

Operation & Maintenance Manual

WA380-6

WHEEL LOADER

SERIAL NUMBERS **WA380-6 A53001 – A53999**

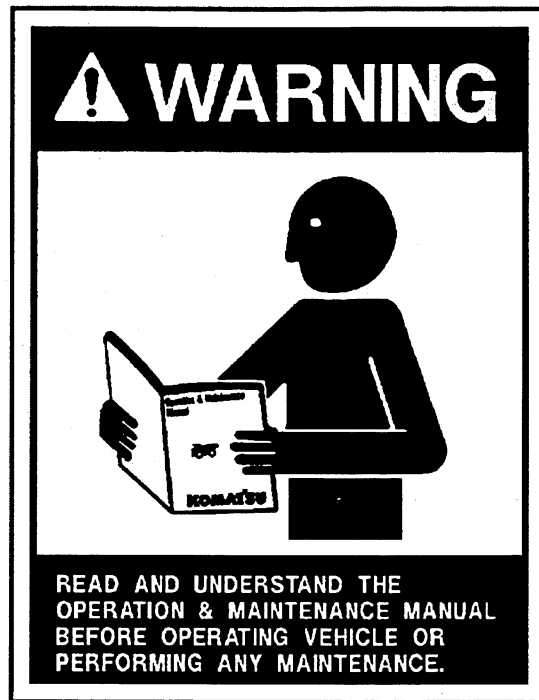
ENGINE **6D107E-1**

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! WARNING

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine. This manual should be kept near the machine for reference and periodically reviewed by all personnel who come in contact with it.

CALIFORNIA

Proposition 65 Warning

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

CALIFORNIA

Proposition 65 Warning

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

INTRODUCTION

INTRODUCTION

FOREWORD

This manual describes procedures for operation, handling, lubrication, maintenance, checking, and adjustment. It will help the operator and maintenance personnel achieve peak performance through effective, economical, and safe machine operation and maintenance.

Keep this manual handy and have all personnel read it periodically. If this manual is lost, damaged, or becomes dirty and can not be read, request a replacement manual from your local distributor.

If you sell the machine, be sure to give this manual to the new owner.

Continuing improvements in the design of this machine can lead to changes which may not be reflected in this manual.

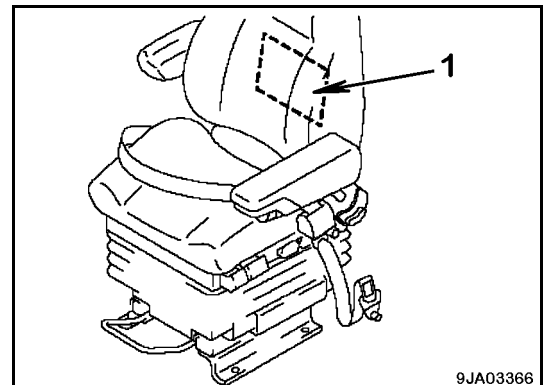
Consult your local Komatsu distributor for the latest available information on your machine or for questions regarding information in this manual.

This manual may contain attachments and optional equipment that are not available in your area. Consult your local Komatsu distributor for items that you may require.

WARNING

- **Improper operation and maintenance of this machine can be hazardous and could result in serious injury or death.**
- **Operators and maintenance personnel must read this manual thoroughly before operating or maintaining this machine.**
- **This manual should be kept near, or with, the machine for reference. All personnel who operate the machine should periodically review the manual.**
- **Some actions involved in operation and maintenance can cause a serious accident if they are not performed in the manner described in this manual.**
- **The procedures and precautions provided in this manual apply only to the intended uses of this machine. If you use your machine for any unintended uses that are not specifically prohibited, you must be sure that it is safe for you and others. You or others should never engage in prohibited uses or actions described in this manual.**
- **Komatsu delivers machines that comply with all applicable regulations and standards of the country to which they are shipped. If this machine has been purchased in another country, or purchased from someone in another country, it may lack certain safety features and specifications that are necessary for use in your country. If there is any question about whether your product complies with the applicable standards and regulations of your country, consult your local distributor or Komatsu before operating the machine.**
- **The safety description is given in “SAFETY INFORMATION” on page 0-3 and in Section 1, “SAFETY AND WARNING DECALS” on page 1-2.**

- ★ Storage location for the *Operation and Maintenance Manual* is in the pocket (1) at the rear of the operator's seat.



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SAFETY INFORMATION

Most accidents are caused by failure to follow fundamental safety rules for the operation and maintenance of the machine. To avoid accidents, read, understand, and follow all precautions and warnings in this manual and on the machine before performing maintenance and machine operations.

The following signal words are used to inform you that there is a potentially hazardous situation that may lead to personal injury or damage. In this manual and on machine labels, different signal words are used to express the potential level of hazard.



Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to most extreme situations.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Remark

This word is used for precautions that must be taken to avoid actions which could shorten the life of the machine.

Safety precautions are described in the **SAFETY** section (Section 1).

KOMATSU AMERICA CORP. cannot predict every circumstance that might involve a potential hazard in operation and maintenance. Therefore the safety message in this manual and on the machine may not include all possible safety precautions. If any procedures or actions not specifically recommended or allowed in this manual are used, you must be sure that you and others can do such procedures and actions safely and without damaging the machine. If you are unsure about the safety of some procedures, contact your local distributor or KOMATSU AMERICA CORP.

APPROVED AND NON-APPROVED USES

The Komatsu WHEEL LOADER described in this manual has been designed and constructed to be used mainly for the following functions. Any non-approved use may void the warranty, damage the machine, or possibly injure the operator.

Approved Functions

- Loading operations
- Excavating
- Grading
- Pushing

Installation of optional equipment can also be used in the following applications.

- Handling of materials (bucket - pallet forks)
- Lifting of materials (extendable boom)

Non-Approved Functions

This paragraph describes some of the improper or unauthorized uses of the machine.

It is impossible to predict all the possible improper uses. If the machine is used for any particular application other than those listed in the Approved Functions list, it is important to contact your authorized Komatsu dealer before carrying out the work operations.

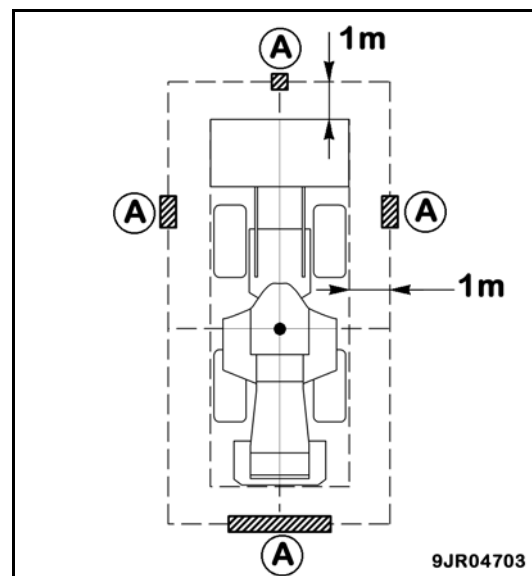
- Use of machine for lifting or transporting personnel in any manner
- Transportation of flammable liquids
- Lifting, moving, or transporting other machines with the front-end loader
- Towing other equipment with the tractor unit or work equipment
- Using the loader as a hammer or for striking or driving objects
- Towing the machine at high speeds
- Traveling at high speeds

VISIBILITY STANDARD

The visibility standards (ISO 5006) for this machine require a view shown in this diagram.

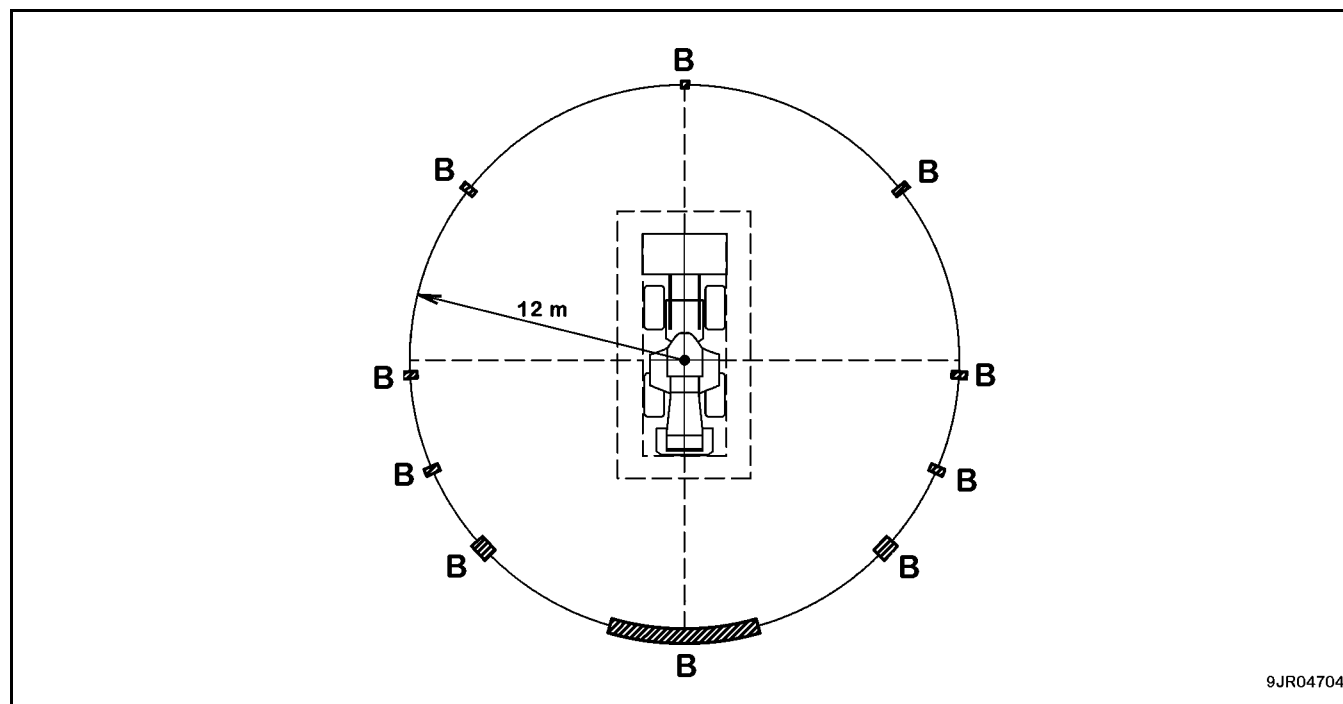
Visibility in Immediate Area

The visibility of this machine in the area 1 meter (1.1 yd) from the outside surface of the machine at a height of 1.5 m (1.6 yd) is shown in the diagram. The hatched area (A) shows the area where the view is blocked by part of the machine when mirrors or other aids to visibility are installed as standard. Be careful; there are places around the machine that cannot be seen when operating the machine.



12-M Radius Visibility

The visibility at a radius of 12 meters (13.1 yd) from the machine is shown in the following diagram. The hatched areas (B) show the areas where the view is blocked when mirrors or other aids to visibility are installed as standard. Be careful; there are places around the machine that cannot be seen when operating the machine.



INTRODUCTION

PRODUCT IDENTIFICATION

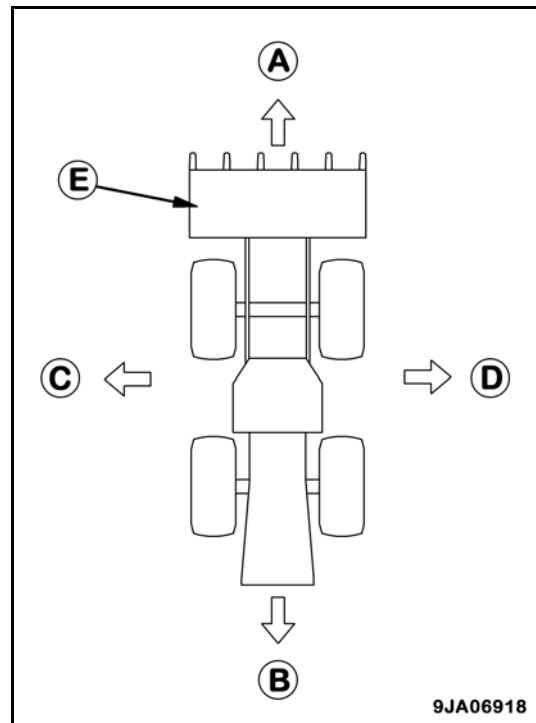
The serial numbers and model numbers on the components are the only numbers that your dealer needs when you require assistance or order replacement parts.

It is a good idea to record this information in this manual. See “SERIAL NUMBERS AND DEALER INFORMATION” on page 0-9.

Directions of Machine

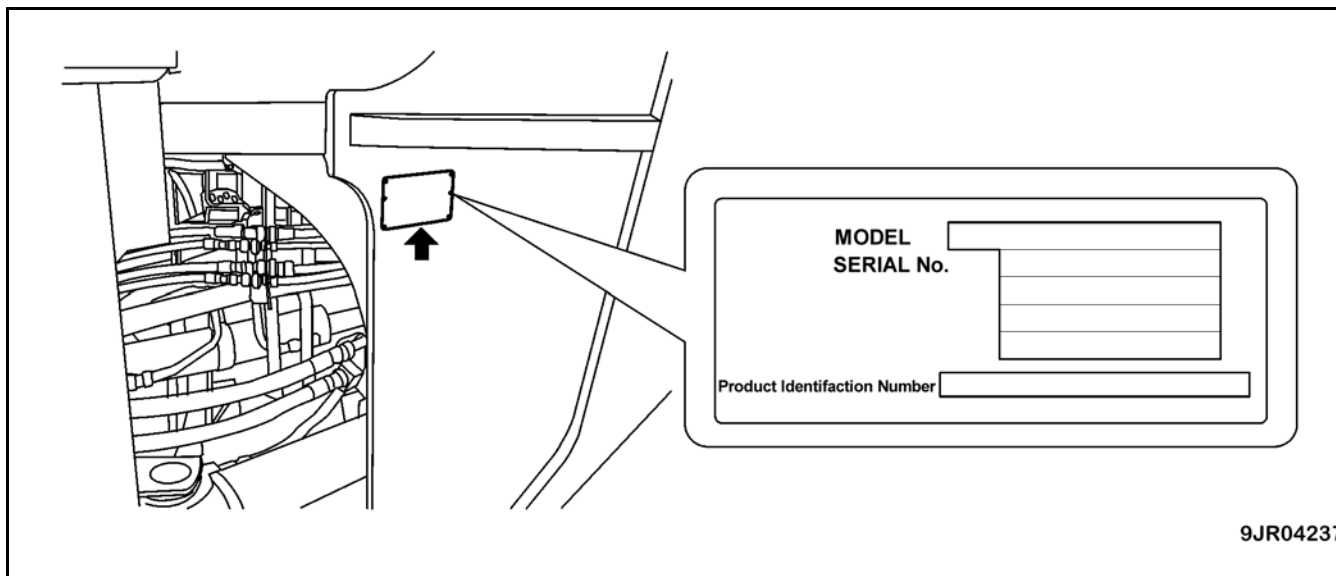
In this manual, the direction of the machine is determined according to the view from the operator’s seat, in the direction of travel (front) of the machine.

- A. Front
- B. Rear
- C. Left
- D. Right
- E. Bucket



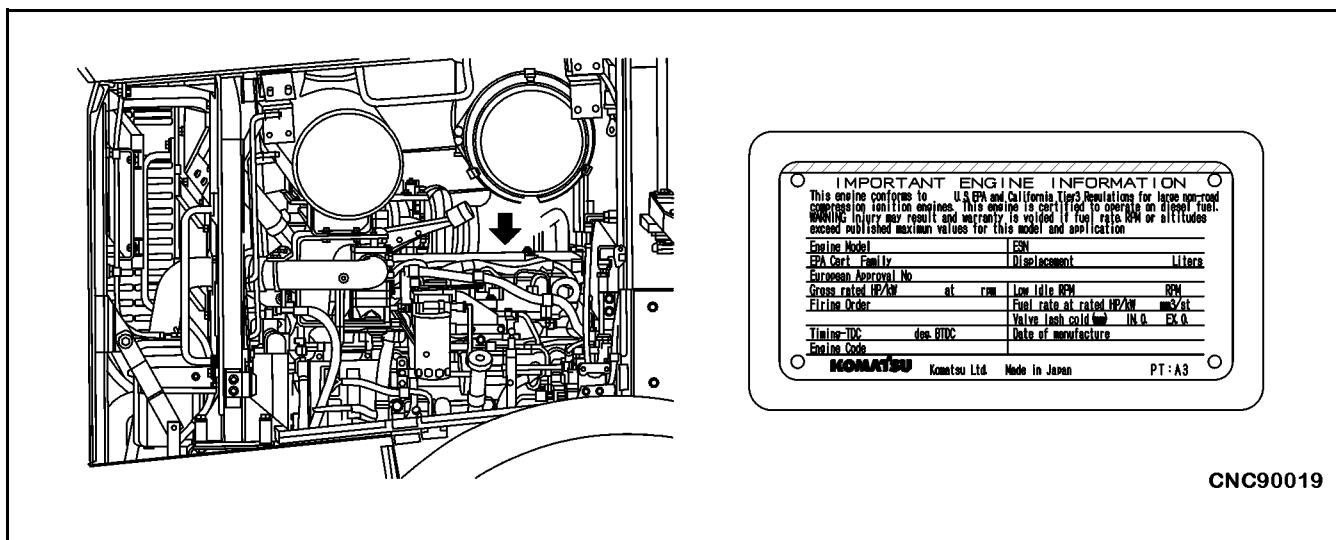
Machine Serial Number

The machine serial number is stamped on the right side, center of the front frame.



Engine Serial Number, EPA Regulations

The engine serial number is on a plate at the top at the rear of the engine, on the right side of the machine.

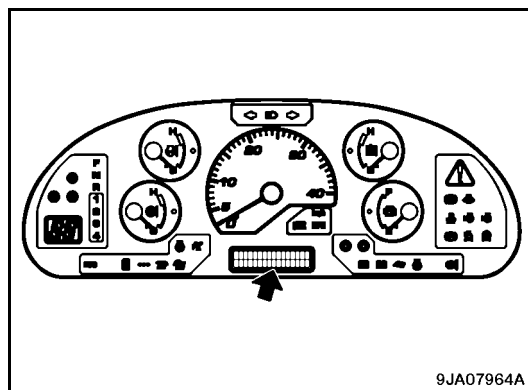


★ EPA: Environmental Protection Agency, USA

INTRODUCTION

Service Meter Location

The service meter is located on the character display at the bottom, center of the machine monitor.



SERIAL NUMBERS AND DEALER INFORMATION

Model: WA380-6

Machine #	
Engine #	

Dealer:

Address:

Phone #

Contacts:

NOTES:

MEMORANDUM

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SAFETY

WARNING

Read and follow all safety precautions. Failure to do so may result in serious injury or death.

This safety section also contains precautions for optional equipment and attachments.

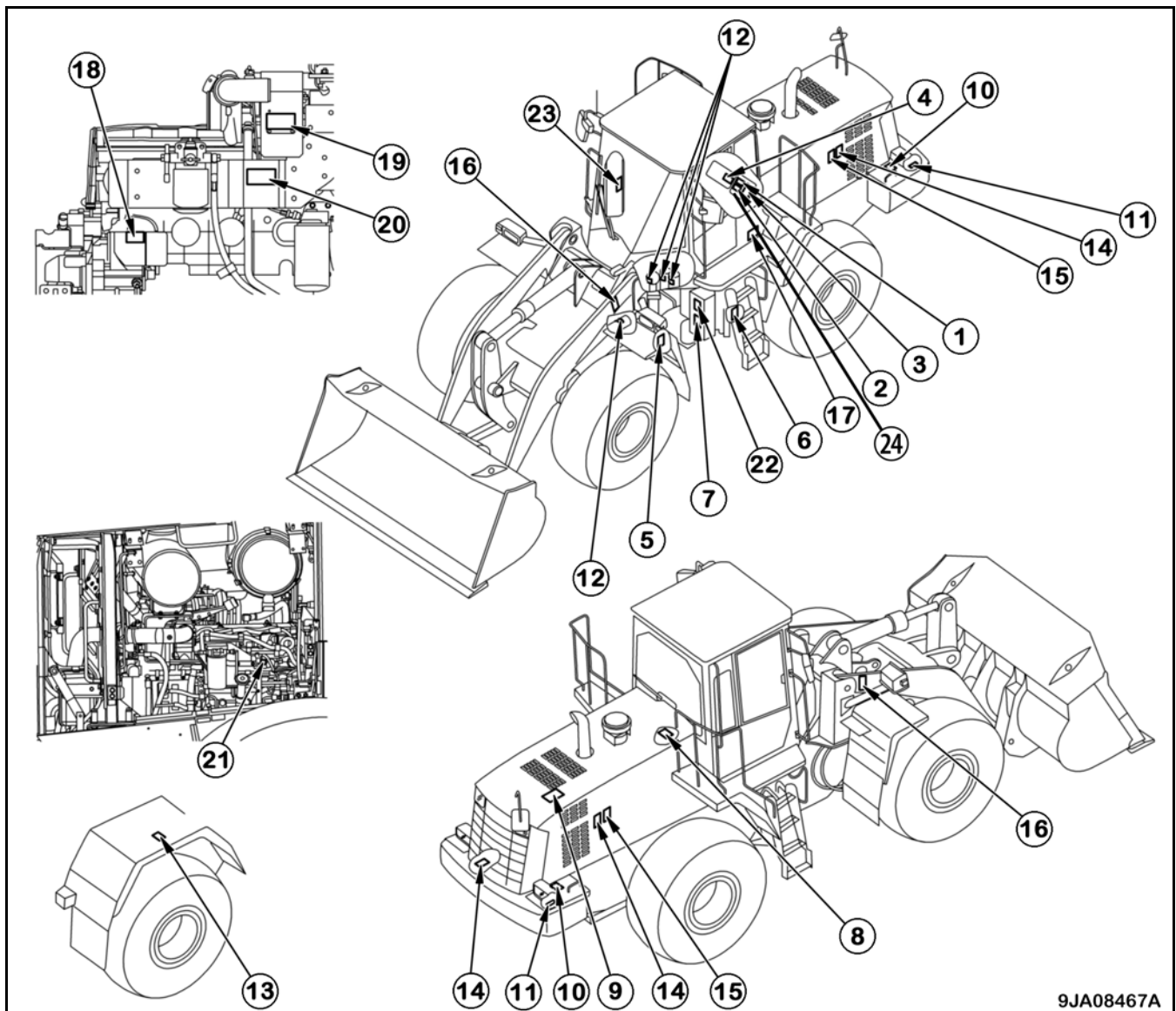
SAFETY

SAFETY AND WARNING DECALS

It is important that all safety and warning decals are in place, not damaged, covered up, or removed. It is also important for the operator to be aware of the decal content and location.

Location of the Safety Decals

- To ensure that the content of these safety decals can be read properly, be sure that they are placed correctly and always keep them clean.
- When cleaning any decal, use soap and water. **NEVER** use organic solvents or gasoline; these solutions may cause the decal to peel off.
- Your **Komatsu** Dealer can provide new replacement decals if the ones on the machine are damaged or missing.
- For part numbers of the safety decals, see this manual or check the actual decal then order the new decals from your Komatsu distributor.
- When replacing damaged or missing decals, be sure that they are placed in the proper location.
- Additional safety or warning decals may be added to your machine, if desired.



Safety Labels

1. Cautions before starting (09651-03001).

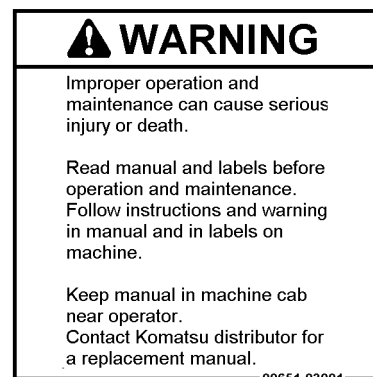
Improper operation and maintenance can cause serious injury or death.

Read manual and labels before operation and maintenance.

Follow instructions and warning in manual and in labels on machine.

Keep manual in machine cab near operator.

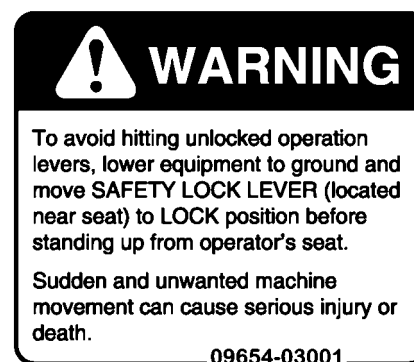
Contact Komatsu distributor for a replacement manual.



2. Cautions for leaving the operator's seat (09654-03001).

To avoid hitting unlocked operation levers, lower equipment to ground and move SAFETY LOCK LEVER (located near seat) to LOCK position before standing up from operator's seat.

Sudden and unwanted machine movement can cause serious injury or death.

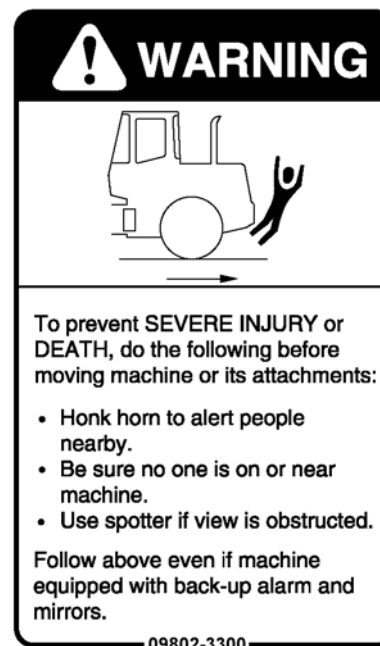


3. Cautions when travelling in reverse (09802-33000).

To prevent SEVERE INJURY or DEATH, do the following before moving machine or its attachments:

- Honk horn to alert people nearby.
- Be sure no one is on or near machine.
- Use spotter if view is obstructed.

Follow above even if machine is equipped with back-up alarm and mirrors.



SAFETY

4. Cautions for working close to electric cables (09801-13001).

Hazardous voltage hazard

Serious injury or death can occur if machine or attachments are not kept safe distance away from electric lines.

	Voltage	Safe Distance
Low Voltage	100V - 200V	2 m (7 ft.)
	6,600V	2 m (7 ft.)
Special High Voltage	22,000V	3 m (10 ft.)
	66,000V	4 m (13 ft.)
	154,000V	5 m (16 ft.)
	187,000V	6 m (20 ft.)
	275,000V	7 m (23 ft.)
	500,000V	11 m (36 ft.)

DANGER

Hazardous voltage hazard
Serious injury or death can occur if machine or attachments are not kept safe distance away from electric lines.

	Voltage	Safe Distance
Low Voltage	100V-200V	2m
	6,600V	2m
Special High Voltage	22,000V	3m
	66,000V	4m
	154,000V	5m
	187,000V	6m
	275,000V	7m
	500,000V	11m

09801-13001

5. There is a crush hazard between the articulating parts of the vehicle (09162-23000).

Crush Hazard. Can cause severe injury or death.

When machine is being operated, never place yourself in articulated area of machine.

DANGER

Crush Hazard. Can cause severe injury or death.

When machine is being operated, never place yourself in articulated area of machine.

09162-23000

6. Cautions for frame lock bar (09161-23000).

If safety bar is unlocked, machine can jackknife unexpectedly when it is being transported or hoisted.

Jackknifing can cause serious injury or death to bystanders.

- Always lock safety bar when machine is being transported or hoisted.
- If necessary, lock safety bar during servicing or maintenance.

WARNING

If safety bar is unlocked, machine can jackknife unexpectedly when it is being transported or hoisted.

Jackknifing can cause serious injury or death to bystanders.

- Always lock safety bar when machine is being transported or hoisted.
- If necessary, lock safety bar during servicing or maintenance.

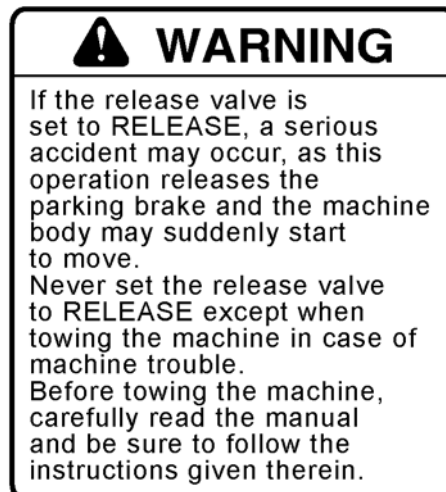
09161-23000

7. Cautions for parking brake.

If the release valve is set to **RELEASE**, a serious accident may occur, as this operation releases the parking brake and the machine body may suddenly start to move.

Never set the release valve to **RELEASE** except when towing the machine in case of machine trouble.

Before towing the machine, carefully read the manual and be sure to follow the instructions given therein.



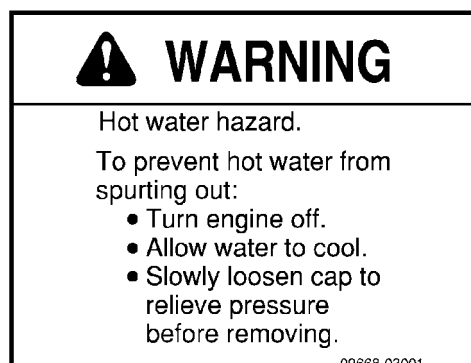
423-93-41311

8. Cautions when coolant is at high temperature (09668-03001).

Hot water hazard.

To prevent hot water from spurting out:

- Turn engine off.
- Allow water to cool.
- Slowly loosen cap to relieve pressure before removing.



09668-03001

9. Cautions when oil is at high temperature (09653-03001).

Hot oil hazard.

To prevent hot oil from spurting out:

- Turn engine off.
- Allow oil to cool.
- Slowly loosen cap to relieve pressure before removing.

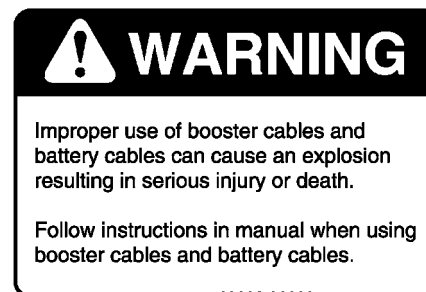


09653-03001

10. Cautions when handling battery cables (09808-03000).

Improper use of booster cables and battery cables can cause an explosion resulting in serious injury or death.

Follow instructions in manual when using booster cables and battery cables.



09808-03000

SAFETY

11. Cautions when handling batteries (09664-30010).

EXPLOSIVE GASES

- 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.

KEEP VENT CAPS TIGHT AND LEVEL POSITION.

- Causes severe burns.
- Contains sulfuric acid.
- In event of accident flush with water and call a physician immediately.

KEEP OUT OF REACH OF CHILDREN.

12. Cautions to prevent explosion (09659-53000).

Explosion hazard

- Keep away from flame.
- Do not weld or drill.

13. Do not climb on fender (09805-03000).

NEVER be on this fender.

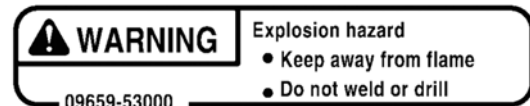
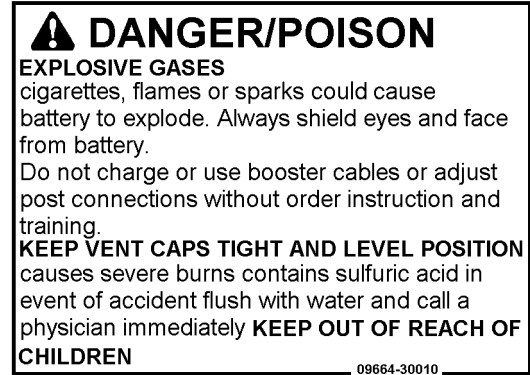
Remark

For machines equipped with a full rear fender.

14. Do not open when the engine is running (09667-03001).

While engine is running:

1. Do not open cover.
2. Keep away from fan and fan-belt.



15. Do not come near the machine (09812-13000).

Keep a safe distance.



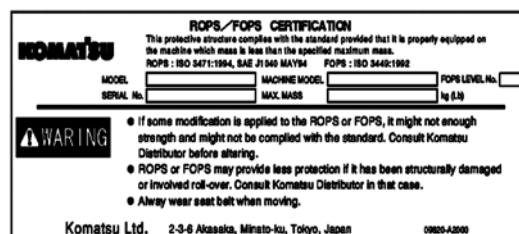
16. Do not go under work equipment (09807-C0883).

- Sign indicates a crush hazard from a falling working device.
- Keep away when the working device is raised.



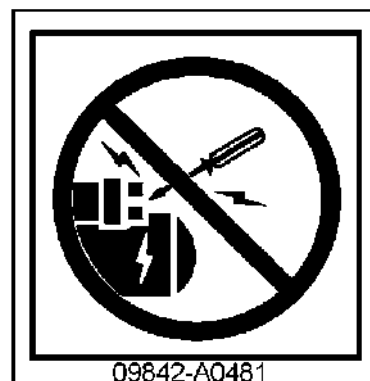
17. Do not modify ROPS (09620-A2000).

- Do not drill, cut, bend, or modify ROPS in any way.
- If damaged, replace the ROPS.
- **DO NOT REPAIR.**



18. Jump start prohibited (09842-A0481).

- Start the engine only after sitting in the operator's seat.
- Do not attempt to start the engine by short-circuiting the starter circuit. Serious injury or fire may result.



SAFETY

19. Caution for high temperature turbocharger (09817-A0753).

Sign indicates a burn hazard from touching heated parts such as engine, motor, or muffler during or right after operation.

Never touch when hot.



09817-A0753

20. Caution for high temperature exhaust pipe (09817-A0753).

Sign indicates a burn hazard from touching heated parts such as engine, motor, or muffler during or right after operation.

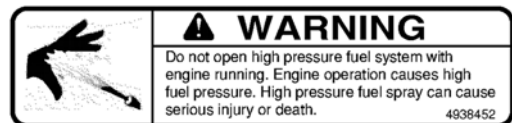
Never touch when hot.



09817-A0753

21. Caution for common rail high pressure (6754-71-1991).

Do not open high pressure fuel system with engine running. Engine operation causes high fuel pressure. High pressure fuel spray can cause serious injury or death.



6754-71-1991

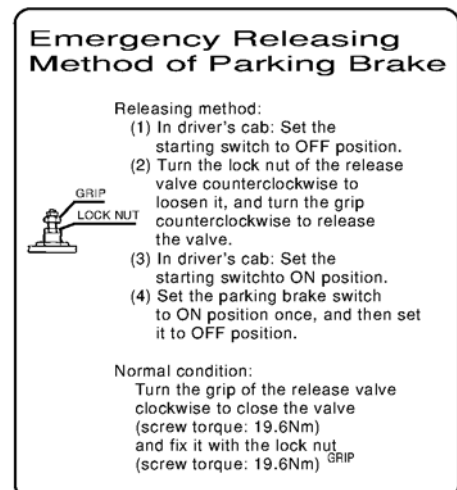
22. Parking brake emergency cancel valve (423-93-41311).

Releasing method:

- (1) In driver's cab: Set the starting switch to OFF position.
- (2) Turn the lock nut of the release valve counterclockwise to loosen it, and turn the grip counterclockwise to release the valve.
- (3) In driver's cab: Set the starting switch to ON position.
- (4) Set the parking brake switch to ON position once, and then set it to OFF position.

Normal condition:

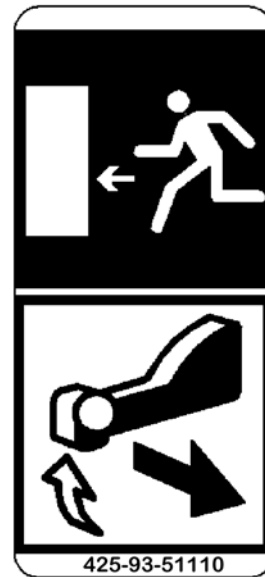
Turn the grip of the release valve clockwise to close the valve (screw torque: 19.6 Nm) and fix it with the lock nut (screw torque: 19.6 Nm)



423-93-41311

23. Emergency escape (425-93-51110).

- Sign indicates the doors on the machine through which you can escape in an emergency.
- Sign indicates the lock knob on the emergency escape door.



24. Komtrax blast zone Warning (09845-00480)

Sign indicates an explosion hazard caused by active radio transmitter at a blast zone.

Keep machine at a safe distance from a blast zone and detonators.



GENERAL SAFETY RULES AND PRECAUTIONS

General Safety Rules

- Only trained and authorized personnel are allowed to operate and service this machine.
- Before operating this machine, it is important to study the operator's manual thoroughly and become familiar with all controls and safety decals. Keep this manual with your machine at all times for easy and quick reference.
- Safety must always be the operator's most important concern. Never operate a machine that is unsafe or in poor operating condition.
- Always perform a pre-operational check on your machine before operating it.
- If the machine is equipped with a seat belt and rollover protective structure, Komatsu requires that the operator is within the confines of the rollover protective structure, with the seat belt fastened snugly around his/her waist, before operating the machine.
- Komatsu requires that if your equipment is designed for operation by one person, it is for one person only. Never allow other personnel to ride on your machine in any manner.
- Never leave your machine running and unattended. Always park the machine in a level area; lower any work equipment to the ground; set the parking brake; lock the controls; and turn the engine off before exiting the operator's compartment.
- Be sure that all personnel are at least 12 m (40 ft) away from any point on the machine before moving or operating the machine. Never allow anyone to stand near the machine while it is in operation. Remember that the larger the machine, the more restricted is your visibility.
- If pedestrians are in the area, proceed slowly and sound your horn. Keep in mind that pedestrians have the right-of-way. A loaded or smaller machine has the right-of-way over an unloaded machine.
- Never use your machine for tasks for which it was not designed; damage to the machine or injury to the operator may result.
- Follow all safety rules, precautions, and instructions when operating or performing maintenance on the machine.
- It is the owner and/or operator's responsibility to replace any safety or warning decals if they are defaced or removed from the machine.
- Think before you act; study the job carefully. Careful operators and service personnel are the best insurance against accidents.
- The operator of this machine must be alert, physically fit, and free from the influence of alcohol, drugs, or medications that might affect his/her eyesight, hearing, or reactions.
- When working with another person on a work site, or during traffic control, be sure that all personnel involved understand all hand signals that are to be used.
- When leaving a job site for long periods of time, always lower all work equipment to the ground; neutralize work equipment controls; and lock and secure your machine properly to avoid tampering by other personnel.
- Never drive up to anyone standing in your path of travel. Always be sure all personnel are standing to the side when you approach them and that they acknowledge your approach.
- Follow all rules relating to safety as outlined in this manual and by your company. Never get involved in horseplay.

Unauthorized Modifications

- If this machine is modified without permission from Komatsu, there is a danger that problems may occur with safety that may lead to serious personal injury.
 - Modifications may have an adverse effect on items such as machine strength and visibility.
 - Before making any modifications, consult your Komatsu distributor. Komatsu cannot take any responsibility for accidents, failures, or damage caused by modifications not authorized by Komatsu.

General Safety at Job Site

- Before starting operations, thoroughly check the area for any unusual conditions that could be dangerous.
- Know where to report an accident or fire. In case of an emergency, have a local emergency phone number available.
- Be careful when operating around or near open burning operations.
- Maintain the fire extinguisher on the machine and a second one at the job site.
- Keep the machine clean, especially from flammable materials such as trash, grease, oil, or fuel.
- Keep all safety equipment in good working condition.
- Check the terrain and condition of the ground at the work site, and determine the safest method of operation.
- Do not operate where there is a hazard of landslides or falling rocks.
- If water lines, gas lines, or high-voltage electrical lines may be buried under the work site, contact each utility company and have them identify the location of these lines.
- Take action to prevent unauthorized people from approaching the job site.
- When working on public roads, position flagmen and erect barriers to ensure the safety of passing traffic and pedestrians.
- When traveling or operating in shallow water or on soft ground, check the shape and condition of the bedrock, and the depth and speed of flow of the water before starting operations.
- Conduct periodic safety training and familiarize all personnel with emergency procedures.

Working on Loose Ground

- Avoid traveling or operating your machine too close to the edge of cliffs, overhangs, and deep ditches. The ground may be weak in such areas. If the ground could collapse under the weight or vibration of the machine, there is a hazard that the machine may fall or tip over.
- Remember that the soil is loose after heavy rain, blasting, or after earthquakes.
- When working on embankments or near excavated ditches, there is a hazard that the weight and vibration of the machine could cause the soil to collapse.
- Before starting operations, take steps to ensure that the ground is safe and to prevent the machine from rolling over or falling.

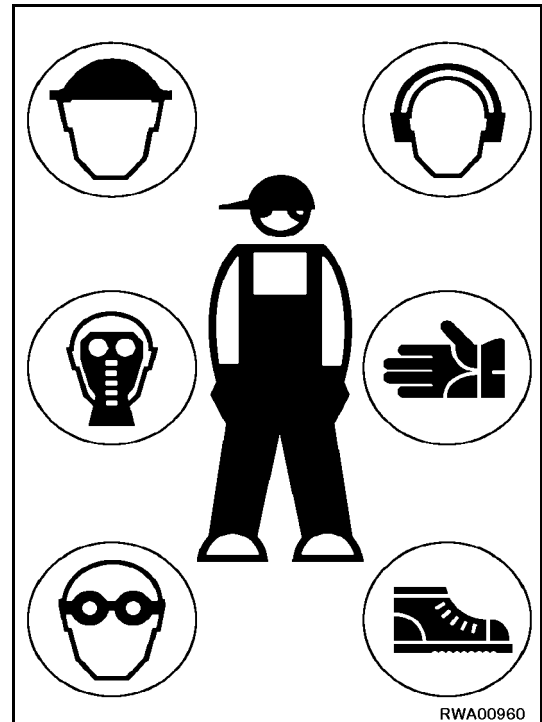
Safety Features

- Be sure that all guards and covers are in place especially after servicing the machine.
- Have guards or covers repaired immediately, if they are damaged. See “Starting Engine” on page 2-99..
- Use safety equipment such as safety locks and seat belt properly. See “Seat Belt Inspection” on page 1-21.
- Never remove any safety features. Always keep them in good operating condition.
- Always secure the machine in a safe position. See “Parking the Machine” on page 1-33. and “Parking the Machine” on page 2-152..
- Seat belt: See “Inside Operator’s Compartment” on page 1-16.
- Improper use of safety features could result in serious bodily injury or death.
- Be sure the machine has the correct equipment required by local rules and regulations.

SAFETY

Personal Protective Equipment

- If your machine is equipped with safety equipment, Komatsu requires this equipment to be used when operating your machine.
- Avoid loose fitting clothing, jewelry, and loose long hair. These can catch on controls or in moving parts and cause serious injury.
- Wear a hard hat, safety glasses, safety shoes, mask, or gloves when operating or maintaining the machine.
- Always wear safety goggles, hard hat, and heavy gloves if your job involves driving pins with a hammer or cleaning the air cleaner element with compressed air.
- Check to be sure no one is near your work area.
- Check to be sure all personal protective equipment is in good condition before using it.
- If you will be subject to loud noise, always wear ear protection.



Fire and Explosion Prevention

Fuel and oil are flammable. Fuel is particularly flammable and can be hazardous.

Always observe the following precautions:

- Keep any open flames, airborne sparks, or burning embers away from flammable fluids.
- Stop the engine and do not smoke when refueling.
- Tighten all fuel and oil caps securely.
- Refueling or adding oil should be done in well-ventilated areas.
- Clean up any fluid spills.

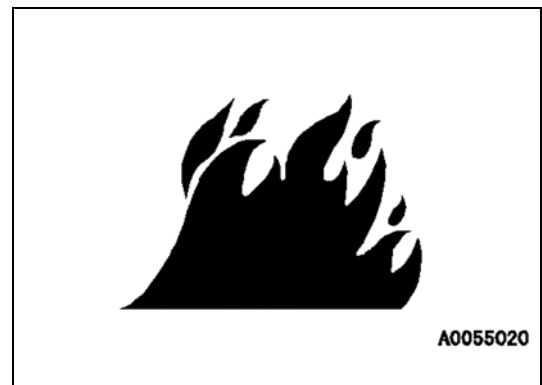


Fire Caused by Fuel, Oil, Antifreeze, or Window Washer Fluid

Do not bring any flame or fire close to flammable substances such as fuel, oil, antifreeze, or window washer fluid. They may catch fire and are hazardous.

To prevent fire, always observe the following precautions:

- Do not smoke or use any flame near fuel or oil.
- Stop the engine before refueling.
- Do not leave the machine while adding fuel or oil.
- Tighten all fuel and oil caps securely.
- Always inspect around the entire fuel tank for leaks; clean or repair, if required.
- Inspect fuel system for leaks.
 - This includes fuel lines, filters, and injection system.
 - Clean or repair, if required.



- Do not spill fuel on overheated surfaces or on parts of the electrical system.
- Use an automotive-type washer fluid in the windshield washer system.
- Never use flammable fluids in the windshield washer system.
- Use well-ventilated areas for adding or storing oil and fuel.
- Keep oil and fuel in the determined place and do not allow unauthorized persons to enter.
- After adding fuel or oil, wipe up any spilled fuel or oil.
- When carrying out grinding or welding work on the chassis, move any flammable materials to a safe place before starting.
- When washing parts with oil, use a non-flammable oil. Diesel oil and gasoline may catch fire. Do not use them.
- Put greasy rags and other flammable materials into a safe container to maintain safety at the work place.
- Do not weld or use a cutting torch to cut any pipes or tubes that contain flammable liquids.

Fire Caused by Accumulation of Flammable Material

- Remove any dry leaves, wood chips, pieces of paper, wood dust, or any other flammable materials accumulated or affixed around the engine, exhaust manifold, muffler, air cleaner, battery, or inside the undercovers.
- Be aware that operations such as logging, mulching, clearing, and landfill work may cause trash and debris to accumulate on the machine. Always remove accumulated trash and debris on a daily basis.
- Clean the machine after servicing the hydraulic system, engine, or fuel system.
- Operations near burn piles or other open burning may cause airborne sparks or glowing embers to cause a fire on the machine.

Fire Caused by Electrical Wiring

Short circuits in the electrical system can cause a fire.

- Always keep electric wiring connections clean and securely tightened.
- Check the wiring every day for looseness or damage to the wire insulation.
 - Tighten any loose connectors or wiring clamps.
 - Repair or replace any damaged, pinched, or chaffed wiring.
- After-market radios or other electrically-operated equipment in the cab must be fused close to the power supply.

Fire Caused by Hydraulic Lines

- Check that all the hose and tube clamps, guards, and cushions are securely fixed in position.
 - If they are loose, they may vibrate during operation and rub against other parts. This may damage the hoses and cause high-pressure oil to spurt out, leading to fire damage or serious injury.
- Check for oil leaks daily and repair them immediately.

Fire Caused by Lighting Equipment

- When checking fuel, oil, battery electrolyte, or coolant, always use lighting with anti-explosion specifications.

Action if Fire Occurs

If a fire occurs, escape from the machine and take the following actions:

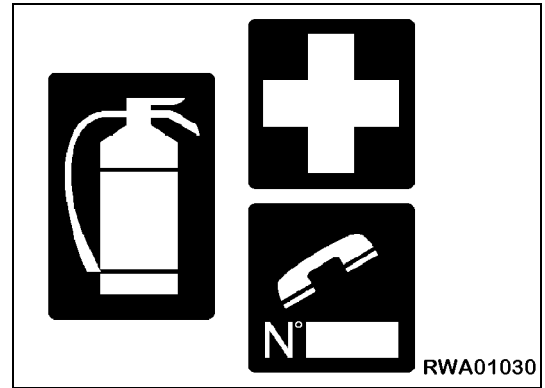
- Do not attempt to move the machine or continue operations.
- Turn the start switch OFF to stop the engine.
- Use the handrails and steps to get off the machine.
- Immediately call for help.
- When using a fire extinguisher, always aim the extinguisher at the base of the fire.
- If an optional fire extinguishing system is in place, be familiar with its operating procedures.

