowered.

NEVER dump wagon toward downward side of slope.



RUN-AWAY VEHICLE!

NEVER travel on slope of 20° or more.

Operate at low speed on slope of 10° or more with Travel Gear Lever in Low Speed position and engine throttle at medium or lower RPM.

Failure to comply will result in death or serious injury.

CRUSH HAZARD!

WAGON MAY FALL!

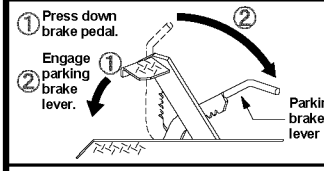
ALWAYS apply stopper to dump lever and engage wagon support to hold wagon in place when inspecting or servicing wagon in the dump position.

Failure to comply will result in death or serious injury.

172652-03691

(12) 172652-03711

⚠WARNING



MACHINE CAN MOVE SUDDENLY!

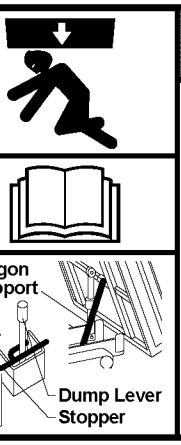
ALWAYS apply parking brake before leaving operator's seat or when parking.

Machine can move without parking brake applied.

Failure to comply could result in death or serious injury.

172652-03711

(13) 172652-03731



⚠DANGER

CRUSH HAZARD!

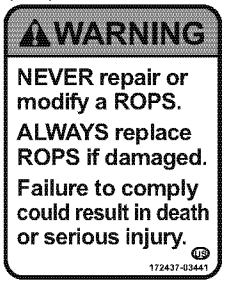
WAGON MAY FALL!

ALWAYS apply stopper to dump lever and engage wagon support to hold wagon in place when inspecting or servicing wagon in the dump position.

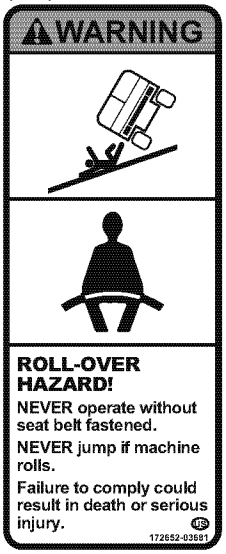
Failure to comply will result in death or serious injury.

172652-03731

(14) 172437-03441



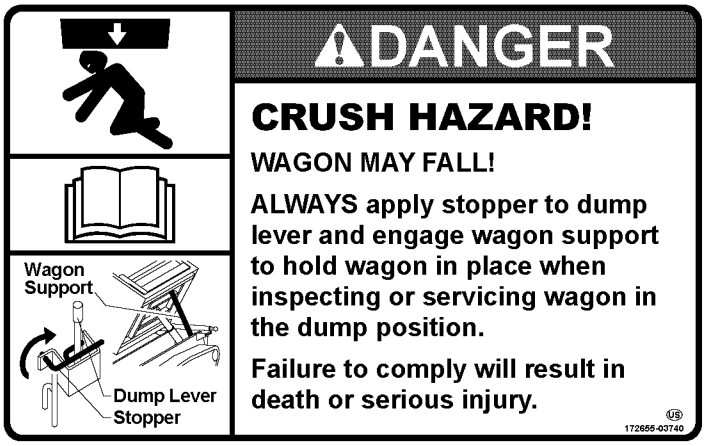
(15) 172652-03681



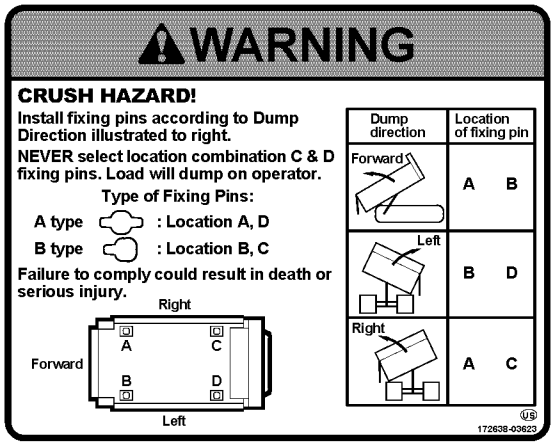
(16) 172A29-03740

(17) 172A29-03750

(18) 172655-03740



(19) 172638-03623



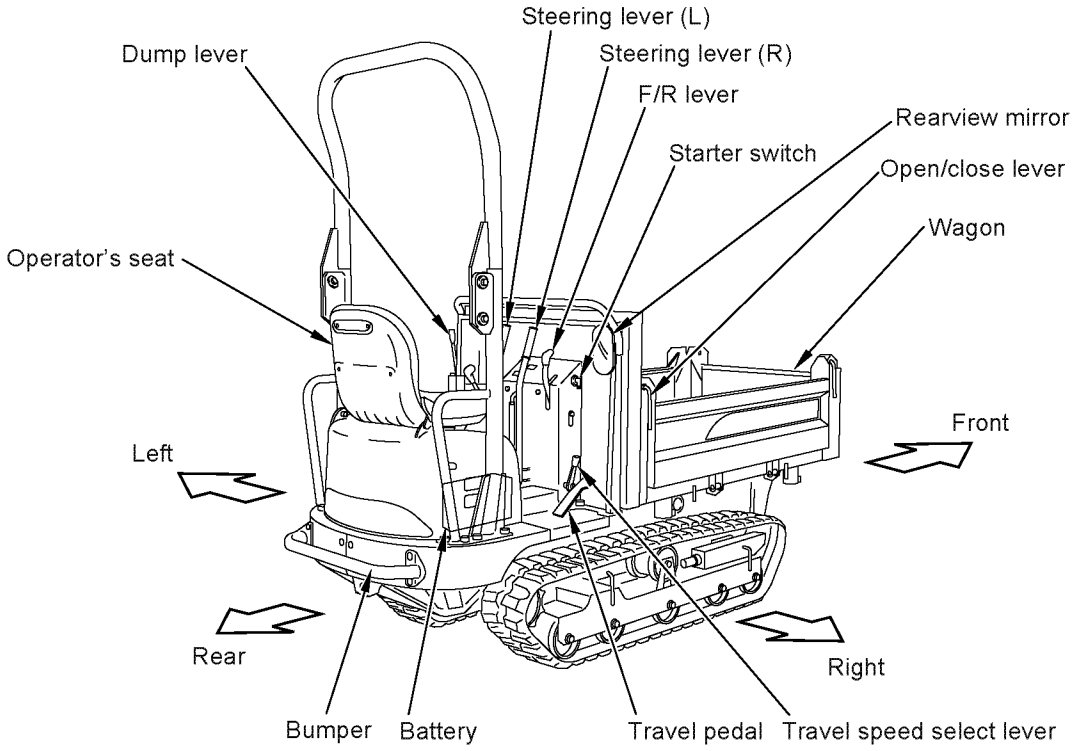
MEMO

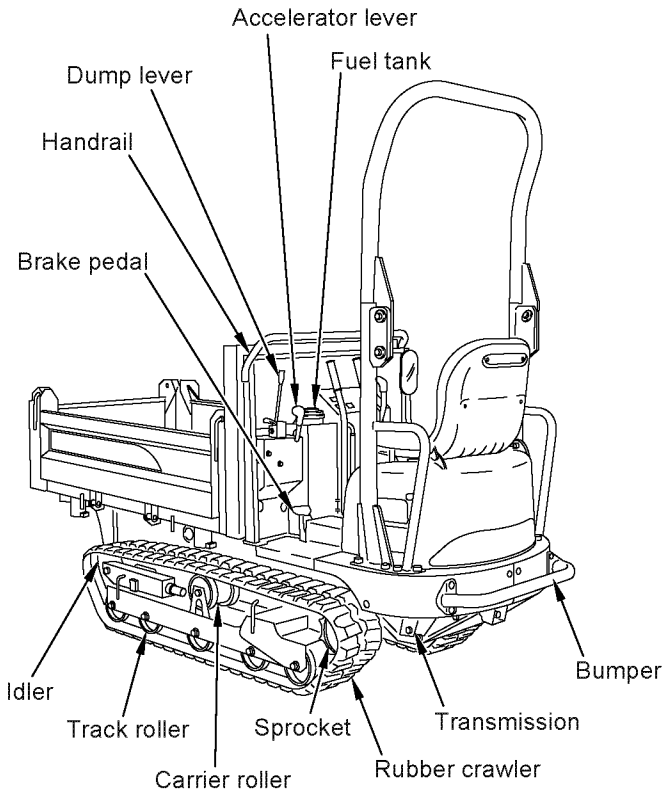
OPERATION

11. Identification of Important Parts

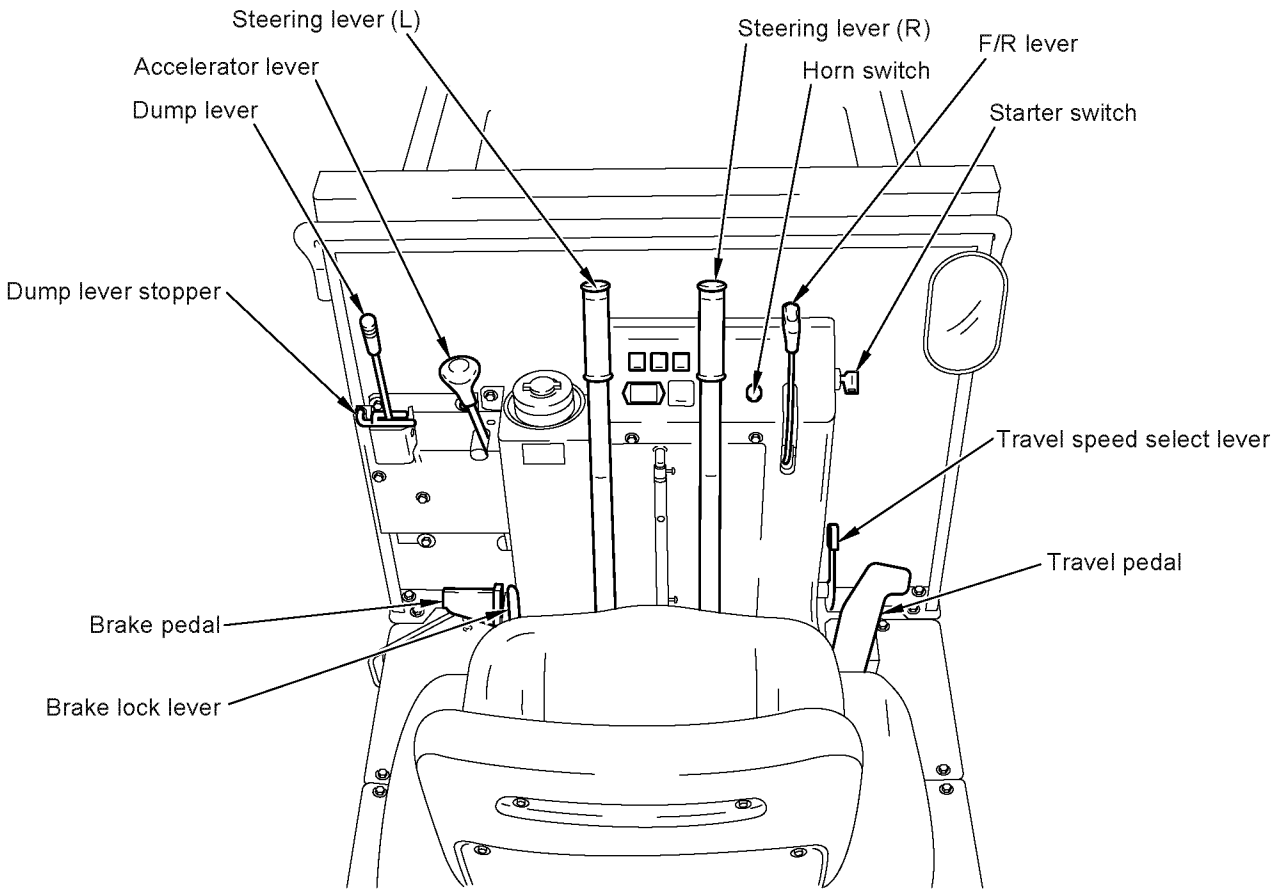
11-1. Overview of the machine

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





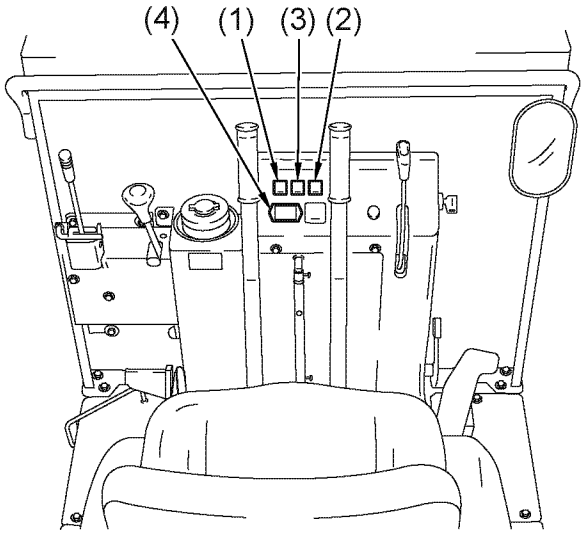
11-2. Controls and switches



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 the third part "MAINTENANCE", or Section "13. Operating Instructions" as well as the monitor signals as described below.

⚠ 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 turned to the "ON" position, a buzzer sounds, the following alarm lamps light, and the hour-meter indicates the accumulated service hours for the machine.

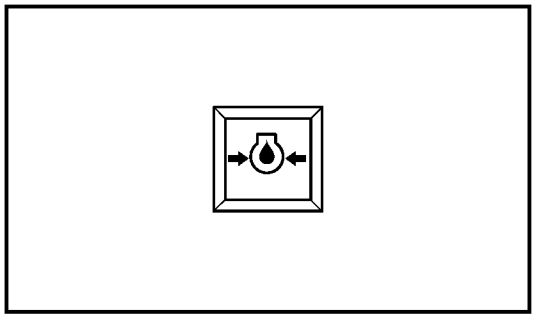
- Engine oil pressure alarm lamp
- Battery charge alarm lamp

Normally, the alarm lamps go off after the engine starts.

If an alarm lamp does not light or the buzzer does not sound when the starter switch key is turned to the “ON” position, the lamp might have blown out or might be broken. Take corrective action, or consult your dealer for assistance.

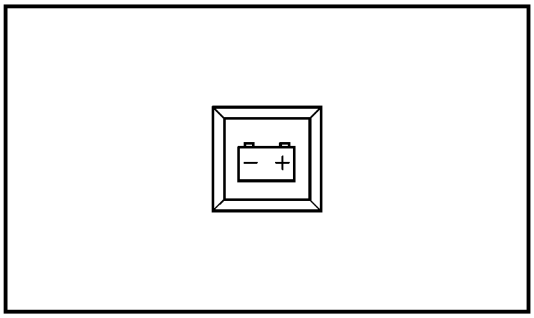
(1) Engine oil pressure alarm lamp

If the 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".



(2) Battery charge alarm lamp

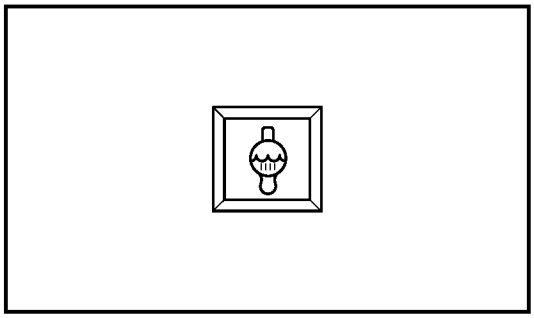
If the battery is not charged properly, the alarm lamp will light and the buzzer will sound. In this event, inspect the battery charging circuit. If you find something abnormal with it, take corrective action by referring to Section "17-4. Troubleshooting".



(3) Water temp. alarm lamp

When the cooling water temperature rises abnormally during operation, the alarm lamp lights and the buzzer sounds, indicating engine overheating.

Idle the engine for a while, and stop the engine. After the engine has cooled, take corrective actions.



(4) Hourmeter

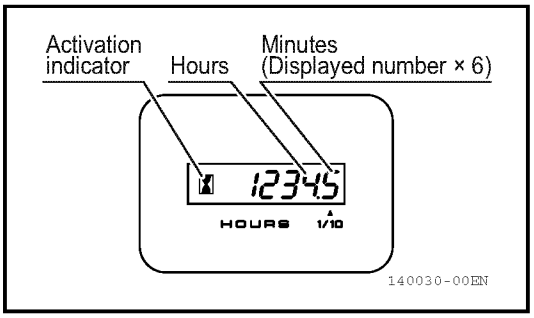
When the starter switch is "ON", it displays the total accumulated hours of the machine operation.

Perform regular maintenance based on the display of the hourmeter.

While the starter switch is in the "ON" position, the hourmeter will advance even if the engine does not run.

Regardless of the engine speed, the hourmeter count will advance by 1 after 1 hour of operation.

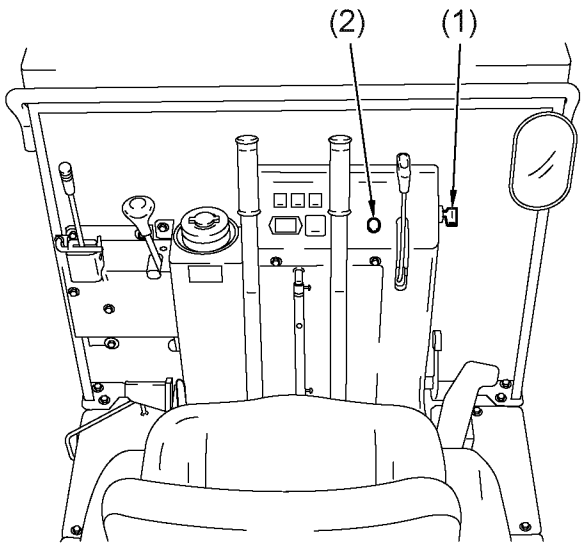
The rightmost digit advances by one in 0.1 hour (6 minutes) increments.



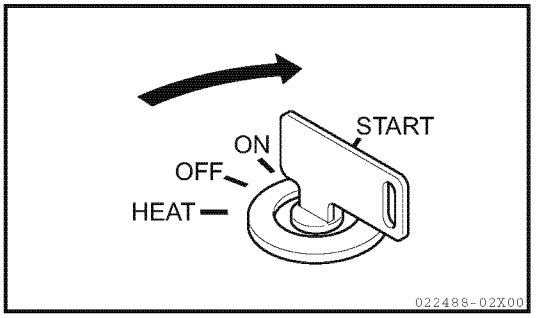
Additional explanation:

When the starter switch is "OFF", the total accumulated hours of the machine operation cannot be displayed.

12-2. Switches



(1) Starter switch

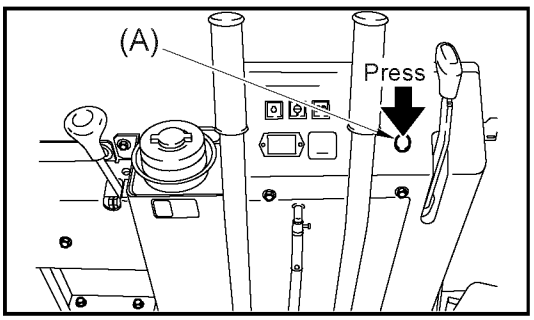


Use this switch to start and stop the engine.

- 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 and the electrical charging circuit. (Keep the starter switch key in this position while running the engine.)
  When the engine is not running and the starter switch key is in the "ON" position, a buzzer will sound.
  Turn the key to the "OFF" position to stop the buzzer.
- 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.
- HEAT position
  Turn the starter switch key to "HEAT" to activate the preheating circuit and warm up intake air to make engine starting easier in cold weather. (Turn the starter switch key to this position when the outside temperature is low.)

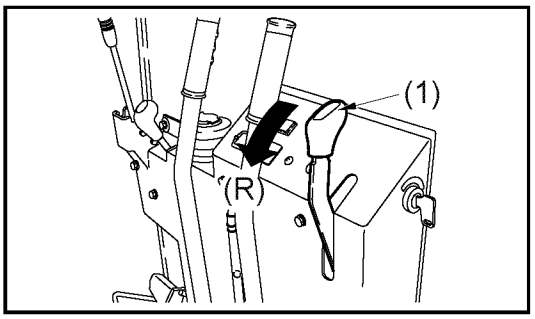
(2) Horn switch

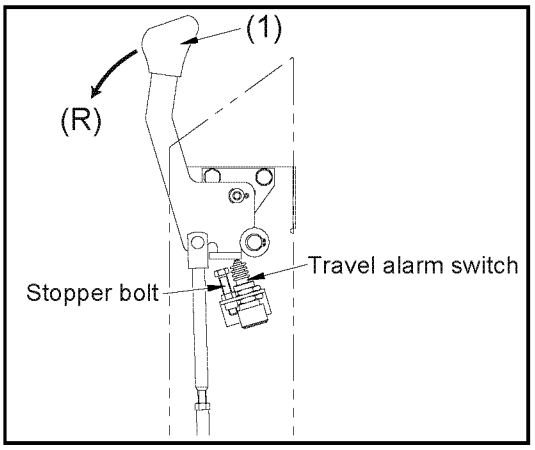
Press the switch (A) on the instrument panel to sound the horn.



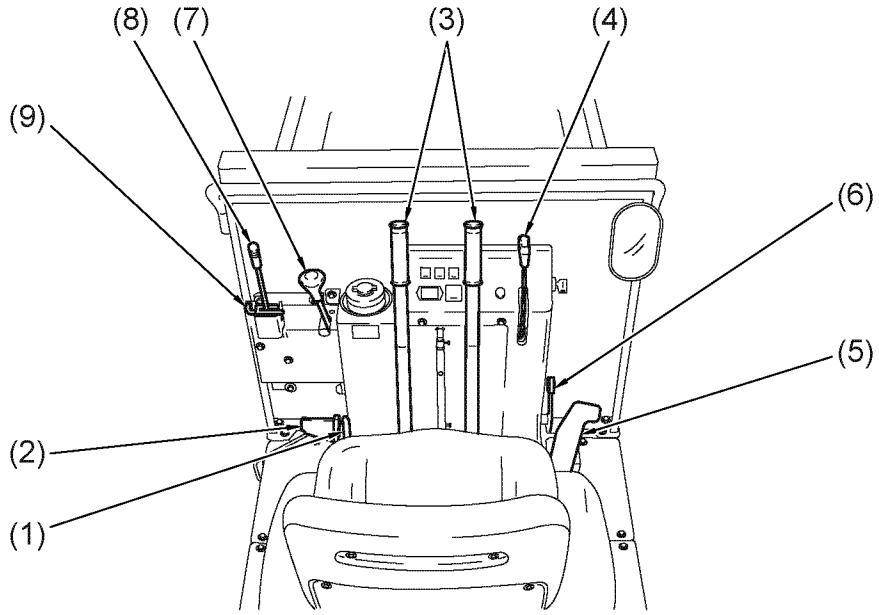
(3) Reverse travel alarm switch

When the F/R lever (1) is moved to reverse position, the reverse travel alarm is turned on and alarm sounds.





12-3. Control levers and pedals



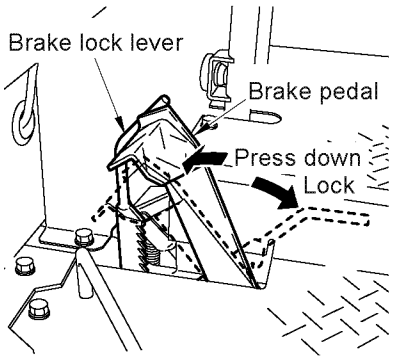
(1) Brake lock lever

⚠ WARNING

- **When leaving the operator's seat, always lower the wagon fully, lock the dump lever with the dump lever stopper, and place the brake lock lever in the lock position to apply the parking brake securely.**
  Keep in mind that if the brake lock lever should not be placed in the lock position, the machine may move abruptly and a serious accident could occur.
- **If the brake pedal is not fully depressed, the brake may not work properly.**

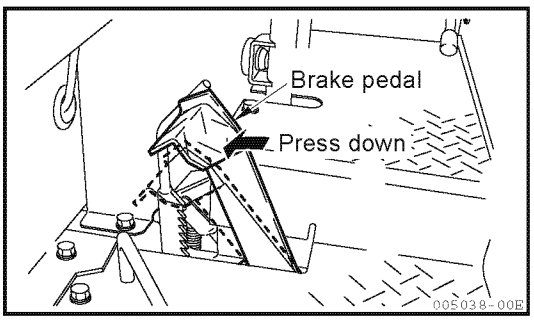
IMPORTANT

- **Do not run the machine with the brake lock lever in the lock position. If the machine travels with the brake applied, a brake system failure may occur. Before running the machine, always place the brake lock lever in the unlock position.**
- **If the brake pedal is locked with the brake lock lever for many hours during parking in a cold place, the brake pedal and the brake lock lever may freeze and the machine may not be able to travel.**



The brake lock lever is used to lock the brake pedal so that it serves as a parking brake.

(2) Brake pedal



IMPORTANT

- **Always release and return the travel pedal to the neutral position before depressing the brake pedal.**
- **Keeping the brake pedal depressed long will degrade the brake performance and get the brake heated. Use the engine brake on a long downward slope to avoid applying the mechanical brake continuously.**

The brake pedal is used to bring the machine to a temporary stop or to stop running the machine.

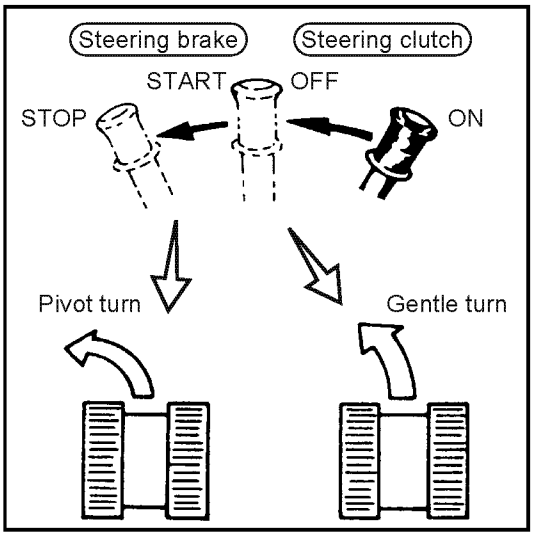
(3) Steering levers

⚠ WARNING

- **Never turn the machine on a slope. If you change the direction of travel of the machine on a slope, the machine may travel in an unexpected direction. Move down to flat ground and then make a turn.**
- **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.**
- **Always turn the machine at low speed on flat ground when the wagon is loaded. Making a quick turn may cause the load to shift, come apart or fall.**

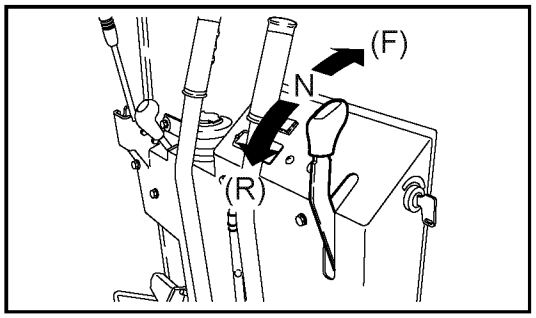
IMPORTANT

Keep in mind that the center of turning of the machine varies depending on whether the wagon is loaded or unloaded.



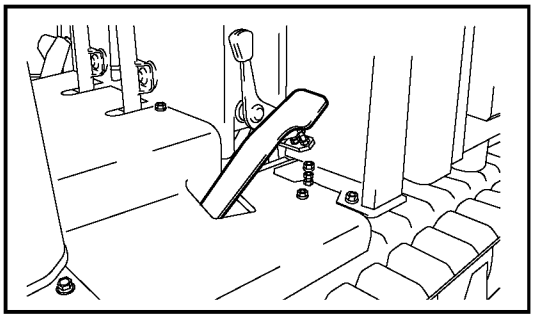
The steering levers control the turning of the machine.
The machine turns in response to the movement of each steering lever.
Operate the steering lever (R) to turn the machine to the right.
Operate the steering lever (L) to turn the machine to the left.

(4) F/R (Forward-Reverse) lever



The F/R lever is used to change the traveling of the machine between forward travel (F) and reverse travel (R).
Always release and return the travel pedal to the neutral position before operating the F/R lever. If the travel pedal is not in the neutral position, the F/R lever cannot be operated.
On a slope, always stop the machine, apply the brake, and then operate the F/R lever.

(5) Travel pedal

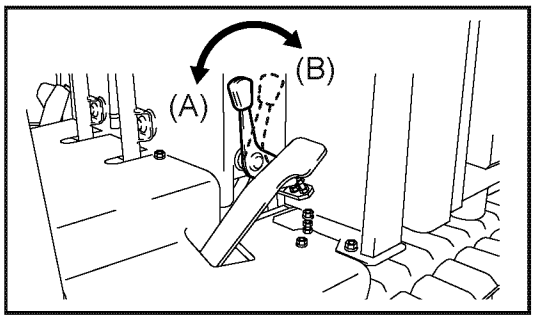


The travel pedal employs H.S.T., which allows travel speed control through pedal operation.
After moving the F/R lever to the forward travel position or to the reverse travel position, depress the travel pedal, and the machine will travel in that direction.

Note :

As you depress the travel pedal, the travel speed increases but the power decreases. When more power is required, return the depressed pedal to an appropriate extent to reduce the travel speed.

(6) Travel speed select lever



Placing the travel speed select lever in the low speed position allows the machine to operate without an engine stall even with the travel pedal depressed. When more power is required with the lever in the low speed position, return the depressed pedal to an appropriate extent to reduce the travel speed. On a slope of 10 degrees or more, place the lever in the low speed position.

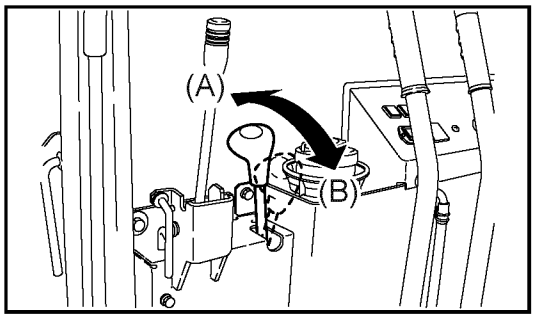
Traveling Condition	Lever Position
Traveling on a slope	(B) (Low speed)
Traveling on rough or muddy ground	
Traveling on flat ground	(A) (High speed)

(7) Accelerator lever

The accelerator lever controls the engine speed (output).

(A) Idling : Push the lever forward fully.

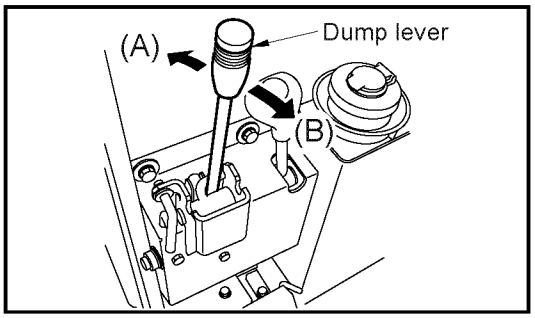
(B) Run : Pull the lever backward fully.



(8) 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.**
- **Make sure that there are no persons near the machine before dumping the wagon.**



The dump lever is used to dump and lower the wagon.

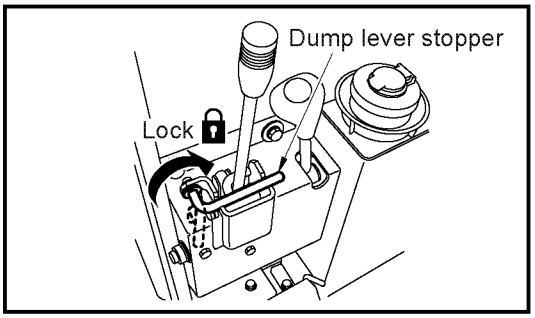
(A) Dump : Push the lever forward.

(B) Lower : Pull the lever backward.

(9) Dump lever stopper

⚠ WARNING

Always lock the dump lever with the dump lever stopper before inspecting, servicing or storing the machine.



The dump lever stopper is used to lock the dump lever.

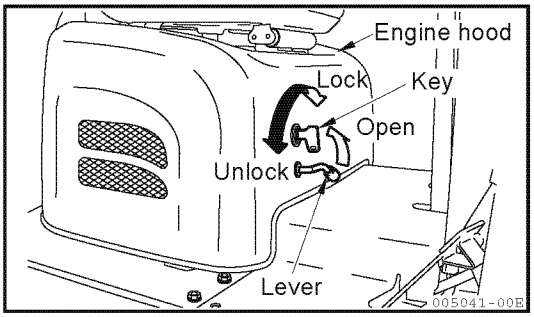
12-4. Engine hood

⚠ 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.

