

⚠ WARNING

Before operating, inspecting, or maintaining this machine, read these instructions thoroughly. Failure to follow these instructions and safety precautions could result in serious injury, death or property damage.

**OPERATING &
MAINTENANCE
INSTRUCTIONS**

**PNEUMATIC
TIRED
ROLLER**

MODEL

TS160-4

From 1TS14-70101

SAKAI

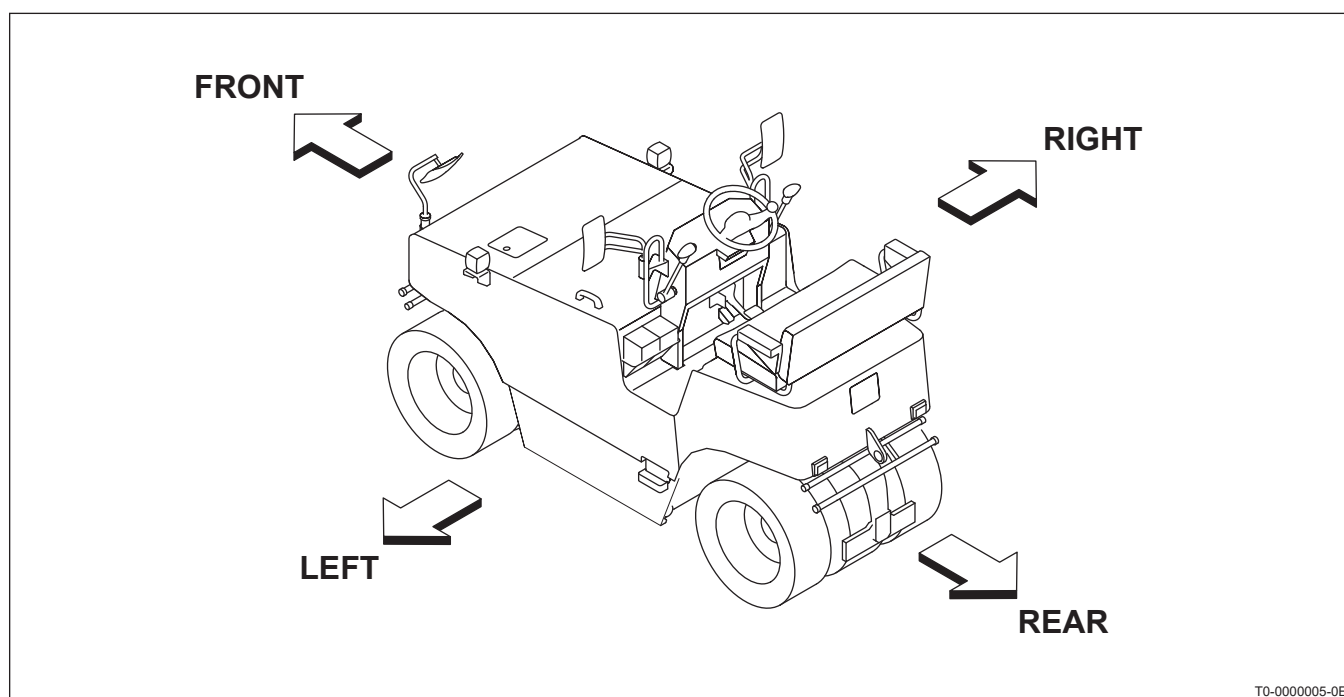
PREFACE

This operator's manual serves as a guide for the use of your SAKAI TS160-4 Pneumatic Tired Roller and should be read thoroughly by all persons using this machine, especially those who are new to the machine, and also for the people who have experience in using the machine and want to refresh their knowledge for the machine.

Keep this manual for future reference and keep it nearby whenever you work.
If the instruction manual is lost or is damaged and is not legible, replace it immediately by contacting your dealer.

The main subjects of this manual are:

(1) Basic precautions for safety, (2) Operation, (3) Periodic maintenance and (4) Specifications. For operation and maintenance of the engine, refer to the Engine Instruction Manual furnished separately. Descriptions in this manual can differ from the engine instructions due to the results of improvements in machine design. If you have any inquiry regarding your machine or this manual, contact your dealers.



⚠ WARNING

- **Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.**
 - **Always start and operate the engine in a well-ventilated area.**
 - **If in an enclosed area, vent the exhaust to the outside.**
 - **Do not modify or tamper with the exhaust system.**
 - **Do not idle the engine except as necessary.**

For more information go to

www.P65warnings.ca.gov/diesel

- **This product can expose you to chemicals including 1, 3-Butadiene and Ethylbenzene, which are known to the State of California to cause cancer and birth defects or other reproductive harm.**

For more information go to

www.P65warnings.ca.gov

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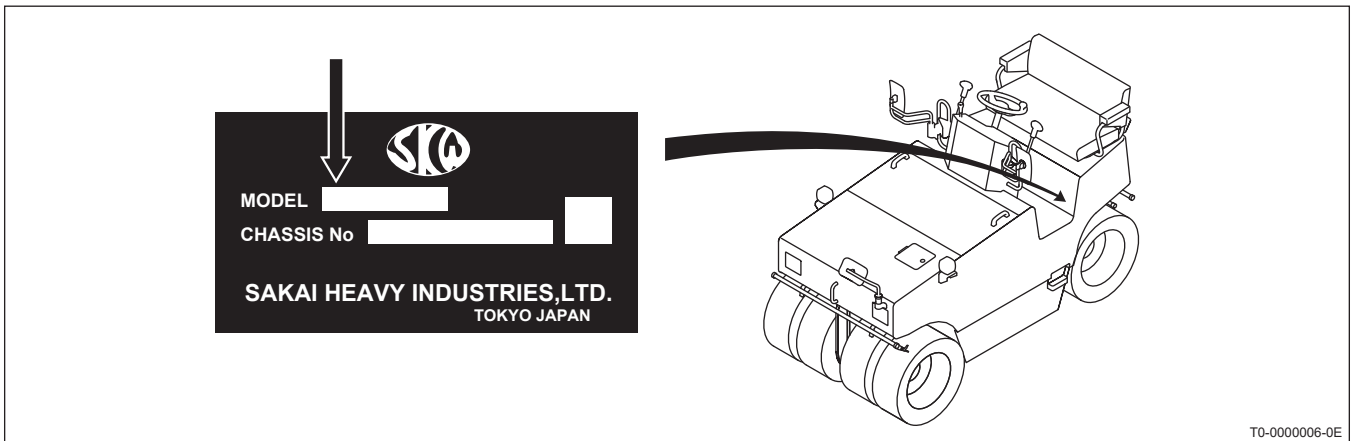
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MACHINE AND ENGINE IDENTIFICATION NUMBERS

When ordering parts or making inquiries about your machine, the following information is requested.

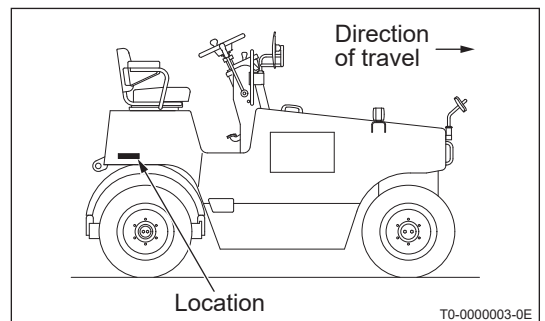
(1) Machine model

Indicated under the operator's seat.

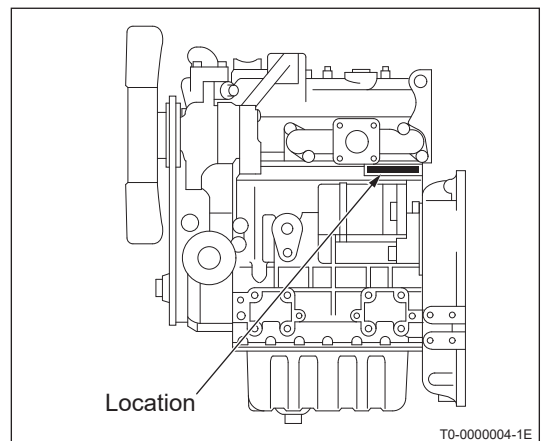


(2) Machine serial number

TS160-4 → 1TS14-○○○○○



(3) Engine serial number



SAFETY PRECAUTIONS

It is almost impossible for the safety notices in this manual and on the machine to cover all the potential dangers. Keep alert to possible dangers not mentioned in this manual and on the safety labels.

WARNING

Before operating, inspecting, or maintaining this machine, read these instructions thoroughly. Failure to follow these instructions and safety precautions could result in serious injury, death or property damage.

For the safe use of your machine, correct handling and periodical maintenance are of utmost importance. Thoroughly read the safety precautions described in this manual. Do not attempt to operate and maintain your machine until you gain a full understanding of these safety statements.

This manual covers the proper and safe method of driving and handling of this machine for its intended use. When this machine is used in a manner other than authorized in this manual, it could be dangerous and you assume responsibility for your own personal safety.

In this manual and on the machine, you will find safety warnings and precautions. Each safety notice starts with a signal word as shown below:

 **DANGER**

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury. The safety labels on the machine are red.

 **WARNING**

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. The safety labels on the machine are orange.

 **CAUTION**

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. The safety labels on the machine are yellow.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety labels on the machine are blue.

Do not alter or modify this machine unless it has been authorized by SAKAI. Doing so could be dangerous and result in serious injury or death.

Do not operate or maintain this machine unless you have read this manual and have been trained in safe and proper use.

MEMO

1 BASIC PRECAUTIONS FOR SAFETY

1.1 General Precautions

■ Ensure proper management of health

- People under the influence of alcohol, drugs, lack of sleep or health problems must avoid driving or repairing the machine at all times, as it may lead to serious accidents.

■ Turn off cell phones

- Turn off cell phones while driving or repairing the machine. Never use a cell phone while driving, as it may lead to serious accidents.

■ Read the operator's manual thoroughly

- Understand the functions of the controls and gauges. Familiarize yourself with their location and how to operate them. Understand the meaning of all of the safety labels attached to the machine.



■ When the instruction manual is lost, damaged or not legible, replace it immediately by contacting your dealer

■ Understanding the uses for the machine

- This machine was developed and manufactured mainly for the purpose of rolling compaction in engineering works. Do not use it for any other purpose. Vibration rolling compaction under conditions of excessive compaction, or using it to crush the rocks can damage the machine.

■ Realize the capability of the machine

- Thoroughly understand the performance of your machine and operate the machine correctly to meet the requirements of the job site. Operating the machine beyond its capabilities may lead to accidents. Use your machine within its capability.

1 BASIC PRECAUTIONS FOR SAFETY

■ Wear protective clothing appropriate to work

- Wear protective clothing, safety shoes and hard hat to suit your work.
- Do not wear clothing and accessories that tend to get caught in the controls or protruded portions of the machine. Do not wear oily clothing.
- Depending on the type of job, wear gloves, earplugs, safety goggles or a mask.

■ Do not use a machine which has not been serviced correctly at regular intervals

- Before working, perform necessary inspections. Start operation only after making certain the machine is in good operating condition. If found to be abnormal, report to the responsible person and have the fault corrected. Operate the machine only after making sure that it is safe to operate.

■ Beware when operating moving parts

- When operating moving parts such as covers, understand the movable range and be careful not to get your hands or feet caught.

■ Obey the worksite rules

- Follow noise standards and worksite rules that deal with safety.

■ Know the work area in advance

- Know the terrain, geology and conditions of the road surface at the worksite. Start working after securing safety such as stationing a guardsman or putting up barriers where there is a risk of falling the machine or collapsing the shoulder of the road.

■ Do not allow anyone to enter the work area except for authorized personnel

■ The operator must determine that it is safe to move the machine to a hazardous area under unusual conditions

- Such areas include sloping land, unstable road shoulders and soft ground.

■ **Prepare in advance for an accident**

- Decide in advance the means of communication in an emergency. Know the location and how to use a fire extinguisher and first-aid kit.

■ **A machine without ROPS must not be operated on slopes or unsafe grounds**

■ **A machine without CABIN must not be operated in bad weather or in a harmful polluted area**

■ **Operator must only operate the machine when sitting in the operator's seat**

■ **When getting on and off the machine, make sure the machine is completely stopped**

- For getting on and off, face the machine and use the handrails and the step.
- Watch your step when getting on or off the machine.
- Do not jump on or off the machine, particularly when it is moving.
- When getting on and off an articulated type machine, make the machine straight before stopping. In the bent state, there is a risk of getting caught or pinched because the getting on and off space will be narrow.

■ **Be careful not to fall**

- Falling off the machine may cause serious injuries or death, so do not place your feet anywhere other than on the steps, and on the operator's platform.

■ **When leaving the machines**

- To prevent theft and to prevent the machine from being operated by unauthorized personnel, always remove the starter key and make sure to carry it with you.

■ **Do not touch the muffler, exhaust pipe or the DPF during and after the engine is running as they are very hot**

1 BASIC PRECAUTIONS FOR SAFETY

■ Be careful of hot parts

- After your machine has operated for some time, the coolant, engine oil and hydraulic oil will heat up and the internal pressure will increase. If, in this state, you try to remove the filler caps, drain the oil or replace the filters, you can get burned. Wait for the temperature of the machine to cool down before performing these tasks.
- To remove the radiator cap, stop the engine and slowly loosen the cap after the coolant cooled down to relieve the pressure (For the radiator cap with a lever, lift the lever to release the trapped pressure before removing the radiator cap).
- When removing the filler cap on the hydraulic tank, release the trapped pressure by turning it slowly to prevent the oil from gushing out (For the cap with a lever, lift the lever to release the trapped pressure before removing the cap).
- While the engine is running or immediately after it has been stopped, do not touch the engine, muffler, exhaust pipes, hydraulic pumps and motors, lights, etc., as they will be hot and cause burns.
- Resin and metallic parts may become hot under direct sunlight on a hot day. Direct contact with such parts may cause burns, so be sure to wear clothing and protective equipment appropriate for the location of the job.



■ Be careful with fire

- The fuel, oil, and antifreeze will catch fire if open flames or ignition sources are used close to them. Fuel is highly flammable.
- Do not smoke and do not use matches or cigarette lighters close to flammable materials.
- When refueling, stop the engine and keep open flames away from the engine.
- The filler caps of the fuel and oil tanks must be securely tightened.

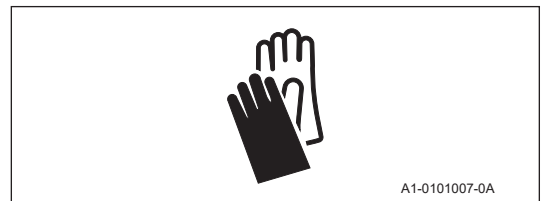


■ In case of machine fire

- In case of a machine fire, stop the engine by turning the Starter switch to the O (OFF) position, then move away from the machine as quickly as possible as it may cause serious injuries or death.

■ How to handle hydraulic fluid

- Wear safety goggles to protect your eyes from contact with hydraulic fluid. It can irritate your eyes. In case of contact with eyes, wash with clean water for 15 minutes and get medical aid immediately.
- The fluid can also irritate your skin. When handling it, wear rubber gloves to avoid contact. In case of skin contact, wash with soap and water.
- Be careful not to swallow the fluid. It can cause diarrhea and vomiting. If swallowed, do not try to voluntarily vomit. Get medical help immediately.



■ Do not use worn tires (If tires installed)

- Tires may get damaged when they are scratched on curb stones, when the machine runs over irregular surfaces of roads or when the machine is operated suddenly.
- Continued use of damaged tires may cause them to blow out. Replace them with new tires.

1 BASIC PRECAUTIONS FOR SAFETY

1.2 Preparation for Safe Operation

■ Clean the step, operator's station, floor board and brake pedal

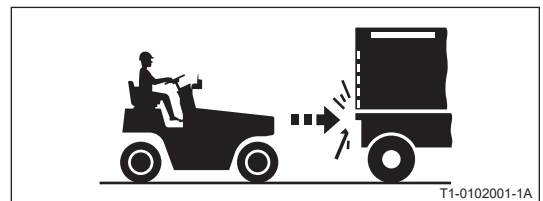
- Do not place parts, tools or unnecessary items on the step, operator's station and floor board.
- Keep the step, floor board, brake pedal, controls and handholds free from mud, oil, ice or water, as they can cause slippage. Repair them if found to be damaged.
Tighten the loose bolts.
- Keep your boot soles free of oil or mud. It may lead to an unexpected accident.

■ Inspect your machine before operation

- Check your machine for damages such as cracks and deformation. If any damage is found, report it to the person in charge.
- Check the level of fluids (fuel, engine oil, coolant, antifreeze and hydraulic oil).
Add as necessary.
- Check the ground on which the machine is parked for signs of leakage of oil, fuel and water. If there is evidence of leakage, investigate the cause and repair it immediately.

■ Watch your distance

- When driving, bear in mind the stopping distance.
Avoid abrupt starting and stopping, and moving in a zigzag direction.



■ Understand the ROPS function (If ROPS installed)

- Ensure that there are no loose bolts, cracks or rust on the ROPS body and the attaching portions.
- Tighten the bolts with the specified torques of 265 N·m after the ROPS are removed.
- Do not weld nor drill holes to the ROPS parts without permission from SAKAI, because it may decrease the strength of the ROPS.
- Be sure to wear the seatbelt during the operation.

1.3 Before Starting the Engine

■ Before getting on, make sure the area around the machine is safe

- Before getting on the machine, make certain that there are no obstacles around the machine and no workers under it. If any worker is close to the machine, warn the machine is about to be moved and to stay away from the path.

■ Make sure the hood and the door are closed

■ Adjust the operator's seat to your most effective operating position

- Sit on the operator's seat. Adjust the seat so that your back will make contact with the seat back when the brake pedal is pressed down to the full extent. Check to be sure that the brake pedal can be fully pressed down without difficulty when you turn your body to run the machine in reverse.
- Adjust the seat to allow proper operation of the steering wheel, levers, switches, etc.

■ Secure good visibility (If CABIN installed)

- Keep the windows clean for good visibility.
- Securely fixed the door whether open or closed.

■ Ensure good forward and backward visibility

- Adjust mirrors for good visibility. If dirty, clean them. If damaged, replace.

■ Check that the horn, lamps and gauges are work correctly

■ Before starting, make certain that each lever is in the neutral position and the parking brake is applied

■ When starting, sound the horn

- Before starting the engine, sound the horn. Make sure there is no one in the immediate vicinity and there are no obstructions around the machine.



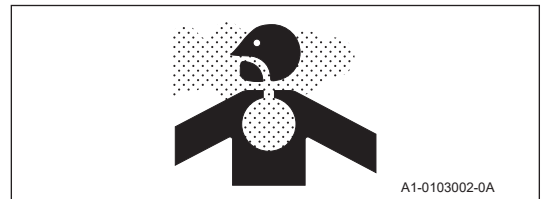
1 BASIC PRECAUTIONS FOR SAFETY

■ Sit in the driver's seat and turn on the engine

- Do not start the engine without sitting on the driver's seat as there is a risk of operational mistakes.

■ Pay attention to ventilation

- Exhaust gas is dangerous.
When starting the engine in a poorly ventilated place such as in an enclosed area, open the windows and the entrance doors to provide sufficient ventilation.



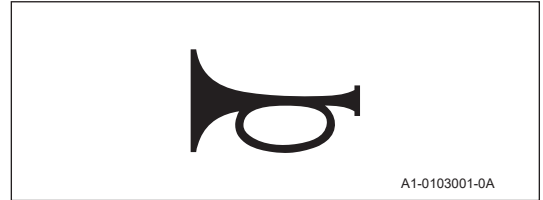
■ Do not stand close to the exhaust gas pipe outlet

- Exhaust gas is harmful if breathed in. Can cause cancer.

1.4 After Starting the Engine

■ Secure safety around the machine

- Before moving the machine, ensure that the area around the machine is clear of personnel and obstructions. Moreover, honk the horn, indicating that you intend to move the machine, but wait a little while before actually moving.



■ Warm up the engine

- Do not start driving the machine immediately after starting the engine. Execute the warming up operation by idling the machine for several minutes.
- Check the ground on which the machine is parked for signs of leakage of oil, fuel and water. If there is evidence of leakage, investigate the cause and repair it immediately.

■ Do a test run

- Make a test run in a safe place to check that there are no abnormal signs.
- Listen for unusual sounds, and check for abnormal temperature rise. If abnormal, park the machine in a safe place and find the source of the trouble before operating.
- Fix all the abnormalities before operating the machine.

1.5 During Operation

■ Strictly observe the traffic regulations

- Follow all the traffic regulations when driving on a public road.

■ Sit in the driver's seat before starting the operation

- Sit in the driver's seat before starting the operation.

■ Do not operate the machine unless you are seated in the operator's seat. Do not drive in a standing posture

- Do not put your legs out or lean forward. Be sure to sit in the proper position while driving the machine.

■ Seatbelt (Seatbelt equipped machines)

- Be sure to wear the seatbelt during the operation.

■ No other person on machine but the operator

- This machine is a one-man roller. Do not allow anyone to get on except the operator. Only the operator is allowed to be on this machine while it is running or in operation.

■ Never get on and off when the machine is moving

- Getting on or off the machine only after making sure it stopped completely and after the parking brake is applied.

■ Refrain from inattentive driving

- Inattentive driving can cause an accident. Use extreme care for workers present in the path of the machine or around it. In case of danger, stop and sound the horn, and proceed when the area is clear of personnel or obstructions.

■ At night, carefully drive the machine

- Nighttime driving tends to diminish the sense of distance. Carefully drive the machine at a speed suitable for the existing lighting. Keep the headlamps and flood lamps lighted. If necessary, provide extra lighting in the work area.

■ **Avoid continuous work for a long time**

- Avoid long hours of continual operation as it may lead to an accident from fatigue.

■ **Do not let anyone enter the work area**

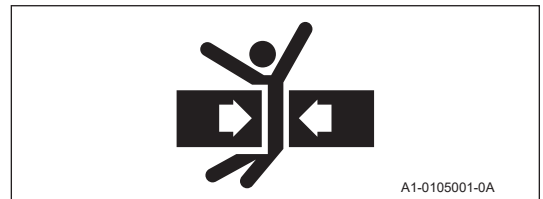
- There is a danger of being run over causing serious injuries or death.
- If the visibility of the driver is poor, arrange a guide to ensure peripheral safety.

■ **When changing the traveling direction, make sure it is safe to do so in the path of the traveling direction**

■ **While making turns, do not run at abnormally high speed and do not turn the steering wheel abruptly and sharply. High speed turns, especially on a soft or an uneven ground, could result in a rollover**

■ **Keep everyone away from the pinch points**

- When making turns, do not allow anyone to come close to the pinch points of the machine.



■ **Repair as soon as possible if found to be broken or faulty**

- If the machine is found to be faulty, stop the machine and repair. Do not operate the machine until the problem is corrected. When any warning lamp indicates faulty operation, inspect the machine after moving it to the nearest safe location.

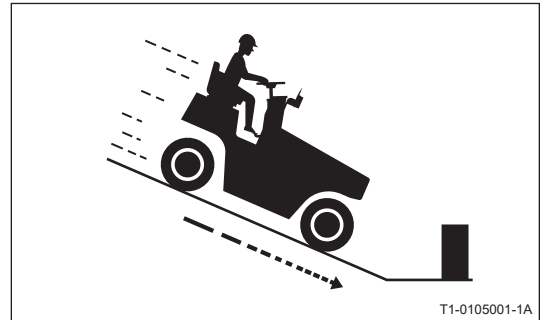
■ **For traveling on structures such as a bridge, make certain that the structures can support your machine. Before traveling on the structure, you must know the load capacity of the structure and the load weight of the machine you are operating to insure safe travel across the structure**

1 BASIC PRECAUTIONS FOR SAFETY

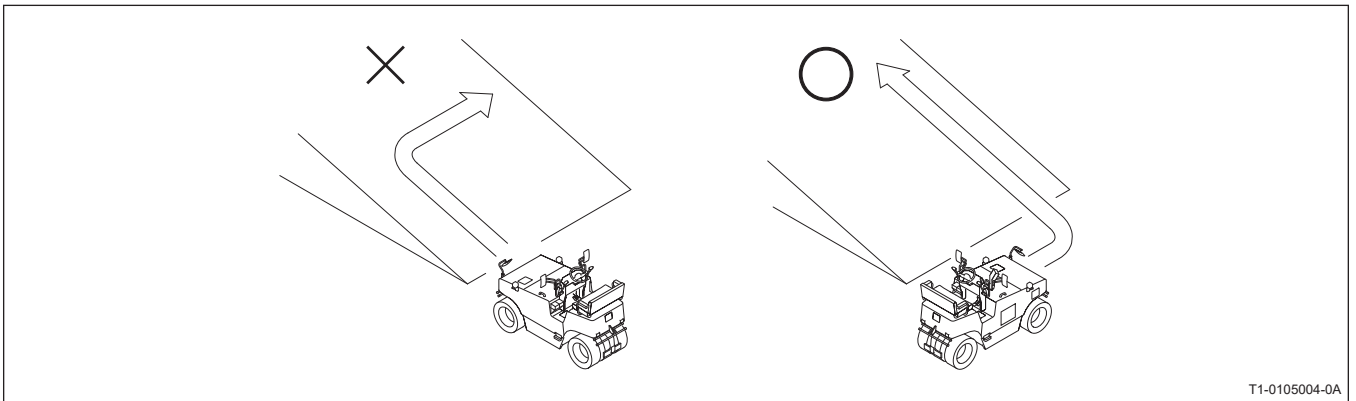
■ On a steep slope, run the machine at low speed

■ When going up or down a slope, run at a steady low speed and do not shift the speed

- Shifting speeds on a slope can cause unexpected running down the slope.
- Going down on a slope at speeds other than low range can cause the machine to get out of control.

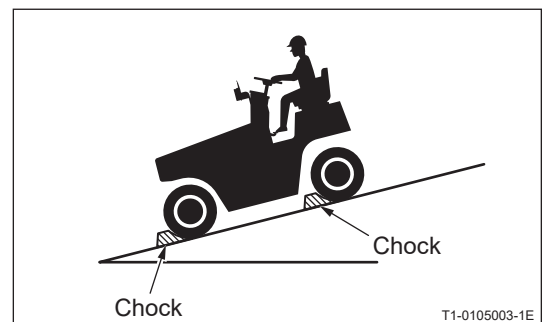


■ Do not make turns on a slope and do not travel across the slope. If necessary to do so, go straight down the slope to the flat ground, move sideways and go straight up to the destination



■ When parking

- Select a level and a hard ground. If necessary to park on a slope, chock the front side of the drums and the tires which are facing the downhill side of the slope.
- When required to park on a public road, provide necessary markings such as flags, barriers and the lighting. However, be sure they do not obstruct the traffic.
- Stop the engine when getting off the machine. Remove the starter key from switch, and store it in a appropriate place.
- Be sure not to get your hands caught when handling the chocks.



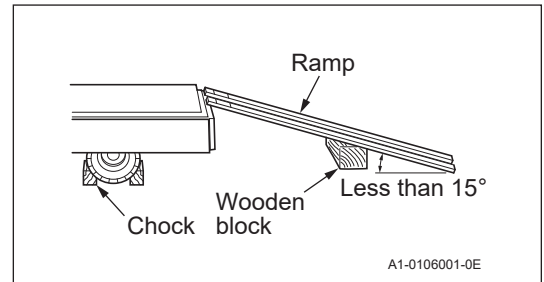
■ **Beware of deformation in tires during long-term parking (If tires installed)**

- The surface of the tires in contact with the ground may become flattened and deformed (forming of flat spots) during the long-term parking.
- The forming of flat spots may cause bounding or shaking during the operation of the machine.
- If flat spots occur, run the machine to restore the circular shape of the tires and improve the situation.
- To prevent the forming of the flat spots during the long-term parking, inflate the tires to a higher pressure within the allowable range and drain the water from the sprinkler tank before parking. Furthermore, move the machine regularly.

1 BASIC PRECAUTIONS FOR SAFETY

1.6 Loading and Unloading

- Loading and unloading can be dangerous. Use extreme care.
- Select a level and hard ground. Leave sufficient distance with the road shoulder blocks.
- Use sturdy ramps with proper width, length and thickness which allow safe loading and unloading. If they deflect considerably under load, apply wooden blocks to reinforce the ramps.
- To prevent your machine from crosswise slippage, keep the ramps free from oil, mud, debris, etc. The drum must also be free from extraneous matter that can cause slippage.
- Do not steer your machine on the ramps. To change or correct the direction, go down the ramps and correct the direction.
- Do not use kinked, twisted or damaged wire ropes for crane or winch operation. Use ones with ample strength.
- When loading is complete, place the wooden blocks under the drums and fasten the chains to the machine to fix properly.



1.7 Transportation

- Follow the required regulations.
- For the transportation route, consider the overall width, height, and weight after the machine is loaded on the trailer.
- Before passing under a bridge or any structure, know the maximum height of the trailer with the machine on it and the clearance with them.

1.8 Towing

- Towing should be carried out in emergency and short distances only.
For long distance, use a truck or a trailer for transportation.
- Do not tow if the braking system has broken down, as it is dangerous.
- Do not perform towing on a slope.
- Tow the machine in accordance with the section on the unloader valve in “2.10 Towing”.
- To tow the machine, use cables with ample strength.
- Do not use twisted, kinked or damaged cables when towing.
- Be sure to attach a wire rope firmly to the towing hook.
- Do not step over the wire rope.
- Keep everyone away from the space between the machine and the towing machine when connecting and while towing.
- Align the connection points of the failed machine and the towing machine in a straight line when connecting the machines.

1 BASIC PRECAUTIONS FOR SAFETY

1.9 Handling the Battery

■ When handling the battery

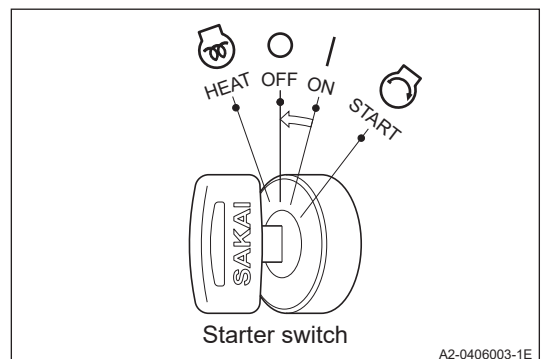
- Refer to “3.3 Periodic Maintenance Points” for information on where to install the battery.
- Battery electrolyte contains sulphuric acid. It will destroy clothing and harm the skin. If it touches your clothing or skin, flush with large quantities of water.
- In case of contact with eyes, flush with clean water and get medical help immediately.
- If swallowed, drink large amount of water and get medical help immediately.
- Wear safety goggles when handling the battery. Wear safety goggles, full face shield, rubber gloves and rubber apron when adding fluids to the battery.
- In poorly ventilated places, do not recharge the battery or bring cigarettes and flames closer to the battery as there is a risk of generating sparks.