SAFETY

Fire Extinguisher and First Aid Kit

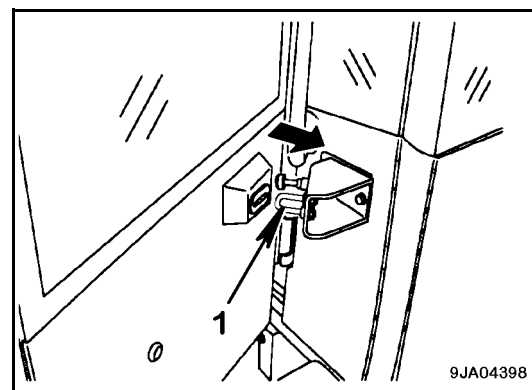
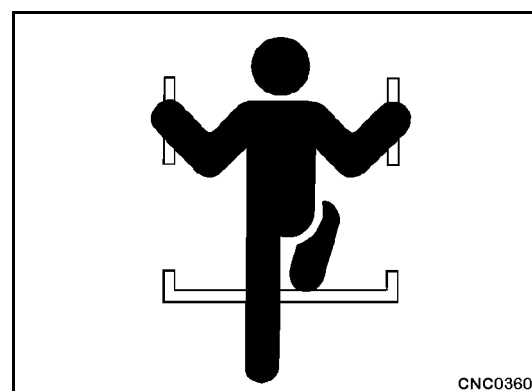
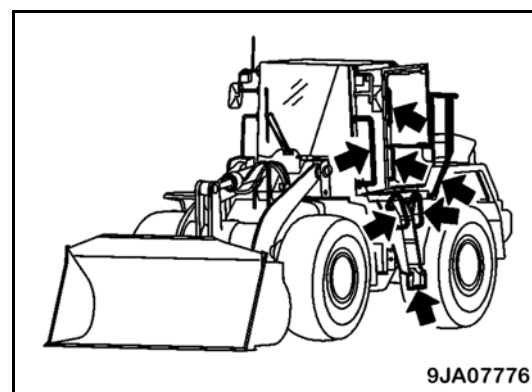
As a precaution in case a fire or an injury occurs, always keep a fire extinguisher and first aid kit on your machine and take the following precautions:

- Be sure that the fire extinguisher is in good condition. Read the label on it to ensure you know how to use it.
- Keep a first aid kit in the storage area. Check the kit periodically and make any additions, if necessary.
- Keep a list of emergency phone numbers in case of an accident.



Mounting and Dismounting

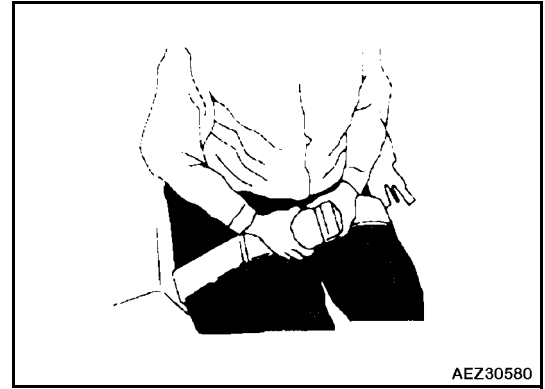
- When mounting or dismounting this machine, always be sure the work equipment is fully lowered to the ground; the engine is OFF; and the parking brake is set.
- Use all hand holds and step plates on your machine (marked by arrows in the graphic).
- Never climb on the engine hood or covers where there are no non-slip pads.
- Never jump off or on to the machine.
- Never move from the step at the rear of the machine or the step at the side of the cab to stand on top of the tire.
- If there is any oil, grease, or mud on your shoes, wipe it off immediately before getting on the machine.
- If there is any oil, grease, or mud on the rails, steps, or platforms, wipe it off immediately before getting on the machine.
 - Always keep these areas clean and in good condition.
- Never get on or off a moving machine.
 - These actions may lead to serious injury.
 - Always bring the machine to a full stop.
- Never get on or off the machine while holding tools in your hand.
- When entering the cab, stand on the top step before opening the door.
- When getting on or off the machine, always face the machine and maintain a **Three-Point Contact** (both feet and one hand, or one foot and both hands) with the handrails, steps, and platforms to ensure that you support yourself properly.
- When entering the cab and opening the cab door, push the door open until it is securely into door latch (1) and held in position.
- Use the handrails on the inside of the door while entering or exiting the cab.
- Never hold any control levers or the steering wheel when getting on or off the machine.



SAFETY

Inside Operator's Compartment

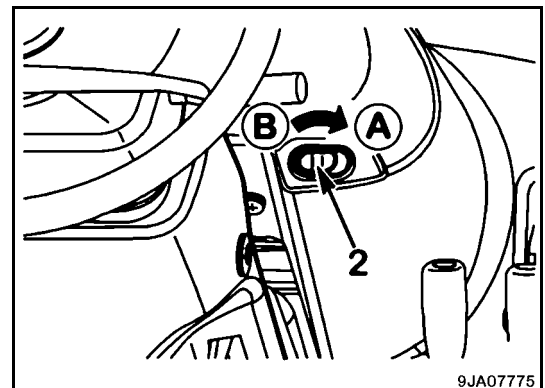
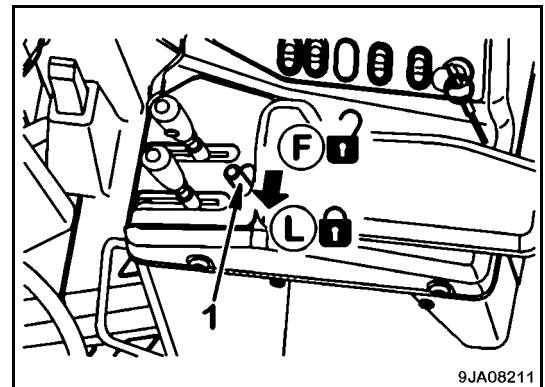
- When entering the operator's compartment, always remove mud and oil from the soles of your shoes.
 - If you operate the brake pedal with mud or oil on your shoes, your foot may slip and may cause an accident.
- After using the ashtray, make sure matches or cigarettes are properly extinguished and be sure to close the lid of the ashtray.
 - If the ashtray is left open, there is danger of fire.
- Do not leave lighters or aerosol cans lying around the operator's compartment.
 - If the temperature inside the operator's compartment gets too high, there is danger that the lighter or aerosol can may explode.
- Do not stick suction pads to the window glass.
 - Suction pads may act as a lens and could cause a fire.
- Do not use cellular telephones inside the operator's compartment when driving or operating the machine.
- After-market radios or other electrically-operated equipment in the cab must be fused close to the power supply.
- Never bring any dangerous objects, such as flammable or explosive items, into the operator's cab.
- To ensure safety, do not use the radio or music headphones when operating the machine.
- Keep the operator's compartment clean.
 - Never allow trash or tools to accumulate; these may hinder the operation of the controls or pedals.
- When operating the machine, do not put your hands or head out of the window or beyond the protection of the ROPS.
- Always use the seat belt supplied with your machine. See "Seat Belt Inspection" on page 1-21.
 - Be sure the seat belt is fastened snugly around your waist before operating the machine.



Precautions When Standing Up from Operator's Seat

When standing up from the operator's seat:

- Lower the work equipment completely to the ground.
 - Set work equipment lock lever (1) to LOCK position (L).
-
- Set parking brake switch (2) to the ON position (A).
 - Stop the engine.
 - ★ If you accidentally touch the control levers when they are not locked, the machine may suddenly move and cause serious personal injury or death.



Precautions When Using ROPS

WARNING

Never modify, weld, cut, or drill on any part of a ROPS structure. Doing so may weaken the structure which could lead to possible failure in a rollover situation.

The ROPS (Roll Over Protective Structure) must never be removed from the machine. The ROPS is installed to protect the operator if the machine rolls over. It is designed not only to support the load if the machine rolls over, but also to absorb the impact of the energy.

The ROPS fulfills all the regulations and standards for all countries.

- If it is modified without authorization or is damaged, the strength may be reduced and it may not be able to fulfill its function properly.
- Never drill, cut, weld on, or modify the ROPS structure.
- If the ROPS structure should become damaged in any way, replace it immediately.
- Do not make repairs to the ROPS structure itself.

Emergency Escape from Operator's Cab

If the left door of the cab does not open or if it is dangerous to get off the machine from the left side, release the open lock of the right door (emergency door) and use the right door as an emergency escape route.

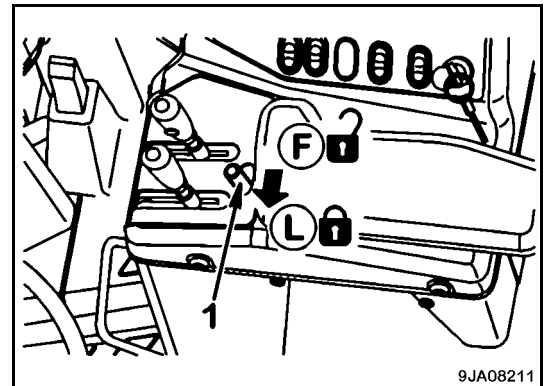
See "Emergency Escape Right Door" on page 2-69..

SAFETY

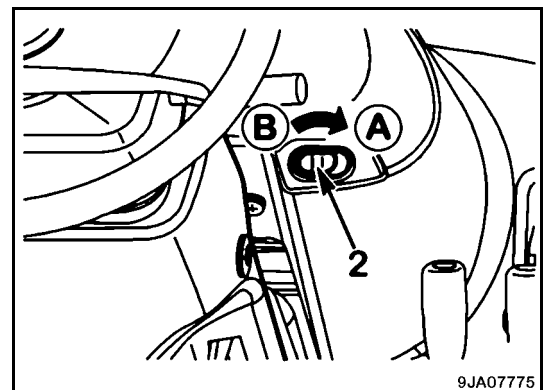
Leaving Operator's Compartment

These procedures must be followed when exiting the operator's cab.

1. Park the machine in a level area.
2. Lower the work equipment completely to the ground.
3. Set work equipment lock lever (1) to LOCK position (L).



4. Set parking brake switch (2) to the ON position (A).
5. Turn the engine OFF.



6. Remove the ignition key and keep the key with you.
7. Use the key to lock and secure all the equipment locks.
 - This will prevent unauthorized personnel from tampering with your machine.
 - You are responsible for securing your machine.

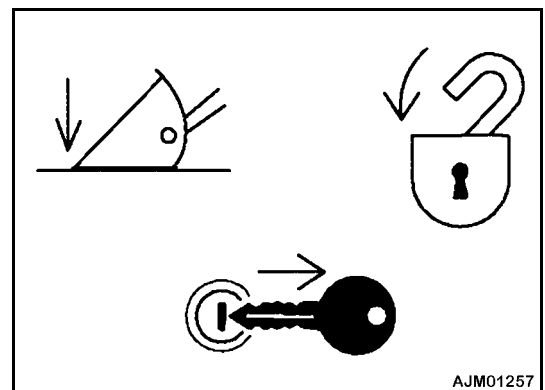
Remark

Never leave your machine running and unattended, even for a moment.

Remark

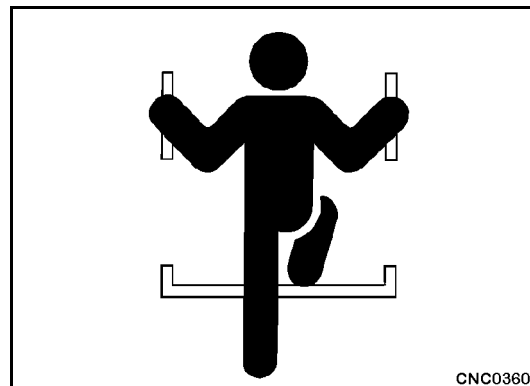
Work equipment posture: See "Parking the Machine" on page 2-152..

Lock: See "Locking the Machine" on page 2-155..



Precautions When Cleaning Cab Glass

- ★ It is extremely dangerous to move from the side of the cab to the step in the center of the front frame.
- Always keep the cab glass clean to ensure good visibility when operating the machine.
- When cleaning the front glass, pay careful attention to the safety of your footing on the platform on the left or right of the cab or on the step on the front fender so that you do not fall off the machine.
- When getting on or off the machine, always face the machine and maintain a three-point contact (both feet and one hand, or one foot and both hands) with the handrails, steps, and platforms to ensure that you support yourself properly.



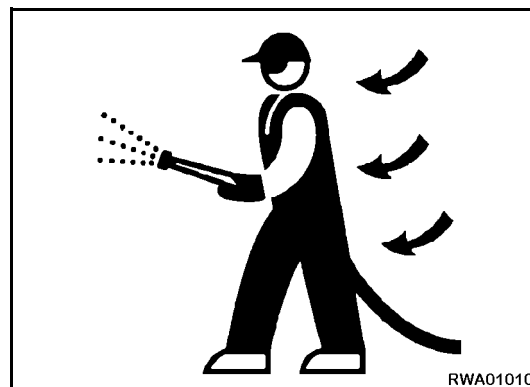
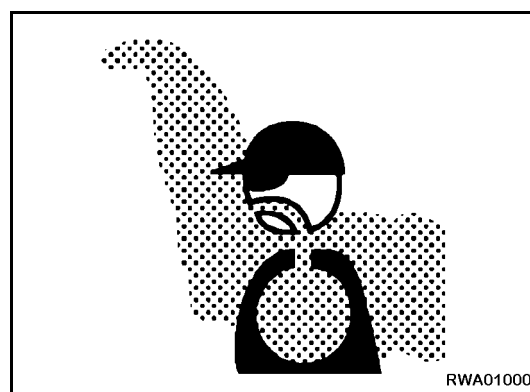
Asbestos Hazard Alert

Asbestos dust in the air can cause lung cancer, if it is inhaled. There is danger of inhaling asbestos materials when working on job sites handling industrial waste.

Always observe the following precautions:

- Spray water to keep down the dust when cleaning. Do not use compressed air for cleaning.
- If there is danger that there may be asbestos dust in the air, always operate the machine from an upwind position. All workers should use an approved respirator.
- Do not allow other people to approach during the operation.
- Always observe the rules and regulations for the work site and environmental standards.

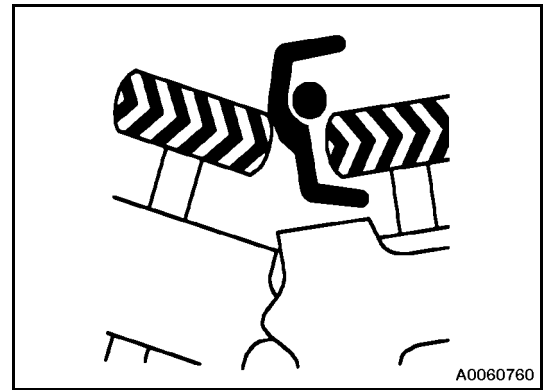
The machine does not contain asbestos but there is a possibility that imitation parts may contain asbestos.



SAFETY

Crush or Pinch-Point Dangers

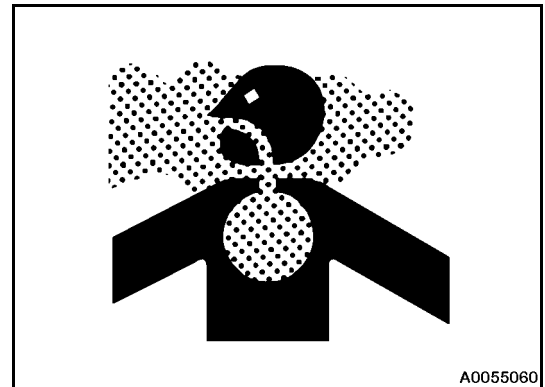
- Never stand in or place any part of your body between the movable components, such as the articulating portions of the machine or between the machine's work equipment.
- When the machine is operated, the clearance changes.
 - If you get caught in this area, it may lead to serious personal injury or death.
- Never drive up to anyone standing in front of a solid object or in your path of travel.
 - The brakes could fail or the machine could slide on a slippery surface causing injury or even death.



Precautions for Ventilation Exhaust Gas

The engine exhaust gas contains substances that may damage your health or even cause death.

- Start or operate the engine in a place where there is good ventilation.
- If the engine or machine must be operated inside a building or underground, where the ventilation is poor, take steps to ensure that the engine exhaust gas is removed and that ample fresh air is brought in.



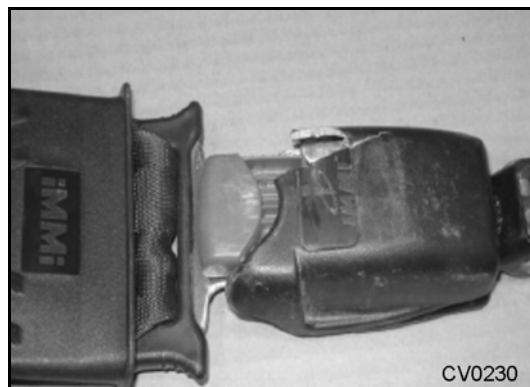
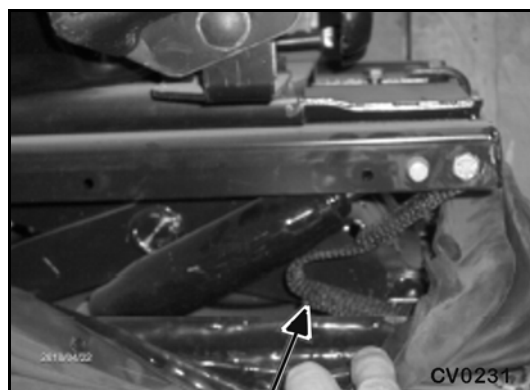
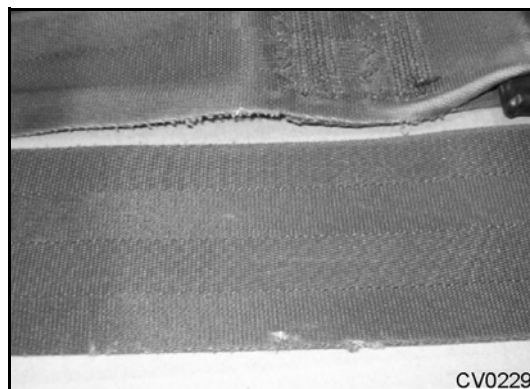
Seat Belt Inspection

⚠ WARNING

Seat belts must be replaced immediately if there are any signs of wear or damage, no matter how recently they were last replaced.

A thorough inspection of the entire seat belt system should occur before starting the engine.

- Inspect the full length and both sides of the seat belt webbing for wear, abrasion, dirt, oil, mildew, paint or other damage. Replace immediately if worn or damaged.
 - If the webbing is cut, fraying, snagging, kinking, or roping, the seat belt must be replaced. Any of these conditions may limit belt retraction.
- There may be internal and/or external tethers mounted on the suspension mechanism. Inspect these for fatigue as well as the integrity of the mounting hardware.
- Inspect the seat belt attachment and adjustment hardware for wear or damage.
 - Retractable and non-retractable buckle housings with damage from abrasions, rubbing, forceful impacts and age, must be replaced. These conditions may weaken the strength of the buckle.
 - Examine the seat belt buckle and retractor housing(s) for proper function.
 - Dirt, debris, lint, leaves, etc. may become encased inside of the retractor housing. With time, this condition may cause a seat belt malfunction.
- Check the mounting structure integrity. Verify that the mounting bolts are secure. Tighten to specified torque, if necessary.
- Check your records or the seat belt “Date of Installation” label (if equipped). Even if there are no signs of damage, the seat belt must be replaced either five years after the date of manufacture, or every three years after the start of usage, whichever comes first.
 - The manufactured date and “Install By” (if equipped) date may be found on the back of the buckle housing and/or on the seat belt webbing.
 - The location of the “Date of Installation” label (if equipped) may vary slightly, but most frequently it will be found on the plastic molding of the seat belt.



If your machine is equipped with a shoulder harness also, inspect the webbing, the shoulder loop web guide and the height adjuster for wear, damage and proper function capabilities

PRECAUTIONS BEFORE STARTING OPERATIONS

As an operator, you are responsible for the safe operation of this machine at all times, regardless of the situation. Although Komatsu cannot cover all operating conditions that pose a major hazard, here are a few basic situations to avoid when using the loader during work or travel operations. It is advisable to study these and always be aware of them before starting your work operations. Failure to do so may result in damage to the machine or injury to the operator and other personnel.

Pre-Operational Checks

Before starting your work operations, it is important to perform a **Pre-operational Check** to be sure your equipment is in safe operating condition. If any problems are found during your pre-operational check, have them repaired immediately. Never operate a machine that is unsafe, damaged, or in need of repair. Failure to perform a pre-operational check before starting work operations may result in damage to the machine or injury to the operator and other personnel.

Remark

It is important that a pre-operational check be performed at the beginning of your work shift. Even if you are taking the machine operations over from another operator, always perform a pre-operational check before you start work.

Ensure Good Visibility

This machine is equipped with mirrors to improve visibility but, even with mirrors, there are blind spots which cannot be seen from the operator's seat. Always be careful when operating the machine.

When operating or traveling in places with poor visibility where it is impossible to confirm the condition of the job site or obstacles in the area around the machine, there is a danger the machine may be damaged or the operator may suffer serious personal injury.

When operating in places with poor visibility, always observe the following rules:

- If visibility is not sufficient, position a flagman. The operator should pay close attention to the signs and follow all of the flagman's instructions.
- Signals should be given by only one flagman.
- When working in dark places, turn the machine's working and front lamps on and, if necessary, set up additional lighting in the area.
- Stop operations if the poor visibility is due to fog, snow, rain, or sand storms.
- Clean the windows and mirrors on the machine then adjust all mirrors to ensure good visibility before starting operations every day.

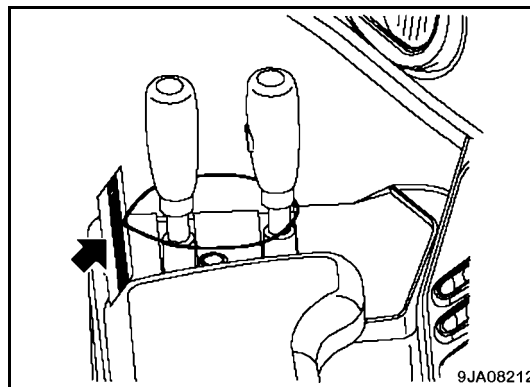
Confirmation of Marks

- On road shoulders or soft ground, set up signs to inform personnel of conditions.
- Make sure all personnel understand the meaning of all the signs.
- If the operators do not know the condition of a job site, the machine may tip over or fall, resulting in injury to the operator.

Precaution for Warning Tag

If there is a “DO NOT OPERATE” warning sign on the work equipment control levers, it means that someone is performing inspection and maintenance of the machine.

- Do not start the engine or touch the levers (1).
 - If this tag is ignored and the machine is operated, the serviceman may be caught in moving or rotating parts of the machine; this will cause serious personal injury or death.
- **ALWAYS** follow the warning sign and do not start the engine or operate any of the controls.



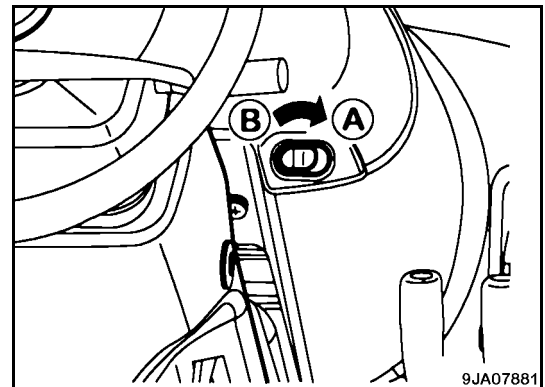
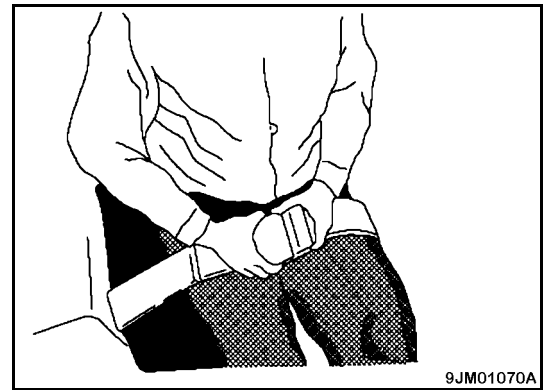
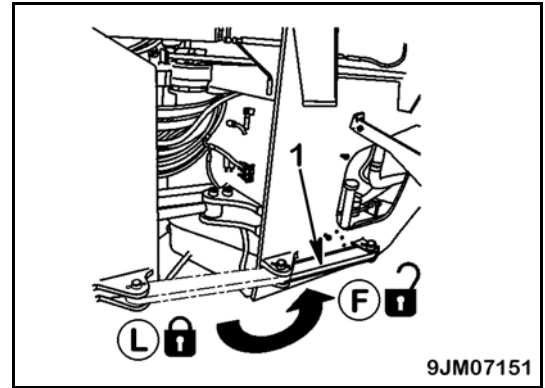
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SAFETY

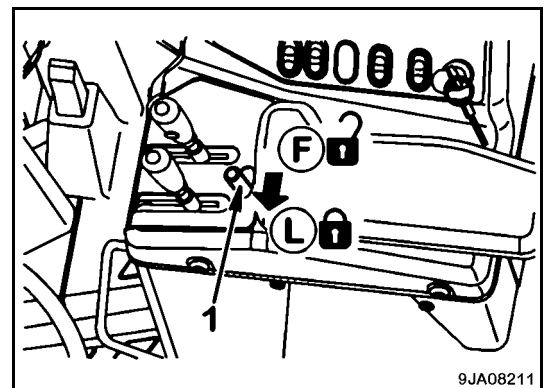
Checks Before Starting Engine, Adjustments

Before starting the engine, perform the following checks and adjustments to confirm that there is no problem with operating the machine. If this step is not performed properly, there is a danger of serious personal injury to the operator or damage to the machine during operation.

- Clean all windows and mirrors on the machine, then adjust all mirrors to prevent any reduction in visibility.
- Securely fix frame lock lever (1) at the FREE position.
- Perform pre-operational checks of the machine.
 - See “Precautions Before Starting Work Operations” on page 2-77..
- Remove all dirt from the front lamps, work lamps, and combination lamps.
- Remove mud, dust, and debris accumulated around the movable parts of the accelerator and brake pedals.
- Check and make sure the pedals work properly.
- Walk around the machine and make sure there are no persons or obstacles above, below, or around the machine.
- Adjust the operator’s seat so it is easy to see to the front of the machine.
- Fasten your seat belt.
- Check for damage or wear to the seat belt or seat belt mounts.
- Adjust the mirrors so the rear of the machine can clearly be seen from the operator’s seat. See “Adjust Mirrors” on page 2-95..
- Check and be sure that the gauges and meters work properly, and the work equipment levers are at the Neutral position.
- Make sure the parking brake switch is in the ON position (A)



- Make sure that work equipment lock lever (1) is in the LOCK position.

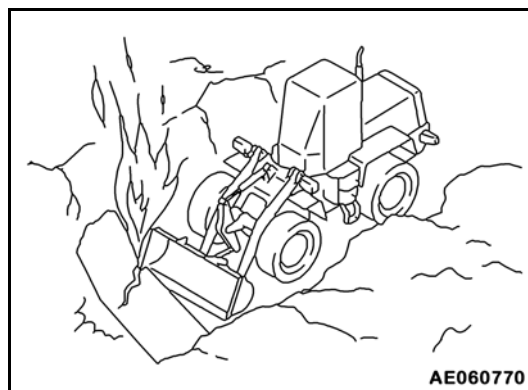


Precautions When Starting

- Do not start the engine if warning tags have been attached to the steering wheel or control levers.
- Before starting the machine, you must be seated and have the seat belt fastened snugly around your waist.
 - It will be impossible to stop operations if a problem occurs and you are not seated, with the seat belt secured.
 - There is a danger of serious personal injury if you are not seated, with the seat belt secured.
- Sound your horn to warn others in the area before starting the engine or moving the machine.
 - There is a danger of serious injury when the machine moves.
- Do not allow anyone in the cab, or on the machine, during operations.
- Be sure all personnel are clear from your work site before starting any work operations.
- DO NOT attempt to start the engine by short-circuiting the engine starting circuit.
 - Such an act could cause serious bodily injury or fire.
 - If necessary, use jumper cables. See “Using Jumper Cables” on page 1-41.

Work Site Hazards

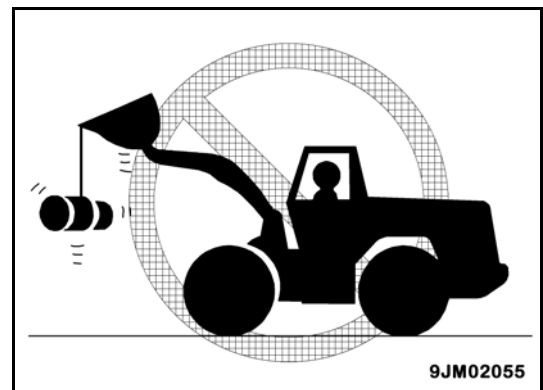
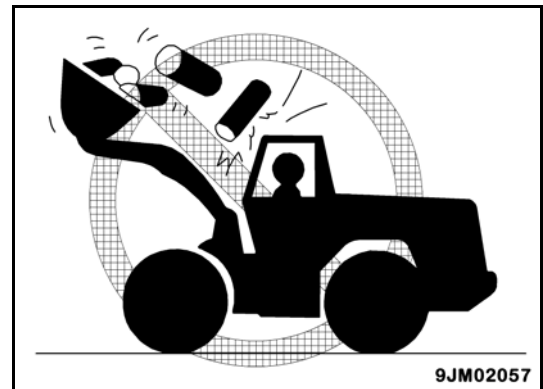
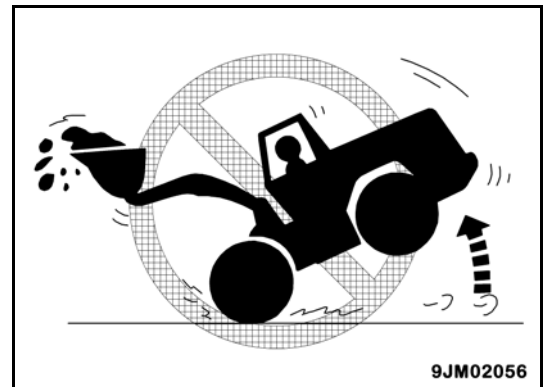
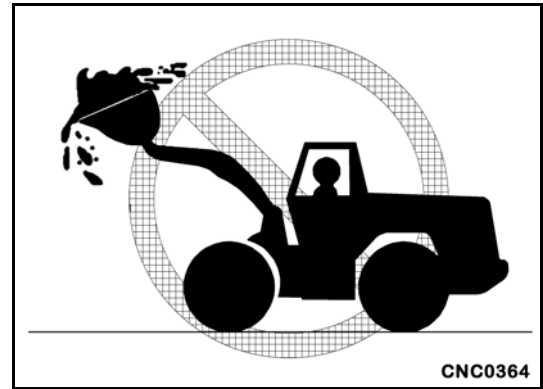
- Before starting any excavating or grading operations, contact all utility departments in your area and have them identify and mark any underground system locations (gas lines, water lines, electrical lines, sewer lines, etc.).
- Check your work area for any unusual ground conditions.
- Make sure your work area is as level as possible and that you will be able to maneuver your work equipment or machine easily.
- If you will be working near a high-traffic area (pedestrians or cars), have a dedicated worker available to direct traffic or install safety fencing around your work site.
- Always be aware of all your work site dangers or distractions.
- Operations such as logging, mulching, land clearing, or landfill operations may cause trash and debris to accumulate on the machine.
 - Remove debris or trash on a daily or more frequent basis (as necessary) to prevent fire.
- Always clean trash from the exhaust system compartments.
 - The hot exhaust compartments may cause fire from contact with flammable material.
- Remove any leaves, wood chips, paper, wood dust, or anything accumulated around the engine that could catch fire.



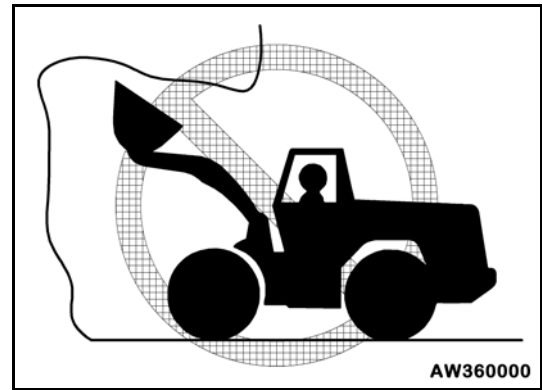
SAFETY

Avoiding Dangerous Situations

- Avoid traveling with the bucket raised.
 - Raising the bucket raises the center of gravity on the machine. Traveling with a raised bucket, especially a loaded bucket, may result in loss of control or a rollover situation.
 - Never raise the bucket unless the machine is stopped.
- When the bucket is raised and loaded, never make sharp turns or start or stop the machine suddenly.
 - This may cause the machine to tip forward.
- Always handle unstable loads carefully.
- Avoid tipping the bucket back or raising the load too high.
- Be sure to operate the work equipment carefully and keep the load as close to the ground as possible.
- Do not use the bucket or lift arms as a crane.
 - The object you are lifting may swing or shift causing the machine to tip, sway, or possibly roll over.



- Never work under overhangs or excavated bank areas.
 - These could collapse and damage the machine or injure the operator.
- Do not approach too close to the edge of cliffs.
 - When doing landfills or when dropping soil over a cliff, dump one pile then use the next pile of soil to push the first pile.
 - The load suddenly becomes lighter when the soil is pushed over a cliff or when the machine reaches the top of a slope.
 - When this happens, there is a danger that the travel speed will suddenly increase; be sure to reduce the speed.

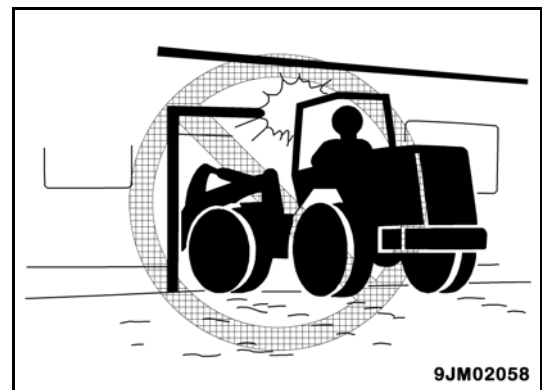


Working Clearances

It is always a good idea to be aware of the clearances around, in front of, behind, and especially above your work area or travel route.

Some basic safety precautions to prevent risk are:

- When working or traveling in an area where clearances are a problem, travel at a slow cautious speed.
- If you are not sure of your clearances, request the aid of another person who can guide or warn you if you get too close to objects.



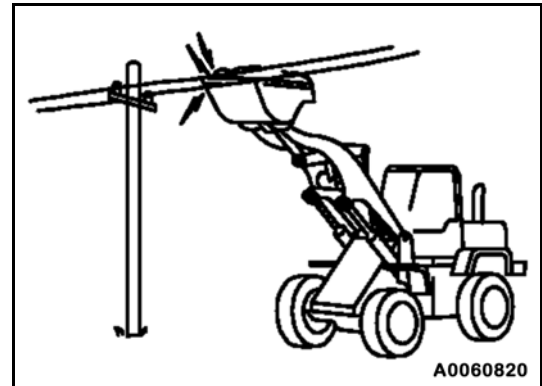
SAFETY

Working Near High-Voltage Cables

⚠ WARNING

- **Electrocution can result from contacting or approaching underground or overhead power cables.**
- **NEVER approach overhead power lines with any part of the machine.**
- **ALWAYS use extreme caution.**

- Before starting work in the vicinity of electric cables, inform the local power company of the work to be performed.
 - Have them take the necessary steps to ensure safety.
- Be aware of the dangers when working around overhead electrical lines. High humidity may pose an electrical hazard even if your machine clears the overhead power lines.
- Know your margin of safety. If possible, have power to the lines disconnected.
 - See the table at the bottom of the page.
 - If disconnection is not possible, request a signal person for guidance to maintain at least the minimum distance required by law from the overhead lines.
- Be prepared for any possible emergency.
 - Wear rubber shoes and gloves.
 - Lay a rubber sheet on top of the seat,
 - Be careful not to touch the chassis with any exposed part of your body.
- When working near high-voltage power lines, **NEVER** let anyone near the machine.
- If your machine should come in contact with overhead electrical lines, stop the machine and remain on the machine until the power company clears the lines and it is safe to get off or move the machine.
 - Do not let anyone near the machine.
- If low power lines pose a greater hazard, have the power company remove the lines until your work is finished.

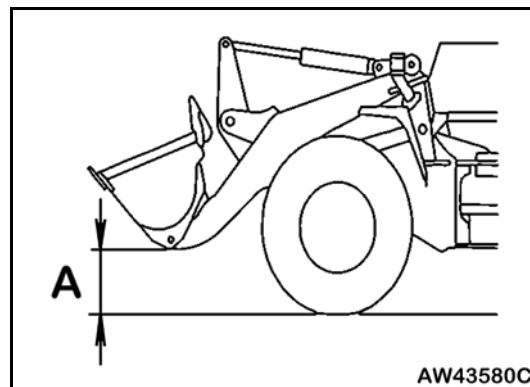


Cable Voltage	Minimum Safe Distance	
100 - 200V	2 m	7 ft.
6,600V	2 m	7 ft.
22,000V	3 m	10 ft.
66,000V	4 m	13 ft.
154,000V	5 m	16 ft.
187,000V	6 m	20 ft.
275,000V	7 m	23 ft.
500,000V	11 m	36 ft.

RULES FOR TRAVEL

Traveling with your machine may pose some hazards. When traveling, always travel in a safe manner and remain alert at all times. A safety-conscious operator is the most important insurance when traveling with the machine. The operator should be aware of the following situations and information.

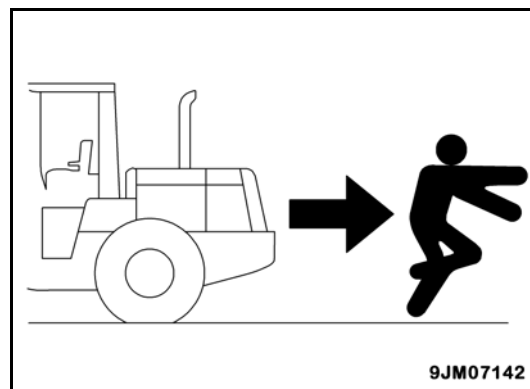
- Raise the bucket to a safe travel height (A) of 50 to 60 cm (20 to 24 in) from the ground.
 - If the work equipment is not raised far enough from the ground, there is danger that the work equipment will touch the ground and cause the machine to tip over.
- Do not operate the work equipment control levers.
- Never set the directional lever to the Neutral position. Always set it to a transmission speed range.
 - If the transmission is at neutral, the engine brakes will not work and the steering wheel will become stiff, creating a dangerous situation.
 - It may also cause damage to the transmission or other parts of the power train. This may lead to serious personal injury or death.
- Never turn the key in the starting switch to the OFF position. The steering becomes stiff; poor steering may lead to serious injury or death.
 - If the engine stops, apply the brake pedal immediately and stop the machine.
- Obey all traffic rules when traveling on local and state roads.
- Always be aware of your clearances and road surface.
 - When traveling on rough ground, travel at low speed and do not operate the steering suddenly.
- When passing over bridges or structures, check first that the structure is strong enough to support the weight of the machine.
- Avoid traveling over obstacles when possible.
 - Do not travel over obstacles which make the machine tilt strongly to the left or right side. There is more danger of the machine tipping over to the left or right than tipping over to the front or rear.
- Plan your route in advance. Be very careful when traveling through tunnels, under bridges, under electric wires, or in other places where the height is limited. If necessary, obtain the aid of an escort to lead or prepare your travel route.
- Never travel at high speeds. Travel at a safe, controllable speed.
 - Loss of control or tire damage may result at high speeds.



Traveling in Reverse

Traveling in reverse may pose several hazards. This is a list of basic rules to follow when traveling in reverse.

- Always operate the machine only when you are seated.
- Be sure that the area behind you is clear of people or objects that might be in the way.
- Before moving your machine, sound the horn to warn others in your area that you are moving.
- Check that the backup alarm (alarm buzzer when machine travels in reverse) works properly.
- When operating in areas that may pose a hazard or where there is poor visibility, designate a person to direct your movements.
- Do not rely totally on the mirrors on your machine. There are blind spots when using the mirrors.



SAFETY

Working on Loose or Unstable Ground

To limit the risk when working on loose or unstable ground:

- Avoid operating the machine too close to the edge of a cliff, open trenches, or ditch lines.
 - These areas may collapse under the weight of your machine causing serious damage to the machine or injury to the operator.
- After a heavy rain or thaw, the surface conditions may become unstable.
 - The weight of the machine may cause certain areas to move or collapse.

Operating on Snow or Frozen Surfaces

It is extremely important to be careful when traveling or operating the machine on icy surfaces. Snow-covered or frozen surfaces are slippery. Your ability to maneuver is seriously affected. The machine may not respond as you expected when turning the steering wheel.

When frozen ground begins to thaw, the ground becomes soft and could cause a machine to get stuck or tip over.

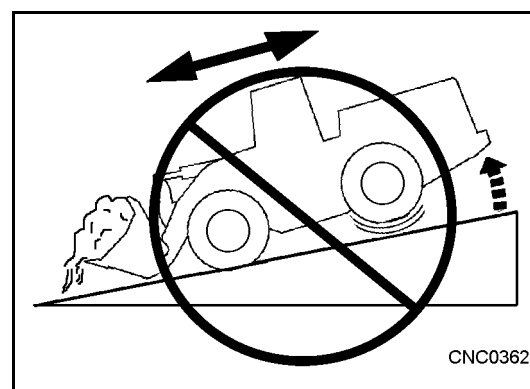
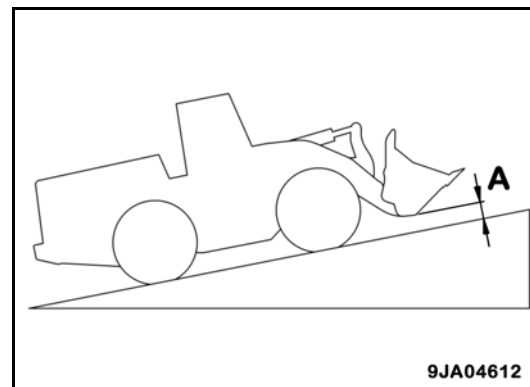
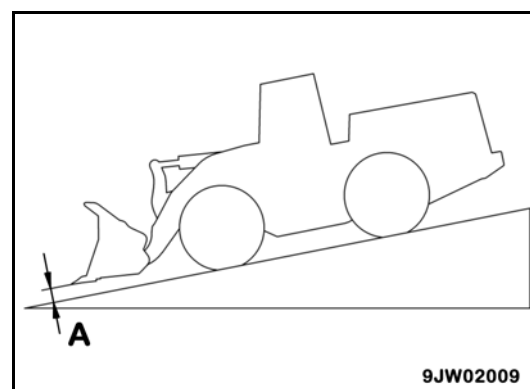
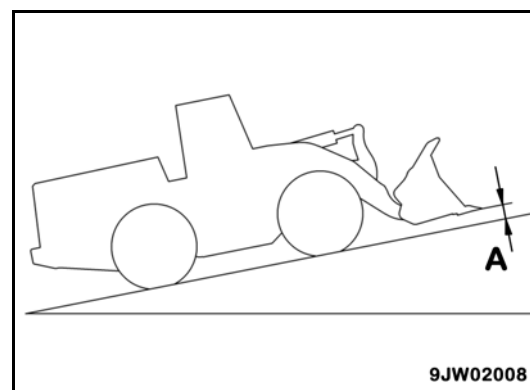
When traveling on frozen surfaces, proceed in the following manner:

- Travel at a slow, safe speed.
- Gently operate the levers.
- Avoid rapid acceleration or braking.
- Stopping distance is increased during slippery conditions. Give yourself sufficient distance to stop the machine.
- When traveling on snow-covered roads, always use tire chains.
- Avoid deep snow. Be careful not to get trapped in a snow drift.
- When clearing snow, it may be difficult to determine where the road shoulder ends. Be careful not to slide off the shoulder and get stuck or tip over. Proceed cautiously.
- When clearing snow, you may not see objects buried in the snow. Proceed cautiously.
- Even a slight slope may cause the machine to slip out of control. Be particularly careful when working on slopes.
- When traveling on snow-covered slopes, apply the brakes gently.
 - Reduce the speed and use the engine as a brake while applying the foot brake intermittently (depress the brake intermittently several times). If necessary, lower the work equipment to the ground to stop the machine.

Travel on Slopes

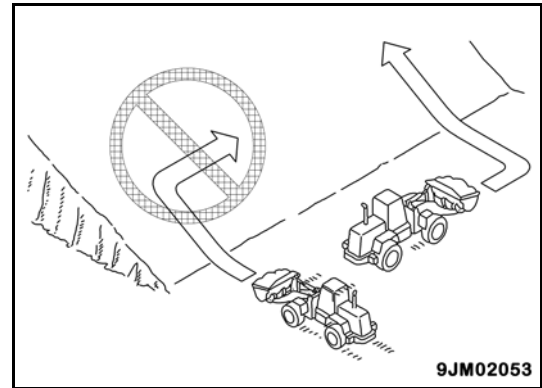
Traveling on slopes may pose a hazard. In order to prevent tipping the machine or losing control, it is important to follow some basic simple rules.

- When traveling over rough ground, travel at a slow, controllable speed.
- Never turn the ignition key off when traveling up or down a slope.
 - If the engine stops, depress the brake pedal immediately; lower the bucket to the ground; and apply the parking brake to stop the machine.
- When traveling up or down a slope with an empty bucket, it is important to travel at a safe, controllable speed with the bucket set in position (A), 20 to 30 cm (8 to 12 in) above the ground.
 - In case of emergency, quickly lower the bucket to the ground to help the machine stop.
- When traveling up or down a slope with a loaded bucket, always keep the bucket 20 to 30 cm (8 to 12 in) above the ground and the load facing the top of the hill.
- Never travel up or down a slope with the load facing the bottom of the hill.
 - Loss of control may result when the brakes are applied.



SAFETY

- Always travel straight up or straight down a slope.
 - Traveling at an angle on a slope may cause the machine to tip or possibly roll over.
- Do not turn on slopes or travel across slopes.
 - Always go down to a flat place to change the position of the machine then travel on to the slope again.
- Travel at low speed when traveling on grass, fallen leaves, or wet steel plates.
 - Even with slight slopes, there is a hazard that the machine may slip.
- When traveling downhill:
 - Travel slowly.
 - Always place the transmission in a low gear before starting to travel.
 - It is dangerous not to use the braking force of the engine. If necessary, use the braking force of the engine together with the brake pedal to control the travel speed.
 - Never shift gear or place the transmission at neutral.



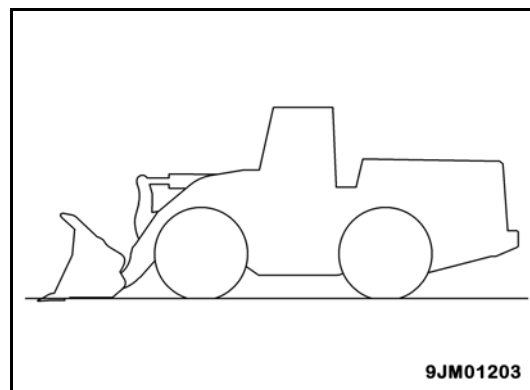
Using the Brakes

- When the machine is traveling, do not rest your foot on the brake pedal.
 - If you travel with your foot resting on the pedal, the brake will always be applied; this will cause the brakes to overheat and fail.
- Do not depress the brake pedal repeatedly, if not necessary.
- When traveling downhill, use the braking force of the engine and always use the right brake pedal at the same time.