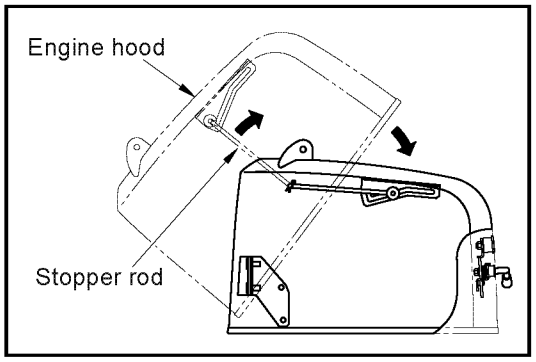
1. Opening the engine hood

1) Insert the starter switch key into the key hole in the engine hood and turn it counterclockwise to unlock the engine hood.
2) Turn the engine hood lever counterclockwise to release the engine hood, and it will open.
3) Open the engine hood fully, and it will be locked with the stopper rod.



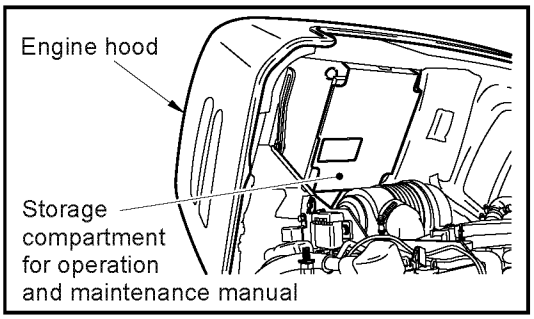
2. Closing the engine hood

1) Raise the engine hood slightly and pull the stopper rod to disengage it.
2) Close the engine hood and press it until it clicks shut.
3) Check that the lever is in the lock position.
4) Turn the starter switch key clockwise to lock the engine hood.



12-5. Storage compartment for the operation & maintenance manual

The storage compartment for the Operation & Maintenance Manual is provided inside the engine hood.
Be sure to keep the Operation & Maintenance Manual in the provided vinyl bag and store it in the storage compartment, so that you can take out the manual from there and refer to it whenever you need.



- Open the engine hood and take out the Operation & Maintenance Manual.
  Refer to Section “12-4. Engine hood” for the procedure for opening the engine hood.

12-6. Fuse

⚠ 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 following two types of fuses are used in the electrical wiring circuit:

Blade fuse

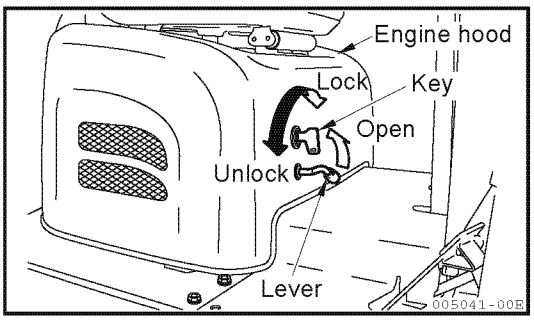
- Protect the electrical equipment from overcurrent which exceeds the allowable limit of the electrical equipment.
- Protect the wiring from overcurrent which exceeds the allowable limit of the wiring due to a problem with the electrical equipment.

Slow-blow fuse

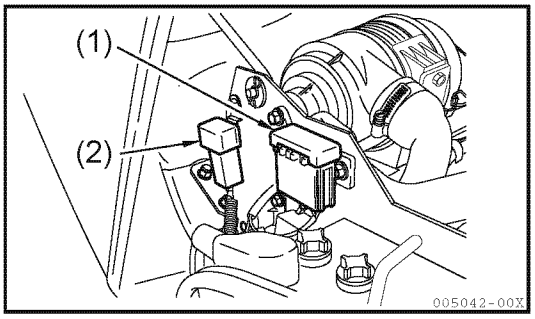
- Protect the electrical equipment and the wiring from a burnout caused by overcurrent which flows in the circuit for large-capacity current when a problem occurs (such as short-circuit due to breaking of wire).

■ Position of the fuse

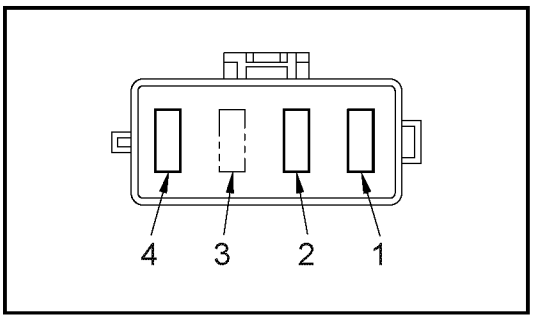
1) Open the engine hood.
   Refer to Section “12-4. Engine hood”.
2) The fuse is installed at the rear on the right side of the machine.



(1) : Blade fuse
(2) : Slow-blow fuse

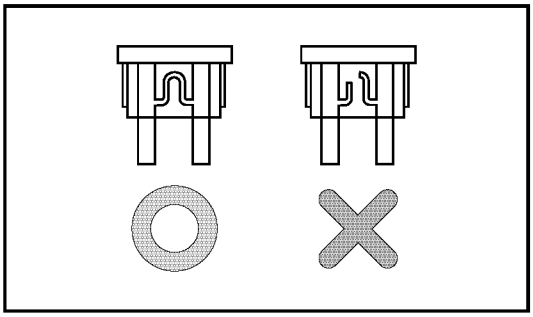


■ Replacing the fuses



If the electrical equipment does not operate when the starter switch is turned to "ON" or "START", the fuse may have been blown out. Follow the procedure below:

1) Turn the starter switch key to the "OFF" position.
2) Open the fuse holder to take the fuses out.
3) If a fuse is blown out, replace it with a spare fuse of rated capacity.



Blade fuse

Symbol	Fuse capacity	Circuit name
1	10A	Engine stop solenoid
2	10A	Headlight (option) Horn Buzzer Alarm lamps Hourmeter Current limiter Back buzzer
3	Empty	
4	10A	Spare fuse

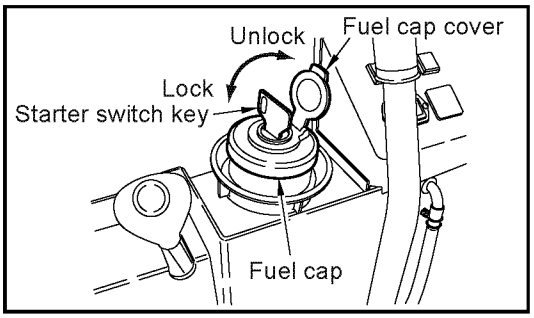
Slow-blow fuse

- Open the slow-blow fuse cover to check it and replace it if necessary.

12-7. Fuel cap

The fuel cap is provided with a key locking system.
Use the starter switch key to open and close the fuel cap.

12-7-1. Locking and unlocking the fuel cap



■ Unlocking the fuel cap

1) Open the fuel cap cover and insert the starter switch key into the key hole in the fuel cap. Then, turn the key clockwise to unlock the fuel cap.
2) Turn the fuel cap counterclockwise and remove it.

■ Locking the fuel cap

1) Install the fuel cap and turn it clockwise.
2) Turn the starter switch key counterclockwise to lock the fuel cap.
3) Remove the key.

12-8. Wagon support

⚠ WARNING

Always install the wagon support to hold the wagon securely when inspecting or servicing the machine with the wagon in the dump position.

The wagon support serves to prevent the wagon from lowering. To install and remove the wagon support, follow the procedure below.

■ Installing the wagon support

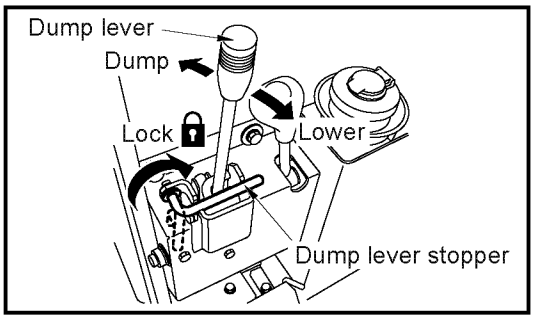
1) Start the engine and idle it.

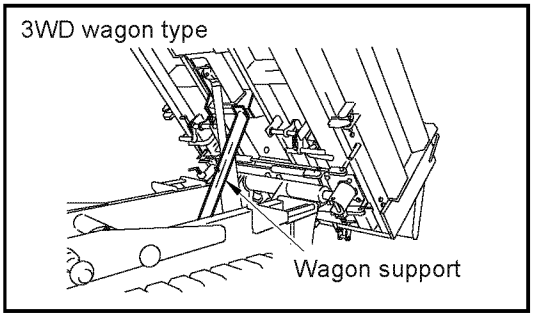
2) Move the dump lever to the dump position to dump the wagon fully.

3) Install the wagon support as illustrated at the right.

4) Slowly move the dump lever to the lower side to lower the wagon slightly and securely engage the wagon support.

5) Stop the engine. Move the dump lever back and forth to relieve the pressure in the hydraulic cylinder circuit and lock the dump lever with the dump lever stopper.

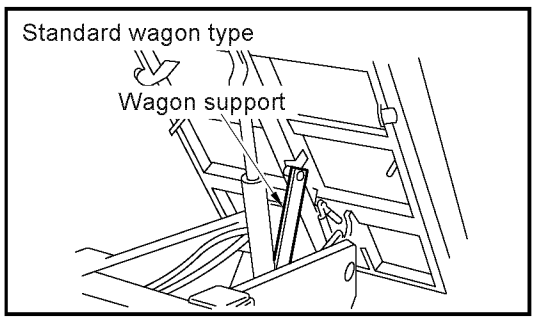




■ Removing the wagon support

1) Unlock the dump lever, slowly move the dump lever to the dump side and remove the wagon support.

2) Return the wagon support to its storage position.



13. Operating Instructions

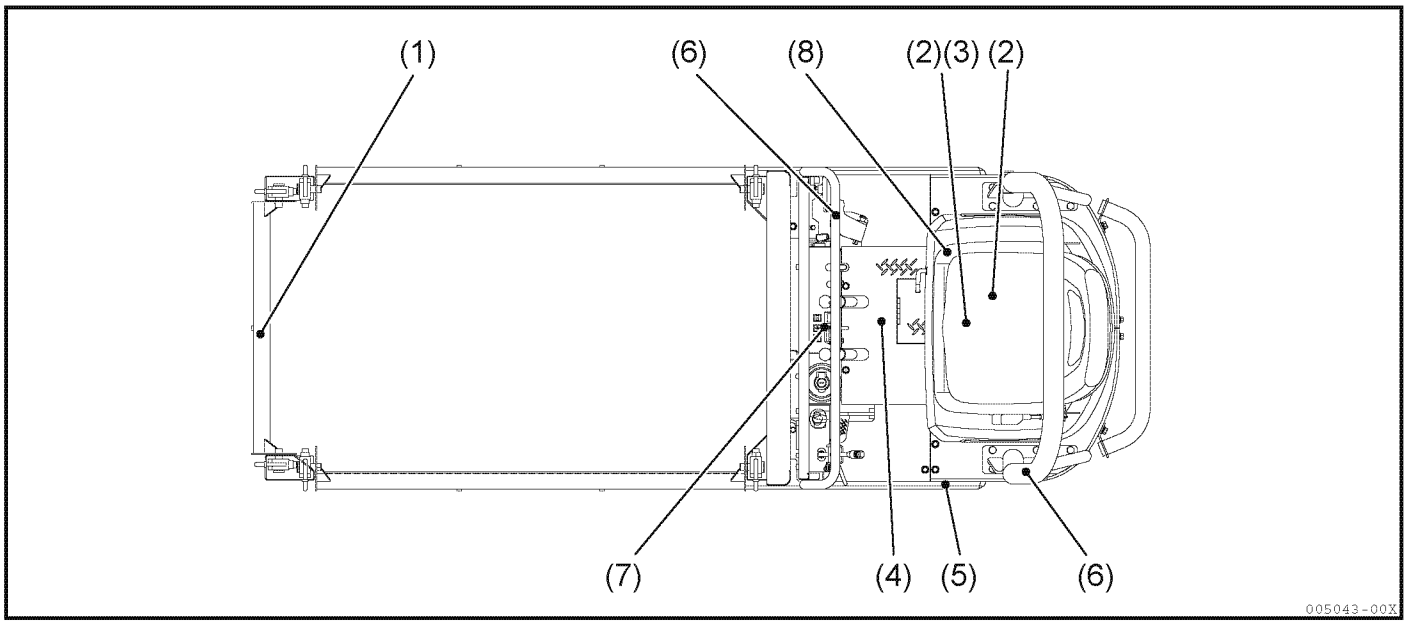
13-1. Checking before starting the engine

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

⚠ 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.**

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 in good condition. In addition, check the electrical wiring for loose connections and for dust deposits in the heat build-up areas.
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, 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 transmission for oil leakage

Check the transmission 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, and rearview mirror for breakage and loose bolts

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

(8) Checking the water separator to see whether the red ring has sunk down to the cup bottom

If the red ring has sunk down to the cup bottom, no water has mixed into the oil; if the red ring is floating in the cup, water is mixed into the oil under the red ring. In this case, take out the cup to remove the water. Refer to Section "25-4-2. Cleaning the fuel filter element (with water separator)" for the removal and reinstallation procedure for the cup.

13-1-2. Checking before start-up

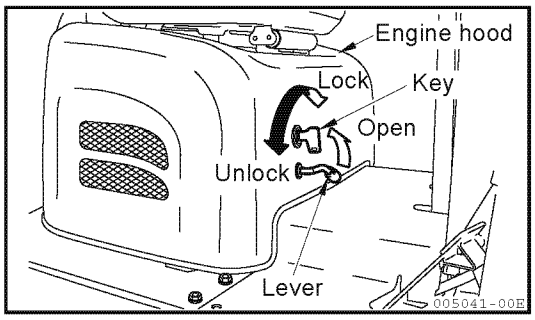
Check the following points before initial start-up for the day.

■ **Checking and replenishing the cooling water**

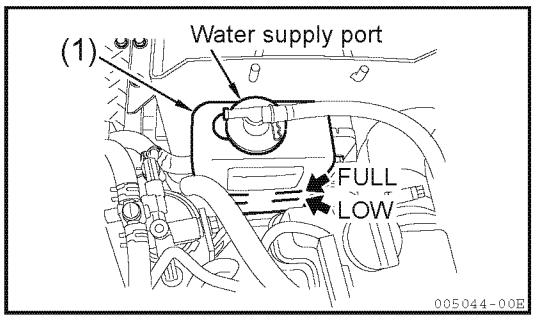
⚠ WARNING

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

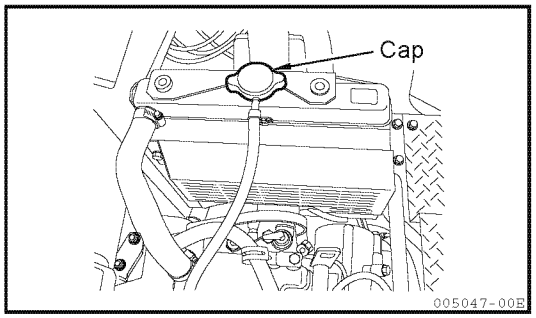
1) Open the engine hood.
   Refer to Section “12-4. Engine hood”.



2) Check that the cooling water lever in the sub-tank (1) (illustrated in the figure at the right) is between the FULL and LOW marks. If the water level is below the LOW mark, refill the sub-tank up to the FULL mark through the water supply port of the sub-tank (1).
   For the quality of cooling water to be used, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".



3) After replenishing, securely tighten the water supply port cap.



4) If the sub-tank is empty, check it for water leakage, and then, check the water level in the radiator.
   If the water level is low, refill the radiator first, then refill the sub-tank.

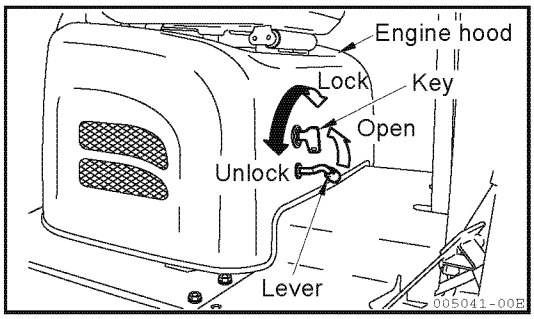
5) If the cooling water level is appropriate, close the engine hood. Refer to Section “12-4. Engine hood”.

■ Checking and replenishing the engine oil

⚠ WARNING

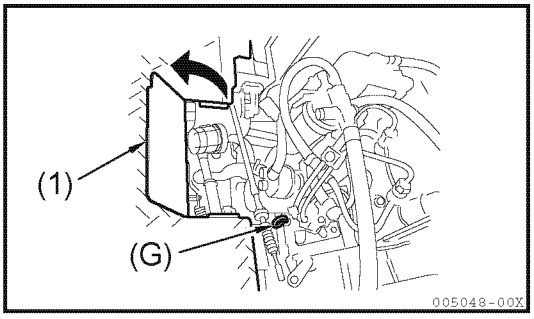
- **At operating temperature, the oil and dipstick areas are hot.**
  Do not allow hot oil or hot components to contact the skin, to prevent bodily injury.
- **Check the oil level and replenish oil after the engine has cooled down sufficiently.**

1) Open the engine hood and open the cover (1) of the step. Refer to Section “12-4. Engine hood” for the procedure for opening the engine hood.

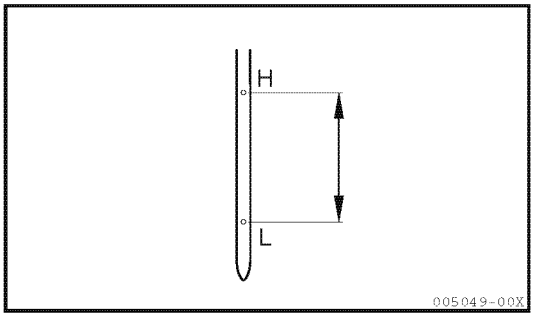


2) Pick up the dipstick (G) and wipe it with a rag to remove oil deposits.

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

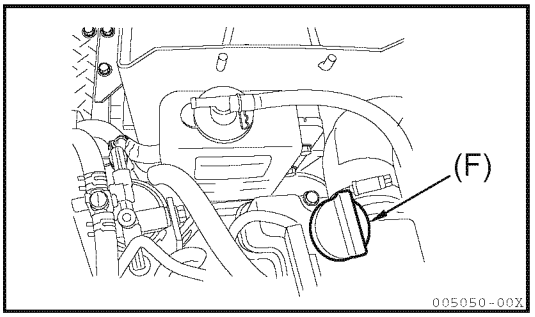


4) If the dipstick (G) is wet above the midpoint between the H and L marks, the engine oil level is appropriate. If the oil level is below the midpoint between the H and L marks, add engine oil through the oil supply port (F). For the quality of the engine oil to be used, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".



5) If the engine oil level is above the H mark, open the cover (2), then remove the excessive amount of oil through the drain plug (P), then recheck the engine oil level.

6) After verifying that the amount of engine oil is appropriate, securely retighten the oil supply port cap. Close the cover of the step and close the engine hood.
   Refer to Section “12-4. Engine hood”.

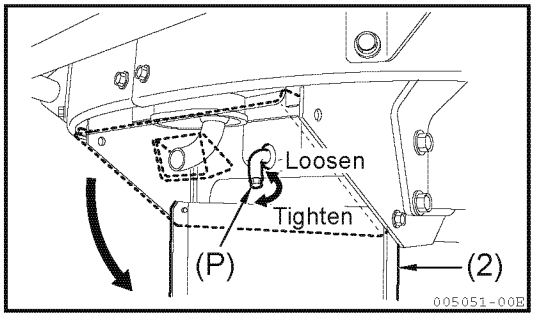


Note :

When checking the engine oil level after running 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.

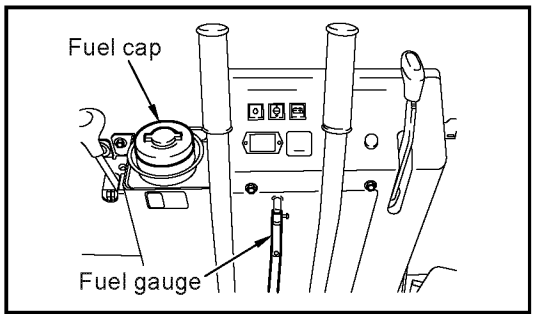
⚠ CAUTION

- **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 level gauge on the fuel tank. If the fuel level is low, open the fuel cap and add fuel through the fuel supply port.

   Fuel tank capacity...3.83 Gals. (14.5 L)

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



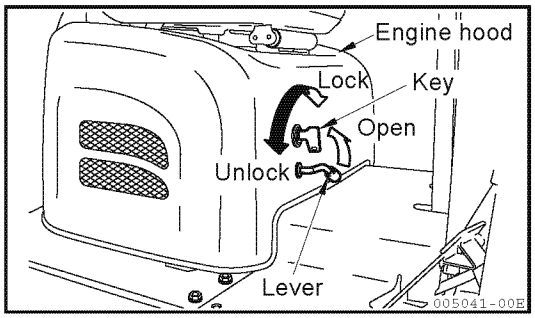
2) After refueling, securely close the fuel cap.
   Refer to Section “12-7. Fuel cap” for the procedures for opening and closing the fuel cap.

■ Checking and adjusting the fan belt tension

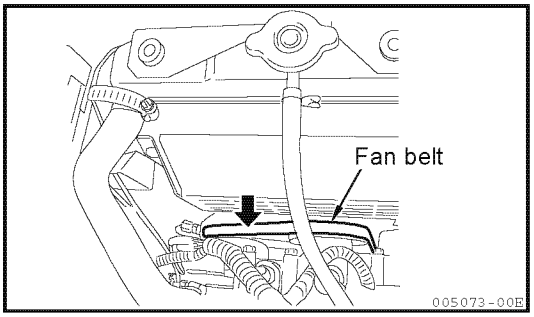
⚠ WARNING

- **Stop the engine, take out the starter switch key, and attach the "Do NOT operate" tag to the starter switch.**
- **The drive belt is hot immediately after the engine is stopped.**
  Do not adjust the drive belt tension immediately after stopping the engine.
- **Adjust the drive belt tension after all of the parts of the engine have cooled sufficiently.**

1) Open the engine hood.
   For the procedure for opening the engine hood, refer to Section "12-4. Engine hood".

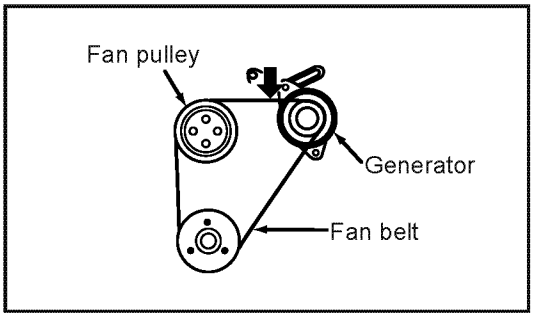


2) Press down on the fan belt between the fan pulley and the generator with a finger, to check the fan belt tension.
   Pressing force : Approximately 22.1 lbs. (10 kg)
   Correct slack : 0.4 to 0.6 in. (10 to 15 mm)



3) Adjust the tension if necessary.
   Refer to Section "25-3. Checking before start-up" for the adjustment procedure.

4) When the tension is proper, close the engine hood.
   Refer to Section "12-4. Engine hood".



IMPORTANT

Improper fan belt tension will shorten the life of the belt.

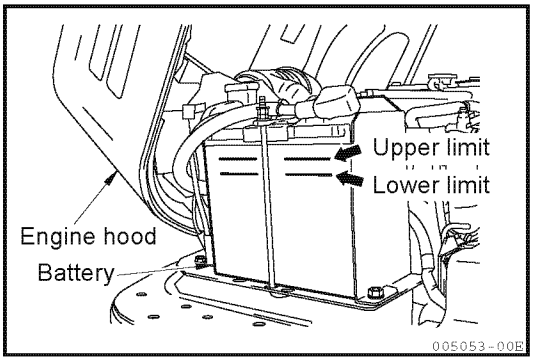
■ Checking and replenishing the battery electrolyte

⚠ 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.**

1) Open the engine hood.
   Refer to Section "12-4. Engine hood".

2) Check the battery electrolyte level with the battery electrolyte level gauge. If the battery electrolyte level is between the upper and lower limit marks, the battery electrolyte level is appropriate.



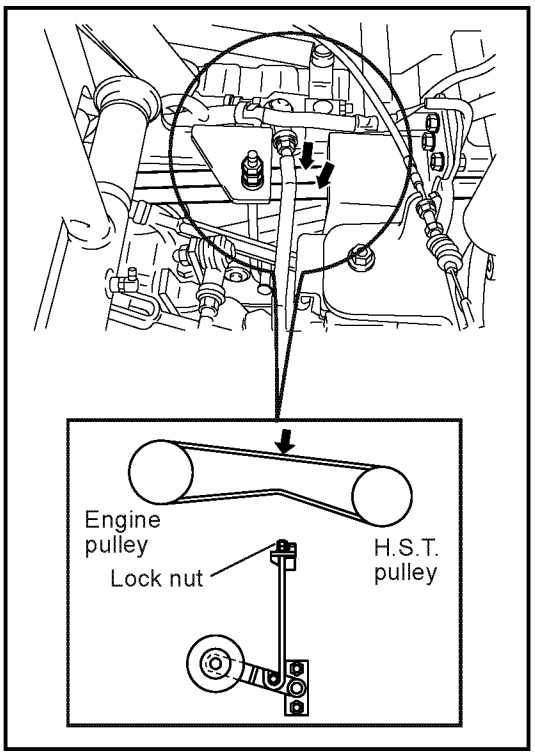
3) If the battery electrolyte level is below the lower limit mark, replenish the battery electrolyte.

4) Close the engine hood.
   Refer to Section "12-4. Engine hood".

■ **Checking the drive belt tension**

⚠ WARNING

- **Stop the engine, take out the starter switch key, and attach the "Do NOT operate" tag to the starter switch.**
- **The drive belt is hot immediately after the engine is stopped.**
  Do not adjust the drive belt tension immediately after stopping the engine.
- **Adjust the drive belt tension after all of the parts of the engine have cooled sufficiently.**



1) Open the engine hood and remove the step.
   For the procedure for opening the engine hood, refer to Section "12-4. Engine hood".

2) Press down on the drive belt between the engine pulley and the H.S.T. pulley with a finger and check the drive belt tension.
   Pressing force : 5.5 to 7.7 lbs. (2.5 to 3.5 kg)
   Correct slack : 0.4 in. (10 mm)

3) If the tension is not proper, refer to Section "25-4-3. Checking and adjusting the drive belt tension" for the procedure for adjusting it.

4) If the tension is proper, install the step and close the engine hood.
   For the procedure for closing the engine hood, refer to Section "12-4. Engine hood".

IMPORTANT
Improper drive belt tension will shorten the life of the belt.

■ Greasing

⚠ WARNING

Always install the wagon support to hold the wagon securely when inspecting or servicing the machine with the wagon in the dump position.

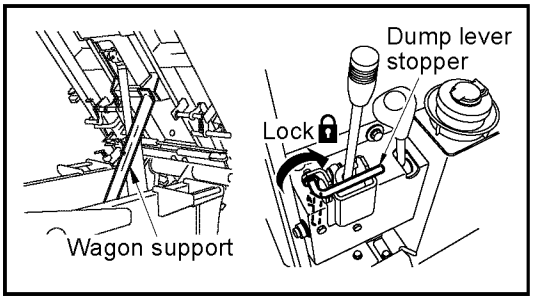
IMPORTANT

Grease the fittings thoroughly after washing the machine or after operation in rain, on soft ground, or in muddy water.

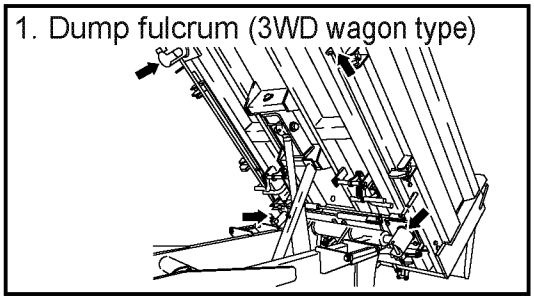
1) Park the machine on level ground. Dump the wagon, install the wagon support to hold the wagon securely and stop the engine. Then, move the dump lever back and forth to relieve the pressure in the hydraulic cylinder circuit and lock the dump lever with the dump lever stopper.

2) Clean the grease fittings indicated by arrows in the figures at the right and grease them with a grease gun.

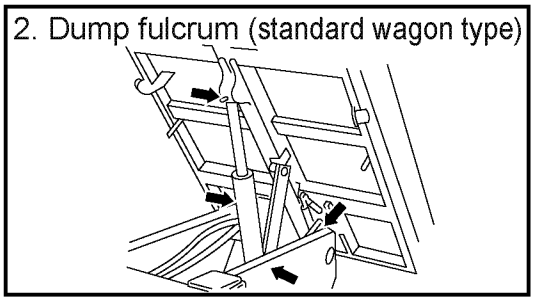
3) After greasing, wipe off any excess that remains.



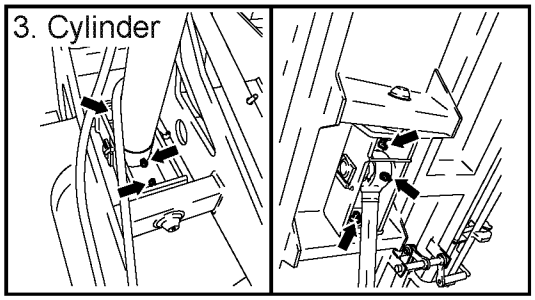
1. Dump fulcrum (3WD wagon type)



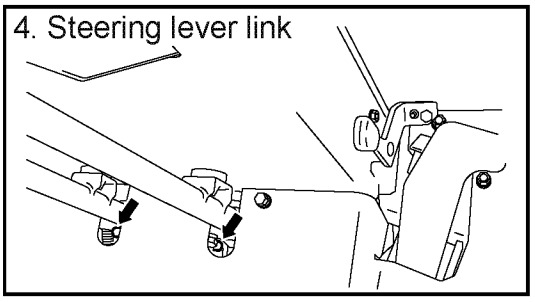
2. Dump fulcrum (standard wagon type)



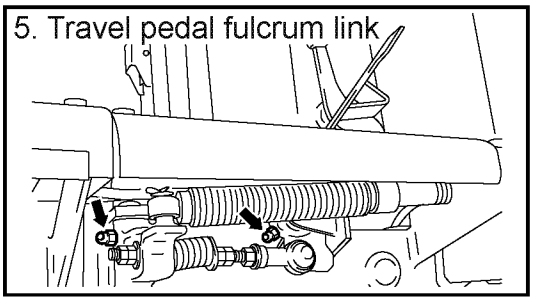
3. Cylinder



4. Steering lever link



5. Travel pedal fulcrum link



■ Checking the electrical equipment

⚠ CAUTION

If a fuse blows out frequently, contact your dealer for assistance.

Check fuses for damage, wiring for poor connections or short circuits, and battery terminals for corrosion or loose fits. Take corrective action.

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

1) Check the monitor functions
- Check the hourmeter function.
- Check the engine oil pressure alarm lamp and battery charge alarm lamp for lighting.

2) Check that the headlight (option) lights correctly.

3) Check that the horn functions correctly.

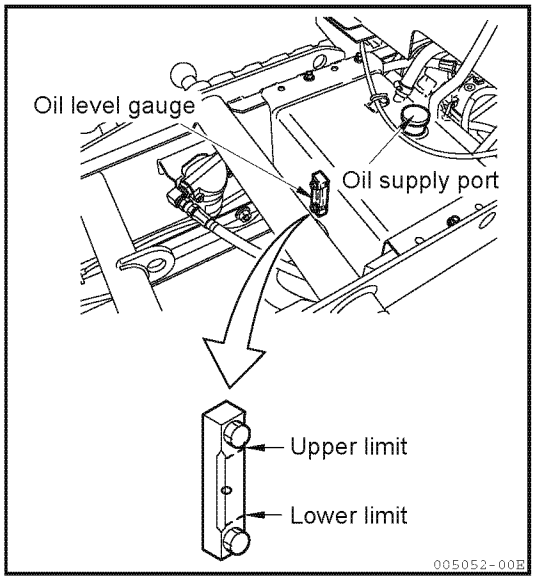
■ **Checking and replenishing the hydraulic oil in the hydraulic oil tank**

⚠ WARNING

- **Always install the wagon support to hold the wagon securely when inspecting or servicing the machine with the wagon in the dump position.**
- **When removing the plug of the oil supply port, slowly loosen it to gradually relieve the internal pressure in the tank, or oil may spurt from the tank.**

1) Park the machine on level ground. Dump the wagon, install the wagon support to hold the wagon securely and stop the engine. Then, move the dump lever back and forth to relieve the pressure in the hydraulic cylinder circuit and lock the dump lever with the dump lever stopper.

2) Check the hydraulic oil level with the oil level gauge. If the oil level is between the upper limit and lower limit marks on the gauge, it is proper.



3) If the hydraulic oil level is low, remove the oil supply port cap and add hydraulic oil until the oil level reaches the middle on the oil level gauge.

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

IMPORTANT

Do not replenish hydraulic oil above the midpoint between the upper limit and the lower limit marks on the oil level gauge with the wagon in the dump position. An excessive amount of hydraulic oil may damage the hydraulic system by placing stress on its components, causing a dangerous high-pressure leak.