⚠ WARNING

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

- Inspect or handle the battery with the engine stopped and the Starter switch in the O position.
- Turn the Starter switch to the O position, then wait at least 30 seconds before removing the battery. If not, an abnormality may arise in the ECM (Engine Control Module).

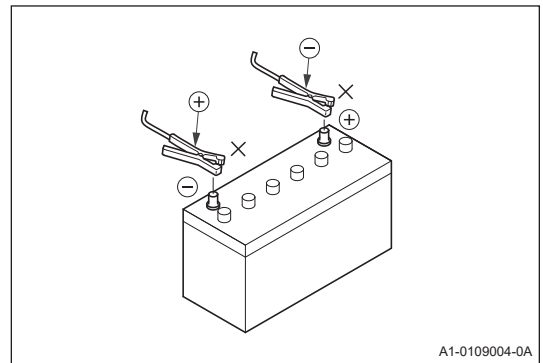


1 BASIC PRECAUTIONS FOR SAFETY

- Keep metallic items such as tools away from the battery terminals.
- Tangled terminals may generate sparks due to improper connections, resulting in the danger of explosions. Make sure terminals are connected firmly.
- The battery is for starting the engine and operating electrical equipment on the machine. Do not use it for any other purpose.
- Do not charge the battery when the top surfaces of the liquids are at the LOWER level (the minimum liquid level) or below. Not only the internal parts of the battery are degraded and the battery lifetime is shortened but also it can cause explosions if you continue to use the battery when the top surfaces of the liquids are at the LOWER level or below. Immediately supply water until the water level is between the UPPER and the LOWER levels.

■ Jump-starting the engine

- Wear safety goggles when jump-starting the machine.
- When starting from another machine, do not allow the two machines to make contact with each other.
- When connecting the battery cables, start with the positive terminal. For disconnection, start with the negative one.
- Do not allow a tool to bridge between the positive terminal and the machine body. This can generate dangerous sparks.
- Do not connect the booster cable to the wrong terminal. Never connect the positive terminal to the negative terminal or the body of the machine.
- Final connection to the engine block of the failed machine may cause sparks. Therefore, the connecting point should be as far as possible from the battery.



1 BASIC PRECAUTIONS FOR SAFETY

1.10 Before Servicing

■ Attach warning tags when servicing the machine

- Serious accidents can occur if the machine is unexpectedly started or controls carelessly by an unauthorized person.
- Perform adequate lockout/tagout procedures. Attach a warning tag at a clearly visible location in the operator's station and insure the key is removed from the Starter switch.

Do not operate.

If not use, keep this warning tag in the tool box.

A1-0110001-0E

■ Setting the chocks

- Before the inspection or the maintenance work, set the chocks in front and behind the roller drum (wheels) to prevent the machine from moving.

■ Use proper tools

- It is very dangerous to use damaged or deteriorated tools or to use the tools for other purposes than intended. Use correct tools for their intended use only.

■ Change safety-related parts at regular intervals

- Change any seatbelt found to be abnormal even if it is within its recommended service interval.
- Change any ROPS found to be abnormal even if it is within its recommended service interval.
- Change any hose found to be abnormal even if it is within its recommended service interval.
- Replace the fuel hose, high pressure hydraulic hoses and the other liquid hoses regularly to prevent fire. Replace the high pressure hoses of the power steering system every two years.
- Refer to "3 PERIODIC MAINTENANCE" for detailed information on the timing of replacements.

Follow the procedures outlined in "3.4 Maintenance Procedure".

Change these parts at recommended service intervals even if found to be normal.

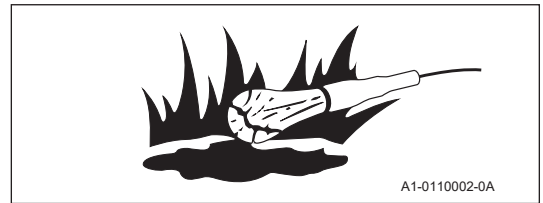
They will deteriorate as time goes on.

■ Make sure the gas dampers are properly maintained (If gas dampers installed)

- Before inspecting the engine room, make sure the gas dampers are firmly stopped and hold the hood. Furthermore, in machines with hood fall prevention stays, make sure they are firmly fixed.

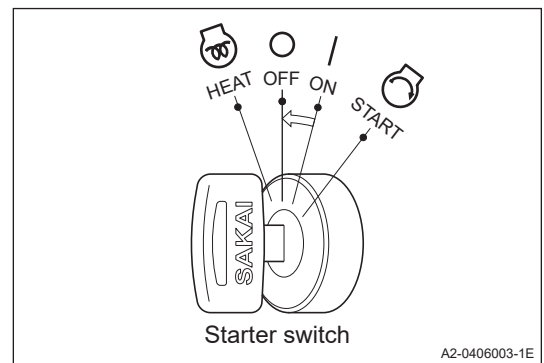
■ Illumination

- For inspecting the level of the fuel, oil, coolant and battery electrolyte, use an explosion-proof lighting. Failure to use this type of lighting can result in an explosion.



■ Inspect or service your machine with the engine stopped

- If required to keep the engine running in a case like radiator interior cleaning, perform the work with two persons. One person should sit on the operator's seat and be ready to stop the engine at any time. He must be careful not to touch the levers that are not necessary. Maintenance personnel must be careful not to touch or caught between the moving parts.



■ Check the coolant level in the radiator

- To check the coolant level, stop the engine and allow the engine and the radiator to cool down before removing the radiator cap. Before removing the cap, cover it with a rag to prevent splashing out of pressurized coolant which may cause burn.

■ Supplying fuel, oils and grease

- Be careful of contaminants entering fluid reservoirs when refilling them.
- Do not cover the filler port when refueling. Refueling a airtight tank might damage the fuel tank.
- Spilled fuel or oil will be slippery. Wipe up immediately. Keep the filler caps tight. Do not use fuel for cleaning. Handle fuel and oil in a well ventilated area.

■ Points to beware of when filling the sprinkler tank with water (For the machines equipped with sprinkler tanks)

- Do not fill the tank with the water inlet blocked. It may damage the sprinkler tank.

1 BASIC PRECAUTIONS FOR SAFETY

1.11 During Servicing

■ Keep unauthorized persons away

- During the service work, do not allow the persons not involved in performing the service to enter the work area, particularly when grinding or welding operation is performed or heavy hammers are being used.



■ Assume an appropriate posture while working

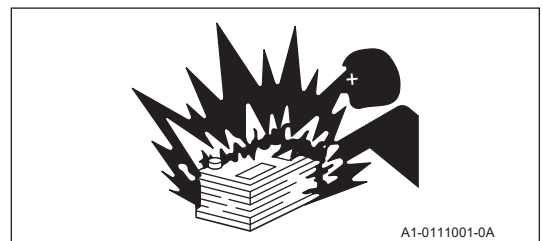
- An unnatural posture during maintenance work may cause injuries. Assume a posture that is appropriate for the work being carried out.

■ Keep your machine clean

- Spilled oil, grease or scattered debris are dangerous. Always keep your machine clean. Moisture that penetrates into the electrical system can cause malfunctions. Do not use water to clean the sensors, connectors and the operator's station.

■ When repairing the electrical system

- Read the warnings in this manual regarding the handling of batteries, and handle them appropriately and safely.
- When repairing the electrical system or welding, disconnect the negative battery terminal, the electronic device and the connectors to shut off the electricity.



NOTICE

Carrying out work while the negative battery terminal, the electronic device and the connectors may cause electric shock, explosions or damage to electronic devices.

■ **Take care not to get caught or crushed**

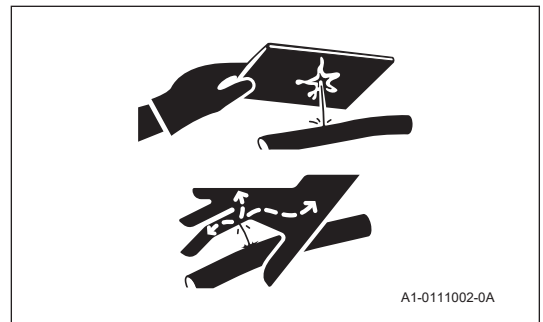
- Be sure to fasten the hood and other covers after opening them to prevent unexpected closing and avoid getting caught between them.
- If there is a need to crawl under the lifted machine, make sure to support it from underneath with a solid prop or block.

■ **Carefully handle high pressure hoses**

- Do not try to bend or hit high pressure hoses against a hard object. Do not use bent or damaged hoses or pipes. There is a risk of burst.
- Replace the damaged fuel hose, hydraulic hoses and the liquid hoses. Spilled of hydraulic oil or any other fluids can cause fire.

■ **Be careful of high pressure hydraulic fluid**

- Bear in mind that the working equipment hydraulic systems are under internal pressure. Do not add, drain, inspect, or service the hydraulic systems until the internal pressure is relieved.



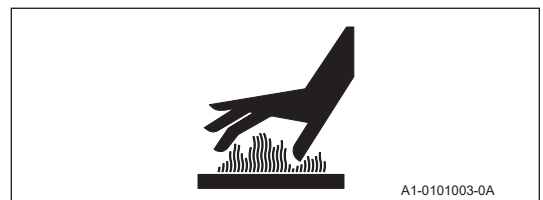
NOTICE

Hydraulic fluid leaking through a fine hole at high pressure can penetrate your skin and eyes. Inspect the leakage by holding a hard board close to the suspected leaking position wearing goggles and gloves. If affected by high pressure oil, get medical help immediately.

■ **Be careful of hot parts**

- The coolant, engine oil and the hydraulic oil become hot after the machine is operated for some time.
- Removing the radiator cap or draining the coolant or oil can cause burn.

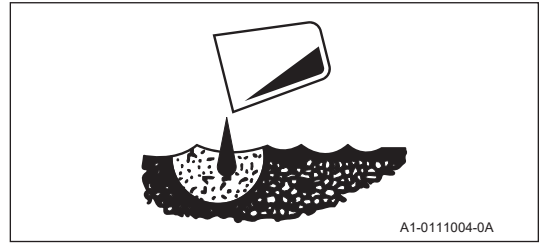
Follow the procedures outlined in “3.4 Maintenance Procedure”.



1 BASIC PRECAUTIONS FOR SAFETY

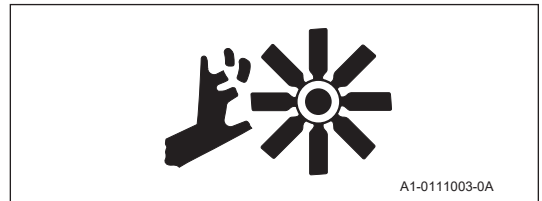
■ Used oil disposal

- Do not throw the used oil into a drain or waterway. Drain the oil from the machine into a proper container. Do not drain directly on the ground.
- Obey the local, state and the federal environment regulations for the proper disposal of oil, fuel, coolant, battery electrolyte or any other fluids.



■ Be careful when inspecting or servicing rotating fans or belts

- Do not wear clothing and accessories that can get caught in moving parts.
- Do not let your body or tools make contact with the fan blades or belts. They can be seriously cut.



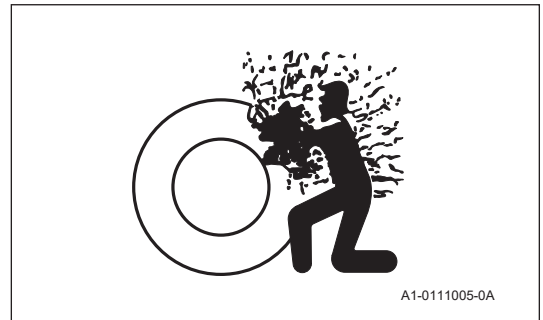
■ Take care in handling the gas damper (If gas dampers installed)

- Never dismantle it.
- Do not throw it into a fire.
- Do not damage the rod.
- Do not bend the tube or rod, or use it as a handle.
- When disposing a gas damper, be sure to fix it firmly and drill a hole around 2 - 3 mm in diameter at about 20 - 30 mm from the edge on the tube bracket side to release the gas pressure. When doing this, be sure to wear a protective goggles because of the risk of scattering oil or chips by the compressed gas inside.

1 BASIC PRECAUTIONS FOR SAFETY

■ Exercise extreme care when replacing and repairing tires (If tires installed)

- Disassembly, repair and reassembly of tires require special facilities and knowledge. Have them repaired at a professional tire repair shop.
- When dismounting a tire, chock the other tires for safety.
- When welding work is carried out near the tires, use extreme care, as this can cause an explosion of the tires.



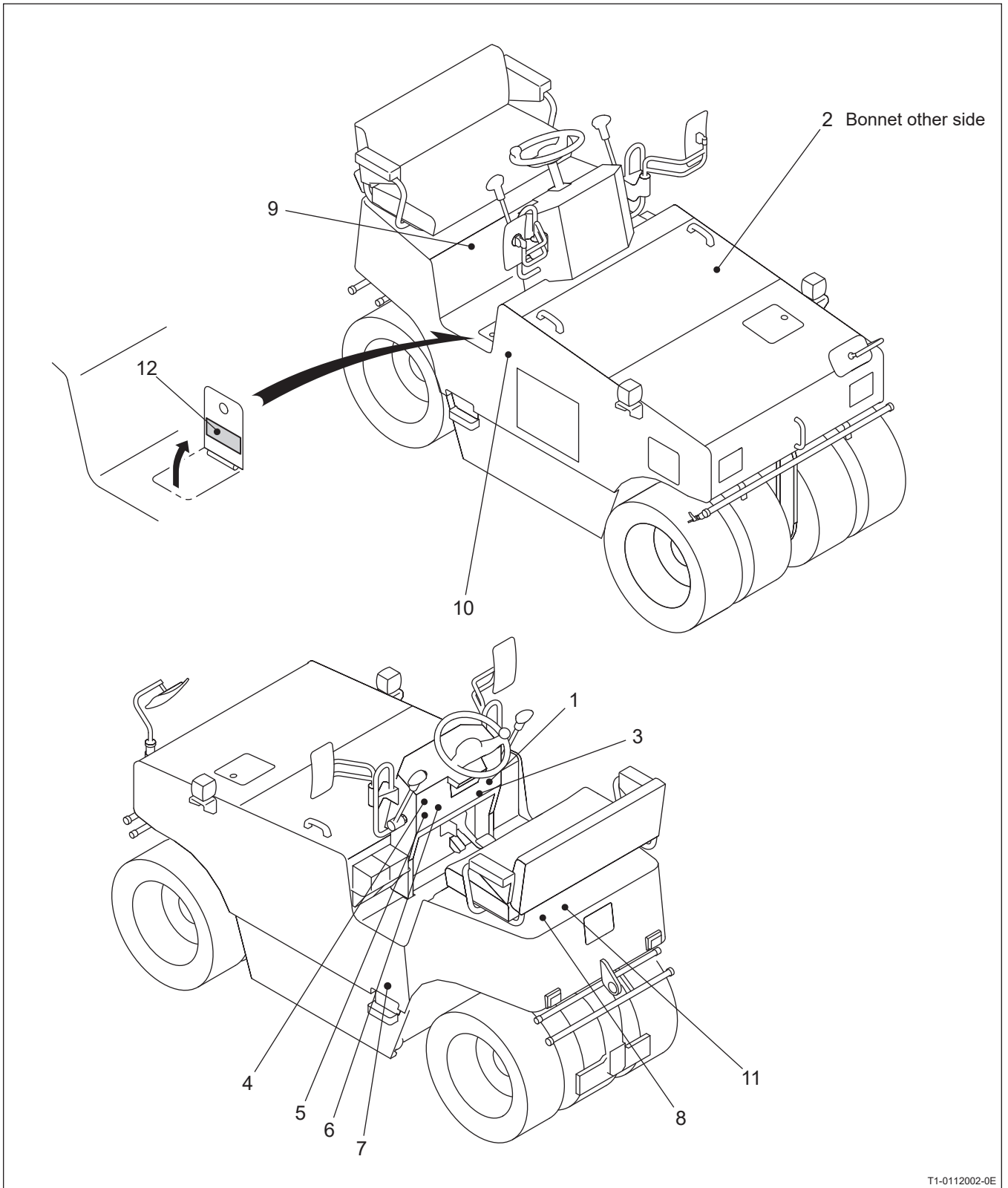
⚠ DANGER

An improperly fitted tire can separate from the rim when inflating and cause serious injury or death.

1 BASIC PRECAUTIONS FOR SAFETY

1.12 Safety Labels


Keep all labels clean. If any label become illegible or is lost, replace with new one.



T1-0112002-0E

1 BASIC PRECAUTIONS FOR SAFETY




1 3998-16504-0

 WARNING
<p>1. When Handling the Machine:</p> <ul style="list-style-type: none"> Operate only while seated. Use the handrails and steps when boarding and getting off. Never carry passengers. Never attempt to board or get off the machine while it is moving. <p>2. Preparation for Safe Operation</p> <ul style="list-style-type: none"> Clean the steps, operator's station and floorboards. Obey the worksite rules. Sakai accepts no responsibility for any injury or damage to the machine caused by unapproved modification. Do not use a machine which needs repair or maintenance. Sound the horn immediately prior to starting the engine to warn people in the vicinity. <p>3. Starting the Engine</p> <ul style="list-style-type: none"> Check that all operating levers are in the neutral position. Idle the engine for about 5 minutes to warm it up prior to commencing work. <p>4. Parking Precautions</p> <ul style="list-style-type: none"> When parking the machine, park it on level ground, set the parking switch and set the roller chocks. Allow the engine to cool off by running it for about 5 minutes before stopping. When getting off the machine, remove the key from the ignition switch.
<small>3998-16504-0</small>


5 3998-16793-0

 WARNING
<p>This product can expose you to chemicals including 1,3-Butadiene and Ethylbenzene, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov</p>
<small>3998-16793-0</small>

8 3998-16501-0

 DANGER
 
<p>Be Careful with Fire</p> <ul style="list-style-type: none"> When refueling, stop the engine and do not smoke. The filter cap of the fuel tank must be kept tight.
<small>3998-16501-0</small>





6 3998-16792-0

 WARNING
<p>Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.</p> <ul style="list-style-type: none"> Always start and operate the engine in a well-ventilated area. If in an enclosed area, vent the exhaust to the outside. Do not modify or tamper with the exhaust system. Do not idle the engine except as necessary. <p>For more information go to www.P65warnings.ca.gov/diesel</p>
<small>3998-16792-0</small>




9 3998-16559-0

DANGER EXPLOSIVE GASES
<p>Cigarettes, flames or sparks could cause battery to explode. Always shield eyes and face from battery. Do not charge or use booster cables or adjust post connections without proper instruction and training.</p> <p>KEEP VENT CAPS TIGHT AND LEVEL</p> <p>POISON CAUSES SEVERE BURNS</p> <p>Contains sulfuric acid. Avoid contact with skin, eyes or clothing. In event of accident flush with water and call a physician immediately.</p> <p>KEEP OUT OF REACH OF CHILDREN</p>
<small>3998-16559-0</small>





2 3998-16502-0

 DANGER
 <ul style="list-style-type: none"> Do not approach, or allow objects to touch the rotating parts. Body parts which make contact with rotating mechanism will be severed.
 <ul style="list-style-type: none"> Do not open the radiator cap when fluid is hot. Radiator fluid is flammable. Avoid exposure to flame when radiator cap has been removed.
 <ul style="list-style-type: none"> Avoid contact with machine parts in the vicinity of the engine while engine is running and after it has been stopped. Contact with hot part will cause burns.
<small>3998-16502-0</small>


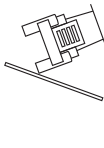
7 3998-16500-0

 WARNING
 
<ul style="list-style-type: none"> Avoid inhalation of exhaust gas. Avoid contact with exhaust pipe while engine is running and after it has been stopped. Contact with hot exhaust pipe will cause burns.
<small>3998-16500-0</small>


10 3998-16499-0

 WARNING
  
<ul style="list-style-type: none"> Do not open the hood with the engine running. Contact with hot parts will cause burns. Contact with rotating parts will cause severe injury.
<small>3998-16499-0</small>


3 3998-16505-0

 DANGER
 <p>Roll Over Prevention</p> <ul style="list-style-type: none"> Do not work in the vicinity of overhanging banks, or on grades steep enough to cause the machine to slide or roll over. Reduce speed prior to making turns. Pay particular attention when operating on uneven surfaces, as the machine may become unstable.
<small>3998-16505-0</small>


11 2998-96001-1

 CAUTION
<p>USE SPECIFIED FUEL ONLY</p> <ul style="list-style-type: none"> Use of other than the specified fuel may result in damage to the engine. Please refer to the manual for details.
<small>2998-96001-1</small>

4 3998-16491-2

 WARNING
<ul style="list-style-type: none"> Read the operator's manual thoroughly before operating the machine. Incorrect operation can cause severe injury or death. It is your responsibility to operate the machine safely.
<small>3998-16491-2</small>

12 1442-19013-0

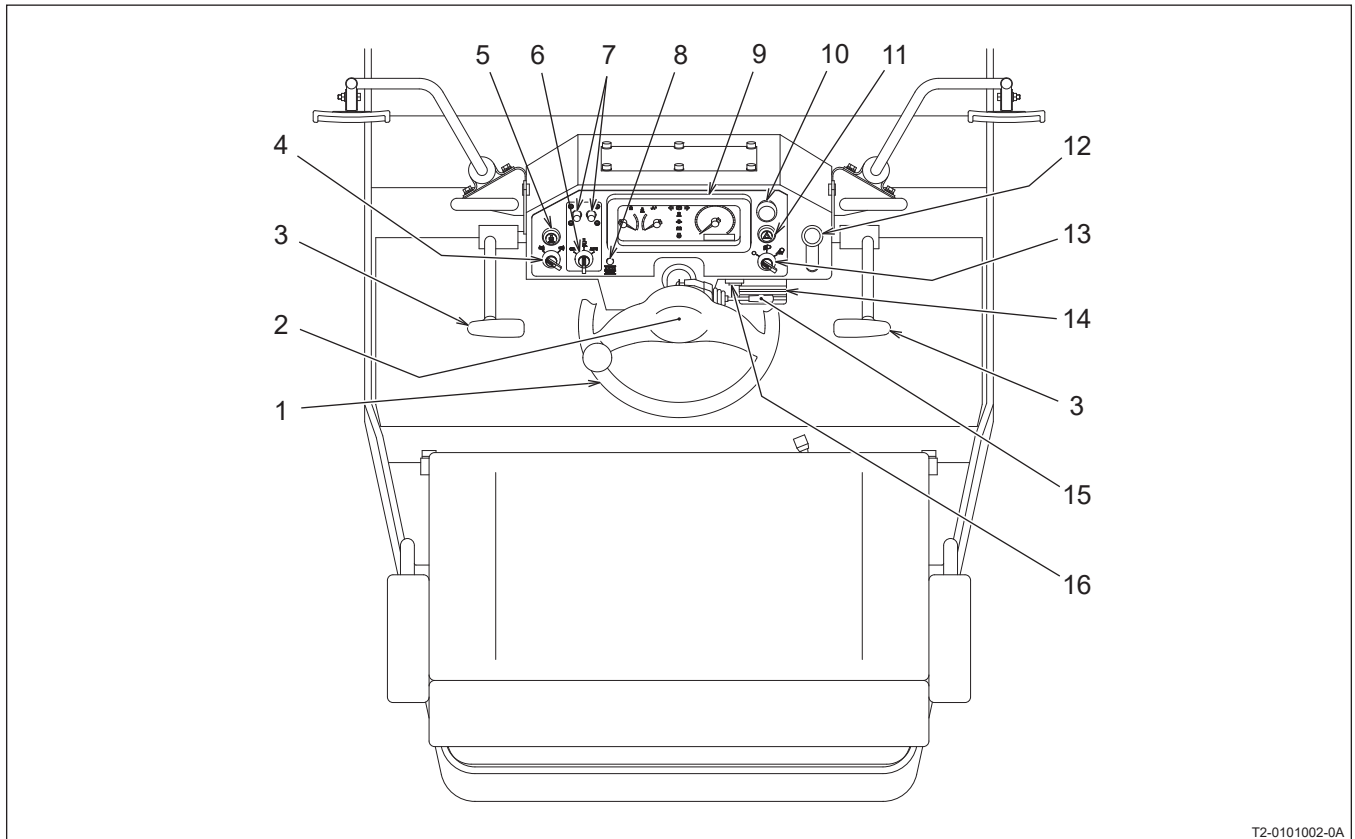
 CAUTION
<p>Under cold conditions where freezing of the anti-adhesion liquid may occur, the entire system including tank, pipes and pump should be drained after operation, in accordance with the procedure outlined in the operation manual.</p>
<small>1442-19013-0</small>

MEMO

2 OPERATION

2.1 Instruments and Controls

2.1.1 Operator's station



T2-0101002-0A

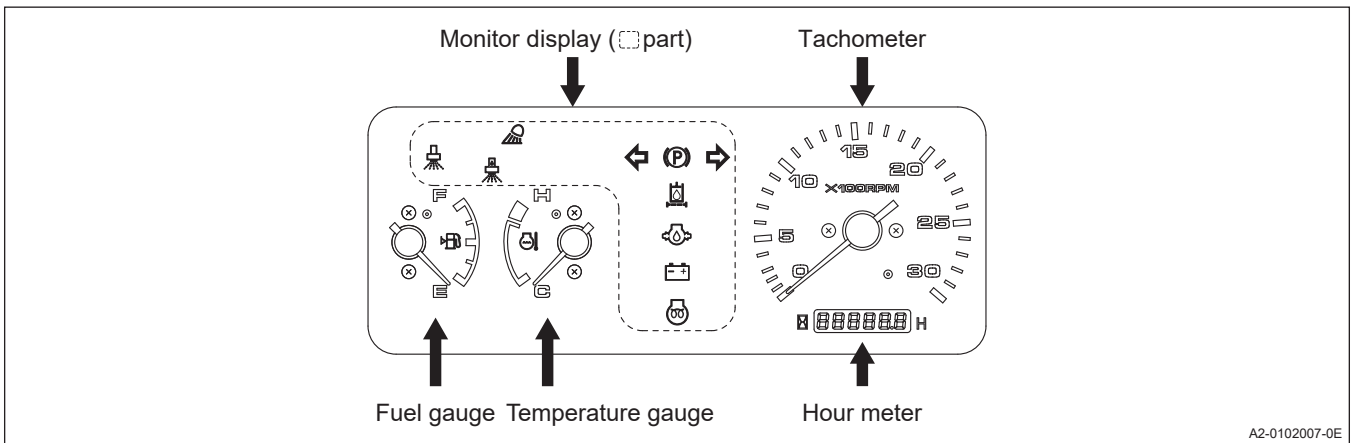
- | | |
|---|-------------------------|
| 1 Steering wheel | 9 Combination meter |
| 2 Horn switch | 10 Parking brake switch |
| 3 Forward-Neutral-Reverse lever
(F-N-R lever) with liquid spray switch | 11 Hazard switch |
| 4 Back buzzer switch | 12 Throttle lever |
| 5 Liquid spray switch | 13 Lamp switch |
| 6 Spray mode selector switch | 14 Brake pedal |
| 7 Spray timer dial | 15 Turn signal lever |
| 8 Eco lamp | 16 Starter switch |

2 OPERATION

2.1.2 Gauges, indicator lamps and warning lamps

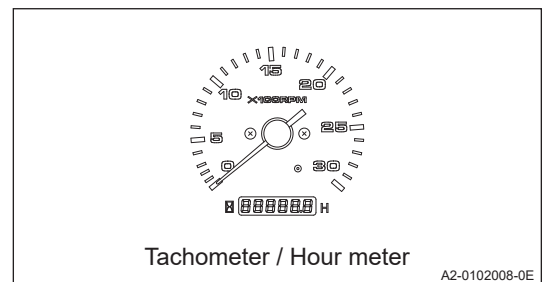
For safe execution of your job, fully understand the role and function of the systems involved.

Combination meter



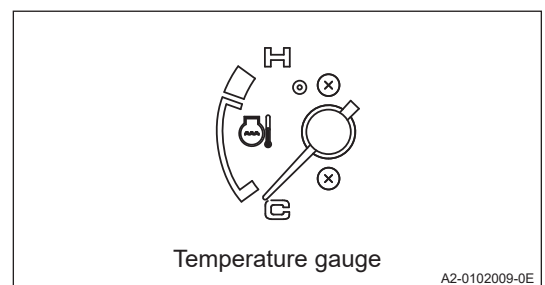
Tachometer / Hour meter

Indicates the engine RPM. The hour meter shows total operating hours. The service interval recommendation in this manual is based on the hour meter readings.



Temperature gauge

Indicates the coolant temperature. Zone close to symbol H indicates overheating. In case of overheating, run the engine at idling speed for about ten minutes before shutting it down. Then determine the cause.



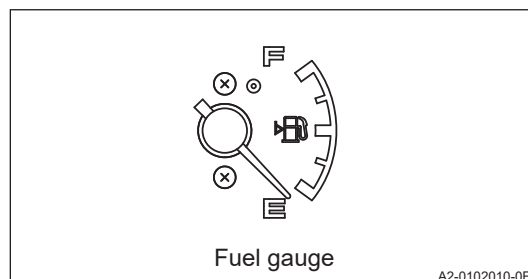
Fuel gauge

Indicates the fuel level in the tank.

E: The tank is empty.

F: The tank is full.