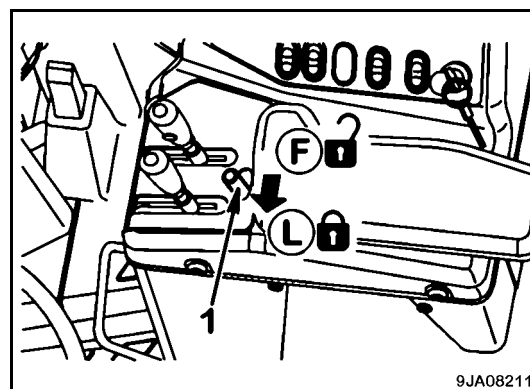
Parking the Machine

When parking the machine, it is important to follow several basic safety rules. You are responsible for the security of the machine when it is parked.

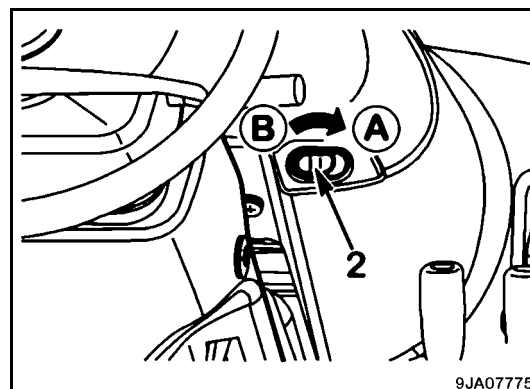
- Always park the machine on a flat, level location away from moving equipment, pedestrians, or traffic.
- Lower all work equipment completely to the ground.



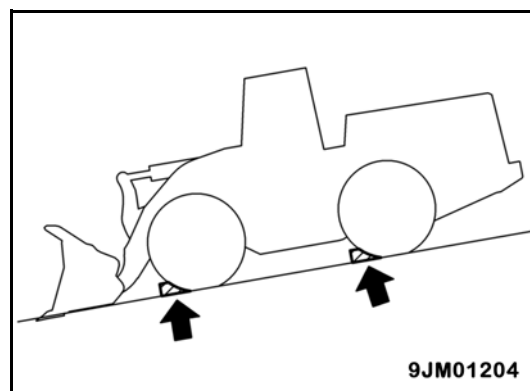
- Set work equipment lock lever (1) to the LOCK position (L).



- Set parking brake switch (2) to the ON position (A) and turn the engine OFF.
- Remove the ignition key and keep the key with you.
 - See “Leaving Operator’s Compartment” on page 1-18.
 - Be sure all access panels, cab, fuel and oil tanks are locked and secure to prevent tampering with the machine while unattended.



- Avoid parking the machine on a slope of any kind.
 - If you must park on a slope, park with the bucket facing down the slope and the wheels blocked to prevent any movement of the machine.



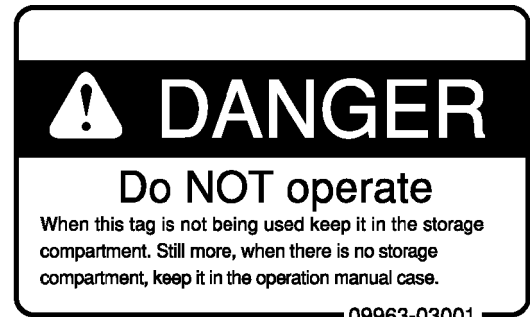
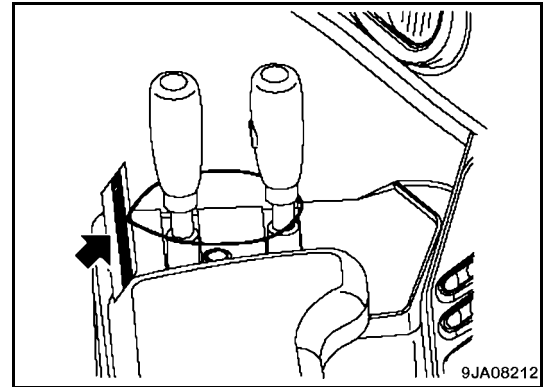
SAFETY

PRECAUTIONS DURING MAINTENANCE OPERATIONS

All maintenance performed on this machine must be performed only by trained and authorized personnel. When performing maintenance it is important to follow the outlined maintenance procedures and safety information outlined in this manual and in the *Shop Manual* for this machine.

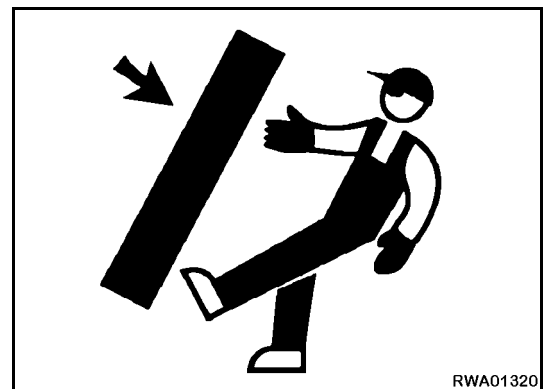
Warning Tags

- For machines equipped with ECSS (Electronically Controlled Suspension System), be sure the system is OFF before proceeding with any maintenance procedures.
- Before performing any maintenance operations on this machine, position the machine on a level and firm surface.
- Lock the equipment controls; remove the ignition key; and tag the steering wheel.
- Alert all personnel in your area that the machine is down for maintenance. If necessary, tag the machine around specific points to warn others that this machine is down for maintenance.
- If the machine will be down for maintenance for a long period of time, be sure to check and see if the warning tags are still in place before you start your repair procedures the next day.

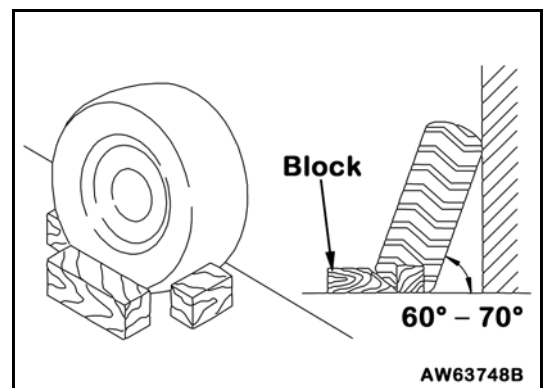


Equipment Storage

- Always store optional or extra work equipment in a safe and secure location.
- Do not store flammable liquids or materials for any length of time.

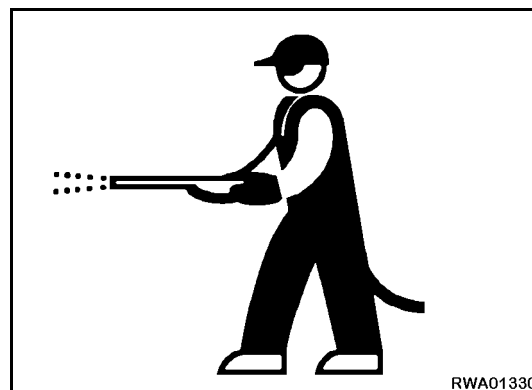


- Store equipment in such a way that it cannot fall or cause injury to others.



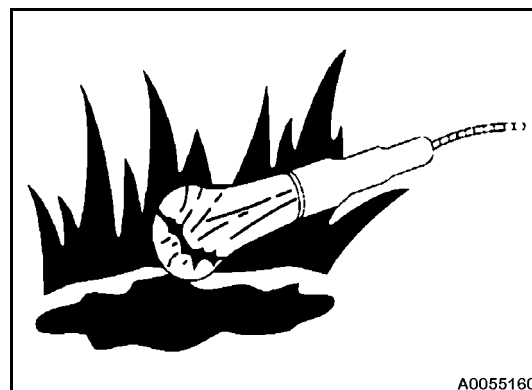
Keeping the Machine Clean

- Never use flammable liquids to clean your machine. Use only approved non-flammable cleaning solvents to clean parts or the machine itself.
- Do not use high-pressure steam cleaners or caustic soaps to wash the machine. Steam cleaning or using caustic soaps may damage paint, wiring, or sensitive electrical components.
- Never use high-pressure water to flood the inside of the operator's cab. Doing so may damage sensitive electrical components.
- When pressure washing, use high-pressure hot water and mild grease-cutting soaps.
- Always grease the machine after cleaning to push any water out of the pivot-point connections.
- Remove trash daily or more often as necessary. Never allow trash to accumulate on the machine.



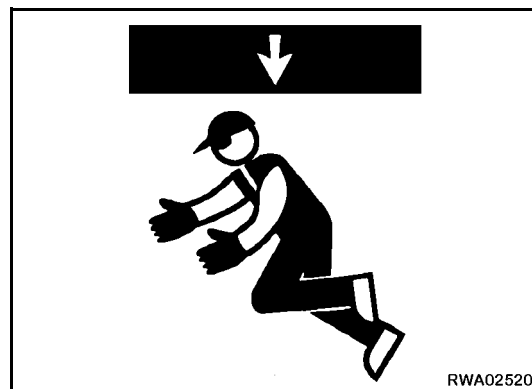
Using Drop Lamps

- Use only approved anti-explosion proof lamps when checking fuel, oil, or batteries.
 - Non-approved lamps can cause an explosion or fire.

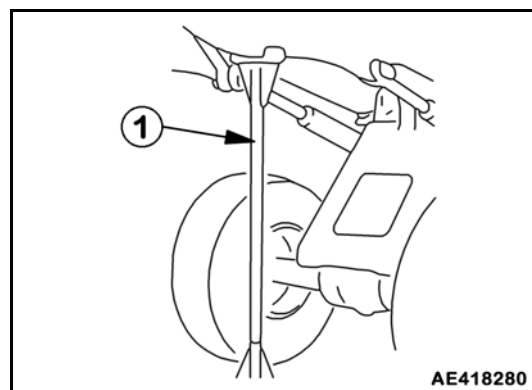


Working Under the Machine

- Always use approved jack stands to support the machine when performing maintenance under the chassis.
- Never rely on hydraulic jacks or the machine's work equipment to support the machine when working under or on the machine.
- Always lower the work equipment to the ground **before** raising the machine for repairs.



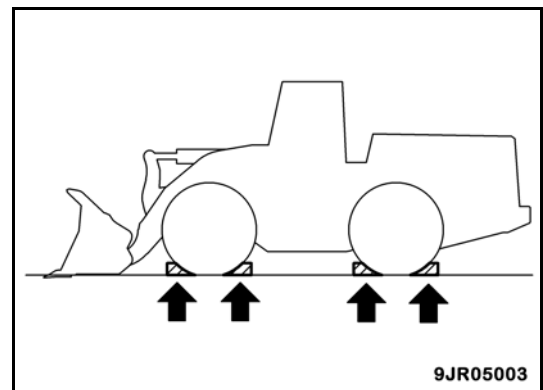
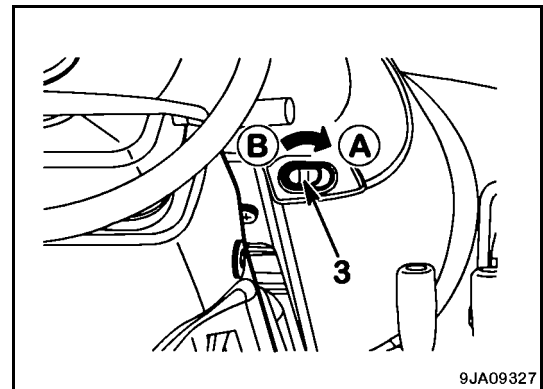
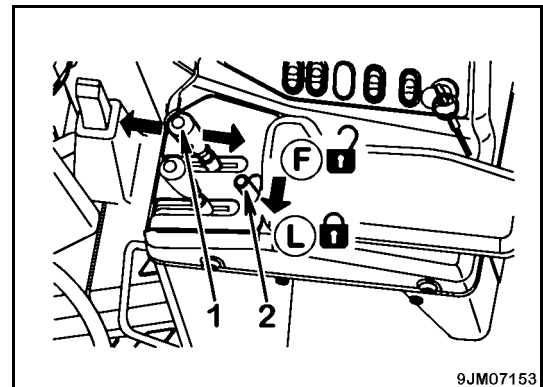
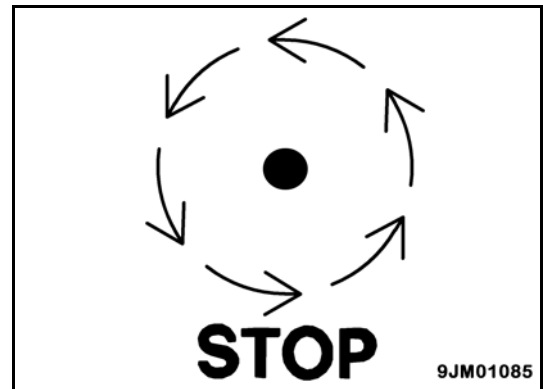
- When performing maintenance or repairs with the bucket raised, always support the bucket safely with the proper support (1) as shown in the figure.
- Never use concrete blocks for support; they can collapse under even light loads.



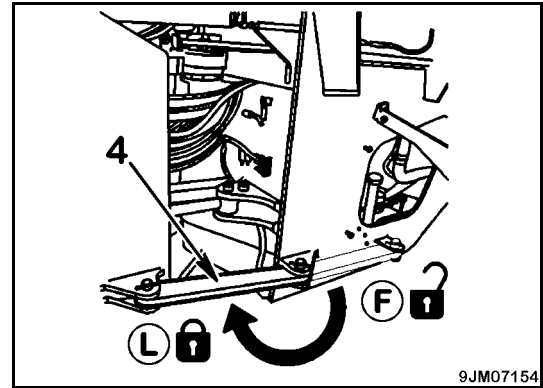
SAFETY

Stopping Machine During Maintenance

- ★ To prevent personal injury, do not carry out maintenance with the engine running. If maintenance must be carried out with the engine running, see “Running the Machine During Maintenance” on page 1-38.
- Lower the work equipment completely to the ground and stop the engine before performing any inspection and maintenance.
- After stopping the engine, turn the starting switch to the ON position; operate work equipment control lever (1) two or three times to release the remaining pressure in the hydraulic circuit; then set work equipment lock lever (2) to LOCK position (L).
- After releasing the remaining pressure in the hydraulic circuit, turn the starting switch to the OFF position.
- Set parking brake switch (3) to the ON position (A) to apply the parking brake.
- Put blocks in front of and behind the tires to prevent the machine from moving.



- Set frame lock bar (4) to lock position (L) to lock the front and rear frames.

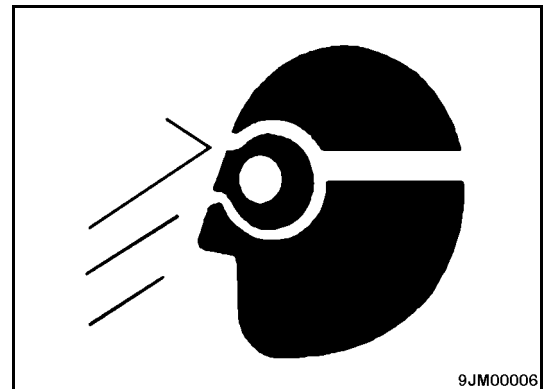


Precautions When Using Hammer

When using a hammer, pins may fly out or metal particles may be scattered. This may lead to serious personal injury or death.

Always follow these precautions:

- When hitting pins or bucket teeth, there is a hazard that broken pieces might be sent flying and injure people in the surrounding area. Always check that there is no one in the surrounding area.
- If hard metal parts such as pins, bucket teeth, cutting edges, or bearings are hit with a hammer, there is a hazard that pieces might be scattered and cause serious personal injury or death. Always wear safety glasses and gloves.
- If the pin is hit with a strong force, there is a hazard that it may fly out and injure people in the surrounding area. Do not allow anyone to enter the area around the machine.



Noise

- When carrying out maintenance of the engine, you are exposed to noise for long periods of time.
- If the noise from the machine is too loud, it may cause temporary or permanent hearing problems.
- Wear ear covers or ear plugs while working.

Precautions When Using Compressed Air

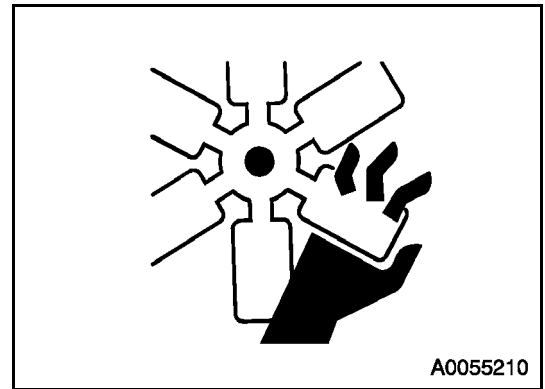
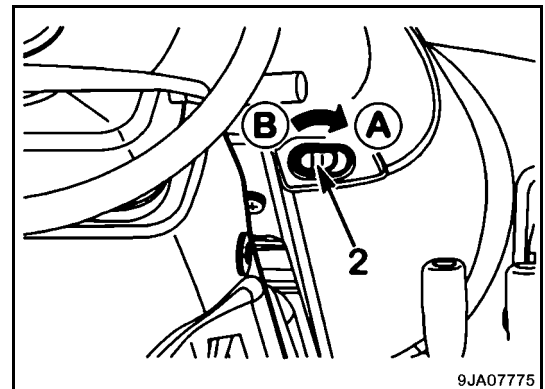
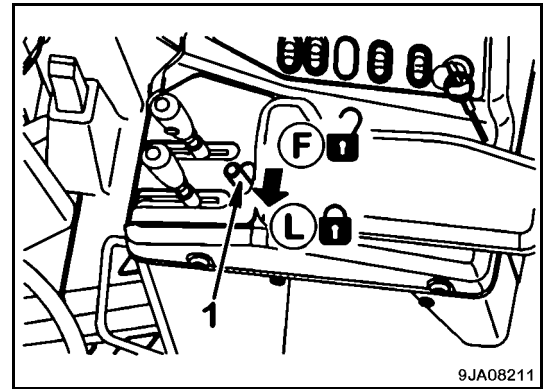
- When carrying out cleaning with compressed air, there is a hazard of serious personal injury caused by flying dust or particles.
- When using compressed air to clean a component, wear safety glasses, anti-dust mask, gloves, and other protective equipment.

SAFETY

Running the Machine During Maintenance

- ★ To prevent personal injury, do not carry out maintenance with the engine running. If maintenance must be carried out with the engine running, carry out the operation with at least two workers and follow these precautions.
 - If during maintenance you must run the engine, have someone remain in the operator's seat while the engine is running.
 - One worker must be ready to stop the engine at all times.
 - Instruct the person sitting in the cab not to operate any controls unless instructed to do so. If the control levers must be operated, always give a signal to the worker and have him/her withdraw to a safe place.
 - For machines equipped with ECSS (Electronically Controlled Suspension System), be sure the system is **OFF** before proceeding with any maintenance procedures.
 - Lower the work equipment to the ground.
 - Set work equipment lock lever (1) to LOCK position (L).
 - Set parking brake switch (2) to the ON position (A).
 - Put blocks under the tires to prevent the machine from moving.

- Be aware of rotating parts while the engine is running.
- Never drop or insert tools or other objects into the fan, fan belt, or other rotating parts.
 - There is danger that these objects may contact the rotating parts and break, or be sent flying.



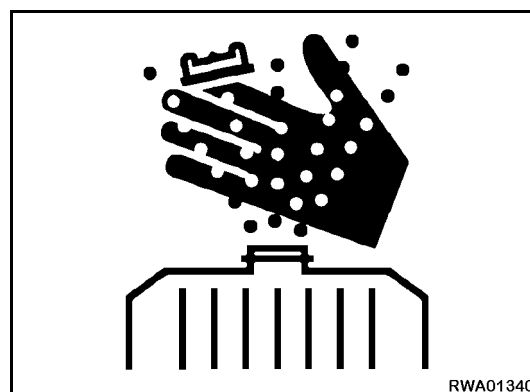
Rules for Refueling the Machine

- Always clean up any spills.
 - Grease, fuel, oil, or coolant spills can pose a trip hazard if not mopped up immediately.
- Be sure you are adding the correct fluids to the proper location.
 - Mixing fluids or adding fluids to the wrong tank can cause damage to internal components.
- When refueling or adding any fluids, be sure you are in a well-ventilated area.
- Never smoke or allow open flames near you while you are refueling the machine.
- Never mix gasoline with diesel fuel.
 - Gasoline is extremely flammable and could cause an explosion.
- Do not fill the fuel tank completely; leave room for the fuel to expand.



Cooling System Precautions

- Never add coolant to a hot or warm engine.
 - Always allow the engine time to cool down completely before opening the radiator cap.
- Never dump used coolant on the ground, in a lake, stream, or in a sewer system.
 - Komatsu requires these fluids to be captured and recycled properly.

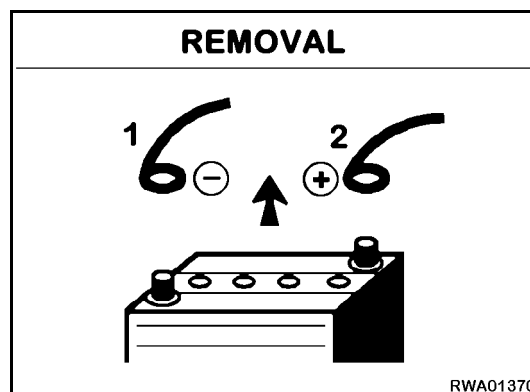


Welding Precautions

- Welding operations must always be carried out by a qualified welder and in a place equipped with proper equipment.
- There is a hazard of gas, fire, or electrocution when carrying out welding.
- Never allow any unqualified personnel to carry out welding.

Battery Precautions

- When working on the electrical system, disconnect the negative (-) battery cable first then the positive (+) battery cable last.
- On completion of work, reconnect the positive (+) cable **first** then the negative (-) cable **last**.



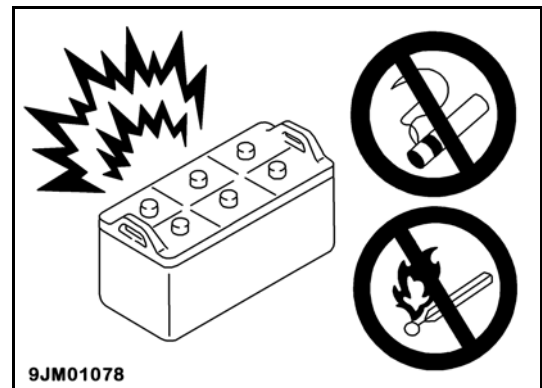
SAFETY

Battery Hazard Prevention

Danger of Battery Exploding

When charging the battery, flammable hydrogen gas is generated from the poles. If the gas ignites, it may explode and cause serious injury or fire.

- **DO NOT** use or charge a battery if the electrolyte is below the LOWER LEVEL mark.
 - Check the electrolyte level periodically and add distilled water **only** to the UPPER LEVEL mark, when required.
- DO NOT smoke or use any flame close to the battery.
- Remove the battery from the machine and take it to a well-ventilated area.
- Remove the battery caps.
- Connect the charger positive (+) cable **first** then the negative (-) cable **last** to the battery posts.
- Start charging the battery.
- After charging the battery, unplug the charger and remove the cables.
- Replace and tighten the battery caps securely.

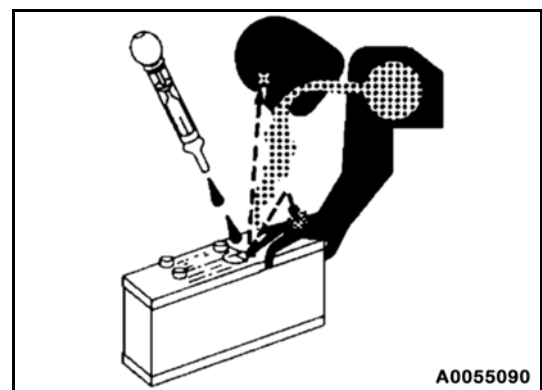


Danger of Dilute Sulfuric Acid

Battery electrolyte includes dilute sulfuric acid. If dilute sulfuric acid gets on your skin or in your eyes, you may suffer serious injury.

Always do the following when handling batteries.

- **ALWAYS** wear safety glasses and rubber gloves.
- If battery electrolyte gets into your eyes:
 - Immediately wash your eyes with a large amount of fresh water for at least 15 minutes.
 - Be sure to wash behind your eyelids.
 - Get immediate medical attention.
- If battery electrolyte gets on your skin or clothes:
 - Immediately wash it off with a large amount of water.
 - Do not use any alkaline fluid as a neutralizer.
 - If you suffer any chemical burn, get immediate medical attention.



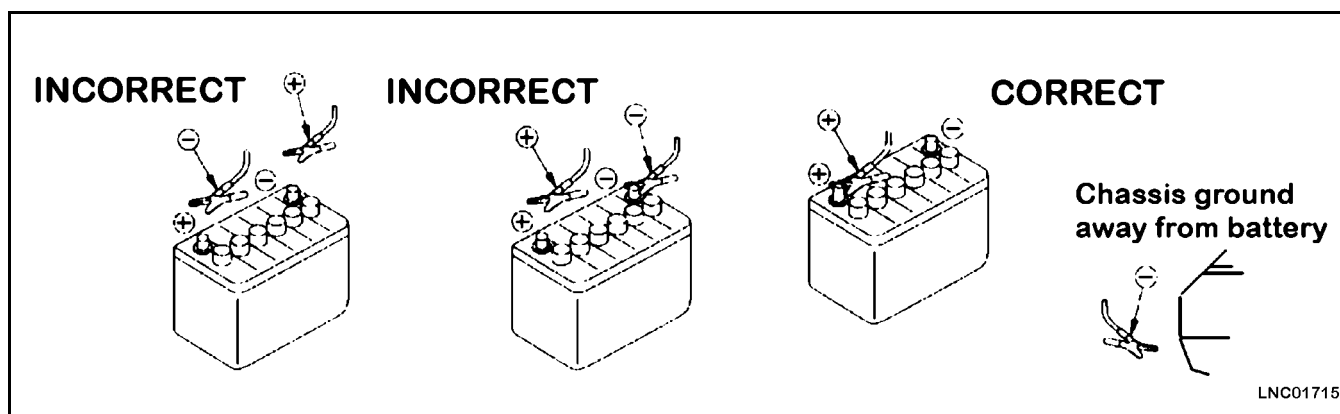
Danger of Sparks

If sparks are generated, they may fly and cause serious personal injury.

- **DO NOT** short-circuit the battery terminals through contact with metal objects, such as tools across the terminals.
- **DO NOT** leave tools lying around.
- When disconnecting the battery terminals, wait approximately one minute after turning the ignition switch off. Always disconnect the negative (-) battery cable **first** then the positive (+) battery cable **last**.
- On completion of work, reconnect the positive (+) cable **first** then the negative (-) cable **last**.
- Secure the battery firmly in the specified position.

Using Jumper Cables

When using jumper cables to start the machine, attach the positive (+) jumper **first** then the negative (-) jumper **last** to a remote location on the chassis, as shown in the following figure. For additional information, see “Starting Engine With Booster Cable” on page 2-178..



Starting the Machine

- Never try to start the machine by tampering or shorting the starter terminals.
 - Accidental movements of the machine could cause injury or even death.
- Always start the machine while seated in the operator’s cab using the ignition switch.

WARNING

- Never use a welder or a machine with a higher voltage system to jump-start the machine.
- Using a higher voltage to jump-start a machine may damage the machine’s electrical system or cause an unexpected explosion or fire.
- Always jump-start a machine with one of equal voltage.
- Never allow the machines to touch each other when jump-starting a machine.



SAFETY

High-Pressure Hoses

The hydraulic system is always under internal pressure. When inspecting or replacing piping or hoses, always check that the pressure in the hydraulic circuit has been released. If the circuit is still under pressure, it will lead to serious injury.

Always take the following precautions:

- Do not carry out any inspection or replacement work when the hydraulic system is under pressure.
- If there is any leakage from the piping or hoses, the surrounding area will be wet. Check for cracks in the piping and hoses and for swelling in the hoses.
- When carrying out inspection, wear safety glasses and leather gloves.

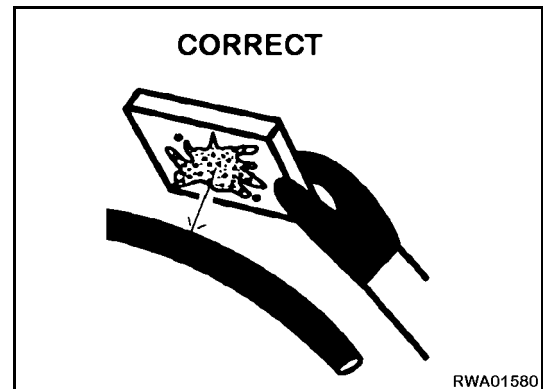
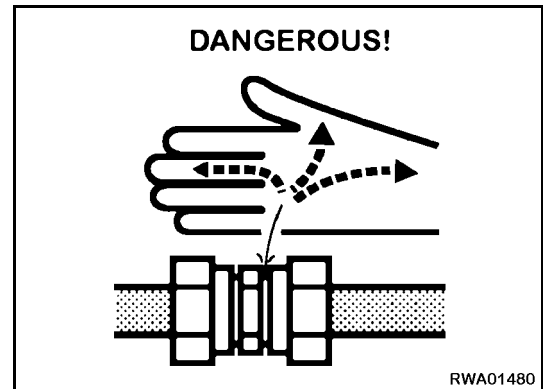
There is a hazard that high-pressure oil leaking from small holes may penetrate your skin or cause blindness if it contacts your eyes directly.

- If you are hit by a jet of high-pressure oil and suffer injury to your skin or eyes, wash the area with clean water and consult a doctor immediately for medical attention.

Safe Handling of High-Pressure Hoses

If oil or fuel leaks from high-pressure hoses, it may cause fire or defective operation which may lead to serious injury.

- If any loose bolts are found, stop work and tighten to the specified torque.
- If any damaged hoses are found, stop operations immediately and contact your Komatsu distributor.
- Replace the hose if any of the following problems are found:
 - Damaged or leaking hydraulic fitting
 - Frayed or cut covering or exposed reinforcement wire layer
 - Covering swollen in places
 - Twisted or crushed movable portion
 - Foreign material embedded in covering



Precautions for High-Pressure Liquids

When you stop the machine at the end of a job, remember that the engine coolant, oil, all engine parts, exhaust stack, and the hydraulic system are still hot and under pressure. If you attempt to drain hydraulic fluid or engine oil under these conditions, you expose yourself to various dangers, including the risk of serious burns.

Perform maintenance procedures described in this manual only when the machine has had time to cool down.

Precautions for High-Pressure Fuel

High pressure is generated inside the engine fuel piping when the engine is running.

- When carrying out inspection or maintenance of the fuel piping system, wait for at least 30 seconds after stopping the engine to let the internal pressure go down before starting inspection or maintenance.
- Never loosen a fuel injector line while the engine is running. Severe injury may result from the high-pressure fuel spray.



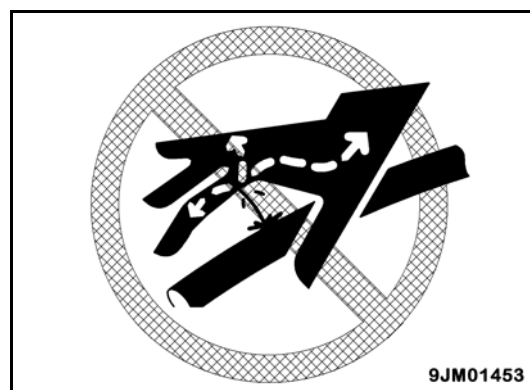
Precautions for High-Pressure Oil

The hydraulic system is always under internal pressure. In addition, the fuel piping is also under internal pressure when the engine is running and immediately after the engine is stopped.

When carrying out inspection or replacement of the piping or hoses, check that the internal pressure in the circuit has been released. If this is not done, it may lead to serious personal injury or death.

Always do the follows actions:

- Do not carry out inspection or replacement work with the circuit under pressure.
- Always release the pressure before starting. For details, see “Stopping Machine During Maintenance” on page 1-36.
- If there is any leakage from the piping or hoses, the surrounding area will be wet. Check for cracks in the piping and hoses and for swelling in the hoses.
- When carrying out inspection, wear safety glasses and leather gloves.
- There is a hazard that high-pressure oil leaking from small holes may penetrate your skin or cause loss of sight if it contacts your skin or eyes directly. If you are hit by a jet of high-pressure oil and suffer injury to your skin or eyes, wash the place with clean water and consult a doctor immediately for medical attention.
- The pressure in the ECSS circuit is stored by an accumulator. Do not remove the ECSS piping or components. If it is necessary to remove these, ask your Komatsu distributor to carry out the removal operation.



SAFETY

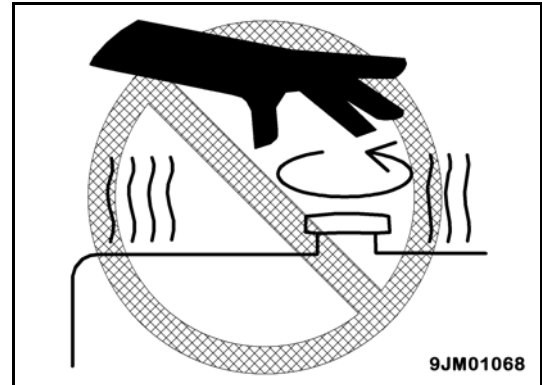
Precautions for High-Temperature Liquids

When you stop the machine at the end of a job, remember that the engine coolant, oil, all engine parts, exhaust stack, and the hydraulic system are still hot and under pressure. If you attempt to drain engine coolant or hydraulic fluid under these conditions, you expose yourself to various dangers, including the risk of serious burns.

Perform maintenance procedures described in this manual only when the machine has had time to cool down.

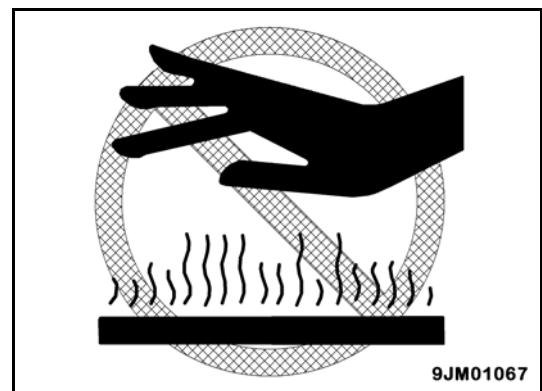
Precautions for High-Temperature Coolant

- To prevent burns from boiling water or steam spurting out when checking or draining the coolant, wait for the coolant to cool down to a temperature where the radiator cap can be touched by hand.
- Once the coolant has cooled, loosen the cap slowly to release the pressure inside the radiator, then remove the cap.



Precautions for High-Temperature Oil

- To prevent burns from hot oil spurting out or from touching high-temperature parts when checking or draining the oil, wait for the oil to cool down to a temperature where the cap or plug can be touched by hand.
- When the oil has cooled, loosen the cap or plug slowly to release the internal pressure, then remove the cap or plug.

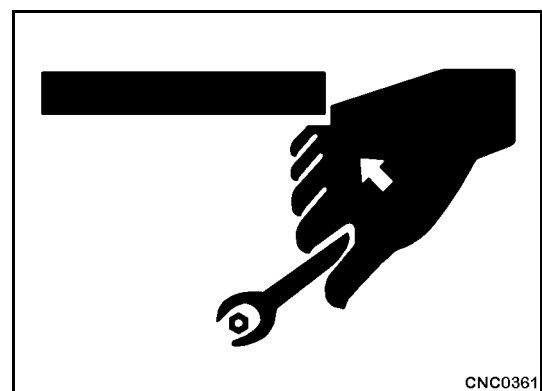


Critical Parts

Periodically some parts must be replaced due to safety purposes. Even if these parts seem to be in good condition and operating properly, they may fail at some point, possibly causing injury to the operator or pedestrian.

Some of the following systems contain components that may fail under extended use:

- Seat belts
- Fuel supply and delivery hoses
- Hydraulic system: main delivery hoses and tubing
- Hydraulic hoses: all the hoses that feed and return the hydraulic fluid to and from the work equipment



★ For additional information, see “PERIODIC REPLACEMENT OF SAFETY-CRITICAL PARTS” on page 3-21..

Handling Accumulator and Gas Spring

This machine is equipped with an accumulator. Even after the engine has stopped, it is possible to operate the work equipment control lever in the LOWER direction for a short time to allow the work equipment to go down under its own weight.

- After stopping the engine, set the work equipment lock lever to the LOCK position and turn the parking brake switch ON.
- The accumulator and gas spring are charged with high-pressure nitrogen gas. If the accumulator is handled mistakenly, it may cause an explosion that could lead to serious personal injury or death.

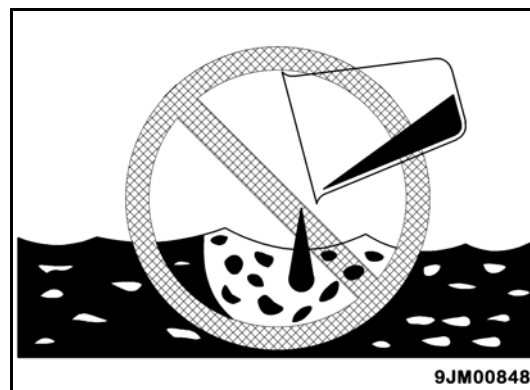
For this reason, always observe the following precautions:

- Do not disassemble the accumulator.
- Do not expose the accumulator to high heat or an open flame.
- Do not weld on the accumulator.
- Do not drill or cut the accumulator.
- Do not strike or crush the accumulator.
- When replacing or disposing of the accumulator, always release the nitrogen pressure from the chamber.

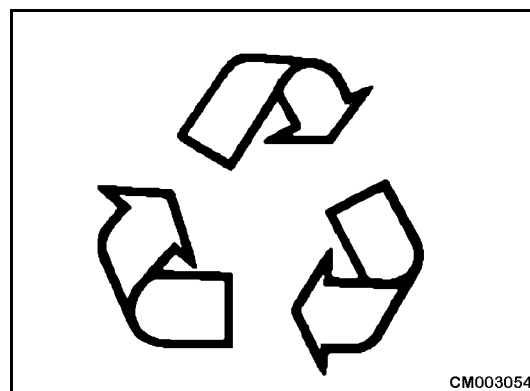


Disposal of Waste Materials

- Always drain fluids from your machine into the appropriate containers. Never drain fluids directly onto the ground.
- Never dump waste fluids in a sewer system, on the ground, in rivers, etc.



- Obey appropriate laws and regulations when disposing of harmful objects such as oil, fuel, filters, batteries, coolant, brake fluid, and hydraulic oil.

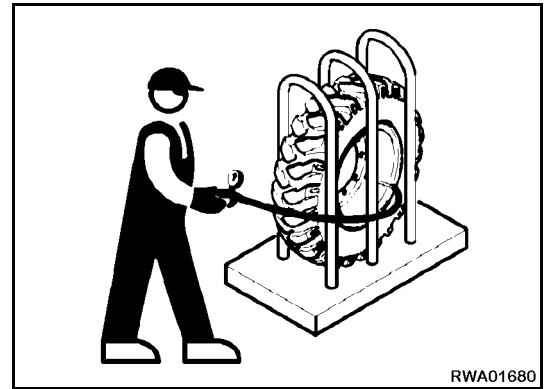


SAFETY

Inflating Tires

Always remember that tires can burst while being inflated, causing serious accidents. Before servicing the tires, observe the following precautions.

- Before inflating tires, always check the wheel rims, tire walls, and tread for cuts, broken cords, or other damage.
 - Have a tire expert perform checks and tire maintenance.
 - When inflating tires, use a protective cage and a compressed air gun with extension hose and pressure gauge.
 - Make sure that there is nobody in the vicinity before starting to inflate a tire.
 - Stand at the tread side of the tire to inflate it.
- ★ For additional information about tires, see “HANDLING TIRES” on page 2-156. and “BUCKET AND TIRES” on page 5-2..



High Voltage

When the engine is running or immediately after it has stopped, high voltage is generated at the injector terminal and inside the engine controller. **There is danger of electrocution.**

- ★ Never touch the injector terminal or inside the engine controller.
 - If it is necessary to touch the injector terminal or the inside of the engine controller, please contact your Komatsu distributor.



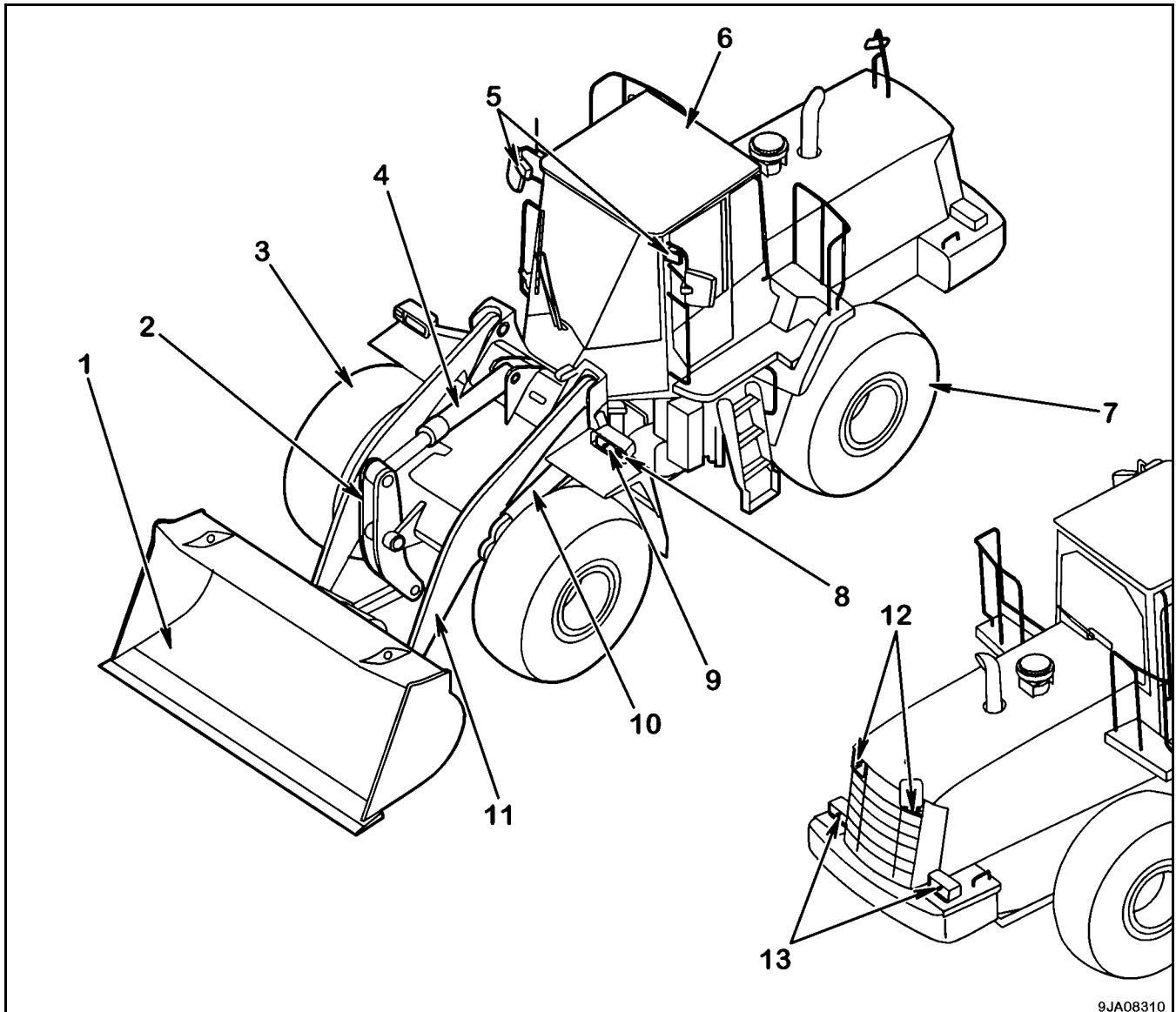
Maintenance of Air Conditioner

- **NEVER** touch the refrigerant.
 - **NEVER** loosen any part of the refrigerant circuit.
 - **NEVER** release any refrigerant into the atmosphere.
- ★ For additional details about the air conditioner, see “AUTOMATIC AIR CONDITIONER” on page 5-31..