Note :

Note that the oil level varies with the oil temperature. When reading the oil level, follow these guidelines:

- *Before start-up, the oil level gauge should read at or near the midpoint of the gauge scale [oil temperature : 50 to 86°F (10 to 30°C)].*
- *During normal operation, the oil level gauge should read at or near the upper limit mark of the gauge scale [oil temperature : 122 to 176°F (50 to 80°C)].*

■ Checking and adjusting the rubber crawler tension

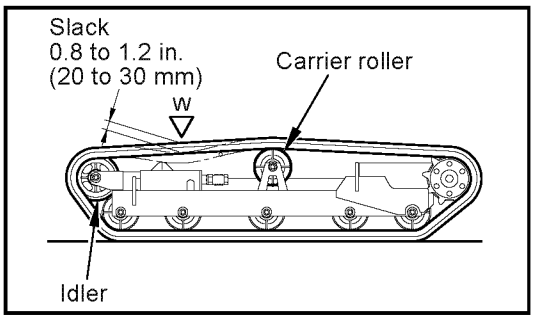
⚠ WARNING

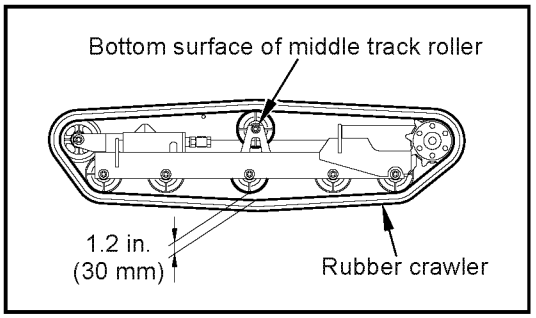
- **When raising the machine, support it with safety blocks of sufficient strength.**
- **When the machine is being checked or adjusted by two persons, one must operate the machine in response to signs from the other.**

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.

• 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 weight of about 132 lbs. (60 kg) on the rubber crawler between the idler and the carrier roller and measure the slack. If it is between 0.8 in. (20 mm) and 1.2 in. (30 mm), the rubber crawler tension is proper.
3) Alternatively, jack up one rubber crawler from the ground and measure the clearance between the bottom surface of the middle track roller and the inside surface of the rubber crawler. If the clearance is about 1.2 in. (30 mm), the rubber crawler tension is proper.

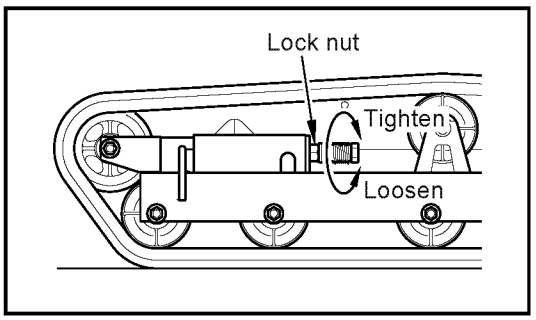




If the rubber crawler tension is improper, adjust it as follows.

• Adjusting the rubber crawler tension

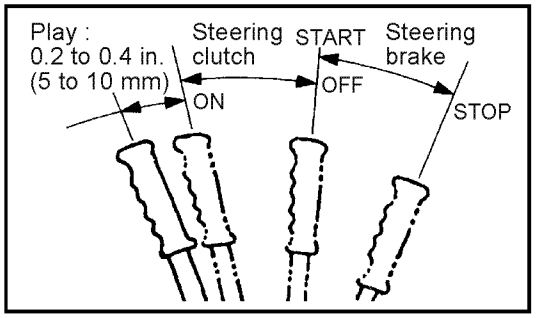
1) Loosen the lock nut and turn the adjusting bolt to adjust the rubber crawler tension so that the slack is within the specified range.
   - To increase the rubber crawler tension, turn the adjusting bolt clockwise.
   - To reduce the rubber crawler tension, turn the adjusting bolt counterclockwise.
2) After adjustment, be sure to tighten the lock nut securely.



■ Checking the steering clutches and brakes

• Checking the steering levers

1) Check each steering lever for play. If the play is between 0.2 in. (5 mm) and 0.4 in. (10 mm), it is proper.
2) Check that both the right and left steering levers have the same stroke length.

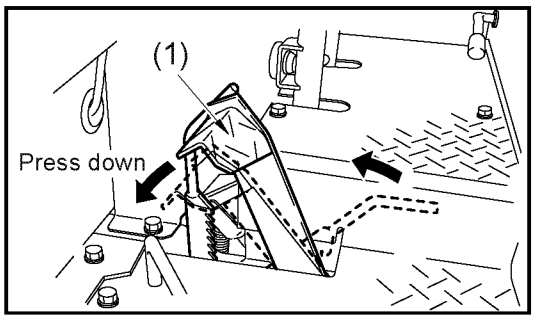


• Adjust the steering clutches and the steering brakes if necessary

Refer to Section "25-2-4. Checking and adjusting the steering clutches and brakes" for the procedures for adjusting them.

■ Checking the brake pedal

1) Depress the brake pedal (1) with your hand and check that the play of the pedal is no more than 3.5 in. (90 mm).
2) If the play exceeds 3.5 in. (90 mm), ask your dealer to check the brake pedal and replace the brake friction plates and steel plates if necessary.



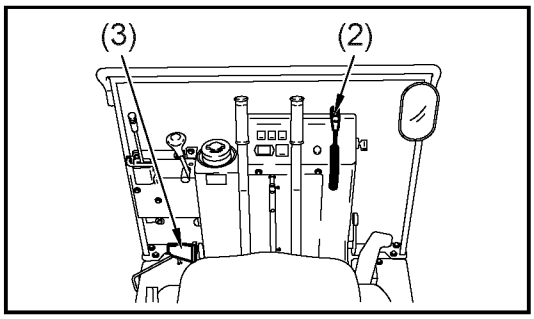
■ Checking the travel pedal and the F/R lever

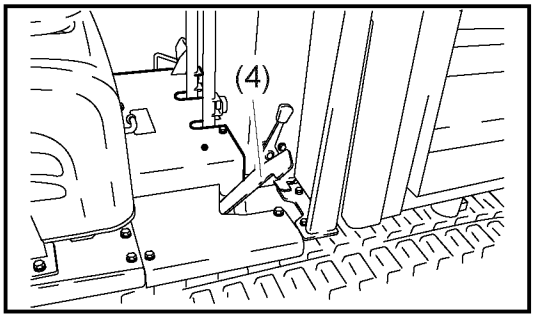
⚠ CAUTION

- **The F/R lever cannot be operated unless the travel pedal is in the neutral position.**
- **Always release and return the travel pedal fully to the neutral position before operating the F/R lever.**

Move the F/R lever (2) from the neutral position to the forward or reverse travel position, press down on the brake pedal (3) fully and then start the engine, before checking the following items:

1) Take your foot off the brake pedal (3) and check that the machine does not move.
2) Press down on the travel pedal (4) slightly to move the machine at very low speed. Then, release the travel pedal (4). Check that the machine stops completely.

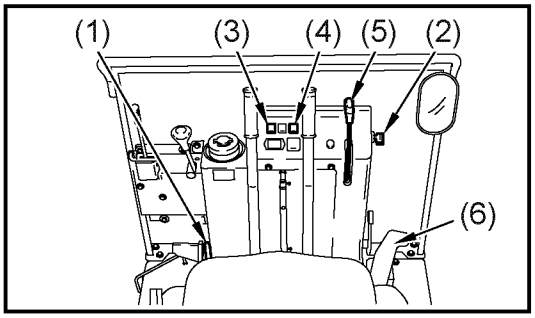




• Adjust the travel pedal and the F/R lever if necessary

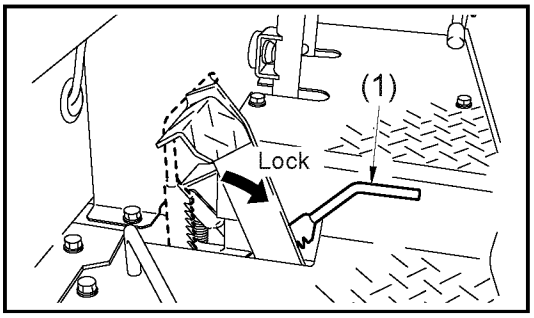
Refer to Section "25-2-6. Checking and adjusting the travel pedal" for the procedures for adjusting them.

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



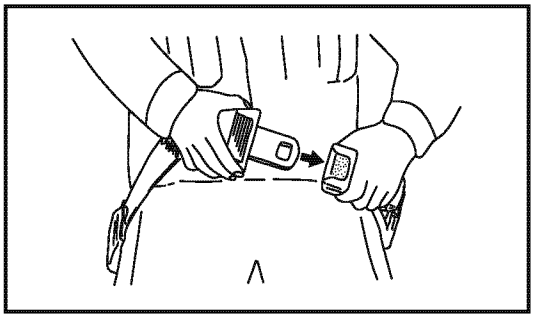
⚠ WARNING

- **When leaving the operator's seat, always lower the wagon fully, lock the dump lever with the dump lever stopper, and place the brake lock lever in the lock position to apply the parking brake securely.**
  Keep in mind that if the brake lock lever should not be placed in the lock position, the machine may move abruptly and a serious accident could occur.
- **Never operate the machine unless the ROPS bar is in its full upright and locked position to prevent bodily injury.**



1) Check that the brake lock lever (1) is in the lock position.

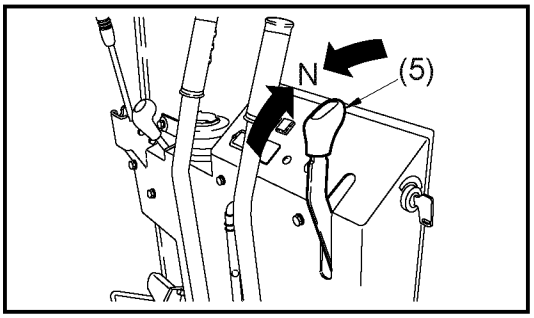
2) Check that the travel pedal (6) is in the neutral position.



3) Check that the F/R lever (5) is in the neutral position.

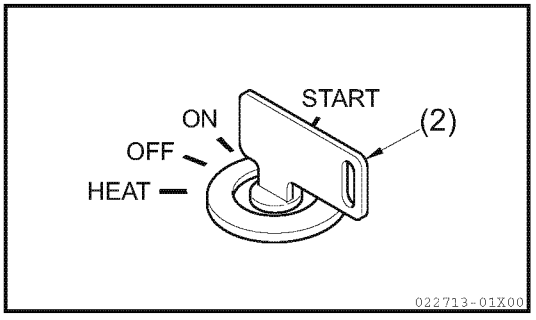
4) Check that all other levers are in their appropriate positions.

5) Fasten the seatbelt snugly.



6) Insert the starter switch key (2) into the starter switch and turn it to the "ON" position. Then check the following points:

[1] The buzzer will sound, and the following alarm lamps will light.
- Engine oil pressure alarm lamp (3)
- Battery charge alarm lamp (4)
- The buzzer will stop when the engine starts.



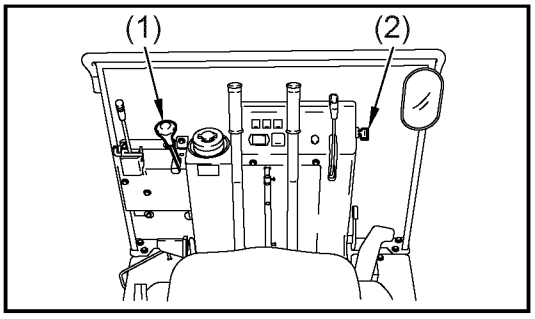
If any of the alarm lamps does not light or the buzzer does not sound, it may mean that an alarm lamp has blown out or is broken. In this event, ask the dealer for repair.

13-2. Starting up the engine

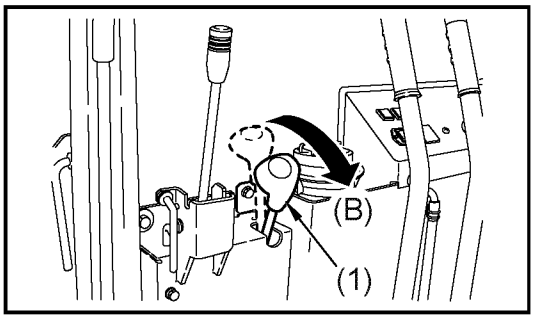
13-2-1. Normal start-up

⚠ 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.**

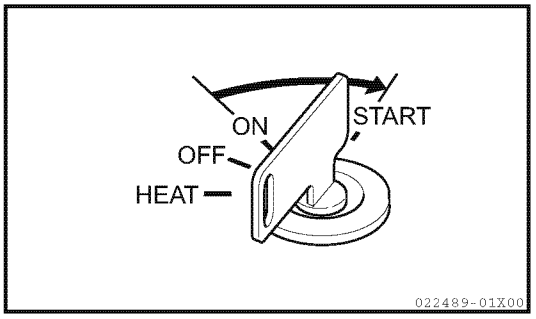


1) Pull the accelerator lever (1) back to the run position (B).



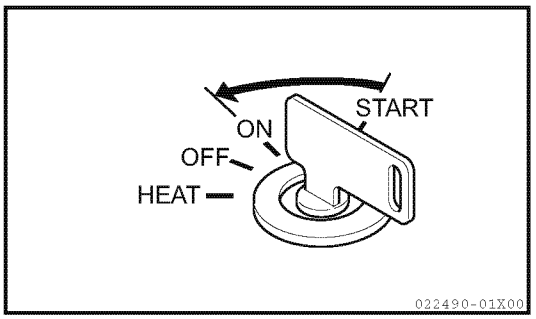
2) Turn the starter switch key (2) in the starter switch to the "START" position. The engine will start.

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.



Note :

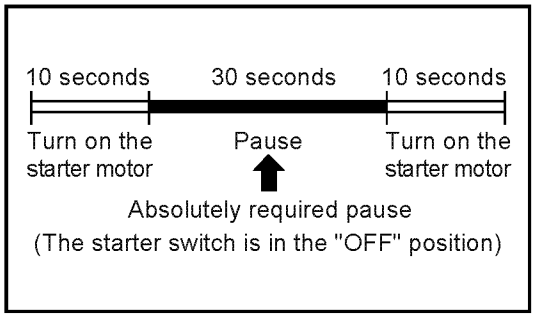
When the engine is warm, the engine can start up even if the accelerator lever is left in the idling position.



IMPORTANT

To protect the starter motor and the battery:

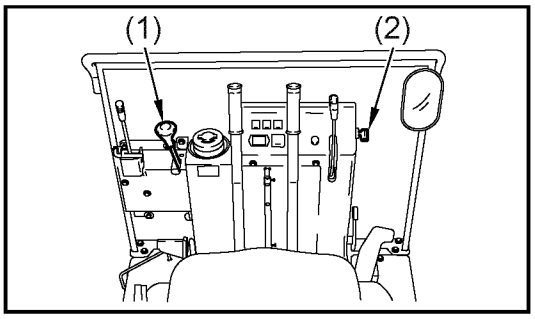
- **Do not keep the starter switch key in the "START" position for more than 10 seconds.**
- **If the engine fails to start, do not attempt to start the engine immediately again, but set the starter switch to the "OFF" position and wait for approximately 30 seconds, then start the engine again.**



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

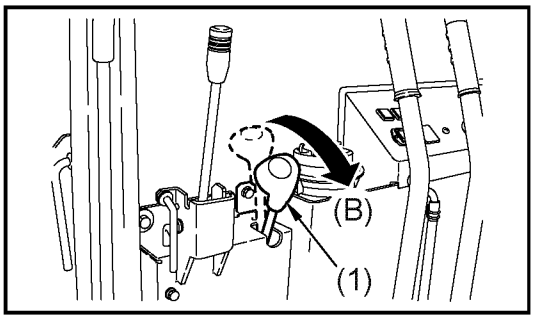
⚠ WARNING

- **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.**

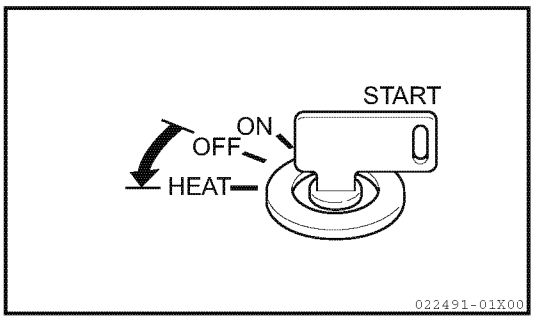


To start the engine when the outside air temperature is low, follow the steps below:

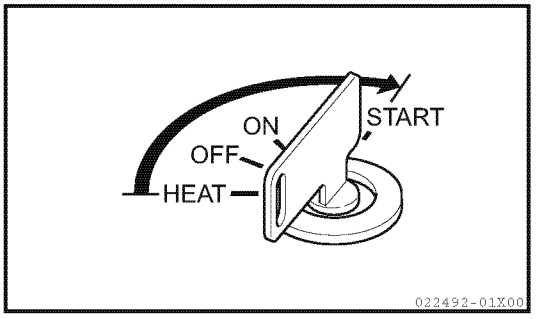
1) Pull the accelerator lever (1) back to the run position (B).



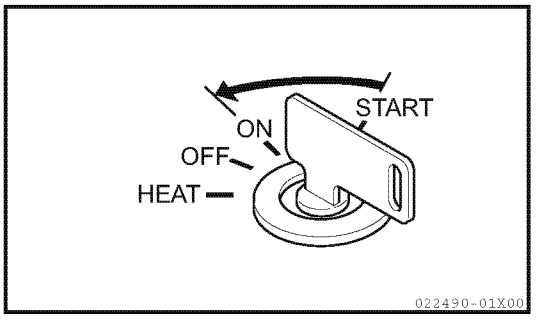
2) Turn the starter switch key (2) in the starter switch to the "HEAT" position and keep it there for approximately 10 to 15 seconds to preheat the intake air of the engine.



3) Turn the starter switch key in the starter switch (2) to the "START" position to start the engine.



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.

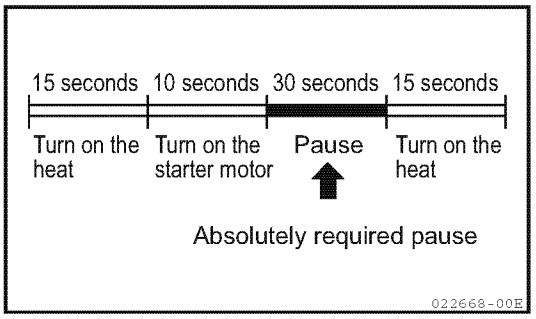


5) When the engine speed has increased, push the accelerator lever (1) forward to the idling position immediately.

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 starter switch to the "OFF" position and wait for approximately 30 seconds, then start the engine again.**
- **Traveling or operating the machine without adequate warming in cold weather may adversely affect the machine performance.**



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

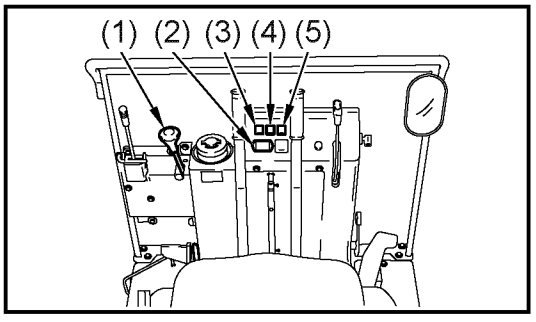
⚠ WARNING

- **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 wagon.
- **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.**

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



1) Pull the accelerator lever (1) to the midpoint between the idling and run positions, and run the engine with no load at medium speed for approximately five minutes.

2) After warming up the engine, check that the alarm lamps are in the following status. If there is anything abnormal, take corrective action.

- Hourmeter (2)..... Normal
- Engine oil pressure alarm lamp (3) .....Off
- Water temperature alarm lamp (4) .....Off
- Battery charge alarm lamp (5).....Off

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

4) Make a test run with the machine to check that the brakes normally work, that the steering levers and the wagon normally operate and that the machine normally travels.

13-4. Traveling

13-4-1. Folding the ROPS bar

⚠ WARNING

- **Never operate the machine unless the ROPS bar is in its full upright and locked position to prevent bodily injury.**
  Never disengage the ROPS bar except:
  - **When moving the machine on a truck bed or similar means of transport.**
  - **When moving the machine under its own power from one location to another where height access is restricted.**
- **Keep clear of pinch-point when folding ROPS bar to prevent bodily injury.**
- **Be careful with the ROPS bar since it is very heavy in weight.**

The ROPS bar can be folded down when the machine travels through a place of a limited height.

1. Folding the ROPS bar

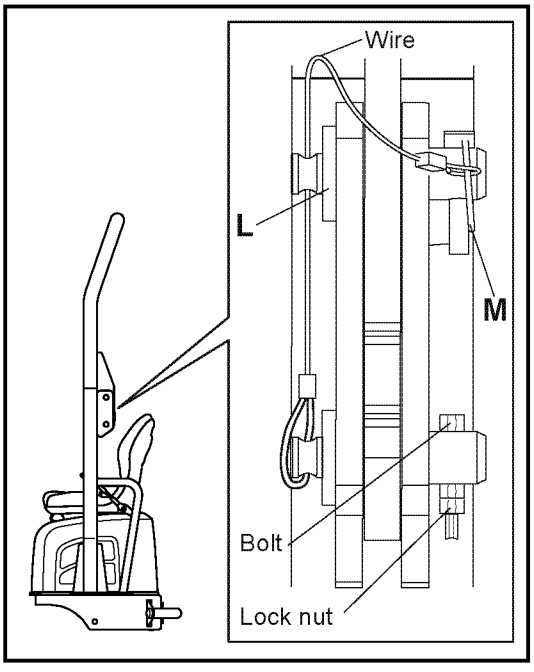
1) Remove the linchpin **M** and pull the linchpin **L** out.
   Do this for the right and left sides.
2) Slowly fold back the ROPS bar.

2. Unfolding the ROPS bar

1) Slowly unfold the ROPS bar.
2) Insert the linchpin **L** and lock it with the linchpin **M** for each side.

Note :

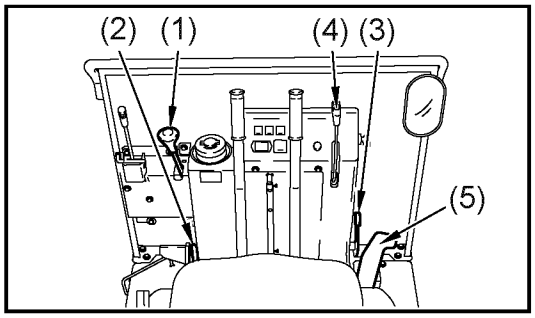
Be careful not to get your finger or other part of your body caught in the moving part of the ROPS bar when handling it.



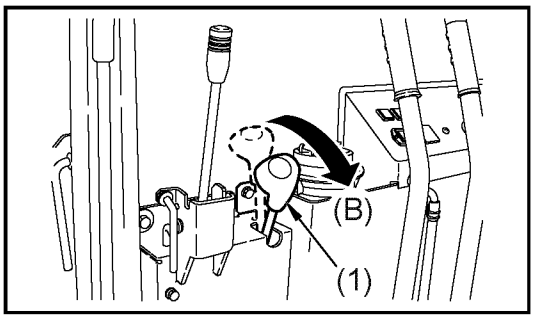
13-4-2. Traveling forward and in reverse

⚠ WARNING

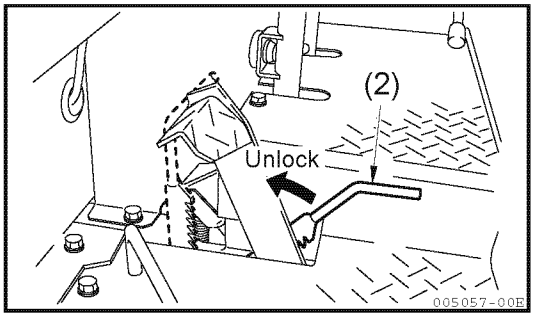
- **A signal person should be in attendance to give signals at sites which are dangerous or not clearly in view of the operator.**
- **Clear all people from the working area.**
- **Sound the horn before beginning travel, to alert the people near the machine.**
- **Clear obstacles from the path of the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



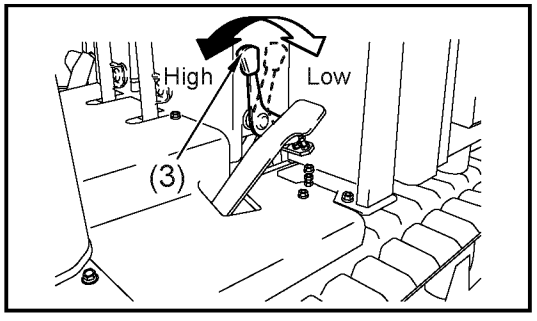
1) Pull the accelerator lever (1) back to the run position (B) to increase the engine speed.



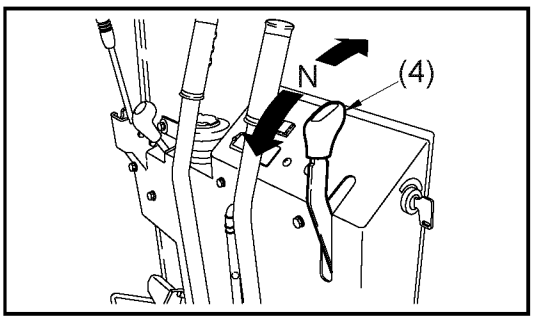
2) Press down on the brake pedal and place the brake lock lever (2) in the unlock position.



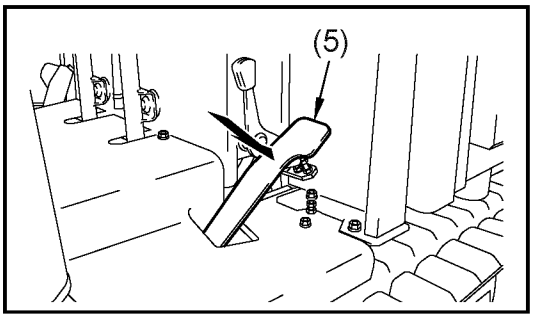
3) Place the travel speed select lever (3) in the low or high speed position depending on the conditions of the work site.



4) Move the F/R lever (4) from the neutral position to the forward or reverse travel position in accord with the direction of travel of the machine.



5) Depress the travel pedal (5).

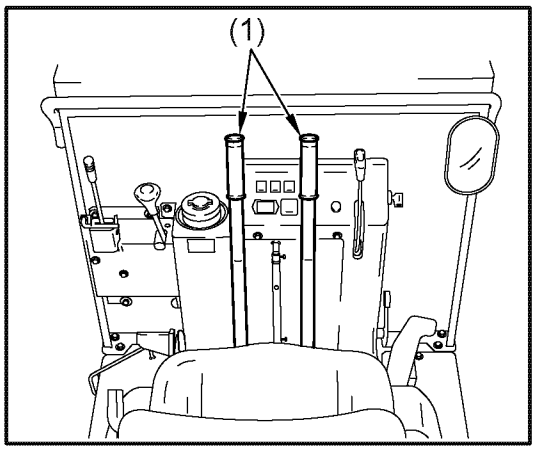


13-5. Steering (turning the machine)

⚠ WARNING

- **Never turn the machine on a slope. If you change the direction of travel of the machine on a slope, the machine may travel in an unexpected direction. Move down to flat ground and then make a turn.**
- **Never turn make a quick turn on concrete or asphalt roads to prevent machine hunting.**
- **Never turn at high speed on rough terrain.**

To steer the machine, operate the steering levers (1).



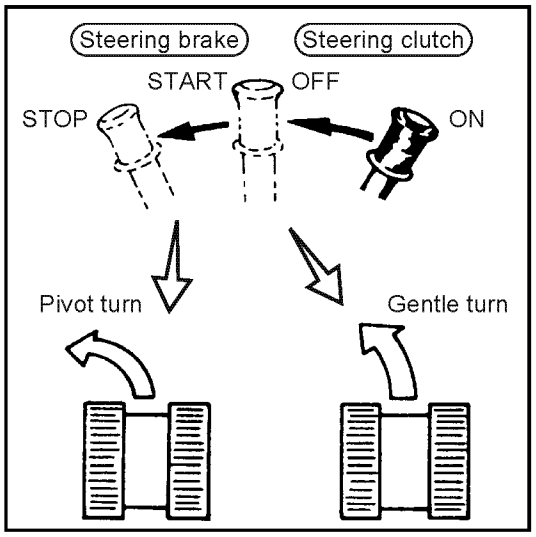
IMPORTANT

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

Operate the two steering levers (1) as follows:

■ Pivot-turning the machine

To pivot-turn left, pull the left steering lever to its stroke end.



Note :

To turn right, operate the right steering lever in the same manner as above.

■ Turning the machine gently

To gently turn left, pull the left steering lever to the OFF position of the steering clutch.

Note :

To turn right, operate the right steering lever in the same manner as above.

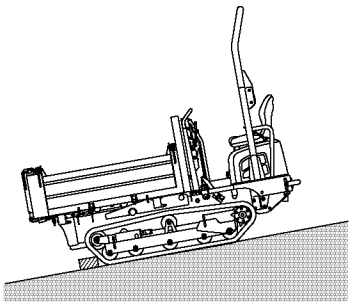
13-6. Stopping the machine

⚠ CAUTION

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

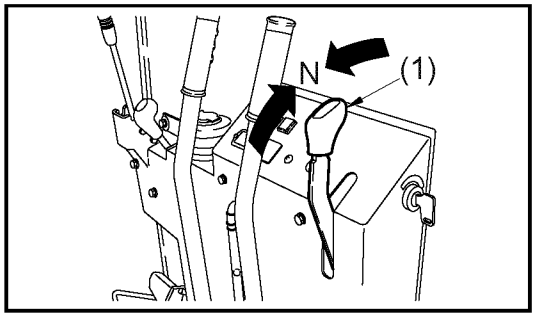
⚠ WARNING

- **Park on solid, level ground.**
- **Do not park on a slope. If parking on a slope is unavoidable, place the brake lock lever in the lock position to apply the parking brake and place solid blocks of wood behind the crawlers.**

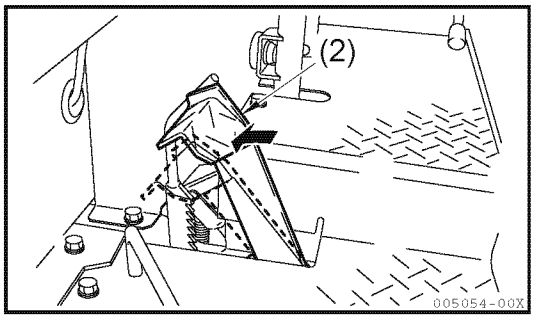


⚠ WARNING

When leaving the operator's seat, always lower the wagon fully, lock the dump lever with the dump lever stopper, and place the brake lock lever in the lock position to apply the parking brake securely. Keep in mind that if the brake lock lever should not be placed in the lock position, the machine may move abruptly and a serious accident could occur.

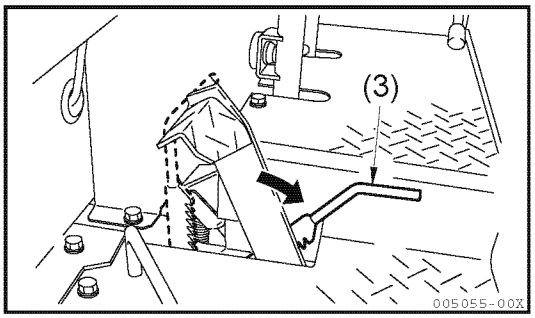


1) Return the travel pedal to the neutral position.



2) Return the F/R lever (1) to the neutral position.

3) Press down on the brake pedal (2) fully, and the machine will stop traveling.



4) Press down on the brake pedal (2) and place the brake lock lever (3) in 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.**

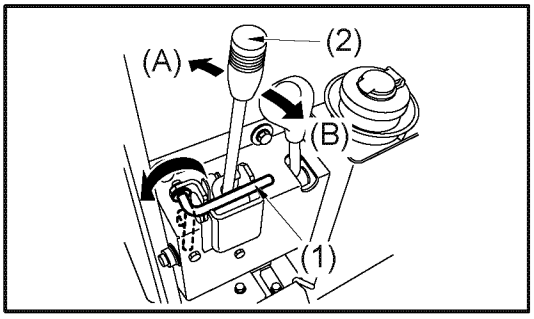
⚠ CAUTION

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) Place the dump lever stopper (1) in the unlock position before dump operation.

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

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

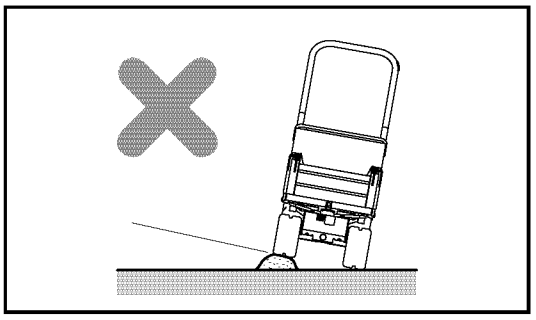


IMPORTANT

When lowered in a loaded state, the wagon may suddenly fall down due to the weight of the load. Operate the dump lever slowly.