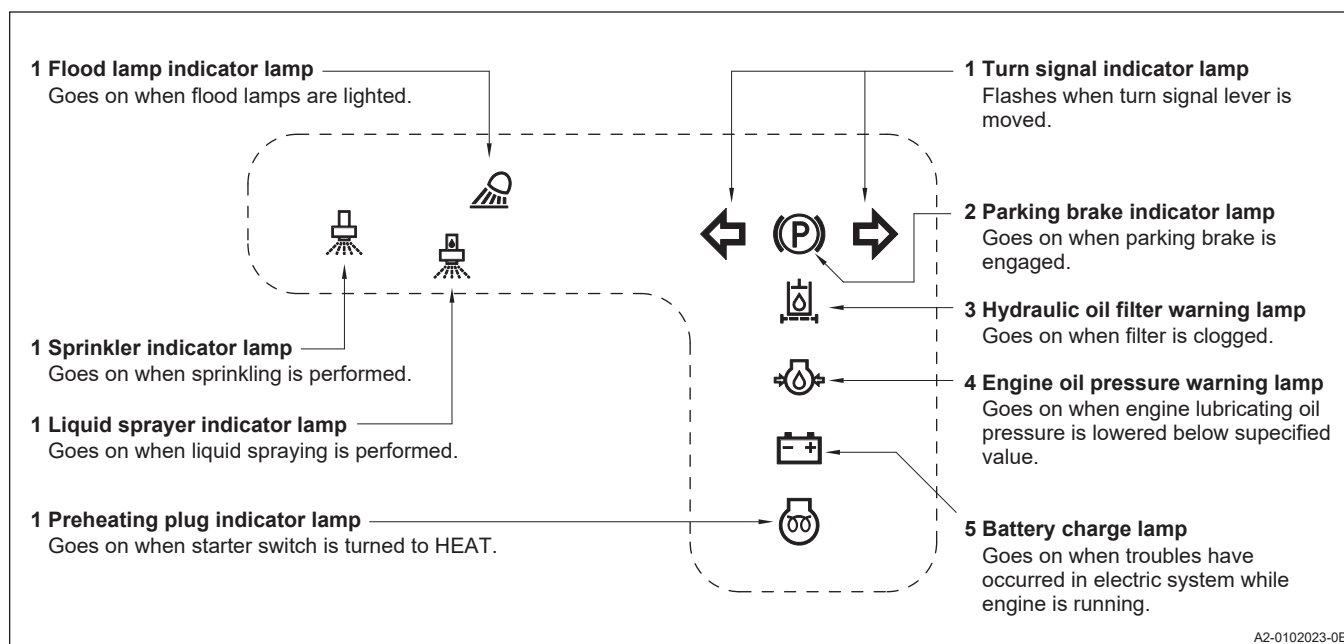
Replenish fuel appropriately before the fuel runs down.



NOTICE

Be sure to use the fuel recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).

Monitor display



1 Indicator lamp []

Display the operation of each corresponding system.

2 Parking brake indicator lamp [(P)]

This flashes once when the Starter switch is turned to the position.

After that it remains on while the parking brake is engaged, and turns off when it is released.

2 OPERATION

3 Hydraulic oil filter warning lamp []

This flashes once when the Starter switch is turned to the I position.

After that it lights up when the hydraulic oil filter is clogged. When it lights up, stop the machine and inspect the cause.

NOTICE

Hydraulic oil filter warning lamp goes on when the engine rpm is increased before the engine gets warmed up adequately. Execute the warm up operation sufficiently by idling the machine and wait until the lamp goes off before starting your work.

4 Engine oil pressure warning lamp []

This turns on when the Starter switch is turned to the I position, and turns off when the engine starts running.

It turns on when the engine oil pressure drops below the specified level during the engine is running. When it lights up, stop the machine and inspect the cause.

5 Battery charge lamp []

This turns on when the Starter switch is turned to the I position, and turns off when the engine starts running.

It turns on when there is an abnormality in the electric charging system during the engine is running. When it lights up, stop the machine and inspect the cause.

NOTICE

- **Checking the warning lamps and Parking brake indicator lamp**

They should turn on when the Starter switch is turned to the I position.

If not, there is some trouble.

Check and repair the combination meter or wirings harness.

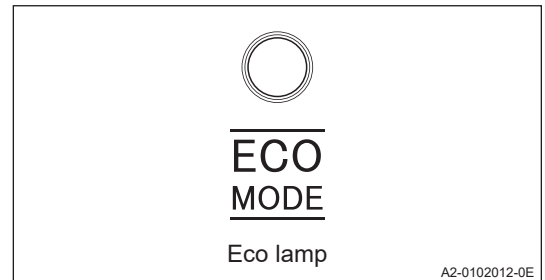
- **The transparent cover of the combination meter**

This may become unclear because of aged deterioration caused by fine sand or dust or ultraviolet light. When any flaw or mist is found on the cover, contact your dealer.

Eco lamp

The Eco lamp will turn on when the engine reaches the required rotation speed.

Fuel efficiency will be high while the lamp is turned on, and work may be carried out with reduced generation of noise. Eco-mode is used during rolling compaction of flat roads.



NOTICE








Rev up the engine when there is a big drop in its rate of revolution during rolling compaction.

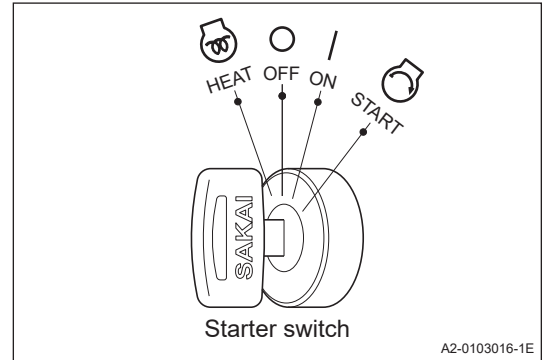
2 OPERATION

2.1.3 Switches

Starter switch

Starts and stops the engine.

-  position : When the engine is cold, hold the Starter switch in the  position, the Preheating plug indicator lamp will go on. Stay in that position until the indicator lamp goes off. Release the Starter switch when the Preheating plug indicator lamp goes off. The key will automatically return to the  position. Turn the key to the START position to start the engine.
-  position : The key can be removed in this position. All the electric systems are switched off. To shut down the engine, move the key to this position.
-  position : The charging circuit and lamp circuit are charged with electricity. Leave the key in the position after starting the engine.
-  position : The engine is cranked and gets started. Release the key the moment when the engine starts. It will automatically return to the  position.







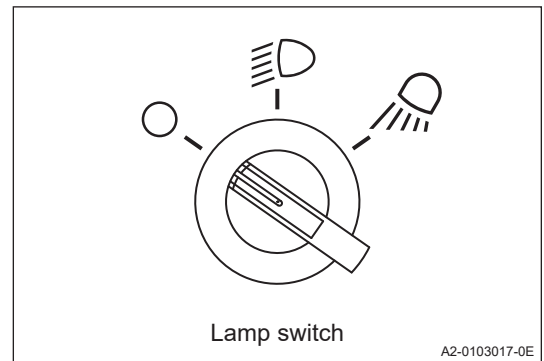
NOTICE

Set the Forward-Neutral-Reverse (F-N-R) lever in the Neutral (N) position and press down the Parking brake switch before starting the engine. Unless these conditions are met, the engine will not start.

Lamp switch

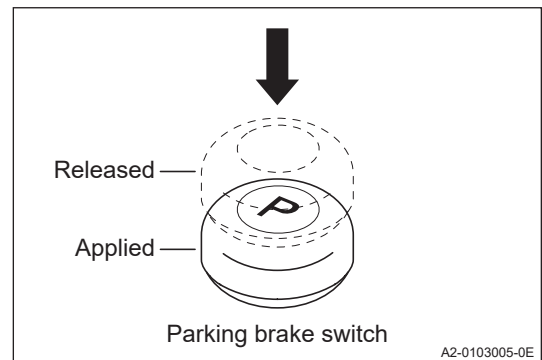
Has three positions.

-  position : All lamps are switched off.
-  position : Each gauge lamp and the headlamps become bright.
-  position : In addition, the flood lamps become bright. At this time, the Flood lamp indicator lamp  will go on.



Parking brake switch

Use it as a parking brake.
Do not use while the machine is moving.
If the switch is pressed down, the parking brake is applied and the Parking brake indicator lamp (P) turns on.
When pressed again, the brake is released and the indicator lamp goes off.



⚠ WARNING

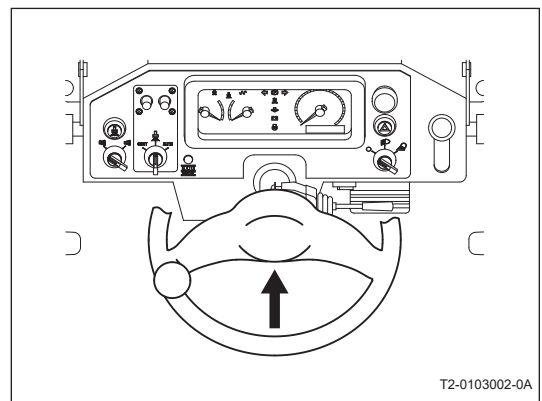
Always press the switch to apply the parking brake before getting off the machine.

NOTICE

- To disengage the brake, be sure to press the switch again.
- Do not pull the switch. It may cause damages.

Horn switch

Pressing the switch at the center of the Steering wheel makes the horn sound.




2 OPERATION

Spray mode selector switch

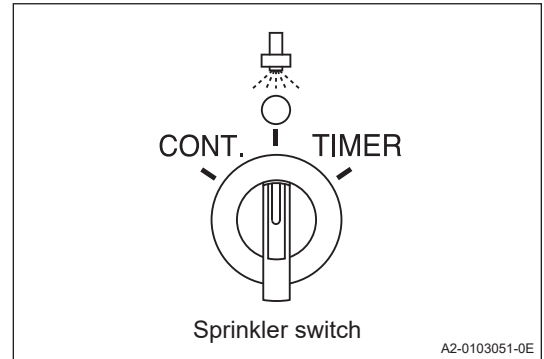
Spray timer dial

The switch selects the sprinkler modes.

CONT. position : Continuous sprinkling is performed, and the indicator lamp  on the Monitor display turns on.

○ position : Sprinkling is shut off, and the indicator lamp goes off.

TIMER position : Intermittent sprinkling takes place.



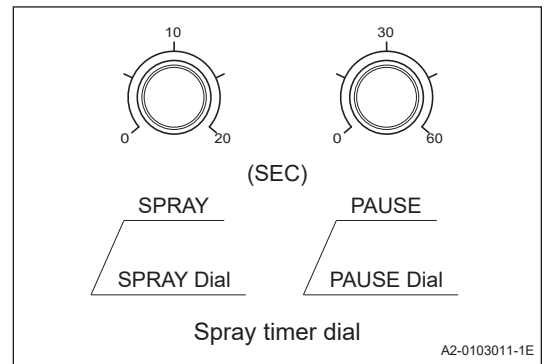
With sprinkler timer dial (SPRAY Dial and PAUSE Dial) set for desired duration, turning the Spray mode selector switch to TIMER position enables intermittent sprinkling action (sprinkling with timer).

Sprinkling duration can be adjusted within 0 - 20 seconds with SPRAY Dial. Idling duration can be set within 0 - 60 seconds by PAUSE Dial.

Adjust the dials to meet job conditions.

Intermittent sprinkling can reduce sprinkling volume, which is expected to save water.


The indicator lamp  on the monitor display will only turn on while water is being sprinkled.

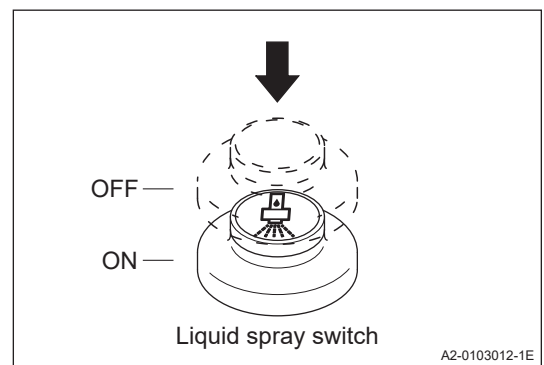


Liquid spray switch

Liquid is sprayed when the switch is pressed.

Spraying is shut off if the switch is released.

While the liquid is being sprayed, the Liquid sprayer indicator lamp  of the liquid lights up.





NOTICE

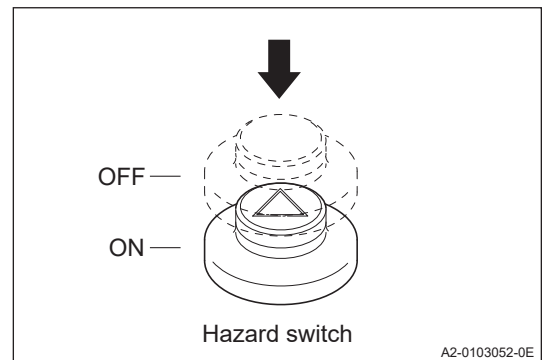
Driving the liquid spray pump with the liquid tank empty will damage the pump.

Pay attention to the liquid level in the tank.

Hazard switch

Pushing the switch causes Turn signal lamp and turn signal indicator lamp  /  start to flash simultaneously.


Pushing the switch again causes the lamps to go off.




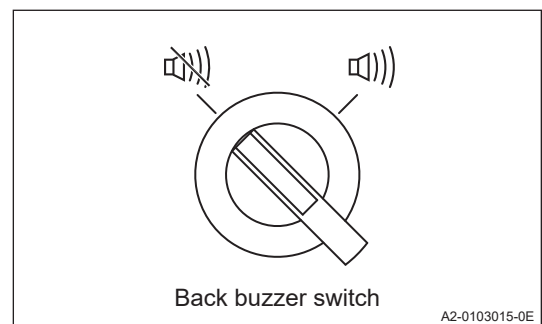
Back buzzer switch (option)

The warning buzzer may be turned off while reversing by operating this switch.



Select the mode to suit the conditions at the construction site.

 position : The warning buzzer sounds while reversing.

 position : The warning buzzer turns off.





⚠ WARNING

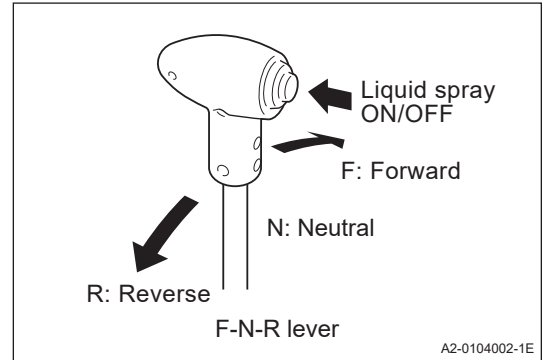
- Set it to the  position unless the work (driving) requires otherwise.
- When setting it to the  position, take adequate care to ensure the safety of others around you.

2 OPERATION

2.1.4 Operating levers and pedals

Forward-Neutral-Reverse lever (F-N-R lever) with liquid spray switch



Moving the F-N-R lever forward or backward makes the machine travel forward or backward. The Neutral (N) position brings the machine to a stop. The machine speed increases or decreases in proportion to the amount of lever movement. Depressing the switch  causes spraying of liquid to start, with indicator lamp  of monitor display going on. Releasing it causes spraying action to stop automatically.





NOTICE

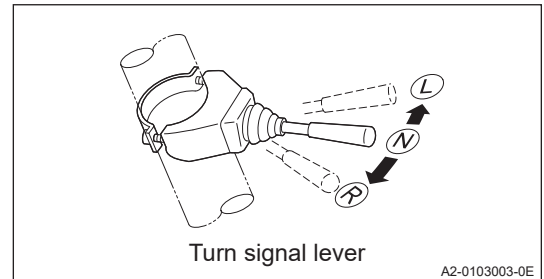
- For normal braking, return the F-N-R lever back to Neutral (N) position.
- In an emergency, depress the Brake pedal.
This provides a quick braking with the F-N-R lever brought to the Neutral (N) position through a mechanical linkage.

Turn signal lever

Turn signal lamp flashes and turn signal indicator lamp  /  start to flash simultaneously when the Turn signal lever is operated.

Tilt forward : Use when turning left. The left turn signal lamp and Turn signal indicator lamp  on the monitor display will flash.

Tilt backward: Use when turning right. The right turn signal lamp and Turn signal indicator lamp  on the monitor display will flash.

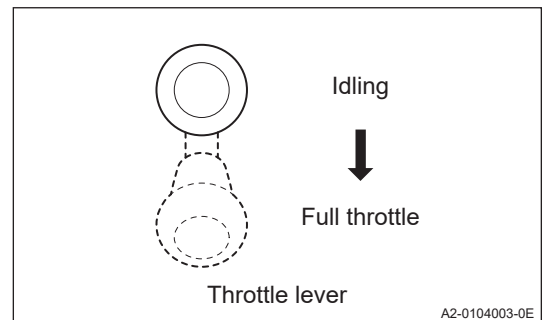


NOTICE

The lever does not return to the OFF position even if the Steering wheel is turned back.

Throttle lever

Shifts the engine RPM.
The engine RPM increases when moved toward the operator.



Brake pedal

Use it in emergencies. Carry out inspections in accordance with "3.3 Periodic Maintenance Points" after each use.

When the pedal is fully depressed in an emergency, the machine will suddenly stop.

NOTICE

- **Do not use the pedal wherever practicable except for an emergency. If used during the compacting operation of asphalt pavement, this can cause damage to its surface.**
- **Depressing the Brake pedal brings the F-N-R lever into the Neutral (N) position.**

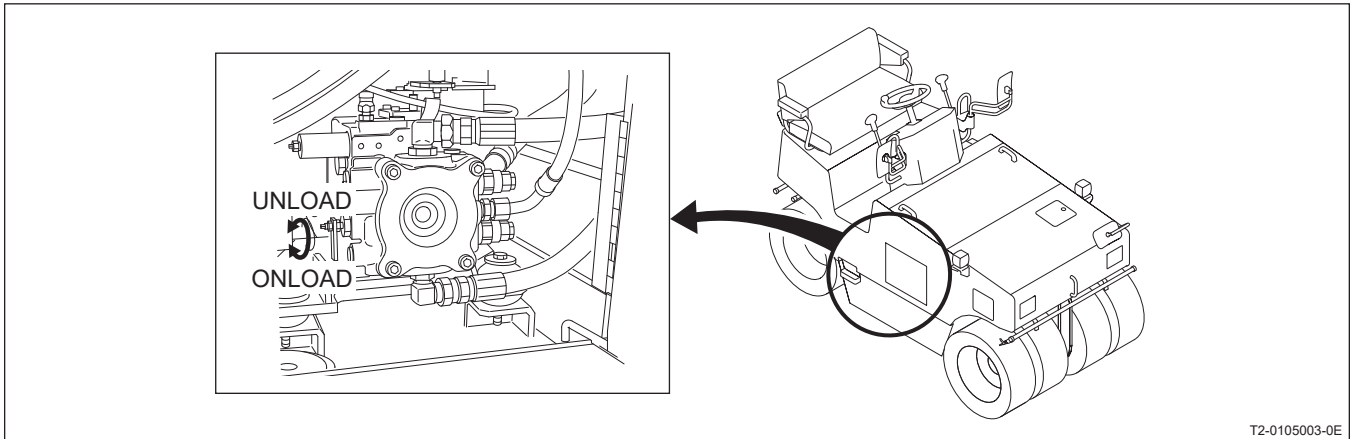
2 OPERATION

2.1.5 Unloader valve

The Unloader valve disengages the drive, similar to a clutch. Use this valve for towing the machine when the engine or the hydraulic drive is failed.

For towing : Turn the valve counterclockwise (UNLOAD).

For normal traveling: Turn the valve clockwise (ONLOAD).



⚠ WARNING

- On a slope, chock the wheels and use extreme care when using the Unloader valve and towing the machine.
- Unloading the Unloader valve will disengage the engine, so never get in front or behind the machine.

NOTICE

For normal travel, be sure that the Unloader valve is in the ONLOAD position.

2.1.6 Fuse box

⚠ CAUTION

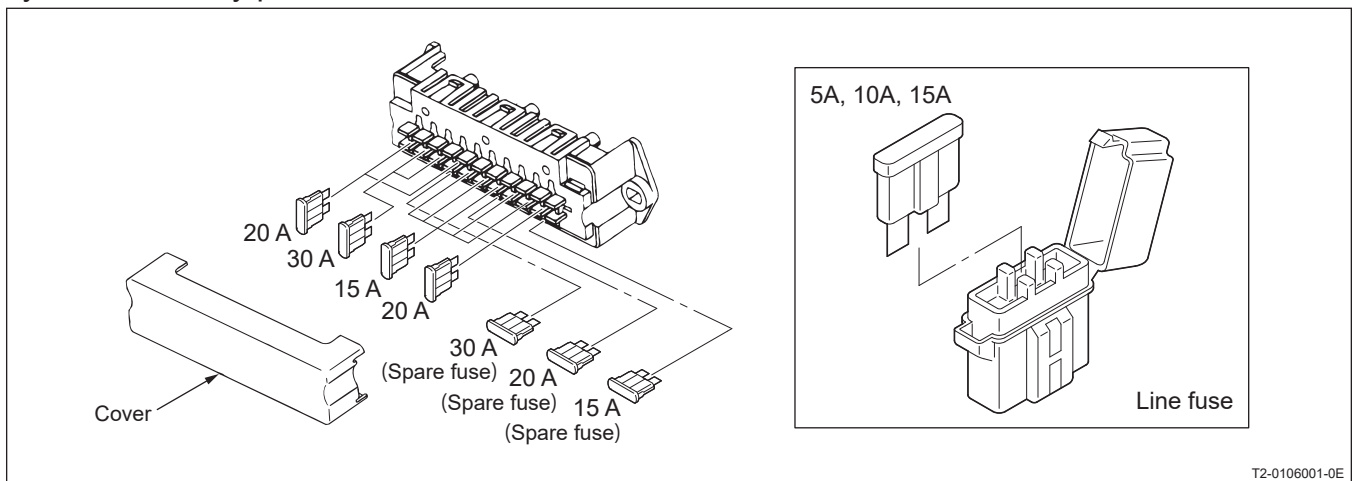
- When changing a fuse, cut the power supply by turning the Starter switch to the **○** position.
- Use fuses of correct capacity. Using the wrong fuses may cause fires.

Fuses protect the electrical components and wiring from burning. Change any fuse which is deteriorated (powder-coated) or the connection is loose with the fuse holder.

To replace fuses, take off the cover.

Be sure to use the fuses of correct capacity.

Using improperly rated fuses may result in poor machine performance, damage to the electrical system, or safety problems, such as an electrical fire.



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2 OPERATION

2.1.7 Fusible link

⚠ CAUTION

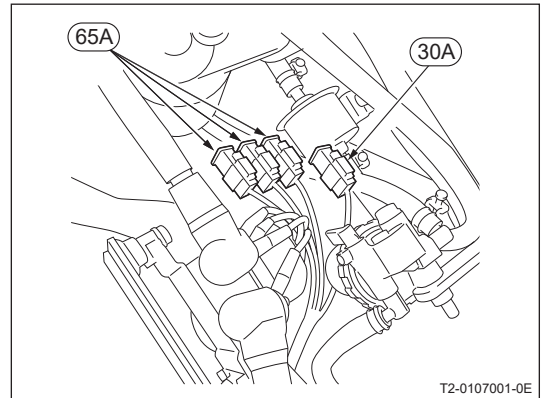
- **When changing a fusible link, cut the power supply by turning the Starter switch to the \bigcirc position.**
- **Use fusible link of correct capacity. Using the wrong fusible link may cause fires.**

As with ordinary fuses, this protects electronic equipment and circuits from burnouts.

If the starter does not turn on when the Starter switch is turned to the **I** position, there is the possibility of a fusible link burnout caused by problems with the electronic equipment or circuits.

Inspect and replace the fusible link after inspecting the electronic equipment and circuits.

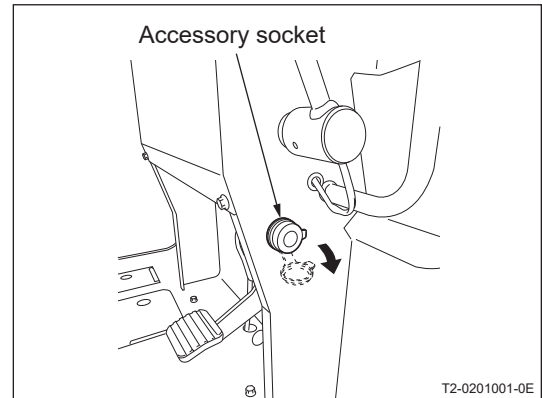
Be sure to replace the fusible link with one of the same capacity.



2.2 Handling

2.2.1 Accessory socket

The Accessory socket can be used by setting the Starter switch to the **I** position. Open the cover of the socket and 12 V DC current can be taken out as a power source for the electronic equipment.



⚠ WARNING

When connecting electronic equipment to the Accessory socket, make sure it does not interrupt the forward and reverse movement of the F-N-R lever.

NOTICE

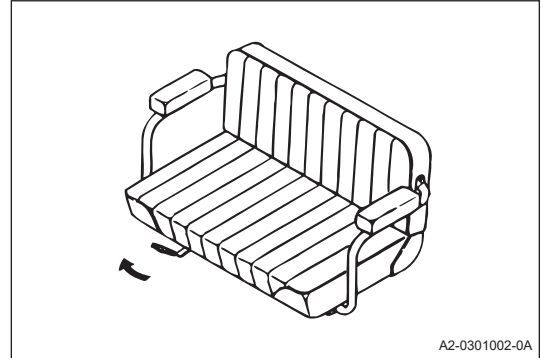
- Use electronic equipment with power consumption of 120 W (12 V, 10 A) or less.
- When not in use, be sure to close the cover tightly to prevent water and dust from entering the socket. If water gets inside, it may cause rust or breakdowns.
- If the socket is exposed to water or condensation, be sure to turn off the power (by turning the Starter switch OFF) before wiping it with a soft and dry cloth.
- There is a possibility of the battery running flat when the Accessory socket is used for a long time to power the electronic equipment with the engine turned off or idling.

2 OPERATION

2.3 Adjustments

2.3.1 Seat

Adjust the seat for your best operating position. Move the lever as shown by arrow. With the lever held in that position, slide the seat forward or backward as desired. When properly adjusted, release the lever.



⚠ WARNING

- **Be sure to wear the seatbelt during the operation.**
- **Do not adjust the seat while driving the machine.**
- **Stop the machine on a flat surface to adjust the seat.**
- **Do not pinch your fingers, hands or legs while adjusting the seat.**
- **Sit and adjust the seat so that your back is in close contact with the backrest of the seat when depressing the Brake pedal fully.**
- **Also make sure to adjust the seat so as to be able to firmly step on the Brake pedal when you twist your body to look back in order to move the machine backwards.**
- **Unexpected accidents may occur if the seat is not fixed completely and it's in the sliding state.**

Before moving the machine, make sure that the seat is completely fixed after making proper adjustments.

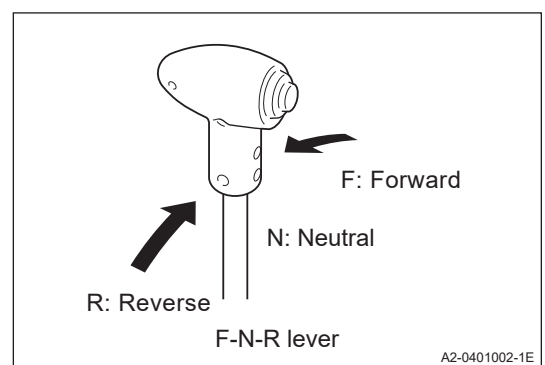
2.4 Operation

⚠ WARNING

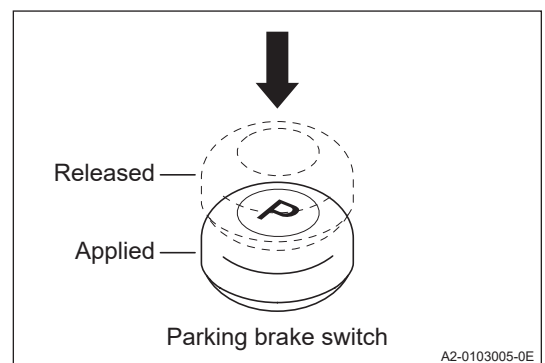
- This machine is a one-man roller.
- Operate the machine from the operator's seat.
- Be sure to wear the seatbelt during operation.

2.4.1 Inspection before starting

1) Check that the F-N-R lever is in the Neutral (N) position.



2) Confirm that the parking brake is engaged.



NOTICE

When the F-N-R lever is not in the Neutral (N) position, or the parking brake is released, the interlocking system will be operated and the engine will not start.

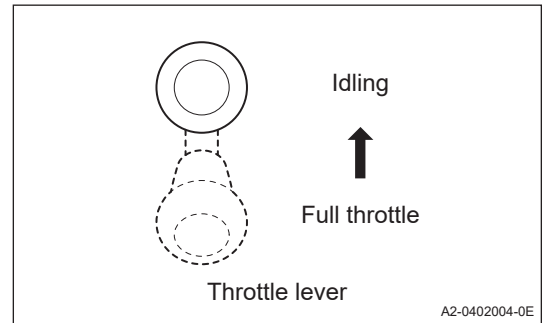
2 OPERATION

2.4.2 Starting the engine

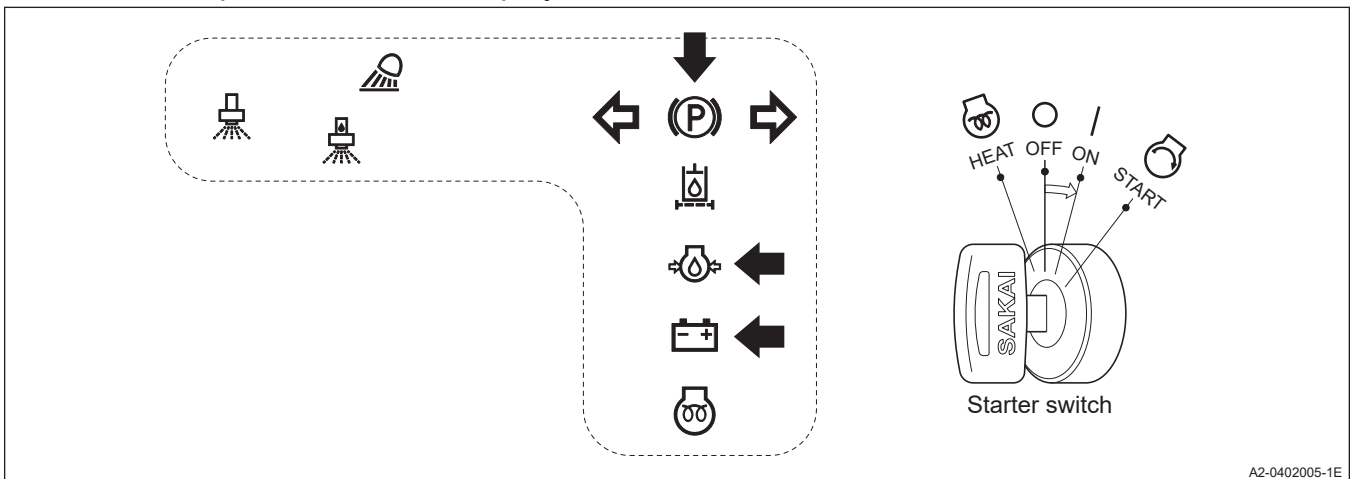
⚠ WARNING

Check that there are no people or obstacles around the machine and beep the horn before starting the engine.