OPERATION

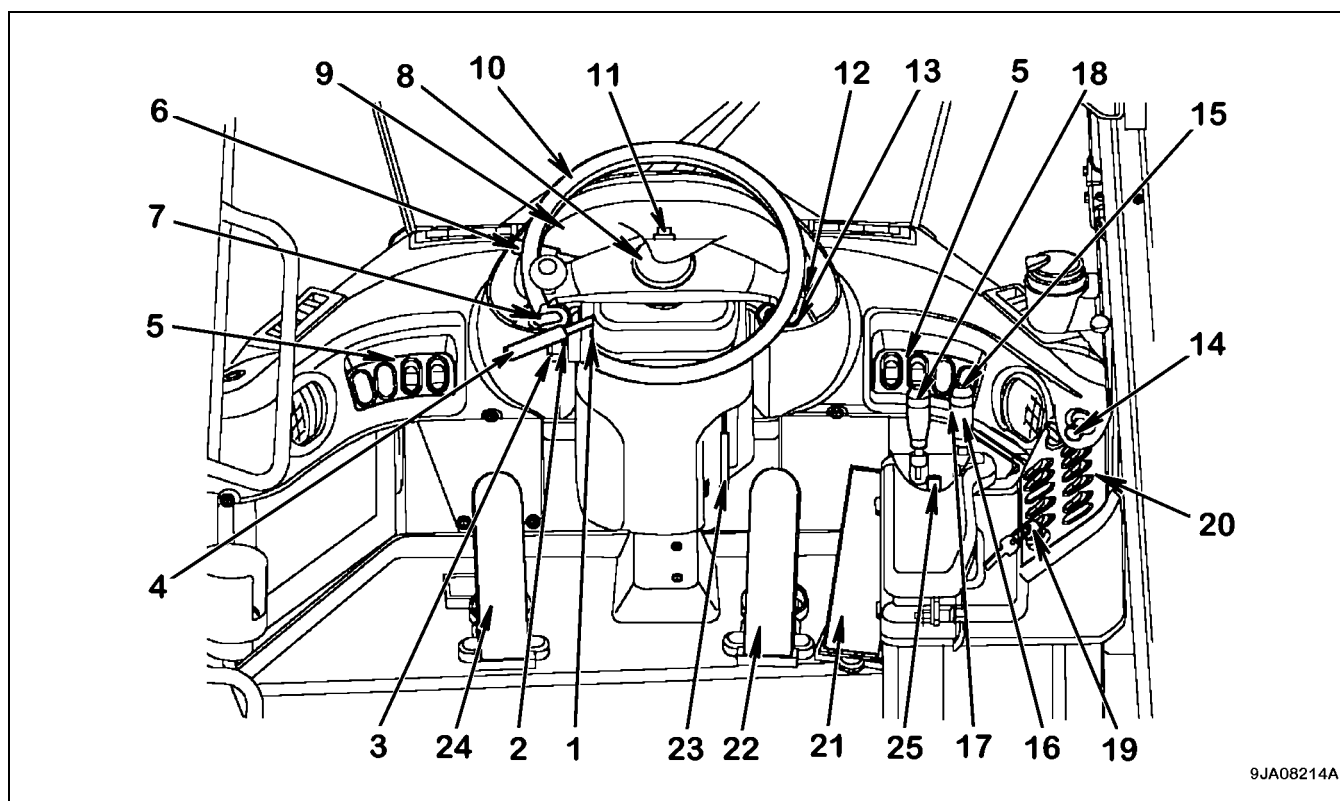
GENERAL VIEW

General View of Machine



- | | |
|-----------------------|---------------------------|
| 1. Bucket | 8. Turn signal lamp |
| 2. Bellcrank | 9. Headlamp |
| 3. Front wheel | 10. Lift cylinder |
| 4. Bucket cylinder | 11. Lift arm |
| 5. Front working lamp | 12. Rear working lamp |
| 6. ROPS cab | 13. Rear combination lamp |
| 7. Rear wheel | |

Controls and Gauges

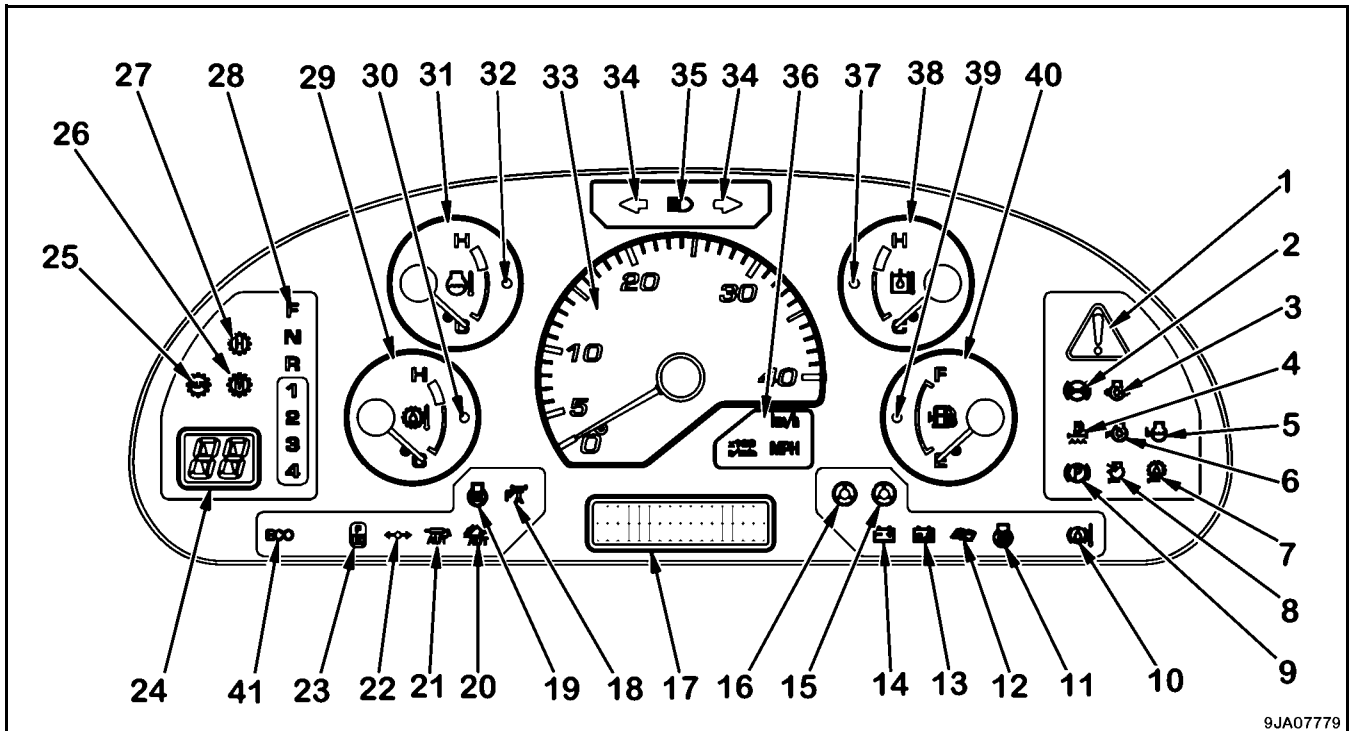


- | | |
|----------------------------|-------------------------------|
| 1. Gearshift lever stopper | 13. Parking brake switch |
| 2. Rear wiper switch | 14. Cigarette lighter |
| 3. Front wiper switch | 15. Kickdown switch |
| 4. Gearshift lever | 16. Lift arm control lever |
| 5. Front switch panel | 17. Hold switch |
| 6. Directional lever | 18. Bucket control lever |
| 7. ECSS * | 19. Starting switch |
| 8. Horn button | 20. Right switch panel |
| 9. Machine monitor | 21. Accelerator pedal |
| 10. Steering wheel | 22. Right brake pedal |
| 11. Hazard lamp switch | 23. Steering tilt lock lever |
| 12. Lamp switch | 24. Left brake pedal |
| Turn signal lever | 25. Work equipment lock lever |
| Dimmer switch | |

★ ECSS = Electronic Controlled Suspension System

OPERATION

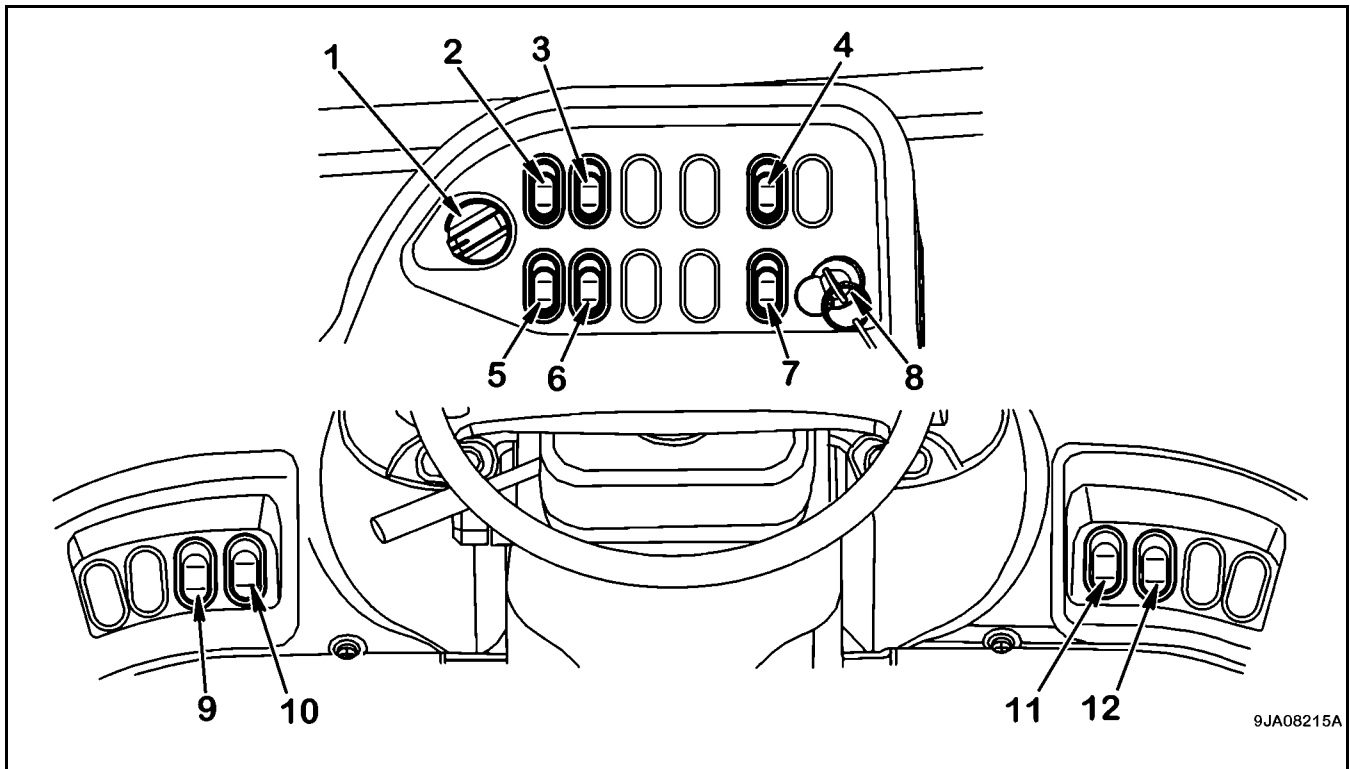
Machine Monitor



1. Central warning light
2. Brake oil pressure caution lamp
3. Engine oil pressure caution lamp
4. Water separator caution lamp
5. Radiator coolant level caution lamp
6. Engine oil level caution lamp
7. Transmission oil filter clogging caution lamp
8. Air cleaner clogging caution lamp
(machines equipped with KOMTRAX)
9. Parking brake pilot lamp
10. Brake oil temperature caution lamp
11. Cooling fan reverse rotation pilot lamp
12. Maintenance caution lamp
13. Battery electrolyte level caution lamp (if equipped)
14. Battery charge circuit caution lamp
15. Steering oil pressure caution lamp (if equipped)
16. Emergency steering pilot lamp (if equipped)
17. Character display portion
18. Power mode pilot lamp (P mode)
19. Preheating pilot lamp
20. Semi-auto digging pilot lamp (if equipped)
21. Auto-greasing pilot lamp (if equipped)
22. Joystick pilot lamp (if equipped)
23. Directional selector pilot lamp
24. Shift indicator
25. Auto-shift pilot lamp
26. Torque converter lockup pilot lamp (if equipped)
27. Shift hold pilot lamp
28. Shift lever position pilot lamp
29. Torque converter oil temperature gauge
30. Torque converter oil temperature caution lamp
31. Engine coolant temperature gauge
32. Engine coolant temperature caution lamp
33. Speedometer
34. Turn signal pilot lamp
35. Headlamp high beam pilot lamp
36. Meter display pilot lamp
37. Hydraulic oil temperature caution lamp
38. Hydraulic temperature gauge
39. Fuel level caution lamp
40. Fuel gauge
41. Economy operation display lamp

OPERATION

Switch Panel



Right Switch Panel

1. Transmission shift mode selector switch
2. Transmission cutoff switch
3. Transmission cutoff set switch
4. Emergency steering switch (if equipped)
5. Power mode selector switch
6. Torque converter lockup switch (if equipped)
7. Cooling fan reverse rotation switch
8. Starting switch

Left Switch Panel

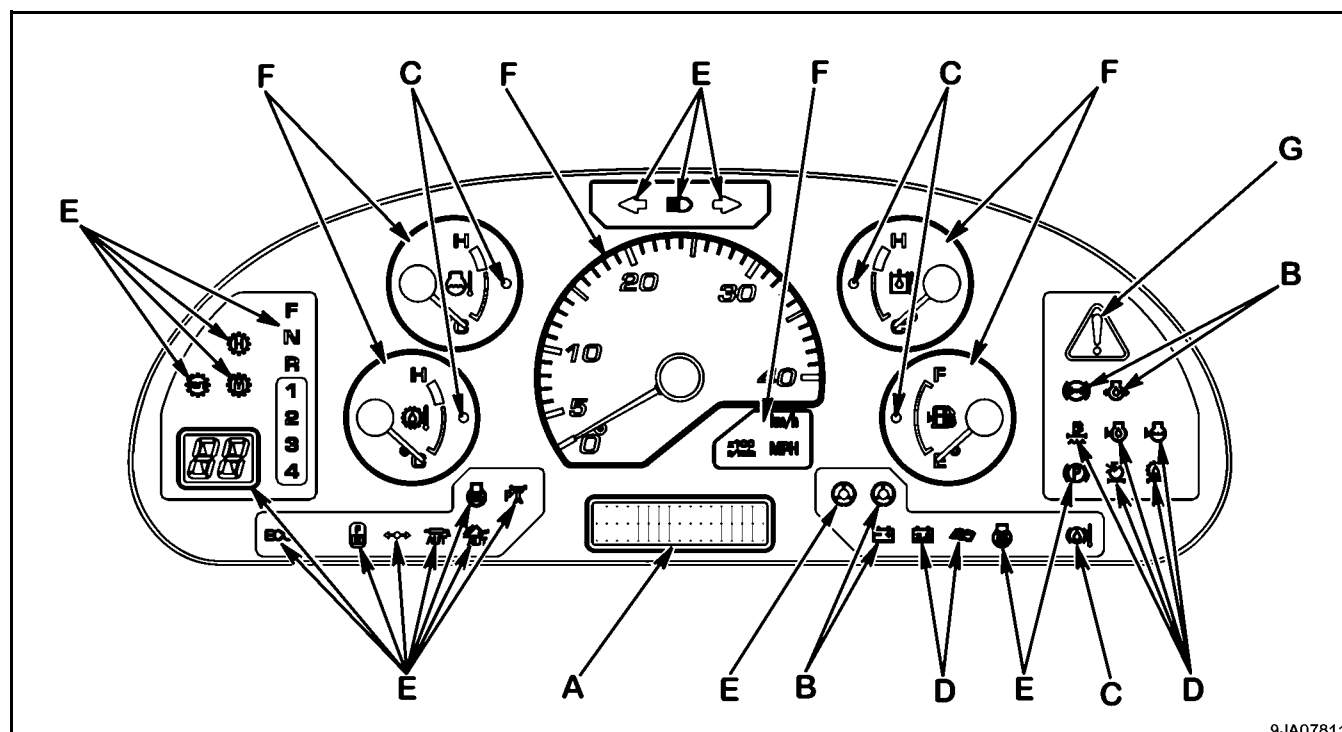
9. Machine monitor mode selector switch 1
10. Machine monitor mode selector switch 2
11. Front working lamp switch
12. Rear working lamp switch

EXPLANATION OF COMPONENTS

This section provides an explanation of the devices needed for operating the machine.

To perform suitable operations correctly and safely, it is important to completely understand methods of operating the equipment and the meaning of the displays.

Machine Monitor



9JA07811

- | | |
|-------------------------------------|--------------------------|
| A. Character display | E. Pilot display portion |
| B. Emergency stop items | F. Meter display portion |
| C. Caution items | G. Central warning lamp |
| D. Inspection and maintenance items | |

Remark

Before the engine is started and when the starting switch is turned to the ON position, a system check is carried out. The central warning lamp, caution lamps, and pilot lamps light up for two seconds.

After the alarm buzzer sounds for two seconds, it stops to indicate that everything is normal.

The shift indicator displays "88" for two seconds.

The indicator gauges and meters start to work after the above system check is completed.

The character display shows "KOMATSU" for three seconds.

If the lamps do not light up, there is probably a failure or disconnection. Contact your Komatsu distributor for inspection.

OPERATION

Types of Warnings

If an abnormality occurs on the machine or if any switch or lever is operated accidentally, the monitor display and buzzer give a warning to inform the operator.

The types of warnings are explained in the following paragraphs. These warnings are divided into different danger levels.

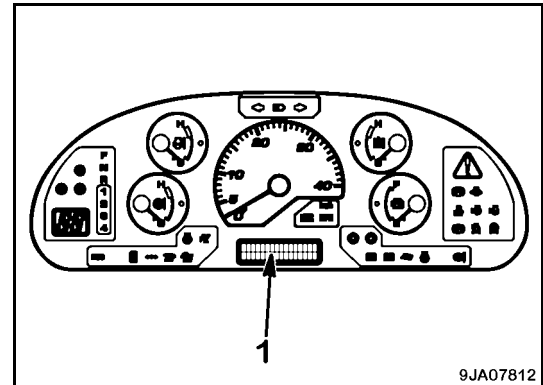
Remark

For details about action codes E03 to E01, see "Action Code Display" on page 2-10.

Emergency Stop

This warning is given if there is a serious failure that affects the normal operation of the machine or if the setting is incorrect.

The central warning lamp on the monitor and the caution lamp for the location of the abnormality illuminate. At the same time, the alarm buzzer sounds and action code E03 is displayed on character display (1).



Caution

This warning is given if the coolant or lubricating oil overheats.

The central warning lamp on the monitor and the individual caution lamps illuminate. At the same time, the alarm buzzer sounds and action code E02 is displayed on character display (1).

Mistaken Operation

This warning is given if any switch or lever is operated by mistake.

The central warning lamp on the monitor illuminates and the alarm buzzer sounds at the same time.

Inspection and Maintenance

This warning is given if it is necessary to carry out inspection and maintenance of wear parts, or if it is necessary to check the oil or coolant level.

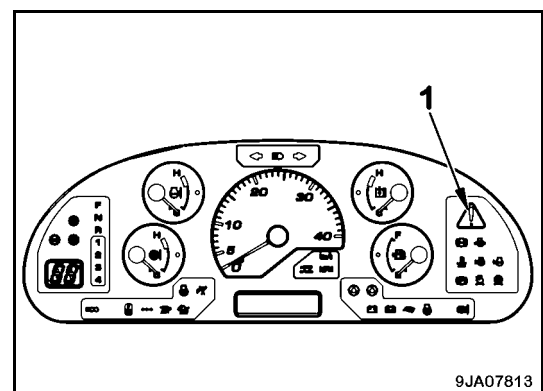
The individual caution lamp on the monitor illuminates. At the same time, action code E01 is displayed on character display (1).

In the case of this warning, the central warning lamp does not illuminate and the alarm buzzer does not sound.

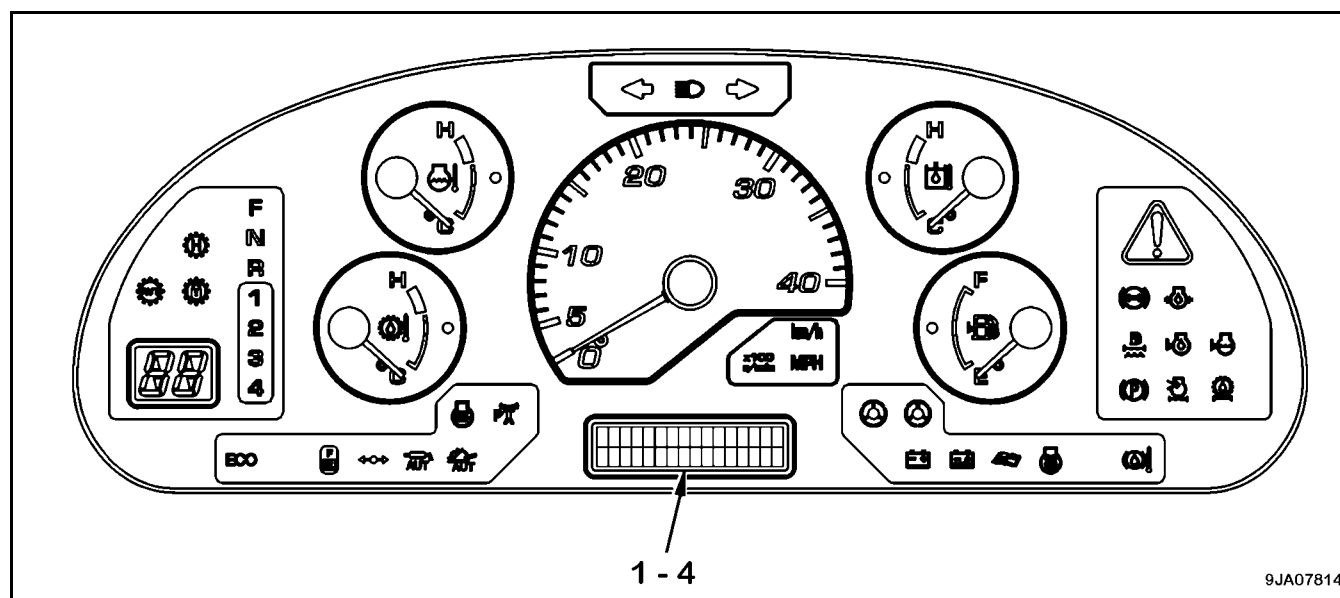
Central Warning Lamp

The central warning lamp (1) illuminates if there is an emergency stop item or caution item, or if mistaken operation of any switch or lever occurs. At the same time, the alarm buzzer sounds.

Check the content of the display and carry out the specified action for that item.



Character Display Portion



1. Service Meter
2. Action code display
3. Failure code display
4. Filter, oil replacement time display

Normally, the service meter is displayed on the character display.

An action code is displayed to recommend suitable action in any of the following circumstances:

- There is a failure on the machine.
- There has been an excessive load on the machine.
- It is necessary to carry out inspection and maintenance.

When the time for replacing the filter or changing the oil is reached, the filter or oil that needs replacement is indicated.

Remark

Information regarding the failure of the machine or maintenance is displayed on the character display when the starting switch is at the ON position.

Check the display to confirm that there is no abnormality before starting to travel.

OPERATION

Service Meter

The service meter (1) shows the total number of hours that the machine has been working.

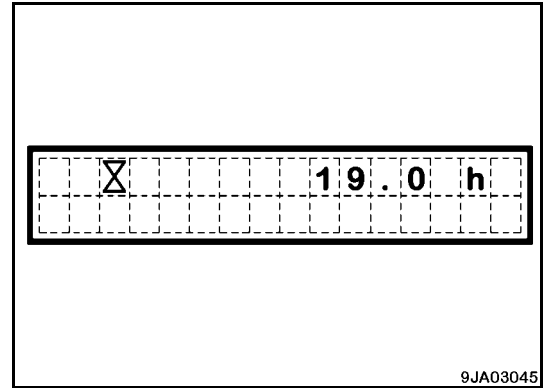
If the engine is running, the service meter advances even if the machine is moving or not.

The service meter advances by one for every hour of operation, regardless of the engine speed.

Even if the starting switch is OFF, the service meter is displayed on the top line if the top (◇) portion of the machine monitor mode selector switch 1 is kept pressed.

Remark

If the starting switch is at the OFF position and the service meter is displayed even though the top (◇) of machine monitor mode selector switch 1 is not pressed, there is probably a failure in the machine. Contact your Komatsu distributor for inspection.



Action Code Display

! WARNING

- If action code E03 is displayed, stop the machine immediately and check the failure code. For details, see "Failure Code Display" on page 2-11.
- Inform your Komatsu distributor of the failure code and ask for repairs.

If there is a failure on the machine, or if it is necessary to change the method of operation, or if inspection or maintenance must be carried out, action code E01, E02, or E03 is displayed on the character display in display portion (2).

If different failures occur at the same time, the action code for the more serious problem is displayed.

Level of seriousness:

- E03 = most serious
- E02 = less serious
- E01 = least serious

In the case of action codes E02 and E03, the alarm buzzer sounds intermittently and the central warning lamp illuminates.

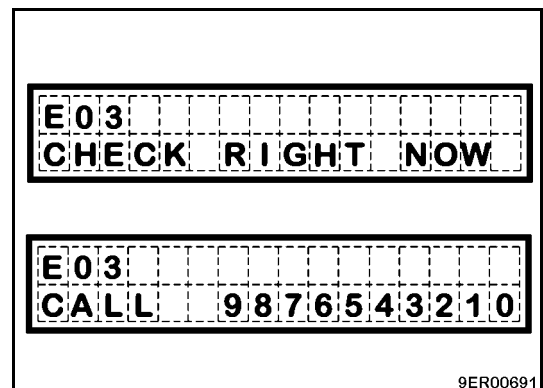
If action code E01, E02, or E03 is displayed on the character display, stop operations; check the content of the display; and take the following action.

E03: When this code is displayed, stop the machine immediately; check the failure code; and contact your Komatsu distributor for repairs.

Remark

"E03" is displayed on the top line of the character display and "CHECK RIGHT NOW" and "CALL" are displayed in turn on the bottom line for 3 seconds each.

The telephone number is displayed to the right of the "CALL" display. If no telephone number has been set, the display is blank. For instructions on setting the telephone number, see "Entering Telephone Number" on page 2-35.

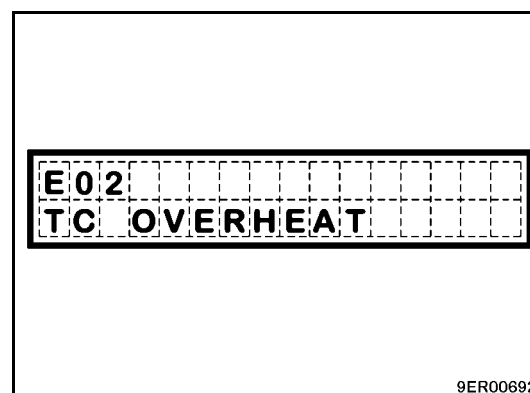


E02: If this code is displayed, stop the machine and run the engine under no load at a mid-range speed.

- If an action code is still displayed after taking the necessary action, check the failure code and contact your Komatsu distributor for repairs.

Remark

The top line of the character display displays “E02” and the bottom line displays the condition of the machine related to overheating.

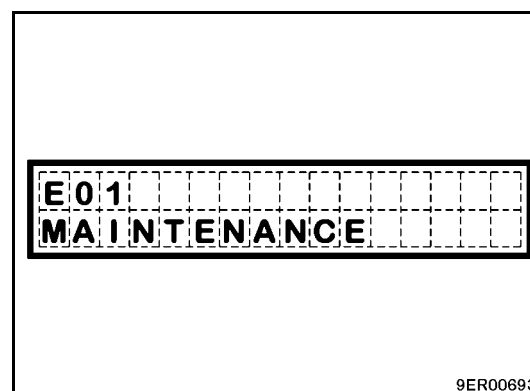


E01: If a failure occurs in the mechanical system, such as a drop in the engine coolant level, the location for maintenance is displayed.

- If the maintenance caution lamp illuminates at the same time, inspect and perform maintenance of the item indicated after completion of the day’s work or when changing shifts.
- If “E01” and “MAINTENANCE” are displayed, check the failure code and ask for repairs to be carried out.

Remark

“E01” is displayed on the top line of the character display and “MAINTENANCE” or the part of the machine requiring inspection, filling of fluid, or replacement is displayed on the bottom line.



Failure Code Display

If an action code is displayed on the character display, check the failure code according to the failure code display method described below.

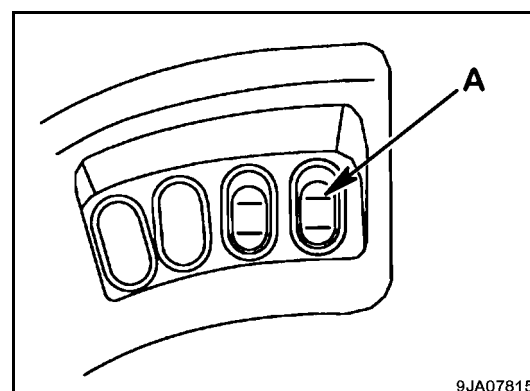
When contacting your Komatsu distributor to request repairs, inform your distributor of the failure code.

Method of Displaying Failure Code

1. If an action code is displayed on the character display of display portion (3), press the top (>) portion of machine monitor mode selector switch 2 (A).

The action code changes to the failure code.

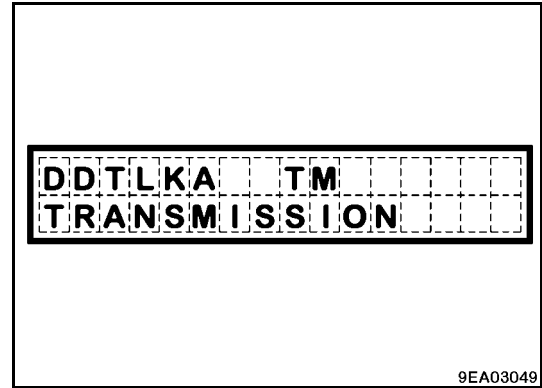
- The failure code is displayed with the first six digits on the left of the top line of the character display.
- The code displayed after the space on the right side of the failure code indicates the controller that detected the failure code.



OPERATION

- The component causing the failure is displayed on the bottom line of the character display.

Top Right Code	Controller Detecting Failure Code
MON	Machine monitor
TM	Transmission controller
ENG	Engine controller
WRK	Work equipment controller (if equipped)



- Press the top (>) of machine monitor mode selector switch 2 (A) again.
 - If the condition is normal, the service meter is displayed for several seconds and then the display returns to the action code.
 - If more than one failure has occurred at the same time, the next failure code is displayed.

Filter, Oil Replacement Time Display

After the starting switch is turned ON and the system check is completed, the filter, oil replacement time display (4) displays (for approximately 30 seconds) the item if any filter or oil item is near the replacement time. The maintenance caution lamp also flashes or lights up at this time.

- After replacing the filter or changing the oil, reset the replacement interval. For details, see “Resetting Filter, Oil Replacement Time” on page 2-34.

Remark

The ID number and item name of the item needing replacement are displayed on the top line of the character display. The time remaining until replacement and the total number of times that replacement was carried out are displayed on the bottom line.

If the replacement time has already passed, a minus (-) sign appears before the time.

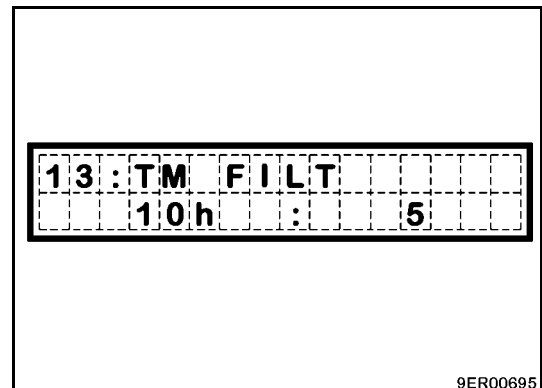
After the display appears for 30 seconds, it does not appear again until the starting switch is turned to the ON position.

A message is not shown on the character display if an action code is displayed.

If there are two or more items to be displayed, the display changes repeatedly every three seconds. If there are more than 10 items, all the items are displayed once each and then the display returns to the normal display.

The display appears when there are 30 hours remaining until the filter or oil replacement time. If the replacement time has passed, a minus (-) sign appears before the time for the first 30 hours. When more than 30 hours have passed, the display is no longer given.

The maintenance caution lamp flashes as the replacement time approaches; after the replacement time has passed, it illuminates.



Items for Display of Filter, Oil Replacement Time

Item	Replacement Interval (H)	Character Display	ID Number
Engine oil	500	ENG OIL	01
Engine oil filter	500	ENG OIL FILTER	02
Fuel pre-filter	500	FUEL P FILT	41
Transmission oil filter	500	TRANSM FILTER	13
Fuel filter	1000	FUEL FILTER	03
Transmission oil	1000	TRANSM OIL	12
Corrosion resistor	1000	CORR-RESISTER	06
Hydraulic tank breather element	2000	HYD BREATHER	05
Hydraulic filter	2000	HYD FILT	04
Hydraulic oil	2000	HYD OIL	10
Axle oil	2000	AXLE OIL	15

Remark

See the sections in the following table for the procedures for replacing the oil and filters.

Item	See
Engine Oil	See "Change Oil in Engine Oil Pan, Replace Engine Oil Filter Cartridge" on page 3-59.
Engine Oil Filter	See "Change Oil in Engine Oil Pan, Replace Engine Oil Filter Cartridge" on page 3-59.
Fuel Prefilter	See "Replace Fuel Prefilter Cartridge" on page 3-61.
Fuel Main Filter	See "Replace Fuel Main Filter Cartridge" on page 3-65.
Corrosion Resistor	See "Replace Corrosion Resistor Cartridge" on page 3-70.
Transmission Oil	See "Change Oil in Transmission Case, Change Transmission Oil Filter Cartridge, Clean Strainer" on page 3-67.
Transmission Oil Filter	See "Change Oil in Transmission Case, Change Transmission Oil Filter Cartridge, Clean Strainer" on page 3-67.
Hydraulic Oil Filter	See "Change Oil in Hydraulic Tank, Replace Hydraulic Tank Filter Element" on page 3-71.
Hydraulic Tank Breather Element	See "Replace Hydraulic Tank Breather Element" on page 3-74.
Hydraulic Oil	See "Change Oil in Hydraulic Tank, Replace Hydraulic Tank Filter Element" on page 3-71.
Axle Oil	See "Change Axle Oil" on page 3-75.

OPERATION

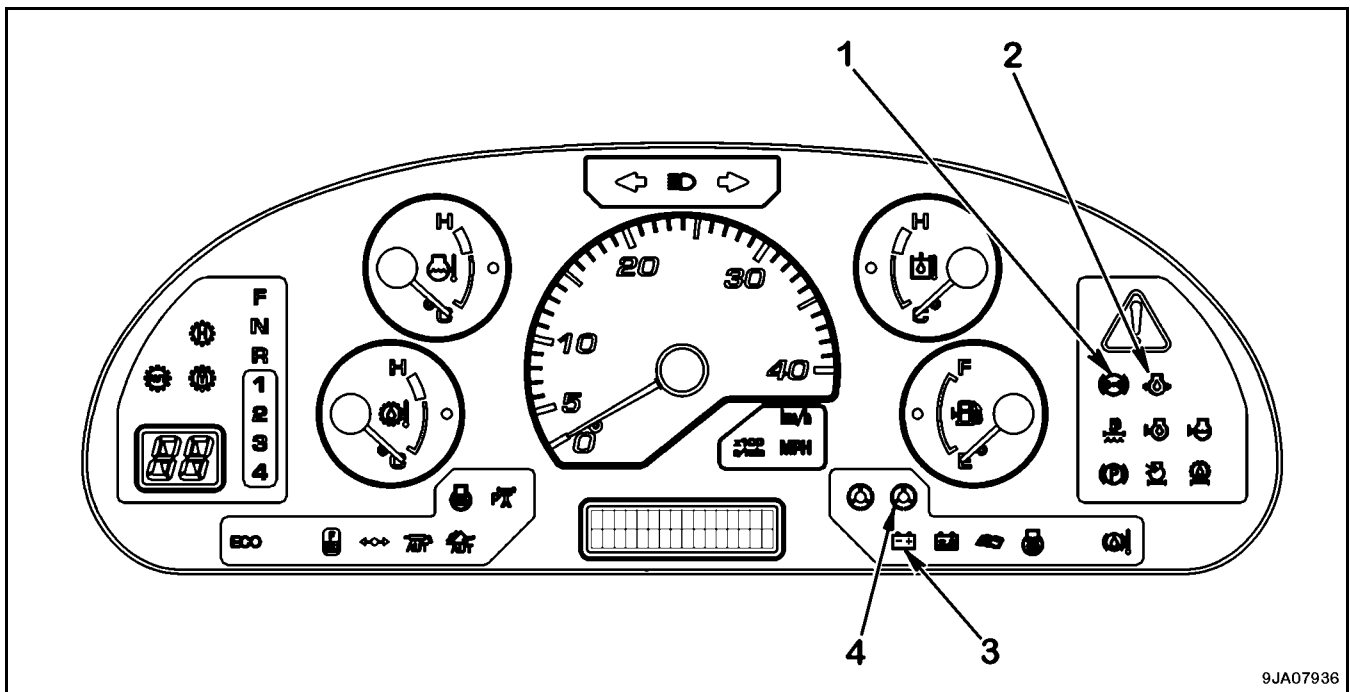
Emergency Stop Items

! WARNING

If these lamps light up and the buzzer sounds, stop operations immediately and carry out inspection and maintenance of the applicable location.

If there is any abnormality in an emergency stop item, the alarm buzzer sounds intermittently and the caution lamp for the location of the abnormality and the central warning lamp light up.

At the same time, the top line of the character display displays “E03” and the bottom line displays “CHECK RIGHT NOW” and “CALL” alternately for three seconds each. Stop the machine immediately; stop the engine; and carry out inspection.



9JA07936

1. Brake oil pressure caution lamp
2. Engine oil pressure caution lamp
3. Battery charge circuit caution lamp
4. Steering oil pressure caution lamp (if equipped)

Brake Oil Pressure Caution Lamp

The brake oil pressure caution lamp (1) illuminates when the brake oil pressure goes below the specified value.

- During check before starting (engine stopped, starting switch ON):

The brake circuit is not actuated while the engine is stopped. The brake oil pressure caution lamp and central warning lamp do not illuminate and the alarm buzzer does not sound.

- During operation (engine running):

If the brake oil pressure goes down during operation, the brake oil pressure caution lamp and the central warning lamp illuminate; the alarm buzzer sounds intermittently.

At the same time, the top line of the character display displays “E03” and the bottom line displays “CHECK RIGHT NOW” and “CALL” alternately for three seconds.

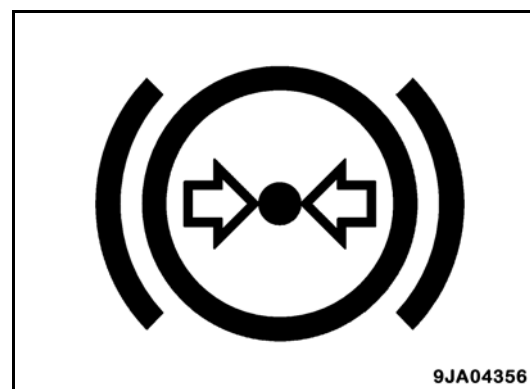
- ★ Stop the machine immediately and carry out inspection.

When the brake oil pressure caution lamp illuminates, it may be impossible to operate the brakes.

- ★ Keep the parking brake applied to prevent the machine from moving.

When the accumulator is being charged immediately after the engine starts, the brake oil pressure caution lamp illuminates but the central warning lamp does not illuminate and the alarm buzzer does not sound.

- ★ Keep the parking brake applied to prevent the machine from moving until the brake pressure is normal and the brake oil pressure caution lamp goes out.



Engine Oil Pressure Caution Lamp

The engine oil pressure caution lamp (2) illuminates to warn the operator that the engine lubricating oil pressure has dropped.

- During check before starting (engine stopped, starting switch ON):

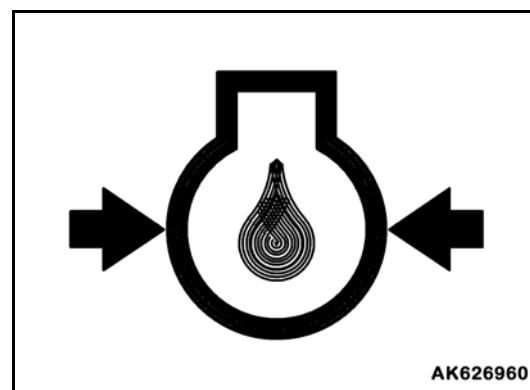
This lamp does not illuminate.

- During operation (engine running):

If the engine lubricating oil pressure goes down during operation, the engine lubricating oil pressure caution lamp and the central warning lamp illuminate; the alarm buzzer sounds intermittently.

At the same time, the top line of the character display displays “E03” and the bottom line displays “CHECK RIGHT NOW” and “CALL” alternately for three seconds.

- ★ Stop the machine immediately; stop the engine; and carry out inspection.



OPERATION

Battery Charge Circuit Caution Lamp

The battery charge circuit caution lamp (3) illuminates when the engine is running to warn the operator that an abnormality has occurred in the charging circuit.

- During check before starting (engine stopped, starting switch ON):

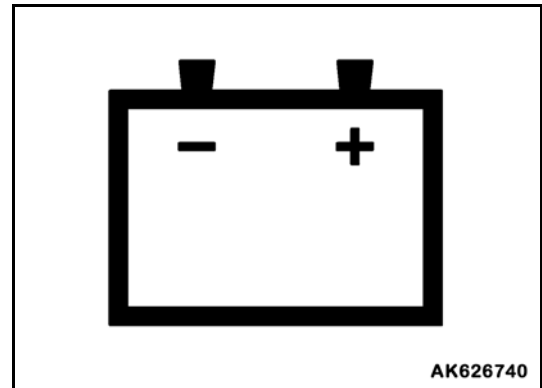
The lamp does not illuminate.

- During operation (engine running):

If an abnormality occurs in the charging circuit during operation, the battery charge circuit caution lamp and the central warning lamp illuminate; the alarm buzzer sounds intermittently.

At the same time, the top line of the character display displays “E03” and the bottom line displays “CHECK RIGHT NOW” and “CALL” alternately for three seconds.

- ★ Stop the machine immediately; stop the engine; and carry out inspection.



Steering Oil Pressure Caution Lamp (Red)

(If equipped)

The steering oil pressure caution lamp (4) glows red when the steering oil pressure has dropped.

- During check before starting (engine stopped, starting switch ON):

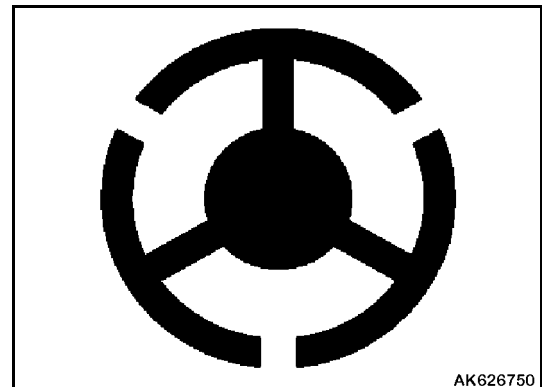
The lamp does not illuminate. It lights up during the self-check of the emergency steering.

- During operation (engine running):

If the steering oil pressure drops during operation, the steering oil pressure caution lamp and the central warning lamp illuminate; the alarm buzzer sounds intermittently.

At the same time, the top line of the character display displays “E03” and the bottom line displays “CHECK RIGHT NOW” and “CALL” alternately for three seconds.

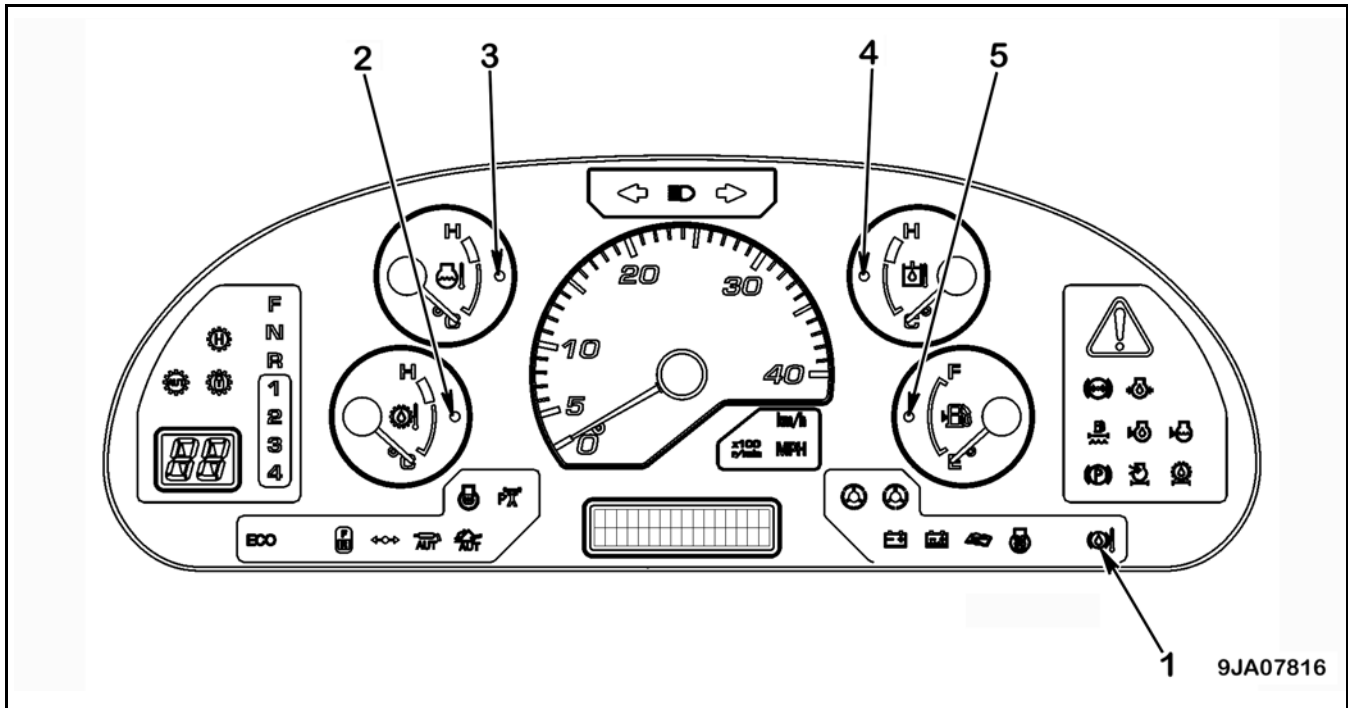
- ★ Stop the machine immediately; stop the engine; and carry out inspection.



Caution Items

! WARNING

If these lamps illuminate, stop operations quickly and carry out inspection and maintenance of the applicable location.



1. Brake oil temperature caution lamp
2. Torque converter oil temperature caution lamp
3. Engine coolant temperature caution lamp
4. Hydraulic oil temperature caution lamp
5. Fuel level caution lamp

OPERATION

Brake Oil Temperature Caution Lamp

The brake oil temperature caution lamp (1) illuminates to warn the operator that the brake oil temperature has increased.

- During check before starting (engine stopped, starting switch ON):

This lamp does not illuminate.

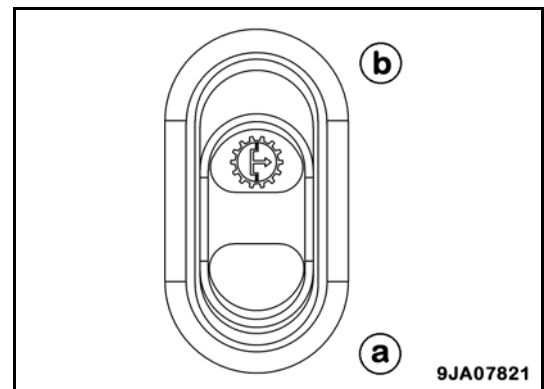
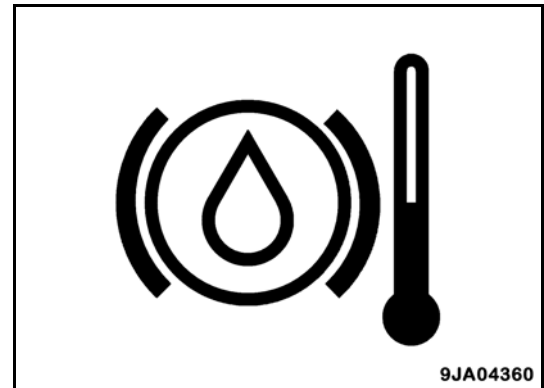
- During operation (engine running):

In continuous heavy-duty operations or when traveling long distances downhill where the brake is used frequently, the brake oil temperature increases. The brake oil temperature caution lamp flashes and the central warning light illuminate; the alarm buzzer sounds intermittently.

At the same time, the top line of the character display displays “E02” and the bottom line displays “BRAKE OVERHEAT.”

★ Take the following action.

- A. Release the accelerator pedal and move the gearshift lever down one range to reduce the travel speed.
- B. Avoid using the brake.
 - Do not keep the brake pedal depressed continuously; use the brake only intermittently.
If use of the brake is reduced for a short time in the way recommended, the brake oil temperature decreases and the caution lamp goes out.
 - Set the transmission cutoff switch to the ON position (b) when carrying out operations.



Torque Converter Oil Temperature Caution Lamp

The torque converter oil temperature caution lamp (2) illuminates to warn the operator that the torque converter oil temperature has increased.

- During check before starting (engine stopped, starting switch ON):

This lamp does not illuminate.

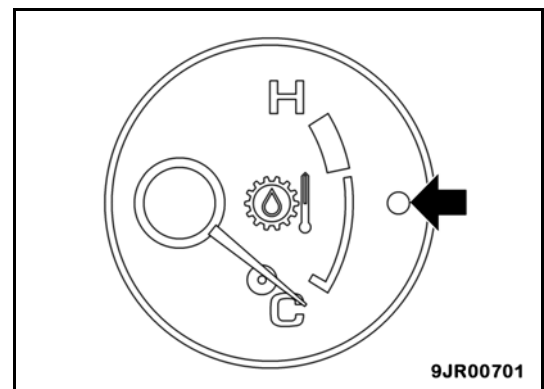
- During operation (engine running):

If the torque converter oil temperature increases, the torque converter oil temperature caution lamp illuminates.

If the oil temperature continues to increase, the central warning lamp illuminates and the alarm buzzer sounds intermittently.

At the same time, the top line of the character display displays “E02” and the bottom line displays “TC OVERHEAT.”

★ Stop the machine and run the engine under no load at a mid-range speed until the lamp goes out.



Engine Coolant Temperature Caution Lamp

The engine coolant temperature caution lamp (3) illuminates to warn the operator that the engine coolant temperature has increased.

- During check before starting (engine stopped, starting switch ON):

This lamp does not illuminate.