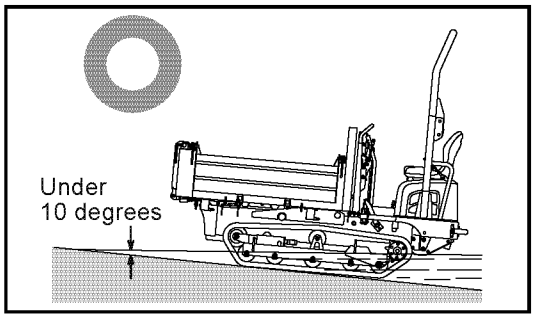
13-8. Precautions for working

■ Precautions for traveling



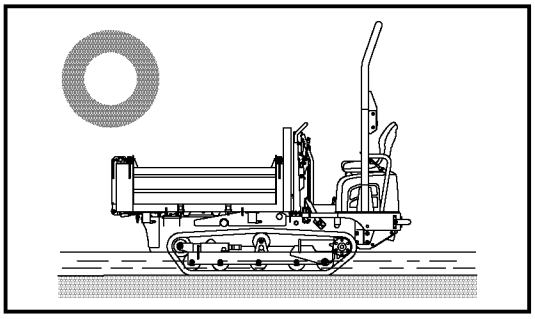
Driving over a stone or a stump subjects the machine (especially undercarriage) to a shock, which may cause damage to the machine.
Avoid such obstacles by driving around them, or removing them.
If driving over them is unavoidable, reduce speed, and drive over the obstacles with the center of the track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

■ Allowable water depth



IMPORTANT

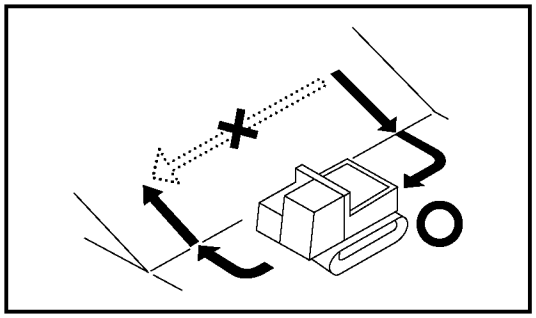
When driving out of water, if the machine goes up a slope at an angle of more than 10 degrees, the frame may submerge too deeply in the water, which may damage the radiator fan. Avoid this if possible when driving out of water.

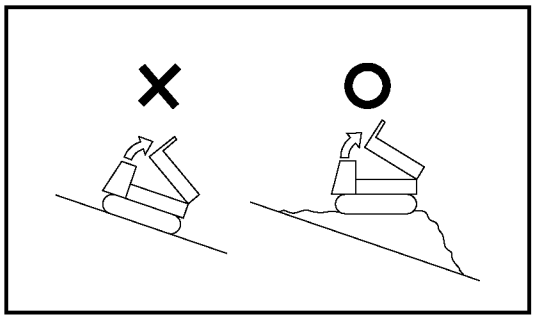


The maximum water depth in which the machine can be used is up to the top of the track frame.
Apply a generous amount of grease to the moving parts that have been submerged in the water for a long time until the used grease is extruded out of the bearings.
(Apply grease especially to the following parts.)

- Dump fulcrums
- Dump cylinder fulcrums
- Steering lever fulcrum
- Travel pedal fulcrum
- Brake pedal fulcrum

13-9. Precautions for going up and down a slope



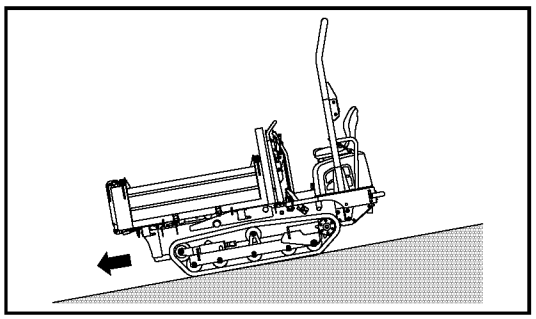


⚠ WARNING

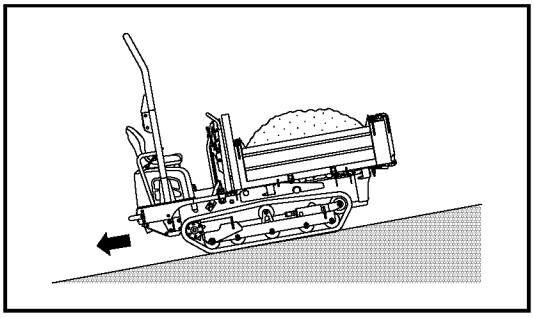
- **Run the machine at low speed on a slope of 9 to 10 degrees or more, with the travel speed select lever in the low speed position.**
- **When going down a slope, run the machine at low speed and adequately apply the engine brake by operating the travel pedal and the accelerator lever.**
- **When driving 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.**

■ Going up and down a slope

1) To go down a steep slope, place the accelerator lever in the idling position and depress the travel pedal in a smaller degree to run the machine at low speed.
   To go down a slope of 10 degrees or more, place the travel speed select lever in the low speed position to run the machine at low engine speed.



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

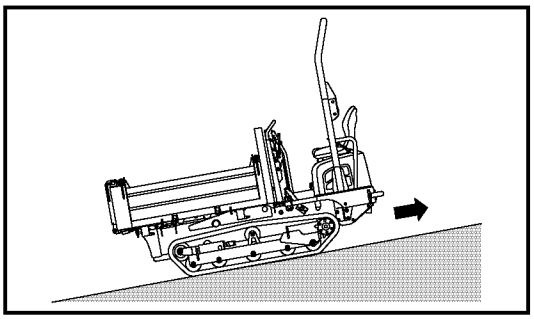
To brake the machine when going down a slope, return the travel pedal to the neutral position and depress the brake pedal.

■ When the crawler is slipping

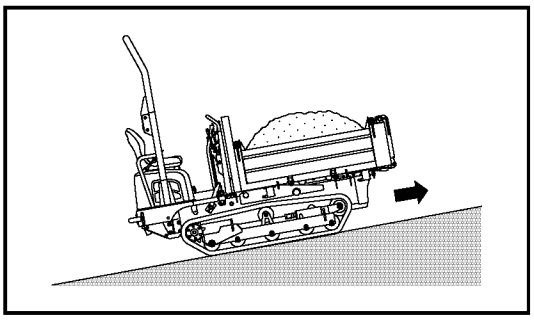
If the crawler is slipping while the machine is going up a slope, stop traveling, descend the slope and take the other route.

■ Going up a slope

1) When going up a steep slope, place the travel speed select lever in the low speed position and depress the travel pedal in a smaller degree and to run the machine at low speed.



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



■ When the engine stops

If the engine stops when the machine is going up a slope, return the travel pedal to the neutral position, press down on the brake pedal fully and place the brake lock lever in the lock position to prevent the machine from moving. Return the F/R lever to the neutral position, place the accelerator lever in the run position, and then restart the engine.

13-10. Removing wagon flaps

⚠ WARNING

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

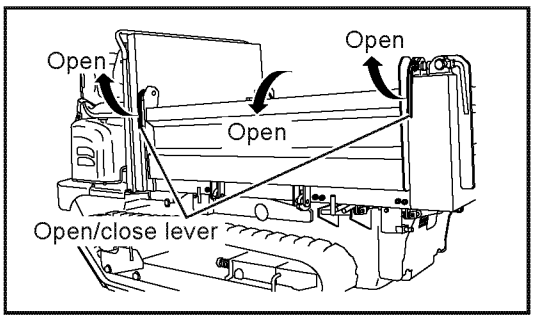
Place the machine on a solid, level ground when removing a flap. Any work performed by a team should be conducted surely in accordance with signals, taking much care about safety.

The wagon has the right, left and front flaps, which can be removed.

■ Removing the side flaps

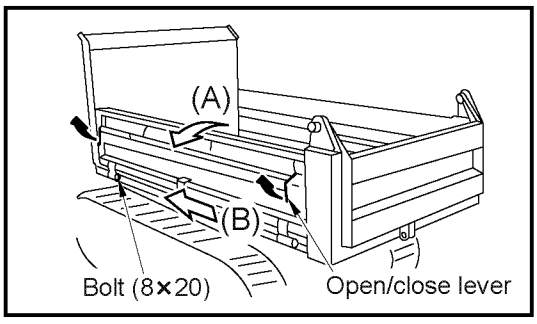
(For 3WD wagon type)
Mass of wagon flaps
Front flap: approx. 29 lbs. (13 kg)
Right and left flaps: approx. 46 lbs. (21 kg) each

1) Start the engine.
2) Raise the wagon slightly by moving the dump lever to just disengage the hook(s) on the bottom of the flap to be removed.
3) While holding the flap with one hand, open the open/close lever on one side of the flap and then the lever on the other side, and slowly remove the flap.



(For standard wagon type)

1) Remove the bolts (8×20) from the side flap of the wagon.
2) Move 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).

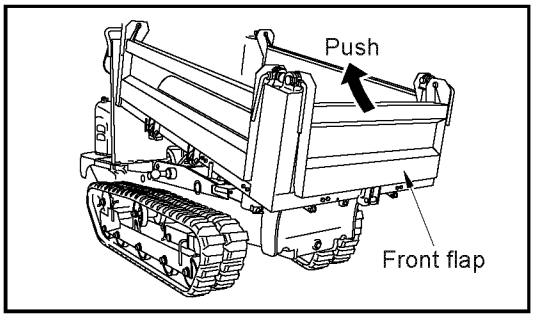


• Side flap mass : 46 lbs. (21 kg)

■ Removing the front flap

1) Start the engine.
2) Operate the dump lever to slightly dump the wagon and unhook the front flap.
3) Remove the front flap by pushing it forward while lifting it up.

• Front flap mass : 29 lbs. (13 kg)



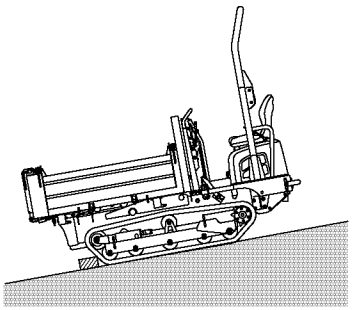
13-11. Parking the machine

⚠ CAUTION

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

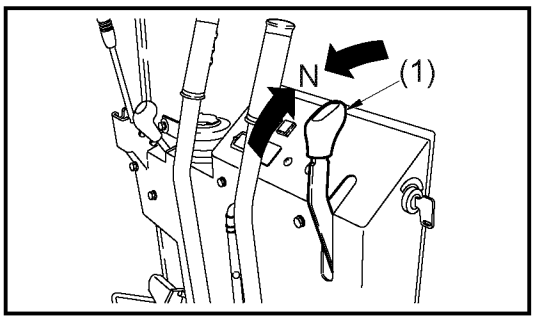
⚠ WARNING

- **Park on solid, level ground.**
- **Do not park on a slope. If parking on a slope is unavoidable, place the brake lock lever in the lock position to apply the parking brake and place solid blocks of wood behind the crawlers.**



⚠ WARNING

When leaving the operator's seat, always lower the wagon fully, lock the dump lever with the dump lever stopper, and place the brake lock lever in the lock position to apply the parking brake securely. Keep in mind that if the brake lock lever should not be placed in the lock position, the machine may move abruptly and a serious accident could occur.



1) Return the travel pedal to the neutral position.

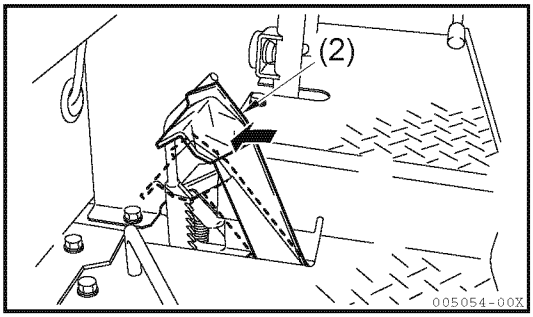
2) Return the F/R lever (1) to the neutral position.

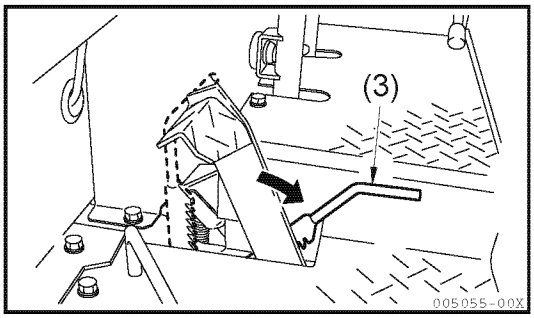
3) Lower the wagon completely.

4) Press down on the brake pedal (2) fully and move the brake lock lever (3) to the lock position to lock the brake pedal (2).

5) Lock the dump lever with the dump lever stopper.

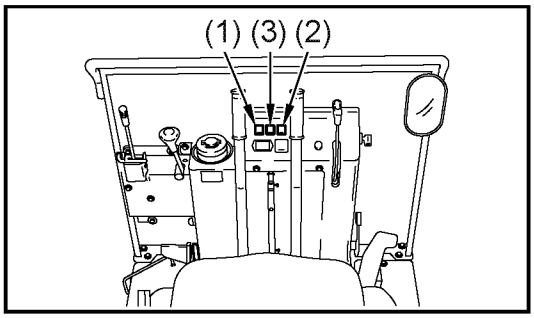
6) Place the accelerator lever in the idling position and turn the starter switch key to the "OFF" position to stop the engine.

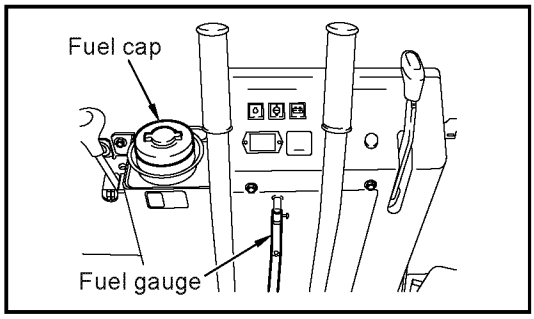




13-12. Inspection requirements after completing operation

Check the monitor for the engine oil pressure (1), the battery charge (2), and the water temperature (3), and also check the residual quantity of fuel with the fuel level gauge. Take any actions necessary.



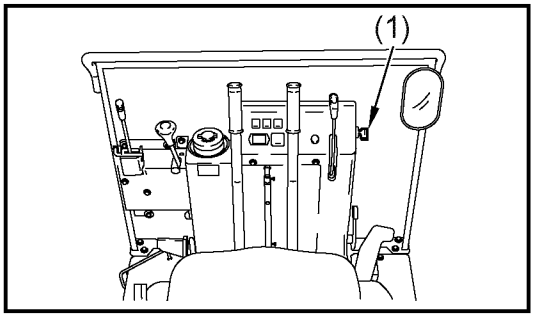


13-13. Stopping the engine

IMPORTANT

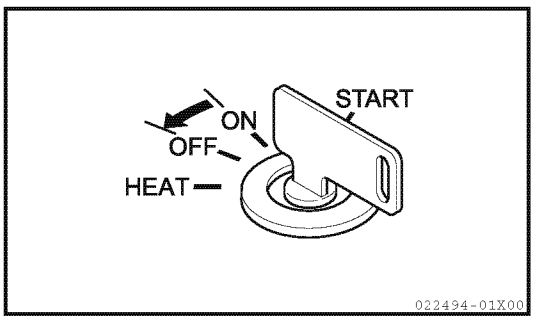
- **Stopping the engine after rotation at high speed may shorten the engine life. Do not stop the engine suddenly except in case of emergency.**
- **If the engine is overheated, do not stop the engine immediately. Gradually lower the engine temperature by rotating the engine at medium rotational speed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

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



2) To stop the engine, turn the starter switch key (1) to the "OFF" position.

3) Take the starter switch key out of the starter switch (1).



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.

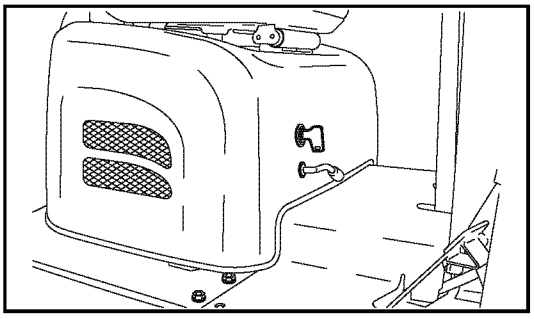
4) Remove mud adhering to the undercarriage of the machine.

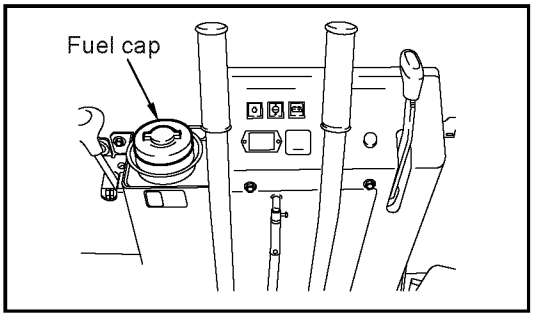
13-15. Locking

Make sure that you lock the following :

(1) Engine hood
(2) Fuel cap

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 accord 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 running or turning the machine will also shorten the life of the rubber crawlers.

- Prevent the rubber crawlers 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 where 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:

- 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 rubber chips from getting into the materials being handled.

- Do not allow the rubber crawler to rub against a concrete boundary, wall or the like.

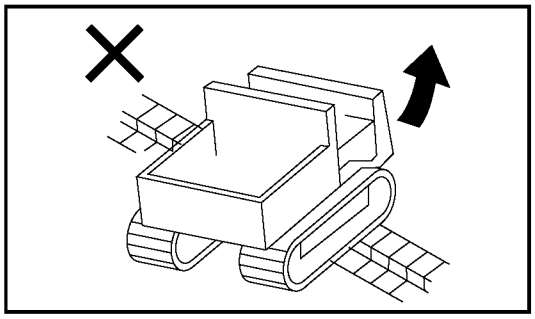
- The rubber crawlers are prone to skid on snow or on a frozen road. Be careful of skidding when traveling or operating on a slope in cold weather.

- Operating the machine in extremely cold weather will deteriorate the rubber crawlers, shortening their life.

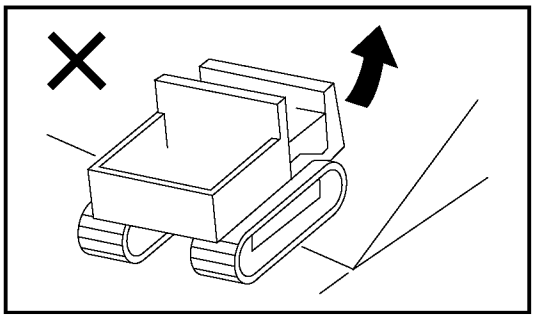
- Use the rubber crawlers between -13°F to +131°F (-25°C to +55°C) because of the physical characteristics of rubber.

• 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.)

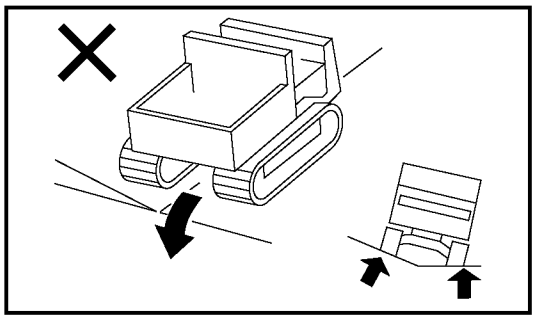
1) Do not steer the machine at an angle other than 90 degrees across a large level gap created by a curbstone or a rock [approximately more than 4 in. (10 cm)]. Run over a level gap at a right angle only to prevent the crawlers from coming off.



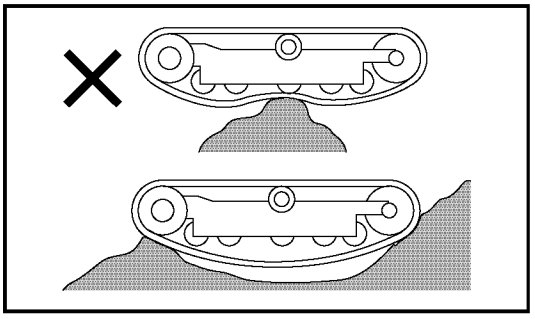
2) Do not steer the machine across a boundary between flat ground and a slope, while traveling in reverse.
If such travel is not avoidable, slow down the speed.



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.

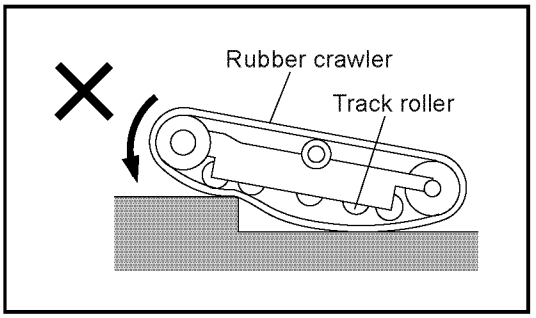


4) The three cases illustrated above are those which could cause the rubber crawlers to loosen. In addition, do not subject the machine to such ground conditions as are illustrated in the figure at the right.

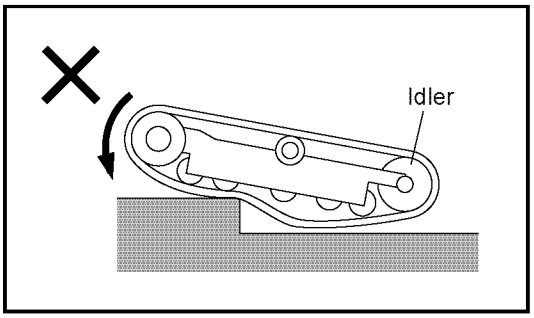


[How the rubber crawlers come off]

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.

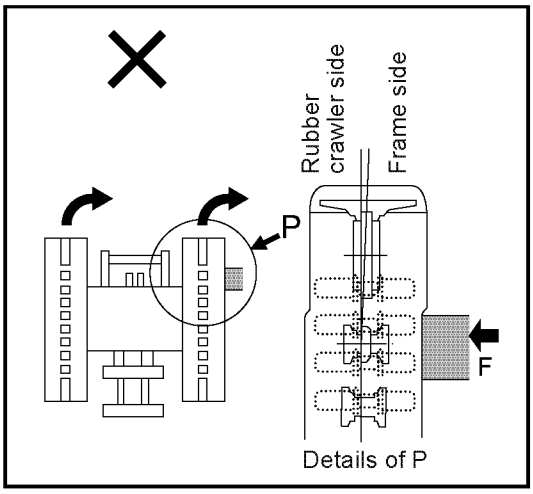


2) If the machine is traveling in reverse, clearance may also be created between the track rollers and the rubber crawlers, and between the idlers and the rubber crawlers, causing the rubber crawlers to come off.



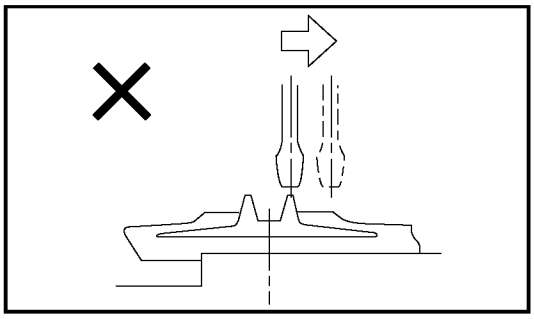
3) Other situations to be avoided.

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

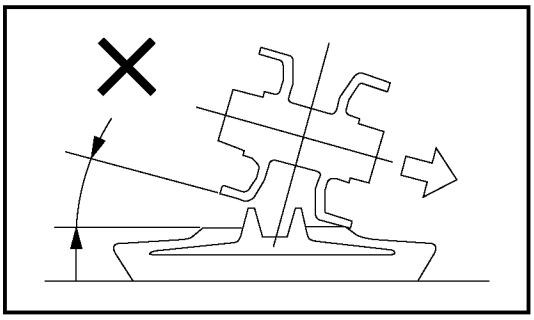


- When the idler and the track rollers are misaligned from the core metal, due to rubber crawler misalignment.

- 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 rubber crawlers

To check and service the rubber crawlers, refer to Sections "25-2. Nonperiodic services" and "25-3. Checking before start-up".

14. Transportation

14-1. Loading and unloading the machine

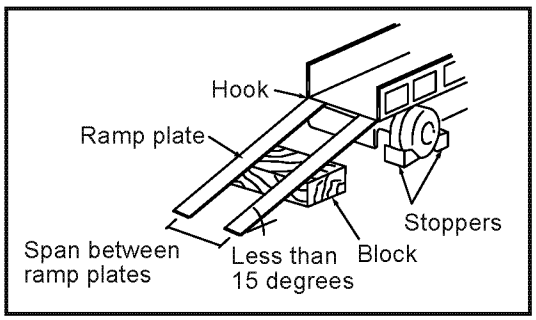
For safety in transporting the machine, comply with all applicable regulations and laws.

⚠ WARNING

- **Be careful when loading and unloading the machine, because it is a job of high hazard potential.**
- **Load or unload the machine on level, solid ground far away from the shoulder of the road.**
- **Load or unload the machine at a low engine speed.**
- **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.**
- **Securely hook the ramp plates to the deck of the truck 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.**
- **Turn slowly when on the truck bed, if it becomes necessary to do so, since the machine's position will be unstable.**

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

1) Firmly brake the truck and apply wheel stoppers to the tires. Securely install the ramp plates on the bed of the truck 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 lever to reduce engine speed.

3) Depress the travel pedal softly to move the machine at low speed.

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 rear first when the wagon is unloaded and the machine front first when the wagon is loaded.
   Do not operate any levers other than the travel and brake pedals while driving on the ramp plates.

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

14-2. Suspending the machine

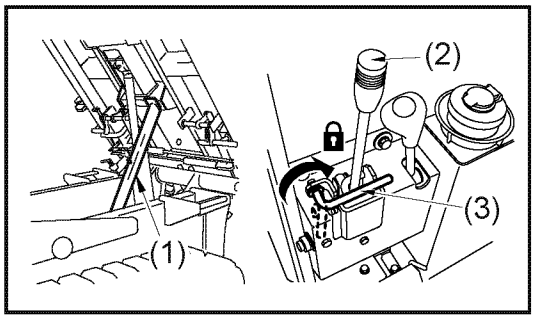
⚠ WARNING

- **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.

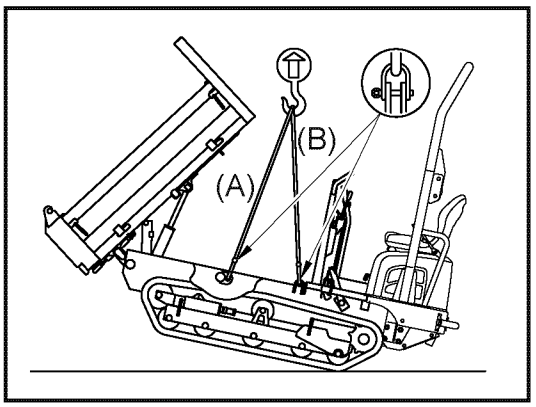
Suspend the machine on the level ground as follows:

1) Start the engine and dump the wagon. Install the wagon support (1) to hold the wagon securely and lock the dump lever (2) with the dump lever stopper (3).



2) Press down on the brake pedal and lock it with the brake lock lever. Stop the engine, and make sure that nothing is left around the operator's seat before leaving the machine.

3) Install the shackles to the three holes in the frame of the machine and securely fasten slingbelts (or wire ropes) to the shackles.



4) 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.*
  [A wire rope should be at least 0.47 in. (12 mm) in diameter.]
- *Length of slingbelts (wire ropes) :*
  (A) 68.5 in. (1.75 m), (B) 68.5 in. (1.75 m)

IMPORTANT

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

Shipping weight :2260 lbs. (1025 kg) (3WD wagon type)
2062 lbs. (935 kg) (Standard wagon type)

14-3. 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 truck, secure the machine as follows:

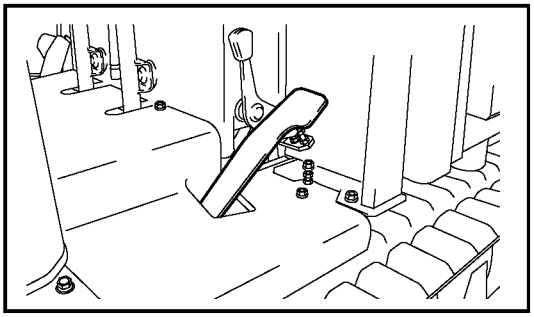
1) Place the travel pedal in the neutral position.

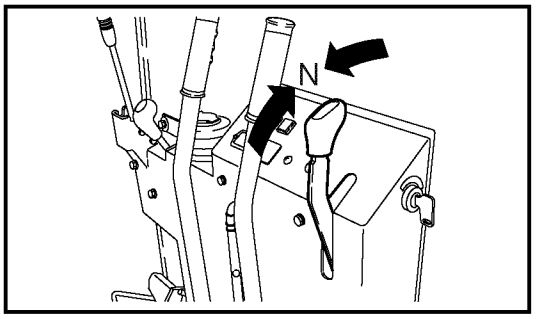
2) Place the F/R lever in the neutral position.

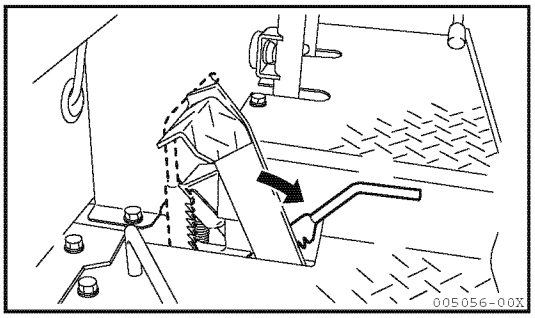
3) Press down on the brake pedal fully to lock it with the brake lock lever.

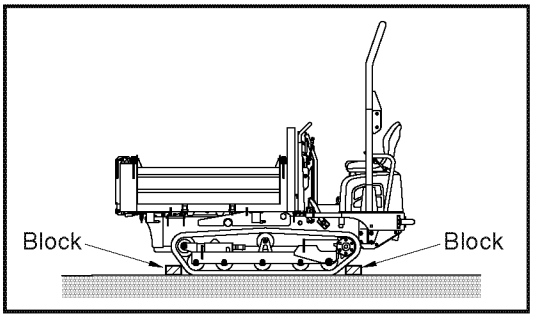
4) Stop the engine to take the starter switch key out of the starter switch.

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









14-4. 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.

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

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 "25-2. Nonperiodic services".

Note :

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

If the temperature falls below -31°F (-35°C), refer to Section "25-2. Nonperiodic services" to control the density of the cooling water.

15-1-3. 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 time.

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

15-3. After cold weather ends

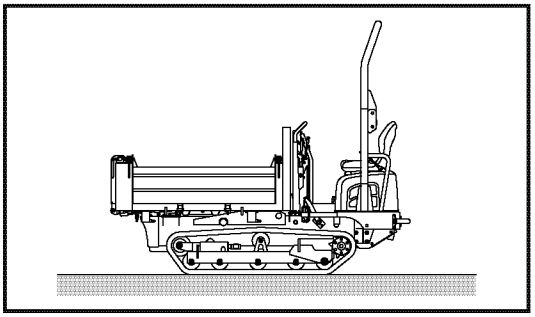
When the temperature rises, do the following:

- 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 cooling system with tap water.

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 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 "25-2. Nonperiodic services" to control the density of the cooling water.
- Lock the dump lever and the brake pedal with the dump lever stopper and the brake lock lever, 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 rods and cover the machine with a polyethylene sheet or oil paper.

Recommended antirust	Manufacturer
P-1300 (Solvent cutback rust preventive oil)	JXTG Nippon Oil & Energy Corporation
P-3 (Solvent cutback rust preventive oil)	
P-300 (Solvent cutback rust preventive oil)	Cosmo Oil

  Some antirust solvent damages rubber materials. Be sure to use the recommended antirust or it's 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 part.
- 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. Phenomena that do not constitute faults

The following phenomena do not constitute faults:

- Any of the wagon flaps does sometimes not close completely.
  Earth, grit or other objects may be jammed between the wagon and the flap.
  Remove them.

- When the machine makes a sharp turn on a concrete road or an asphalt road, hunting occurs.
  Turn the machine gently to prevent hunting.

- An abnormal sound sometimes comes from the H.S.T. when the machine starts or stops traveling.

- In some cases, the steering lever does not return to its original position.
  This is caused by the steering clutch being engaged. If the machine goes on traveling, the lever will return to its original position.

17-2. Precautions for operation in water

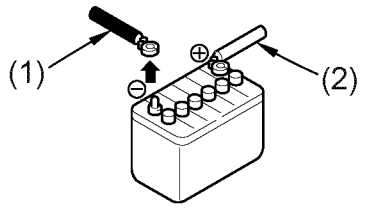
- After operating the machine in water, always grease all the fulcrum parts which were submerged in water.
  After greasing, dump and lower the wagon and move the machine back and forth several times. Then, grease the fulcrum parts again.