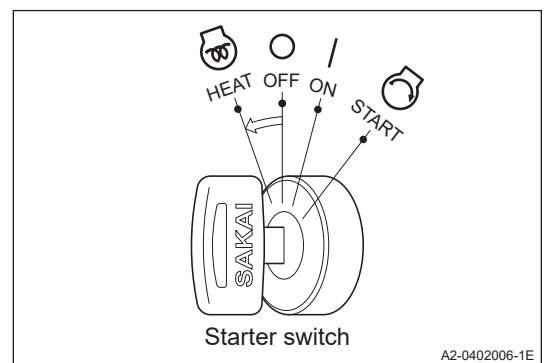
1) Set the Throttle lever in a IDLING position.




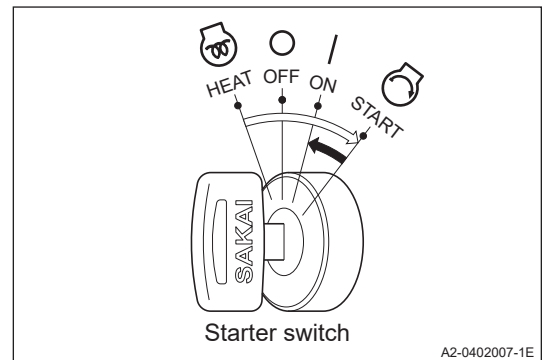
2) Turn the Starter switch to the **|** position and check that the warning lamps and Parking brake indicator lamp on the Monitor display turn on.




3) In cold weather, hold the Starter switch in the **⚠** position until the indicator lamp **⚠** goes on. Let the Starter switch key to stay in this position till the indicator lamp goes off. Now the engine is ready to start.



- 4) Turning the key to the  position makes the engine start. Release the key the moment the engine is started. The key will automatically return to the **I** position.



NOTICE

- Do not keep the Starter switch key at the  position for more than 15 seconds.
- When the engine fails to start, or you want to restart the engine immediately after turning it off, wait around 30 seconds before restarting it.
- Check that the warning lamps on the Monitor display turn off immediately after the engine is started. If any of these warning lamps stay on while the engine is running, shut down the machine, determine the cause and fix the fault.

2 OPERATION

2.4.3 After starting the engine

Do not move the machine immediately after starting the engine.
Perform the following steps.

NOTICE

Avoid increasing the engine speed abruptly before the warming up is completed.

- 1) Run the engine at around $1,200\text{min}^{-1}$ (rpm) for about 5 minutes to warm up. The warming up run allows the lubricating oil to reach the vital parts of the engine and the hydraulic system and gradually warming up the engine, the engine oil and the hydraulic oil to prepare the machine for driving.
- 2) After the warming up operation, check that:
 - Temperature gauge Pointer stays near the center zone
 - Fuel gauge Pointer stays between the E and F marks
 - Battery charge lamp turned off
 - Engine oil pressure warning lamp turned off
- 3) Check for the color of exhaust gas, listen for unusual sounds and vibration. If abnormal, determine the cause and correct the problem.

WARNING

Stay in driver's seat while starting the engine and during the operation.

2.4.4 Traveling

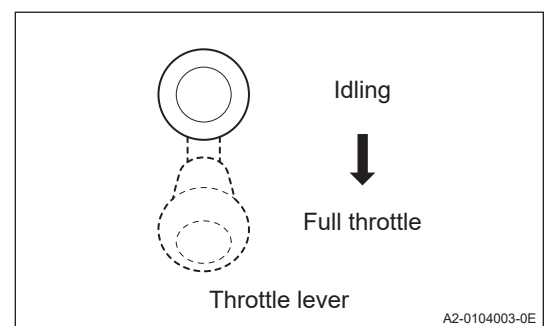
⚠ WARNING

- When starting to move, operate the horn after securing the safety around the machine.
- Be sure to wear the seatbelt during operation.

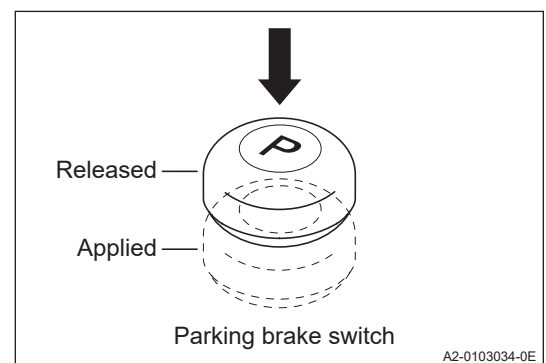
NOTICE

While traveling, do not turn the Starter switch to the \bigcirc position.

- 1) Speed up the engine by pulling the Throttle lever towards you.



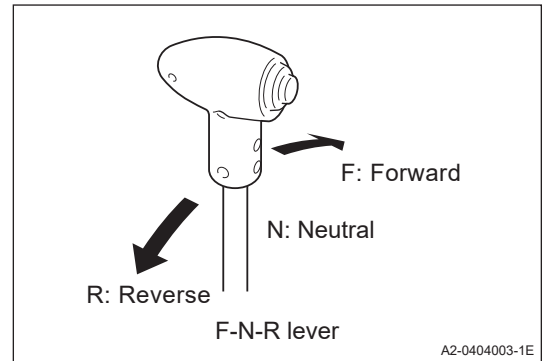
- 2) Press down the Parking brake switch to release the brake. Check that the Parking brake indicator lamp (P) on the Monitor display turns off.

**NOTICE**

Do not pull the switch. It may damage the switch.

2 OPERATION

3) Move the F-N-R lever in the direction you want to travel, and the machine will start traveling.



⚠ WARNING

- Pay extreme attention to the area behind the machine when reversing, since the space just behind the machine tends to be a blind spot.
- Pay careful attention to your surroundings and maintain the control of the machine when changing the switches. Whenever possible, stop the machine to change the switch settings before continuing the operation.

NOTICE

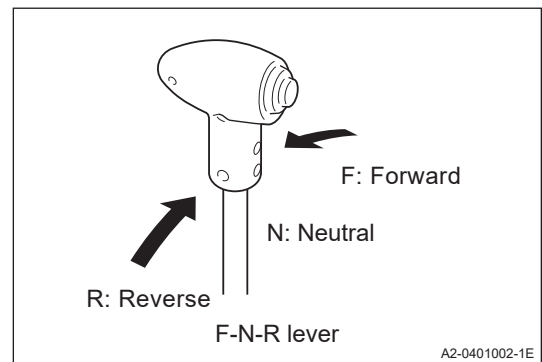
- Do not operate the F-N-R lever quickly.
- The travel speed can be controlled by the Throttle lever and F-N-R lever.
- Increase the engine RPM when starting of the machine and when the engine speed drops drastically while driving.

2.4.5 Braking and parking

⚠ WARNING

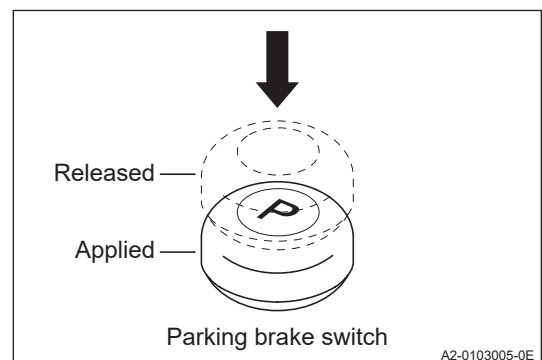
- Avoid abrupt braking. Leave enough space from other vehicles or objects for braking safely.
- Avoid parking on a slope.
If necessary to park on a slope, chock the tires or roll to prevent unexpected moving down the slope

1) Move the F-N-R lever to the Neutral (N) position, and the machine will come to a halt.

**NOTICE**

- For normal braking, move the F-N-R lever back to the Neutral (N) position.
- In an emergency, depress the Brake pedal. This provides a quick braking with the F-N-R lever brought to the Neutral (N) position through a mechanical linkage.

2) Press the Parking brake switch securely, and check that the Parking brake indicator lamp (P) illuminates.

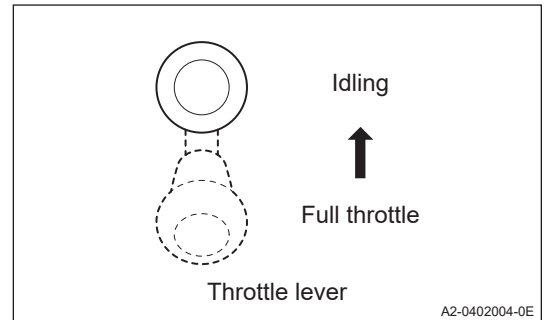
**NOTICE**

Do not pull the switch. It may damage the switch.

2 OPERATION

2.4.6 Stopping the engine

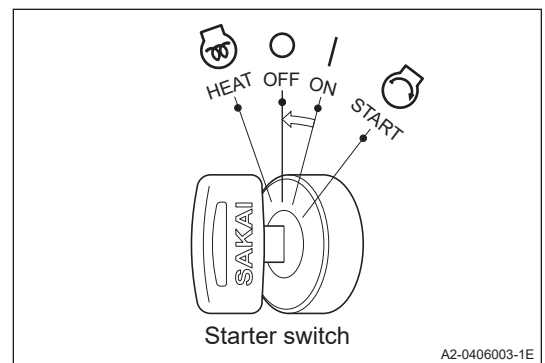
- 1) Set the Throttle lever in a IDLING position, wait for about 5 minutes with the engine idling to gradually cool down the engine.



NOTICE

- Do not bring a hot engine to a sudden stop except in an emergency. This will shorten the life of its component parts.
- Do not also allow an overheated engine to come to a sudden stop, but run it at middle idling speed for gradual cooling down.

- 2) Turn the Starter switch to the O position to stop the engine.



NOTICE

While traveling, do not turn the Starter switch to O position.

- 3) Remove the Starter switch key.

⚠ WARNING

- When dismantling from the machine, apply the brake by pressing the Parking brake switch. If necessary to park on a slope, chock the wheels to prevent unexpected moving down the slope.
- Never fail to remove the Starter switch key when leaving the machine.

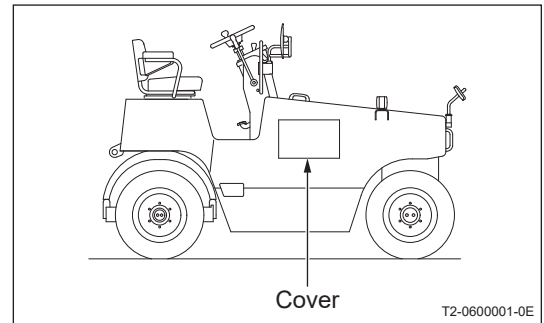
2.4.7 Check after stopping the engine

- 1) Perform the walk-around checks for oil and water leakage, and abnormal signs around the tires.
- 2) Fill the fuel tank.
- 3) Remove waste paper if any from the engine compartment, as this will pose a possible fire hazard.
- 4) Scrape mud or other materials from and around the tires.
- 5) When transporting the machine, please strictly comply with all applicable laws and regulations.

2 OPERATION


2.5 Water Spray System

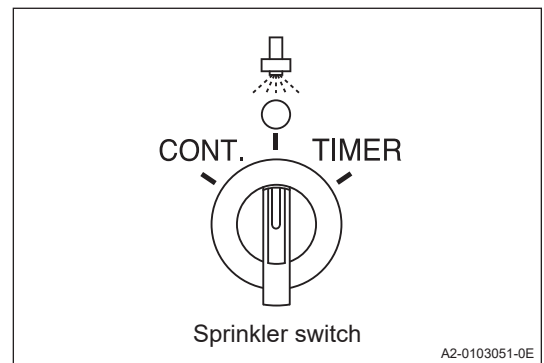
- 1) Before turning Water Spray System on, check for the water level in the sprinkler tank. Add water as necessary.
Open the cover on the right side of the machine and remove the cap on the sprinkler tank to check the quantity of water.




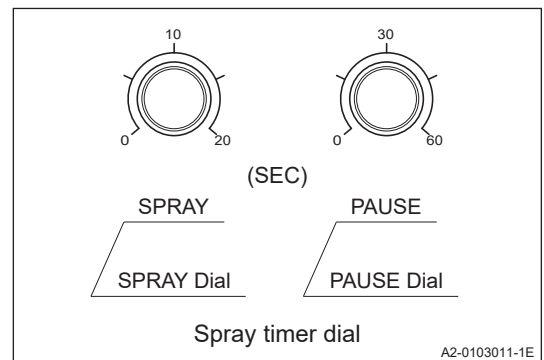
NOTICE

Use clean water wherever practicable.

- 2) The switch selects the sprinkler modes; continuous sprinkling mode or intermittent sprinkling mode.
CONT. position : Continuous sprinkling is performed, and the indicator lamp  on the Monitor display turns on.
○ position : Sprinkling is shut off, and the indicator lamp goes off
TIMER position : Intermittent sprinkling takes place.



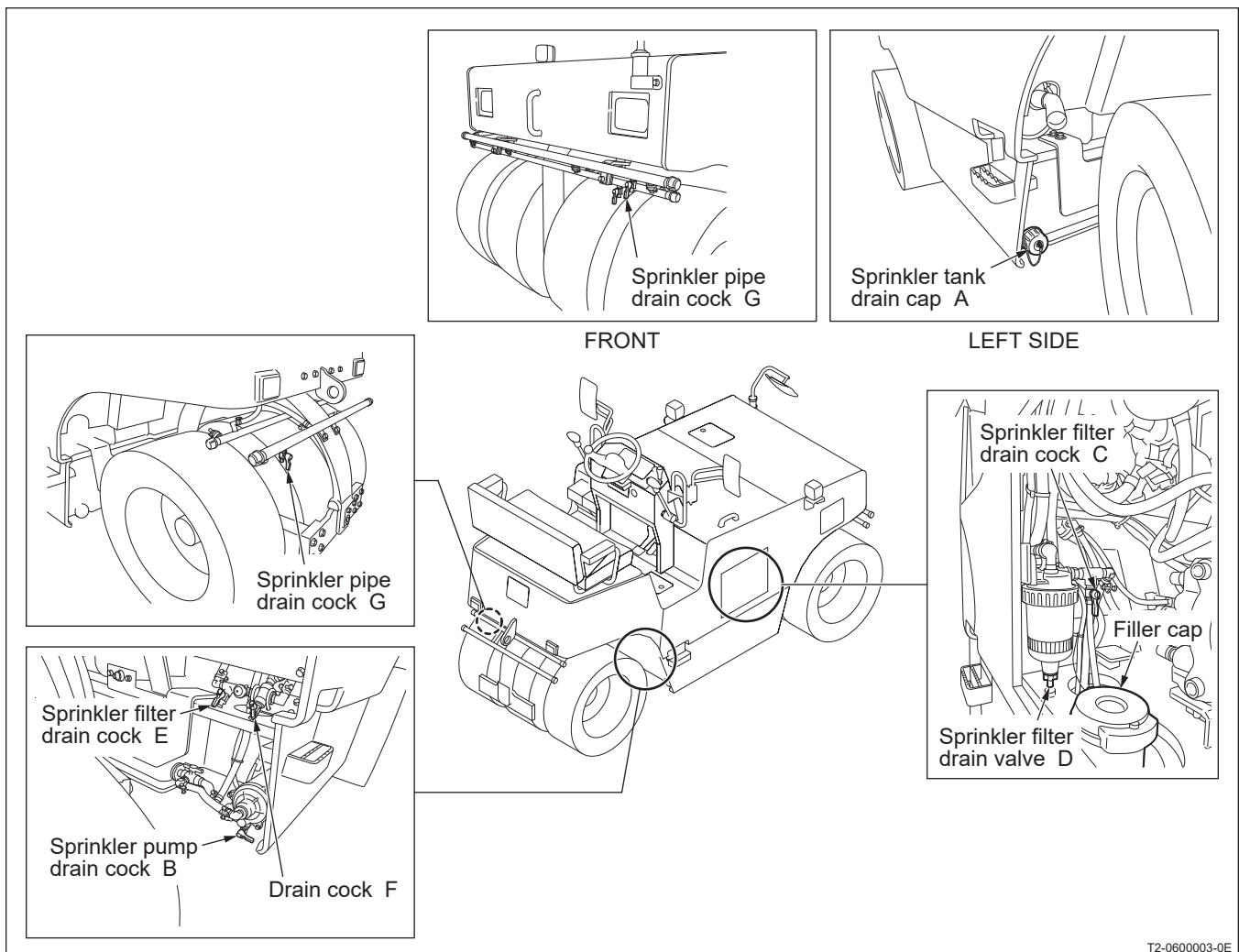
For intermittent sprinkling, set the sprinkling time in following procedure:
Sprinkling duration can be adjusted within 0 - 20 seconds with SPRAY Dial. Idling duration can be set within 0 - 60 seconds by PAUSE Dial. Adjust the dials to meet job conditions.
Intermittent sprinkling can reduce sprinkling volume, which is expected to save water.
The indicator lamp  on the Monitor display will only turn on while water is being sprinkled.



NOTICE

When beginning rolling compaction of the asphalt, turn the water sprinkler switch to CONT. and switch it to TIMER when the surface to be rolled has become completely wet. Repeat the procedure when starting rolling compaction even after short breaks.

2.5.1 How to sprinkle water

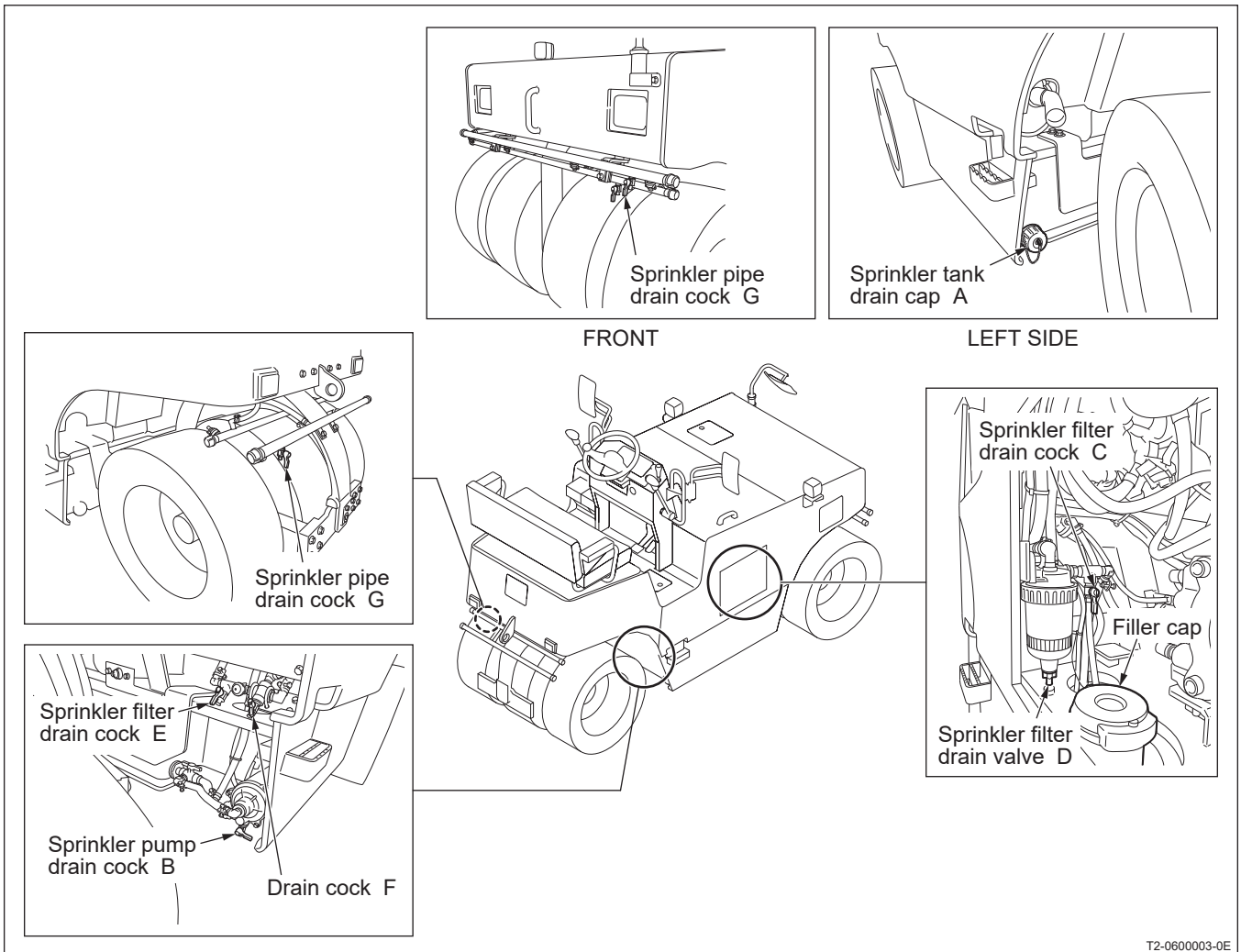


T2-0600003-0E

- 1) Turn the Sprinkler tank drain cap (A) clockwise, attach the drain cap, and fill the tank with water.
- 2) Operate the sprinkler pump and check the cocks and valves in the following order. Open and close each valve and cocks, and after confirming water is flowing from each location, close them.
 - 2)-1 Sprinkler pump drain cock (B)
 - 2)-2 Sprinkler filter drain cock (C)
 - 2)-3 Sprinkler filter drain valve (D)
 - 2)-4 Sprinkler filter drain cock (E)
 - 2)-5 Drain cock (F)
- 3) Make sure that water is coming out of the front and rear Sprinkler pipe drain cocks (G) and then close them.
- 4) Open and close the Sprinkler filter drain cock (C) several times to release any air inside the filter.

2 OPERATION

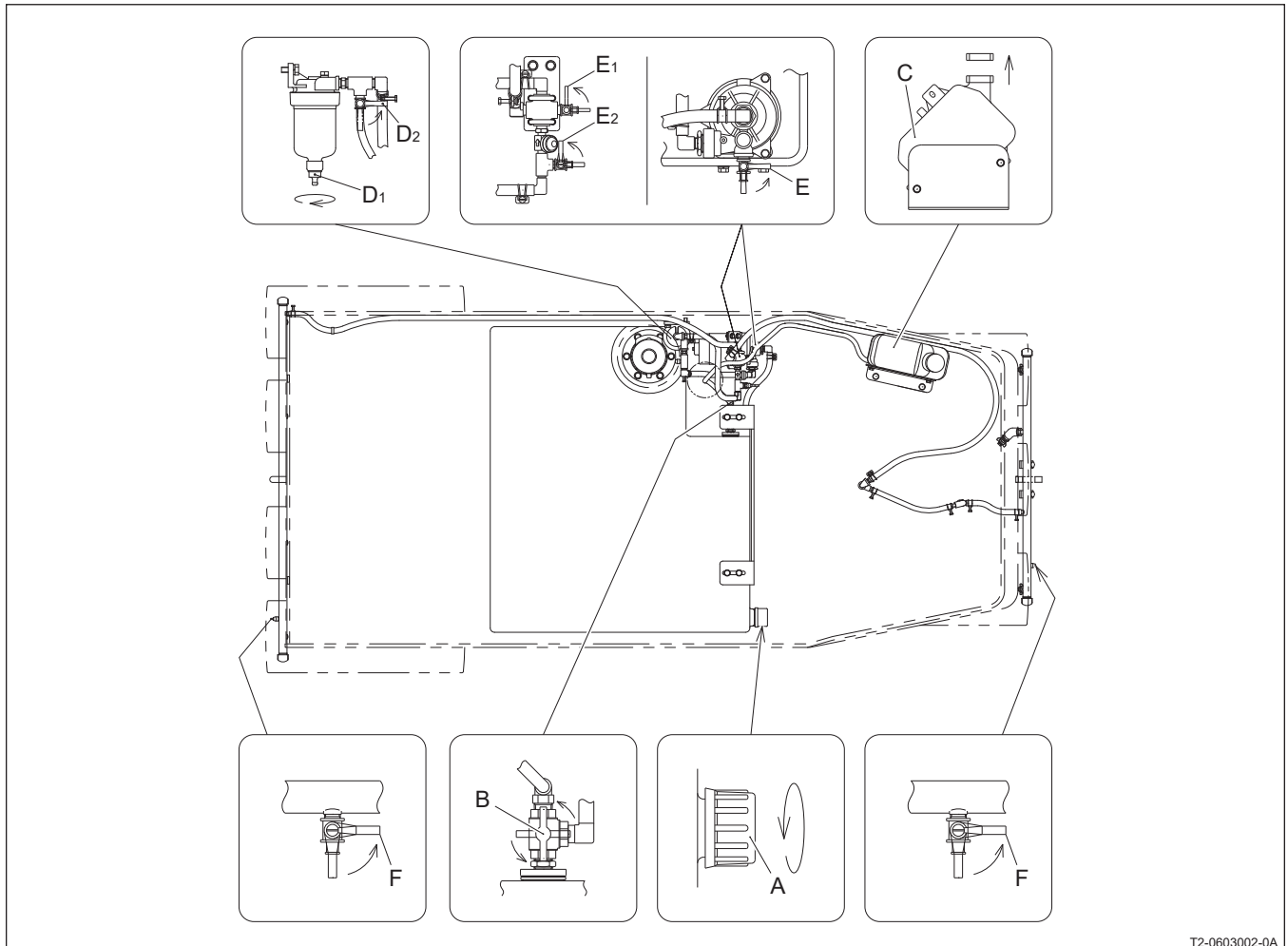
2.5.2 How to drain water



- 1) Open the Filler cap of the sprinkler tank.
- 2) Turn the Sprinkler tank drain cap (A) counterclockwise and completely drain the tank.
- 3) Open the Sprinkler pump drain cock (B), Sprinkler filter drain cock (C), Sprinkler filter drain valve (D), Sprinkler filter drain cock (E), before draining water thoroughly.
- 4) Drain the front and rear sprinkler pipe by opening Sprinkler pipe drain cock (G).
- 5) Make sure to completely drain any water from the hose, pump, and nozzle.
For the hose at the front axle swivel section, turn the steering wheel and drain the water from the hose.

2.5.3 How to operate antifreeze circulation during cold weather (with antifreeze tank)

Be sure to follow the procedures below when there is the possibility of freezing.



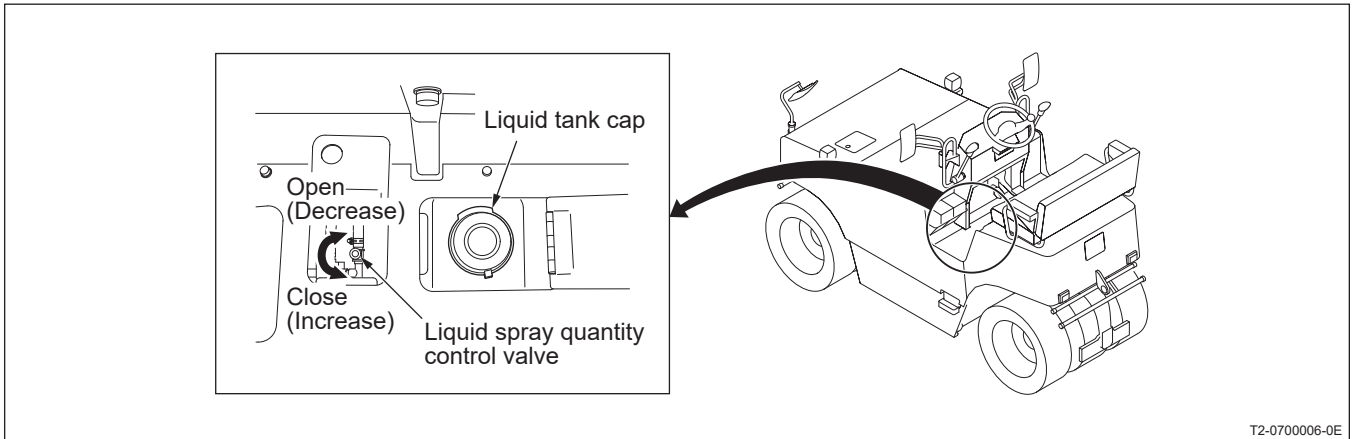
T2-0603002-0A



- 1) Turn the Drain cap (A) of the sprinkler tank to drain the water.
(Do not lose the packing of the cap)
- 2) Turn the Switch cock (B) to the position for sucking up antifreeze from the tank.
- 3) Close the Sprinkler pump drain cock (E).
- 4) Close the Sprinkler filter drain cock (D1 and D2) .
- 5) Close the Sprinkler pipe drain cocks (F) on the front and rear.
- 6) Close the Drain cocks (E1 and E2) on the hose pipes.
- 7) Pour the antifreeze solution into Antifreeze solution tank (C).
- 8) Turn on sprinkler switch and check to make sure the antifreeze solution comes out of sprinkler nozzle.

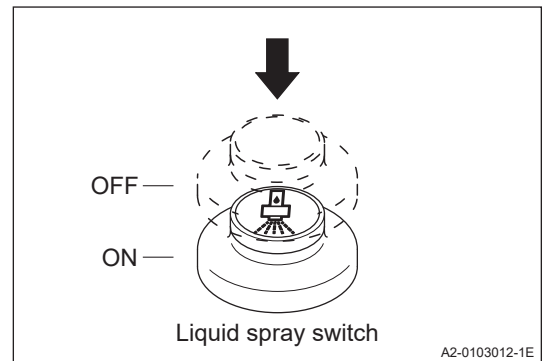
2 OPERATION

2.6 Liquid Spray System

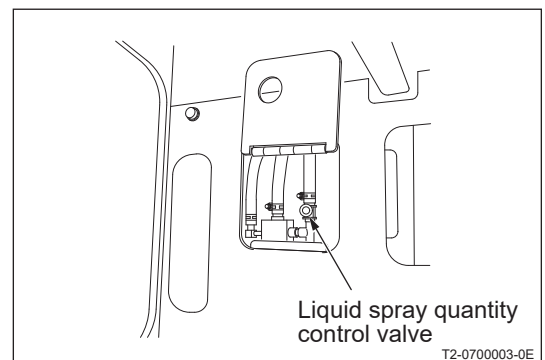
- 1) Before turning the Liquid Spray System on, check the liquid level in tank.
Add liquid as necessary.
Look at the tank under the left side of the driver seat to check the liquid level.
- 2) Open the door left below the operator's seat, and the Liquid spray quantity control valve will appear.
Turn this valve clockwise fully.