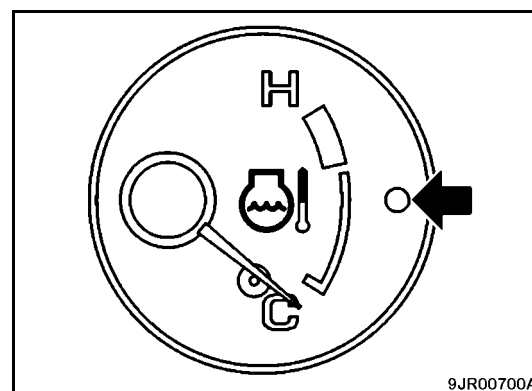
- During operation (engine running):

If the engine coolant temperature increases, only the engine coolant temperature caution lamp illuminates.

If the coolant temperature continues to increase, the central warning lamp illuminates and the alarm buzzer sounds intermittently.

At the same time as the central warning lamp illuminates, the top line of the display displays “E20” and the bottom line displays “ENGINE OVERHEAT.”

- ★ Stop the machine and run the engine under no load at a mid-range speed until the lamp goes out.



Hydraulic Oil Temperature Caution Lamp

The hydraulic oil temperature caution lamp (4) warns the operator that the hydraulic oil temperature has increased.

- During check before starting (engine stopped, starting switch ON):

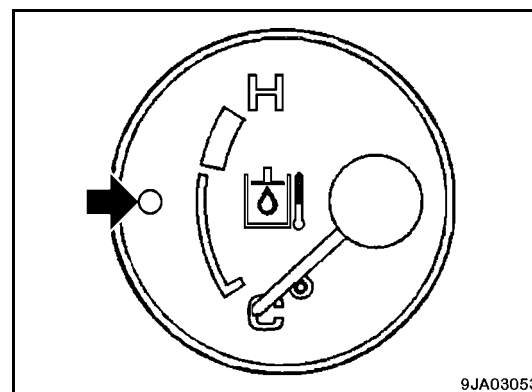
This lamp does not illuminate.

- During operation (engine running):

If the hydraulic oil temperature increases, the hydraulic oil temperature caution lamp and the central warning lamp illuminate; the alarm buzzer sounds intermittently.

At the same time, the top line of the character display displays “E02” and the bottom line displays “HYD OVERHEAT.”

- ★ Stop the machine and run the engine under no load at a mid-range speed until the lamp goes out.



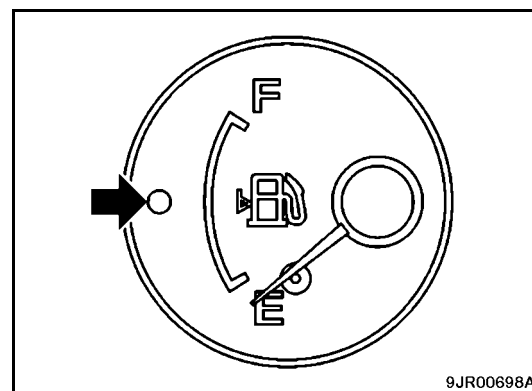
Fuel Level Caution Lamp

The fuel level caution lamp (5) illuminates when the amount of fuel remaining in the fuel tank goes below 27 liters (7.13 US gallons).

- ★ If the lamp illuminates, check the fuel level immediately and add fuel. For details, see “Check Fuel Level, Add Fuel” on page 2-87.

Remark

Even if the caution lamp illuminates, action code E02 is not displayed on the character display.

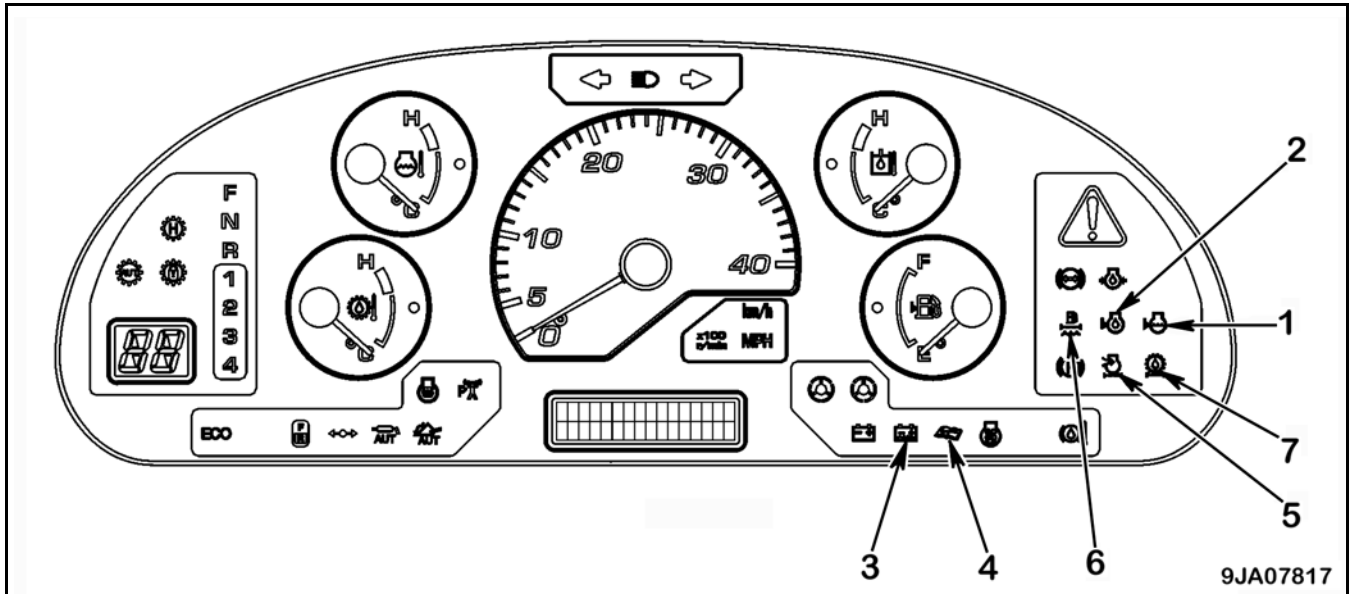


OPERATION

Inspection and Maintenance Items

! WARNING

If these lamps light up, stop operations immediately and carry out inspection and maintenance of the applicable location.



1. Radiator coolant level caution lamp
2. Engine oil level caution lamp
3. Battery electrolyte level caution lamp (if equipped)
4. Maintenance caution lamp
5. Air cleaner clogging caution lamp (machines equipped with KOMTRAX)
6. Water separator caution lamp
7. Transmission oil filter clogging caution lamp

Radiator Coolant Level Caution Lamp

The radiator coolant level caution lamp (1) illuminates to warn the operator that the coolant level in the radiator has dropped.

- During check before starting (engine stopped, starting switch ON):

This lamp illuminates if the coolant level in the radiator is low.

At the same time, the top line of the character display displays “E01” and the bottom line displays “COOLANT LOW.”

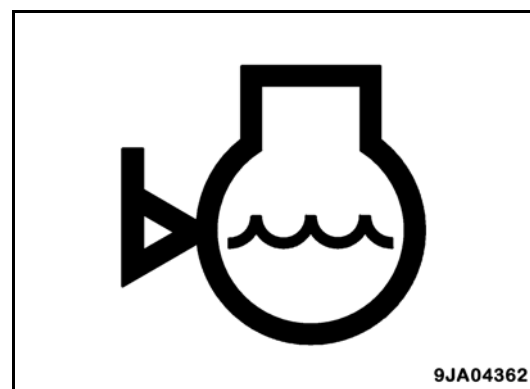
- ★ Check the coolant level in the radiator subtank and add coolant.

- During operation (engine running):

If the coolant level in the radiator drops too low, the radiator coolant level caution lamp illuminates.

At the same time, the top line of the character display displays “E01” and the bottom line displays “COOLANT LOW.”

- ★ Stop the engine; check the coolant level in the radiator subtank; and add coolant.



Engine Oil Level Caution Lamp

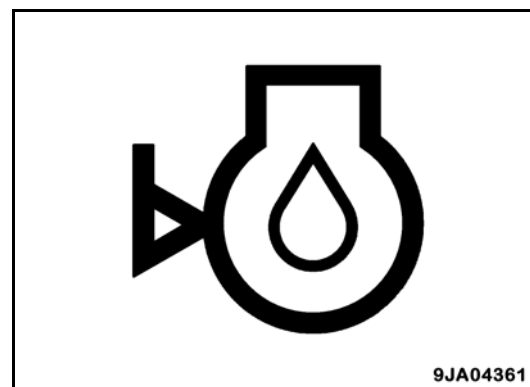
The engine oil level caution lamp (2) illuminates to warn the operator that the oil level in the engine oil pan has dropped.

- During check before starting (engine stopped, starting switch ON):

The engine oil level caution lamp illuminates if the oil level in the engine oil pan is low.

At the same time, the top line of the character display displays “E01” and the bottom line displays “COOLANT LOW.”

- ★ Do not start the engine. Check the oil level in the engine oil pan and add oil.



Remark

During the prestart check, if the engine is started with the engine oil level caution lamp illuminated, the lamp will remain lit.

Stop the engine; check the oil level in the engine oil pan; and add oil.

Battery Electrolyte Level Caution Lamp

(If equipped)

The battery electrolyte level caution lamp (3) is not used.

OPERATION

Maintenance Caution Lamp

WARNING

If the caution lamp lights up, repair the problem as soon as possible. If the repair is not made, it will lead to failure.

When the time for an oil change is reached, the maintenance caution lamp (4) flashes or illuminates for approximately 30 seconds after completion of the system check when the starting switch is at the ON position.

Remark

The maintenance caution lamp flashes when there is less than 30 hours to the replacement time. After the replacement time has passed, the lamp stays on.

- For details of the items covered by filter and oil replacement, see “Filter, Oil Replacement Time Display” on page 2-12.
- After replacing the filter or changing the oil, reset the replacement time. For details, see “Resetting Filter, Oil Replacement Time” on page 2-34.

Air Cleaner Clogging Caution Lamp

(Machines equipped with KOMTRAX)

When the engine is running, the air cleaner clogging caution lamp (5) illuminates to warn the operator that the air cleaner element is clogged.

- During check before starting (engine stopped, starting switch ON):
Lamp does not illuminate.
- During operation (engine running):

If the air cleaner element becomes clogged, the caution lamp lights up. At the same time, the top line of the character display displays “E01” and the bottom line displays “AIR FILTER.”

- ★ Stop the engine and clean or replace the element.

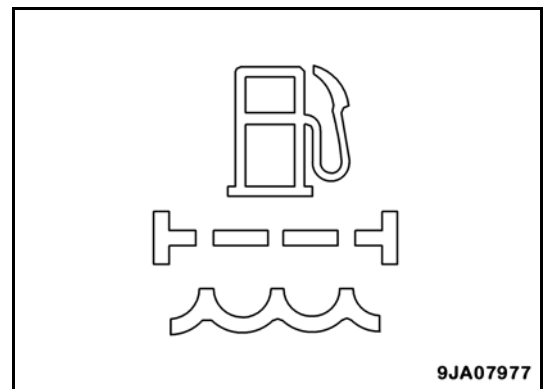
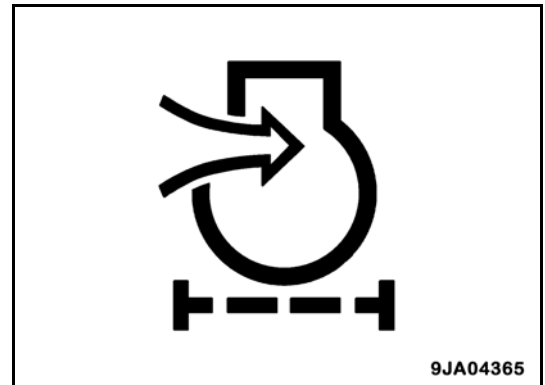
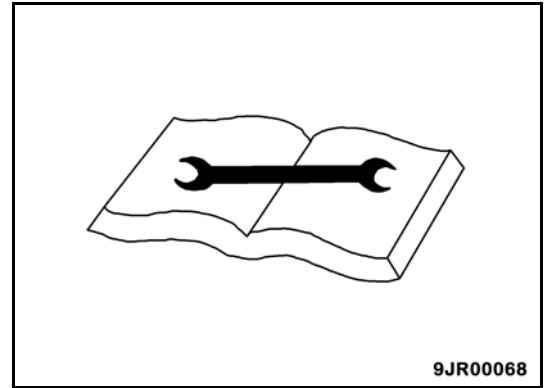
Remark

It is possible to check the extent of the clogging in the air cleaner by checking the dust indicator installed at the side of the air cleaner.

Water Separator Caution Lamp

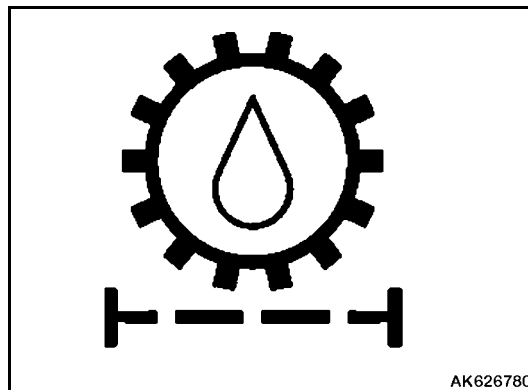
The water separator caution lamp (6) lights up if water accumulates in the water separator installed to the fuel prefilter.

- ★ If it lights up, check the prefilter. For details, see “Replace Fuel Prefilter Cartridge” on page 3-61.



Transmission Oil Filter Clogging Caution Lamp

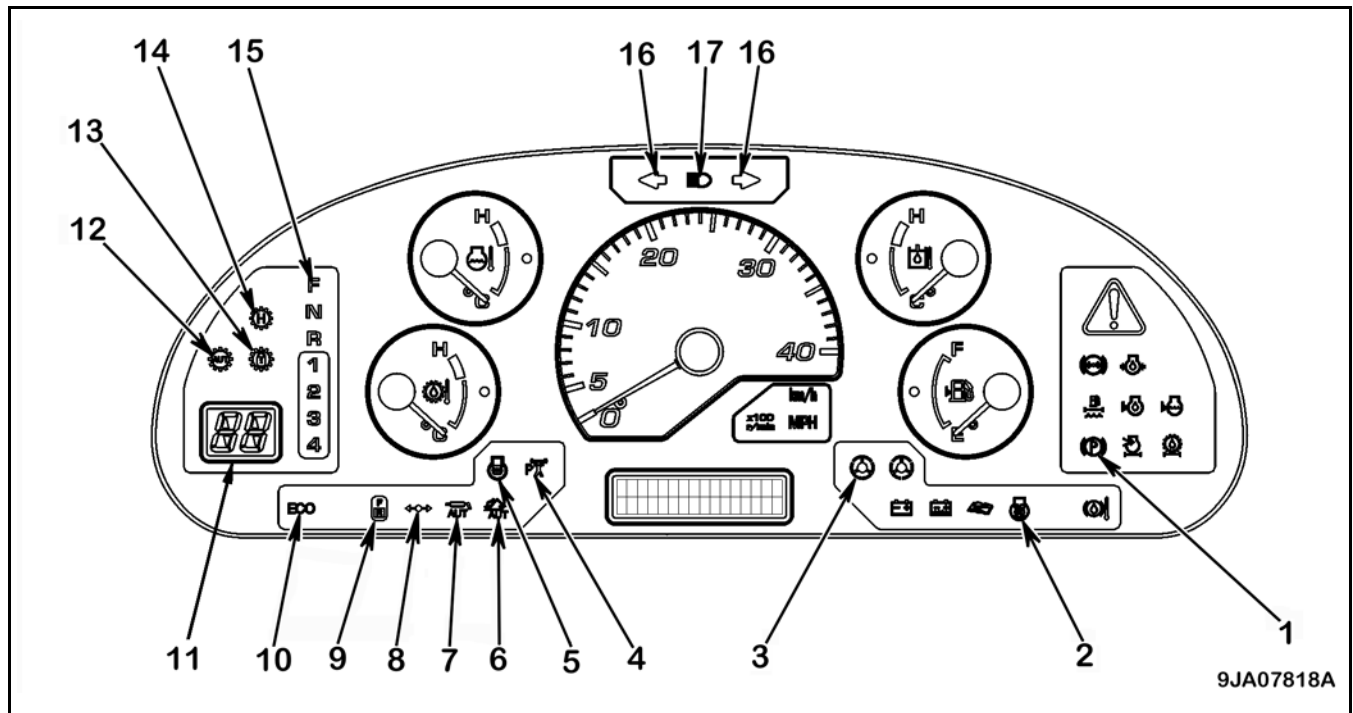
The transmission oil filter clogging lamp (7) is not used.



OPERATION

Pilot Display Portion

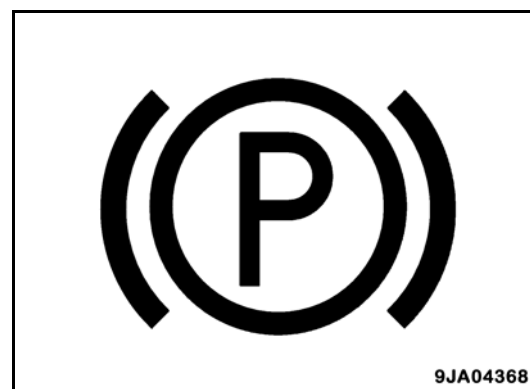
When the starting switch is ON, the pilot display lights up when the display items are functioning.



1. Parking brake pilot lamp
2. Cooling fan reverse rotation pilot lamp
3. Emergency steering pilot lamp (if equipped)
4. Power mode pilot lamp (P mode)
5. Preheating pilot lamp
6. Semi-auto digging pilot lamp (if equipped)
7. Auto-greasing pilot lamp (if equipped)
8. Joystick pilot lamp (if equipped)
9. Directional selector pilot lamp
10. Economy operation display lamp
11. Shift indicator
12. Auto-shift pilot lamp
13. Torque converter lockup pilot lamp (if equipped)
14. Shift hold pilot lamp
15. Shift lever position pilot lamp
16. Turn signal pilot lamp
17. Head lamp high beam pilot lamp

Parking Brake Pilot Lamp

The parking brake pilot lamp (1) illuminates when the parking brake is applied.

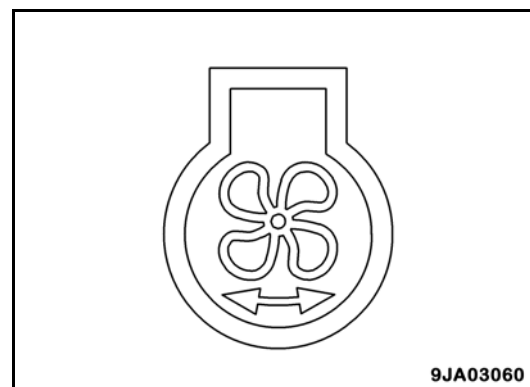


Cooling Fan Reverse Rotation Pilot Lamp

The cooling fan reverse rotation pilot lamp (2) illuminates when the direction of rotation of the cooling fan is reversed.

At the same time, “COOLING FAN REVERSE” is displayed on the character display.

For details of operation, see “Cooling Fan Reverse Rotation Switch” on page 2-54.



Emergency Steering Pilot Lamp (Green)

(If equipped)

The emergency steering pilot lamp (3) illuminates when the emergency steering is actuated.

If the engine stops when the machine is traveling, or an abnormality occurs in the steering oil pressure circuit, and the machine is traveling at a speed of more than 2 km/h (1.2 mph), the emergency steering is automatically actuated and the lamp lights up.

- ★ If the lamp lights up, move the machine immediately to a safe place; stop the engine; and check the condition.

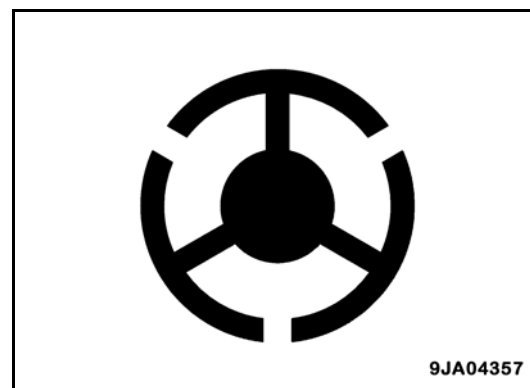
The lamp flashes if the emergency steering is actuated continuously for one minute. At the same time, “E02 EMR S/T OVERRUN” is displayed on the character display.

- ★ Move the machine immediately to a safe place; stop the engine; and check the condition.

Remark

There is an emergency steering self-check function.

For details, see “Emergency Steering Self-Check Function” on page 2-118.

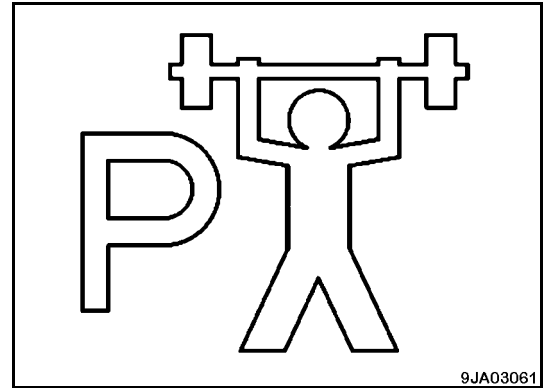


OPERATION

Power Mode Pilot Lamp (P Mode)

The power mode pilot lamp (4) illuminates when the P mode is selected.

Use the power mode selector switch to select the P mode.

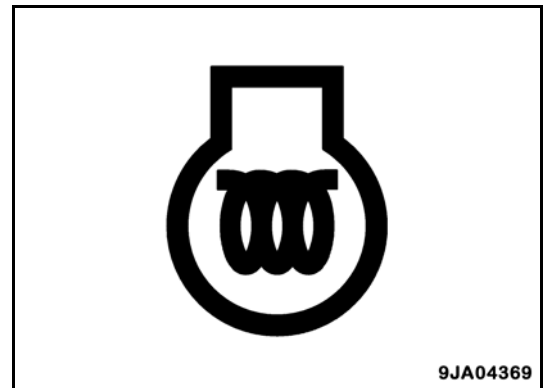


Preheating Pilot Lamp

The preheating pilot lamp (5) illuminates when the engine preheating electric heater is actuated.

In cold weather when the starting switch is turned to the ON position, this lamp illuminates. The lamp goes out when preheating is completed.

The preheating time differs according to the ambient temperature.



Semi-Auto Digging Pilot Lamp

The semi-auto digging pilot lamp (6) is not used.

Auto-Greasing Pilot Lamp

(If equipped)

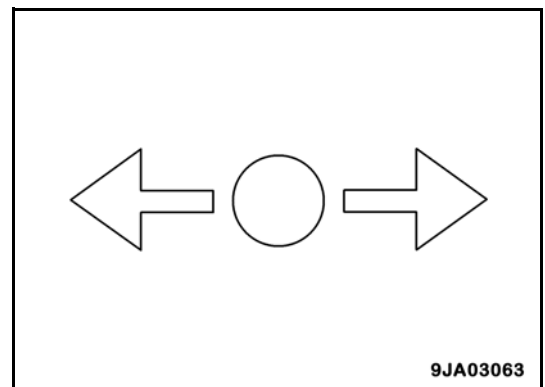
The auto-greasing pilot lamp (7) is not used.

Joystick Pilot Lamp

(If equipped)

The joystick pilot lamp (8) illuminates when the joystick ON/OFF switch is at the ON position and the joystick console is tilted to the front.

For details, see “JOYSTICK STEERING SYSTEM” on page 5-7.

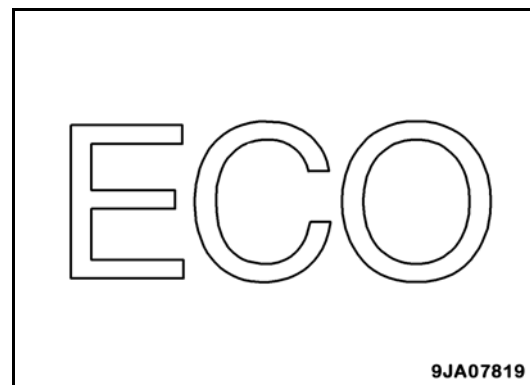


Directional Selector Pilot Lamp

The directional selector pilot lamp (9) is not used.

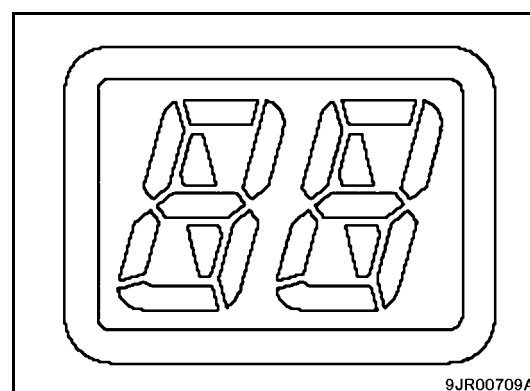
Economy Operation Display Lamp

The economy operation display lamp (10) illuminates when the economy mode is used.



Shift Indicator

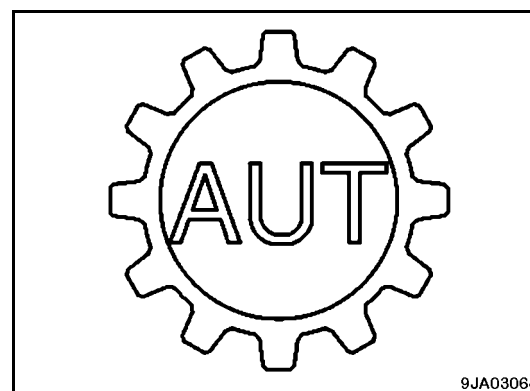
The shift indicator (11) indicates the transmission gear range (actual travel speed range).



Auto-Shift Pilot Lamp

The auto-shift pilot lamp (12) illuminates when the auto-shift function is selected.

Use the transmission shift mode selector switch to select the shift mode.



Torque Converter Lockup Pilot Lamp

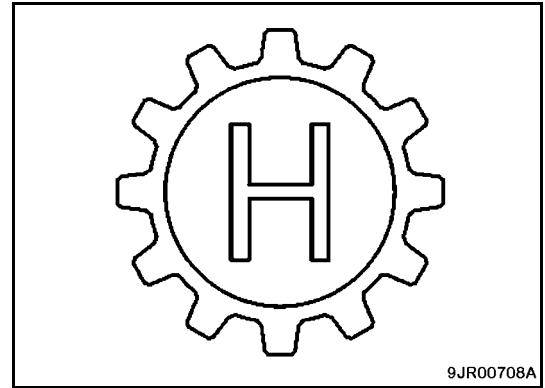
(If equipped)

For details, see "TORQUE CONVERTER LOCKUP" on page 5-3.

OPERATION

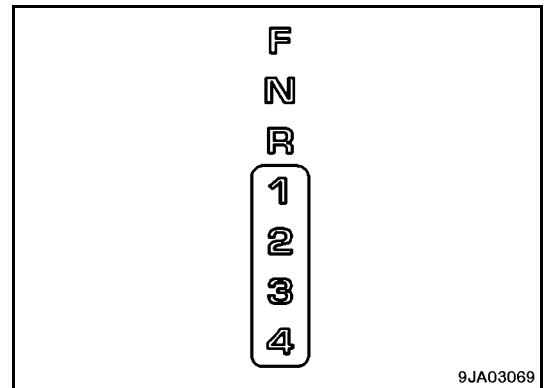
Shift Hold Pilot Lamp

The shift hold pilot lamp (14) illuminates when the shift hold is actuated.



Shift Lever Position Pilot Lamp

The shift lever position pilot lamp (15) displays the transmission position of the gearshift lever.

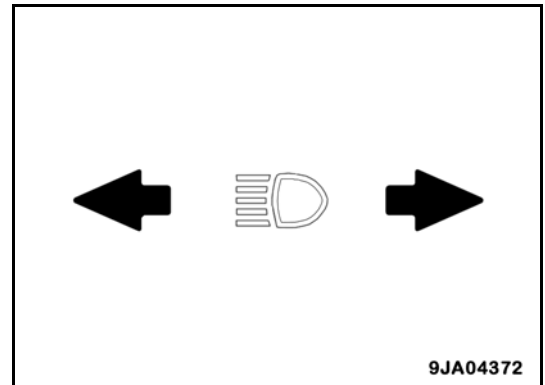


Turn Signal Pilot Lamp

The turn signal pilot lamp (16) flashes at the same time as the turn signal lamp flashes.

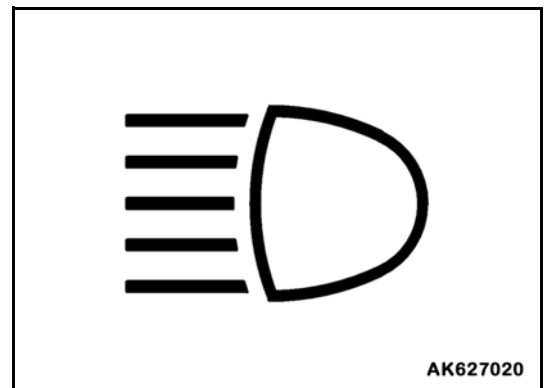
Remark

If there is a disconnection in the turn signal lamp, the flashing interval becomes shorter.

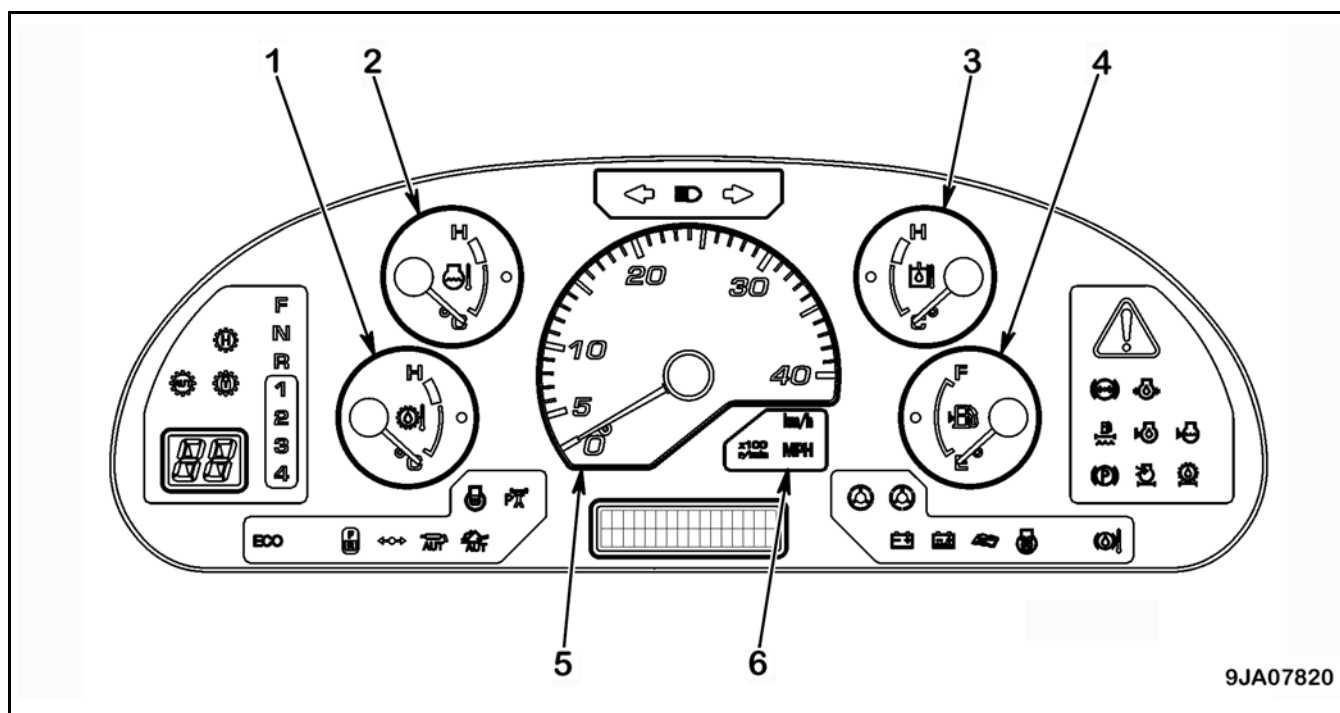


Head Lamp High Beam Pilot Lamp

The head lamp high beam pilot lamp (17) illuminates when the head lamps are set to high beam.



Meter Display Portion



9JA07820

1. Torque converter oil temperature gauge
2. Engine coolant temperature gauge
3. Hydraulic temperature gauge
4. Fuel gauge
5. Speedometer
6. Meter display pilot lamp

OPERATION

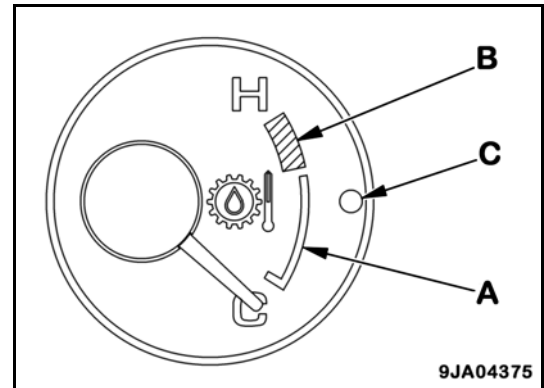
Torque Converter Oil Temperature Gauge

The torque converter oil temperature gauge (1) indicates the torque converter oil temperature.

- The indicator should be in the white range (A) during operations.
- If the indicator enters the red range (B) during operations, caution lamp (C) inside the torque converter oil temperature gauge will light up. At the same time, the central warning lamp illuminates and the alarm buzzer sounds intermittently.

The top line of the character display displays “E02” and the bottom line displays “TC OVERHEAT.”

- ★ Run the engine under no load at a mid-range speed and wait until the indicator goes down to the white range (A).



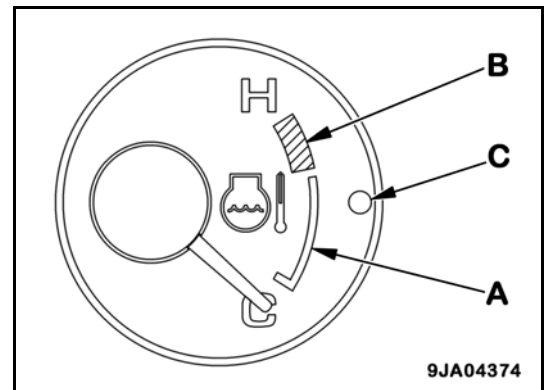
Engine Coolant Temperature Gauge

The engine coolant temperature gauge (2) indicates the engine coolant temperature.

- The indicator should be in the white range (A) during normal operations.
- If the indicator enters the red range (B) during operations, caution lamp (C) inside the engine coolant temperature gauge lights up. At the same time, the central warning lamp illuminates and the alarm buzzer sounds.

The top line of the character display displays “E02” and the bottom line displays “ENGINE OVERHEAT.”

- ★ Run the engine at a mid-range speed under no load and wait for the indicator to return to the white range (A).



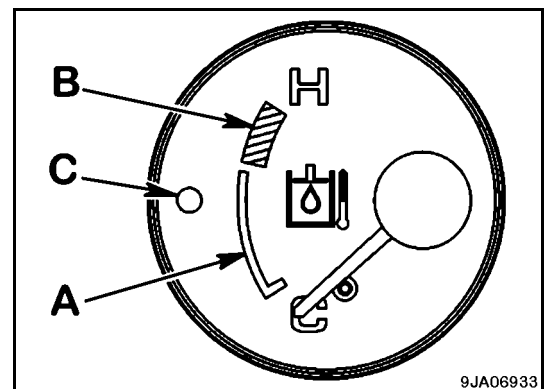
Hydraulic Temperature Gauge

The hydraulic temperature gauge (3) indicates the hydraulic oil temperature.

- The indicator should be in the white range (A) during operations.
- If the indicator enters the red range (B) during operations, caution lamp (C) inside the hydraulic oil temperature gauge will light up. At the same time, the central warning lamp illuminates and the alarm buzzer sounds intermittently.

The top line of the character display displays “E02” and the bottom line displays “HYD OVERHEAT.”

- ★ Run the engine under no load at a mid-range speed and wait until the indicator goes down to the white range (A).



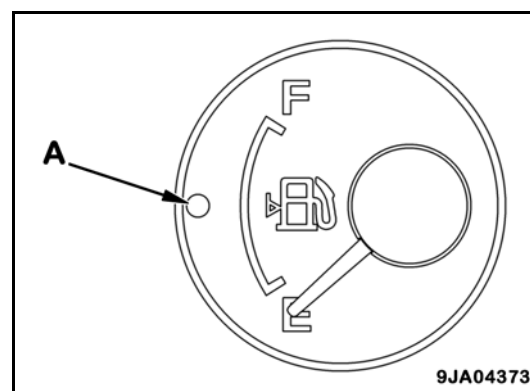
Fuel Gauge

The fuel gauge (4) indicates the amount of fuel remaining in the fuel tank.

- F: Full tank
- E: Fuel level is low.

When the remaining amount of fuel goes below 27 liters (7.13 US gal), caution lamp (A) inside the fuel gauge lights up.

★ If the caution light illuminates, check the fuel level then add fuel.



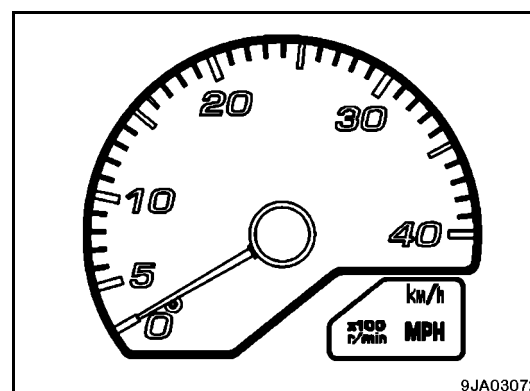
Speedometer

The speedometer (5) indicates the travel speed of the machine.

The display unit is indicated on meter display pilot lamp (6).

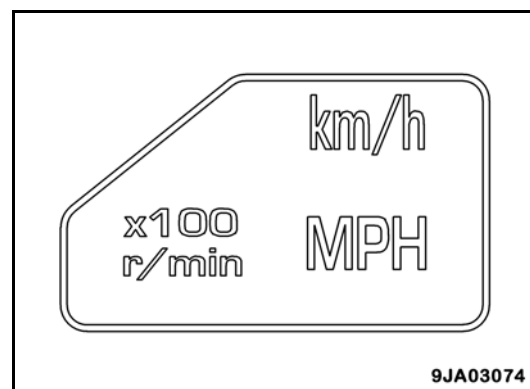
It is also possible to display the engine speed by switching meter (5).

If you wish to switch between the speedometer and tachometer, contact your Komatsu distributor to have it switched.



Meter Display Pilot Lamp

The meter display pilot lamp (6) displays the unit for the travel speed or engine tachometer.



OTHER FUNCTIONS OF MACHINE MONITOR

Overall Menu

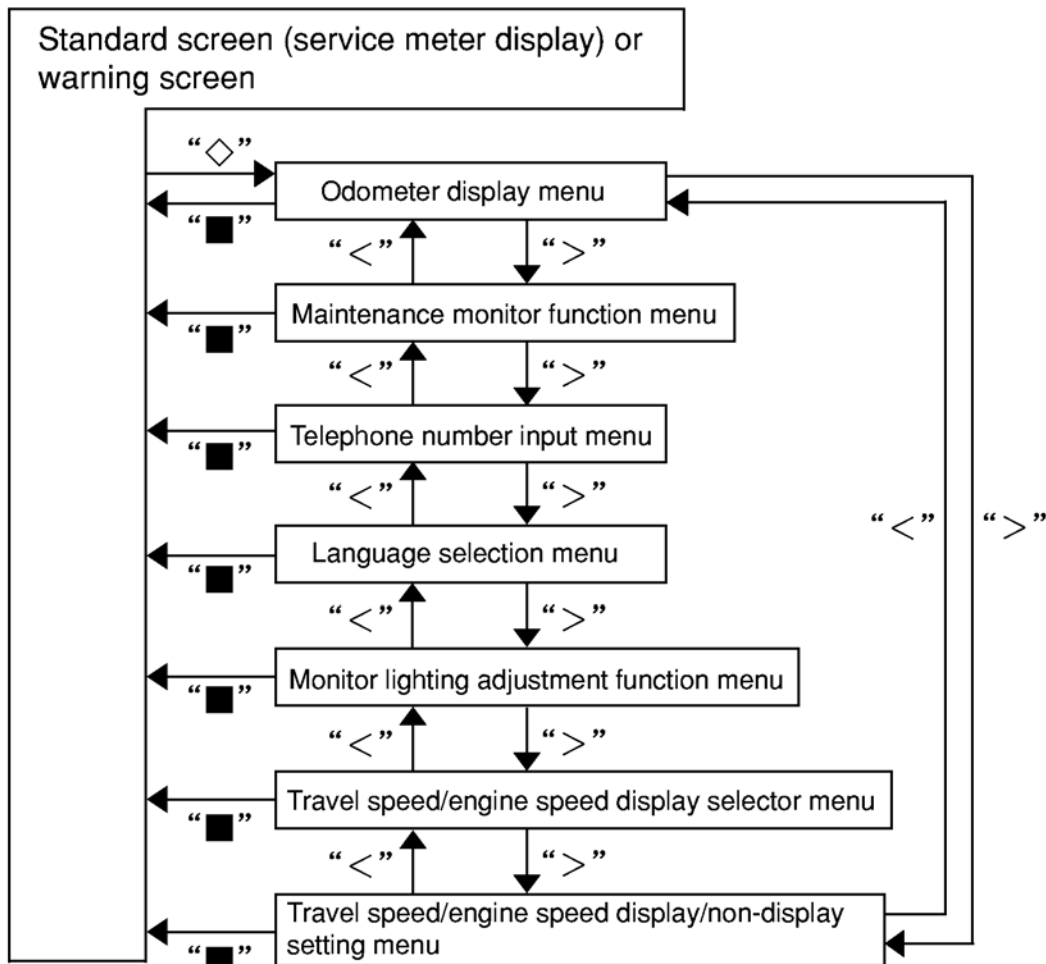
The machine monitor also has the following functions:

- Odometer
- Filter/oil replacement time reset
- Telephone number input
- Language selection
- Monitor brightness adjustment

Operation

- ★ When the (◊) portion of the machine monitor mode selector switch 1 is pressed from the standard screen (service meter display) or warning screen, the display changes to “ODO.” Press the (>) or (<) portion of the machine monitor mode selector switch 2 and move to the following menus.
- ★ To return from each menu to the standard menu, press (■) of the machine monitor mode selector switch 1.

Overall menu



Standard screen (service meter display)



- ◇、■ : Machine monitor mode selector switch 1
- >、< : Machine monitor mode selector switch 2

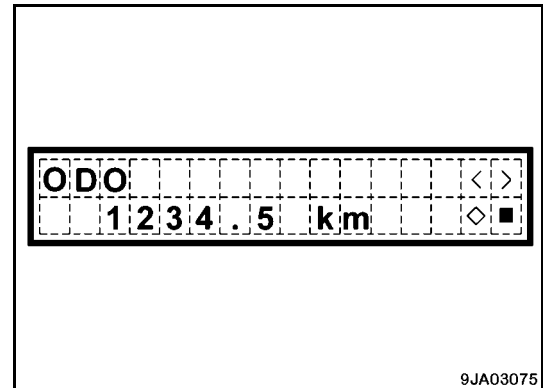
AJA00700

OPERATION

Displaying Odometer

Use this function to check the total distance that the machine has traveled.

1. Check that the character display is displaying the service meter or an action code.
 - If there is any other display, turn the starting switch OFF; turn the starting switch ON again; and wait for the service meter display or action code display to appear.
2. Press (◇) of machine monitor mode selector switch 1 to display “ODO” (odometer).
3. After checking the screen, press (■) of machine monitor mode selector switch 1 or turn the starting switch OFF.



Resetting Filter, Oil Replacement Time

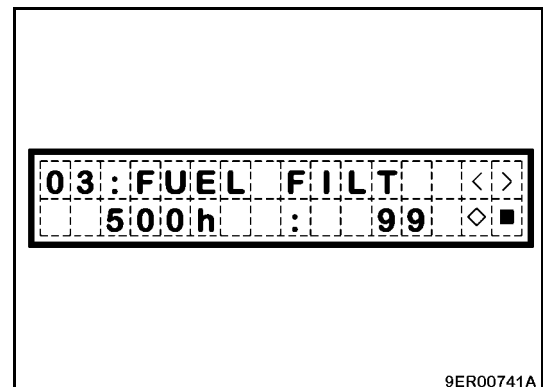
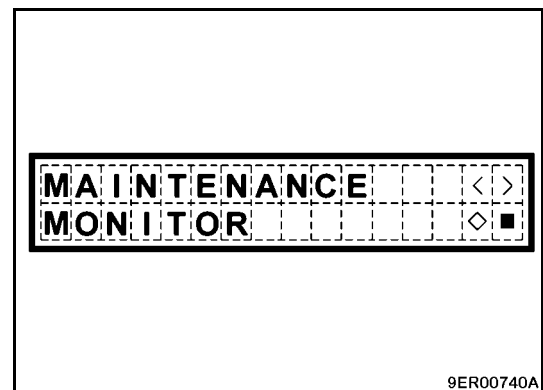
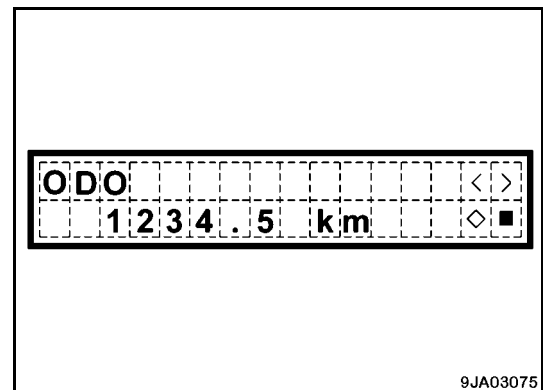
Use this function to reset the oil and filter replacement time.

The filter and oil replacement time is displayed on the character display. If the filter and oil have been replaced, reset the filter and oil change time.

1. Press (◇) of machine monitor mode selector switch 1 to display “ODO” (odometer).
2. Press (>) or (<) of machine monitor mode selector switch 2 to display “MAINTENANCE MONITOR.”
3. Press (◇) of machine monitor mode selector switch 1. The screen switches to the display shown on the right.

The replacement interval is shown on the bottom line at the left and the total number of times the item has been replaced is shown on the right.
4. Press (>) or (<) of machine monitor mode selector switch 2 to display the filter or oil item that has reached the replacement time.

For details of the items to reset, see “Filter, Oil Replacement Time Display” on page 2-12.



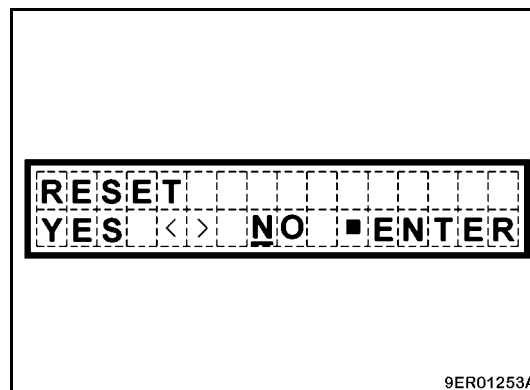
- Press (◊) of machine monitor mode selector switch 1. The screen switches to the display shown on the right.

“RESET” and “ITEM TO RESET” are displayed on the top line in turn.

- When resetting the replacement interval, press (>) or (<) of machine monitor mode selector switch 2; set the cursor on YES; then press (■) of machine monitor mode selector switch 1. The time is reset and the screen returns to the previous screen.

To abort the operation, set the cursor on NO and then press (■) of machine monitor mode selector switch 1.

- When resetting the replacement interval for another item, repeat the procedure from Step 4. After completing the resetting operation, press (■) of machine monitor mode selector switch 1 twice or turn the starting switch OFF.