17-3. If the battery is overdischarged

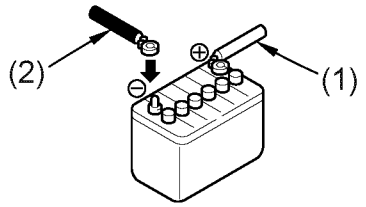
⚠ WARNING

- **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



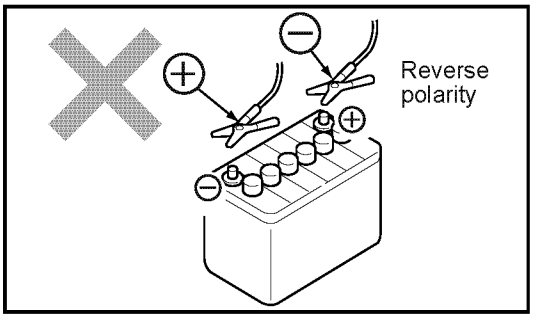
17-3-1. Starting the engine using booster cables

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 terminal.**
- **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 the 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.**
- **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:

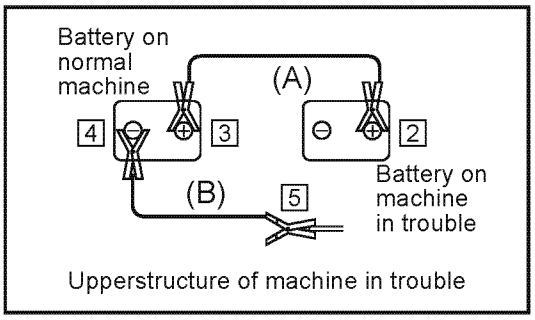
1) Turn the starter switches on both the normal machine and the machine in trouble to the "OFF" position.

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

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

4) Connect the clip of the booster cable (B) (normally black) to the negative terminal on the normal machine.

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



Upperstructure of machine in trouble

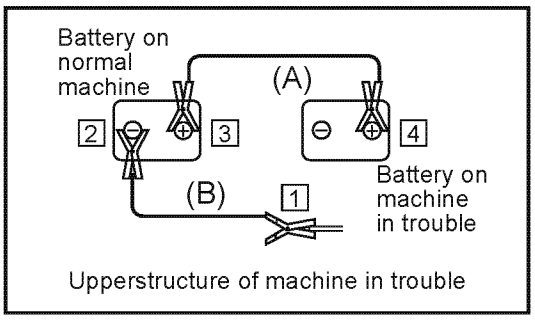
■ Starting the engine

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.
   If the engine does not start, wait for more than two minutes and retry starting. (At this point, do not stop the engine on the normal machine and keep engine speed at full.)

■ 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 (B) from the engine block on the machine in trouble.

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

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

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

17-4. Troubleshooting

- If you suspect a problem, immediately inspect the machine and solve the problem by referring to the list below.
- Contact your dealer for assistance, regarding the measures indicated in parentheses in the list below.
- If any abnormalities or troubles are encountered that are not included among those shown below, ask your dealer for assistance.

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.)
	Water temp. alarm lamp lights.	• Loose fan belt	• Adjust belt tension.
		• Buildup of dust and water scale on cooling system	• Replace cooling water. Clean inside of cooling system.
		• Defective thermostat	• Replace thermostat.
		• Clogged radiator fin or inclined fin	• Clean or repair fin.
		• Defective electrical system	• Check or replace electrical system.
	Turning on starter motor does not start engine.	• Shortage of fuel	• Refill fuel tank.
		• Air mixed in fuel system	• Repair air leak. Release air from fuel system.
		• Defective fuel injection pump or deteriorated nozzle performance	(• Replace pump or nozzle.)
		• Improper compression	(• Check and repair.)
		• Blown out slow-blow fuse	• Replace slow-blow fuse.
		• Damaged key stop solenoid. Link disengagement	(• Check and repair.)
	Dark exhaust comes out of machine.	• Clogged air cleaner element	• Clean or repair element.
		• Deteriorated nozzle performance	(• Check and repair.)
		• Improper compression	(• Check and repair.)
	Exhaust color is white or bluish white.	• Too much oil in oil pan	• Drain oil from oil pan to specified level.
		• Improper fuel	• Replace fuel with recommended one.
		• Worn cylinder or piston ring	(• Repair.)
Electrical equipment	Turning starter switch to "START" dose not start starter motor.	• Defective wiring system	• Check and repair wiring system.
		• Defective starter switch	• Replace starter switch.
		• Insufficiently charged battery	• Recharge battery.
		• Defective starter motor	(• Check and repair.)
	Maximum engine speed does not provide enough brightness of headlight (option).	• Defective wiring system	• Check terminals for looseness and disconnection. Repair terminal, if necessary.
		• Defective generator or regulator	(• Check and repair.)
	During engine operation, headlight (option) is extremely bright, and frequently burns out.	• Defective regulator	(• Replace regulator.) (• Repair.)
	Speed of starter motor is too low.	• Defective wiring system	• Check and repair wiring system.
		• Insufficiently charged battery	• Recharge battery.
		• Defective starter motor	(• Check and repair.)
	Electrolyte leaks from battery.	• Defective battery	(• Replace battery.)

Trouble		Cause	Measure
Electrical equipment	Electrolyte leaks.	• Defective generator or current limiter • Defective diode	(• Replace generator or regulator.) (• Repair.)
	Battery charge alarm lamp lights when engine is running at high speed.		
	Battery charge alarm lamp does not light when engine stops with starter switch in "ON" position.	• Lamp bulb burned out • Insufficiently charged battery • Defective current limiter • Defective wiring (Blowout of fuse)	• Replace lamp bulb. • Charge battery. • Replace regulator. • Check and repair wiring. (Replace fuse).
	Engine oil pressure alarm lamp lights when engine is running.	• Shortage of engine oil • Defective engine oil pressure switch	• Add oil to specified level. (• Replace switch.)
	Horn does not sound.	• Defective horn switch • Defective horn • Defective wiring (Blowout of fuse)	• Replace horn switch. • Replace horn. • Check and repair wiring. (Replace fuse).
Steering clutches and brakes	When right (or left) steering clutch is disengaged, machine does not turn to the right (or to the left).	• Improperly adjusted steering clutch • Improperly adjusted brake • Worn brake friction plates	• Adjust steering clutch. • Adjust steering brake. (• Replace worn plates.)
	Parking brake does not work well.	• Improperly adjusted brake • Worn brake friction plates	• Adjust brake. • Replace worn plates.
Transmission and transmission case	Abnormal sound comes from transmission.	• Shortage of lube oil • Worn or damaged gear teeth surfaces • Gear shifted due to broken fork spring • Wear or seizure of bearing	• Check and refill. (• Replace gear.) (• Check and replace defective part.) (• Replace bearing.)
	Oil leaks from transmission.	• To much lube oil • Loose bolt • Defective O-ring, oil seal or packing	• Check and discharge lube oil until specified level. • Retighten bolt. (• Replace defective part.)
	Machine does not travel or travel speed is slow.	• Shortage of hydraulic oil • Clogged filter • Improperly adjusted travel pedal link • Defective H.S.T. pump or motor	• Check and refill. • Clean or replace filter. • Check and adjust travel pedal link. (• Ask dealer for repair.)
	Machine does not travel.	• Broken drive belt	• Replace drive belt.
Under carriage	One side of each sprocket tooth is worn or rubber crawler comes off.	• Too loose crawler • Distorted crawler frame • Worn idler or track roller	• Adjust crawler tension to a value within specified range. (• Repair and reinforcement or replace.) (• Replace.)
	Oil leaks from idler, track roller or carrier roller	• Damaged seal • Damaged bearing • Broken drive belt	(• Replace part.) (• Replace part.) • Replace drive belt.

Trouble		Cause	Measure
Hydraulic system and Wagon	Wagon does not dump or dumps too slowly when moving dump lever to the dump position.	• Overload • Shortage of hydraulic oil in hydraulic system • Insufficient discharge volume of hydraulic pump • Air mixed from pump suction side • Too high viscosity of hydraulic oil (in extremely cold weather) • Clogged filter	• Reduce load. • Replenish hydraulic oil up to specified level. (Check for oil leakage.) (• Contact dealer for measuring oil quantity and oil pressure.) • Check and retighten piping and joint part. • Replace with oil of proper viscosity. • Check and clean or replace.
	Abnormal sound comes from pump.	• Clogged filter • Air mixed from pump suction side • Worn or damaged internal part of pump	• Check and clean or replace filter. • Check and retighten piping and joint part. (• Repair or replace.)
	Oil leaks from hydraulic pump.	• Loose connector • Detective seal (deteriorated) • Loose pump through bolt	• Retighten connector. (• Repair or replace.) • Retighten bolt.
	Front flap does not close.	• Bent fulcrum pin • Earth and grits, ready-mixed concrete, etc. attached to fulcrum pin area • Distorted hook or rod • Large play of wagon stay	• Repair fulcrum pin. • Clean fulcrum pin area. • Repair or replace hook or rod. • Adjust play.

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

If the machine is used at a rocky place, check the undercarriage for damage. Check for loose bolts and nuts, cracks, wear, and other damage. Loosen the tension of the crawlers more than usual.

Observe the precautions for cleaning the machine

- Do not spray steam directly at the connectors and on the electrical parts.
- 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, CD class
Transmission oil	Engine oil SAE 30, CD class
Hydraulic oil	YANMAR SUPER HYDRO OIL (ISO VG46)
Fuel	Diesel light oil
Engine cooling water	YANMAR genuine long-life coolant (LLC), 51% 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 (cock) 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 "25-2-3. 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 filters (cartridge types) 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.

19-3. Hydraulic system

- The hydraulic system is hot during and immediately after operation. It is also under high pressure during operation. Therefore, check and service the hydraulic system carefully as follows:
  - Park the machine on level ground. Dump the wagon and install the wagon support to hold the wagon securely.
  - Stop the engine and move the dump lever back and forth to relieve the pressure in the hydraulic cylinder circuit.
  - Wait until the temperature drops sufficiently before starting maintenance.
    Do not suddenly remove any plugs, screws or connecting parts of the hoses. Otherwise oil may spout out due to residual internal pressure even when the oil temperature has lowered. Be careful not to stand in front of any plugs, screws or connecting parts when loosening them, to prevent injury. Loosen them gradually, to relieve the internal pressure.
  - Always relieve the internal pressure before checking and servicing the hydraulic system.
- Check the hydraulic oil level, replace the filter element, and replace the hydraulic oil when necessary.
- After removing hydraulic hoses and piping, check the O-rings and the packing for damage before reinstalling them.
  Replace them if they are damaged.
- Bleed air after replacing or cleaning the hydraulic oil filter element or strainer, repairing or replacing the hydraulic equipment, or reinstalling the hydraulic cylinder or piping.

Bleed air according to the following procedure:

1) Set the engine speed to medium. That is, set the accelerator lever in the middle of the stroke.
2) Slowly operate the dump cylinder 4 to 5 times to approximately 4 in. (100 mm) before both stroke ends.
3) Operate the cylinder 4 to 5 times at full stroke.
   - Failure to bleed air from the hydraulic cylinder and operating it suddenly to the stroke ends could cause piston seal damage.
   - If air is left in the hydraulic circuit, it will compress and expand and the hydraulic equipment will not operate smoothly.
     Air in the hydraulic circuit may shorten the service life of the hydraulic pump.
4) Check the hydraulic oil level and replenish hydraulic oil to the specified level if necessary.

20. Consumables

Periodically replace consumable parts such as filter elements and an air cleaner element.
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 numbers and name in ( ) represent those of the part which must be replaced at the same time.

Item	Name	Q'ty	Replacing time interval
Engine oil filter	Oil filter cartridge	1	Every 200 service hours (At first 50 service hours)
Hydraulic oil return filter	Filter element	1	Every 500 service hours (At first 250 service hours)
Fuel filter	Fuel filter element (O-ring)	1 (1)	Every 400 service hours
Air cleaner	Cleaner element	1	Every 400 service hours
Filter for feed pump	Pre-filter	1	Every 400 service hours

21. Fueling, Oiling and Greasing Based on Temperature Range

21-1. Fuel and oil

Select fuel and oil based on to 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 below -31°F (-35°C).
If the temperature falls below -31°F (-35°C), refer to Section "25-2. Nonperiodic services" to control the density of the cooling water.

Part be refilled	Oil type	Recommendations with regard to temperature ranges °F (°C) -4 (-20) 14 (-10) 32 (0) 50 (10) 68 (20) 86 (30)	Prescribed amount of oil	Amount of oil to be changed
Engine oil pan	Engine oil	SAE 10WCD SAE 10W-30CD SAE 15W-40CD	1.80 Qts. (1.7 L)	1.80 Qts. (1.7 L)
Transmission	Transmission oil	SAE 30 CD SAE 10W-30CD	4.5 Qts. (4.3 L)	4.5 Qts. (4.3 L)
Hydraulic oil system	Hydraulic oil	ISO VG46	4.36 Gals. (16.5 L)	3.70 Gals. (14.0 L)
Fuel tank	Light oil	No. 1-D or No. 2-D diesel fuel	3.83 Gals. (14.5 L)	–
Cooling system	Water	YANMAR genuine long-life coolant (LLC), 51% added water	Radiator 1.69 Qts. (1.6 L) Subtank 0.42 Qts. (0.4 L)	–

22. Standard Tightening Torque for Bolts and Nuts

22-1. Required tools

The following tools are required for servicing:

No.	Name	Part number	Q'ty
1	Screwdriver (replaceable head)	104200-92350	1
2	Filter wrench 64	172498-05100	1
3	Pressure nozzle	172122-05101	1
4	Wrench 8×10	28110-080100	1
5	Wrench 12×14	28110-120140	2
6	Wrench 17×19	28110-170190	1
7	Wrench 22×24	28110-220240	2
8	Wrench 27×30	28110-270300	1
9	Wrench 32×36	28110-320360	1
10	Hexagon socket screw key 4	28150-040000	1
11	Hexagon socket screw key 5	28150-050000	1
12	Hexagon socket screw key 8	28150-080000	1
13	Grease hose	933110-09701	1
14	Grease injector 800	933110-09802	1
15	Pliers 200	933171-00470	1

22-2. Torque table

Bolts or nuts in the metric system should be tightened at the torque described below unless specified otherwise.

Item		Thread size × pitch	Tightening torque ft•lbf (N•m)	Remarks
Hexagon bolt (7T) Nut	Coarse threads	M6 × 1	7.2 to 8.7 (9.8 to 11.8)	1) Apply 80% tightening torque when the bolt or nut is tightened to aluminum. 2) Apply 60% tightening torque for 4T bolt and lock nut. 3) Use fine threads for engine only.
		M8 × 1.25	16.7 to 20.9 (22.6 to 28.4)	
		M10 × 1.5	32.5 to 43.4 (44.1 to 58.8)	
		M12 × 1.75	58 to 72.4 (78.5 to 98.1)	
		M14 × 2	86.8 to 108.5 (117.7 to 147.1)	
		M16 × 2	123 to 151.9 (166.7 to 206.0)	
		M18 × 2.5	173.6 to 209.8 (235.4 to 284.4)	
		M20 × 2.5	238.7 to 296.6 (323.6 to 402.1)	
	Fine threads	M14 × 1.5	94 to 108.5 (127.5 to 147.1)	
		M16 × 1.5	155.5 to 177.2 (210.8 to 240.3)	
PT plug		1/8	7.2 (9.8)	
		1/4	14.5 (19.6)	
		3/8	21.7 (29.4)	
		1/2	43.4 (58.8)	
Pipe joint bolt		M8	9.4 to 12.3 (12.7 to 16.7)	
		M12	18.1 to 25.3 (24.5 to 34.3)	
		M14	28.9 to 36.1 (39.2 to 49.0)	
		M16	36.1 to 43.4 (49.0 to 58.8)	

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.

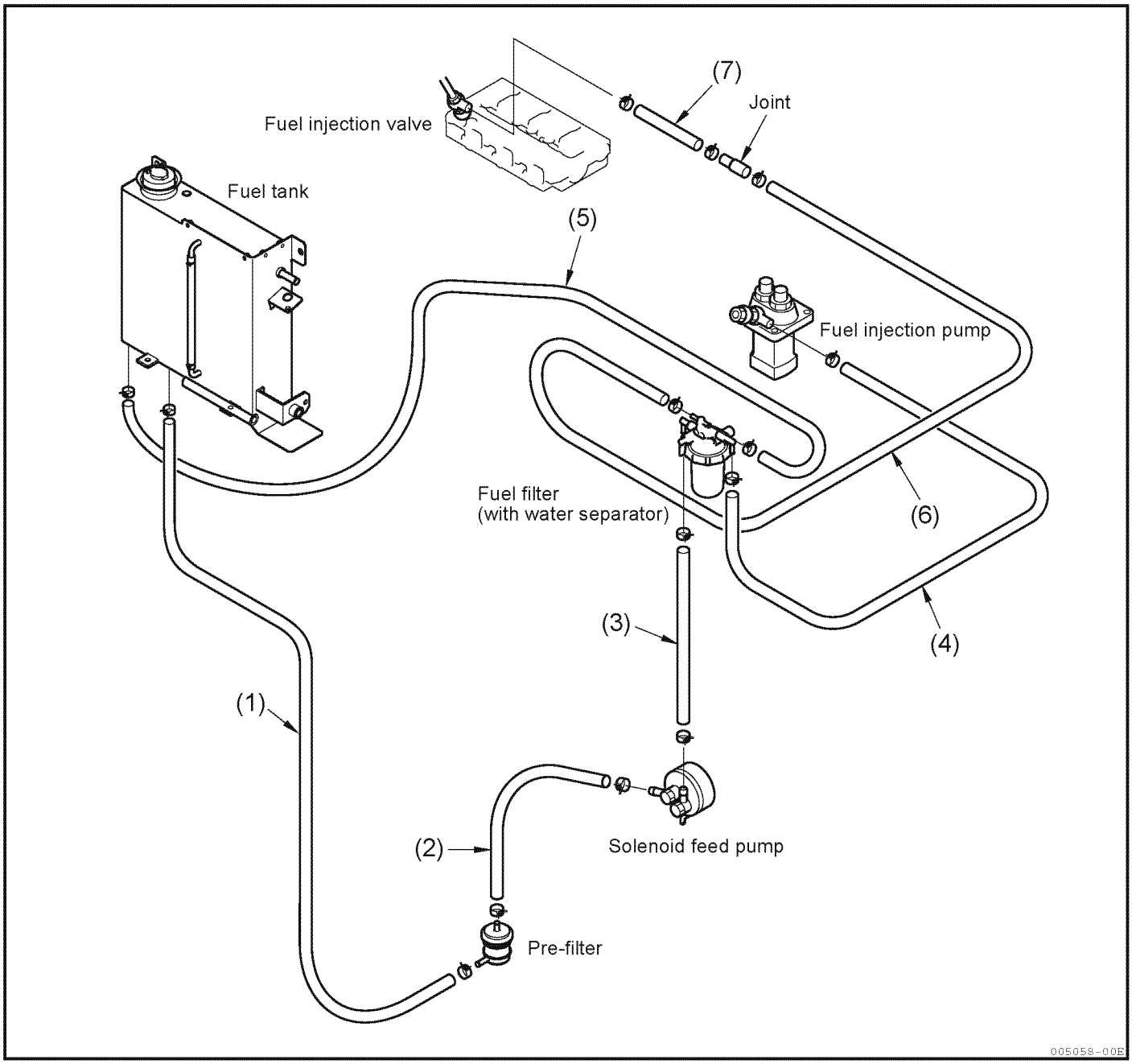
For further information about replacing the essential parts, ask your dealer.

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 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 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-filter)	1	Every 2 years or every 2000 service hours, whichever first occurs.
2	Fuel hose (pre-filter to feed pump)	1	
3	Fuel hose (feed pump to fuel filter)	1	
4	Fuel hose (fuel filter to fuel injection pump)	1	
5	Fuel hose (fuel filter to fuel tank)	1	
6	Fuel hose (fuel injection pump to fuel filter)	1	
7	Fuel hose (fuel injection valve to fuel injection valve)	2	
8	Fuel hose (fuel injection valve to fuel injection pump)	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
■ **At first 50 hours (only once after the new machine has started to be used)**	
Replacing the engine oil and the engine oil filter	3-21
Checking and replenishing the transmission oil	3-21
■ **At first 100 hours (only once after the new machine has started to be used)**	
Replacing the transmission oil	3-21
■ **At first 250 hours (only once after the new machine has started to be used)**	
Replacing the hydraulic oil return filter	3-21
■ **Nonperiodic services**	
Checking the rubber crawlers	3-22
Replacing the rubber crawler	3-24
Cleaning the inside of the cooling system	3-27
Checking and adjusting the steering clutches and brakes	3-31
Checking and adjusting the brake pedal	3-31
Checking and adjusting the travel pedal	3-32
Checking and adjusting the F/R lever	3-33
■ **Checking before start-up**	
Checking and adjusting the rubber crawler tension	3-34
Checking and replenishing the cooling water	3-35
Checking and replenishing the engine oil	3-36
Checking and replenishing the fuel in the fuel tank	3-37
Checking and replenishing the hydraulic oil in the hydraulic oil tank	3-38
Checking and adjusting the fan belt tension	3-39
Checking and replenishing the battery electrolyte	3-41
Greasing	3-42
Checking the electrical equipment	3-43
Checking the drive belt tension	3-44
Checking the steering clutches and brakes	3-44
Checking the brake pedal	3-44
Checking the travel pedal and the F/R lever	3-44

Check and service points	Page
■ **Every 50 hours**	
Draining the water and deposits from the fuel tank	3-45
Cleaning the fuel filter element (with water separator)	3-46
Checking and adjusting the drive belt tension	3-47
■ **Every 100 hours**	
(Perform the same maintenance as indicated for every 50 service hours)	3-48
■ **Every 200 hours**	
Replacing the engine oil and the engine oil filter	3-48
Checking and cleaning the air cleaner	3-50
Checking and cleaning the radiator fin	3-52
Adjusting the governor lever and accelerator device	3-53
■ **Every 250 hours**	
Checking and replenishing the transmission oil	3-54
■ **Every 400 hours**	
Replacing the fuel filter element	3-55
Replacing the pre-filter	3-57
Replacing the air cleaner element	3-58
■ **Every 500 hours**	
Replacing the hydraulic oil return filter	3-59
■ **Every 1000 hours**	
Replacing the transmission oil	3-60
Replacing the hydraulic oil and cleaning the suction filter	3-61
Checking and adjusting the intake/exhaust valve clearances	Ask your dealer
Checking and adjusting the fuel injection valve	Ask your dealer
Retighten the cylinder head bolts	Ask your dealer
Checking the generator and the starter motor	Ask your dealer
■ **Every 2000 hours**	
Checking and replacing the fuel piping and the cooling water piping	Ask your dealer
Lapping the intake/exhaust valves	Ask your dealer
Checking and adjusting the fuel pump	Ask your dealer

■ List of periodic inspection and servicing

◇ : 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 loose bolts & nuts, retighten		◇					
	Check engine condition		◇					
	Check drive belt tension			◇/□				
	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							□
	Replace return filter					● 1st time	●	
	Check for abnormality of hydraulic pump		◇					
Grease	Check grease-up positions, grease		■					
	*Greasing swing gears and swing bearings			■				
	*Greasing track gauge change cylinder and link fulcrum			■				
Undercarriage	Check, adjust crawler tension		◇					
	*Check air pressure, wear, flaw in tyres		◇					
Steering equipment	Check performance, play of steering levers		◇					
	Check performance, play of travel pedal		◇					
	*Check performance of speed change lever		◇					
	Check performance of forward/reverse lever		◇					
	*Check performance, play of steering wheel		◇					
	Brake pedal	Stroke	◇					
		Performance	◇					
	*Parking brake	Stroke	◇					
		Performance	◇					
	Check performance of accel. lever		◇					
Electric equipment	*Check head light, horn		◇					
	Check hourmeter function		◇					
	Check function of charge, oil and pilot lamps		◇					
	Check wire breakage, short-circuits, loose terminals, retighten		◇					
	Check, resupply battery electrolyte		◇					
	Check specific gravity of electrolyte						□As required	
	Check function of monitor		◇					

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

Check & service items		Daily	Every 50	Every 200	Every 400	Every 1000	Every 2000 hrs
Fuel	Check & supply fuel to the tank	◇					
	Drain fuel tank		□				
	Clean water separator		□				
	Replace fuel filter element, pre-filter				●		
Lube oil	Check quantity of engine oil	◇					
	Replace engine oil		● 1st time	●			
	Replace engine oil filter		● 1st time	●			
Cooling water	Check & supply cooling water	◇					
	Clean radiator fin			□			
	Check fan belt tension	◇/□					
	Replace the cooling water					●	
	Clean & check cooling water system					●within one year	
Rubber hose	Check & replace fuel pipe, cooling water pipe						●
Operation system	Check & adjust governor lever, accelerator	◇		□			
Intake system	Clean air cleaner & replace element			□	●		
	*Check turbocharger, adjust					□	
Cylinder head	Adjust intake and exhaust valve clearances					□	
	Lapp intake and exhaust valves						□
Fuel pump & injection valve	Check fuel injection valve nozzle, clean					□	
	Check & adjust fuel injection pressure & atomizing condition					□	
	Check fuel pump, adjust						□

*Applicable to models with the relevant equipment

Note :

1) When the machine is used at dusty worksites, clean and replace the filter elements 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 services

Service a new machine at 50, 100 and 250 hours, as follows.

25-1-1. At first 50 hours

- Replacing the engine oil and the engine oil filter.
  For these procedures, refer to Section "25-6. Maintenance every 200 service hours".
- Checking and replenishing the transmission oil.
  For this procedure, refer to Section “25-7. Maintenance every 250 service hours”.

25-1-2. At first 100 hours

- Replacing the transmission oil.
  For this procedure, refer to Section "25-10. Maintenance every 1000 service hours".

25-1-3. At first 250 hours

- Replacing the hydraulic oil return filter.
  For this procedure, refer to Section "25-9. Maintenance every 500 service hours".

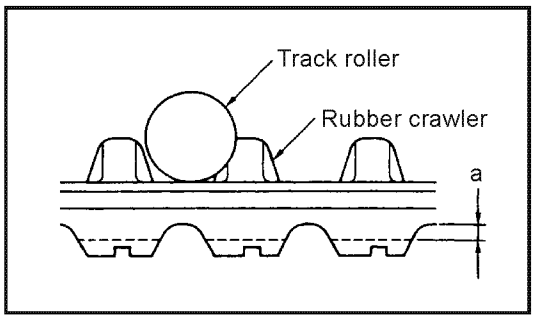
25-2. Nonperiodic services

25-2-1. Checking the rubber crawlers

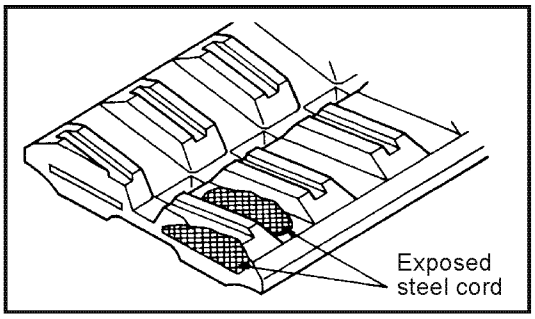
Rubber crawlers in the following condition require repair or replacement. Ask your dealer to repair or replace them.

■ 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.

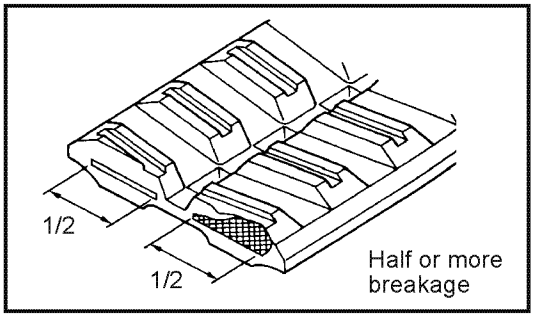


- If two or more links of the steel cord inside the crawler are exposed due to wear of the lugs, replace the crawler with a new one.



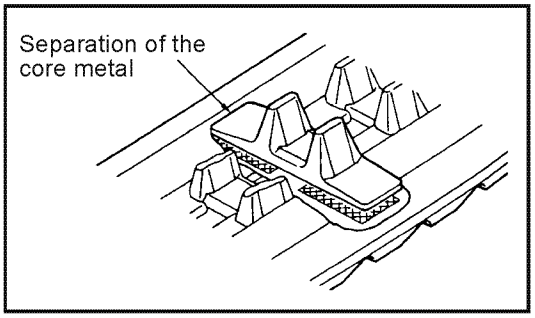
■ Rubber crawler steel cord breakage

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.

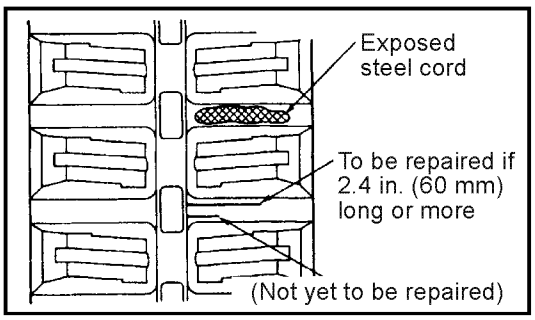


■ **Crack in the rubber crawler**

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.



25-2-2. 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.**
- **Be careful not to get injured, because the clearance between the rubber crawler and the wagon is small.**
- **If the tension of the rubber crawler cannot be loosened by the procedure described here, ask your dealer to repair the rubber crawler.**

■ **Removing the rubber crawler**

⚠ WARNING

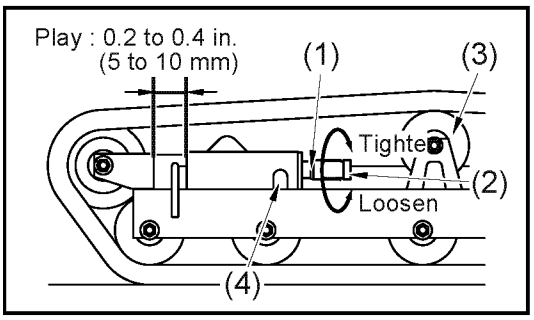
- **It is very dangerous to loosen the rubber crawler by any procedure other than that described below.**
- **If the tension of the rubber crawler cannot be loosened, ask your dealer to repair or replace the rubber crawler.**

⚠ CAUTION

- **Take great care in handling rubber crawlers, because they are very heavy.**
- **Be careful not to get injured, because the clearance between the rubber crawler and the wagon is small.**

■ Prepare a jack and some wooden blocks

1) Loosen the lock nut (1) and then the adjusting bolt (2), and press the idler (3) in.



2) With the idler (3) pressed in, if the distance shown in the figure at the right exceeds the specified range, mud may be caught in the idler fork. Remove the cover (4) and clean the idler fork to remove the mud.

3) 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 wooden blocks between the frame and the ground.

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

■ Installing the rubber crawler

• Prepare two crowbars.

1) Engage the rubber crawler with the sprocket.

2) Place the rubber crawler on the idler, and at the same time, install the core metal protrusion of the rubber crawler beyond the carrier roller.

3) Press the lower side of the rubber crawler toward the center of the machine, and place the core metal of the rubber crawler so that it is adjacent to the idler.

4) Insert a crowbar into the sprocket hole and touch the end of the crowbar to the side face of the idler (on the inner side of the machine). While pressing the crowbar toward the inside of the machine, insert another crowbar between the core metal of the rubber crawler and the idler. Then, pry and move the crowbar toward the idler gradually until the core metal protrusion covers the idler.

25-2-3. 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 cooling water according to the following table.

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

Park the machine on level ground to clean the inside of the cooling system 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.

Table of mixing ratio of anti-freeze to water

Lowest temperature	°F (°C)	23 (-5)	14 (-10)	5 (-15)	-4 (-20)	-13 (-25)	-22 (-30)	-31 (-35)	-40 (-40)
Amount of anti-freeze	Qts. (L)	0.32 (0.3)	0.53 (0.5)	0.63 (0.6)	0.74 (0.7)	0.85 (0.8)	0.95 (0.9)	1.06 (1.0)	1.16 (1.1)
Amount of water	Qts. (L)	1.80 (1.7)	1.59 (1.5)	1.48 (1.4)	1.37 (1.3)	1.27 (1.2)	1.16 (1.1)	1.06 (1.0)	0.95 (0.9)

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

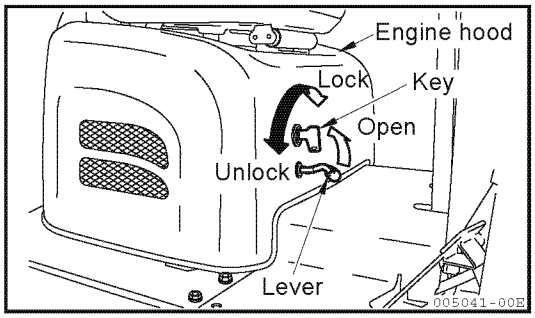
When removing the drain plug, take care that the anti-freeze does not contact your eyes or skin.

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

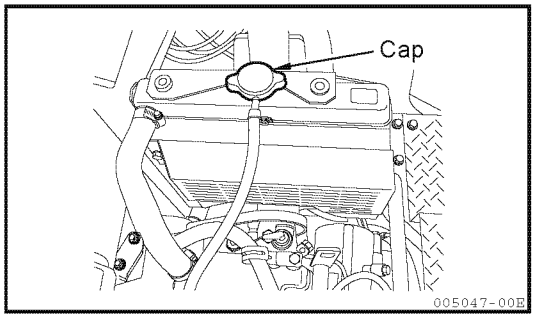
■ Things to prepare

• Container for cooling water...Capacity : 2.1 Qts. (2.0 L) or more

1) Open the engine hood.
Refer to Section "12-4. Engine hood".



2) Slowly remove the radiator cap, pour in a washing agent and mount the cap.