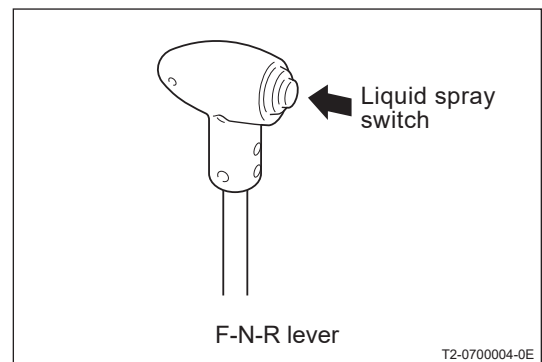
- 3) The liquid is sprayed over the tires. Press the Liquid spray switch to spray, and the Liquid sprayer indicator lamp  of monitor display lights up. Spraying is shut off, and the Liquid sprayer indicator lamp  of monitor display is turned off when the switch is released.



Open the door left below the operator's seat, and the Liquid spray quantity control valve will appear. Open this valve (clockwise), and the spray quantity will decrease.
Close it (counterclockwise) to increase the spray quantity.



The switches on the F-N-R levers on both sides also permit liquid spraying. Release the switch, and spraying will stop automatically.



NOTICE

If the liquid is not sprayed from the nozzle even when pressing the Liquid spray switch, fully open the Liquid spray quantity control valve and press the Liquid spray switch again to remove air in the circuit.

Adjustment of nozzle extension width

When spraying the tires with liquid, adjust the nozzle extension width so that the liquid will not be sprayed beyond the tire.

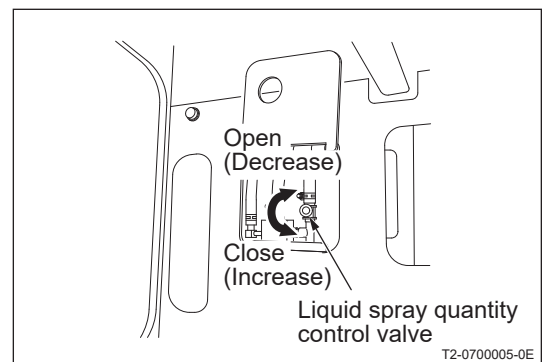
Operate the Liquid spray quantity control valve on the liquid pipes of the front and rear tires to adjust the nozzle extension width.

Turn the valve counterclockwise.

... The nozzle extension width will increase
(The spraying quantity increases).

Turn the valve clockwise.

... The nozzle extension width will decrease
(The spraying quantity decreases).



NOTICE

- Diesel oil, kerosene, etc. must not be sprayed to tires because they will cause tire swelling / deformation and asphalt discoloring.
- For spraying, use the smallest amount possible. Excessive spraying can cause premature wear of tires, their deformation and adverse effect on the pavement surface.
- Driving the liquid spray pump with the liquid tank empty will damage the pump. Pay attention to the liquid level in the tank.
- For a long storage of the machine, drain the liquid through the drain hole.

2.7 Safety Precautions for Work

2.7.1 Compaction operation

■ Change the direction of travel gently

- When changing the direction of travel during asphalt mix compaction, slowly shift the F-N-R lever.

NOTICE

Increase the engine RPM when the engine speed drops drastically during rolling compaction.

■ Drive at a speed appropriate for the road surface conditions

- Drive slowly on uneven surfaces.

2.7.2 When going downhill

■ Use the F-N-R lever

- Run slowly when going downhill. Do not use excessive speed. Avoid changing the speed if possible when going downhill. Start slowly and stop slowly when on steep slopes.

■ Use the engine brake

- Go downhill by applying the engine brake along with the F-N-R lever operation.

WARNING

- **When going downhill, adjust the travel speed not to allow the engine speed to exceed 2,400 min⁻¹(rpm) .
If you suddenly shift the F-N-R lever while driving, the engine speed may exceed 2,400 rpm, so do not make sudden operations.**
- **When going uphill, run at low speed. Do not attempt to shift speeds during traveling. The machine can slip down the slope.**

2.7.3 On a slope

■ Working on a sidehill

- Work in an uphill / downhill direction, and avoid working on sidehill with the machine inclining sideways.

2.8 Applicable Jobs

This machine can be used for the variety of jobs as listed below:

Work

- Asphalt road paving
- Dust removal treatment for road
- Road improvement
- Embankment construction
- Dam construction
- Construction of forestry and farm roads
- Foundation building
- Construction of sidewalk, shoulder and gutter foundation

Material to be compacted

- Asphalt pavement
- Crusher run
- Cement concrete
- Sands
- Soils
- Slag
- Soft rock

Layers to be compacted

- Surface course, Binder course
- Base course
- Subgrade
- Embankment
- Shoulder
- Sidewalk

2.9 After Operation

Check for the coolant temperature, engine oil pressure and fuel level.

Observe the following to prevent the machine getting stuck or unworkable next morning due to mud, extraneous matter on the tires or due to freezing in the cold weather:

- 1) Remove mud and water from the machine. Especially the mud on the hydraulic cylinder piston rod may get into the seals together with water drops damaging the seals.
- 2) Park the machine on a hard and dry surface. If such a place is not available, cover the ground with hard plates.
- 3) Low temperature will cause a significant reduction of battery efficiency. Cover the batteries or remove from the machine and store in a warm place till the following day's operation. Take care not to tilt the battery when removing from the machine as there is a danger of battery fluid leaking.
- 4) To prevent freezing, drain water from the spray system. Refer to "2.5 Water Spray System".

NOTICE

Do not clean with high pressure water around the instrument panel or behind the dash board. It may cause instrument failures.

2.10 Towing

⚠ WARNING

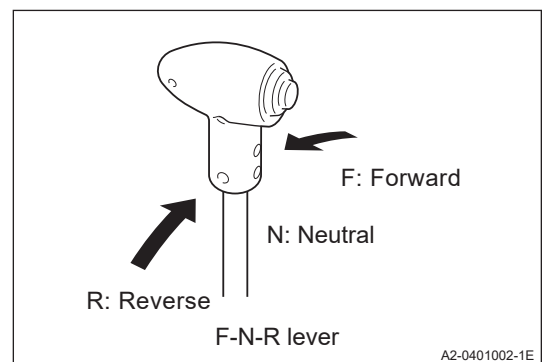
- Do not tow if the braking system is broken as it is dangerous.
- Do not perform towing on a slope.
- Do not use twisted, kinked or damaged cables when towing.
- Do not step over the wire rope.
- To tow the machine, use cables with ample strength.
- Keep everyone away from the space between the machine and the towing machine when connecting them and while towing.
- Align the connection points of the failed machine and the towing machine in a straight line when connecting.
- Be sure to attach the wire rope firmly to the towing hook.

NOTICE

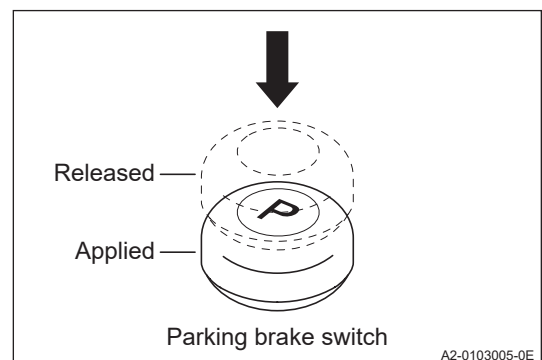
Towing should only be carried out in emergencies and over the short distances. A truck or trailer should be used for long distance transport.

2.10.1 If the engine can be started

1) Move the F-N-R lever to the Neutral (N) position.



2) Press the Parking brake switch securely, and check the Parking brake indicator lamp (P) illuminates. If the lamp does not turn on, refer to “2.1.3 Switches”.

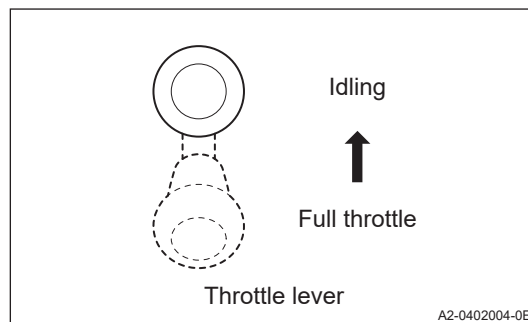


NOTICE

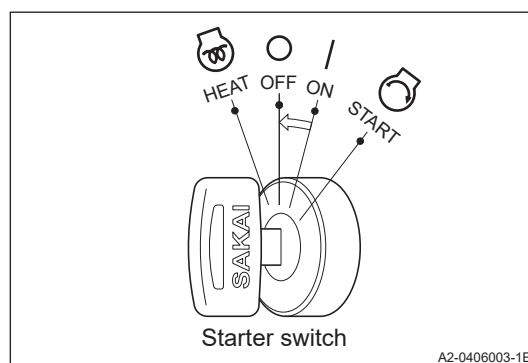
Do not pull the switch. It may damage the switch.

2 OPERATION

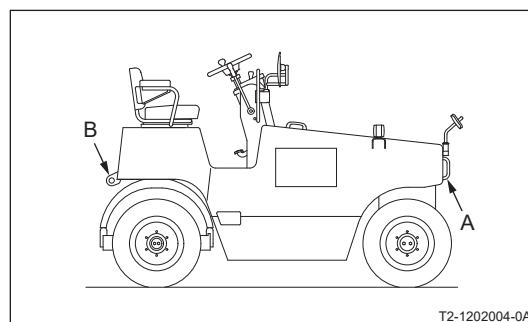
- 3) Set the Throttle lever in a position, slightly higher than IDLING.



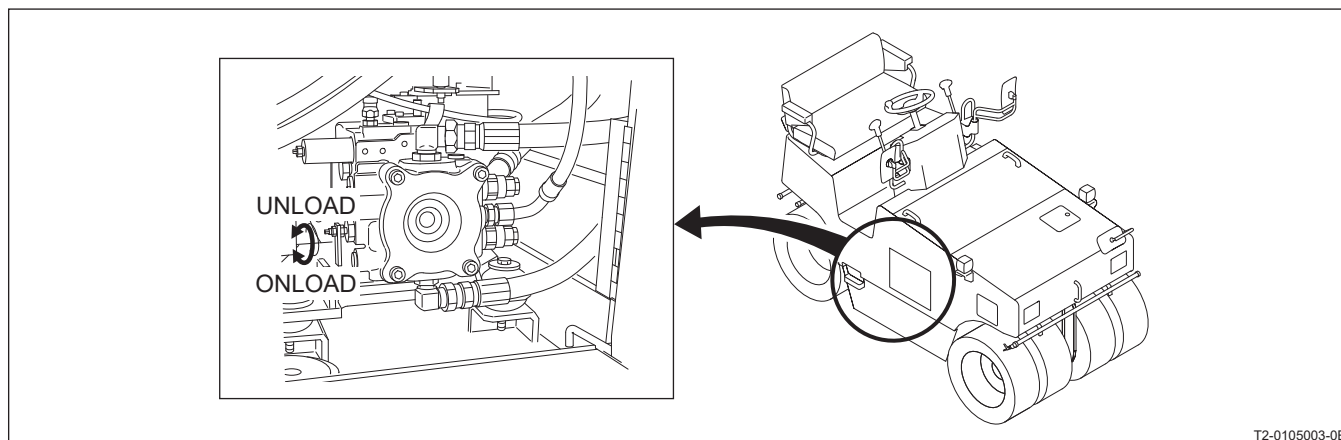
- 4) Turn the Starter switch to the O position to stop the engine.



- 5) Draw the wire rope from the other machine and put its hook on the hooking point (A or B) of the machine.



- 6) Turn the Unloader valve counterclockwise to the UNLOAD position.
Refer to “2.1.5 Unloader valve”.



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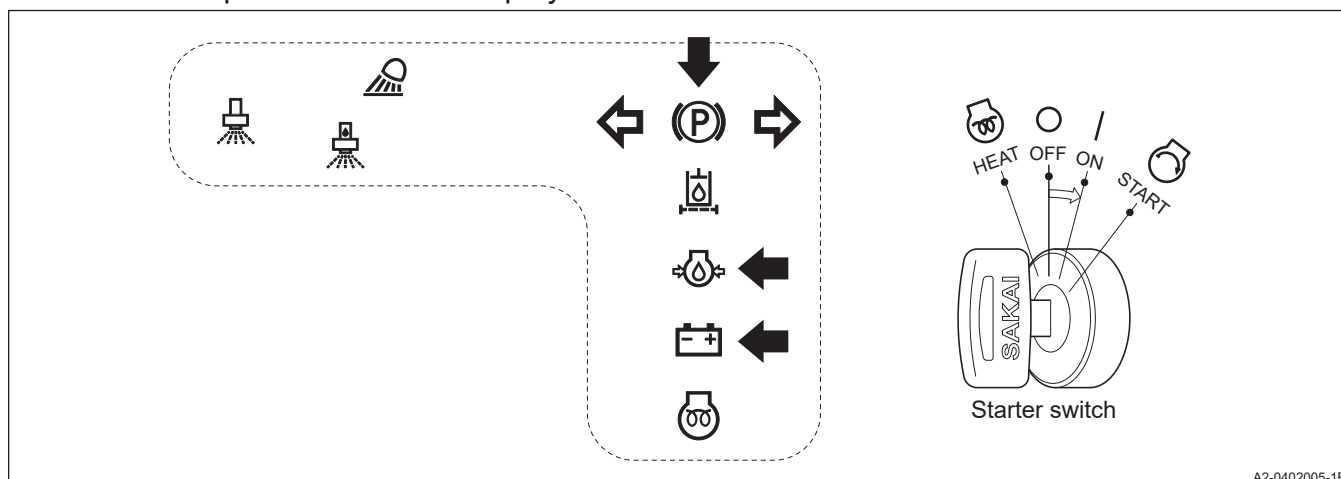
⚠ WARNING

- Open (Turning to UNLOAD side) the Unloader valve on a flat ground. And chock the tires.
- Be sure to apply the parking brake before opening the Unloader valve.
- Turning the Unloader valve to UNLOAD position will cut the power for traction. Do not enter the areas ahead and behind the machine as it is very dangerous.

NOTICE


For normal operation, be sure the Unloader valve is in the ONLOAD position.

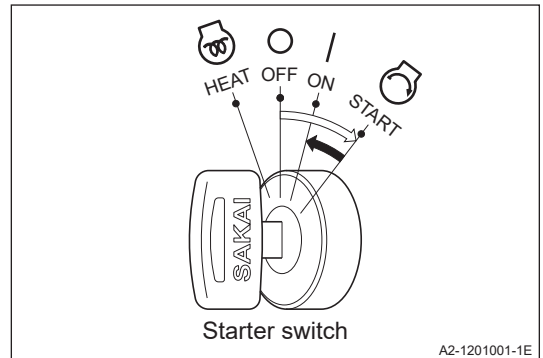
- 7) Turn the Starter switch to the **I** position and check that the warning lamps and Parking brake indicator lamp on the Monitor display are on.



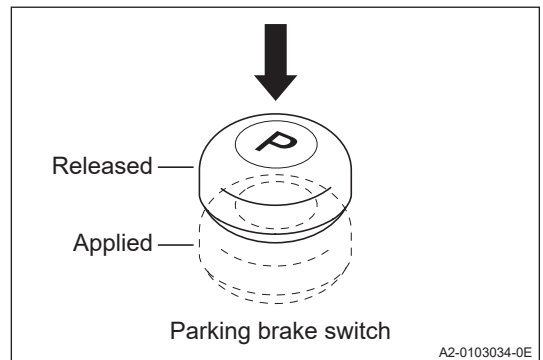
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2 OPERATION

8) Turning the key to the  position makes the engine start. Release the key at the moment when the engine started. The key will automatically return to I position.



9) Press down the Parking brake switch to release the brake. Check that the Parking brake indicator lamp (P) on the Monitor display turns off.



10) Tow the machine.

WARNING

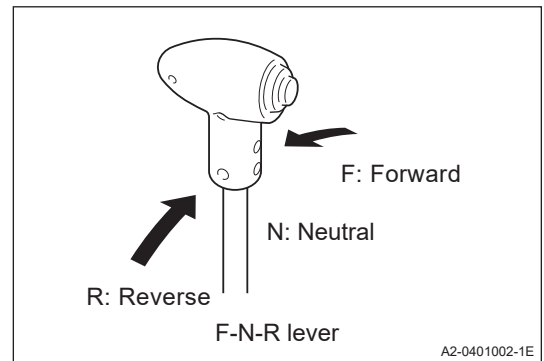
- Do not release the Brake pedal until towing begins. Take your foot off the Brake pedal when the wire rope gets under tension. The steering of the machine can be done while towing.
- Hold the Steering wheel.
- Do not touch the F-N-R lever. It may cause unexpected movements.
- Depress the Brake pedal in an emergency.
- Tow the machine slowly. It may move in unexpected ways.

11) Turn the Unloader valve clockwise to the ONLOAD position.
Refer to “2.1.5 Unloader valve”.

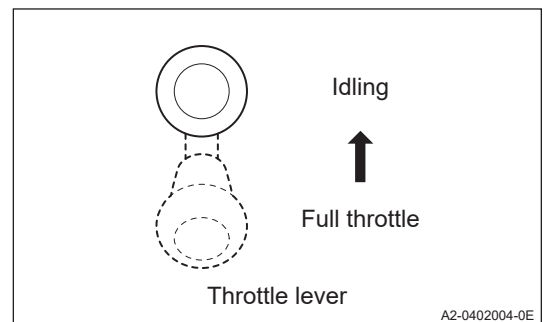
2.10.2 If the engine cannot be started

This section applies to situations in which the parking brake cannot be applied or released by operating the Parking brake switch.

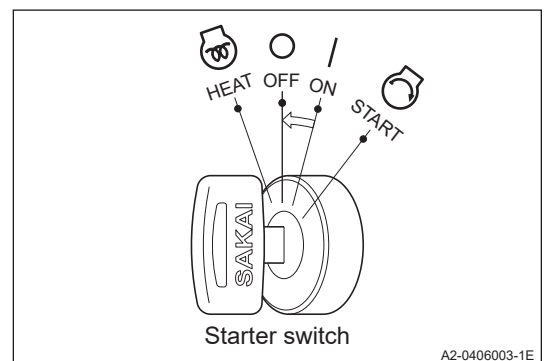
1) Move the F-N-R lever to the Neutral (N) position.



2) Set the Throttle lever in the IDLING position.

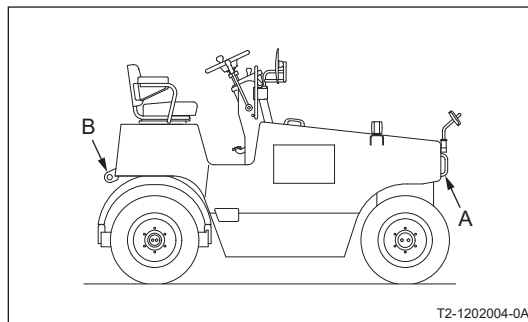


3) Turn the Starter switch to the O position.

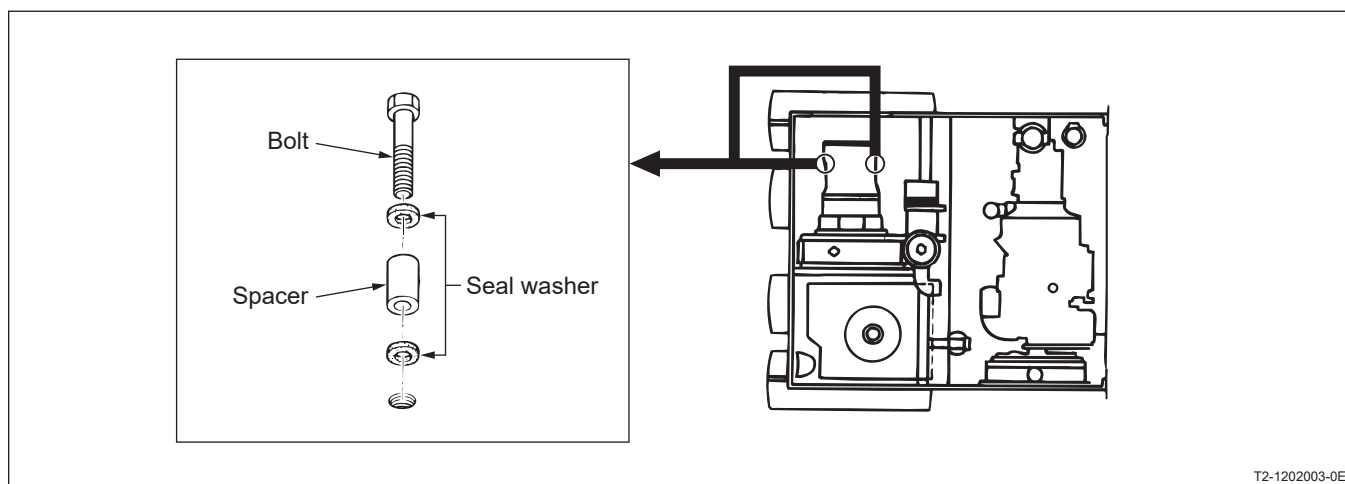


2 OPERATION

- 4) Draw the wire rope from the other machine and put its hook on the hooking point (A or B) of the machine.

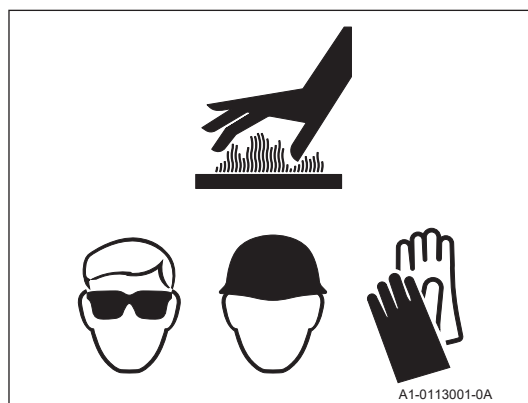


- 5) Release the brake.
Refer to "2.10.3 Release the brake".

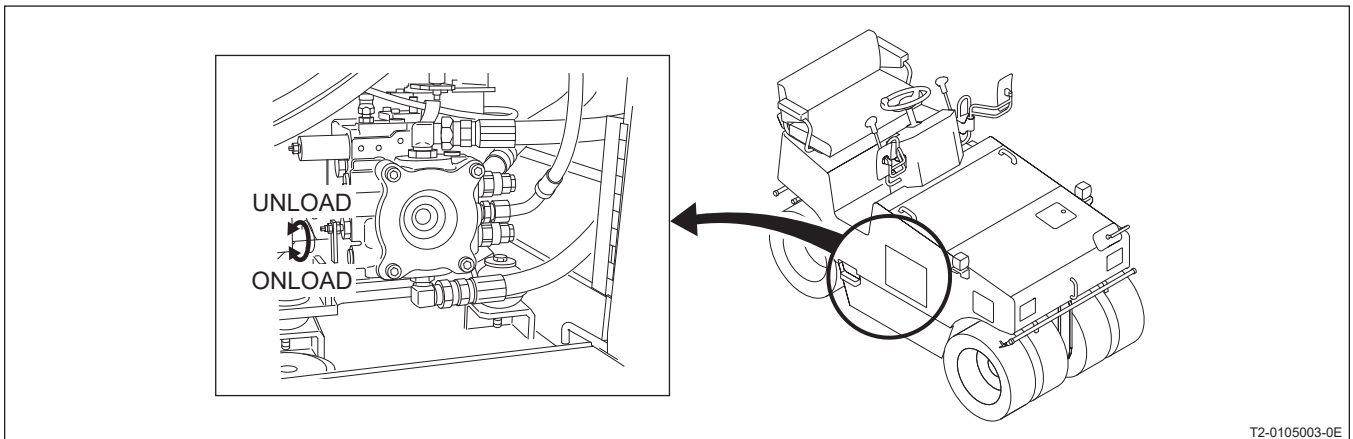


⚠ WARNING

- When release the brake, turn the Unload valve clockwise and make sure it is in the ONLOAD position.
- Disengage the brake on a flat ground.
- Chock the tires.
- Do not try to release the brake immediately after stopping a hot engine. Let the oil cool down.
- For the brake release work, wear a hard hat, safety goggles and protector gloves.



- 6) Turn the Unloader valve counterclockwise to the UNLOAD position.
Refer to “2.1.5 Unloader valve”.



⚠ WARNING

- Chock the tires.
- Turning the Unloader valve to UNLOAD position will cut the power for traction. Do not enter the areas ahead and behind the machine as it is very dangerous.

- 7) Tow the machine.

⚠ WARNING

- Keep away from the machine.
- Tow the machine slowly. It may move in unexpected ways.

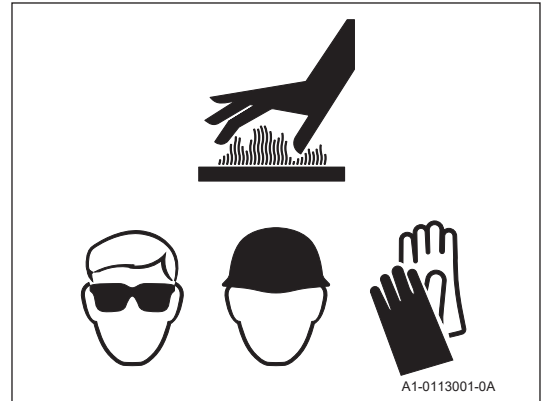
- 8) After the towing, set the Unloader valve to the ONLOAD position, replace the Brake release bolt, Seal washer, and Spacer back into the machine frame, and tighten the Blank plugs.

2 OPERATION

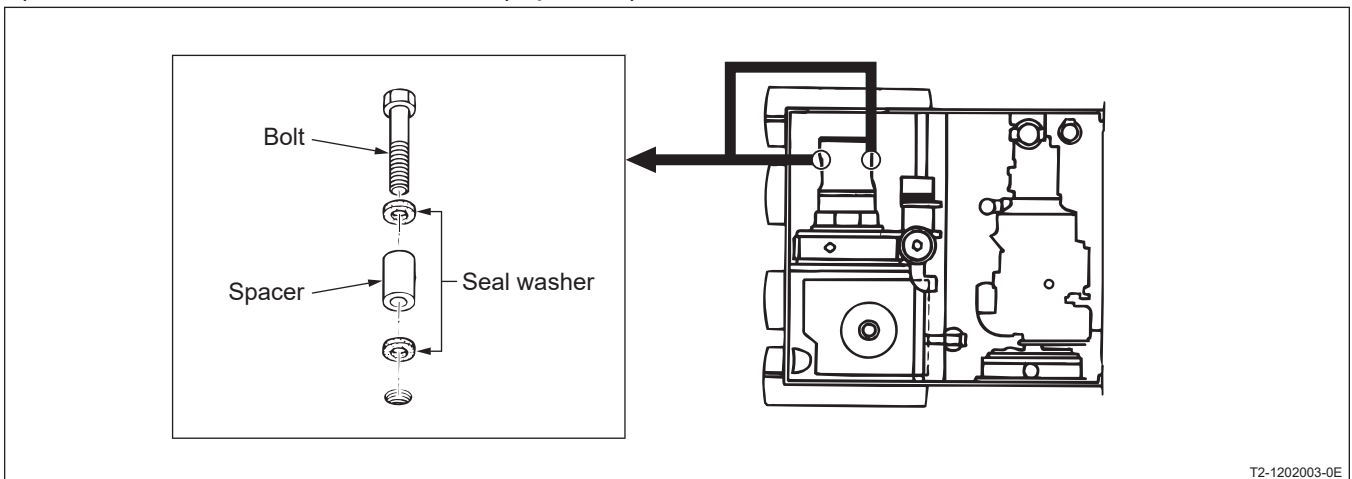
2.10.3 Release the brake

⚠ WARNING

- When release the brake, turn the Unload valve clockwise and make sure it is in the ONLOAD position.
- Disengage the brake on a flat ground.
- Chock the tires.
- Do not try to release the brake immediately after stopping a hot engine. Let the oil cool down.
- For the brake disengaging work, wear a hard hat, safety goggles and protector gloves.



1) Remove the brake release bolts (2 pieces) from the motor.



NOTICE

Conduct the work rapidly, as the oil will gush out when the plugs are taken off.

2) Remove the spacer and seal washer from the bolts and insert only the bolts again into the bolt hole.
Tight the bolts evenly. When screwed in until they become a little tight, the brake is released.

NOTICE

Wash clean the brake release bolts before fitting to the motors.

3) After the towing, set the Unloader valve to the ONLOAD position, replace the Brake release bolt, Seal washer, and Spacer back into the machine frame, and tighten the bolt hole.

2.11 Loading and Unloading

⚠ WARNING

- Use sturdy ramps with proper width, length and thickness which allow safe loading and unloading.
- If the ramps deflect considerably under load, apply wooden blocks to reinforce them.
- Loading should be conducted on a level and hard ground. Leave a sufficient distance between the machine and the shoulder.
- To prevent slippage on the ramps, keep the tires free from mud, oils, etc. The ramps must also be free of grease, oil and ice.
- Do not steer the machine on the ramps. If the machine is facing the wrong direction, bring down the machine from the ramps without steering and correct the direction.

NOTICE

For loading and unloading, use ramps or a proper loading stand.

2.11.1 If the engine can be started

- 1) Apply the brakes and chock the wheels of the truck or trailer.

Aligned the center of the machine with the center of the truck or trailer and fix the ramps securely.

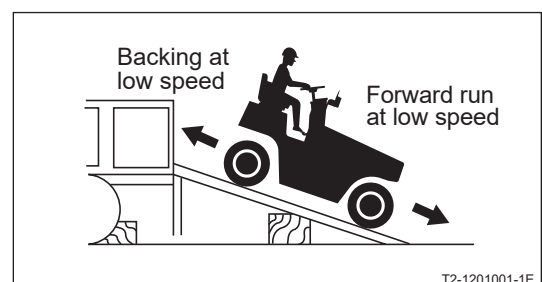
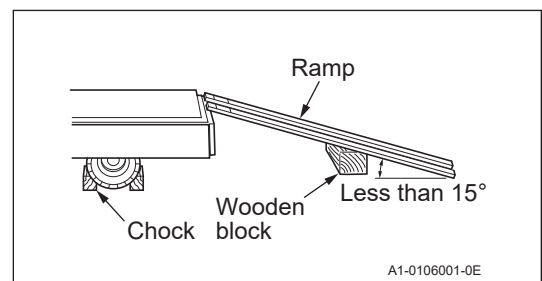
The angle between the ramps and ground must be less than 15 degrees.