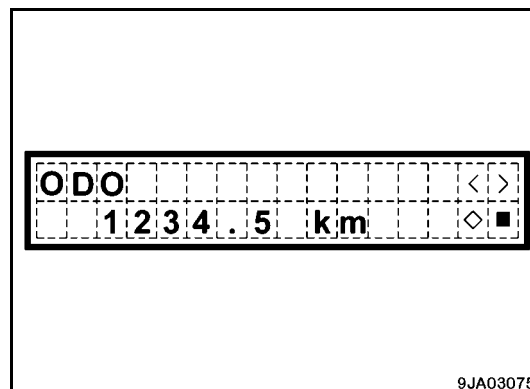
9ER01253A

Entering Telephone Number

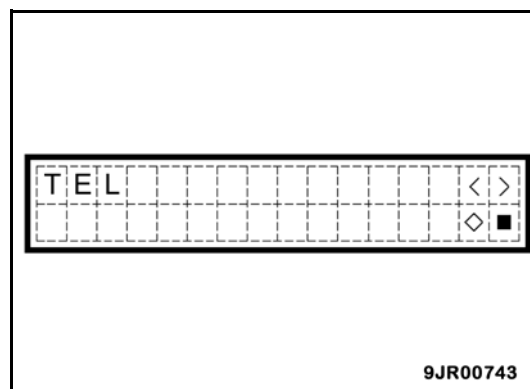
Use this function to input the telephone number.

It is possible to display the telephone number on the right side of “CALL” displayed on the character display when action code E03 is generated.

- Press (◊) of machine monitor mode selector switch 1 to display “ODO” (odometer).
- Press (>) or (<) of machine monitor mode selector switch 2 to display “TEL.”



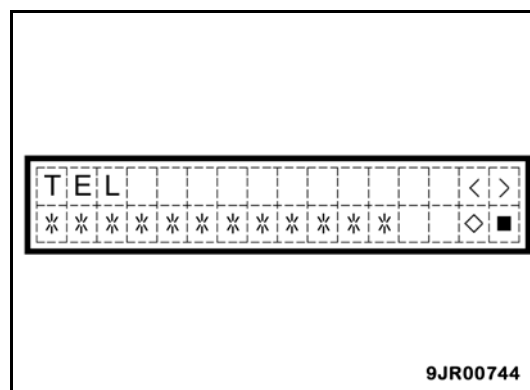
9JA03075



9JR00743

- Press (◊) of machine monitor mode selector switch 1. The screen switches to the display shown on the right.

Once the telephone number has been input, the number will always be displayed on the screen.



9JR00744

OPERATION

- The telephone number can be displayed up to 12 digits. Input in order starting from the first digit on the left.

The cursor is displayed at the input position.

Press (>) or (<) of machine monitor mode selector switch 2 to input "0 - 9." To leave a blank, input an asterisk (*).

After selecting the input value, press (◇) of machine monitor mode selector switch 1.

The input value is accepted and the cursor moves to the next digit.

- Repeat the procedure in Step 4 until the last digit has been input.
 - At the last digit, press the (◇) portion of the machine monitor mode selector switch 1. The input values are accepted and the screen returns to the previous screen.
 - If the wrong number is input or the input operation is to be aborted, press (■) of machine monitor mode selector switch 1. The screen returns to the previous screen.
- After completing the operation, press (■) of machine monitor mode selector switch 1 twice or turn the starting switch OFF.

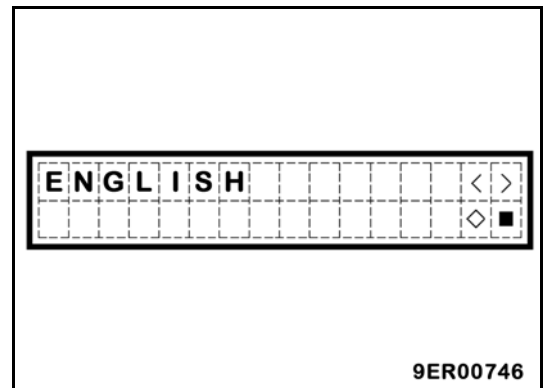
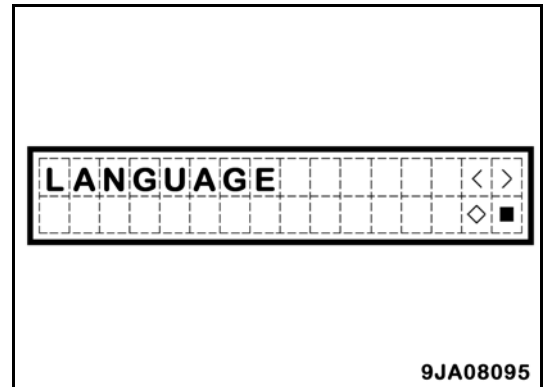
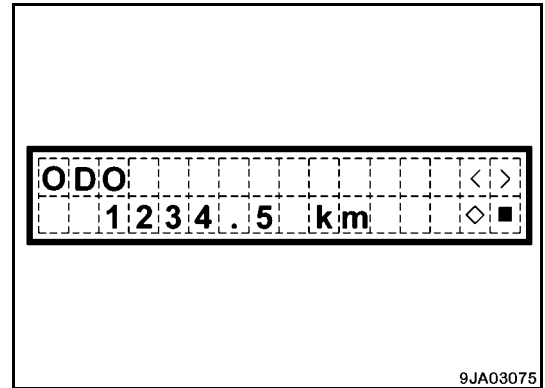
Selecting Language

Use this function to switch the language displayed on the character display.

Remark

The following explanation is for when English is set as the language for the character display.

- Press (◇) of machine monitor mode selector switch 1 to display "ODO" (odometer).
- Press (>) or (<) of machine monitor mode selector switch 2 to display "LANGUAGE."
- Press (◇) of machine monitor mode selector switch 1. The presently selected language is displayed.



- Press (>) or (<) of machine monitor mode selector switch 2 to select the desired language.

The available languages are English, Japanese, German, French, Italian, Spanish, and Swedish.

Language	Display
English	ENGLISH
Japanese	日本語
German	DEUTSCH
French	FRANCAIS
Italian	ITALIANO
Spanish	Español
Swedish	SVENSKA

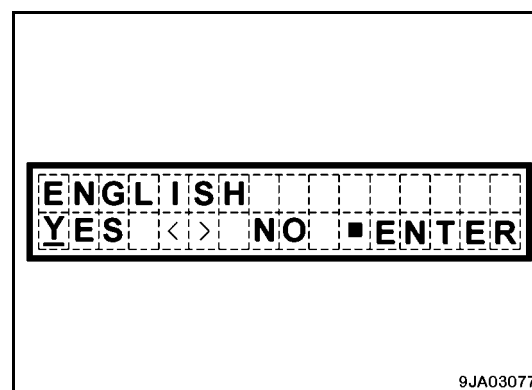
AJM00810

- After selecting the desired language, press (◇) of machine monitor mode selector switch 1.

To accept the selected language, set the cursor on YES and then press (■) of machine monitor mode selector switch 1. The language is set and the screen returns to the previous screen.

To abort the operation, set the cursor on NO and then press (■) of machine monitor mode selector switch 1.

- After completing the operation, press (■) of machine monitor mode selector switch 1 twice or turn the starting switch OFF.



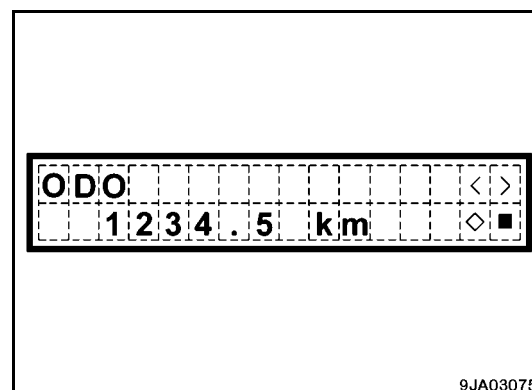
Adjusting Monitor Brightness

Use this function to adjust the brightness of the monitor.

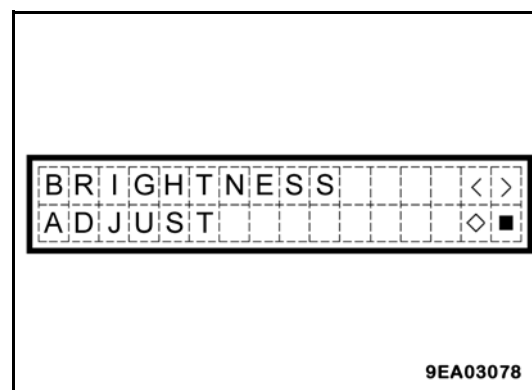
Remark

The starting switch must be ON and the headlights turned ON.

- Press (◇) of machine monitor mode selector switch 1 to display “ODO” (odometer).

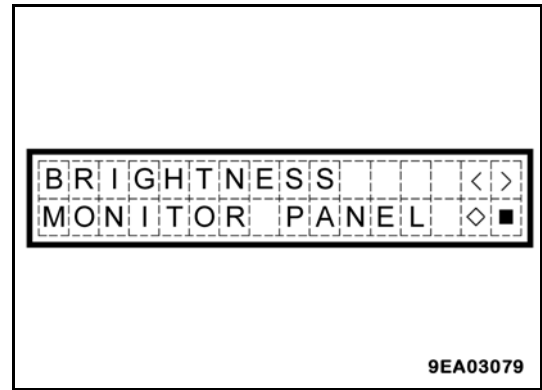


- Press (>) or (<) of machine monitor mode selector switch 2 to display “BRIGHTNESS ADJUST.”

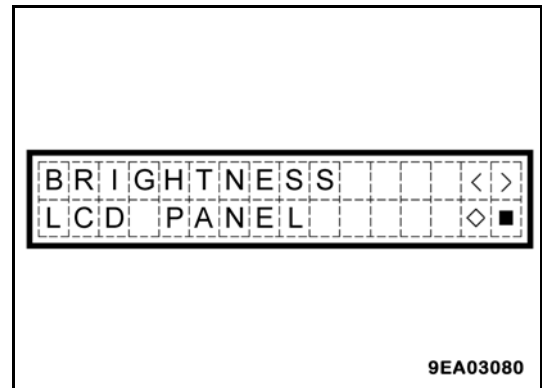


OPERATION

3. Press (◇) of machine monitor mode selector switch 1. “MONITOR PANEL” is displayed on the bottom line and it is now possible to adjust the monitor brightness (excluding the liquid crystal display).



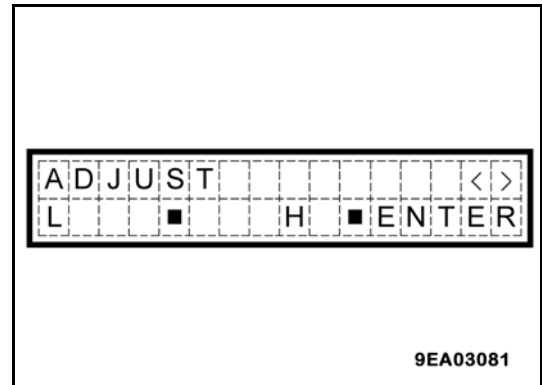
- ★ The brightness can be adjusted separately for the overall monitor (excluding the liquid crystal display) or for the liquid crystal display (LCD) only.
- ★ If you want to adjust only the liquid crystal display (LCD), press (>) or (<) of machine monitor mode selector switch 2 to switch to the “LCD PANEL” display.



4. Press (◇) of machine monitor mode selector switch 1. The screen switches to the display shown on the right and it is now possible to adjust the brightness.
5. Press (>) or (<) of machine monitor mode selector switch 2 to select a brightness level between L and H (seven levels available).
6. After selecting the desired brightness, press (■) of machine monitor mode selector switch 1.

The brightness is set and the screen returns to the previous screen.

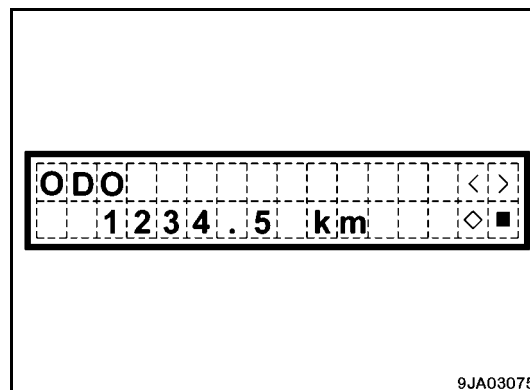
7. After completing the operation, press (■) of machine monitor mode selector switch 1 twice or turn the starting switch OFF.



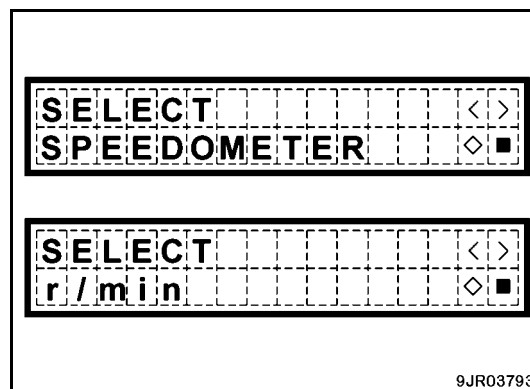
Switching Travel Speed/Engine Speed Display

Use this function to switch between the travel speed (km/h, mph) and the engine speed display.

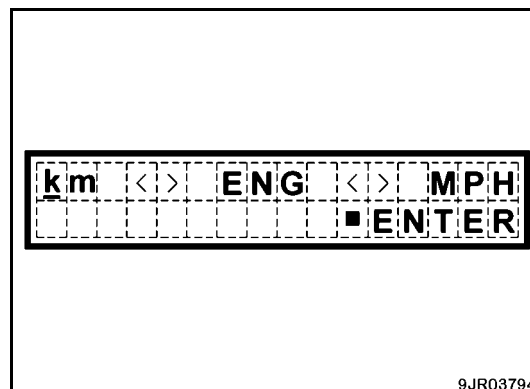
1. Press (◊) of machine monitor mode selector switch 1 to display "ODO" (odometer).



2. Press (>) or (<) of machine monitor mode selector switch 2 to display "SELECT SPEED" or "SELECT r/min."



3. Press (◊) of machine monitor mode selector switch 1.
The display changes and returns to the service meter display.

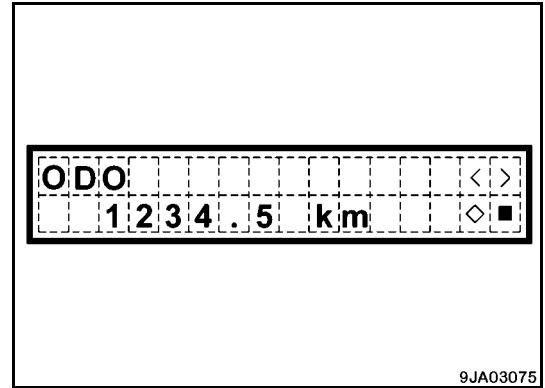


OPERATION

Switching Travel Speed/Engine Speed Display/Non-Display

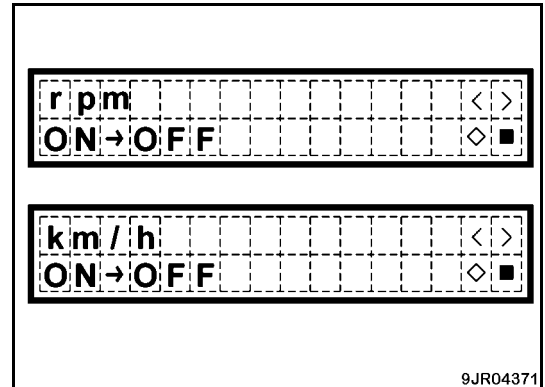
Use this function to display the travel speed or engine speed, or to have no display on the character display.

1. Press (◇) of machine monitor mode selector switch 1 to display “ODO” (odometer).



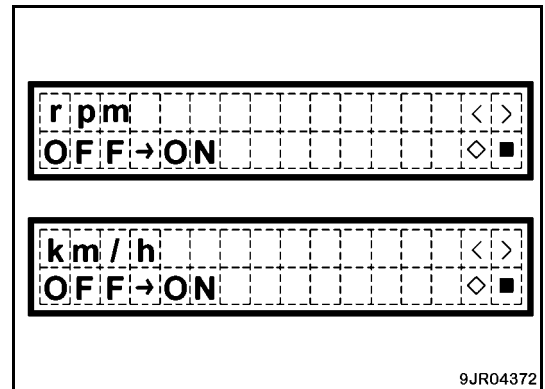
2. Press (>) or (<) of the machine monitor mode selector switch 2 to display “rpm ON → OFF” or “km/h ON → OFF.”

To set to no display for the travel speed or engine speed on the character display, display “rpm OFF → ON” or “km/h OFF → ON.”



3. Press (◇) of machine monitor mode selector switch 1.

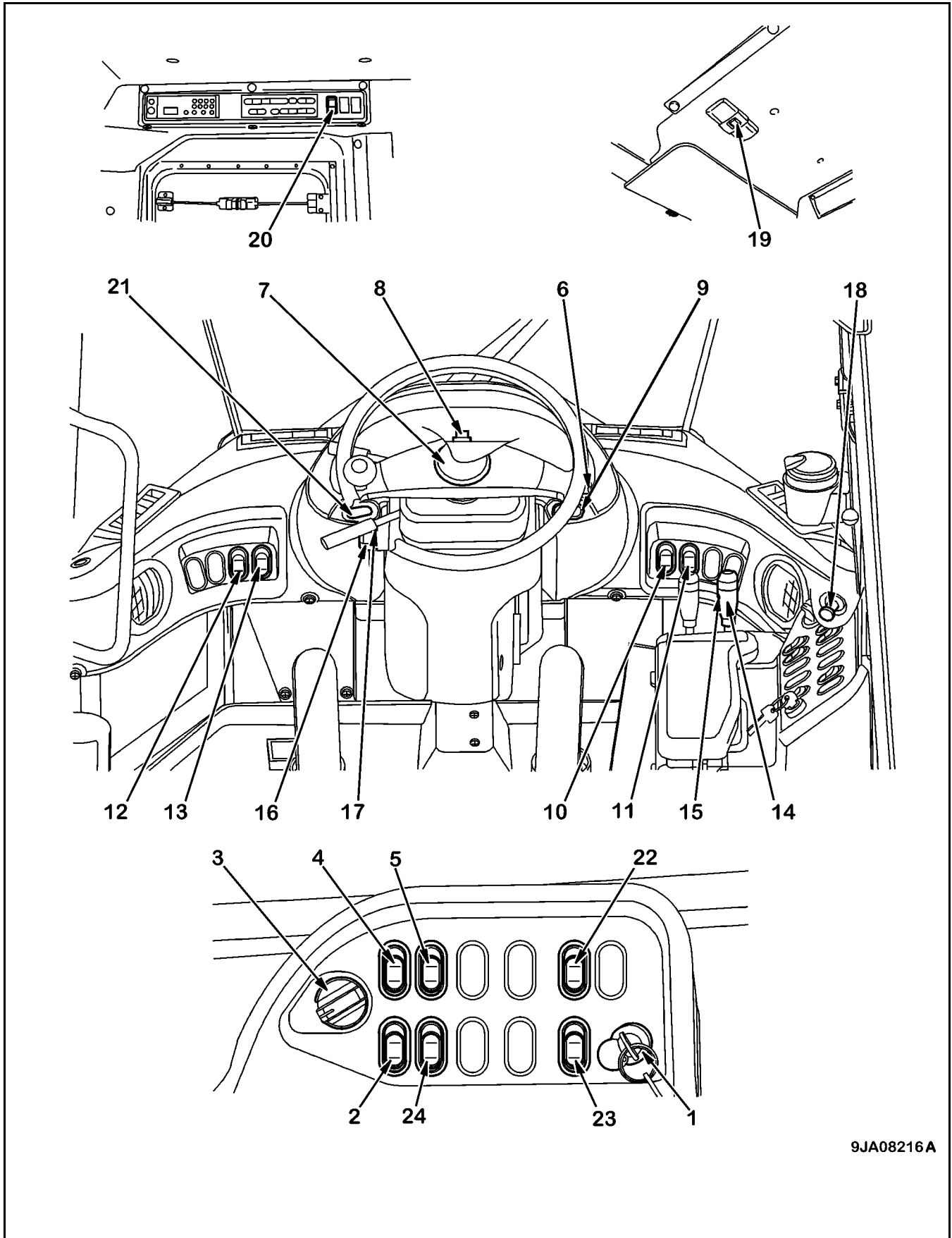
The item that was being displayed changes to non-display and the item that was not displayed is displayed. The screen returns to the service meter display.



MEMORANDUM

OPERATION

Switches



1. Starting switch
2. Power mode selector switch
3. Transmission shift mode selector switch
4. Transmission cutoff switch
5. Transmission cutoff set switch
6. Lamp switch
 - Turn signal lever
 - Dimmer switch
7. Horn button
8. Hazard lamp switch
9. Parking brake switch
10. Front working lamp switch
11. Rear working lamp switch
12. Machine monitor mode selector switch 1
13. Machine monitor mode selector switch 2
14. Kickdown switch
15. Hold switch
16. Front wiper switch
17. Rear wiper switch
18. Cigarette lighter
19. Room lamp switch
20. Rear heated-wire glass switch
21. ECSS * switch
22. Emergency steering switch (if equipped)
23. Cooling fan reverse rotation switch
24. Torque converter lockup switch (if equipped)

★ ECSS = Electronic Controlled Suspension System

OPERATION

Starting Switch

The starting switch (1) is used to start or stop the engine.

- (A): OFF position

The key can be inserted and removed at this position. All the electric system switches are turned off and the engine is stopped. In addition, the parking brake is automatically applied.

- (B): ON position

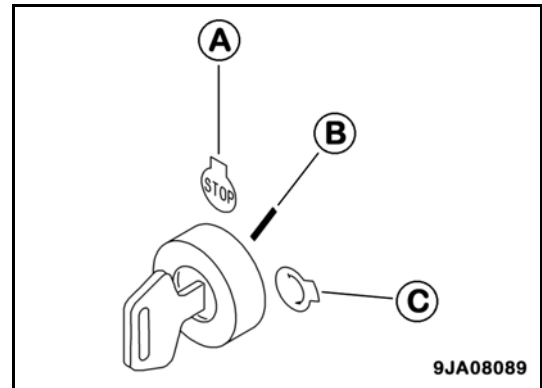
In this position, electric current flows to the charging and lamp circuits. Keep the starting switch key at the ON position while the engine is running.

If the ambient temperature is low when the engine is started, the preheating pilot lamp will light up automatically and preheating will start. The preheating time depends on the ambient temperature.

If the preheating pilot lamp lights up, wait for it to go out and then turn the key to the START position.

- (C): START position

This is the engine-start position. Keep the key at this position while cranking the engine. Immediately after starting the engine, release the key. The key will automatically return to the ON position.



Power Mode Selector Switch

The power mode selector switch (2) is used to switch the engine output to match the purpose of the operation.

- Position (a): E mode (engine output low)

Operations with emphasis on fuel economy, such as operations on level ground where a maximum output is not needed.

To carry out operations with effective fuel consumption, normally set to the E mode.

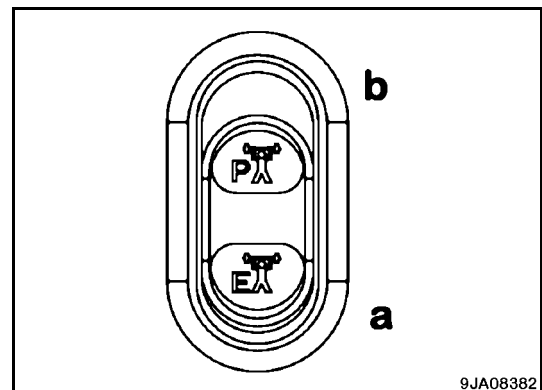
The maximum engine speed is set lower than in the P mode but, except for hard operations such as heavy-duty digging of rock, this mode provides ample power and good fuel consumption. You can also reduce fuel consumption by pressing the accelerator pedal lightly.

- Position (b): P mode (engine output high)

Operations with emphasis on productivity

When the P mode is selected, the power mode pilot lamp (P mode) on the machine monitor lights up.

Set to the P mode when carrying out heavy-duty digging operations of rock or operations where speed is required, or when traveling at high speed on flat ground or on slopes.



Transmission Shift Mode Selector Switch

The transmission shift mode selector switch (3) is used to change the shift point when the AUTO SHIFT/MANUAL selector switch has been switched to auto-shift.

At each of the L, H positions, the system switches to auto-shift and the auto-shift pilot lamp on the machine monitor lights up. Normally, set to auto-shift.

- **MANUAL position:**

System is set to manual shift and speed range is a position selected by gearshift lever.

- **L position:**

Travel speed when shifting up is low (flat ground, normal travel).

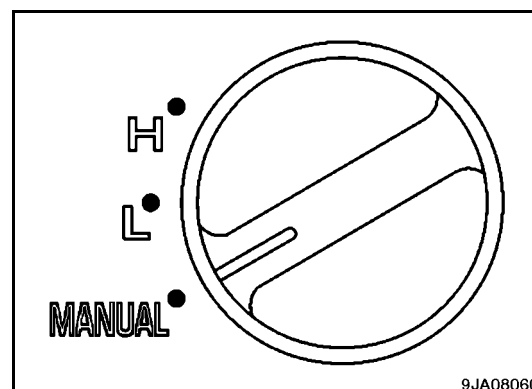
If it is set to the L position when the work is mainly operations on flat ground, it is possible to shift up when the engine speed is low. This is effective in reducing fuel consumption.

- **H position:**

Travel speed when shifting up is high (traveling uphill, traveling at high speed).

★ For details of the manual shift, see “Manual Shift” on page 2-59.

★ For details of the auto-shift, see “Automatic Shift” on page 2-59.



Transmission Cutoff Switch

! WARNING

- **When moving the machine off an uphill slope, set the transmission cutoff switch to the OFF position; depress the brake pedal; then gradually depress the accelerator pedal and release the brake slowly to allow the machine to start off.**
- **This prevents the machine from rolling backwards.**

The transmission cutoff switch (4) is used to turn the transmission cutoff system ON and OFF.

When the switch is pressed, the pilot lamp lights up and the system turns ON. The transmission is shifted to neutral at the adjusted brake pedal depression position.

★ Keep the switch at the ON position normally.

For details about adjusting the cutoff position, see “Adjusting Transmission Cutoff Position” on page 2-115.

- **Position (a): OFF**

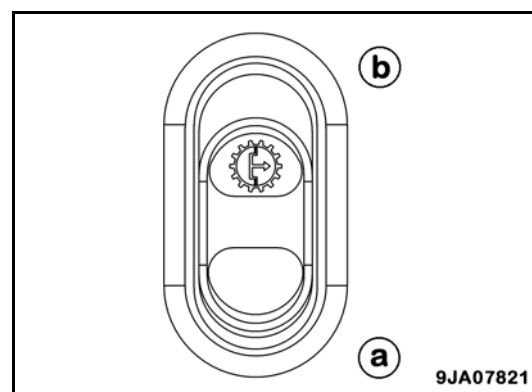
The brake pedal acts in the normal manner.

- **Position (b): ON**

Left brake pedal acts as normal brake but also switches the transmission to NEUTRAL.

Remark

The brake pedal position when the cutoff system is actuated can be adjusted by using the transmission cutoff set switch on the right switch panel.



OPERATION

Transmission Cutoff Set Switch

⚠ WARNING

Apply the parking brake before adjusting the transmission cutoff position.

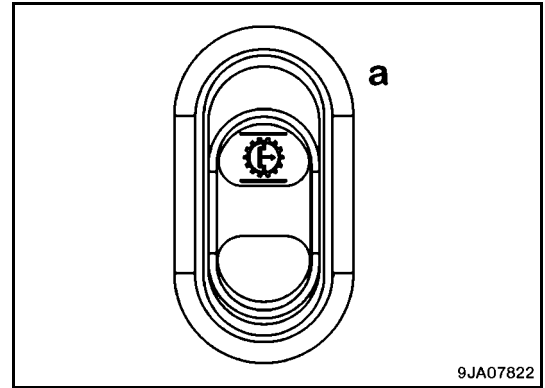
The transmission cutoff set switch (5) is used to adjust the brake pedal position where the transmission is automatically shifted to Neutral.

- Position (a): ON

Cutoff position can be adjusted.

When the switch is released, it automatically returns to its original position.

For instructions about adjusting the cutoff position, see “Adjusting Transmission Cutoff Position” on page 2-115.



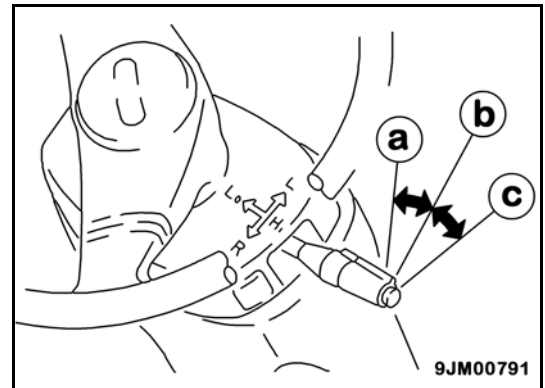
Lamp Switch

The lamp switch (6) is used to light up the front lamps, side clearance lamps, tail lamps, and instrument panel.

- Position (a): OFF
- Position (b): Side clearance lamps, tail lamps, and instrument panel light up.
- Position (c): Headlamps light up in addition to lamps at position (b).

Remark

The lamp switch can be operated regardless of the position of the lever.



Turn Signal Lever

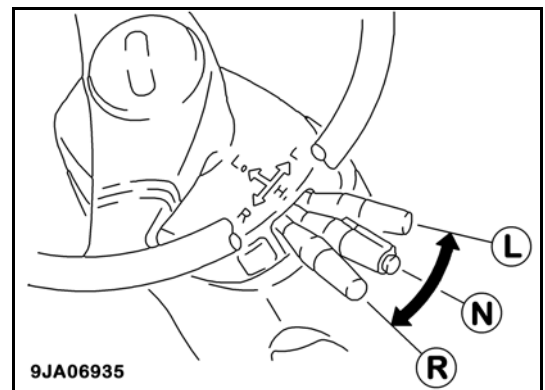
The turn signal lever (6) is used to operate the turn signal lamp.

- (L) position: LEFT TURN (Push lever FORWARD.)
- (N) position: OFF
- (R) position: RIGHT TURN (Pull lever BACK.)

Remark

When the lever is operated, the turn signal pilot lamp also flashes.

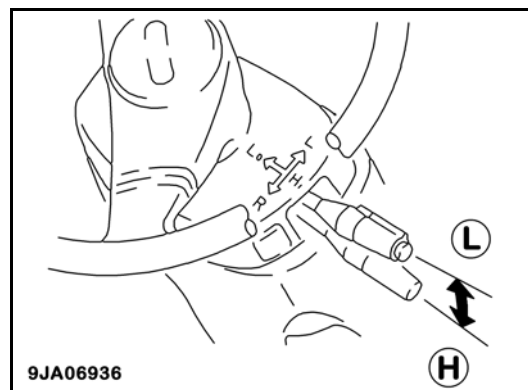
When the steering wheel is turned back, the lever automatically returns to its original position. If it does not return, return it manually.



Dimmer Switch

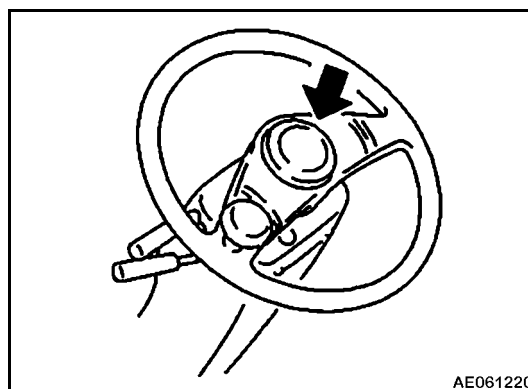
The dimmer switch (6) is used to switch the headlamps between high beam and low beam.

- Position (L): Low beam
- Position (H): High beam



Horn Button

The horn button (7), in the center of the steering wheel, is used to sound the horn.



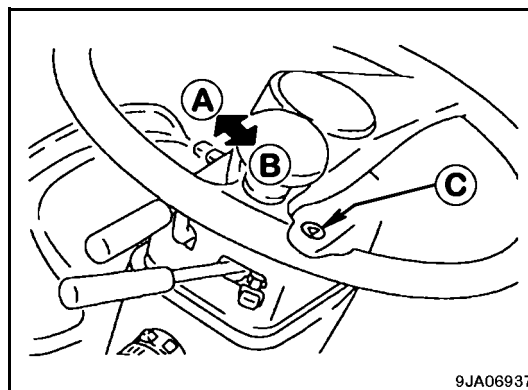
Hazard Lamp Switch

WARNING

- Use the hazard lamps only for emergencies.
- Using the hazard lamps when traveling will cause problems for other machine operators.

The hazard switch (8) is used in emergencies, such as when the machine breaks down and has to be parked on the road.

- Position (A): Turn signal lamp and turn signal pilot lamp flash, and pilot lamp (C) light up at the same time.
- Position (B): Lamps are OFF.



OPERATION

Parking Brake Switch

WARNING

- Always apply the parking brake when leaving or parking the machine.
- Even if the parking brake switch is turned ON, there is danger until the parking brake pilot lamp lights up. Keep the brake pedal depressed.

Remark

Never use the parking brake switch to apply the brakes when traveling, except in an emergency. Apply the parking brake only after the machine has stopped.

If the parking brake has been used as an emergency brake when traveling at high speed (near the maximum speed), contact your Komatsu distributor to have the parking brake checked for any abnormality.

The parking brake switch (9) is used to actuate the parking brake.

- Position (A): ON

The parking brake is applied and the parking brake pilot lamp lights up.

- Position (B): OFF

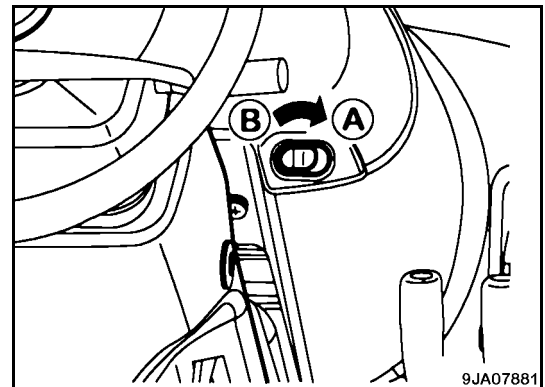
The parking brake is released.

Remark

If the directional lever is placed in F (FORWARD) or R (REVERSE) with the parking brake applied, the central warning lamp illuminates and the alarm buzzer sounds.

Before starting the engine, turn the parking brake switch ON.

When the parking brake is applied, the machine will not move off even if the directional lever is operated.



Front Working Lamp Switch

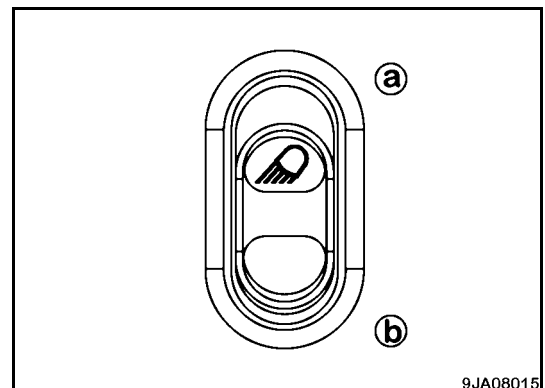
WARNING

Always turn the working lamp OFF before traveling on public roads.

The front working lamp switch (10) is used to light up the front working lamp.

- Position (a): Working lamp lights up.
- Position (b): Working lamp goes out.

If position (a) is pressed, the pilot lamp will light up and the working lamp circuit will be switched ON.



Rear Working Lamp Switch

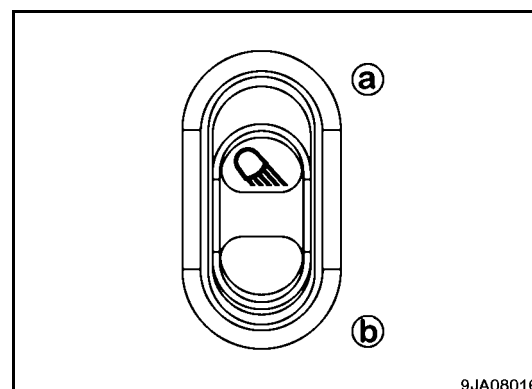
WARNING

Always turn the working lamp OFF before traveling on public roads.

The rear working lamp switch (11) is used to light up the rear working lamp.

- Position (a): Working lamp lights up.
- Position (b): Working lamp goes out.

If position (a) is pressed, the pilot lamp will light up and the working lamp circuit will be switched ON.

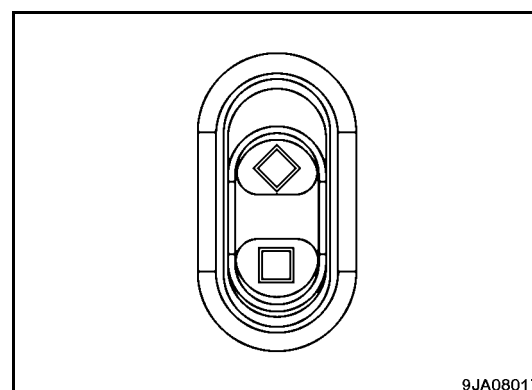


Machine Monitor Mode Selector Switch 1

The machine monitor mode selector switch 1 (12) is used to switch the function of the character display.

When the switch is released, it automatically returns to its original position.

- Position (◇): Press here to select (confirm) each mode or operation.
- Position (■): Press here to cancel each mode or operation.

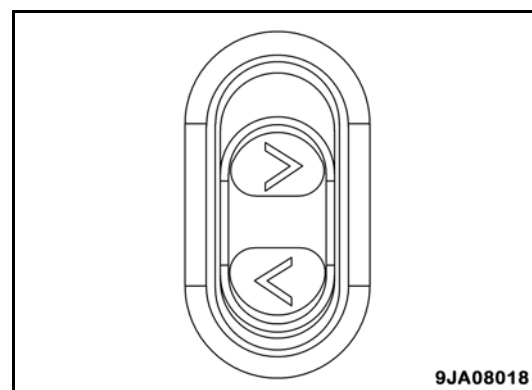


Machine Monitor Mode Selector Switch 2

The machine monitor mode selector switch 2 (13) is used to switch the function of the character display.

When the switch is released, it automatically returns to its original position.

- Position (>): Press here to move to the next screen, to move the cursor forward, or to increase the number when entering numerals.
- Position (<): Press here to return to the previous screen, to move the cursor back, or to reduce the number when entering numerals.



OPERATION

Kickdown Switch

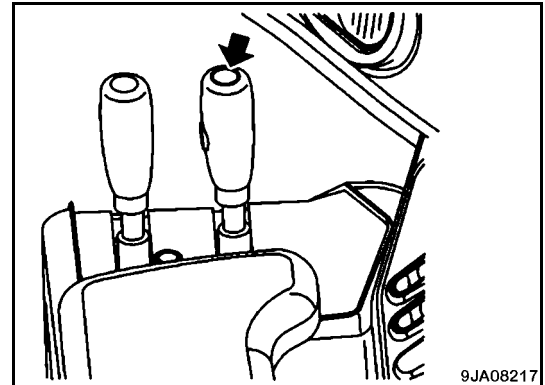
The kickdown switch (14) is used to shift the transmission down.

The switch is located at the head of the lift arm control lever. If the switch is pressed when the gearshift lever is at F2, the transmission shifts down one range.

- ★ Use this when you need to increase the drawbar pull in digging operations.

If switch (14) is pressed when the transmission shift range is in FORWARD 1st (F1) and the power mode selector switch is at E mode, it is possible to switch to P mode.

- ★ Use this function during scraping-up operations or during digging operations when you want to increase the lifting force.



When using E mode:

2nd → 1st → 1st
E mode → E mode → P mode

When using P mode:

2nd → 1st
P mode → P mode

If the transmission is in auto-shift and the travel speed is below 10.5 km/h (6.5 mph) in any speed range when traveling in either forward or in reverse, the kickdown switch is actuated and it is possible to shift down to 1st.

This makes it easy to carry out load and carry operations.

Even if the travel speed is more than 10.5 km/h (6.5 mph), the kickdown switch can be used to shift the transmission down. Each time the kickdown switch is pressed, the speed range shifts down one range at a time (F4 → F3 → F2).

Remark

When canceling the kickdown, operate the directional lever. In manual shift, the kickdown can be canceled by operating the gearshift lever to any position other than 2nd. It is also possible to cancel the kickdown by turning the starting switch OFF.

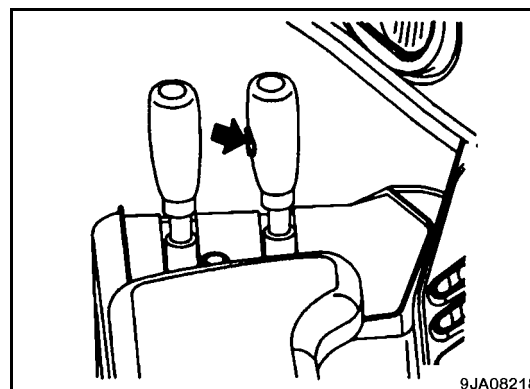
In auto-shift if the travel speed becomes high after the kickdown, the gear will be shifted up by the auto-shift.

In auto-shift when traveling at more than 18 km/h (11.2 mph) in 3rd or at more than 28 km/h (17.4 mph) in 4th, the transmission will not shift down even if the kickdown switch is pressed. This is to prevent overrun of the engine.

Hold Switch

The hold switch (15) is used to fix the speed range when traveling while using the automatic transmission.

Press the switch at the side of the lift arm control lever knob.

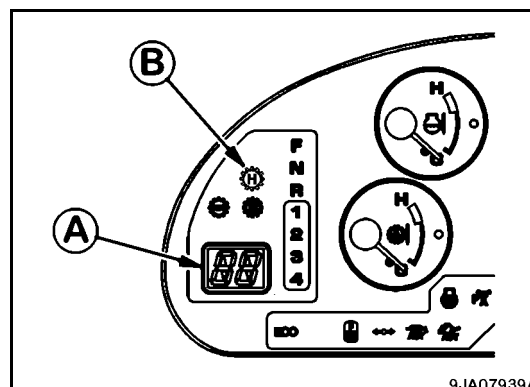


The transmission will be fixed in the speed range displayed on the shift indicator (A) and the shift HOLD pilot lamp (B) illuminates. When the switch is pressed again, the display goes out.

Use this function to select the desired speed range when traveling uphill or downhill, or when carrying out operations such as grading.

Remark

When canceling the shift hold, operate the directional lever or gearshift lever or operate the transmission shift mode selector switch to MANUAL. It is also possible to cancel the hold shift by turning the starting switch OFF.



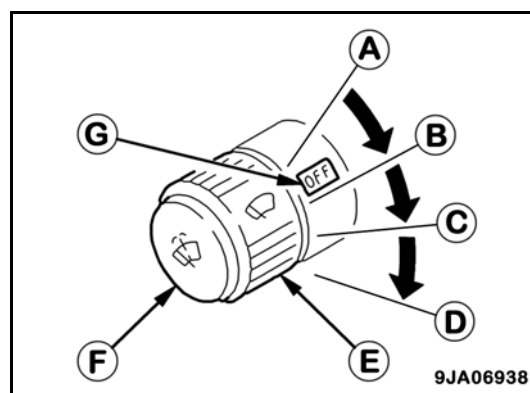
Front Wiper Switch

Turn rotary switch (E) of the front wiper switch (16) to operate the front wiper.

Press pushbutton (F) to spray washer fluid onto the front glass.

It is possible to check the position of the switch in display window (G).

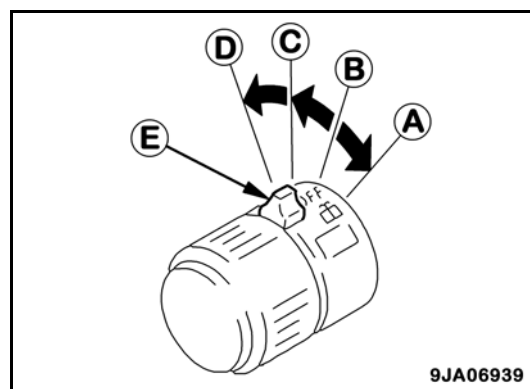
- Position (A): (OFF) Stop
- Position (B): (INT) Intermittent wiper
- Position (C): Low-speed wiper
- Position (D): High-speed wiper



Rear Wiper Switch

Turn lever (E) on the rear wiper switch (17) to operate the rear wiper.

- Position (A): Washer liquid is sprayed out.
- Position (B): OFF
- Position (C): Wiper is operated.
- Position (D): Washer fluid is sprayed out; wiper is operated.

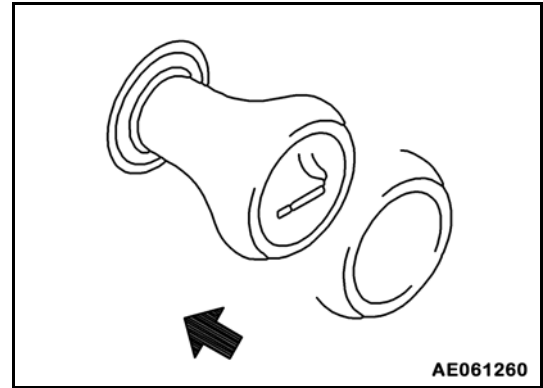


OPERATION

Cigarette Lighter

The cigarette lighter (18) is used to light cigarettes.

If the cigarette lighter is pushed in, it returns to its original position after several seconds. When it returns, pull it out and light the cigarette.



Room Lamp Switch

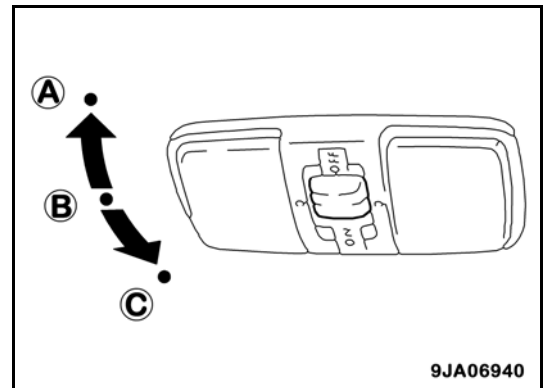
The room lamp switch (19) lights up the room lamp.

- Position (A): OFF
- Position (B): Lights up when cab door is opened.
- Position (C): Lights up.

Remark

The room lamp lights up even when the main switch is OFF. When leaving the operator's compartment, turn the switch to position (A) or (B).

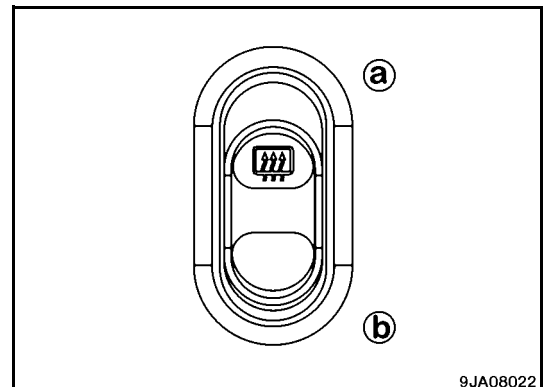
When operating with the cab door fully open, set the switch to position (A).



Rear Heated-Wire Glass Switch

When the rear heated-wire glass switch (20) is pressed, electric current flows through the heated-wire glass at the rear and the mist is removed from the glass.

- Position (a): ON
Removes mist from glass.
- Position (b): OFF



Electronic Controlled Suspension System Switch (ECSS)

⚠ WARNING

- If the machine is traveling or the work equipment is raised, the work equipment will move the moment the ECSS switch is turned ON.
- If operations are carried out with the ECSS switch at the ON position, the work equipment may move the moment the ECSS switch is operated.
- Never turn the ECSS switch ON during inspection or maintenance. The work equipment will move and create a dangerous situation.

The ECSS is a device that uses the hydraulic spring effect of an accumulator to absorb the vibration of the chassis during travel, allowing the machine to travel smoothly and at high speed.

Remark

Always stop the machine and lower the work equipment to the ground before operating the ECSS switch.

When carrying out inspection and maintenance, first lower the work equipment to the ground, then turn the ECSS switch OFF before starting the inspection and maintenance operation.