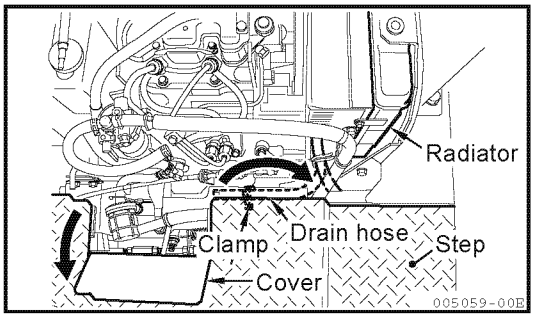
IMPORTANT

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

Follow the instructions of the manufacturer.

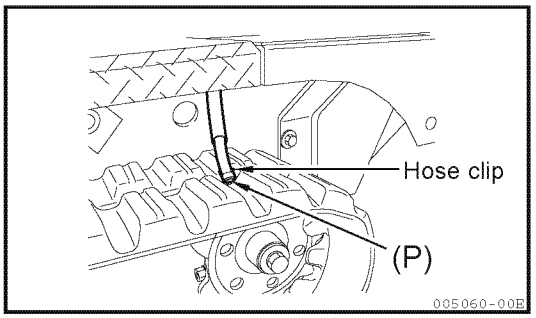
3) Start the engine until the water temperature rises to 176°F (80°C) or more and idle the engine for 10 to 15 minutes. Then stop the engine.

4) After the engine has cooled down, open the cover to remove the drain hose from the clamp and put it between the step and radiator.
Then, put the container to receive cooling water from the drain hose end.



5) Remove the hose clip and pin (P) from the drain hose to completely drain the cooling water in the radiator.

6) After the water is completely discharged, reinstall the pin (P) and pour tap water into the water supply port of the radiator.



7) When the cooling system is filled with water, remove the pin (P), idle the engine 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.
Hold the water supply hose securely while flushing with running water.

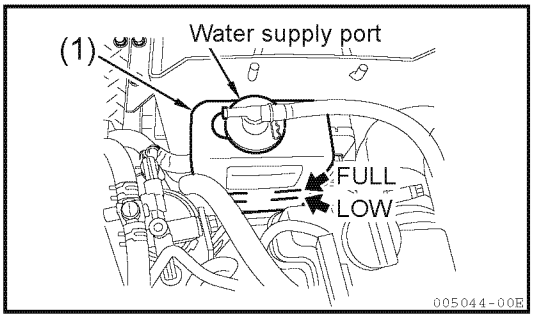
8) After flushing with running water, stop the engine, drain the cooling system completely and then install the pin (P) and hose clip.
   Place the drain hose in the original position and keep it in the place by the clamp.

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

10) To bleed air, idle the engine for 5 to 6 minutes and then run the engine without load at high speed for 5 to 6 minutes. (While running the engine, keep the radiator cap removed.)

11) Approximately 5 minutes after stopping the engine, pour water mixed with anti-freeze up to the water supply port of the radiator, and reinstall the radiator cap.

12) Drain the cooling water from the sub-tank (1), wash the inside of the sub-tank (1) and pour water mixed with anti-freeze up to the "FULL" level.

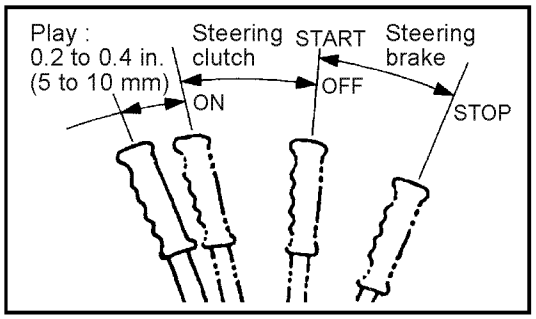


13) Close the cover.

14) Close the engine hood.
   Refer to Section "12-4. Engine hood".

25-2-4. Checking and adjusting the steering clutches and brakes

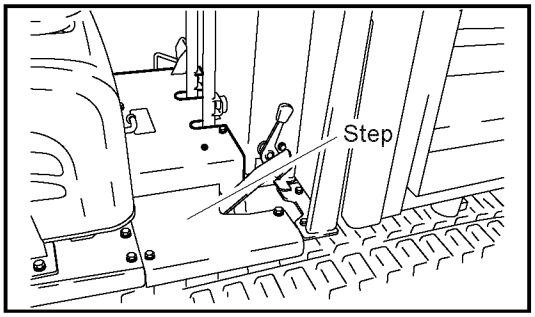
■ Checking the steering levers



1) Check each steering lever for play. If the play is between 0.2 in. (5 mm) and 0.4 in. (10 mm), it is proper.

2) Check that both the right and left steering levers have the same stroke length.

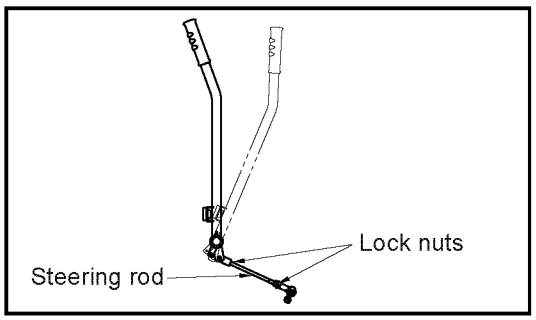
■ Adjusting the steering clutches



1) Remove the step.

2) Adjust the steering lever (1) with the steering rod so that the play of the lever will be between 0.2 in. (5 mm) and 0.4 in. (10 mm).

3) Check that both the right and left steering clutches disengage at the same time when both steering levers are operated together.



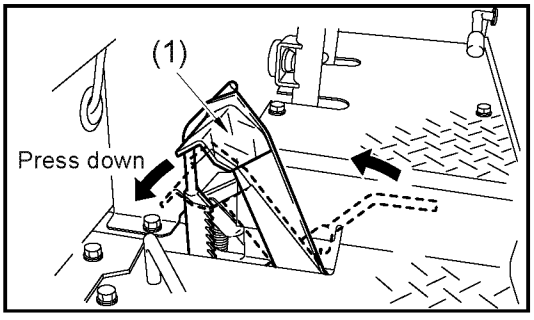
4) Be sure to tighten the lock nuts securely.

■ Adjusting the steering brakes

1) If the stroke length of one steering lever is not the same as that of the other one, adjust the steering lever having the shorter stroke with the steering rod so that the steering lever will have the same stroke length as the other steering lever.

2) If the stroke length of the steering lever exceeds 11.8 in. (300 mm), ask your dealer to check the lever and replace the brake friction plates and steel plates if necessary.

25-2-5. Checking and adjusting the brake pedal



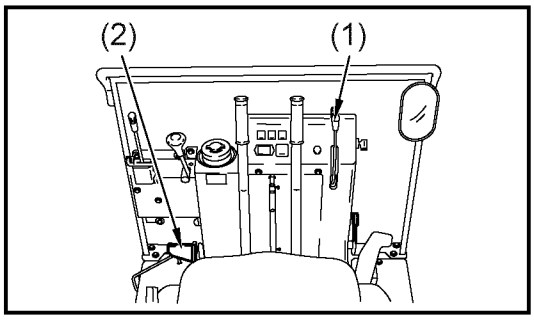
1) Depress the brake pedal (1) with your hand and check that the play of the pedal is no more than 3.5 in. (90 mm).

2) If the play exceeds 3.5 in. (90 mm), ask your dealer to check the brake pedal and replace the brake friction plates and steel plates if necessary.

25-2-6. Checking and adjusting the travel pedal

⚠ CAUTION

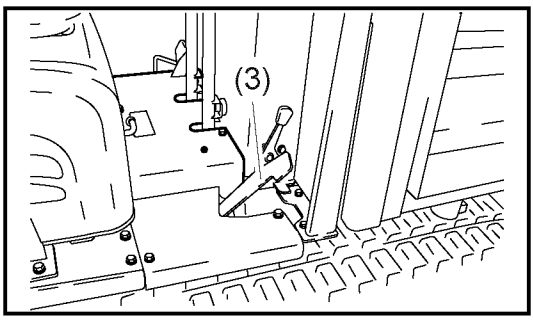
- **The F/R lever cannot be operated unless the travel pedal is in the neutral position.**
- **Always release and return the travel pedal fully to the neutral position before operating the F/R lever.**



■ Checking the travel pedal

Move the F/R lever (1) from the neutral position to the forward or reverse travel position, press down on the brake pedal (2) fully and then start the engine, before checking the following items:

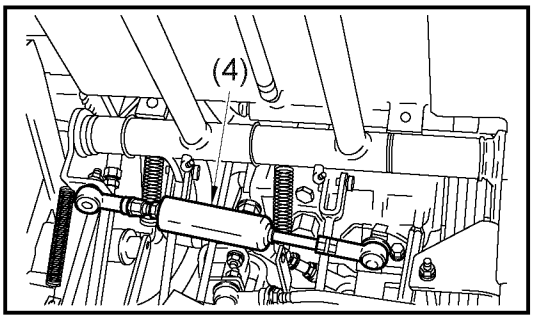
1) Take your foot off the brake pedal (2) and check that the machine does not move.



2) Press down on the travel pedal (3) slightly to move the machine at very low speed. Then, release the travel pedal (3). Check that the machine stops completely.

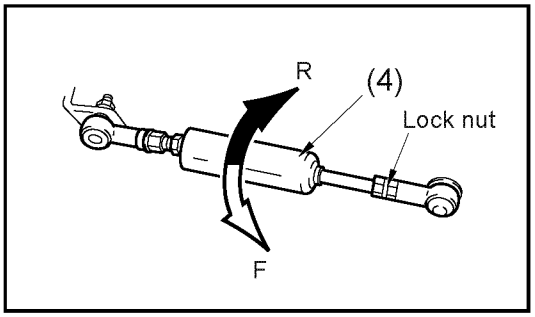
■ Adjusting the travel pedal

1) Remove the step.



2) Move the F/R lever (1) from the neutral position to the forward or reverse travel position, press down on the brake pedal (2) fully and then start the engine. Run the engine at medium speed.

3) Release the brake pedal (2). Loosen the lock nut and slowly turn the return spring (4) to the F side to find the point at which the machine starts moving.
   Next, slowly turn the return spring (4) to the R side to find the point at which the machine starts moving.
   When doing this, count the number of turns you give the return spring (4) from the F side to the R side. Then, give it half of the turns back to the F side.



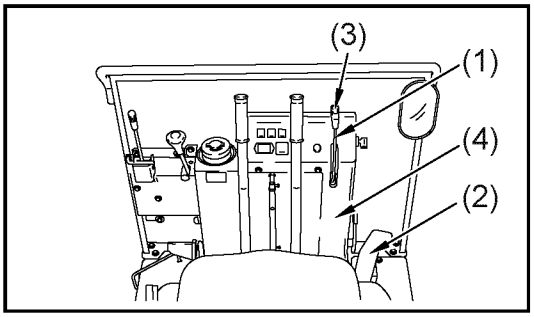
[Example]
If you give the return spring (4) three full turns from the F side to the R side, give it a turn and a half from the R side to the F side.

25-2-7. Checking and adjusting the F/R lever

⚠ CAUTION

- **The F/R lever cannot be operated unless the travel pedal is in the neutral position.**
- **Always release and return the travel pedal fully to the neutral position before operating the F/R lever.**

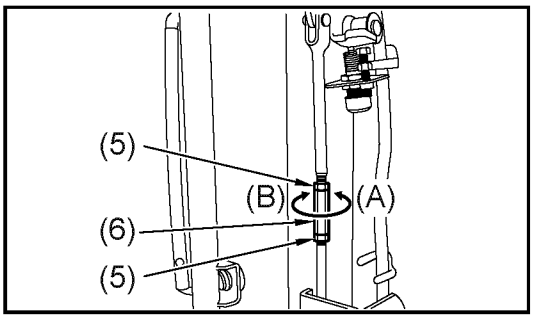
■ Checking the F/R lever



1) Move the F/R lever (1) to the forward and reverse travel positions each and press down on the travel pedal (2), to check that the machine moves to forward and reverse.

2) Place the F/R lever (1) in the neutral position and press down on the travel pedal (2) to check that the machine does not move.

■ Adjusting the F/R lever



1) Remove the knob (3) from the F/R lever (1) and remove the instrument panel (4).

2) Place the F/R lever (1) in the neutral position.
Loosen the lock nuts (5) and adjust the F/R lever by the turnbuckle (6) so that the machine does not move even if the travel pedal is pressed down

- If the machine moves to forward : Turn the turnbuckle to the (A) side.
- If the machine moves to reverse : Turn the turnbuckle to the (B) side.

3) Tighten the lock nuts (5).
Tightening torque :
M8 : 16.6 to 21.0 ft•lbf (22.6 to 28.4 N•m)

4) Install the instrument panel (4).

5) Install the knob (3).

25-3. Checking before start-up

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

25-3-1. Checking and adjusting the rubber crawler tension

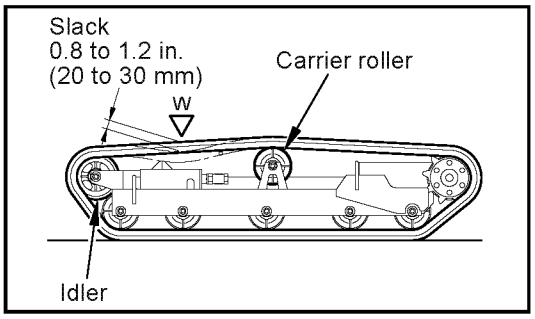
⚠ WARNING

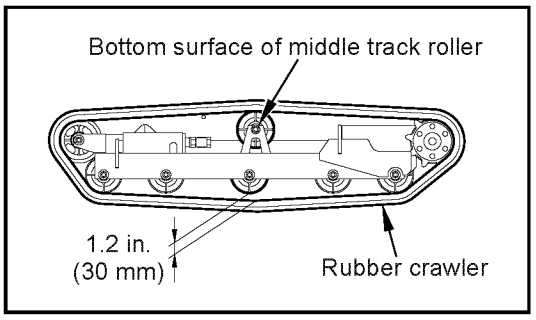
- **When raising the machine, support it with safety blocks of sufficient strength.**
- **When the machine is being checked or adjusted by two persons, one must operate the machine in response to signs from the other.**

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.

■ 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 weight of about 132 lbs. (60 kg) on the rubber crawler between the idler and the carrier roller and measure the slack. If it is between 0.8 in. (20 mm) and 1.2 in. (30 mm), the rubber crawler tension is proper.
3) Alternatively, jack up one rubber crawler from the ground and measure the clearance between the bottom surface of the middle track roller and the inside surface of the rubber crawler. If the clearance is about 1.2 in. (30 mm), the rubber crawler tension is proper.

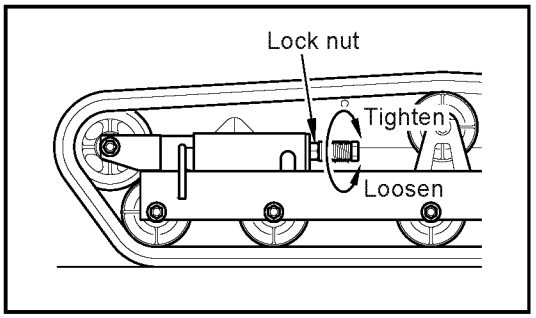




Working with the rubber crawler too loose will cause the rubber crawler to come off or the core metal to wear out earlier.

■ Adjusting the rubber crawler tension

1) Loosen the lock nut and turn the adjusting bolt to adjust the rubber crawler tension so that the slack is within the specified range.
   - To increase the rubber crawler tension, turn the adjusting bolt clockwise.
   - To reduce the rubber crawler tension, turn the adjusting bolt counterclockwise.
2) After adjustment, be sure to tighten the lock nut securely.

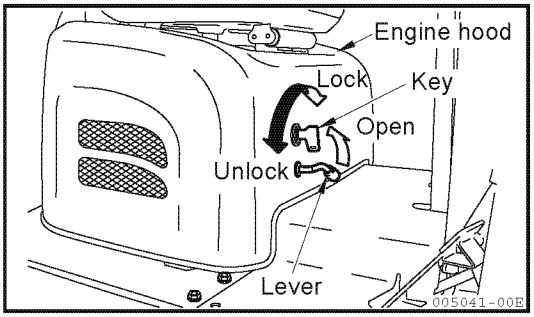


25-3-2. Checking and replenishing the cooling water

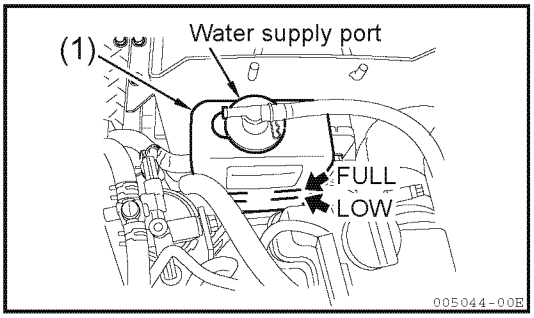
⚠ WARNING

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

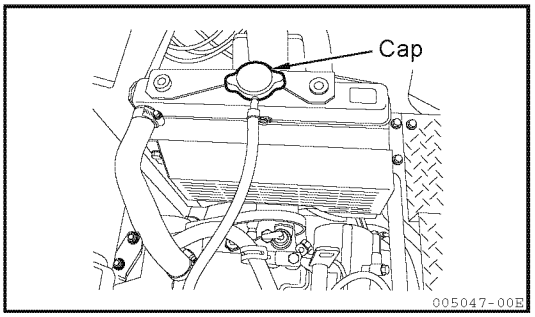
1) Open the engine hood.
   Refer to Section "12-4. Engine hood".



2) Check that the cooling water level is between the FULL and LOW marks on the sub-tank (1) (illustrated at the right). If the cooling water level is low, add cooling water up to the 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".



3) Securely close the cap after replenishing.



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

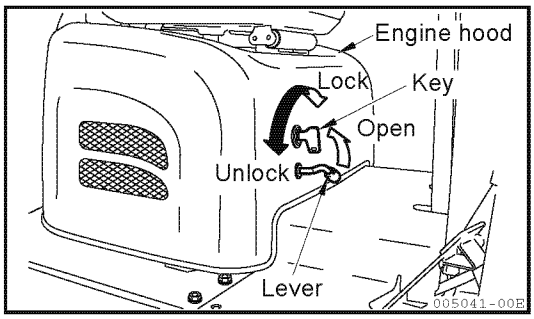
5) If the cooling water level is proper, close the engine hood.
   Refer to Section "12-4. Engine hood".

25-3-3. Checking and replenishing the engine oil

⚠ WARNING

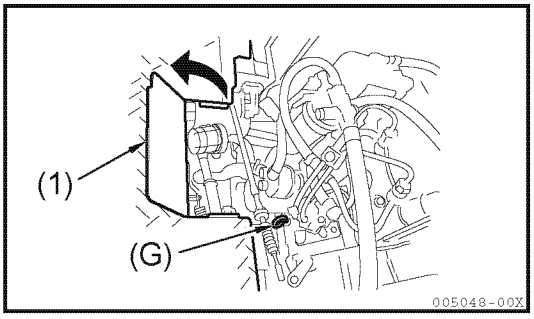
- **At operating temperature, the oil and dipstick areas are hot.**
  Do not allow hot oil or hot components to contact the skin, to prevent bodily injury.
- **Check the oil level and replenish oil after the engine has cooled down sufficiently.**

1) Open the engine hood and open the cover (1) of the step. Refer to Section "12-4. Engine hood" for the procedure for opening the engine hood.

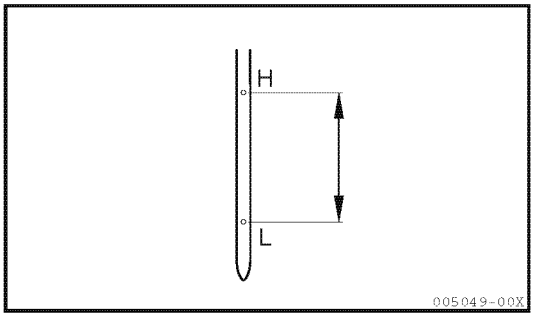


2) Pick up the dipstick (G) and wipe it with a rag to remove oil deposits.

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

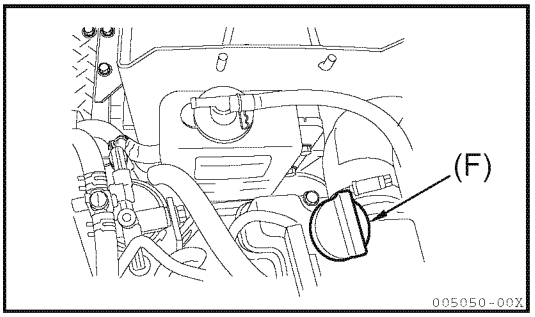


4) If the dipstick (G) is wet above the midpoint between the H and L marks, the engine oil level is appropriate. If the oil level is below the midpoint between the H and L marks, add engine oil through the oil supply port (F). For the quality of the engine oil to be used, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".



5) If the engine oil level is above the H mark, open the cover (2), then remove the excessive amount of oil through the drain plug (P), then recheck the engine oil level.

6) After verifying that the amount of engine oil is appropriate, securely retighten the oil supply port cap. Close the cover of the step and close the engine hood.
   Refer to Section "12-4. Engine hood".

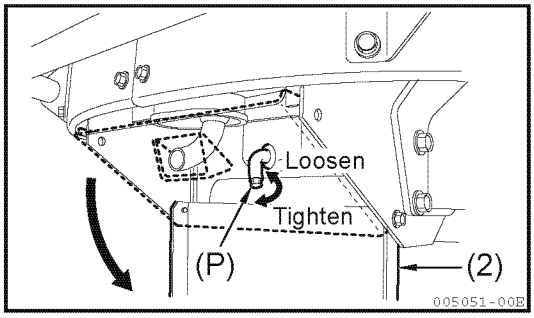


Note :

When checking the engine oil level after running 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.



25-3-4. 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.

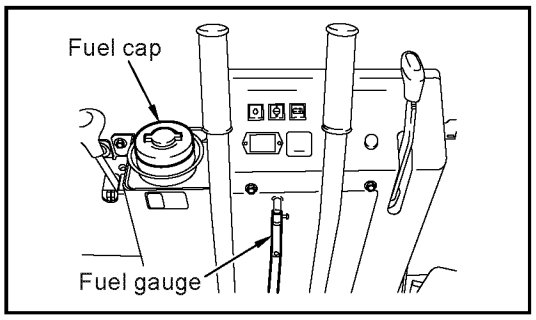
⚠ CAUTION

- **Do not remove the 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 level gauge on the fuel tank. If the fuel level is low, open the fuel cap and add fuel through the fuel supply port.

   Fuel tank capacity...3.83 Gals. (14.5 L)

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



2) After refueling, securely close the fuel cap.
   Refer to Section "12-7. Fuel cap" for the procedures for opening and closing the fuel cap.

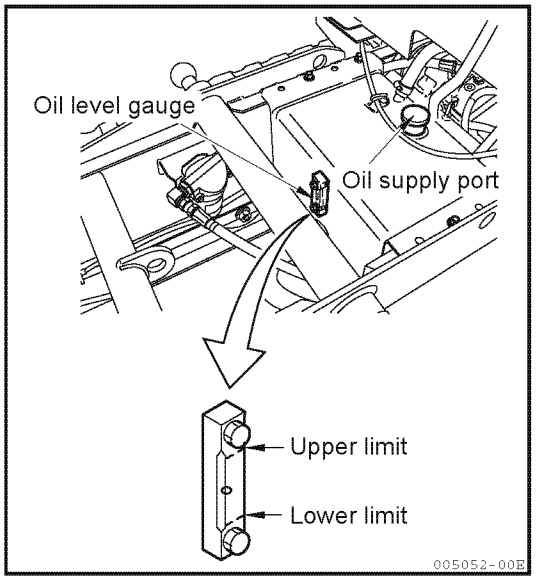
25-3-5. Checking and replenishing the hydraulic oil in the hydraulic oil tank

⚠ WARNING

- **Always install the wagon support to hold the wagon securely when inspecting or servicing the machine with the wagon in the dump position.**
- **When removing the plug of the oil supply port, slowly loosen it to gradually relieve the internal pressure in the tank, or oil may spurt from the tank.**

1) Park the machine on level ground. Dump the wagon, install the wagon support to hold the wagon securely and stop the engine. Then, move the dump lever back and forth to relieve the pressure in the hydraulic cylinder circuit and lock the dump lever with the dump lever stopper.

2) Check the hydraulic oil level with the oil level gauge. If the oil level is between the upper limit and lower limit marks on the gauge, it is proper.



3) If the hydraulic oil level is low, remove the oil supply port cap and add hydraulic oil until the oil level reaches the middle on the oil level gauge.

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

IMPORTANT

Do not replenish hydraulic oil above the midpoint between the upper limit and the lower limit marks on the oil level gauge with the wagon in the dump position. An excessive amount of hydraulic oil may damage the hydraulic system by placing stress on its components, causing a dangerous high-pressure leak.

Note :

Note that the oil level varies with the oil temperature.
When reading the oil level, follow these guidelines:

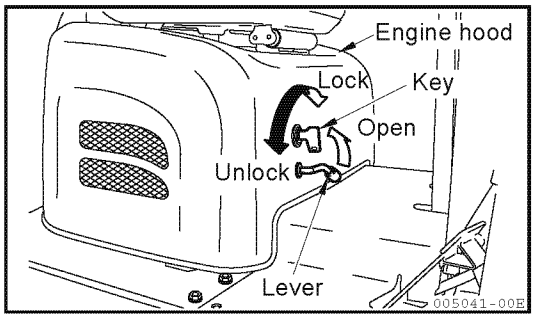
- *Before start-up, the oil level gauge should read at or near the midpoint of the gauge scale [oil temperature : 50 to 86°F (10 to 30°C)].*
- *During normal operation, the oil level gauge should read at or near the upper limit mark of the gauge scale [oil temperature : 122 to 176°F (50 to 80°C)].*

25-3-6. Checking and adjusting the fan belt tension

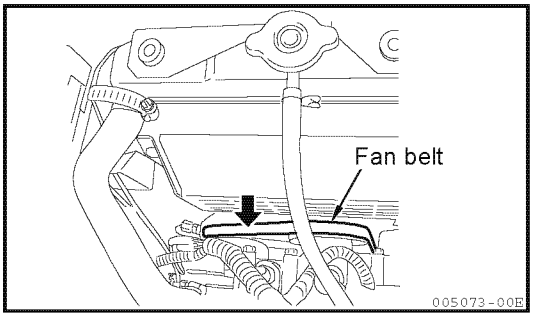
⚠ WARNING

- **Stop the engine, take out the starter switch key, and attach the "Do NOT operate" tag to the starter switch.**
- **The drive belt is hot immediately after the engine is stopped.**
  Do not adjust the drive belt tension immediately after stopping the engine.
- **Adjust the drive belt tension after all of the parts of the engine have cooled sufficiently.**

1) Open the engine hood.
   For the procedure for opening the engine hood, refer to Section "12-4. Engine hood".

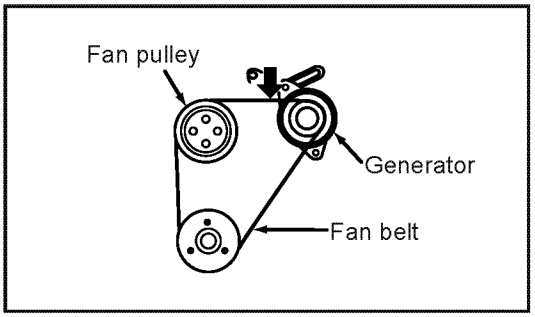


2) Press down on the fan belt between the fan pulley and the generator with a finger, to check the fan belt tension.
   Pressing force : Approximately 22.1 lbs. (10 kg)
   Correct slack : 0.4 to 0.6 in. (10 to 15 mm)



3) Adjust the tension if necessary.
   Refer to Section "25-3. Checking before start-up" for the adjustment procedure.

4) When the tension is proper, close the engine hood.
   Refer to Section "12-4. Engine hood".



IMPORTANT

Improper fan belt tension will shorten the life of the belt.

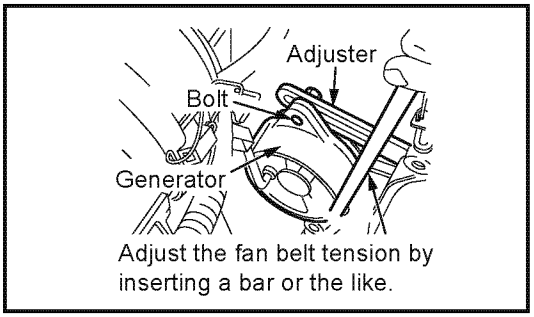
■ Adjusting the fan belt tension

■ Things to prepare

• Wooden bar (e.g., the handle of a hammer)

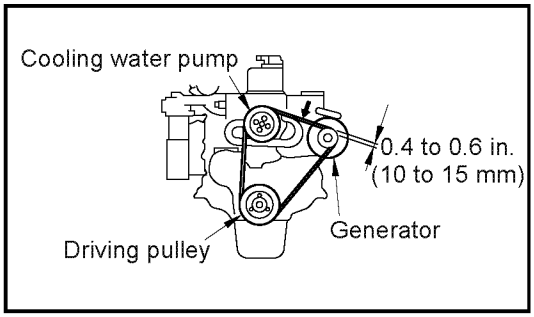
1) Loosen the generator mounting bolts.

2) Insert a wooden bar between the generator and the cylinder block, and move the generator to adjust the fan belt tension so that the belt will be depressed approximately 0.4 to 0.6 in. (10 to 15 mm) with a pressing force of 22.1 lbs. (10 kg).



Adjust the fan belt tension by inserting a bar or the like.

3) Retighten the mounting bolts to secure the generator.



4) 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.

5) 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.

[Fan belt size] (Inch)

	Size
Fan belt	HM27.5

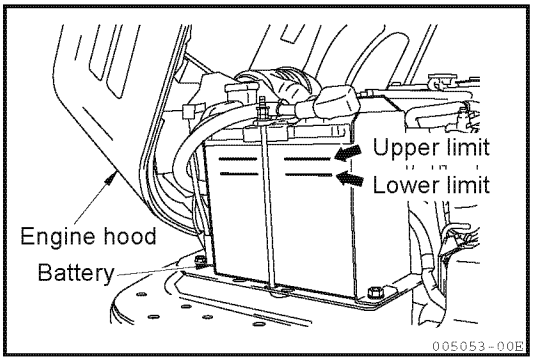
25-3-7. Checking and replenishing the battery electrolyte

⚠ 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.**

1) Open the engine hood.
   Refer to Section "12-4. Engine hood".

2) Check the battery electrolyte level with the battery electrolyte level gauge. If the battery electrolyte level is between the upper and lower limit marks, the battery electrolyte level is appropriate.



3) If the battery electrolyte level is below the lower limit mark, replenish the battery electrolyte.

4) Close the engine hood.
   Refer to Section "12-4. Engine hood".

25-3-8. Greasing

⚠ WARNING

Always install the wagon support to hold the wagon securely when inspecting or servicing the machine with the wagon in the dump position.

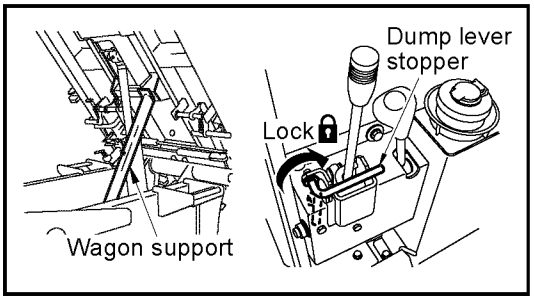
IMPORTANT

Grease the fittings thoroughly after washing the machine or after operation in rain, on soft ground, or in muddy water.

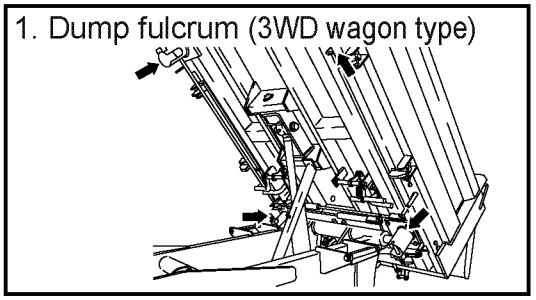
1) Park the machine on level ground. Dump the wagon, install the wagon support to hold the wagon securely and stop the engine. Then, move the dump lever back and forth to relieve the pressure in the hydraulic cylinder circuit and lock the dump lever with the dump lever stopper.

2) Clean the grease fittings indicated by arrows in the figures at the right and grease them with a grease gun.

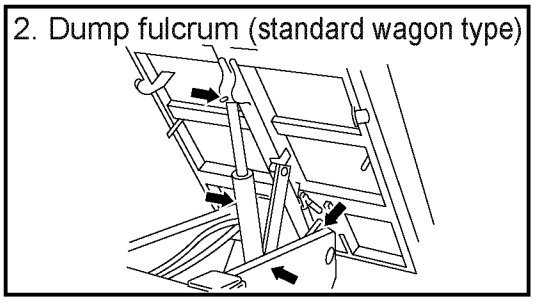
3) After greasing, wipe off any excess that remains.