Leave enough space between the ramps according to the width of the machine tire.

- 2) Decide the direction correctly and conduct loading or unloading at low speed.

For loading, run backward at low speed.

For unloading, run forward at low speed.



- 3) Stop the machine safely in the correct position on the truck or trailer.

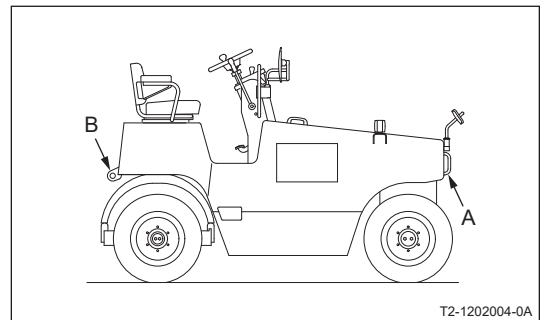
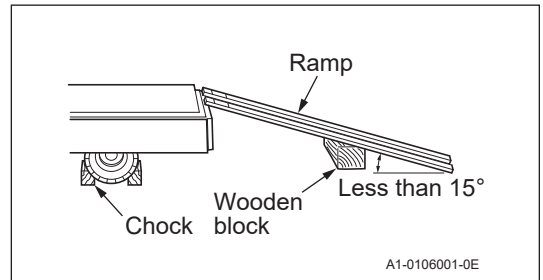
2 OPERATION

2.11.2 If the engine cannot be started

⚠ WARNING

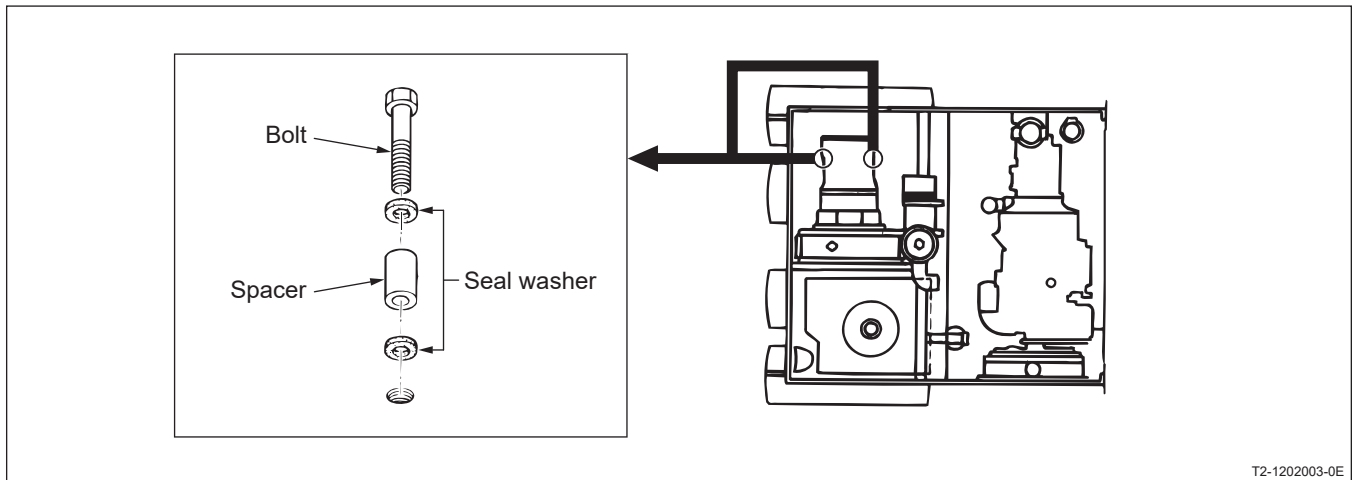
Do not enter the areas ahead and behind the machine as it is very dangerous.

- 1) Aligned the center of the machine with the center of the truck or trailer and fix the ramps securely.
Apply the brakes and chock the wheels of the truck or trailer.
The angle between the ramps and ground must be less than 15 degrees.
Leave enough space between the ramps according to the width of the machine tire.
- 2) Draw the wire rope from the truck or trailer winch and put its hook on the hooking point (A or B) of the machine.



3) Release the brake.

Refer to "2.10.3 Release the brake".



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⚠ WARNING

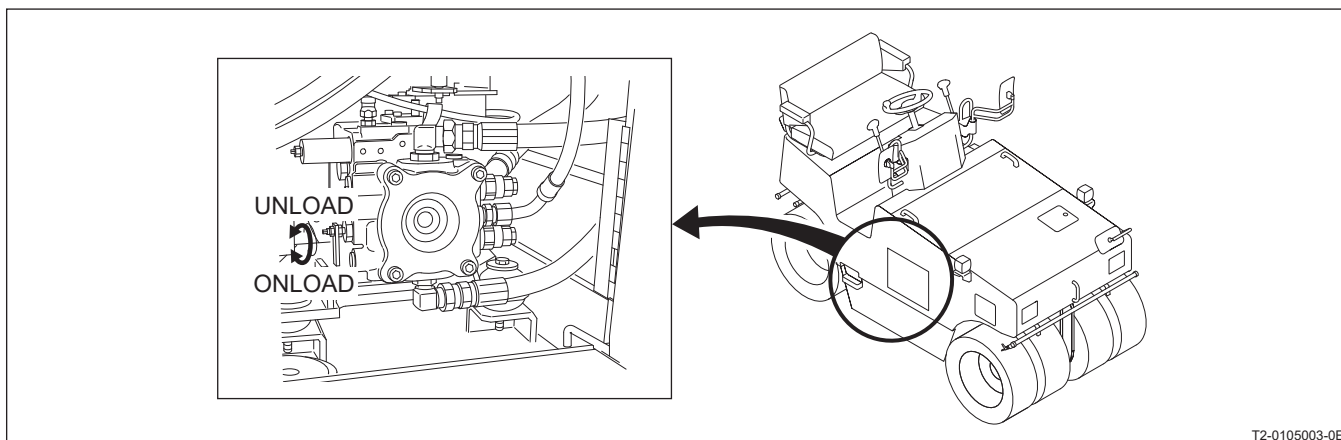
- Disengage the brake on a flat ground.
- Chock the tires.
- Do not try to release the brake immediately after stopping a hot engine. Let the oil cool down.
- For the brake disengaging work, wear a hard hat, safety goggles and protector gloves.



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2 OPERATION

- 4) Turn the Unloader valve counterclockwise to the UNLOAD position.
Refer to “2.1.5 Unloader valve”.



⚠ WARNING

- **Chock the tires.**
- **Turning the Unloader valve to UNLOAD position will cut the power for traction. Do not enter the areas ahead and behind the machine as it is very dangerous.**

- 5) Perform loading by means of the truck or trailer winch.
6) Stop the machine safely in the correct position on the truck or trailer.
7) After the loading is completed, return the Unloader valve to the ONLOAD position.

2.12 After Loading the Machine

Tie the machine as follows after stopping it safely in the correct position on the truck or trailer.

- 1) Press the Parking brake switch to apply the parking brake. Place the chocks under the tires to prevent movement.
If the brake is released before loading, apply the brake.
Refer to “2.10.3 Release the brake”.
- 2) If the Unloader valve to UNLOAD position before loading, return the Unloader valve to the ONLOAD position,
Refer to “2.1.5 Unloader valve”.
- 3) Fix the machine firmly with ropes tied at the front and rear towing hook holes and be careful that it does not slip sideways.

2.13 Transportation

NOTICE

To decide the transporting route, check the width of the road, height and weight (including the machine) of the truck or trailer. Obey the relevant regulations.

For transportation, obey traffic regulations.

2 OPERATION

2.14 Operation in Cold Weather

In cold weather, take the following measures to prevent troubles such as starting difficulties and coolant freezing.

2.14.1 Fuel, oil and grease

Use fuel and oil with low viscosity (refer to “3.6 Fluid and Lubricant Capacities”).

2.14.2 Coolant

⚠ WARNING

- **Coolant is flammable. Do not bring open flames close and do not smoke when handling it.**
- **Do not remove the radiator cap while the coolant is hot. Hot water may spurt out and cause burns. When the water temperature drops, slowly turn the cap to release the pressure and remove the cap.**

NOTICE

Use ethylene glycol-base antifreeze.

Use soft water for coolant. And mix the antifreeze to it.
Please refer to the following table for the mixing ratio.

Ambient temperature	-33°C	-26°C	-20°C	-16°C	-11°C
Amount of antifreeze	2.8 L	2.5 L	2.2 L	2.0 L	1.7 L
Amount of water	2.8 L	3.1 L	3.4 L	3.6 L	3.9 L
Ratio	50 %	45 %	40 %	35 %	30 %

Our machines are filled with a long-life coolant.
The life of the antifreeze is two years.
Use non-amine type long-life coolant when changing.

NOTICE

- **Use of machine with a rich coolant in summer time can overheat the engine depending job conditions.**
- **Use a coolant of 30% solution in the hot season.**

2.14.3 Battery

⚠ WARNING

- The battery generates hydrogen gas, so there is a danger of explosions. When there is a danger of generating sparks in poorly ventilated places, avoid recharging the battery and keep away the cigarettes and flames etc.
- The battery contains diluted sulfuric acid, which will dissolve clothes and burn skin. If you get battery fluid on your clothes or skin, wash it off immediately with plenty of clean water.
- If you get it in your eyes, rinse them immediately with clean water and seek the medical help of a doctor.
- If you accidentally ingest it, drink plenty of water and immediately seek the medical help of a doctor.
- Always wear safety goggles handling the battery.
- The inspection and handling of batteries should be carried out with the engine turned off and the Starter switch in the ○ position.
- Turn the Starter switch to the ○ position, then wait at least 30 seconds before removing the battery. If not, an abnormality may arise in the ECM (Engine Control Module).
- Be careful not to connect the two battery terminals together by tools or other metallic objects.
- To disconnect the battery cables, start with the negative terminal (ground). When connecting, start with the positive terminal. Do not allow a metallic item to bridge between the positive terminal and the machine body. This can generate sparks, causing an explosion.
- Loose terminals may generate sparks due to improper connections, resulting in the danger of explosions. Make sure terminals are connected firmly.
- The battery is for starting the engine and operating the electrical equipment on the machine. Do not use it for any other purpose.

NOTICE

The power-supply voltage of this machine is 12 V.

When the temperature decreases, the battery capacity will lower, possibly freezing the electrolyte. The battery should be maintained in a good state at all times, with care taken to keep it warm in preparation for use the next morning.

Check the color of the hydrometer attached on the battery top to charge or replace the battery.

Green Satisfactory (Good)

White Charging is necessary (Charging required)

Red Replacement is necessary (Electrolyte insufficient)

Carry out inspections in accordance with “3.3 Periodic Maintenance Points”.

2.15 When the Cold Season is Over

Proceed as follows when the winter is over and the warm climate begins:

- 1) Change the oil and the fuel with those suitable for warm season (refer to “3.6 Fluid and Lubricant Capacities”).
- 2) If AF-PT antifreeze is in use, drain the coolant completely, wash inside the cooling system, and refill with clean water (city water).

2.16 Extended Storage

Proceed as follows to leave the machine unused for more than a month:

- 1) Store the machine in a closed area after cleaning.
- 2) Conduct oiling, greasing and changing of oil.
- 3) Grease the exposed portion of hydraulic cylinder piston rods.
- 4) Cover the battery after disconnecting the negative cable or remove the battery from the machine and store in a safe place.
- 5) If the temperature is expected to go below 0°C, add antifreeze to the coolant.
- 6) Completely drain the water of spray system.
- 7) Place the F-N-R lever to the Neutral (N) position, turn the sprinkler switch off and apply the Parking brake.
- 8) Chock the machine tires.
- 9) Remove the Starter switch key.

2.17 During and After the Storage Period

⚠ WARNING

If it is necessary to operate the machine in indoor storage space, ensure good ventilation by keeping windows and doors of the storage area open to prevent gas poisoning.

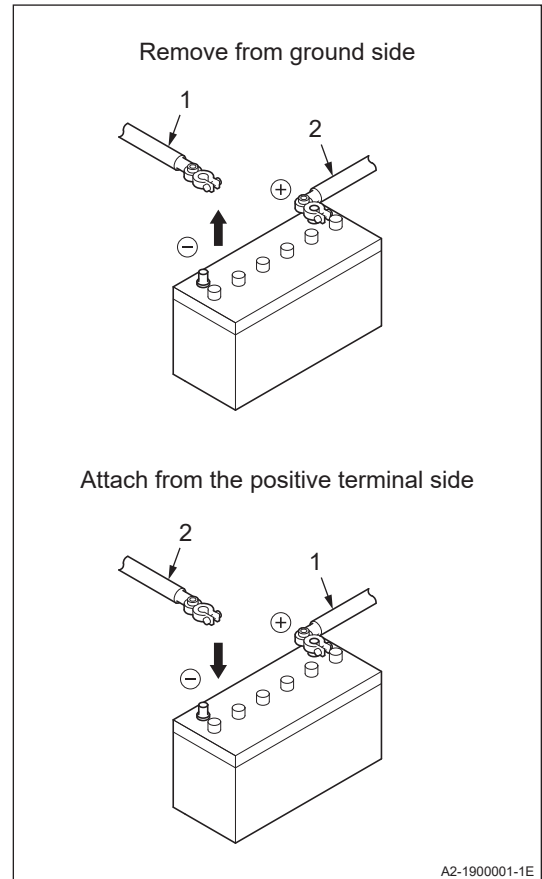
During storage period, operate the machine at least once a month to prevent the oil films on the lubricated parts from deteriorating and also to charge the batteries.

2 OPERATION

2.18 When the Battery Has Discharged

⚠ WARNING

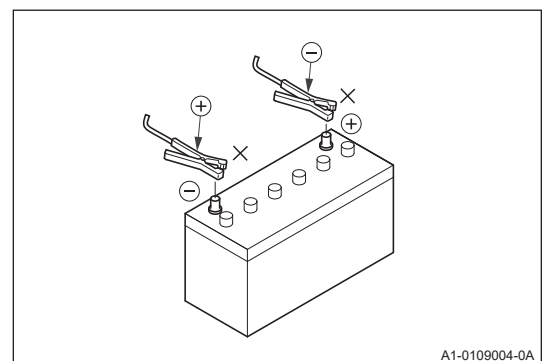
- To check and handle the batteries, keep the engine stopped with the Starter switch in the \bigcirc position.
- The batteries release explosive gases. Do not smoke close to the batteries. Keep flames and sparks away from the batteries.
- The battery liquid is very corrosive and will harm your clothing or skin. If it contacts your clothing or skin accidentally, flush with sufficient amount of water. In case if you get it in your eyes, flush with water and get medical help.
- To disconnect the battery cables, start with the negative terminal (ground). When connecting, start with the positive terminal. Do not allow a metallic item to bridge between the positive terminal and the machine body. This can generate sparks, causing an explosion.
- Loose battery terminals can cause sparks resulting an explosion. When connecting the terminals, make certain that they are tight.



2.18.1 Connecting and disconnecting the booster cables

⚠ WARNING

- Do not allow the positive terminal to make contact with the negative terminal when connecting the booster cables.
- Wear safety goggles when jump-starting the engine.
- Do not allow the machine to make contact with the booster supply.
- Do not make wrong connections. Connect the negative cable to the engine block earth as much as far from the battery, as sparks may occur when connecting.



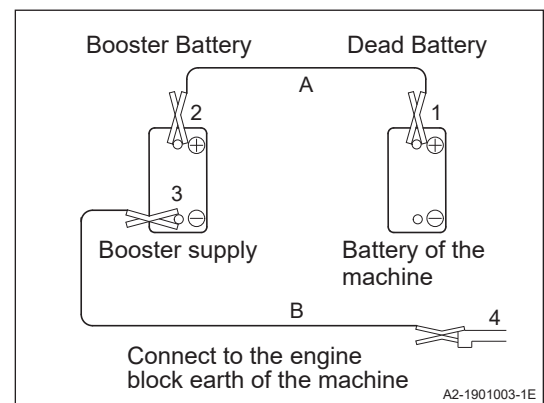
NOTICE

- Use the booster cables and the end clips of proper size suited to the battery capacity.
- Use the batteries of the equal capacity for the machine and the booster supply.
- Check the booster cables and the end clips for signs of damage and corrosion.
- Securely connect the clips.
- The power-supply voltage of this machine is 12 V.

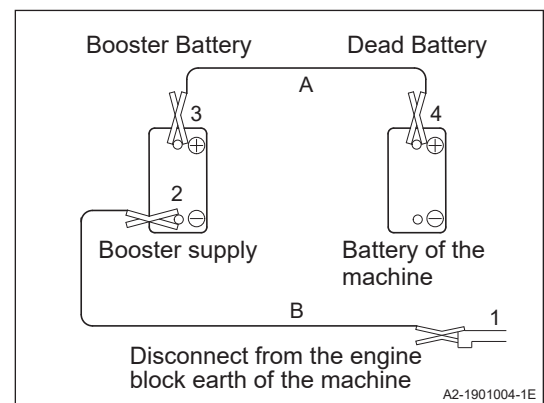
When jump-starting the engine, connect the booster cables as follows:

■ Connection of booster cables

- 1) Connect one end of the positive booster cable (A) to the positive terminal of the battery on the machine.
- 2) Connect the other end of the positive booster cable (A) to the positive terminal of the booster battery.
- 3) Connect the negative booster cable (B) to the negative terminal of the booster supply.
- 4) Connect the other end of the negative booster cable (B) to a good earth ground on the engine block of the machine.

**■ Disconnection of booster cables**

- 1) Disconnect the negative booster cable (B) from the engine block earth.
- 2) Disconnect the negative booster cable (B) from the booster supply.
- 3) Disconnect the positive booster cable (A) from the booster supply.
- 4) Disconnect the positive booster cable (A) from the machine.



MEMO

3 PERIODIC MAINTENANCE

3.1 Precautions

3.1.1 Inspection and maintenance

Failure to inspect and lubricate the machine at the correct regular intervals increases the chance of occurring problems and reduces the service life of the machine.

This manual describes the standard inspection / maintenance period, but it is necessary to use the machine always in the best condition by shortening the period and enhancing the content depending on the usage conditions such as site conditions and work conditions.

WARNING

Be careful not to get burn yourself when replacing filters, elements, oil, etc. which are hot after use.

NOTICE

- **After maintenance and inspection, record the inspection results.**
- **Note that the replacing filter elements, refilling or changing oil and grease and cleaning the radiator fins are important.**
- **Waste oil, waste coolant, and used filters, elements, etc., should be handled by specialized disposal companies.**

3.1.2 General precautions

- 1) Always use SAKAI genuine parts for replacement.
- 2) Use lubricants recommended by SAKAI. Avoid mixing different brand lubricants.
- 3) For hydraulic oil replenishment, changing, level checking, filter cleaning or replacement, oiling and greasing, use extreme care to prevent dust from entering these systems.
- 4) For checking the oil level or changing oil, park the machine on a level and hard surface.
- 5) Change the oil while it's warm.
- 6) For a long-term storage, fill the fuel tank, lubricate necessary points and run the machine for more than 20 minutes once a month.
- 7) In freezing weather, add antifreeze to the coolant according to the ambient temperature.
- 8) Repair and service the hydraulic pumps and motors in the authorized service shops.
- 9) Turn the Starter switch to O position when performing services such as repairing broken wires, short circuits and tightening loose terminals.

3 PERIODIC MAINTENANCE

3.1.3 Periodic replacement of important maintenance parts

The following parts and components should be replaced periodically as detailed on the next page.

These parts are prone to material deterioration due to aging or physical change due to friction. While it is difficult to determine their useful limit by regular inspection, you should replace with new ones after certain periods of service to ensure they function as intended.

If any defects are detected such as crack, deformation or oil leakage, replace them even if it is within the scheduled replacement time.

System or Mechanism	Part name	Periodical replacement maintenance part	Replacement period	Remarks
1 Brake system	Master cylinder	Seals (rubber parts)	2 years	
	Wheel cylinder	Seals (rubber parts)	2 years	
	Brake piping parts	Brake hose	2 years	
		Air hose	2 years	
	Operating parts	Cable	4 years	
2 Steering system	Orbitrol	Seals (rubber parts)	2 years	
	Hydraulic piping parts	Hydraulic hose	2 years	
	Steering cylinder	Seals (rubber parts)	2 years	
	Hydraulic pump	Seals (rubber parts)	4 years	
3 Power transmission system (inclusive of axle)	Axle	Seals (rubber parts)	4 years	
	Travel pump	Seals (rubber parts)	4 years	
	Travel motor	Seals (rubber parts)	4 years	
	Hydraulic piping parts	Hydraulic hose	4 years	
4 Fuel system	Isolator rubber	Isolator rubber itself	4 years	
	Piping parts	Fuel hose	2 years	
5 Engine related	Engine mounting parts	Isolator rubber	4 years	
	Seals (rubber parts)	Packing and others	4 years	
	Drive parts	V-belt	2 years	or 500 hours
	Piping parts	Engine drain hose	4 years	
6 Cooling system	Piping parts	Radiator hose	2 years	
		Radiator drain hose	4 years	
7 Control related parts	Cable	Cable	4 years	
8 Intake system	Piping parts	Intake hose	2 years	
		CAC hose	2 years	
9 Hydraulic system	Hydraulic piping parts	Hydraulic hose	4 years	

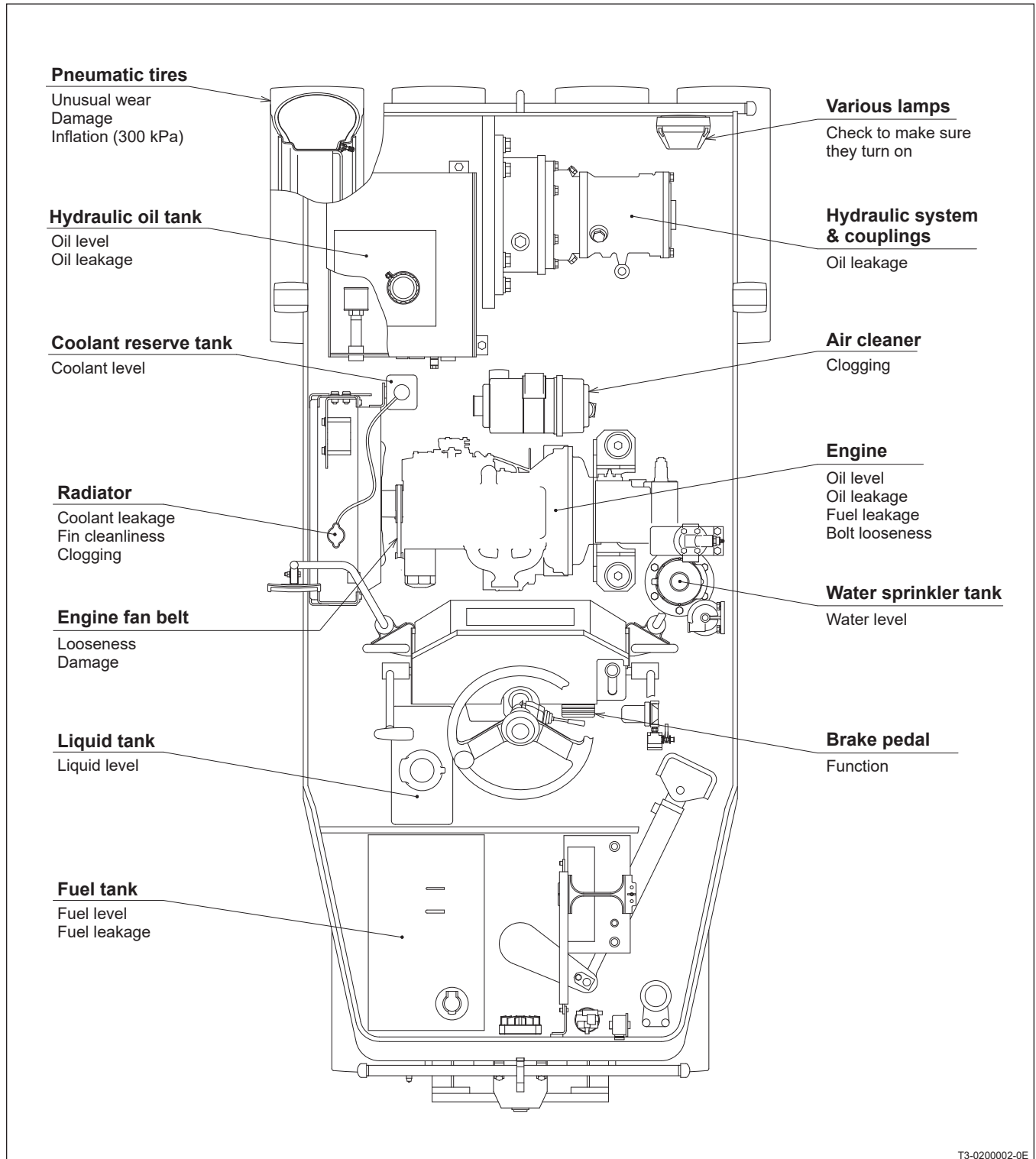
NOTICE

- **With a new machine, change the engine oil and change the engine oil filter element, tighten the Wheel hub nut, after 50 hours of operation for the first time only (refer to “3.4 Maintenance Procedure”).**
- **When trouble occurs in the location indicated by the indicator lamp on the Monitor display, sensor will work and corresponding lamp comes on. If this occurs, conduct necessary service regardless of the periodic service interval recommendation.**
 - 1) **The hydraulic oil filter warning lamp ⇨ Replace elements**
- **Check the electric wiring at regular intervals not exceeding one month. Replace it if there is any abnormality.**
- **If there is any trouble on the electric wiring, replace it with new one.**
 - 1) **Damage to the wire harness and loose clamps**
 - 2) **Loose sockets**
 - 3) **Function of electrical systems**
- **For the parts other than listed above, if any abnormality is found during periodical inspection or daily check, replace or repair it immediately.**

3 PERIODIC MAINTENANCE

3.2 Walk-around Inspection

Daily walk-around inspection is important for efficient operation of this machine. Therefore, perform walk-around inspection and look for loose bolts, nuts and signs of leakage in addition to the following before using this machine each day.

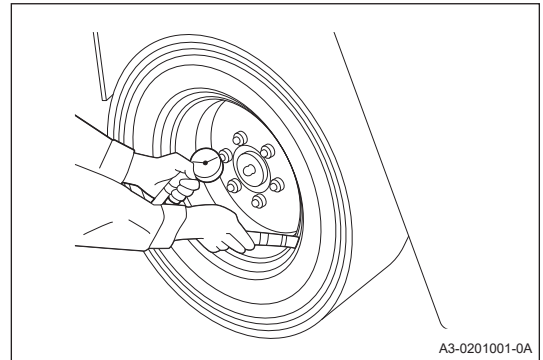


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3.2.1 Tire inflation check

Use a tire gauge to check the inflation pressure when the tire is cool, to make sure it is 300 kPa (3.0 kgf/cm²).

Adjust the pressure when it is not at the designated pressure above.



⚠ WARNING

Improper handling of tires have a risk of tire breakage and rim scattering. When checking for the inflation pressure and inflating the tires, do not stand facing the rim, but stand behind the tread of the tire.

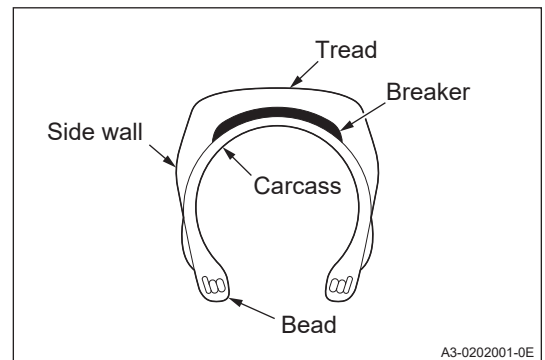
3.2.2 Tire damage check

Check the tires for damage and the extent to which they are damaged (Check to see if the damage penetrates to the carcass).

- 1) Check the tire tread for cuts.
- 2) Check the rim for cracks and the rim flange for deformation.

Tires that have problems as listed below are not serviceable. Replace with new ones to secure safety.

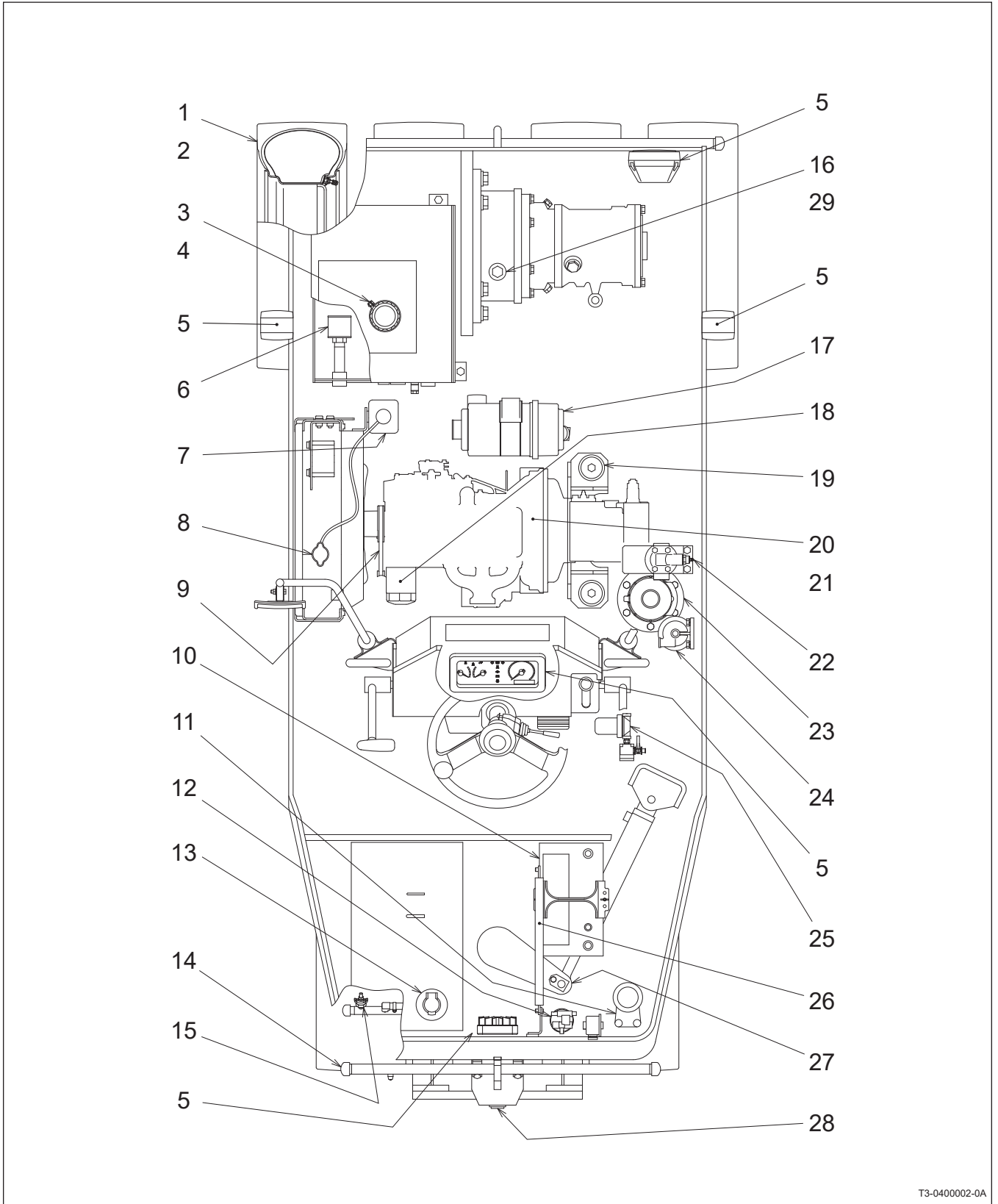
- Tire with bead wires damaged or noticeably deformed.
- Tires markedly worn with carcass pry exposed.
- Tires with carcass damaged beyond one thirds of their width.
- Tires having signs of flaking.
- Tires with radiated cracks penetrating to the carcass.
- Tires with marked wear, deformation and damage which make the tires unbearable to use.