When carrying out leveling work, turn the ECSS switch OFF.

The ECSS switch (21) is used to turn the ECSS ON and OFF.

- Position (a): ON

The pilot lamp lights up and the ECSS is actuated.

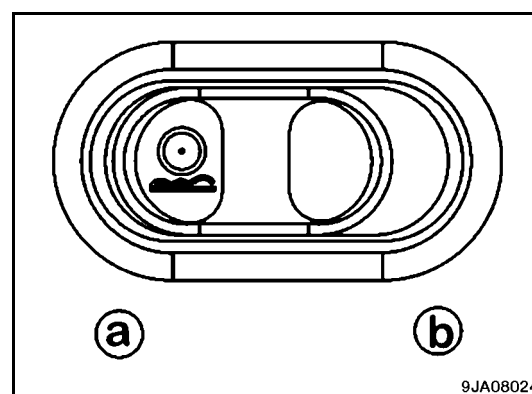
- Position (b): OFF

The ECSS is not actuated.

Remark

When traveling in 1st, the ECSS is not actuated.

When the speed range is 2nd to 4th, and the travel speed is more than 5 km/h (3.1 mph), the ECSS is automatically actuated; when the travel speed goes below 3 km/h (1.9 mph), it is automatically disengaged.



Emergency Steering Switch

(If equipped)

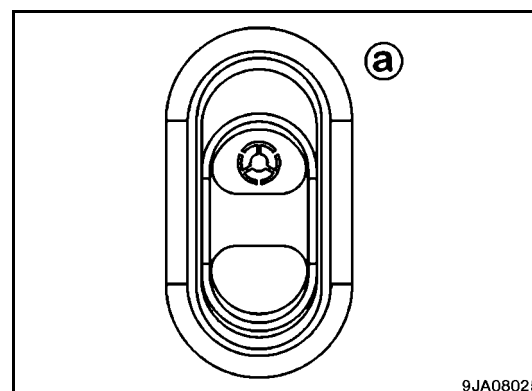
The emergency steering switch (22) is the manual control switch for the emergency steering. Even when the engine has stopped, steering operations are possible by pressing this switch.

- Position (a): ON

The pilot lamp inside the switch and the emergency steering pilot lamp on the machine monitor light up and it becomes possible to operate the steering. When the switch is released, it automatically returns to its original position.

Actuate the emergency steering only in cases of emergency or when checking the function. The time for operating the emergency steering continuously is a maximum of 60 seconds.

- ★ When using the emergency steering, travel at a speed of less than 5 km/h (3.1 mph). For details, see “Emergency Steering (if equipped)” on page 2-117.



OPERATION

Cooling Fan Reverse Rotation Switch

The cooling fan reverse rotation switch (23) is used to rotate the cooling fan in the reverse direction when cleaning the radiator. For details about the cleaning procedure, see “Clean Radiator Fins and Oil Cooler Fins” on page 3-38.

- Position (a): Manual reverse rotation switch ON

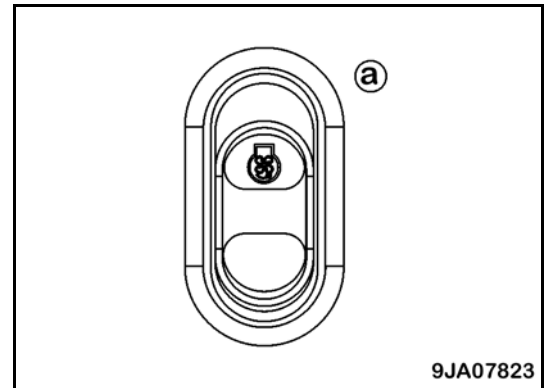
If the switch is pressed once when the fan is rotating in the normal direction, the fan will rotate in reverse; if the switch is pressed again, the fan will rotate in the normal direction.

When the fan is rotating in the reverse direction, the cooling fan reverse rotation pilot lamp on the machine monitor lights up.

- ★ Run the engine at idling when operating the switch.

Remark

When the direction of rotation of the fan switches, the reverse rotation pilot lamp flashes.



Cooling Fan Auto-Reverse Rotation Switch

(If equipped)

The cooling fan auto-reverse rotation switch (23) is used to rotate the cooling fan in the reverse direction when cleaning the radiator. For details about the radiator cleaning procedure, see “Clean Radiator Fins and Oil Cooler Fins” on page 3-38.

- Position (a): Auto-reverse rotation function ON

The fan automatically rotates in reverse for two minutes every two hours.

The pilot lamp inside the switch and the cooling fan reverse rotation pilot lamp on the machine monitor light up.

- Position (b): Manual reverse rotation switch ON

If the switch is pressed once when the fan is rotating in the normal direction, the fan will rotate in reverse; if the switch is pressed again, the fan will rotate in the normal direction.

When the fan is rotating in the reverse direction, the cooling fan reverse rotation pilot lamp on the machine monitor lights up. Reverse rotation continues for approximately 10 minutes after the switch is pressed.

- Position (c): Neutral (OFF)

The cooling fan is constantly set to normal rotation.

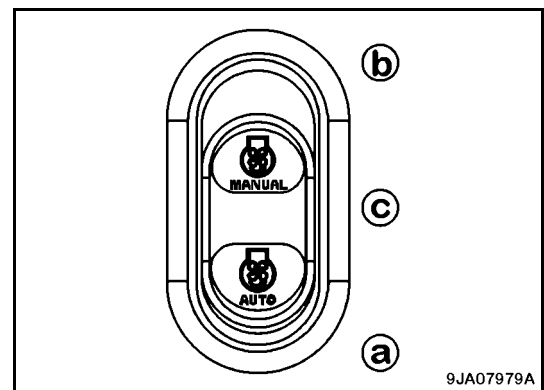
- ★ Run the engine at idling when operating the switch.

Remark

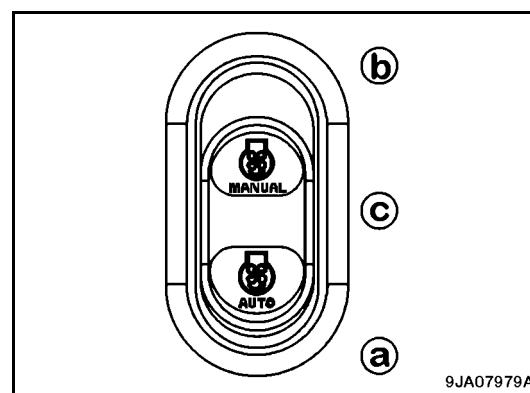
When the fan rotation direction is switched, the reverse rotation pilot lamp flashes.

To protect the machine, the fan rotation direction does not change when the fan is operating under high load or in low temperatures. (For details, see “Conditions for Switching Fan Rotation” on page 2-55.)

When the engine is stopped, the fan rotation direction returns to the normal direction.



- If the switch is set to position (b) (manual reverse rotation ON), the switch will return to position (c) (Neutral) when the switch is released.
- Even if the switch is not kept pressed at position (b), the fan will rotate in the reverse direction for a fixed time; there is no need to keep the switch pressed at position (b).
- If the engine cooling water, hydraulic oil, or torque converter oil overheat (the caution lamp for the oil temperature gauge on the machine monitor lights up) during reverse rotation of the fan, the reverse rotation of the fan is forcibly stopped and the fan switches to rotation in the normal direction.
- It is possible to adjust the following automatic reverse rotation functions:
 - Cycle fan automatic reverse rotation (Standard: 2 hours)
 - Continuous time fan automatic reverse rotation (Standard: 2 minutes)
 - Ask your Komatsu distributor to carry out the adjustment.



Conditions for Switching Fan Rotation

You can switch from normal rotation to reverse rotation manually or automatically.

Using Manual Reverse Rotation Function

You can switch from normal rotation to reverse rotation and from reverse rotation to normal rotation.

Switching from Normal Rotation to Reverse Rotation

The fan will switch from normal rotation to reverse rotation only if **all** the following conditions are fulfilled. If **all** the conditions are not fulfilled, the fan direction will not change.

Conditions:

- Portion (b) of the cooling fan automatic reverse rotation switch is pressed once.
- The engine speed is between Lo and 1200 rpm.
- The engine water temperature is less than 90°C (194°F). (The indicator on the engine water temperature gauge is below horizontal.)
- The hydraulic oil temperature is less than 90°C (194°F). (The indicator on the hydraulic oil temperature gauge is below horizontal.)
- The torque converter oil temperature is below 100°C (212°F). (The indicator on the torque converter oil temperature gauge is below horizontal.)
- At least 30 seconds have passed since the engine was started.
- If the direction is switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change from flashing and will remain illuminated.
- If the direction is not switched, the cooling fan reverse rotation pilot lamp on the machine monitor will continue to flash.

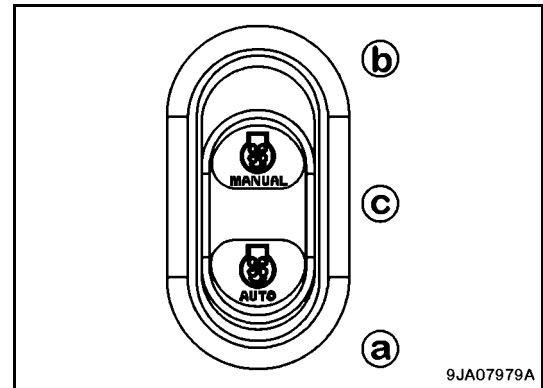
OPERATION

Switching from Reverse Rotation to Normal Rotation

The fan will switch from reverse rotation to normal rotation if **any** of the following conditions are fulfilled. If **none** of the conditions are fulfilled, the fan direction will not change.

Conditions:

- More than 10 minutes have passed after the fan started to rotate in reverse and the engine speed has dropped to less than 1200 rpm.
- When portion (b) of the cooling fan automatic reverse rotation switch is pressed again when the fan is rotating in reverse, and the engine speed has dropped to less than 1200 rpm.
- If the direction is switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change in this manner: Lighted up → flashing → OFF.
- If the direction is not switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change from being illuminated to flashing and will continue to flash.



Using Automatic Reverse Rotation Function

The fan automatically switches from normal rotation to reverse rotation and from reverse rotation to normal rotation.

Switching from Normal Rotation to Reverse Rotation

The fan will switch from normal rotation to reverse rotation only if **all** the following conditions are fulfilled. If **all** the conditions are not fulfilled, the fan direction will not change.

Conditions:

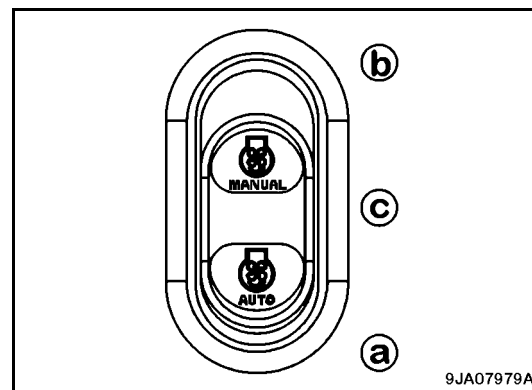
- The cooling fan automatic reverse rotation switch is at position (a).
- The engine water temperature is less than 90°C (194°F). (The indicator on the engine water temperature gauge is below horizontal.)
- The hydraulic oil temperature is less than 90°C (194°F). (The indicator on the hydraulic oil temperature gauge is below horizontal.)
- The torque converter oil temperature is below 100°C (212°F). (The indicator on the torque converter oil temperature gauge is below horizontal.)
- At least 30 seconds have passed since the engine was started.
- The set time for switching has passed.
- If the direction is switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change from flashing and will stay illuminated.
- If the direction is not switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change from OFF to flashing and will continue to flash.

Switching from Reverse Rotation to Normal Rotation

The fan will switch from reverse rotation to normal rotation if **both** of the following conditions are fulfilled. If **neither** of the conditions are fulfilled, the fan direction will not change.

Conditions:

- When the cooling fan automatic reverse rotation switch is set to any position other than portion (a) when the fan is rotating in reverse, and the hydraulic oil temperature has gone above 50°C (122°F) (the indicator on the hydraulic oil temperature gauge is in the green range).
- When the continuous time for fan automatic reverse rotation has passed and the hydraulic oil temperature has gone above 50°C (122°F) (the indicator on the hydraulic oil temperature gauge is in the green range).
- If the direction is switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change in this manner: Lighted up → flashing → OFF.
- If the direction is not switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change from being illuminated to flashing and will continue to flash.

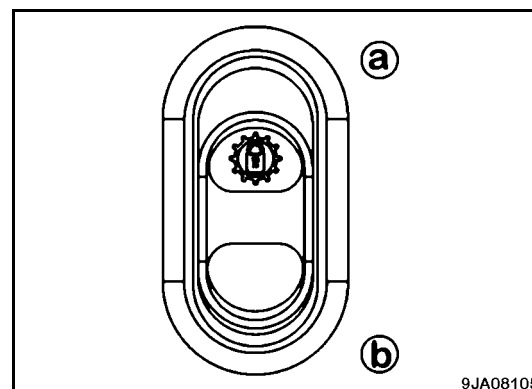


Torque Converter Lockup Switch

(If equipped)

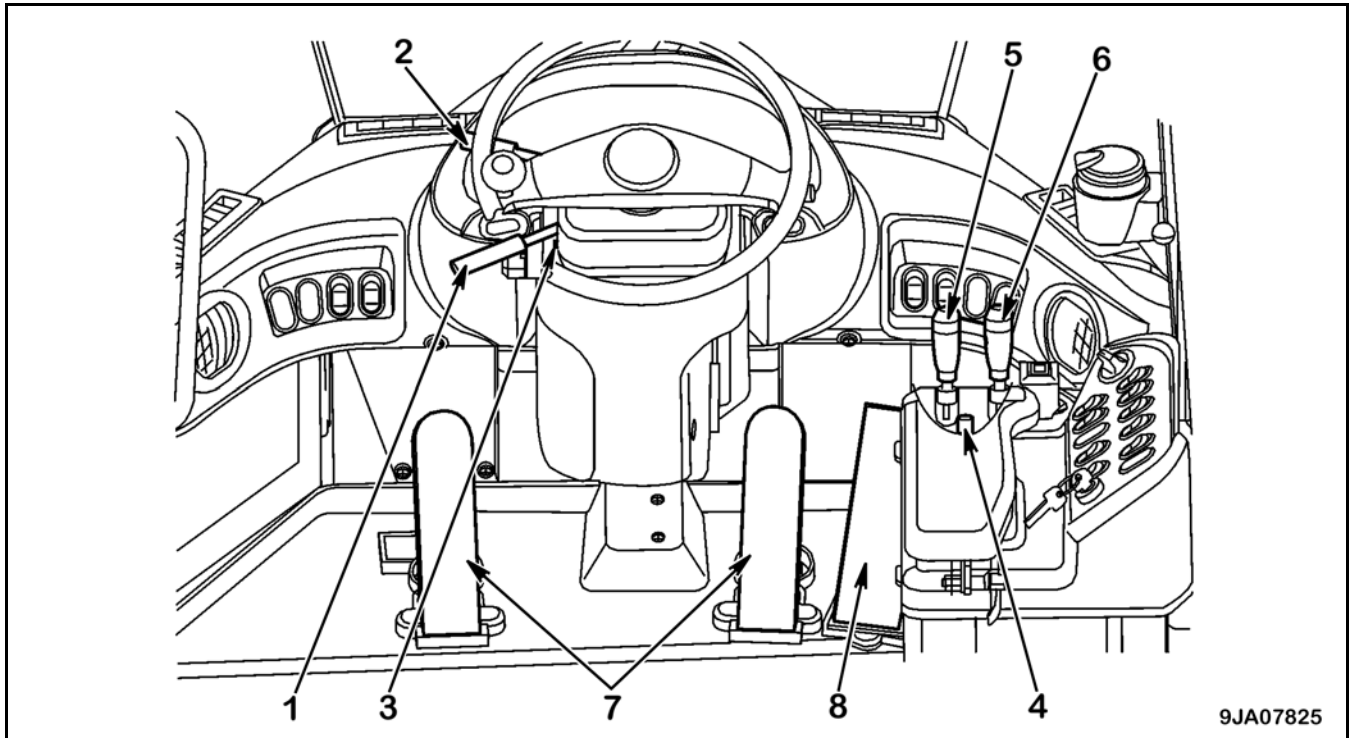
The torque converter lockup switch (24) controls the torque converter lockup function.

- ★ For details about the torque converter lockup, see “TORQUE CONVERTER LOCKUP” on page 5-3.



OPERATION

Control Levers, Pedals



1. Gearshift lever
2. Directional lever
3. Gearshift lever stopper
4. Work equipment lock lever
5. Bucket control lever
6. Lift arm control lever
7. Brake pedals
8. Accelerator pedal

Gearshift Lever

The gearshift lever (1) changes the speed range of the transmission.

Manual Shift

This machine has a 4-FORWARD, 4-REVERSE speed transmission.

Place the gearshift lever in a suitable position to obtain the desired speed range.

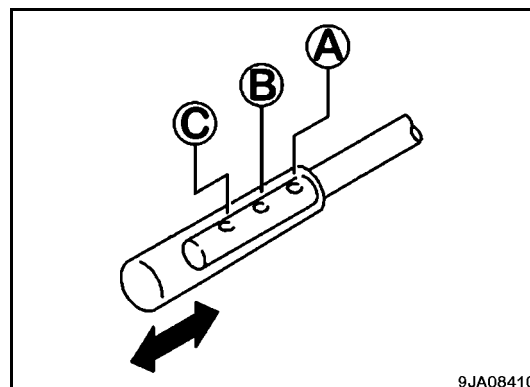
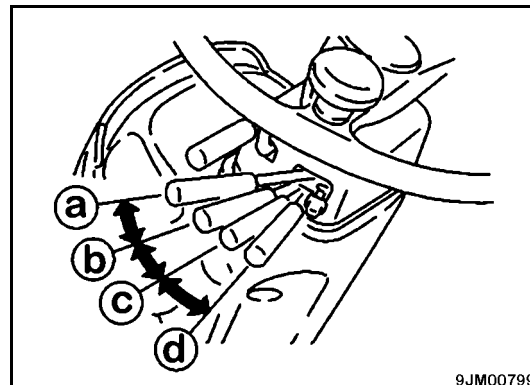
- 1st and 2nd speeds are used for working.
- 3rd and 4th speeds are used for traveling.

When the gearshift lever stopper is used, it is impossible to shift to 3rd or 4th. Disengage the gearshift lever stopper before trying to shift gears.

- Position (a): 1st
- Position (b): 2nd
- Position (c): 3rd
- Position (d): 4th

Remark

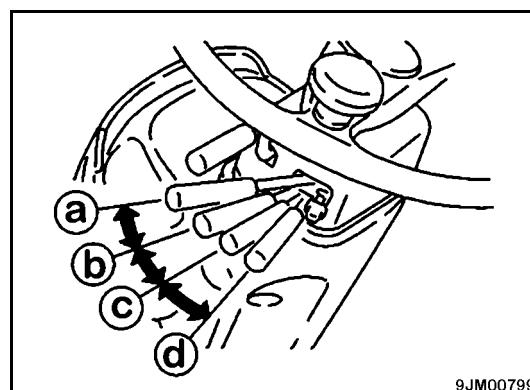
The length of the lever can be adjusted to three stages (positions (A), (B), or (C)). Contact your Komatsu distributor to adjust the length of the lever. (The lever is installed to position (B) when shipped from the factory.)



Automatic Shift

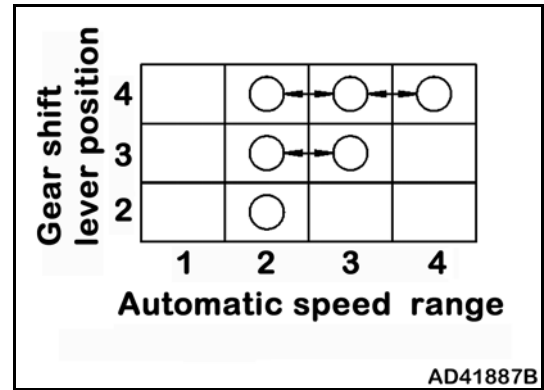
Automatic gearshifting can be carried out in 2nd, 3rd, or 4th speed range of the four forward and reverse speeds, depending on the travel conditions.

- Position (a): 1st
- Position (b): 2nd
- Position (c): 3rd
- Position (d): 4th



OPERATION

The range of speeds during automatic gearshifting is determined by the position of the gearshift lever as shown in the chart on the right.



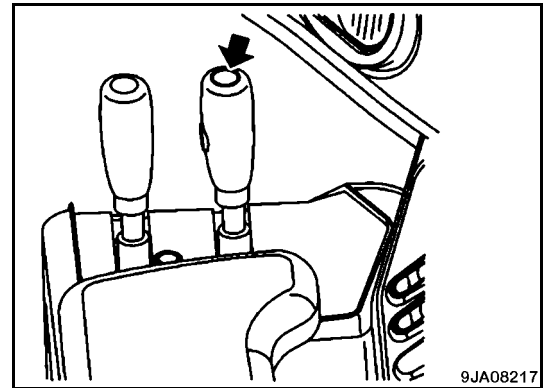
Remark

The first position for the gearshift lever fixes the transmission in 1st. There is no automatic shifting of the transmission.

When shifting down from 2nd to 1st, press the kickdown switch on the lift arm control lever.

If the transmission is in auto-shift and the travel speed is below 10.5 km/h (6.5 mph) in any speed range when traveling in either forward or reverse, the kickdown switch is actuated and makes it possible to shift down to 1st. This makes it easy to carry out load-and-carry operations.

Even if the travel speed is more than 10.5 km/h (6.5 mph), this switch can be used to shift the transmission down. Each time the kick-down switch is pressed, the speed range shifts down one range at a time (when in 4th: F4 → F3 → F2, when in 3rd: F3 → F2).



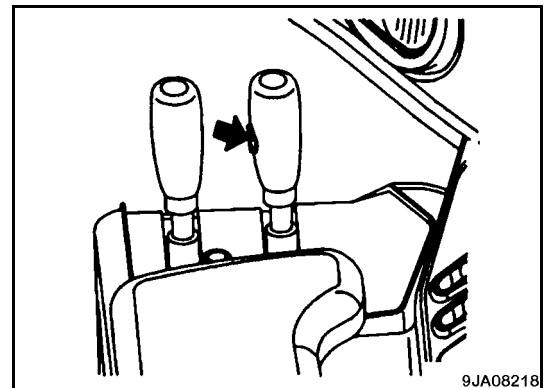
To set the desired speed range when traveling uphill or downhill, or when carrying out grading, do as follows.

- When fixing the speed range:

Press the HOLD switch on the lift arm control lever. The speed range is fixed at the speed range displayed on the transmission indicator on the machine monitor.

- When shifting up or down from set speed range:

Shift gear with the gearshift lever.



Remark

When the transmission has been shifted down from 2nd to 1st with the kickdown switch, it will shift up from 1st to 2nd when the travel speed increases.

Directional Lever

The directional lever (2) is used to change the direction of travel of the machine between forward and reverse.

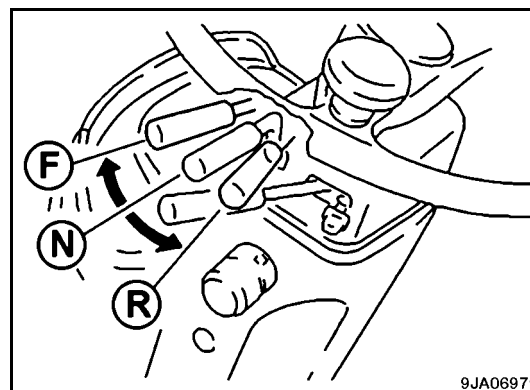
If the directional lever is not at the N position when starting the engine, the engine does not start. In this case, the central warning lamp will light up and the buzzer will sound.

Return the gearshift lever to the N position and start the engine.

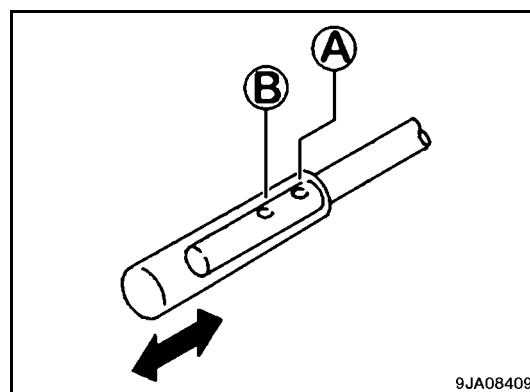
- Position (F): Forward
- Position (N): Neutral
- Position (R): Reverse

Remark

The length of the lever can be adjusted to two stages (positions (A), (B)). Contact your Komatsu distributor to adjust the length of the lever. (The lever is installed to position (A) when shipped from the factory.)



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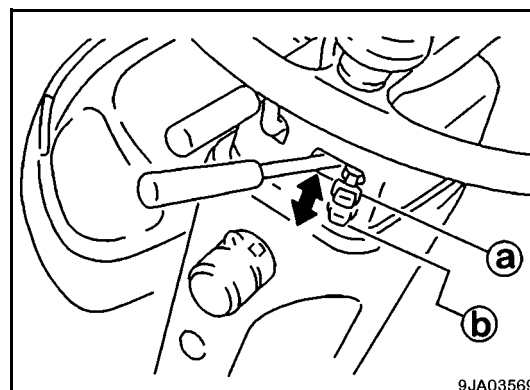


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Gearshift Lever Stopper

The gearshift lever stopper (3) prevents the gearshift lever from entering the 3rd or 4th position when working.

- Position (a): Stopper actuated.
- Position (b): Stopper released.



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OPERATION

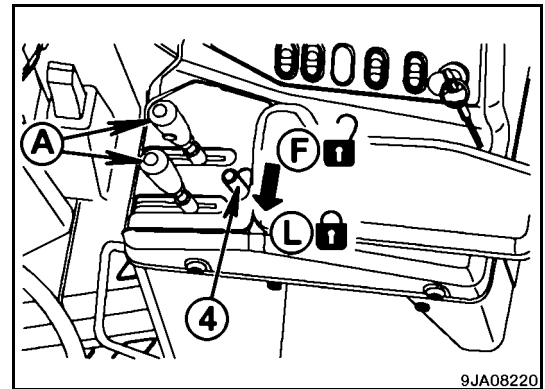
Work Equipment Lock Lever

⚠ WARNING

- Before leaving the operator's seat, set the work equipment lock lever securely to the LOCK position. If the work equipment lock lever is not at the LOCK position and the work equipment control lever (A) is touched by mistake, this may lead to a serious accident. Check that the lever is in the position shown in the diagram.
- When operating the work equipment lock lever, check that work equipment control lever (A) is at the HOLD position.
- When operating the work equipment lock lever, be careful not to touch work equipment control lever (A).

The work equipment lock lever (4) is used to lock the work equipment control levers and prevent operation of the work equipment.

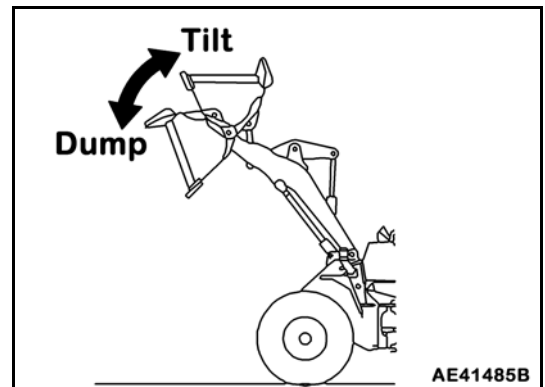
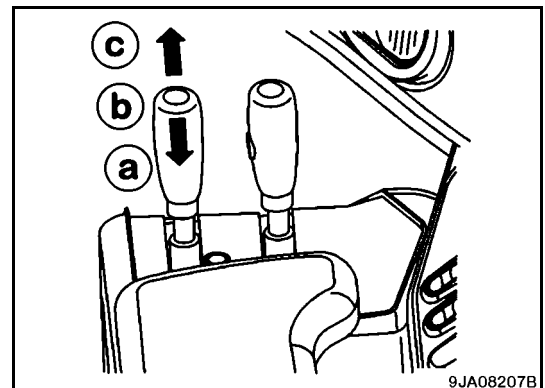
Pull the work equipment lock lever towards the center of the machine to set it to LOCK position (L).



Bucket Control Lever

The bucket control lever (5) operates the bucket.

- Position (a): TILT
When the bucket control lever is pulled further from the TILT position, the lever is stopped in this position until the bucket reaches the preset position of the positioner, and the lever is returned to the HOLD position.
- Position (b): HOLD
The bucket is kept in the same position.
- Position (c): DUMP



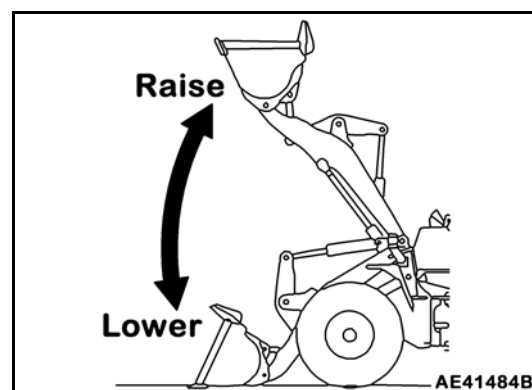
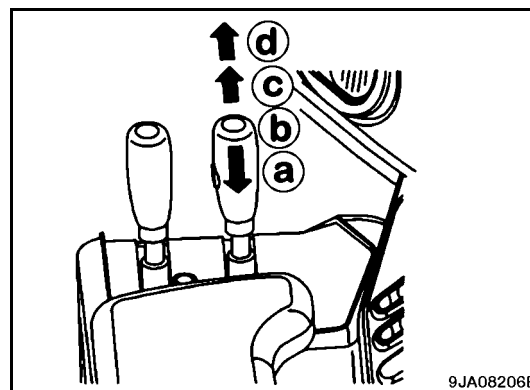
Lift Arm Control Lever

The lift arm control lever (6) is used to operate the lift arm.

- Position (a): RAISE
When the lift arm control lever is pulled further from the RAISE position, the lever stops at this position until the lift arm reaches the preset position of the kickout, and the lever is returned to the HOLD position.
- Position (b): HOLD
The lift arm is kept in the same position.
- Position (c): LOWER
- Position (d): FLOAT
The lift arm moves freely under external force.

Remark

Do not use the FLOAT position when lowering the bucket. Use the FLOAT position when leveling, see "Leveling Operations" on page 2-124.



OPERATION

Brake Pedals

⚠ WARNING

- When traveling downhill, always use the right brake pedal. Use the braking force of the engine together with the brake.
- Do not use the brake pedal repeatedly more than necessary. If the brake is used too frequently, the brake will overheat.
If this happens, the brakes will not work and may lead to a serious accident.
- Do not put your foot on the brake pedal unless necessary.

The brake pedals (7) operate the brakes.

Right Brake Pedal

The right brake pedal operates the wheel brakes.

Use the right brake pedal for normal braking operations.

Left Brake Pedal

The left brake pedal operates the wheel brakes.

When the transmission cutoff switch is in the ON position and the left brake pedal is depressed, wheel brakes are applied and the transmission is set to the neutral position at the same time.

If the transmission cutoff switch is at the OFF position, the left brake pedal acts in the same manner as the right brake pedal.

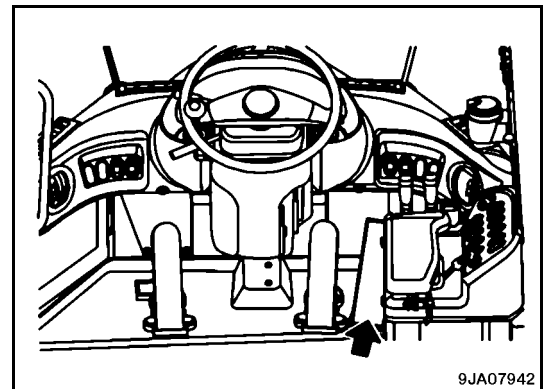
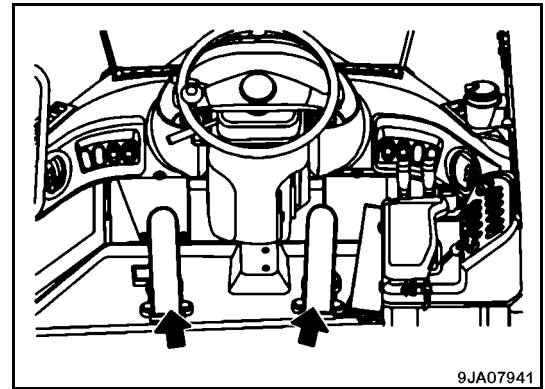
Remark

When using the brake and accelerator together to reduce the machine travel speed or to stop the machine while carrying out operations, set the transmission cutoff switch to the ON position and use the brake pedal.

Accelerator Pedal

The accelerator pedal (8) controls the engine speed and output.

The engine speed can be freely controlled between low idling and full speed.



SECURITY LOCKS AND SAFETY FEATURES

This machine is equipped with several security locks and safety features designed to protect the operator, persons performing service, repair, or inspections on the machine, as well as the general public when the machine is not in use and unattended. It is important for the operator of the machine to know where these features are located and when to use them.

Failure to do so may result in damage to the machine or injury to personnel.

Steering Column Tilt Lever

WARNING

Stop the machine before adjusting the tilt of the steering wheel. If this operation (adjustment) is carried out while the machine is moving, it may lead to a serious accident or personal injury.

The steering column tilt lever is used to hold the steering wheel in position.

- (F) FREE position

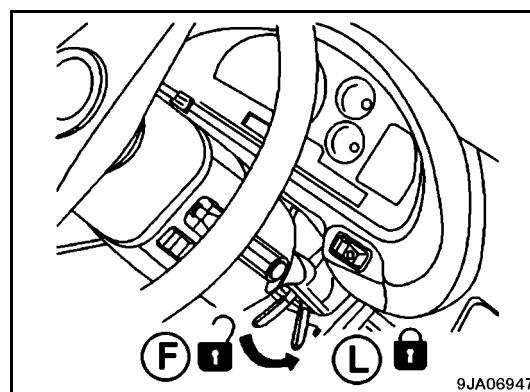
Steering wheel can be moved to front, rear, up, and down.

- (L) LOCK position

Steering wheel is held in position.

- ★ The adjustment amounts are shown in the following table.

Up-Down movement	When at 0 mm (0 in)	When Moved up to 40 mm (1.6 in)
Tilt amount	0 - 105 mm (0 - 4.1 in)	0 - 130 mm (0 - 5.1 in)



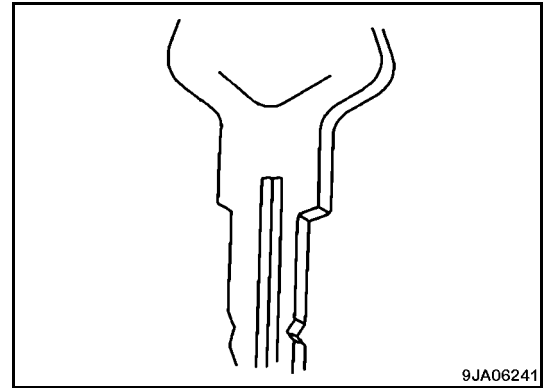
OPERATION

Cap with Lock

This machine is equipped with cap locks for the following ports:

- Fuel tank filler port
- Hydraulic tank filler port (if equipped)

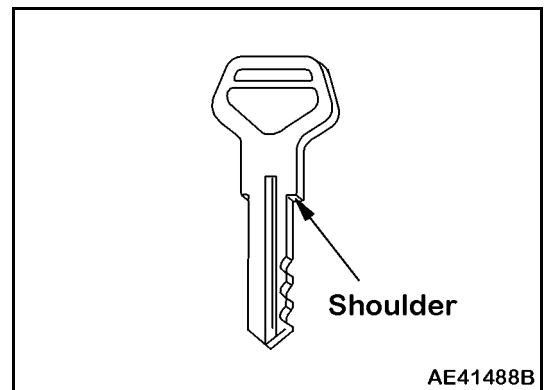
Use the starting switch key to open or close the caps.



Opening the Cap (for Fuel Tank Filler Port)

1. Insert the starting switch key into the key slot until the shoulder contacts the keyhole.

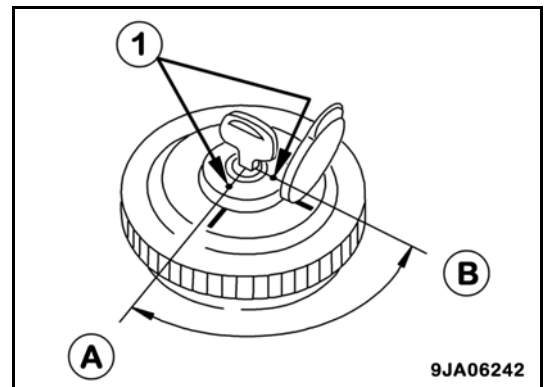
If the key is turned before it is inserted fully into the slot, the key may break.



2. Turn the key clockwise and align the key groove with the mark (1) on the cap, then open the cap.
 - Position (A): OPEN
 - Position (B): LOCK

Locking the Cap

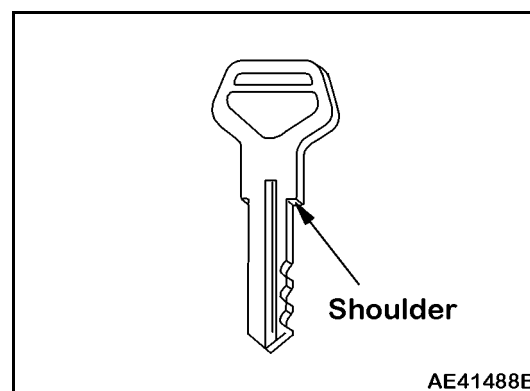
1. Turn the cap until it is tight.
2. Insert the key into the key slot.
3. Turn the key to the LOCK position (B), then remove the key.



Opening the Cap (for Hydraulic Tank Filler Port)

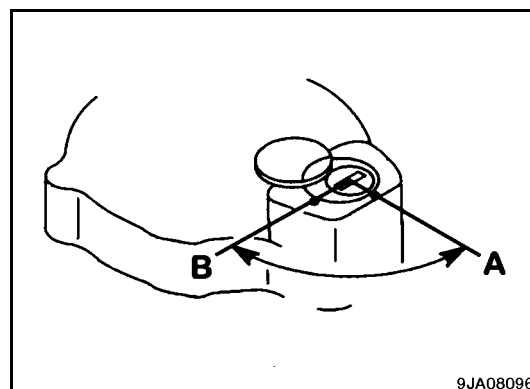
1. Insert the starting switch key into the key slot until the shoulder contacts the keyhole.

If the key is turned before it is inserted fully into the keyhole, the key may break.



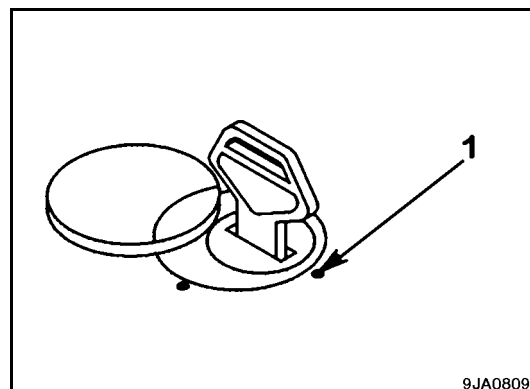
2. Turn the key counterclockwise and align the groove in the rotor with the countermark (1) on the cap. Turn the key slowly until you hear a clicking sound. This releases the lock and allows the cap to be opened.

- Position (A): OPEN
- Position (B): LOCK



Locking the Cap

1. Screw the cap into place.
2. Turn the starting switch key to LOCK position (B), then remove the key.



Backup Alarm

This safety feature warns people behind the machine that the machine will travel in reverse. The backup alarm sounds when the directional lever is set to the R position.

OPERATION

Frame Lock Bar

! WARNING

- Always lock the frame lock bar when transporting or lifting the machine. If the machine is transported or lifted when the frame is not locked, the machine may suddenly articulate. If the machine articulates, it may cause serious personal injury to people in the surrounding area.
- During maintenance, lock the frame lock bar.
- Always remove the frame lock bar for general travel operations. If it is not removed, the steering wheel cannot be used for steering. This is extremely dangerous and may lead to serious injury or death.

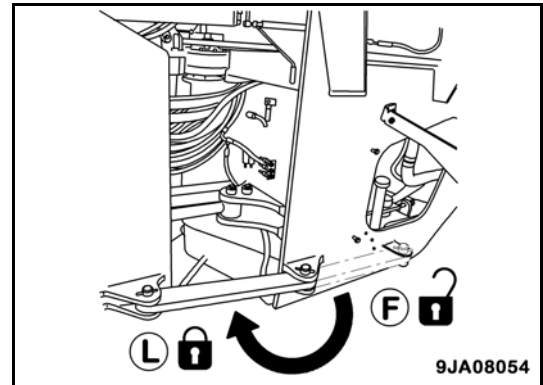
The frame lock bar is used to lock the front and rear frames to prevent the frames from articulating.

- (L) LOCK position

Front and rear frames are locked and the machine cannot articulate. Set to this position when carrying out inspection and maintenance.

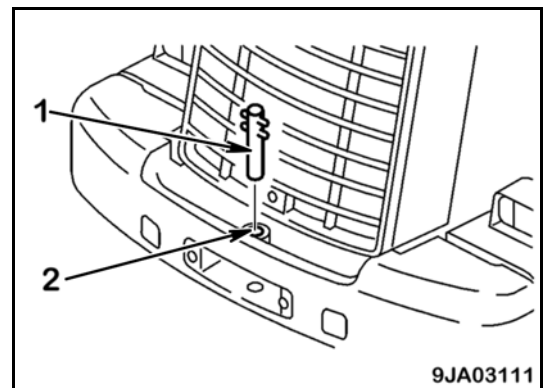
- (F) FREE position

Set to this position for normal operations.



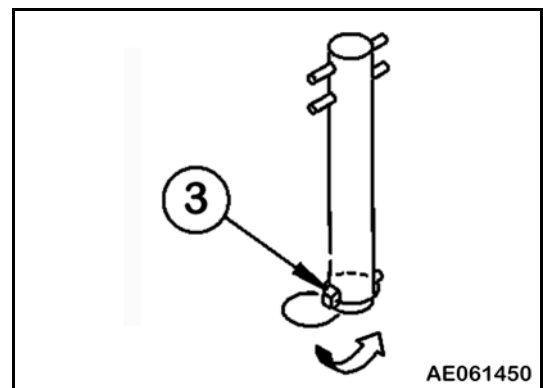
Towing Pin

1. Insert towing pin (1) into hole (2) in the counterweight.



2. Set lynch pin (3) so that the towing pin does not come out.

★ Carry out this operation in reverse to remove the pin.



MACHINE FEATURES

Cab Door

Emergency Escape Right Door

WARNING

- The right cab door is provided as an emergency escape from the cab when it is impossible to leave the cab from the left cab door. Do not use the right cab door for getting in or out of the operator's compartment.
- Never operate the machine with the door open to around 90 degrees. There is danger that the door will extend beyond the outermost part of the machine. There is also danger that the door may suddenly shut when the brakes are operated. This is extremely dangerous.
- Always operate the machine with the right door fully closed (locked) or partially opened (quarter lock).

Remark

The right window of the cab cannot be opened or closed from the outside.

Normal Condition of Right Door During Operation

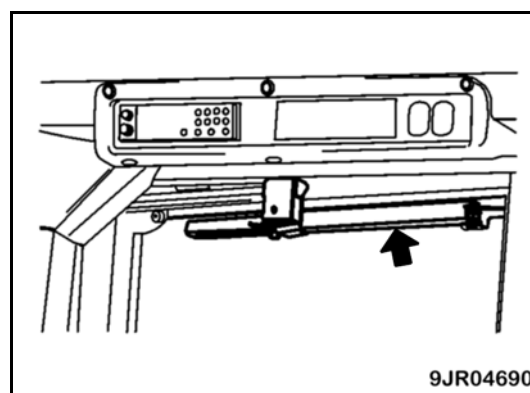
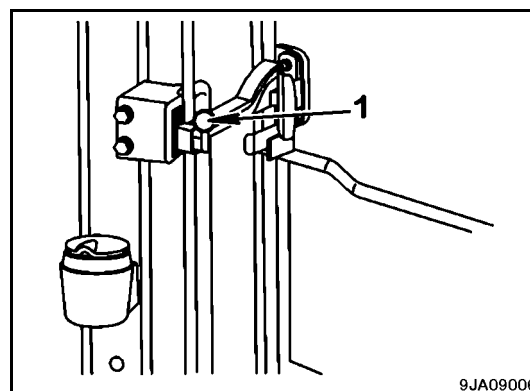
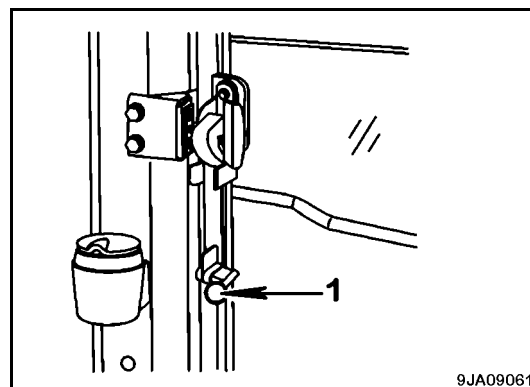
When the lock release knob (1) is pushed down securely, the lock is applied.

- When using the air conditioner or heater, carry out operations with the knob in this position.

If open lock knob (1) is lifted up, the right door will partially open (quarter lock).

- When letting outside air in on the right side, carry out operations with the knob in this position.

★ The gas damper is not a lock device to keep the cab door open.



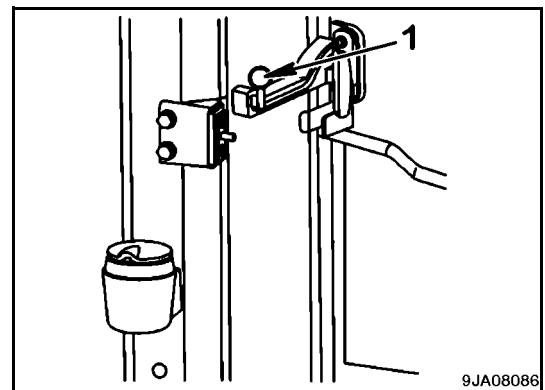
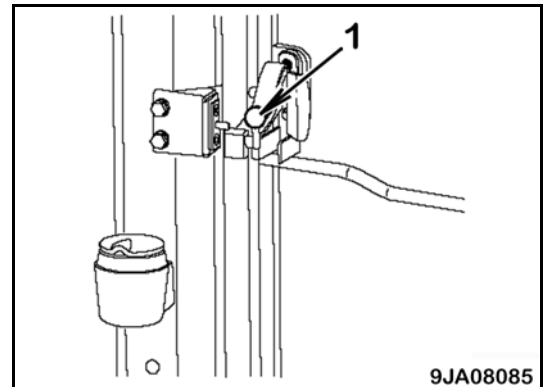
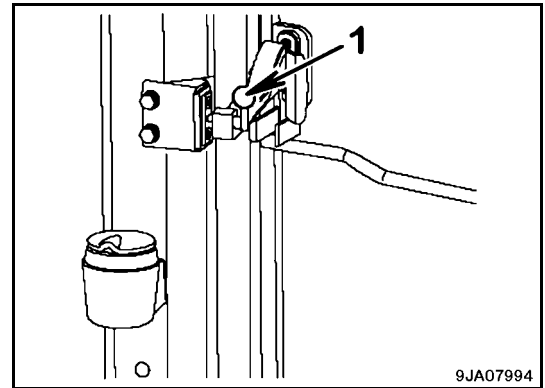
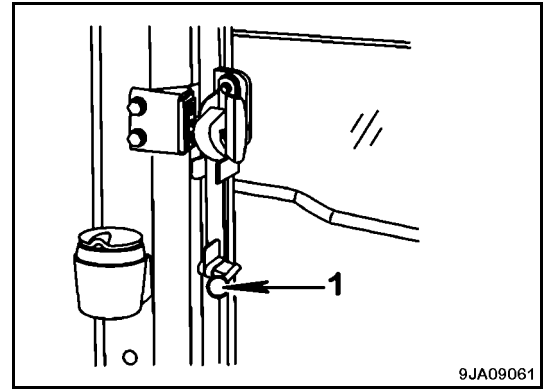
OPERATION

Door Operating as Emergency Escape

If the left door of the cab does not open or if it is dangerous to get off the machine from the left side, use the right emergency door.