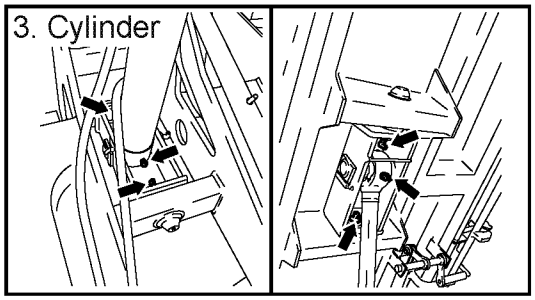
1. Dump fulcrum (3WD wagon type)



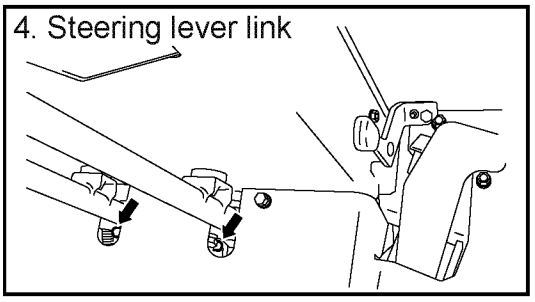
2. Dump fulcrum (standard wagon type)



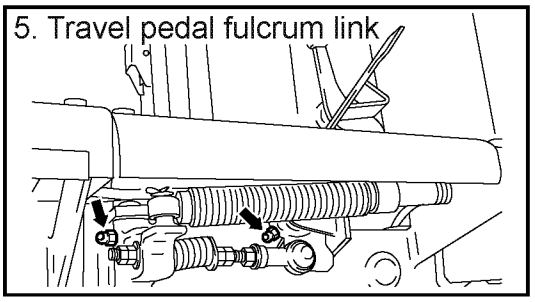
3. Cylinder



4. Steering lever link



5. Travel pedal fulcrum link



25-3-9. Checking the electrical equipment

⚠ CAUTION

If a fuse blows out frequently, contact your dealer for assistance.

Check fuses for damage, wiring for poor connections or short circuits, and battery terminals for corrosion or loose fits. Take corrective action.

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

1) Check the monitor functions
- Check the hourmeter function.
- Check the engine oil pressure alarm lamp and battery charge alarm lamp for lighting.

2) Check that the headlight (option) lights correctly.

3) Check that the horn functions correctly.

25-3-10. Checking the drive belt tension

Refer to Section “25-4-3. Checking and adjusting the drive belt tension”.

25-3-11. Checking the steering clutches and brakes

Refer to Section “25-2-4. Checking and adjusting the steering clutches and brakes”.

25-3-12. Checking the brake pedal

Refer to Section “25-2-5. Checking and adjusting the brake pedal”.

25-3-13. Checking the travel pedal and the F/R lever

Refer to Section “25-2-6. Checking and adjusting the travel pedal”.

25-4. Maintenance every 50 service hours

25-4-1. Draining the water and deposits from the fuel tank

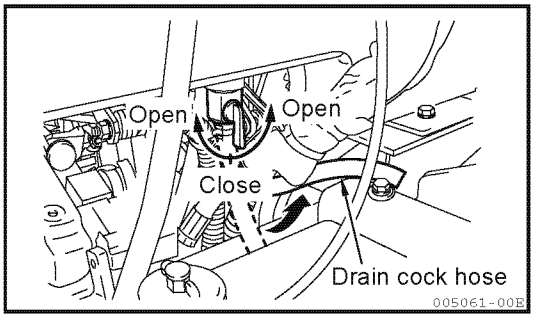
⚠ WARNING

- **Always install the wagon support to hold the wagon securely when inspecting or servicing the machine with the wagon in the dump position.**
- **Keep sparks, flames and lit cigarettes away.**
- **If any fuel is spilled when draining the fuel, it may cause a fire. Wipe up the spilled fuel completely.**

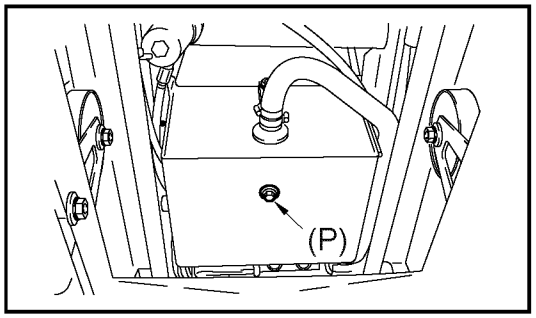
■ Thing to prepare

• Container for fuel waste

1) Park the machine on level ground. Dump the wagon, install the wagon support to hold the wagon securely and stop the engine. Then, move the dump lever back and forth to relieve the pressure in the hydraulic cylinder circuit and lock the dump lever with the dump lever stopper.



2) Draw out the drain cock (P) hose on the bottom of the fuel tank and place the container for fuel waste under the hose.



3) Open the drain cock (P) to discharge the water and dirt deposits in the fuel tank.
Take care that the fuel does not contact your body.

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

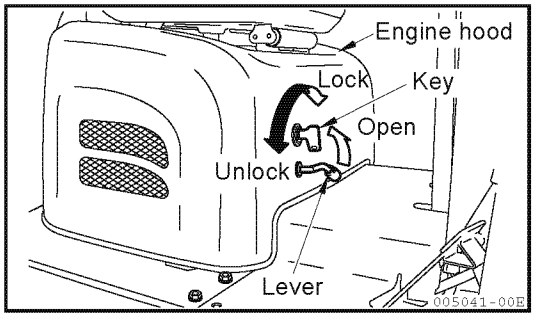
25-4-2. Cleaning the fuel filter element (with water separator)

⚠ WARNING

- **Keep sparks, flames and lit cigarettes away.**
- **At operating temperature, the engine components are hot.**
- **Disconnect the battery and clean the element after the engine has cooled sufficiently.**
- **Fuel leaked or spilled onto hot surfaces or electrical components could cause a fire.**

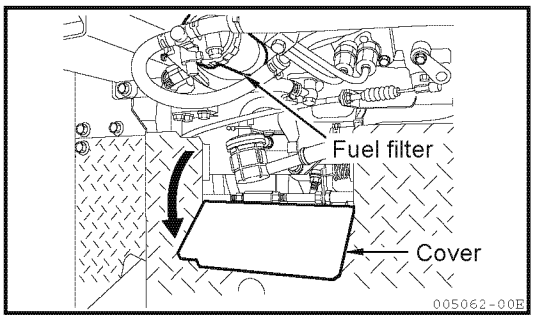
■ **Things to prepare**

- Cloth
- Filter wrench



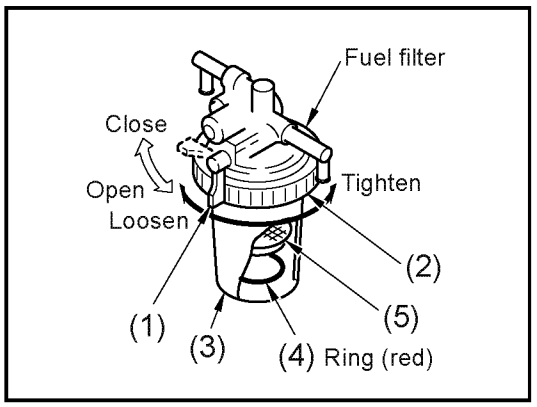
1) Open the engine hood.
   Refer to Section "12-4. Engine hood".

2) Place a cloth under the fuel filter.



3) After setting the fuel filter cock (1) to the closed position, loosen the retainer ring (2) to remove the cup (3) and drain the water from the cup.
   Do not lose the red ring (4) in the cup.

4) Remove the element (5) and clean it and the inside of the cup (3) using light oil or a washing agent.



5) Check the O-ring and if it is damaged or deformed, replace it with a new one.

6) Install the element (5) and the cup (3) and turn the cock (1) to the open position.

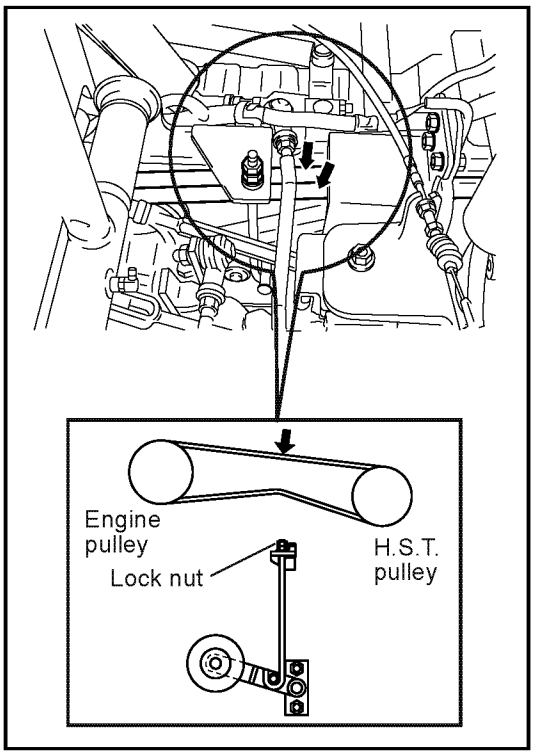
7) Remove the cloth, then release air.
   Refer to Section "25-8-1. Replacing the fuel filter element".

8) After releasing air, start the engine and check for fuel leak.
   If there is nothing wrong, stop the engine and close the engine hood.
   Refer to Section "12-4. Engine hood".

25-4-3. Checking and adjusting the drive belt tension

⚠ WARNING

- **Stop the engine, take out the starter switch key, and attach the "SERVICING IN PROGRESS" tag to the starter switch.**
- **The drive belt is hot immediately after the engine is stopped.**
  Do not adjust the drive belt tension immediately after stopping the engine.
- **Adjust the drive belt tension after all of the parts of the engine have cooled sufficiently.**



■ Checking the drive belt tension

1) Open the engine hood and remove the step.
   For the procedure for opening the engine hood, refer to Section "12-4. Engine hood".
2) Press down on the drive belt between the engine pulley and the H.S.T. pulley with a finger and check the drive belt tension.
   - Pressing force : 5.5 to 7.7 lbs. (2.5 to 3.5 kg)
   - Correct slack : 0.4 in. (10 mm)
3) If the tension is not proper, adjust it according to the procedure below.
4) If the tension is proper, install the step and close the engine hood.
   For the procedure for closing the engine hood, refer to Section "12-4. Engine hood".

■ Adjusting the drive belt tension

1) Loosen the lock nut.
2) Turn the adjusting nut for the tension rod clockwise to adjust the drive belt tension so that the drive belt will be depressed 0.4 in. (10 mm) with a pressing force of 5.5 to 7.7 lbs. (2.5 to 3.5 kg).
3) Be sure to tighten the lock nut securely.

IMPORTANT

If the drive belt cannot be adjusted properly because of lost elasticity or any other damage, it needs to be replaced. Ask your dealer to replace the drive belt with a new one.

- Drive belt size: SB53 (Red W800)

25-5. Maintenance every 100 service hours

Perform the same maintenance as indicated for every 50 service hours.

25-6. Maintenance every 200 service hours

Also perform the maintenance every 50 and 100 service hours.

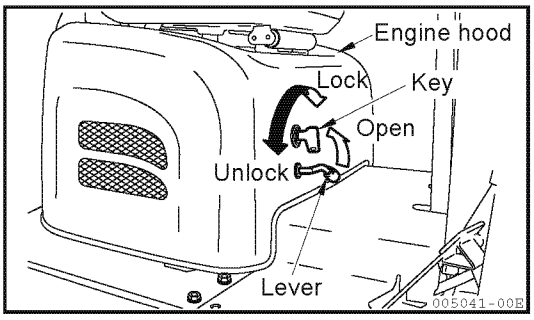
25-6-1. Replacing the engine oil and the engine oil filter

⚠ WARNING

- **Do not replace the oil immediately after the engine stops to prevent bodily injury, because all the components are hot.**
- **Do not allow hot oil or components to contact your skin.**
- **Replace the oil and the oil filter after the oil and the components have cooled sufficiently.**

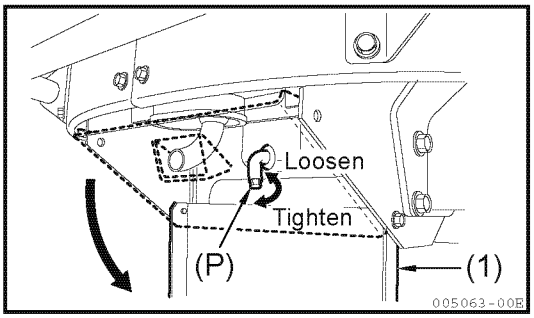
■ Things to prepare

- Replacement new oil : 1.8 Qts. (1.7 L)
- Container for waste oil : Capacity of 2.1 Qts. (2 L) or more
- Filter wrench for engine oil filter cartridge



1) Open the engine hood.
   Refer to Section "12-4. Engine hood".

2) Remove the step.



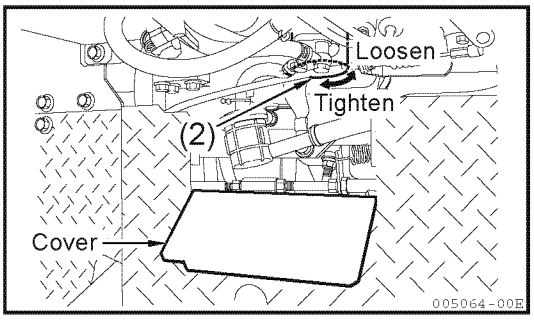
3) Put the container for waste oil under the drain plug on the bottom of the machine body.

4) Open the cover (1) and slowly remove the drain plug (P) so that the oil should not splash on you and drain the waste oil.

5) Check the waste oil, and contact your dealer if any metallic particles or foreign objects are mixed in it.

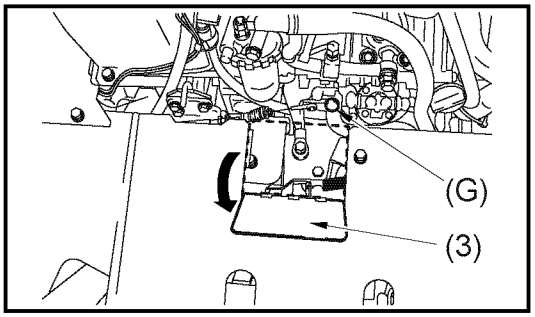
6) Reinstall the drain plug (P).

7) Turn the oil filter cartridge (2) counterclockwise with the filter wrench to remove it.
   After removing the oil filter, wait 10 to 15 minutes before replacing it.



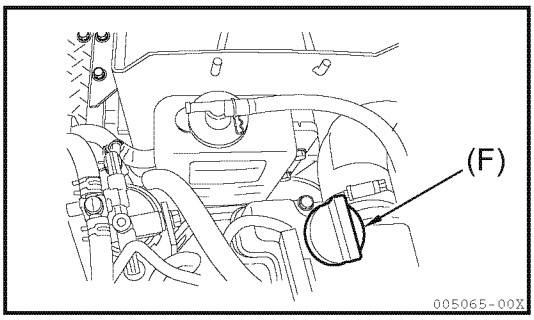
8) Wipe the dirt and oil from the filter mount and apply engine oil (or apply grease lightly) to the seal surface of a new oil filter cartridge.

9) When mounting the new filter (cartridge), turn it 2/3 of a turn after the seal surface has contacted the filter mount.



10) Reinstall the step.

11) Open the cover (3) of the step, and add engine oil up to the upper limit (H) mark on the oil dipstick through the oil supply port (F).
   Refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range" for the oil to be used.



12) Idle the engine for several minutes and then stop the engine. Then check that the oil level exceeds the midpoint between the upper and lower limit marks on the oil dipstick.
   Refer to Section "25-3. Checking before start-up".

13) Install and tighten the oil supply port cap securely.

14) Close the cover (3) of the step, and close the engine hood.
   Refer to Section "12-4. Engine hood".

Replace the engine oil and the oil filter 6 months after the previous replacement, even if the service hours have not reached 200 hours.
Also replace them at 200 service hours, even if 6 months have not elapsed since the previous replacement.

25-6-2. Checking and cleaning 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 100 PSI (0.7 MPa) for cleaning purposes.**

■ Cleaning procedure for element

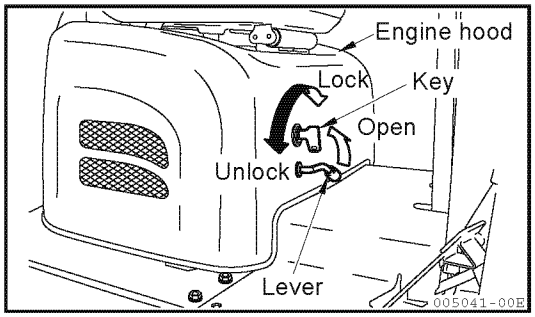
1) Open the engine hood.
   Refer to Section "12-4. Engine hood".

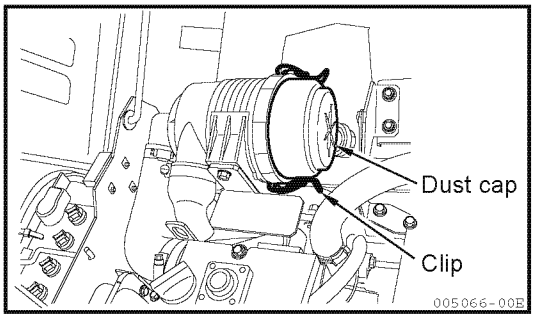
2) Remove the clips and remove the dust cup.

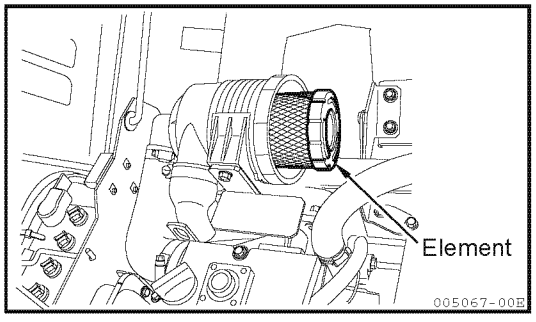
3) Remove the element.
   Cover the connector side at the back of the air cleaner body using a clean cloth and tape to prevent dirt from entering.

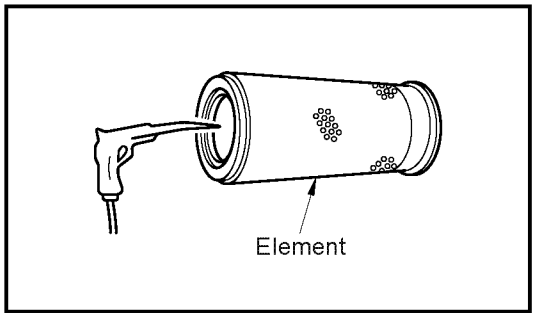
4) Clean the dust cup and the inside of the body.

5) Blow the dry, compressed air [100 PSI (0.7 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 dirt. Blow compressed air again from inside the element, to complete the dirt removal.

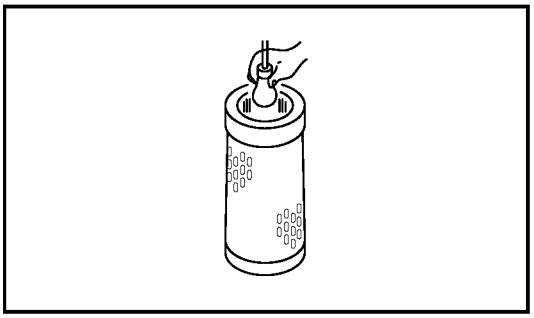








6) After cleaning, illuminate the element from inside with a light bulb and check it. If there are any small holes or thin areas, replace the element with a new one.



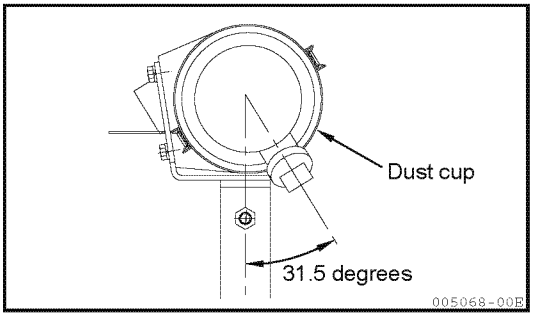
IMPORTANT

- **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.**

7) Remove the protective cloth and tape used to cover the air cleaner body.

8) Insert the newly-cleaned element.

9) Install the dust cup with the arrow mark on it turned 22.5 degrees counterclockwise, as shown in the figure at the right.



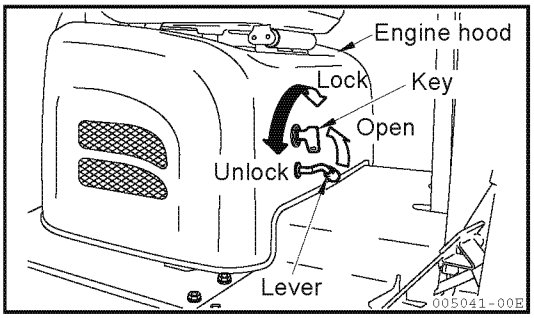
10) Close the engine hood.
Refer to Section "12-4. Engine hood".

25-6-3. Checking and cleaning the radiator fin

⚠ WARNING

- **Never attempt to check and clean the radiator fin while the engine is running.**
  Always stop the engine and allow it 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.**

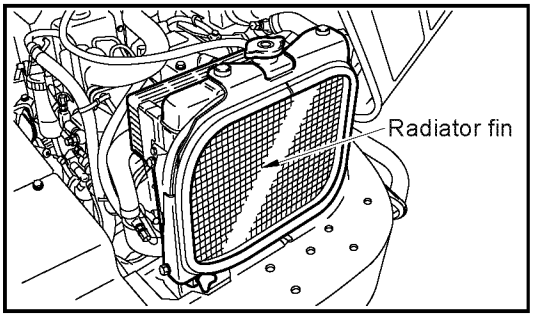
1) Open the engine hood.
   Refer to Section "12-4. Engine hood".



2) Clean off any mud, dirt or leaves clogged in the radiator fin by blowing compressed air or by flushing with steam.

IMPORTANT

- **Always blow the compressed air away from the fin to prevent damage to the fin.**
- **A damaged fin will cause water leakage and overheating.**



3) Check that the radiator fin is straight and that all the dirt has been removed completely.

4) Close the engine hood.
   Refer to Section "12-4. Engine hood".

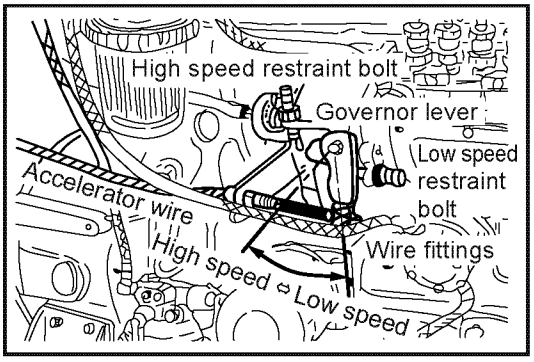
25-6-4. Adjusting the governor lever and accelerator device

⚠ CAUTION

Never remove the restraint bolt for the fuel injection pump or the restraint bolt governing the amount of fuel injected. Doing so will impair safe operation, lower the efficiency of the engine and shorten its life.

The governor lever and the accelerator devices (i.e., accelerator lever, pedal, etc.) are connected by an accelerator wire.
If the wire becomes stretched or if the connections become loose, deviation in position may result and make operation unsafe. Inspect the wire periodically and adjust it if necessary.

1) Check that the governor lever on the engine side is touching the restraint bolt on the high speed side when the accelerator device is in the high speed position.
2) Check that the governor lever on the engine side is touching the restraint bolt on the low speed side when the accelerator device is in the low speed position.
3) If the governor lever does not touch the restraint bolt on either the high or low speed side when you check them, loosen the adjust screws on the fittings for the accelerator wire and adjust the position of the wire.



25-7. Maintenance every 250 service hours

Also perform the maintenance every 50 service hours.

25-7-1. Checking and replenishing the transmission oil

⚠ WARNING

- **The transmission oil and the transmission case are hot immediately after ceasing machine operation and can cause bodily injury.**
  Do not allow hot oil or the case to contact your skin.
  Replace oil after the oil and the case have cooled sufficiently, if necessary.
- **At operating temperature, the transmission case 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**

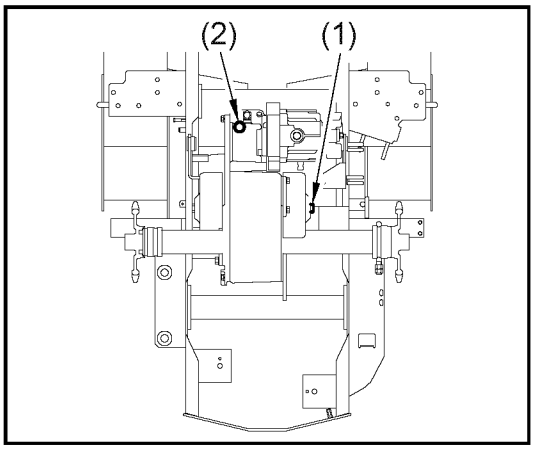
- Container for oil
- Oil jug

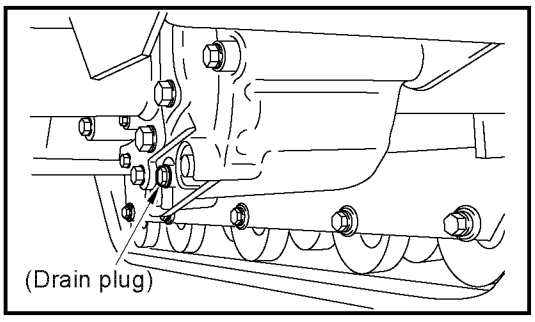
1) Place the container for oil under the oil level port plug (1) of the transmission case.

2) Remove the oil level port plug (1) and check that the oil level reaches the lower end of the oil level port.

3) If the oil is insufficient in quantity, remove the oil supply port plug (2) in the upper part of the transmission case and replenish transmission oil through the oil supply port.
   Stop replenishing transmission oil when it begins overflowing from the oil level port.
   Refer to Section “21. Fueling, Oiling and Greasing Based on Temperature Range".

4) After replenishing transmission oil, install and tighten the oil level port plug (1) and the oil supply port plug (2).





25-8. Maintenance every 400 service hours

Also perform the maintenance every 50, 100, and 200 service hours.

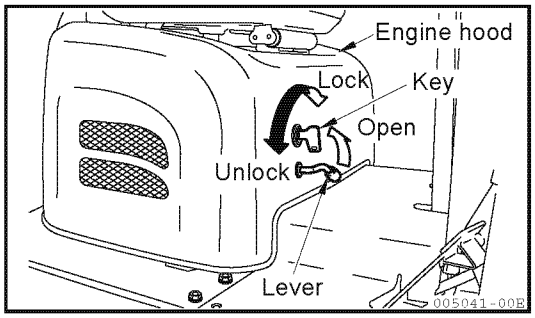
25-8-1. Replacing the fuel filter element

⚠ WARNING

- **Keep sparks, flames and lit cigarettes away.**
- **At operating temperature, the engine components are hot and can cause a burn.**
- **Disconnect the battery and replace the element after the engine has cooled sufficiently.**
- **Fuel leaked or spilled onto hot surfaces or electrical components could cause a fire.**
- **Drain the fuel from the fuel filter into a container before removing the fuel filter.**

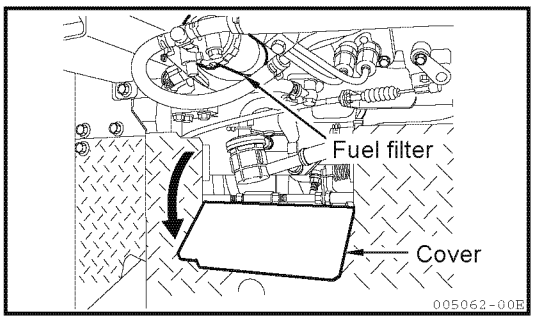
■ **Things to prepare**

- Cloth
- Filter wrench



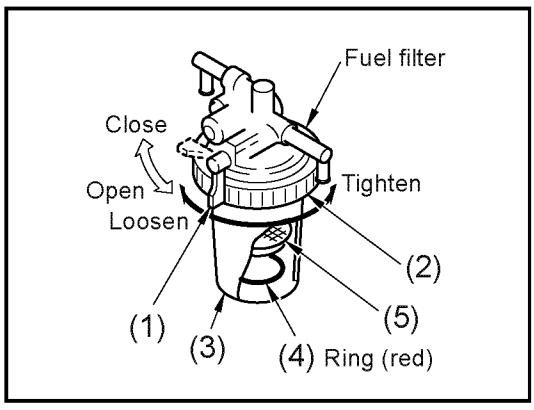
1) Open the engine hood.
   Refer to Section "12-4. Engine hood".

2) Place a cloth under the fuel filter.



3) After setting the fuel filter cock (1) to the closed position, loosen the retainer ring (2) to remove the cup (3), and remove the element (5).
   Be sure not to lose the red ring (4) inside the cup.

4) Clean the cup (3) using light oil or washing agent and install a new element.
   Replace the O-ring when replacing the element.



5) After replacing the fuel filter element, remove the cloth, then release air.
   (Refer to the following page.)

6) After releasing air, start the engine and check for fuel leak.
   If there is nothing wrong, stop the engine and close the engine hood.
   Refer to Section "12-4. Engine hood".

How to release air:

1) Fill up the fuel tank.
2) Place the accelerator lever in the "RUN" position.
3) Turn the starter switch to the "START" position to crank the engine for approximately 10 seconds.
   Air will be automatically released and the engine should starts.

IMPORTANT

If the engine does not start within 10 seconds, wait at least a minute before again attempting to restart the engine.

Whenever you refuel, release air in the same way. After the engine starts, sometimes it will revolve irregularly. In that case, turn the starter switch to the "OFF" position, wait for one minute or more and turn the starter switch to the "START" position again.

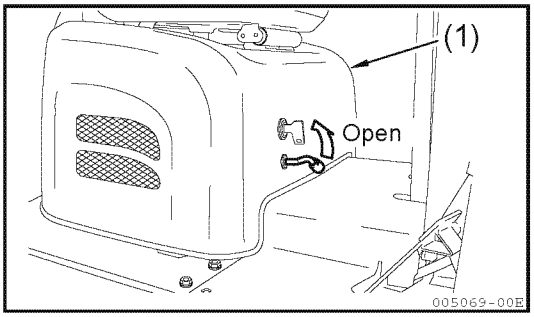
25-8-2. Replacing the pre-filter

⚠ WARNING

- **Always install the wagon support to hold the wagon securely when inspecting or servicing the machine with the wagon in the dump position.**
- **Never attempt to replace the pre-filter immediately after the engine stops. At the operating temperature, the engine components are hot and can cause a burn. Replace the pre-filter after the engine components have cooled sufficiently.**
- **After replacing the pre-filter, install the fuel hoses securely to prevent oil leak.**
- **Keep sparks, flames and lit cigarettes away.**

■ **Things to prepare**

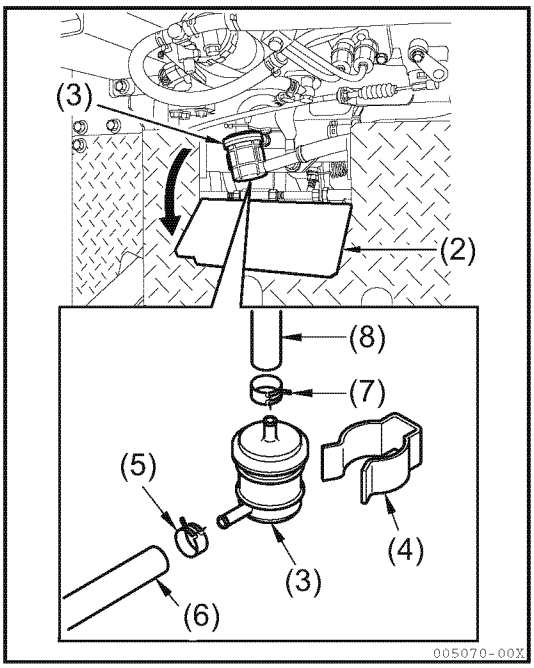
• Container for fuel



1) Open the engine hood (1) and the cover (2) on the floor step.

2) Remove the pre-filter (3) from the clamp (4).

3) Place the container for fuel under the pre-filter (3).



4) Loosen the clamp (5) to remove the fuel hose (6) from the pre-filter (3).

5) Loosen the clamp (7) to remove the fuel hose (8) from the pre-filter (3).

6) Install the fuel hoses (6) and (8) to a new pre-filter (3), then fasten them with the clamps (5) and (7).

7) Install the new pre-filter (3) to the clamp (4).

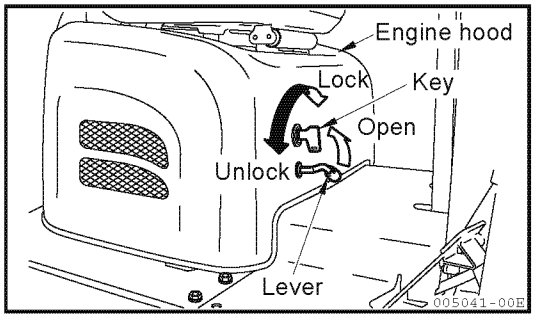
8) Release air.
Refer to Section "25-8-1. Replacing the fuel filter element" for the air release procedure.