Tires are found to be damaged or huge difference in amount of wear is noticed between the front and rear tires or between the left and right tires or the rim is found to be bent, have them checked by a qualified workshop.

3 PERIODIC MAINTENANCE

3.3 Periodic Maintenance Points



T3-0400002-0A

3 PERIODIC MAINTENANCE

Interval	No.	Item	Service	Lubricant	Q'ty
Every 10 service hours or daily	1	Tires	Tire air pressure Check unusual wear Check looseness wheel hub nut		7
	3	Hydraulic oil level gauge	Check oil level	Hydraulic oil	1
	7	Reservoir	Check coolant level	Coolant	1
	9	Fan belt	Check tension and unusual wear		1
	10	Battery	Check looseness of terminal and appearance		1
	13	Fuel tank	Check fuel level	Diesel oil	1
	20	Engine oil level gauge	Check oil level	Engine oil	1
Initial 50 hours	2	Wheel hub nut	Check looseness		42
	18	Engine oil filter	Change filter		1
	21	Engine oil pan	Change engine oil	Engine oil	1
Every 100 service hours	21	Engine oil pan	Change engine oil	Engine oil	1
	27	Cylinder pin	Apply grease	Grease	2
	28	Rear wheel pin	Apply grease	Grease	2
Every 200 service hours	18	Engine oil filter	Change filter		1
Every 250 service hours	2	Wheel hub nut	Check looseness		42
Every 450 service hours	11	Fuel filter	Change filter		1
Every 500 service hours	4	Hydraulic oil tank	Change hydraulic oil	Hydraulic oil	1
	6	Hydraulic oil suction filter	Change filter		1
	8	Radiator	Clean fins		1
	22	Hydraulic oil line filter	Change filter		1
Every 500 hours or 3 months, or each time after brake pedal is used	29	Parking brake	Check function		1
Every 1000 service hours	16	Gear case : Wheel motor	Change gear oil	Gear oil	1
	19	Shockmounts : Engine mount	Check for cracks		4
As needed	5	Lighting	Check light up		-
	12	Fuel prefilter	Drain water and dirt		1
	13	Fuel tank	Drain water and dirt		1
	14	Sprinkler pipe and nozzle	Clean inside		-
	15	Liquid spray pipe and nozzle	Clean inside		-
	17	Air cleaner	Clean or replace element		1
	23	Sprinkler tank	Clean inside		1
	24	Sprinkler filter	Clean or change filter		1
	25	Liquid spray filter	Clean or change filter		1
	26	Gas damper	Check function		1

3 PERIODIC MAINTENANCE

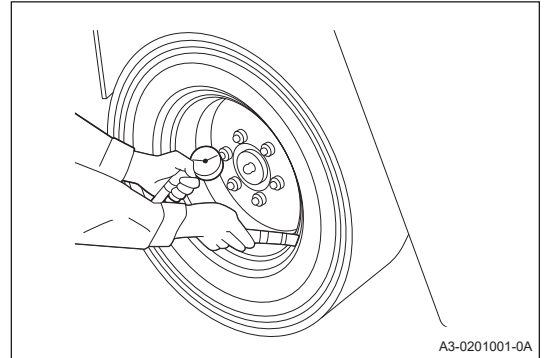
3.4 Maintenance Procedure

➔ For servicing the engine, see the separate engine manual.

(1) Every 10 service hours or daily

1 Tires

- 1) Check for unusual wear and damage.
- 2) Check for the inflation pressure.
300 kPa (3.0 kgf/cm²)
- 3) Check the Wheel nuts for looseness.

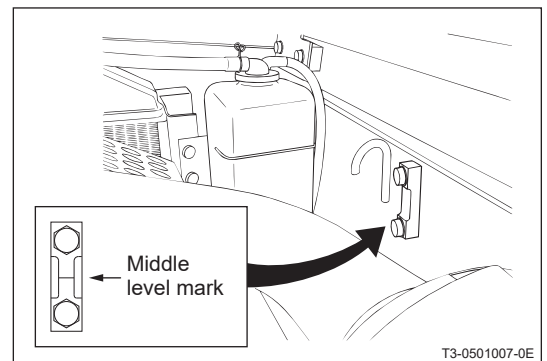


3 Hydraulic oil level gauge

Check the oil level with the Oil level gauge on the side of the tank.

The level is proper if it is Middle level mark.

If necessary, add hydraulic oil from the Filler port.



NOTICE

Be sure to use hydraulic oil recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).

7 Reservoir

With the cap removed, check to see if the coolant level is near the port. Add as necessary. Use soft water for coolant. For the coolant, use soft water.

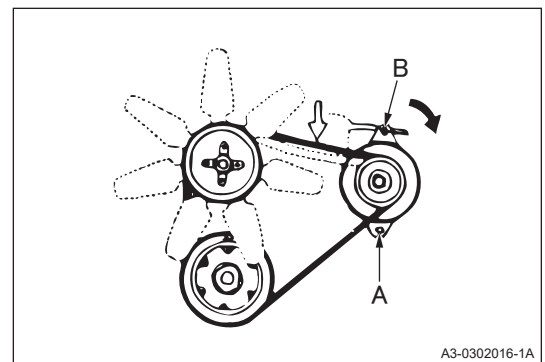
⚠ WARNING

Do not remove the radiator cap while the coolant is hot.



9 Fan belt

- 1) Check the Fan belt for wear and damage. Replace as necessary.
- 2) Check the tension. Depress the middle of belt with a push of about 49 N (5 kgf). Properly adjusted belt deflects about 10mm.
- 3) To adjust, loosen alternator bracket bolt (A) and plate bolt (B), and slide the alternator.



3 PERIODIC MAINTENANCE

10 Battery

- 1) Check the color of the hydrometer attached on the battery top to charge or replace the battery.
Green ... Satisfactory (Good)
White ... Charging is necessary (Charging required)
Red Replacement is necessary (Electrolyte insufficient)
- 2) If the terminals are loose, tighten the terminals and apply a thin coat of petroleum jelly or grease to prevent rust.
- 3) Make sure that the surface of the battery is normal.
- 4) Be sure to tighten the battery holder if it is loose.

WARNING

- **The battery generates hydrogen gas, so there is a danger of explosions. When there is a danger of generating sparks in poorly ventilated places, avoid recharging the battery and keep away the cigarettes and flames etc.**
- **The battery contains diluted sulfuric acid, which will dissolve clothes and burn skin. If you get battery fluid on your clothes or skin, wash it off immediately with plenty of clean water.**
- **If you get it in your eyes, rinse them immediately with clean water and seek the medical help of a doctor.**
- **If you accidentally ingest it, drink plenty of water and immediately seek the medical help of a doctor.**
- **Always wear safety goggles when handling the battery.**
- **The inspection and handling of batteries should be carried out with the engine turned off and the Starter switch in the ○ position.**
- **Turn the Starter switch to the ○ position, then wait at least 30 seconds before removing the battery. If not, an abnormality may arise in the ECM (Engine Control Module).**
- **Be careful not to connect the two battery terminals together by tools or other metallic objects.**
- **To disconnect the battery cables, start with the negative terminal (ground). When connecting, start with the positive terminal. Do not allow a metallic item to bridge between the positive terminal and the machine body. This can generate sparks, causing an explosion.**
- **Loose terminals may generate sparks due to improper connections, resulting in the danger of explosions. Make sure terminals are connected firmly.**
- **The battery is for starting the engine and operating the electrical equipment on the machine. Do not use it for any other purpose.**

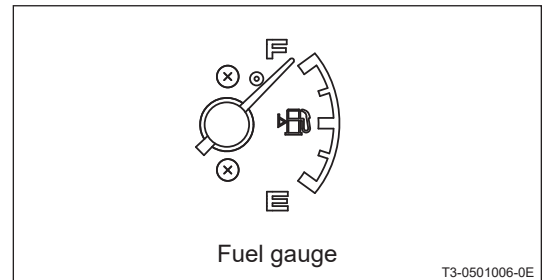
NOTICE

- **The power-supply voltage of this machine is 12 V.**
- **Use only batteries recommended by SAKAI (refer to “3.5 Consumable Parts”).**

3 PERIODIC MAINTENANCE

13 Fuel tank

Check the fuel level with the fuel gauge.
Add as necessary from fill hole.
To open the filler cap, insert the starter key.



⚠ WARNING

Inspect the oil level by parking the machine on a flat, level ground.

NOTICE

Be sure to use fuel recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).

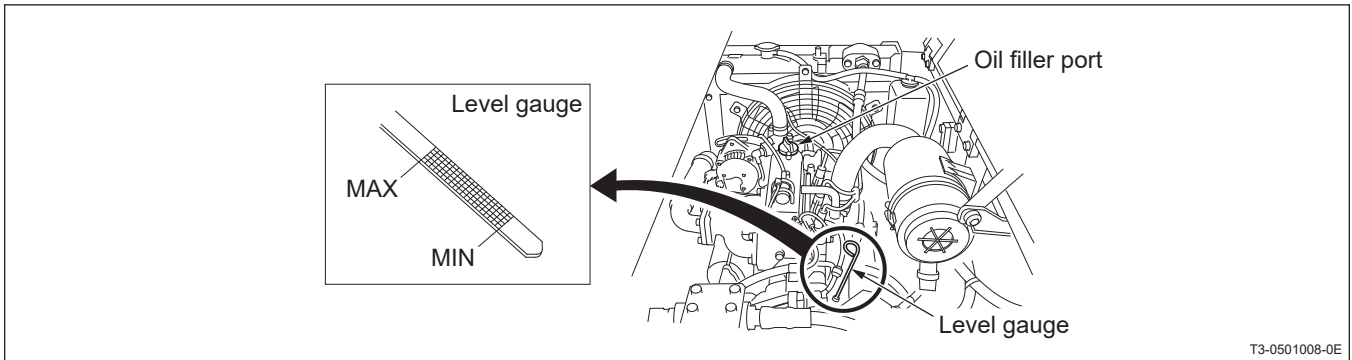
3 PERIODIC MAINTENANCE

20 Engine oil level gauge

Stop the engine and check the engine oil level.

Pull out the Oil level gauge and wipe off the oil. Then insert into the full length of the oil dip pipe again and pull it out.

Check that the oil level is between MAX and MIN. In case of shortage, add oil through the Oil filler port.



⚠ WARNING

The engine, engine oil and the engine parts are hot and may cause burn immediately after the engine is stopped. Please wait until the temperature is dropped before inspecting.

NOTICE

- **When checking the amount of oil after running the engine, please check at least 15 minutes after the engine is stopped. If the machine is inclined, please move it to a flat ground before checking the oil level.**
- **Be sure to use engine oil recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).**

(2) Initial 50 service hours

2 Wheel hub nut

Check the Wheel hub nut for looseness. If it is loose, tighten it.
Be sure to torque it to the specified value.

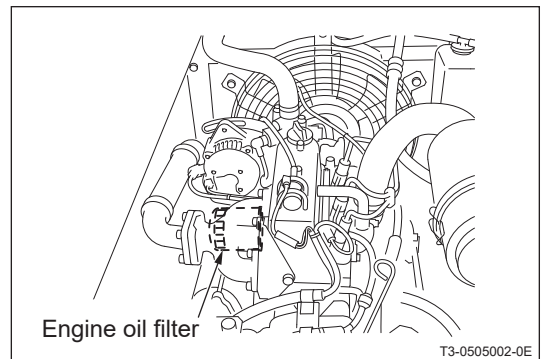
Tightening torque: **147 N·m**

⚠ CAUTION

- Turn the Wheel hub nut in the tightening direction during inspection.
- Excessive tightening of the Wheel hub nut will cause to breakage of bolts or cracks in the disc wheel. Be sure to observe the specified torque.

18 Engine oil filter

Change the Engine oil filter.

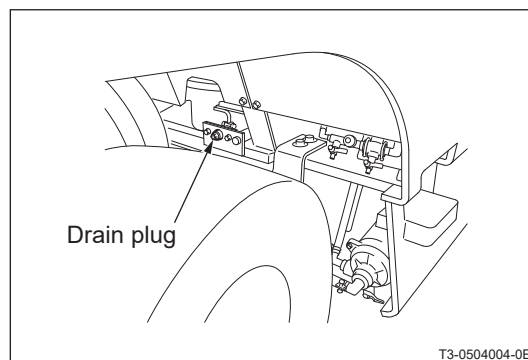


3 PERIODIC MAINTENANCE

21 Engine oil pan

Change the Engine oil and Engine oil filter.

- 1) Remove the Drain plug and drain the oil while it is warm after operation.



⚠ WARNING

Be careful not to get burned when draining warm oil.

- 2) Refit the Drain plug and fill the crankcase with the engine oil from the Filler port.

NOTICE

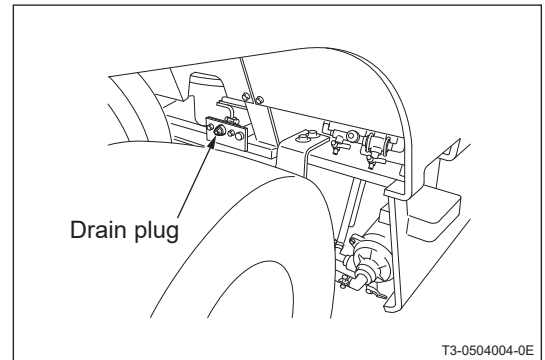
Be sure to use the engine oil recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).

(3) Every 100 service hours

21 Engine oil pan

Change the Engine oil.

- 1) Remove the Drain plug and drain the oil while it is warm after operation.



⚠ WARNING

Be careful not to get burned when draining warm oil.

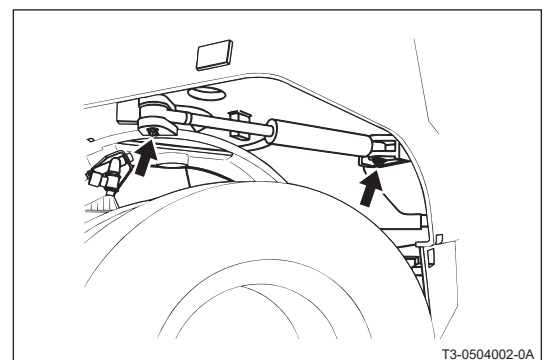
- 2) Refit the drain plug and fill the crankcase with the engine oil from the fill port on the cylinder head cover.

NOTICE

Be sure to use engine oil recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).

27 Cylinder pin

Grease the fittings at two locations.



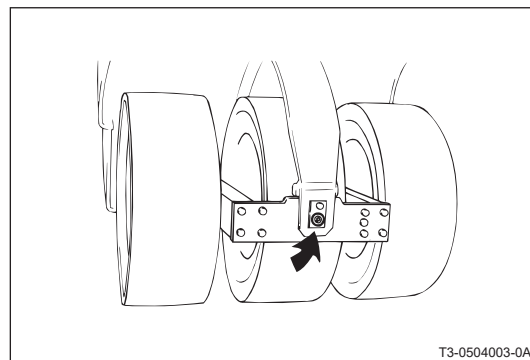
NOTICE

Be sure to use grease recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).

3 PERIODIC MAINTENANCE

28 Rear wheel pin

Grease the yoke pin at.



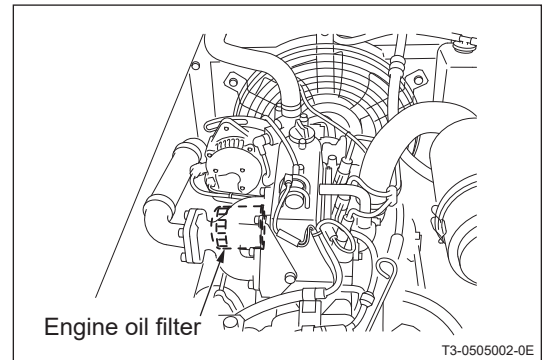
NOTICE

Be sure to use grease recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).

(4) Every 200 service hours

18 Engine oil filter

Change the Engine oil filter.



(5) Every 250 service hours

2 Wheel hub nut

Check the Wheel hub nut for looseness. If it is loose, tighten it.
Be sure to torque it to the specified value.

Tightening torque: **147 N·m**

NOTICE

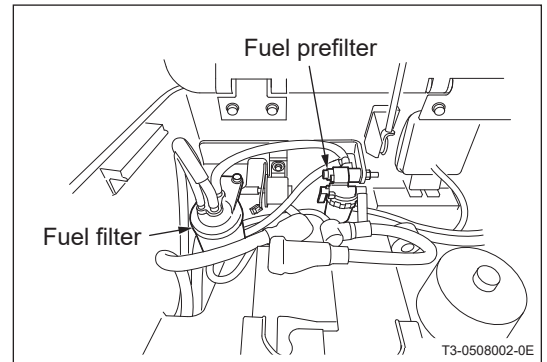
- Turn the Wheel hub nut in the tightening direction during inspection.
- Excessive tightening of the Wheel hub nut will cause to breakage of bolts or cracks in the disc wheel. Be sure to observe the specified torque.
- Tighten the Wheel hub nut 50 hours after purchase of a new machine or replacement of tires.

3 PERIODIC MAINTENANCE

(6) Every 450 service hours

11 Fuel filter

Change the Fuel filter.

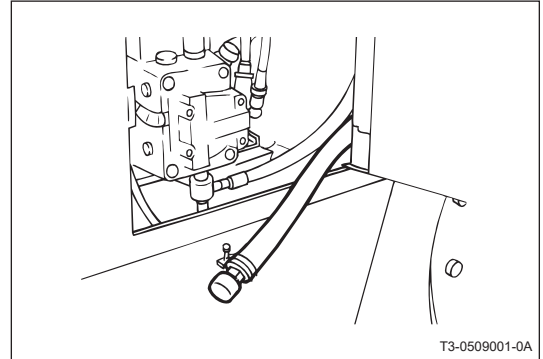


(7) Every 500 service hours

4 Hydraulic oil tank

Change the Hydraulic oil.

- 1) Remove the Drain plug, and drain oil while it is warm.
- 2) Clean inside of the tank, and fill fresh oil to the specified level.
- 3) Start the engine, and run at idling for 2 to 5 minutes. When the bubbles in the hydraulic oil are gone, stop the engine and recheck the oil level.



⚠ WARNING

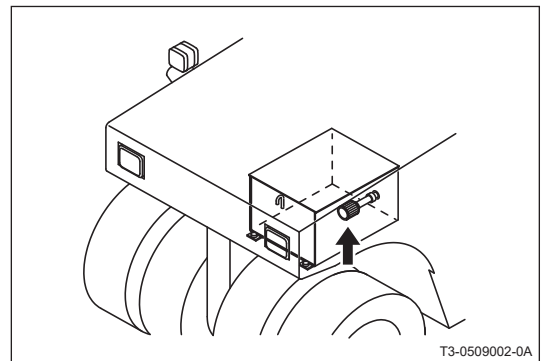
Be careful not to get burned when draining warm oil.

NOTICE

Be sure to use hydraulic oil recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).

6 Hydraulic oil suction filter

Take off the hydraulic tank cover. Take out and clean the Filter element, change the Filter element if necessary.



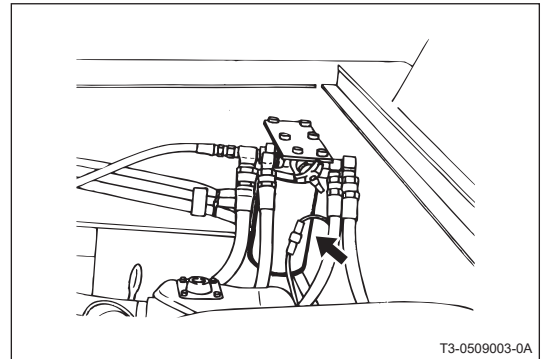
8 Radiator

Clean the cooling fins.

3 PERIODIC MAINTENANCE

22 Hydraulic oil line filter

Remove the filter case by turning counterclockwise as viewed from the bottom, and change the filter.



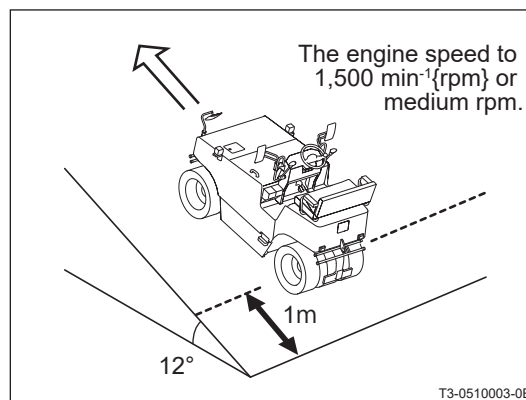
(8) Every 500 service hours or 3 months, or each time after brake pedal is used

29 Parking brake

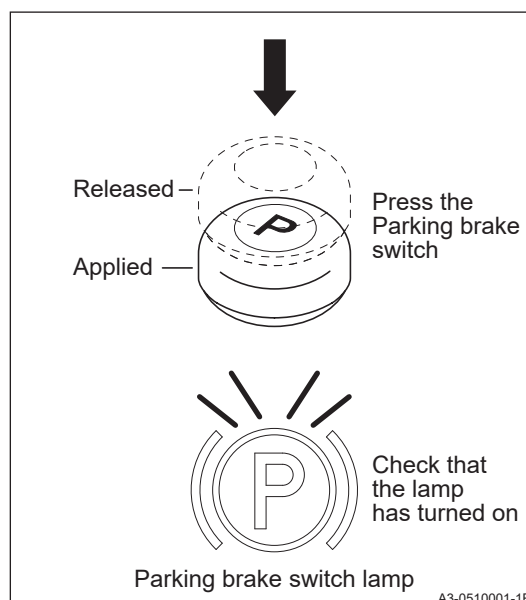
⚠ WARNING

- Make sure there are no people or obstacles near the machine to ensure safety.
 - Keep your hands on the F-N-R lever and the Steering wheel during this inspection.
- The machine may move unexpectedly during the inspection, which may lead to accidents.

- 1) Adjust the engine speed to $1,500 \text{ min}^{-1}$ (rpm) or medium rpm.
- 2) With the engine running, move the machine upward by 12° (20%) (slope with upward inclination of 12°) on a hard surface such as asphalt pavement.

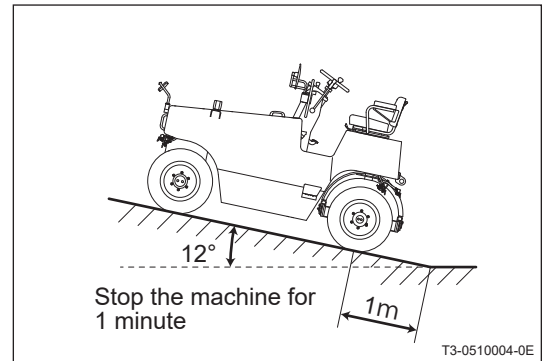


- 3) Press the Parking brake switch (P) to engage the parking brake. Check that the Parking brake indicator lamp (P) turns on. If the lamp (P) does not turn on, contact your dealer.



3 PERIODIC MAINTENANCE

- 4) Remain seated to make sure the machine remains completely still for 1 minute. If it moves, move it immediately to a flat ground, stop using it, contact your dealer, and have it repaired.



⚠ WARNING

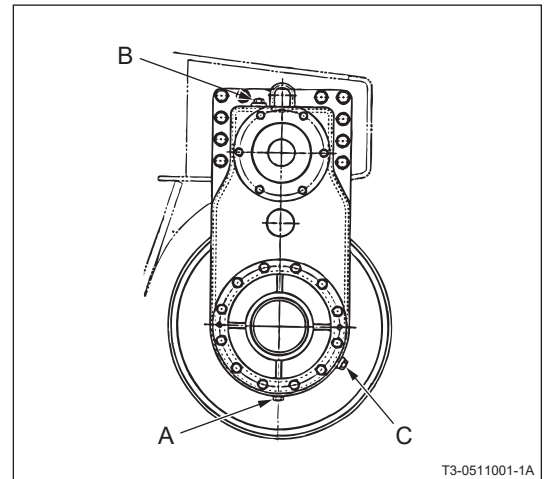
- **This inspection should be performed each time the Brake pedal is used. If not inspected, the parking brake may malfunction the next time when you try to use it, resulting in a serious accident.**
- **Do not modify the machine without the permission for safety reasons. We are not responsible for injuries, death or breakdowns caused by the modifications.**

(9) Every 1,000 service hours

16 Gear case : Wheel motor

Change the Gear oil.

- 1) Remove Drain plug (A) provided right below to drain it while the oil is still warm, and then attach the Drain plug (A).
- 2) Remove the Filler port (B) and Level port (C), respectively.
- 3) Supply oil until it overflows Level port (C).
- 4) Attach the Filler port (B) and Level port (C), respectively.



⚠ WARNING

Be careful not to get burned when draining warm oil.

NOTICE

Be sure to use gear oil recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).

19 Shockmounts : Engine mount

Check the rubber blocks for cracks, and their mounting bolts for looseness.

3 PERIODIC MAINTENANCE

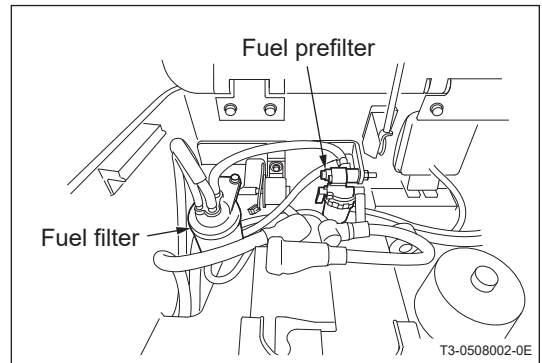
(10) As needed

5 Lighting

Make sure that all the lighting (turn signal lamps, headlamps and flood lamps) light up or blink by operating switches on the operation panel. If they do not light up, replace them with new ones.

12 Fuel prefilter

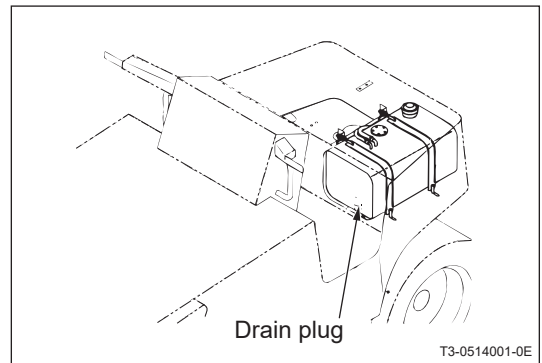
Drain the water and sediment.



13 Fuel tank

Clean the inside of the Fuel tank.

- 1) With the Drain plug removed, remove the water and sediment from the bottom of the tank.
- 2) If sedimentation is substantial, remove the Drain plug and clean the inside of the tank.
- 3) After completing the necessary work and refueling, tighten the Filler cap securely.



⚠ WARNING

- The fuel will ignite if open flames or ignition sources are used close to it.
- When removing the water or sediment from a tank filled with fuel, the fuel will gush out when the Drain plug is fully screwed out.



NOTICE

Be sure to use fuel recommended by SAKAI (refer to “3.6 Fluid and Lubricant Capacities”).

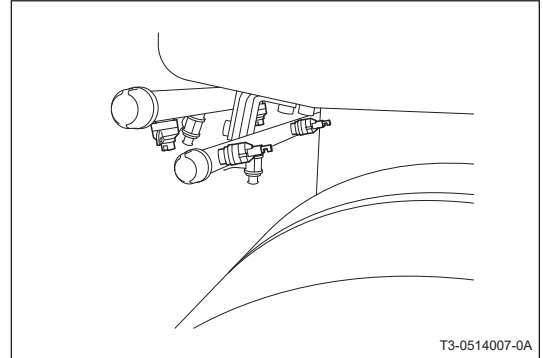
3 PERIODIC MAINTENANCE

14 Sprinkler pipe and nozzle

15 Liquid spray pipe and nozzle

Clean the Sprinkler pipe and the Nozzle.

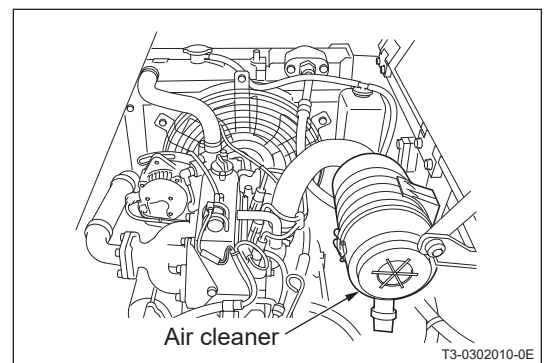
- 1) Clean inside of the sprinkler pipe with the pipe cocks open and the water sprinkler or liquid spray operated.
- 2) Take off the one-touch removal nozzles from the sprinkler pipe or remove the caps from the nozzles. Take out nozzle filters.
- 3) Clean the filters. Use a needle or the like to clean nozzle hole. Refit the filters to the nozzles.



17 Air cleaner

Clean the Air cleaner.

- 1) Unclip and remove the cover, and pull out the element.
- 2) Blow compressed air from inside of the element to clean.



CAUTION

To prevent dust from getting into your eyes and nose, wear protective equipment such as safety goggles and dust respirators before cleaning the air cleaner or element.

- 3) Fix the cover with the clip.

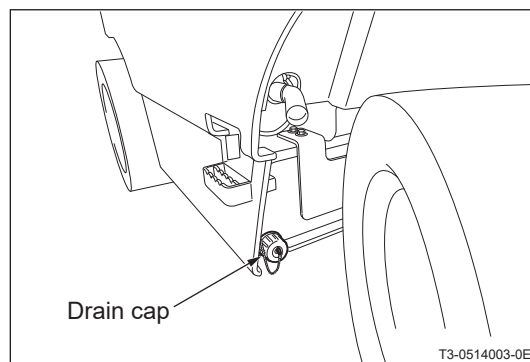
NOTICE

In normal use, change the element once in every six cleanings.

3 PERIODIC MAINTENANCE

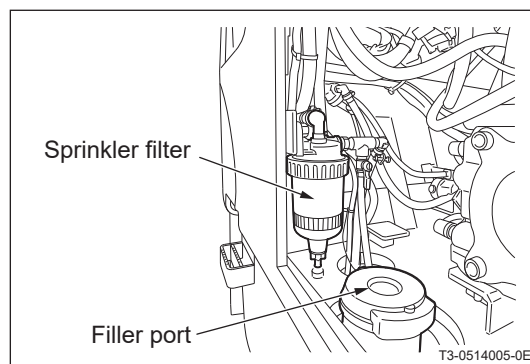
23 Sprinkler tank

Remove the Drain cap and put water through the water filler hole to discharge sediment from the tank. After discharging sediment, attach the Drain cap.



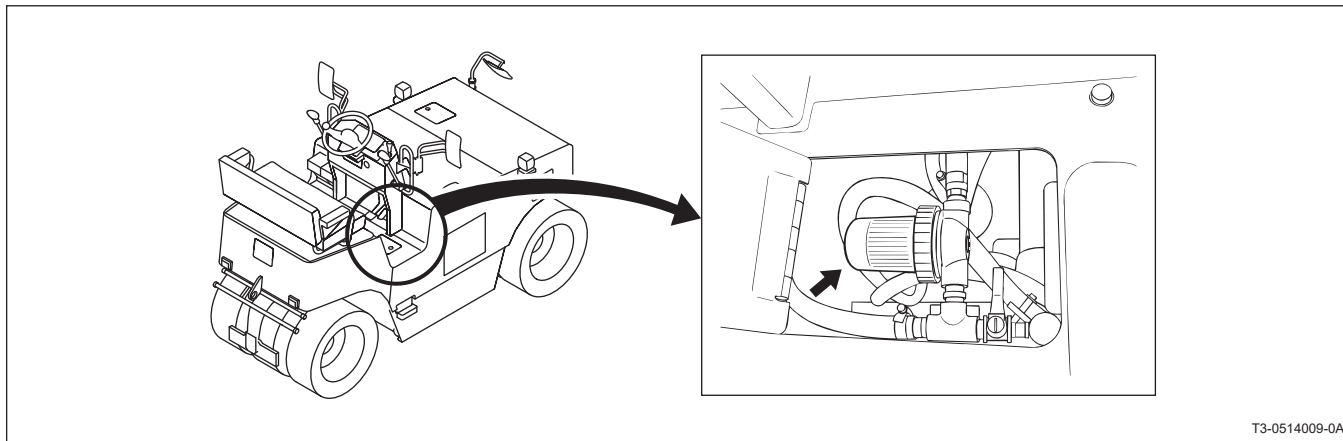
24 Sprinkler filter

Take off the filter case by turning counterclockwise as viewed from the bottom. Clean the Sprinkler filter. Change the Sprinkler filter if necessary.



25 Liquid spray filter

Remove the filter case located on the lower right of the driver's station. Clean or change the element.



26 Gas damper

Raise the cover under the sheet, and check that the cover has been held by the gas damper. If not, replace the gas damper with a new one.

3 PERIODIC MAINTENANCE

3.5 Consumable Parts

Replace consumable parts such as filter elements and air cleaner elements during periodical maintenance or before reaching the wear limit. Proper replacement of consumable parts will improve the overall life of the machine, resulting in cost-effective operations.

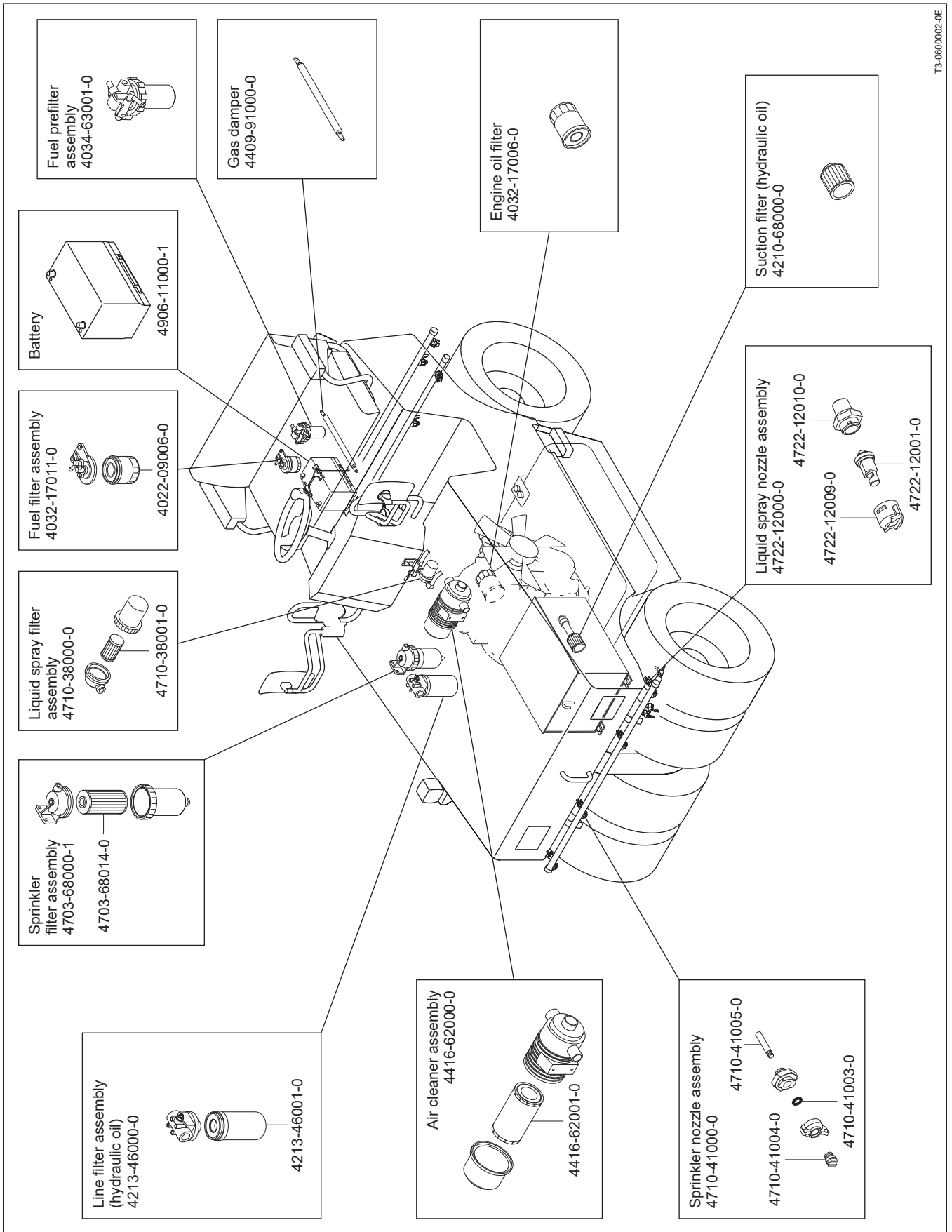
Use genuine SAKAI parts as replacement parts.

The part numbers are subject to change due to the part improvements to the parts.

When ordering parts, make sure to obtain the latest part numbers by checking with our distributorship or one of our certified service shops of the version, model name and model number of the machine in use.

Consumable Part	Part No.	Interval		Remark
		Annual replacement (year)	Replacement per operation (hours)	
Engine oil filter	4032-17006-0		200	
Fuel prefilter assembly	4034-63001-0		As needed	
Fuel filter assembly	4032-17011-0		As needed	
Fuel filter	4022-09006-0		450	
Suction filter (hydraulic oil)	4210-68000-0		500	
Line filter assembly (hydraulic oil)	4213-46000-0		As needed	
Line filter (hydraulic oil)	4213-46001-0		500	
Air cleaner assembly	4416-62000-0		As needed	
Element	4416-62001-0		As needed	After cleaning six times
Sprinkler filter assembly	4703-68000-1		As needed	
Sprinkler filter	4703-68014-0		As needed	
Sprinkler nozzle assembly	4710-41000-0		As needed	
Nozzle	4710-41004-0		As needed	
O-ring	4710-41003-0		As needed	
Strainer	4710-41005-0		As needed	
Liquid spray filter assembly	4710-38000-0		As needed	
Liquid spray filter	4710-38001-0		As needed	
Liquid spray nozzle assembly	4722-12000-0		As needed	
Nozzle	4722-12001-0		As needed	
Cap	4722-12009-0		As needed	
Adapter	4722-12010-0		As needed	
Gas damper	4409-91000-0	2	As needed	
Battery	4906-11000-1	2	As needed	95D31R

3 PERIODIC MAINTENANCE



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3 PERIODIC MAINTENANCE

3.6 Fluid and Lubricant Capacities

(1) General rules

- 1) Never add water or lubricant with the strainer removed.
- 2) Use the recommended lubricant and hydraulic fluid.
- 3) Do not use different brands of lubricants and hydraulic fluids.
- 4) Be careful of contaminants entering fluid reservoirs when refilling them.
- 5) When replacing oil, drain it completely and clean the container with flushing oil before filling it with new oil.
- 6) Be sure to use the specified type of fuel when fueling the SAKAI machines.
Nonconformities or problems resulting from the use of fuels and lubricants other than those specified by SAKAI are not covered by our warranty.

(2) Capacity

Compartment	Type of fluid	Capacity in liters (gal.)
Engine oil pan	Engine oil	3.4 (0.9)
Radiator	Coolant	4.3 (1.1)
Fuel tank	Diesel oil	36 (9.5)
Hydraulic oil tank	Hydraulic oil	39 (10.3)
Gear case	Gear oil	1.6 (0.42)
Water Sprinkler tank	Water	165 (43.6)
Liquid tank	Liquid	10 (2.6)

(3) Rating

Lubricant	Service classification	Ambient temp. and applicable viscosity rating			Applicable standards
		-15 – 30°C (5 – 86°F) Cold	0 – 40°C (32 – 104°F) Moderate	15 – 55°C (59 – 131°F) Tropical	
Engine oil	API CF	SAE 10W-30	SAE 30	SAE 40	MIL-L-2104D
Gear oil	API GL-5	SAE 80W-90	SAE 90	SAE 140	MIL-L-2105
Hydraulic oil	Anti wear	ISO VG32 over VI 140	ISO VG46 over VI 140	ISO VG68 over VI 110	ISO-3448
Grease	Lithium type extreme pressure				NLGI-2
Fuel	Diesel oil				ASTM D975-2D

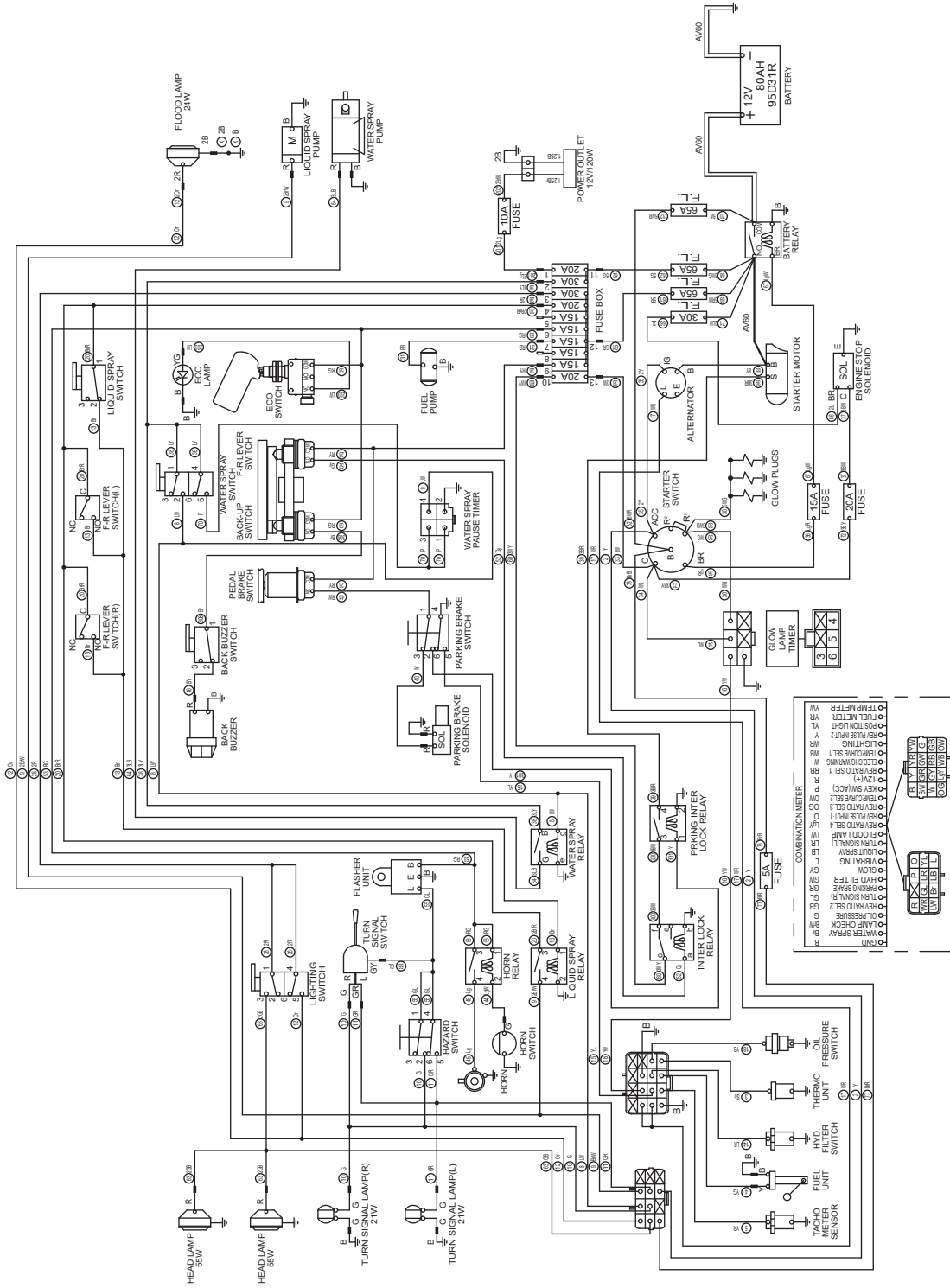
(4) Recommended lubricants

Oil company \ Lubricant	Engine oil API CF	Gear oil API GL-5	Hydraulic oil ISO VG 46	Grease NLGI-2
CHEVRON	DELO 400	RPM Universal Gear Lubricants	Rando HDZ	Multifak EP
BP	Venellus C-Extra	Energear HYPO-U	Bartran HV	Energrease LS-EP
CASTROL	CW30	Axle EPX	Hyspin AWH	Spheerol EPL
EXXON MOBIL	Delvac MX	Mobilube HD	DTE 10 Excel	Alvania EP
SHELL	Rimula Super	Gelco Multi Gear	Tellus S2 V	Mobilux EP

3 PERIODIC MAINTENANCE

3.7 Electric Wiring Diagram

T3-080002-0E



CAUTION: Size of wires not indicated by letters are AV 0.85.

Color of wire	B	BR	BR	BR	GR	GR	GR	LR	P	Pink	RW	WR	White/Red stripe	YR	Yellow/White stripe	LB
	Black	Brown/Red stripe	Brown/White stripe	Blue/Red stripe	Green/Red stripe	Green/White stripe	Blue/White stripe	Blue/Red stripe	Red	White	White/Red stripe	White/Red stripe	White/Red stripe	Yellow/Red stripe	Yellow/White stripe	Blue/Black stripe
	Black/Red stripe	Brown/White stripe	Brown/White stripe	Blue/White stripe	Green/White stripe	Green/White stripe	Blue/White stripe	Blue/White stripe	Red	Red	White/Red stripe	White/Red stripe	White/Red stripe	Yellow/White stripe	Yellow/White stripe	White/Black stripe
	Black/White stripe	Green	Green	Blue/White stripe	Green/White stripe	Green/White stripe	Blue/White stripe	Blue/White stripe	Red/Black stripe	Red/Black stripe	White	White	White	Yellow/Black stripe	Brown/White stripe	
	Black/White stripe	Green/Black stripe	Green/Black stripe	Light green	Gray	Gray	Light green	Light green	Red/Black stripe	Red/Black stripe	White/Black stripe	White/Black stripe	White/Black stripe	Yellow/Black stripe	Yellow/Black stripe	Blue/Black stripe
	Brown	Blue stripe	Blue stripe	Orange	Blue	Blue	Orange	Orange	Red/Blue stripe	Red/Blue stripe	White/Blue stripe	White/Blue stripe	White/Blue stripe	Yellow/Blue stripe	Yellow/Blue stripe	White/Blue stripe

3.8 Fuse Box and Line Fuse

Fuse Box

The Fuse box contains two 30 A-, three 20 A-, five 15 A-, and spare fuses of one 30 A-, two 20 A-, two 15 A-.

Refer to “2.1.6 Fuse Box”.

Line Fuse

The Line fuse holders of 20 A-, 15 A-, 10 A-, 5 A- are located on the DASH BOARD.

Refer to “2.1.6 Fuse Box”.

WARNING

Use the fuses of correct capacity. Using the wrong fuses may cause fires.

NOTICE

When a fuse is burned, determine the cause before replacing.

4 SPECIFICATIONS

3.9 Battery

- Leaving the battery unused for a long time or using its power excessively at any time may damage the plates and shorten its life.
- For long-term storage, charge it fully, store in a cool and dry place, and check the level of charge at least once a month.
- Keep the battery in a satisfactory condition at all times.
- The battery should be in a satisfactory condition when the engine is to be started on cold days. Avoid starting the engine with the battery in a poor condition at any time.

⚠ WARNING

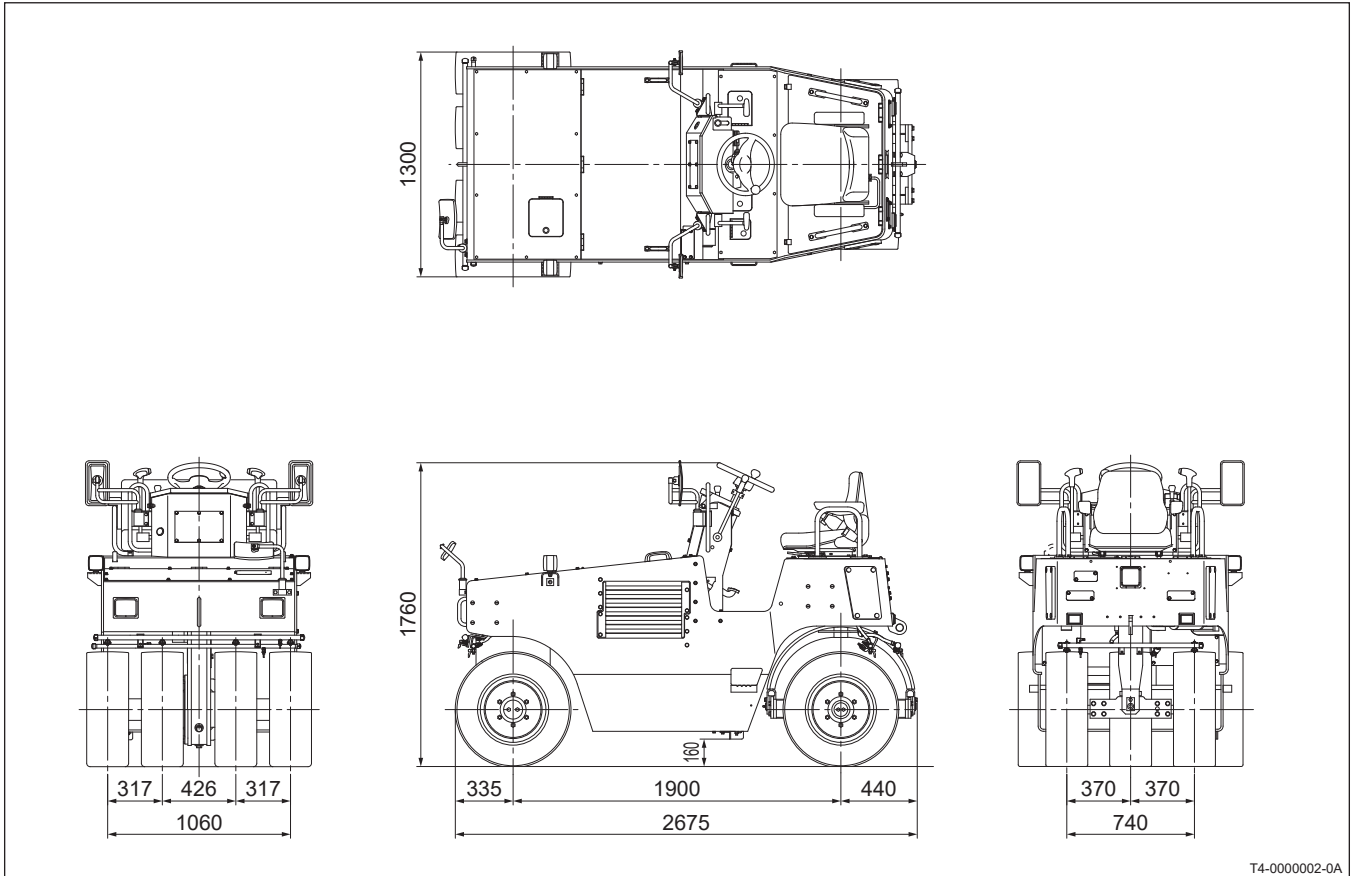
- **The battery generates hydrogen gas, so there is a danger of explosions. When there is a danger of generating sparks in poorly ventilated places, avoid recharging the battery and keep away the cigarettes and flames etc.**
- **The battery contains diluted sulfuric acid, which will dissolve clothes and burn skin. If you get battery fluid on your clothes or skin, wash it off immediately with plenty of clean water.**
- **If you get it in your eyes, rinse them immediately with clean water and seek the medical help of a doctor.**
- **If you accidentally ingest it, drink plenty of water and immediately seek the medical help of a doctor.**
- **Always wear safety goggles when handling the battery.**
- **The inspection and handling of batteries should be carried out with the engine turned off and the Starter switch in the ○ position.**
- **Turn the starter switch to the ○ position, then wait at least 30 seconds before removing the battery. If not, an abnormality may arise in the ECM (Engine Control Module).**
- **Be careful not to connect the two battery terminals together by tools or other metallic objects.**
- **To disconnect the battery cables, start with the negative terminal (ground). When connecting, start with the positive terminal. Do not allow a metallic item to bridge between the positive terminal and the machine body. This can generate sparks, causing an explosion.**
- **Loose terminals may generate sparks due to improper connections, resulting in the danger of explosions. Make sure terminals are connected firmly.**
- **The battery is for starting the engine and operating the electrical equipment on the machine. Do not use it for any other purpose.**

NOTICE

The power-supply voltage of this machine is 12 V.

4 SPECIFICATIONS

(1) TS160-4



T4-0000002-0A

Model	TS160-4	Performance	
Weight		Gradeability	25 degrees
Operating weight	2,890 kg (6,370 lbs)	Compaction width	1,300 mm (51")
On front axle	1,695 kg (3,735 lbs)	Minimum turning radius	4.1 m (162")
On rear axle	1,195 kg (2,635 lbs)	Engine	
Dimension		Model	KUBOTA "D1105-E4B" Diesel Engine
Overall length	2,675 mm (105")	Total displacement	1.123 liters (68.5 cu.in)
Overall width	1,300 mm (51")	Rated output	15.6 kW / 2,400 min ⁻¹ (21 HP / 2,400 rpm)
Overall height	1,760 mm (69")	Max. torque	71.4 N·m / 1,600 min ⁻¹ (53 ft·lb / 1,600 rpm)
Wheelbase	1,900 mm (75")	Tank capacity	
Tire size		Fuel tank	36 liters (9.5 gal)
Front	9.5/65-15-6PR (OR)	Hydraulic oil tank	39 liters (10.3 gal)
Rear	9.5/65-15-6PR (OR)	Water sprinkler tank	165 liters (43.6 gal)
Performance			
Travel speed (forward/reverse)	0 - 10.5 km/h (0 - 6.3 mile/h)		

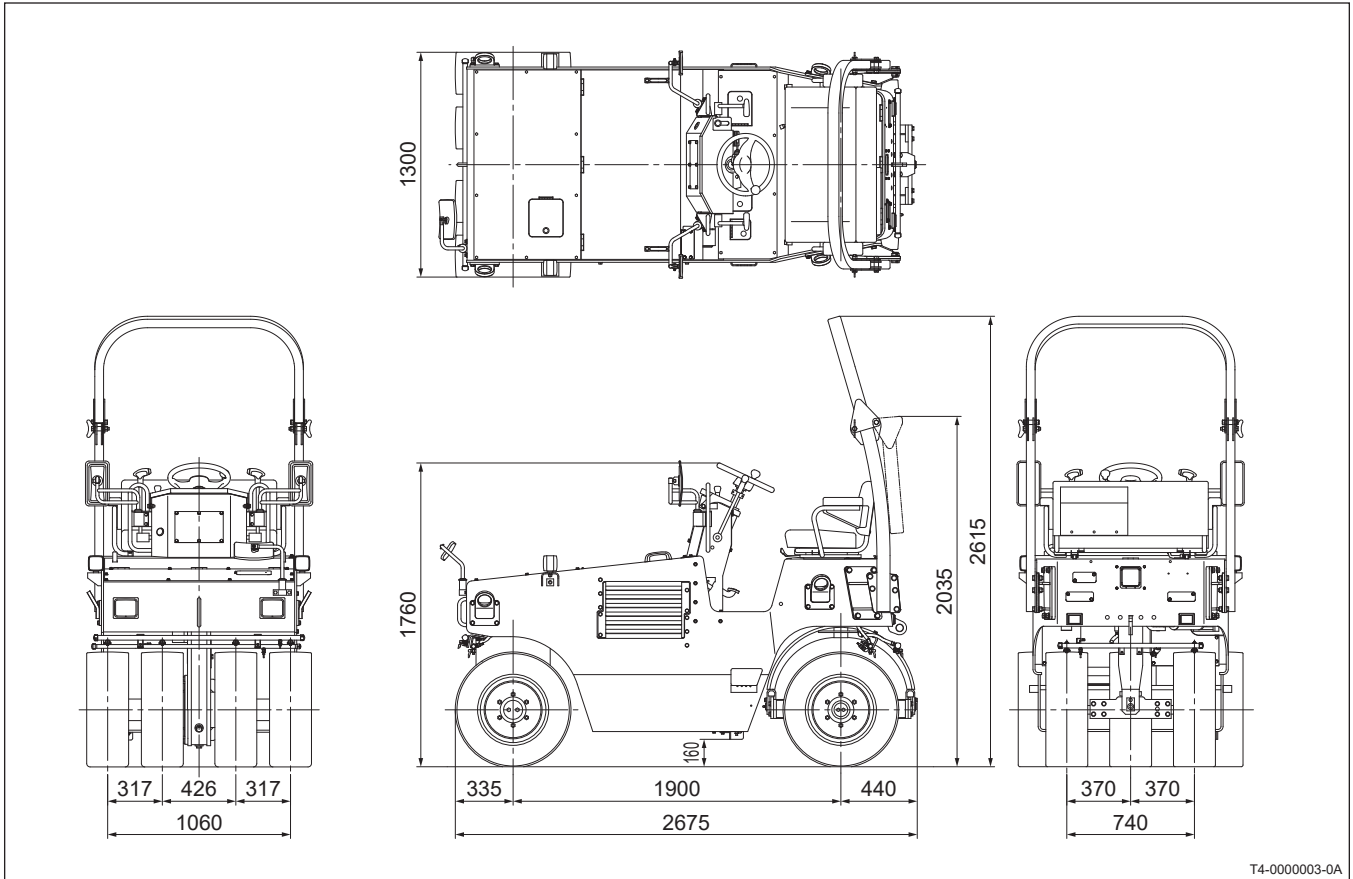
NOTE : 1) Gradeability is the calculated value. It may vary with ground surface conditions.

2) According to European Standards (EN500-1, ISO 6165, etc.), the weight are defined as follows.

Operating weight : Fuel=50%, Water=50%, Operator=75kg.

4 SPECIFICATIONS

(2) TS160-4 (with ROPS)



T4-000003-0A

Model	TS160-4 (with ROPS)	Performance	
Weight		Gradeability	25 degrees
Operating weight	2,955 kg (6,515 lbs)	Compaction width	1,300 mm (51")
On front axle	1,705 kg (3,760 lbs)	Minimum turning radius	4.1 m (162")
On rear axle	1,250 kg (2,755 lbs)	Engine	
Dimension		Model	KUBOTA "D1105-E4B" Diesel Engine
Overall length	2,675 mm (105")	Total displacement	1.123 liters (68.5 cu.in)
Overall width	1,300 mm (51")	Rated output	15.6 kW / 2,400 min ⁻¹ (21 HP / 2,400 rpm)
Overall height	2,615 mm (103")	Max. torque	71.4 N·m / 1,600 min ⁻¹ (53 ft·lb / 1,600 rpm)
Wheelbase	1,900 mm (75")	Tank capacity	
Tire size		Fuel tank	36 liters (9.5 gal)
Front	9.5/65-15-6PR (OR)	Hydraulic oil tank	39 liters (10.3 gal)
Rear	9.5/65-15-6PR (OR)	Water sprinkler tank	165 liters (43.6 gal)
Performance			
Travel speed (forward/reverse)	0 - 10.5 km/h (0 - 6.3 mile/h)		

NOTE : 1) Gradeability is the calculated value. It may vary with ground surface conditions.

2) According to European Standards (EN500-1, ISO 6165, etc.), the weight are defined as follows.

Operating weight : Fuel=50%, Water=50%, Operator=75kg.

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