25-8-3. Replacing the air cleaner element

⚠ WARNING

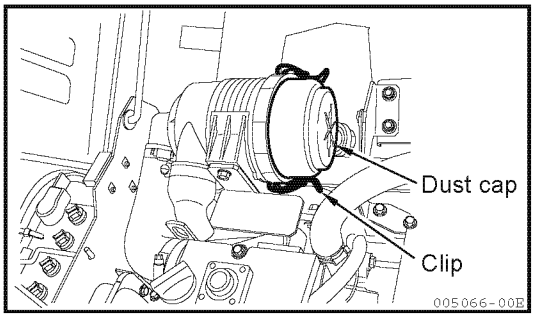
Never attempt to replace the air cleaner element while the engine is running.
Replace the air cleaner element after the engine has been stopped and has cooled sufficiently.

1) Open the engine hood.
   Refer to Section "12-4. Engine hood".



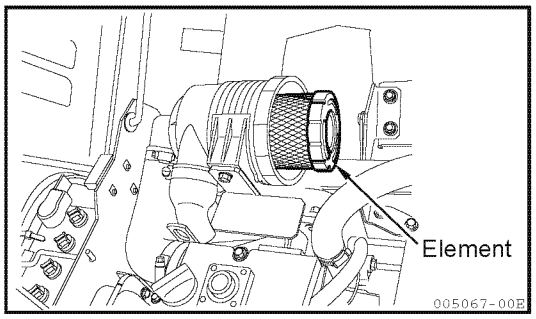
2) Remove the clips and remove the dust cup.

3) Remove the element.
   Cover the connector side at the back of the air cleaner body using a clean cloth and tape to prevent dirt from entering.

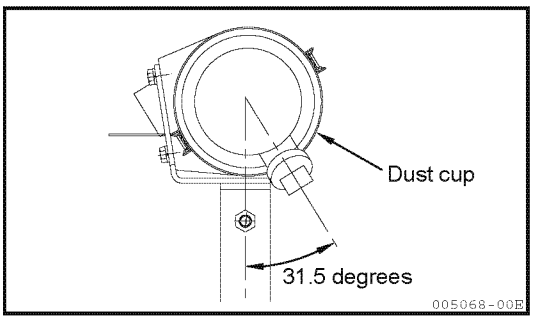


4) Clean the dust cup and the inside of the body.
   Remove the protective cloth and the tape used to cover the air cleaner body.

5) Install a new element.



6) Install the dust cup as shown to the right.



7) Close the engine hood.
   Refer to Section "12-4. Engine hood".

25-9. Maintenance every 500 service hours

Also perform the maintenance every 50, 100 and 250 service hours.

25-9-1. Replacing the hydraulic oil return filter

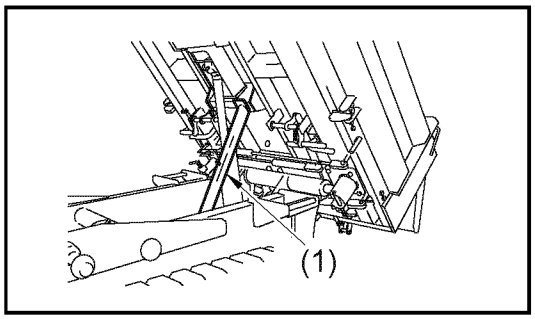
⚠ WARNING

- **Always install the wagon support to hold the wagon securely when inspecting or servicing the machine with the wagon in the dump position.**
- **The hydraulic oil and the tank are hot and under pressure at the operating temperature. Never replace the filter immediately after ceasing machine operation. Wait until the hydraulic oil tank has cooled enough to permit you to touch its surface with your bare hand.**

■ Things to prepare

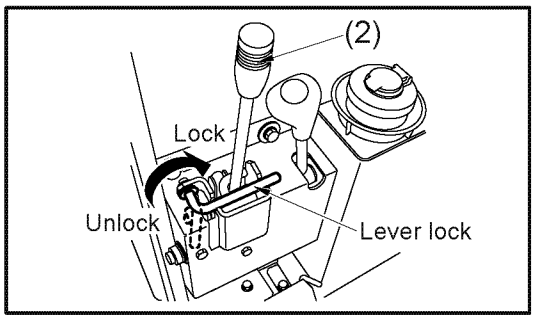
- Container for oil
- Filter wrench

1) Park the machine on level ground. Dump the wagon, install the wagon support (1) to hold the wagon securely and stop the engine. Then, move the dump lever (2) back and forth to relieve the pressure in the hydraulic cylinder circuit and lock the dump lever (2) with the dump lever stopper.



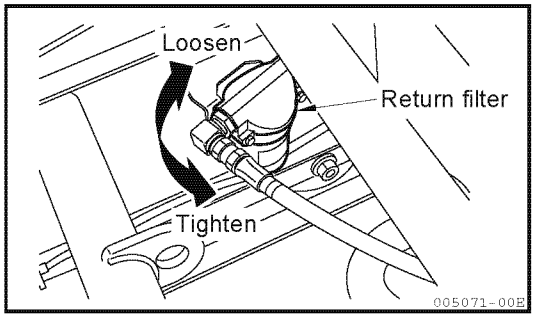
2) Place the container for oil under the return filter.

3) Remove the filter cartridge using the filter wrench.



4) Wipe off the dirt and oil from the filer mount with a cloth moistened with light oil, and install a new filter cartridge after applying hydraulic oil to the sealing surface of the cartridge.
Refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range" for the hydraulic oil to be used.

5) Gently turn the new filter cartridge by hand until its sealing surface touches the filter mount, and then give it another 2/3 of a turn with the filter wrench.



6) After installing the new filter cartridge, run the engine and check that there is no oil leak from between the mating faces.

25-10. Maintenance every 1000 service hours

Also perform the maintenance every 50, 100, 200, 250 and 500 service hours.

25-10-1. Replacing the transmission oil

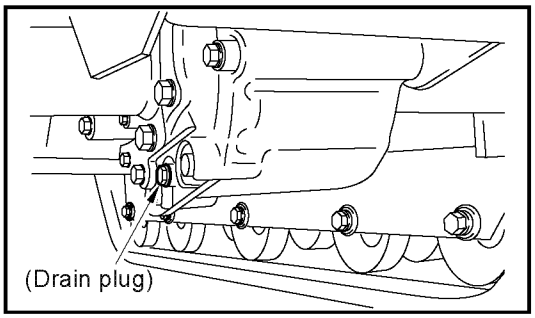
⚠ WARNING

- **The transmission oil and the transmission case are hot immediately after ceasing machine operation and can cause bodily injury such as a burn. Do not allow hot oil or the case to contact your skin. Replace the oil after the oil and the case have cooled enough to permit touching the surface of the case with your bare hand.**
- **At operating temperature, the transmission case 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.**

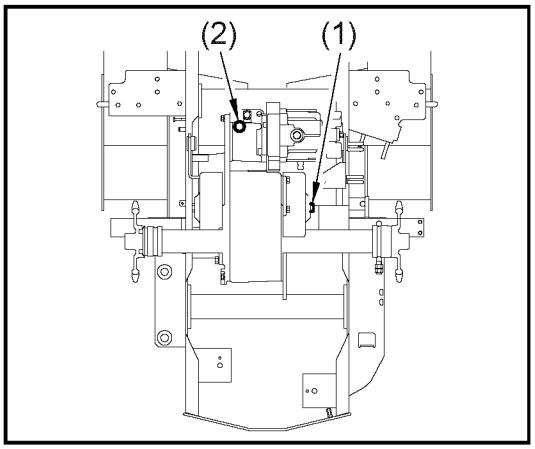
■ Things to prepare

- Container for waste oil : Capacity of 4.5 Qts. (4.3 L) or more
- New transmission oil : 4.5 Qts. (4.3 L)
- Oil jug

1) Place the container for waste oil under the drain plug in the lower part of the transmission case.



2) Slowly loosen and remove the drain plug and drain the transmission oil into the container.
   Take care that the transmission oil does not contact your body.
3) Check the O-ring mounted on the drain plug, and replace it with a new one if it is damaged.
   After draining the transmission oil, install and tighten the drain plug.
4) Check the oil drained, and contact your dealer if any metal powder or foreign matter is found in the oil.
5) Remove the oil supply port plug (2) and the oil level port plug (1) in the upper part of the transmission case, and replenish a specified quantity of transmission oil through the oil supply port.
   Stop replenishing transmission oil when it begins overflowing from the oil level port.
   Refer to Section “21. Fueling, Oiling and Greasing Based on Temperature Range” for the transmission oil to be used.

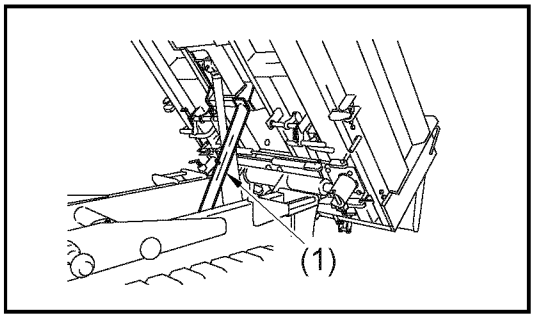


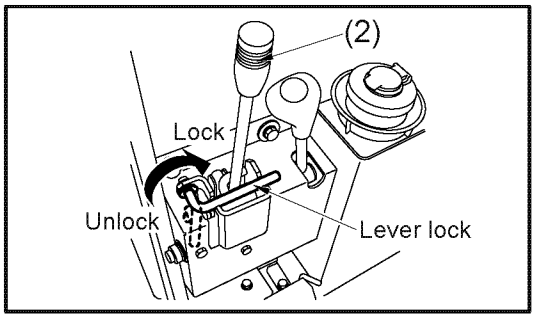
6) After replenishing transmission oil, install and tighten the oil level port plug (1) and the oil supply port plug (2).

25-10-2. Replacing the hydraulic oil and cleaning the suction filter

⚠ WARNING

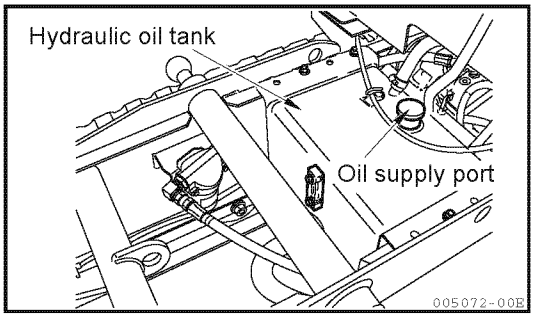
- **Always install the wagon support to hold the wagon securely when inspecting or servicing the machine with the wagon in the dump position.**
- **The hydraulic oil and the tank are hot and under pressure at operating temperature. Never replace the oil immediately after operation is stopped. Wait until 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.**



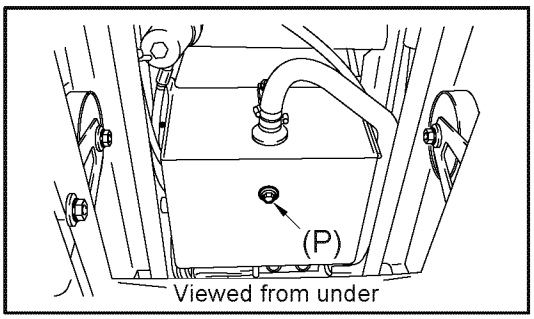


■ **Things to prepare**

- Container for waste oil :
  Capacity of 4.36 Gals. (16.5 L) or more
- New hydraulic oil : 3.83 Gals. (14.5 L)
- O-rings

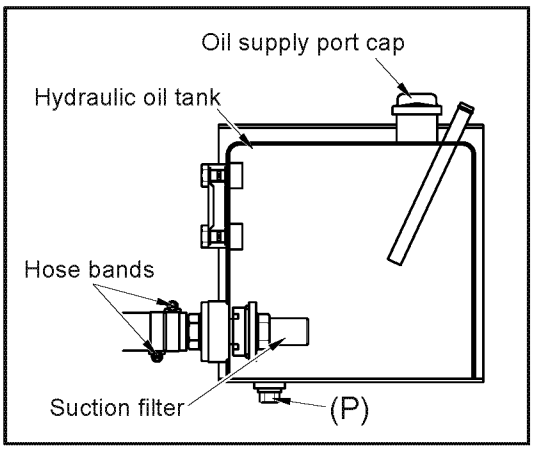


1) Park the machine on level ground. Dump the wagon, install the wagon support (1) to hold the wagon securely and stop the engine. Then, move the dump lever back and forth to relieve the pressure in the hydraulic cylinder circuit and lock the dump lever (2) with the dump lever stopper.



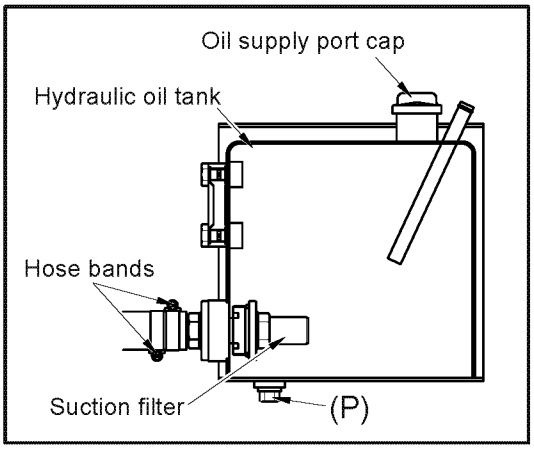
2) Place the container for waste oil under the drain plug (P) on the bottom of the hydraulic oil tank.

3) Slowly loosen and remove the drain plug (P), and drain the hydraulic oil into the container.
   Take care that the hydraulic oil does not contact your body.



4) Remove the oil supply port cap.

5) Degrease and clean the threads of the drain plug (P), and replace the O-ring mounted on the plug with a new one.



6) After draining the waste oil, install and tighten the drain plug.
Tightening torque : 43.4 ft•lbf (59 N•m)

7) Loosen the hose bands to remove the hose from the suction filter.

8) Remove the suction filter. Remove the dirt from the filter and wash it with a washing agent or light oil.

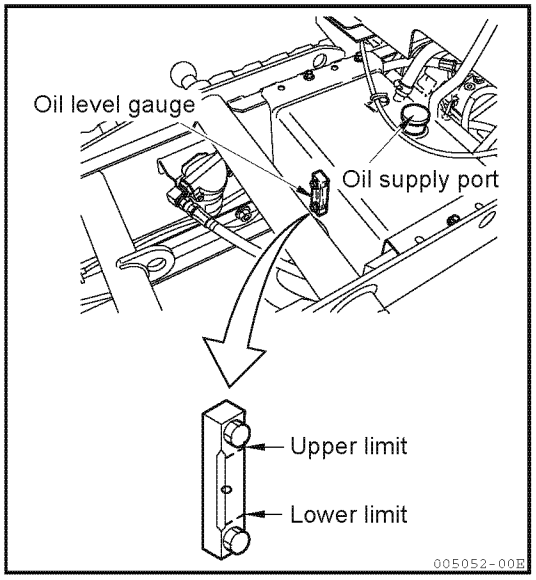
9) Check the filter. If the filter is damaged or cracked, replace with a new one.

10) Degrease and clean the threads of the filter and replace the O-ring mounted on it with a new one. Then, install the filter in the hydraulic oil tank.
Tightening torque : 72.4 to 86.8 ft•lbf (98.1 to 117.7 N•m)

IMPORTANT
Do not allow any dirt to enter the tank when installing the filter.

11) Install the hose to the filter, and tighten the hose bands.
Tightening torque : 1.8 to 2.5 ft•lbf (2.5 to 3.4 N•m)

12) Add oil to the specified level in the hydraulic oil tank. Check the oil level with the oil level gauge on the side of the machine and do not add oil beyond the midpoint between the upper and lower limit marks on the oil level gauge.
Refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range" for the oil to be used.



13) Reinstall the oil supply port cap.

14) After replacing the oil, place all control levers in the neutral position and idle the engine for approximately 2 to 3 minutes. Then, test the dump lever for proper operation.

25-10-3. Checking and adjusting the intake/exhaust valve clearances
Ask your dealer.

25-10-4. Checking and adjusting the fuel injection valve
Ask your dealer.

25-10-5. Retighten the cylinder head bolts
Ask your dealer.

25-10-6. Checking the generator and the starter motor
Ask your dealer.

25-11. Maintenance every 2000 service hours

Also perform the maintenance every 50, 100, 200, 250, 400, 500 and 1000 service hours.

25-11-1. Checking and replacing the fuel piping and the cooling water piping

Ask your dealer.

25-11-2. Lapping the intake/exhaust valves

Ask your dealer.

25-11-3. Checking and adjusting the fuel pump

Ask your dealer.

HANDLING THE THREE-WAY DUMP WAGON

26. Handling the Three-way Dump Wagon

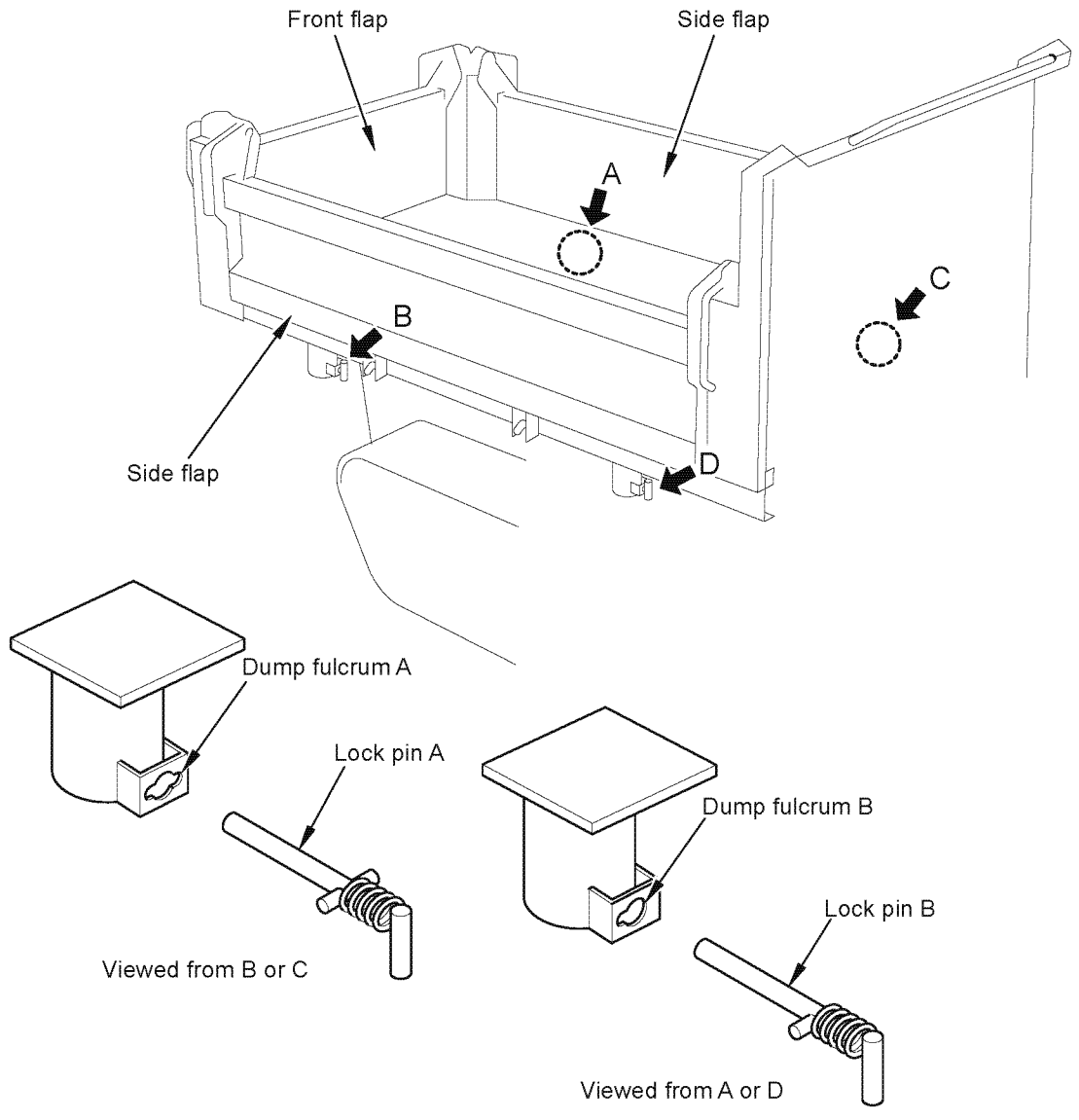
⚠ WARNING

When the wagon is dumped to the side, the center of gravity of the machine largely shifts. If the wagon with a sticky load, such as clay, on its bed is dumped to the side, the machine may topple over on its side. Do not dump the wagon to the side when the machine has a sticky load on the wagon.

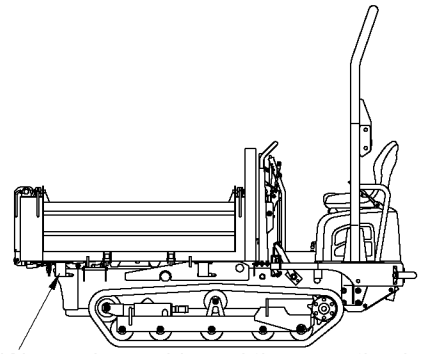
⚠ CAUTION

Do not run the machine with the wagon flaps open to prevent damage to the rubber crawlers.

26-1. Component parts



26-2. Wagon dump side and the mounting locations of lock pins



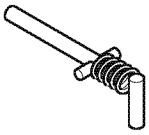
Wagon dump side and the mounting locations of lock pins

⚠ CAUTION

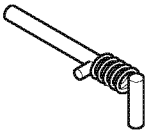
- **Never mount the lock pins in the dump fulcrums C and D together. In that combination, the wagon will be dumped toward the operator's seat.**
- **After inserting each lock pin fully, turn it 90 degrees clockwise to prevent it from falling out. (When you release the lock pin, it will be locked in place by the spring.)**

The wagon can be dumped to any of the three sides: to the front, to the right or to the left. Decide the combination of mounting locations of two lock pins according to the wagon dump side.

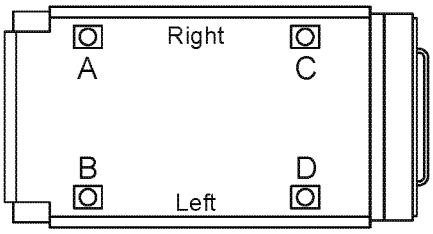
- Lock pin A

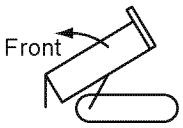
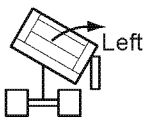
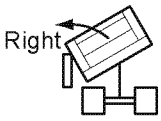


- Lock pin B



- Dump fulcrums



Wagon dump side	Mounting locations of lock pins
	A, B
	B, D
	A, C

IMPORTANT

Always lower the wagon and stop the engine before changing the mounting locations of the lock pins.

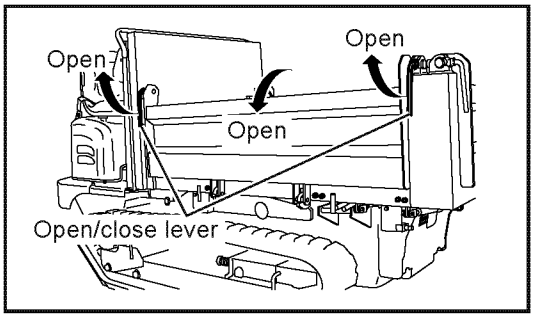
Moving the dump lever and relieving the pressure after stopping the engine will make it difficult to change the mounting locations of the lock pins.

26-3. Removing the wagon flaps

⚠ CAUTION

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

The three wagon flaps (front, right and left flaps) can each be removed.



- **Removing the wagon flaps**

Mass of wagon flaps

Front flap: approx. 33 lbs. (15 kg)

Right and left flaps: approx. 44 lbs. (20 kg) each

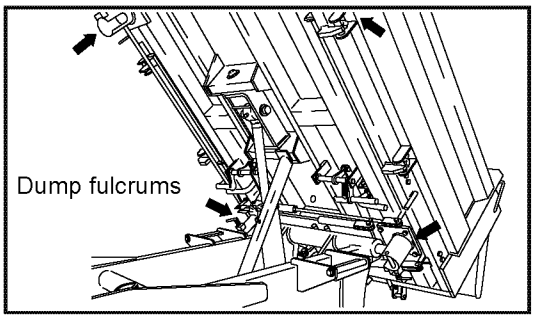
1) Start the engine.
2) Raise the wagon slightly by moving the dump lever to just disengage the hook(s) on the bottom of the flap to be removed.
3) While holding the flap with one hand, open the open/close lever on one side of the flap and then the lever on the other side, and slowly remove the flap.

26-4. Inspection and maintenance

⚠ WARNING

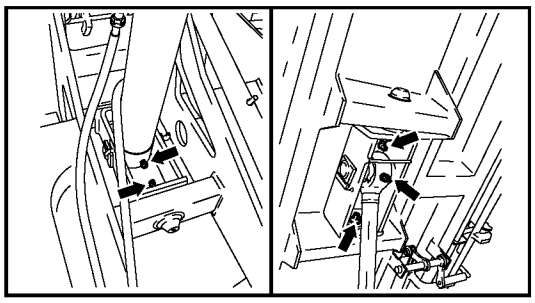
Always install the wagon support to hold the wagon securely when inspecting or servicing the machine with the wagon in the dump position.

1) Checking and retightenning the major bolts and nuts
   Check them daily.
   - Dump fulcrum mounting bolts
     Tightening torque : 57.9 to 72.3 ft•lbf (78.5 to 98.1 N•m)



2) Grease up points
   Check them daily.
   - Wagon and related parts

     (1) Dump fulcrum
     (2) Dump cylinder fulcrum
     (3) Moving part of roller for opening and closing hook



SPECIFICATIONS AND DIMENSIONAL DIAGRAMS

27. Specifications and Dimensional Diagrams

27-1. Specifications

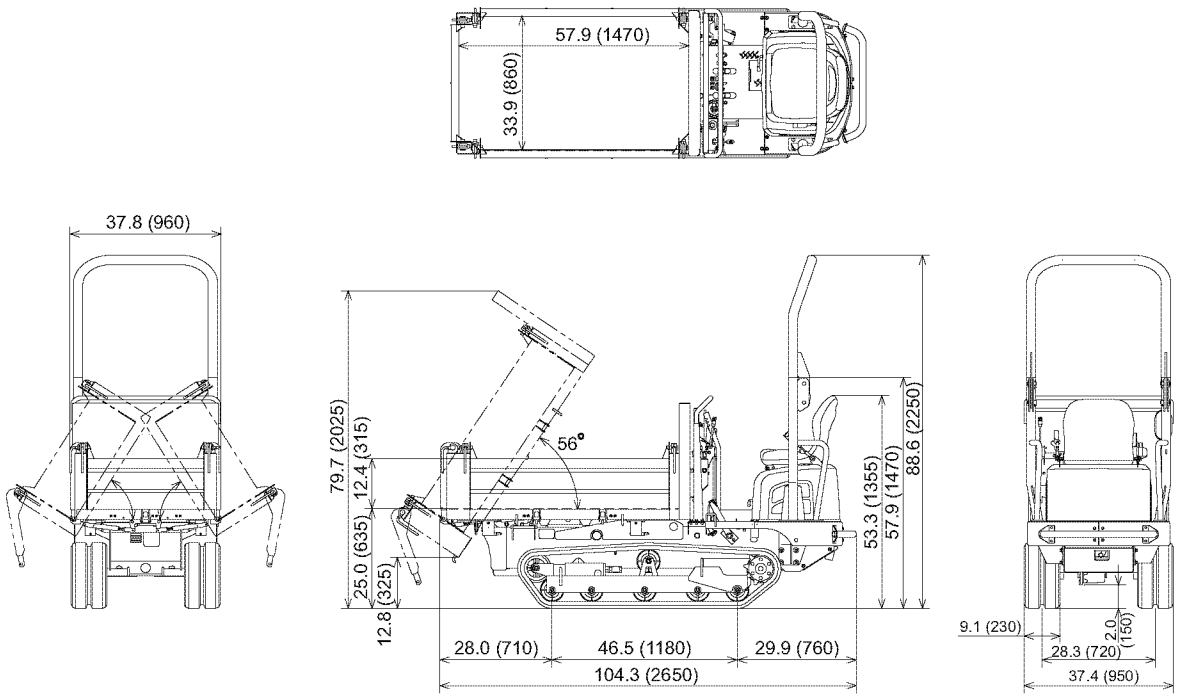
■ Specifications

Item			Unit	C12R-C	
				3WD wagon type	Standard wagon type
Engine	Type		-	402J-05 IG84557R	
	Rated output		HP (kW)	10.5 (7.8)	
	Rated speed		RPM	2800	
Operating mass			lbs. (kg)	2426 (1100)	2227 (1010)
Paymass			lbs. (kg)	2536 (1150)	
Drive system			-	H.S.T.	
Travel speed			MPH (km/h)	3.4 (5.5)	
Dimensions	Overall length		in. (mm)	104.3 (2650)	
	Overall width		in. (mm)	37.8 (960)	37.4 (950)
	Overall height		in. (mm)	88.6 (2250)	
	Track gauge		in. (mm)	28.3 (720)	
	Crawler width		in. (mm)	9.1 (230)	
	Minimum ground clearance		in. (mm)	5.9 (150)	
Wagon	Inside dimensions	Length	in. (mm)	57.9 (1470)	
		Width	in. (mm)	33.9 (860)	32.7 (830)
		Height	in. (mm)	12.4 (315)	12.6 (320)
	Capacity	Struck	cu.ft. (cu.m)	14.1 (0.40)	
		Heaped	cu.ft. (cu.m)	18.4 (0.52)	
	Maximum dump angle		degrees	56 (front), 58 (right and left)	58
Ground pressure		Loaded	PSI (kPa)	5.83 (40.2)	5.68 (39.2)
		Unloaded	PSI (kPa)	2.84 (19.6)	2.70 (18.6)

■ Dimensional diagrams

3WD wagon type

in. (mm)



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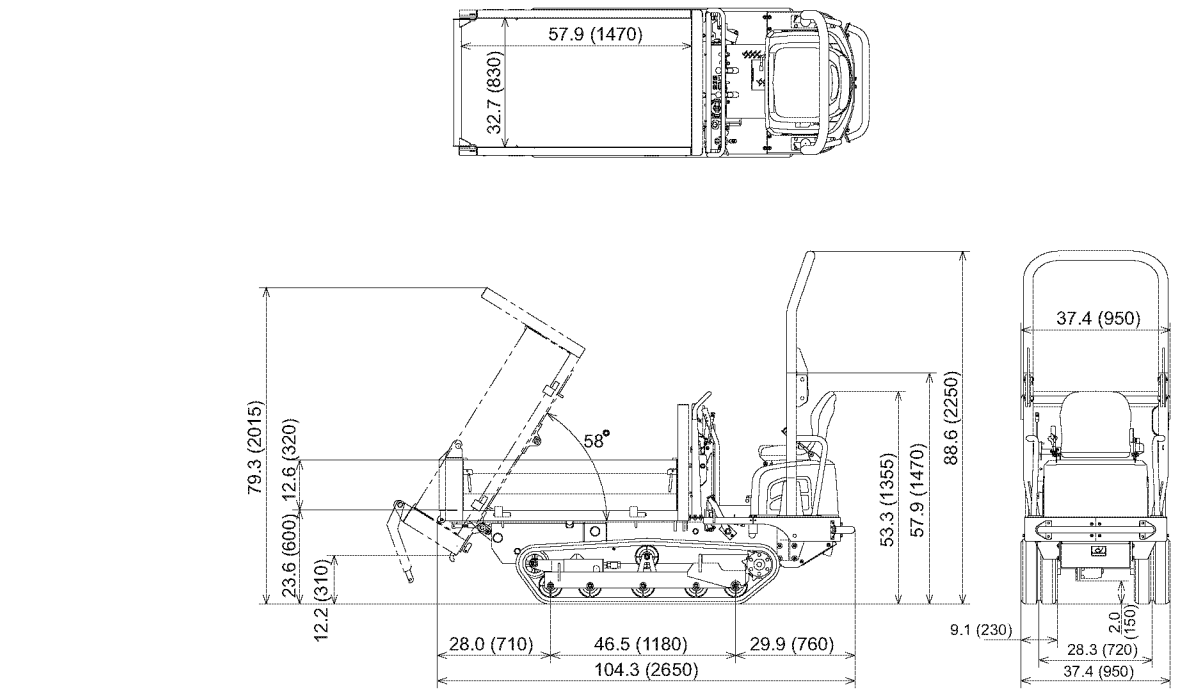
Standard wagon type

in. (mm)



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NOTES

28. Maintenance Log

Maintenance log

Date	Machine hours	Service performed

Date	Machine hours	Service performed

Date	Machine hours	Service performed

Date	Machine hours	Service performed

29. Notes

Notes

MEMO

YANMAR CONSTRUCTION EQUIPMENT CO., LTD.
1717-1, Kumano, Chikugo-shi, Fukuoka, 833-0055, Japan
TEL: +81-942-53-5465 FAX:+81-942-53-5132

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YANMAR CONSTRUCTION EQUIPMENT CO., LTD.

https://www.yanmar.com

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2023.03-0A4