Release the open lock of the right door to open the door fully and use it as an emergency escape route.

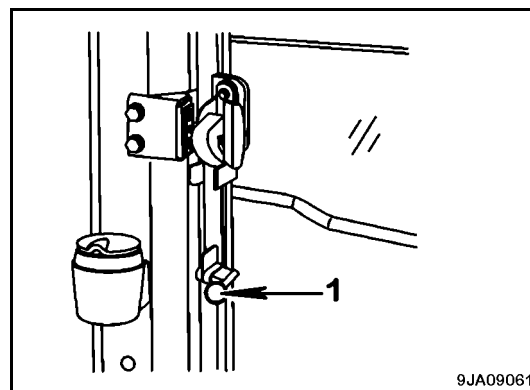
1. Lift open lock knob (1) up.
2. Grip open lock knob (1) and pull it towards the rear of the machine.
3. Remove the open lock guide rail from the window pillar guide to free the right door lock.
4. Open the right door fully and escape through the door.



- To return the open lock to its original position, use your hand to hold lock knob (1) open and pull it gradually to align the open lock guide rail with the guide and then push the open lock knob to the front.

Check that the rail is completely fitted into the guide then push open lock knob (1) down to set it securely to the LOCK position.

- Check that the rail is completely fitted into the guide and then push open lock knob (1) down to set it securely to the LOCK position.

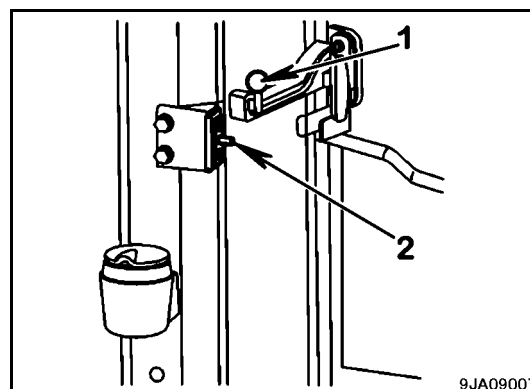


9JA09061

Remark

If the door is closed without holding the open lock knob (1) by hand, the plastic part of the lock lever will hit pin (2) at the cab side; this may break the plastic part.

Always use your hand to hold the lock knob (1) open when closing the door.



9JA09007

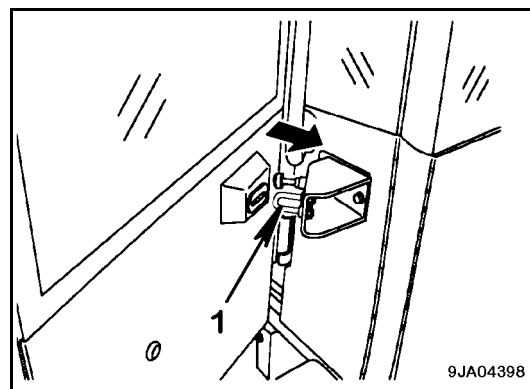
⚠ WARNING

- Always check that the cab door is locked, both when it is open and when it is closed.
- Always stop the machine on level ground before opening or closing the door.
- Avoid opening or closing the door on a slope. There is danger that the operating effort may suddenly change.
- When opening or closing the door, always use the door handle and knob.
- Be careful not to get your hands caught by the front pillar or center pillar.
- When there is any person inside the cab, always call out a warning before opening or closing the door.

Left Cab Door, Opening Lock

When getting in or out of the operator's compartment, or when operating with the door open, use this lock to hold the door in position.

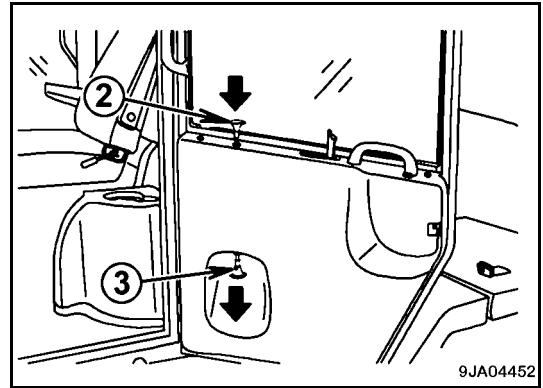
- Push the door against catch (1) to lock it in position.
- When attaching the door in position, lock it firmly to the catch.
- When getting on or off the machine, hold the handrail on the inside.



9JA04398

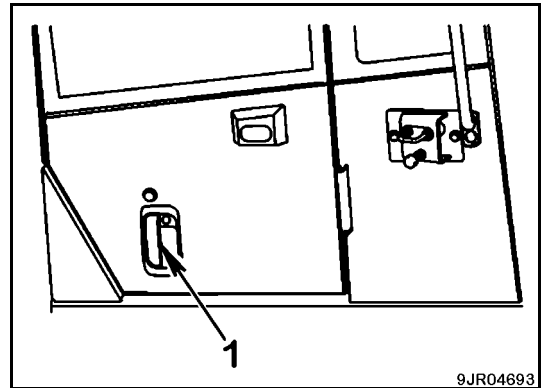
OPERATION

4. When closing the door from the operator's seat, push knob (2) to release the catch.
5. When closing the door after getting off the machine, pull knob (3) to release the catch.



Left Cab Door, Door Handle

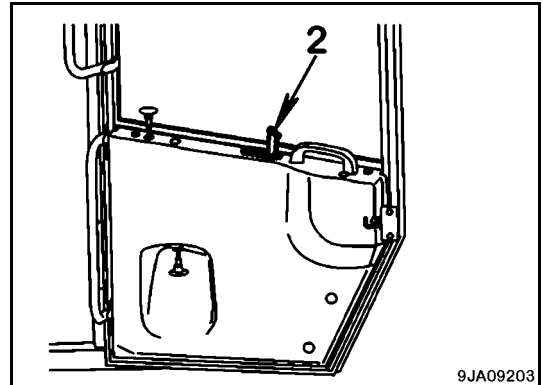
If the door has not been locked with the key, it is possible to pull door handle (1) and open the door fully.



Left Cab Door, Door Open Knob

When door open knob (2) is pulled, it is possible to open the door fully.

- ★ It is possible to open the door in this way even when the door is locked with the key.



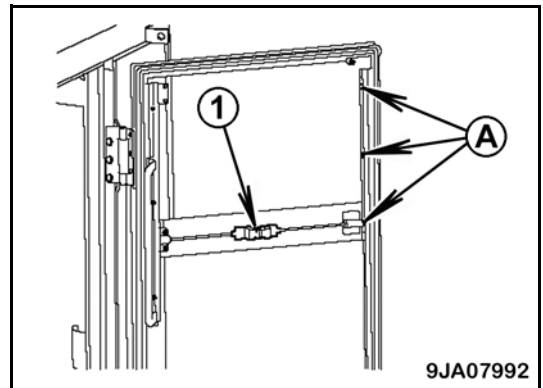
Cab Sliding Window Lock Release Knob

- ★ Left and right windows

Use this knob when you want to move the door window glass up or down to open or close it.

1. Grip lock cancel knob (1) to release the lock, then move the glass down to a lower lock position.
2. Release lock cancel knob (1).

- ★ There are three points for lock position (A).



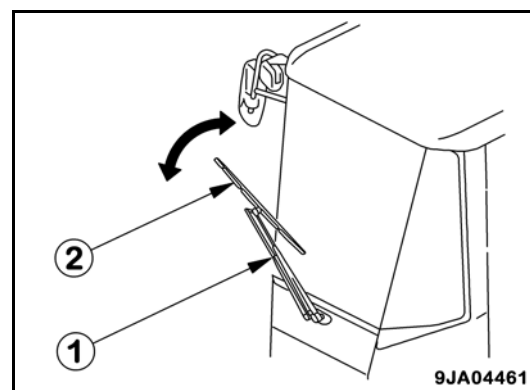
Cab Wiper

Preventing Wiper Arm Bracket Damage

Remark

When angling the wiper arm (1) to the front, check that the wiper blade is hanging free.

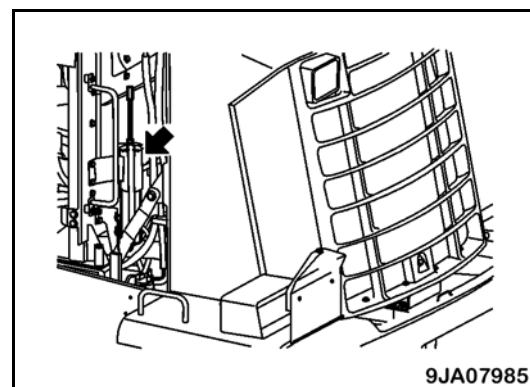
If when angling the wiper arm (1) to the front, the wiper arm is angled with the wiper blade (2) locked to the arm (the bottom of the blade is caught on the arm), abnormal force is brought to bear on the mounting bracket. This force may break the bracket.



Grease Pump

The grease pump is stored in the holder on the left radiator side of the engine bulkhead at the rear of the machine.

- After using it, wipe the grease off the outside of the pump and install it in position.
- Insert the grease pump in the holder and secure it with the rubber band.
- Hitch the tail chain of the grease pump to the hook at the bottom of the holder.



ELECTRICAL

Fuses

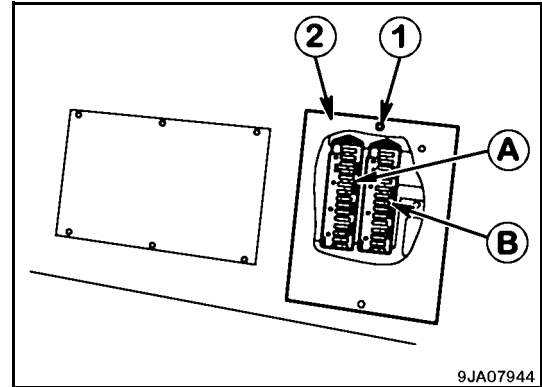
⚠ WARNING

Before replacing a fuse, be sure to turn off the starting switch.

The fuses protect the electrical equipment and wiring from a short circuit or overload condition.

Replace the fuse if any of the following conditions are present:

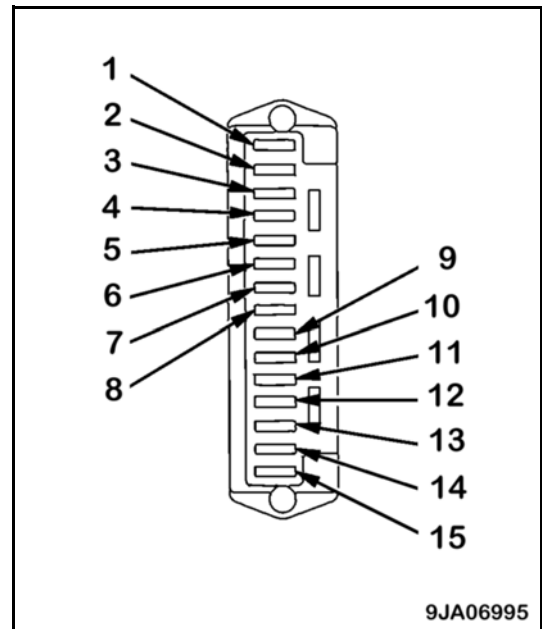
- The fuse is corroded.
- There is white powder around the fuse.
- The fuse is loose in the fuse holder.
- ★ Replace a fuse only with another of the same capacity.



Fuse Capacity and Circuits

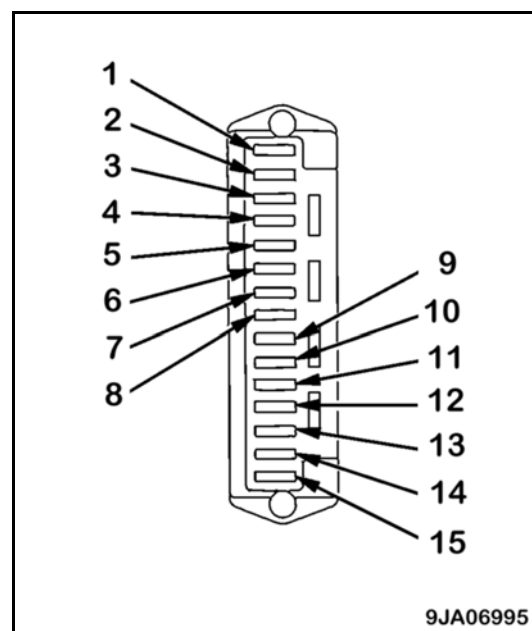
Fuse Box A

No.	Fuse Capacity	Circuit
1	10A	Left front lamp
2	10A	Right front lamp
3	10A	Left clearance lamp
4	10A	Right clearance lamp
5	20A	Main lamp circuit
6	10A	Instrument panel B Load meter printer (if equipped)
7	5A	Air conditioner B
8	20A	Air conditioner A
9	20A	Wiper, washer
10	10A	Backup lamp, brake lamp
11	10A	Work equipment positioner Work equipment controller A (if equipped)
12	5A	Emergency steering
13	5A	Parking brake
14	10A	Transmission control A
15	10A	Horn



Fuse Box B

No.	Fuse Capacity	Circuit
1	5A	Engine control B
2	20A	Rear heated wire glass
3	10A	Air suspension seat
4	20A	Yellow rotating lamp (if equipped)
5	10A	Turn signal indicator
6	20A	Car radio, cigarette lighter, 12V power source
7	10A	Rear working lamp
8	10A	Front working lamp
9	10A	Spare 1
10	30A	Engine control A
11	5A	Transmission control B Work equipment controller B (if equipped)
12	10A	Room lamp
13	10A	Instrument panel A KOMTRAX (if equipped)
14	10A	Hazard lamp
15	20A	Starting switch

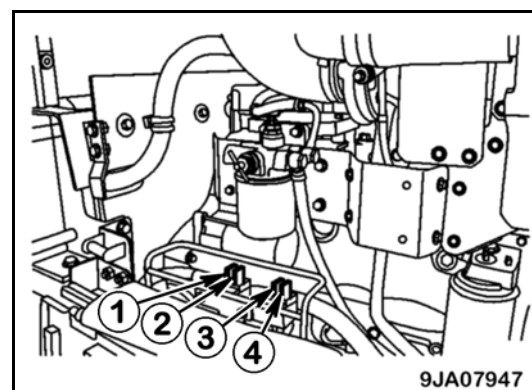


Slow-Blow Fuses

If the power does not come on when the starting switch is turned ON, the slow-blow fuse may be blown. Inspect the fuse and replace it, if necessary.

The slow-blow fuses are located on the left side of the machine, near the engine.

- (1) 50A: Permanent power source
- (2) 50A: Main power A
- (3) 50A: Main power B
- (4) 120A: Heater relay (electrical intake air heater)



OPERATION

Power Outlet

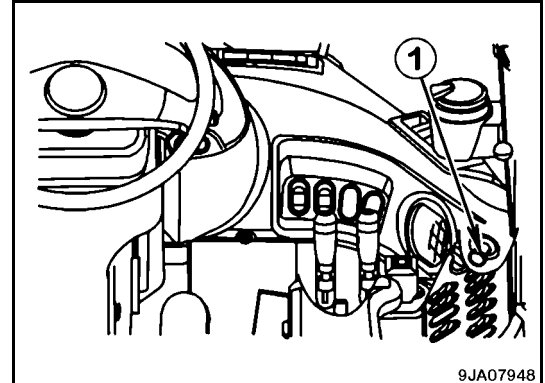
There are two power sources:

- Cigarette lighter (24V)
 - Electric power source (12V) (if equipped)
- ★ Check the voltage of the electrical equipment and select the appropriate power source.
- ★ Mistaken use, such as using 24V as the power source for 12V equipment, will damage the equipment.

Cigarette Lighter

When cigarette lighter (1) is removed, the lighter socket can be used as a 24V power source.

- Maximum amperage: 9A (216W)



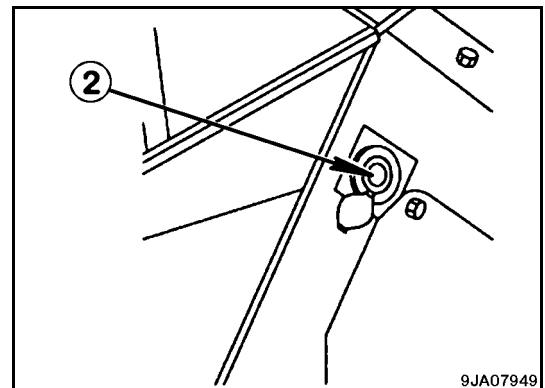
Electric Power Source

Electric power source (2) (if equipped) can be used as a 12V power source.

- Maximum amperage: 10A (120W)

Remark

When using the electric power source, do not install any equipment which exceeds the maximum amperage.



WORK OPERATIONS

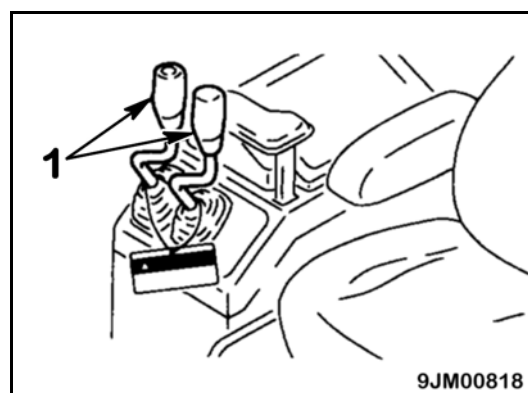
! WARNING

- Always hang a warning sign on the work equipment control lever (1).
- Accumulation of flammable materials and leakage of fuel or oil around the battery or high-temperature parts of the engine, such as the engine muffler and turbocharger, may cause fire on the machine. Check thoroughly and repair any problems that are found, or contact your Komatsu distributor.
- Always repair any damage to the handrails and steps and tighten any loose bolts. Failure to do this may cause workers to fall and suffer serious personal injury.

Walk-Around Check

Before starting your machine and proceeding with any work operations:

- Check the area around and under the machine.
- Check for loose nuts and bolts, damage to any parts, leakage of fuel, oil, or coolant.
- Check the condition of the work equipment and the hydraulic systems.
- Check for looseness or play in electric wiring.
- Check that there is no dust accumulated around high-temperature parts.



Precautions Before Starting Work Operations

Before starting work operations, it is important to perform several procedures to be sure your equipment is in a safe operating condition. It is also important to be aware of the hazards involved when operating your machine.

If the machine is at an angle, reposition it so that it is level before starting your check.

Perform the following inspections and cleaning every day before starting the engine for the day's work.

1. Check for damage, wear, play in the work equipment, cylinders, linkage, and hoses.
 - Check that there are no cracks, excessive wear, or play in the work equipment, cylinders, linkage, or hoses. If there is an abnormality, repair it.
2. Remove dirt and dust from around engine, battery, and radiator.
 - Check if there is any dirt or dust accumulated around the engine or radiator.
 - Check if there is any flammable material (dead leaves, twigs, etc.) accumulated around the battery, engine muffler, turbocharger, or other high-temperature engine parts.
 - Remove all such dirt, dust, or flammable material.
3. Check for coolant or oil leakage around the engine.
 - Check that there is no oil leakage from the engine or coolant leakage from the cooling system. If there is a problem, repair it.

OPERATION

4. Check for oil leakage from the transmission case, axle, hydraulic tank, hoses, joints.
 - Check that there is no oil leakage. If there is a problem, repair the leakage.
5. Check for oil leakage from the brake line.
 - Check that there is no oil leakage. If there is a problem, repair the leakage.
6. Check for damage to the lamps.

Remark

Before starting operations, clean all dirt from the surface of the lamps.

If the lamps are used with mud stuck to the surface, the lamp may overheat and be damaged.

If the lamp is cleaned when it is overheated, the sudden change in temperature may cause the lens to crack.

Turn the lamp off and wait for the temperature to go down before cleaning the lamp.

7. Check for loose air cleaner mounting bolts.
 - Check for loose bolts. Tighten any loose bolts.
8. Inspect rims.

WARNING

- **Check the rims (wheels) and rings to confirm that there is no deformation, corrosion, or cracks.**
 - **In particular, check the side rings, lock rings, and rim flanges thoroughly.**
-

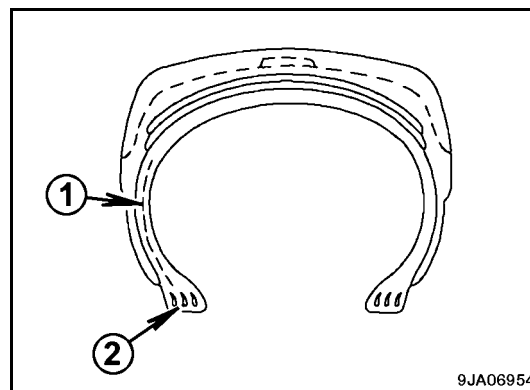
9. Check for damaged or worn tires, wheels, and wheel hub bolts. Check for loose mounting bolts.
 - Check for cracks or peeling of the tires and for cracks or wear to the wheels (side rim, rim base, lock ring). If there is an abnormality, repair or replace the part.
 - Tighten any loose wheel bolts.
 - If any valve caps are missing, install new caps.

! WARNING

If worn or damaged tires are used, they may burst and cause serious injury or death.

To ensure safety, do not use tires exhibiting the following characteristics.

- **Wear:**
 - Tires with a tread groove of less than 15% of that of a new tire
 - Tires with extreme uneven wear or with stepped-type wear
- **Damage:**
 - Tires with damage which has reached the cords (1), or with cracks in the rubber
 - Tires with cut or pulled cords
 - Tires with peeled (separated) surface
 - Tires with damaged bead (2)
 - Leaking or improperly repaired tubeless tires
 - Deteriorated, deformed, or abnormally damaged tires which do not seem usable.

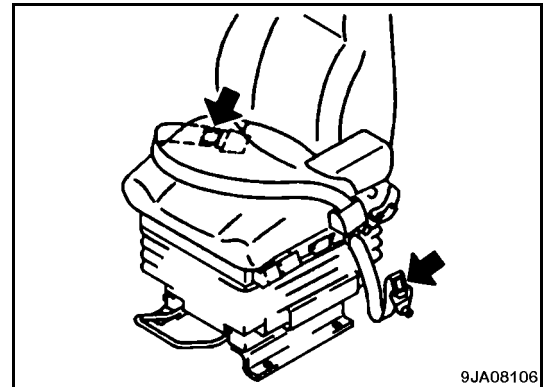
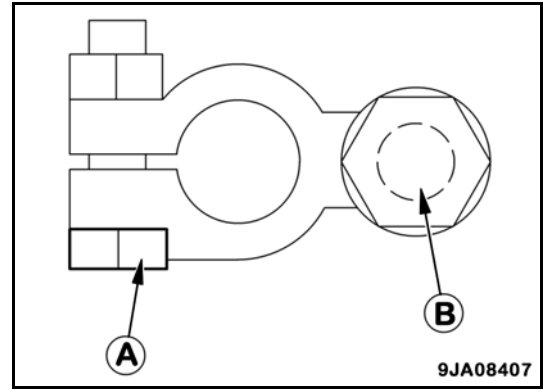


OPERATION

10. Check for loose battery terminals.
 - Tighten any loose terminal.
11. Clean the cab window.
 - Clean the cab window to ensure good visibility when operating the machine.
12. Check rear view mirror, underview mirror.
 - Check that the mirrors are not damaged. Replace them if they are damaged.
 - Clean the surface of the mirrors and adjust the angle so that the operator can see the area to the rear and under the machine from the operator's seat.
 - When cleaning the mirrors, use a mop with a long handle.
13. Check for loose ROPS mounting bolts.
 - If any loose bolts are found, tighten them to $927 \pm 103 \text{ N}\cdot\text{m}$ ($683.72 \pm 75.97 \text{ lbf ft}$).
 - If bolts are damaged, replace them with genuine Komatsu bolts.
14. Check for damage and loose bolts on the handrail and steps.
 - Repair any damage and tighten any loose bolts.
15. Check for damage to the seat belt and mounting clamps. See "Seat Belt Inspection" on page 1-21.
 - Check that there are no loose bolts on the equipment mounting the seat belt to the machine.
 - Tighten the bolts if necessary.

Tightening torque: $24.5 \pm 4.9 \text{ N}\cdot\text{m}$ [$18.17 \pm 3.61 \text{ lbf ft}$]

 - If the belt is damaged or fluff is starting to form, or if there is any damage or deformation of the seat belt holders, replace the seat belt.



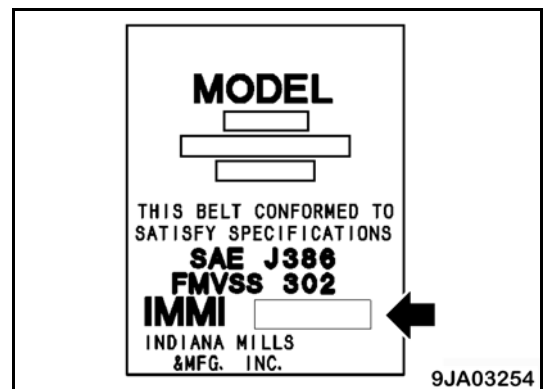
⚠ WARNING

Even if there appears to be no abnormality with the seat belt, replace it once every three years. See "Seat Belt Inspection" on page 1-21.

Remark

The date of manufacture of the seat belt is marked on the belt at the place indicated by the arrow in the figure to the right.

16. Check for damage to gauges, lamps on the instrument panel, and loose bolts.
 - Check for damage to the panel, gauges, and lamps. If there is a problem, replace the parts.
 - Clean off any dirt on the surface.
 - Tighten any loose bolts.



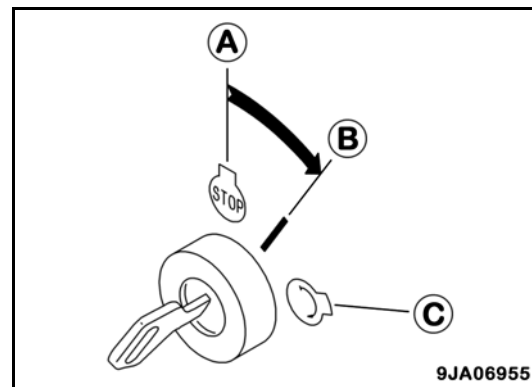
Check Before Starting Engine

Remark

Perform the checks in this section before starting the engine each day.

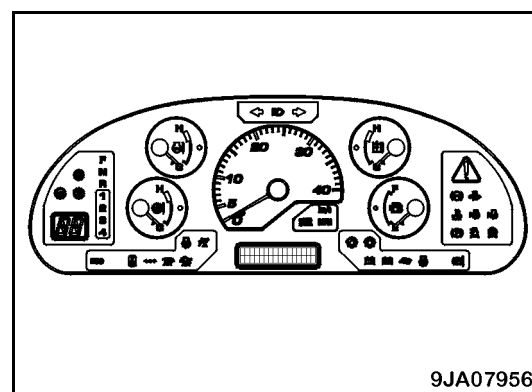
Check Machine Monitor

1. Turn the starting switch to the ON position (B).



2. Check that all the monitors, gauges, and the central warning lamp illuminate for approximately two seconds, and that the alarm buzzer sounds for approximately two seconds.

If the lamps do not illuminate, there is probably a failure or disconnection. Contact your Komatsu distributor for inspection.



OPERATION

Check Coolant Level, Add Coolant

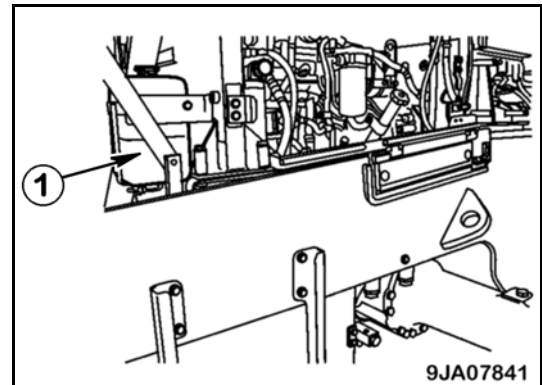
WARNING

- Do not open the radiator cap unless necessary.
- Wait for the engine to cool down before checking the coolant in the subtank. The coolant remains at high temperature and the radiator is under high internal pressure immediately after the engine has stopped. If the cap is removed to check the coolant level in this condition, there is a hazard of burns.
- Wait for the temperature to go down and then turn the cap slowly to release the pressure before removing it.

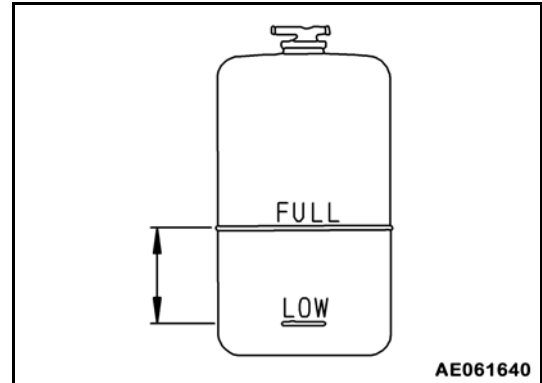
Remark

When adding coolant, use the step and handrail on your machine to support yourself securely.

1. Open the side door of the engine hood on the right side of the machine to access subtank (1).



2. Check that the coolant level is between the FULL and LOW range on subtank (1). If the coolant level is low, add coolant through the water filler port of subtank (1) to the FULL line.
3. After adding coolant, tighten the cap securely.
4. If subtank (1) is empty, check for water leakage. Check the water level in the radiator. If the water level is low, add coolant to the radiator, then add coolant to subtank (1).
 - If the volume of coolant added is more than usual, check for possible leakage.
 - Confirm that there is no oil in the coolant.



Check Oil Level in Engine Oil Pan, Add Oil

⚠ WARNING

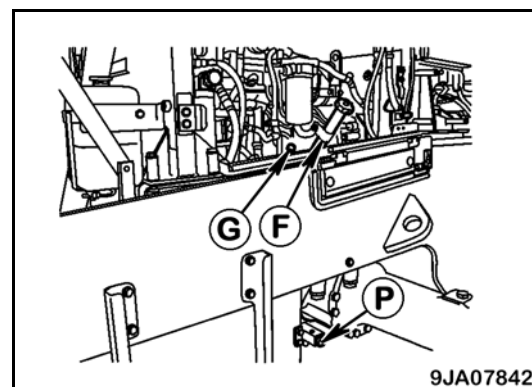
- The parts and oil are at high temperature immediately after the engine is stopped and may cause serious burns.
- Wait for the temperature to go down before starting the operation.

★ Make sure that the machine is parked in a horizontal position before you check the oil level.

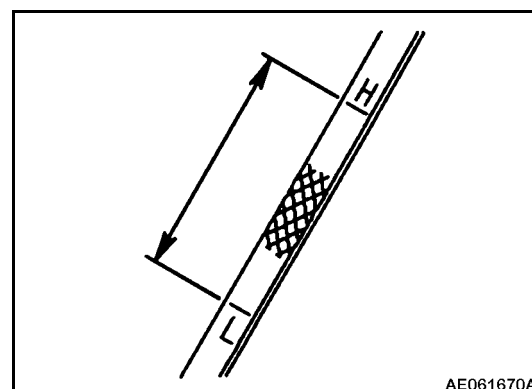
Remark

After the engine has been operated, wait for at least 15 minutes after stopping the engine before checking the oil level.

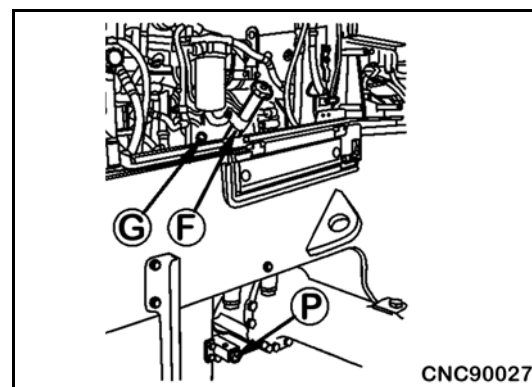
1. Stop the engine and wait for the temperature of all parts to go down.
2. Open the inspection cover on the right side at the rear of the machine.
3. Take out dipstick (G) and use a cloth to wipe off the oil.
4. Fully insert dipstick (G) into filler pipe (F) and then remove it.



5. The oil level should be between the H and L marks on dipstick (G).
 - If the oil level is below the L mark, add oil through oil filler (F).



6. If the oil is above the H mark, drain the excess engine oil from drain plug (P) and check the oil level again.
7. If the oil level is correct, tighten oil filler cap (F) securely and close the inspection window.



OPERATION

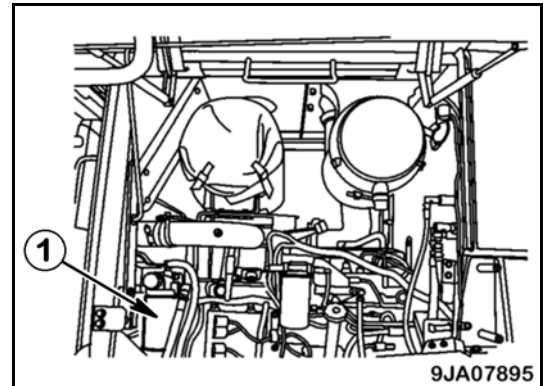
Check Water Separator

WARNING

- Each part of the engine is still very hot immediately after the engine is stopped. Do not attempt to drain cooling water or remove the filter element cup.
- High pressure is generated inside the engine fuel piping while the engine is running. Wait for more than 30 seconds after the engine stops for the engine to cool down sufficiently. Once the engine is cool, start draining cooling water or removing the filter element cup.
- Do not bring fire close to the machine.

1. Open the engine side cover on the right side of the machine.

The water separator (1) forms one unit with the fuel prefilter, and is at the bottom.

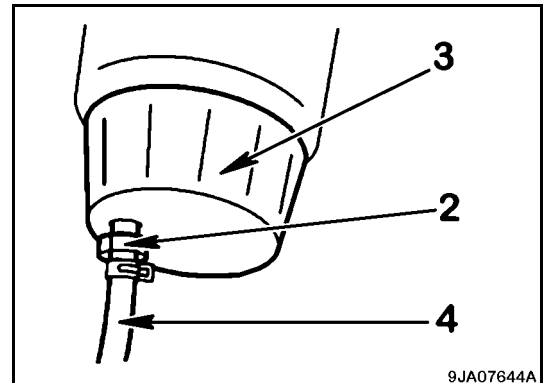


2. It is possible to judge the condition of the water and sediment through transparent cap (3). If water or sediment is accumulated, set a container under drain hose (4) to collect the discharged water.

3. Loosen plug (2) and drain the water.

4. Tighten plug (2) as soon as fuel starts to be discharged from drain hose (4).

Tightening torque: 0.2 - 0.45 N•m (1.77 – 3.98 lbf in)



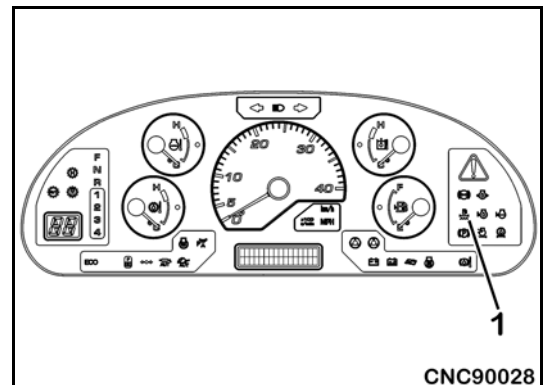
Remark

On this machine, a sensor is installed to detect if water is accumulated at the bottom of the fuel prefilter.

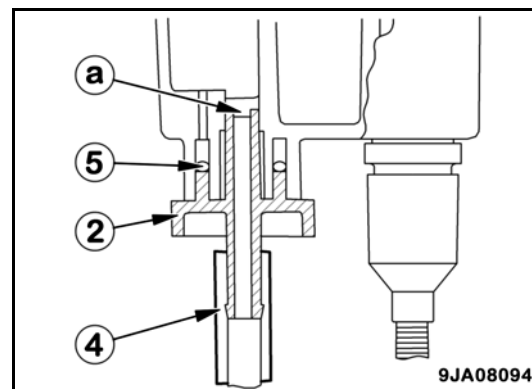
5. If the water separator caution lamp (1) on the machine monitor lights up, do Steps 1 - 4 to drain the water.

Remark

If plug (2) is stiff, coat O-ring (5) of plug (2) with grease.



- A. Set a fuel container under drain hose (4).
- B. Loosen plug (2), then drain all the sediment together with the fuel from drain hose (4).
- C. Check that nothing comes out from drain hose (4), then remove plug (2).
- D. Coat O-ring portion (5) with a suitable amount of grease. When doing this, be careful not to let the grease get on the drain valve water drain port (a) or the plug thread.
- E. Screw in plug (2) by hand until it contacts the bottom.
- F. Remove the fuel container.



- ★ If transparent cap (3) is dirty and the contents cannot be easily seen, clean transparent cap (3) when replacing the filter.
- ★ When washing, if plug (2) is removed, coat the O-ring with grease, then tighten by hand until it contacts the bottom.

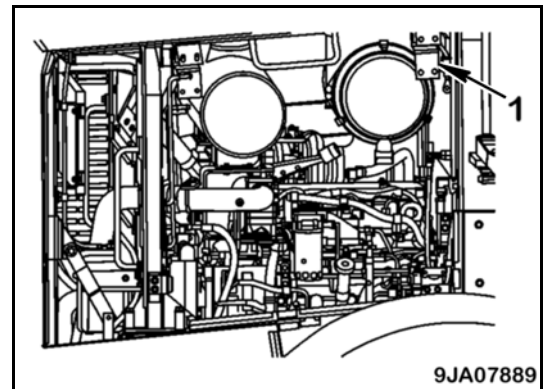
OPERATION

Check Air Cleaner

WARNING

- If inspection, cleaning, or maintenance is carried out with the engine running, dirt will get into the engine and damage it. Always stop the engine before carrying out these operations.
- When using compressed air, there is danger that dirt may be blown around and cause serious injury.
- Always use protective glasses, dust mask, and other protective equipment.

1. Open the engine side cover on the right side of the chassis.
2. If the yellow piston in the display portion of dust indicator (1) installed to the air cleaner enters the red range (7.5 kPa [1.09 psi]), clean the element.
3. After cleaning, press the button of the dust indicator to reset it.
4. If the yellow piston enters the red range (7.5 kPa [1.09 psi]) soon after the dust indicator is reset, it is necessary to replace the element.
 - ★ For details about replacing the element, see “Clean, Replace Air Cleaner Element” on page 3-26.



Electronic Air Cleaner Clogging Sensor

(Machines equipped with KOMTRAX)

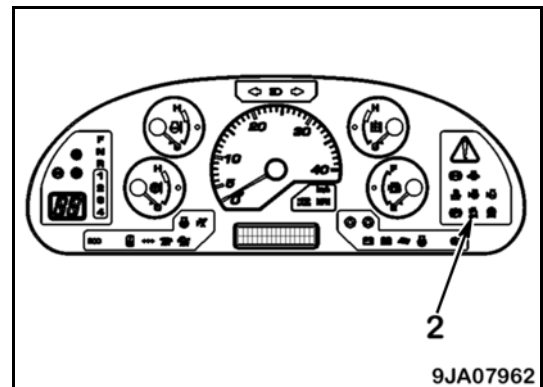
If the yellow piston in the display portion of dust indicator (1) enters the red range (7.5 kPa), or air cleaner clogging caution lamp (2) on the machine monitor lights up, clean the air cleaner element.

Remark

Do not clean the element until the air cleaner clogging caution lamp lights up.

If the element is cleaned frequently before the air cleaner becomes clogged, the air cleaner will not be able to provide its expected performance and the cleaning efficiency will deteriorate.

In addition, dirt stuck to the element will drop inside the inner element more frequently during the cleaning operation.



Check Fuel Level, Add Fuel

! WARNING

- When filling with fuel, never let the fuel overflow. Do not continue to add fuel after the fuel supply automatically stops. This may cause a fire. If too much fuel is added, there is danger that the fuel may expand because of the rise in the ambient temperature and cause the fuel to overflow.
- Spilled fuel may cause a fire. Always wipe off any spilled fuel completely.
- Fuel is highly flammable and a dangerous substance. Never bring fire or flames near fuel.

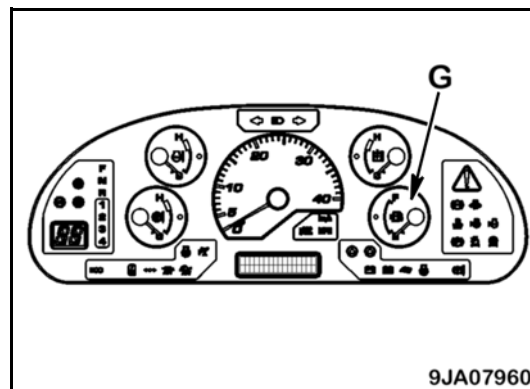
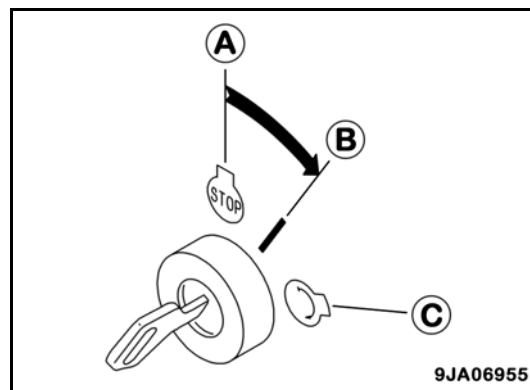
Remark

If the engine has run out of fuel and has stopped, it is necessary to bleed the air completely from the fuel line before starting the engine again. See "Bleeding Air from Fuel Line" on page 3-63 for instructions on bleeding air from the fuel line.

Be careful not to let the engine stop because of lack of fuel.

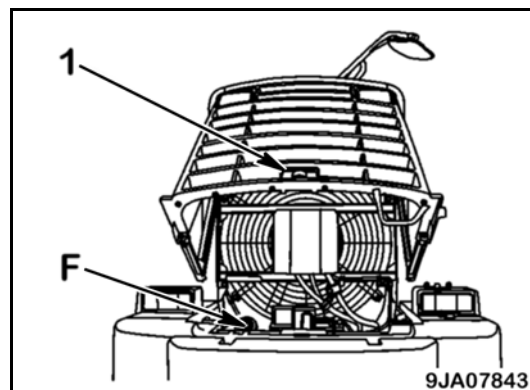
If the engine has run out of fuel, the air bleeding operation can be carried out more quickly when the fuel tank is full.

1. Turn the engine starting switch to the ON position (B) and check the fuel level with fuel level gauge (G).
2. After checking, turn the switch back to the OFF position (A).



3. After completing operations, open grill (1) and add fuel through fuel filler (F) until the fuel tank is full.
 - ★ Do not add more fuel once the tank is full.
 - ★ For details about opening and closing the cap, see "Cap with Lock" on page 2-66.

4. After adding fuel, tighten the cap securely.
 Fuel capacity: 300 liters (79.25 US gal)



OPERATION

Check Electric Wiring

WARNING

- If fuses frequently blow or if there are traces of short circuits on the electrical wiring, locate the cause and repair immediately, or contact your Komatsu distributor for repairs.
- Accumulation of flammable material (dead leaves, twigs, dry grass, etc.) around the battery may cause a fire. Always remove such material.
- Keep the top surface of the battery clean and check the breather hole in the battery cap. If it is clogged with dirt or dust, wash the battery cap to clear the breather hole.

-
- Check that the fuses are not damaged, that the fuses are of the correct capacity, and that there are no signs of short circuits or disconnections in the electric wiring.
 - Check that there are no loose terminals or connectors. Tighten any loose parts.
 - Check the wiring of the battery, starting motor, and alternator carefully.
 - Check that there is no flammable material accumulated around the battery. Remove all flammable material.
 - Consult your Komatsu distributor about repairs and correction of problems.

Check Inflation Pressure of Tires

- Check for damage or wear to the tires and the rims.
- Check for loose wheel hub nuts (bolts).
- Measure the inflation pressure with a tire pressure gauge while the tires are cool, before starting work.

Remark

The appropriate inflation pressure differs according to the type of work. See "HANDLING TIRES" on page 2-156.

Check Parking Brake

- Check that the parking brake works properly. See "Parking Brake Switch" on page 2-48 and "Check Parking Brake" on page 2-88.
- If there is any problem in the operation of the parking brake or the brake does not provide the proper braking effect, contact your Komatsu distributor to have the brake adjusted.

Check Brake Pedal

- Drive the machine forward and check the effect of the brakes.
- If there is any problem in the functioning of the brakes, contact your Komatsu distributor to have the brakes adjusted.

Check Condition of Window Washer Spray

- Operate the window washer and check that the washer fluid sprays out properly.
- If the fluid does not spray out properly, clean the washer nozzle with a safety pin or thin wire.
- If the condition is still not improved, ask your Komatsu distributor to carry out inspection and repair.

Check Wiping Efficiency of Wiper

- Operate the wiper and check that it wipes the window properly under each operating speed: intermittent, low speed, high speed.
- Operate the window washer to make the glass wet while checking the wiper.
- If the wiping condition is poor, clean the surface of the glass or replace the rubber wiper blade.
- If the condition is still not improved, ask your Komatsu distributor to carry out inspection and repair.

Check Horn

- Operate the horn switch and check that the horn sounds.
- If there is any abnormality, ask your Komatsu distributor to carry out inspection and repair.

Check Defroster Function

- Operate the air conditioner and check that the air blows out properly onto the front glass.
- If there is any abnormality, ask your Komatsu distributor to carry out inspection and repair.
- Operate the rear heated-wire glass switch and check that the rear glass surface is heated properly.
- If there is any abnormality, ask your Komatsu distributor to carry out inspection and repair.

Check Locks

- Check that all places can be locked properly.
 - ★ For locations that can be locked, see “Locking the Machine” on page 2-155.
- If any abnormality is found, ask your Komatsu distributor to carry out inspection and repair.

Check Emergency Exit

- Operate the knob for opening and closing the emergency exit, and check that it works properly.
- If any abnormality is found, ask your Komatsu distributor to carry out inspection and repair.

OPERATION

Adjust Seat

⚠ WARNING

- Park the machine in a safe place and stop the engine when adjusting the operator's seat.
- Set the work equipment lock lever to the LOCK position to prevent any accidental contact with the control levers.
- Adjust the seat position at the beginning of each shift or when operators change.
- Adjust the seat so that you can depress the brake pedal fully while sitting with your back against the backrest.

Remark

When pulling up levers (2) and (3), be careful not to pull up the switch box at the front by mistake. There is danger that the switch box may be damaged.

When the left armrest is at the raised position, do not push down on the tip of the armrest with your hand to support your weight. There is danger that the armrest mount may be damaged.

Adjustments (E), (J), and (K) use the air compressor built into the seat. Turn the engine starting switch to the ON position when carrying out the adjustment.

(A) Fore-and-aft adjustment

- Pull lever (1) up; set the seat to the desired position; then release the lever.

Adjustment range: 180 mm (7.08 in)
. (10 mm (0.39 in) x 18 stages)

(B) Adjusting seat angle

- Move lever (2) up and, while sitting, push down on the rear of the seat to tilt it backward.
- Move lever (3) up and push down on the front of the seat to tilt it forward.

Adjustment range: 24 degrees (front and rear tilt)
. (three stages each)

(C) Adjusting height of seat

- Move levers (2) and (3) up, then move the seat up or down to the desired position.
- Since these levers are also used for adjusting the seat angle, set the seat to the desired height while adjusting the angle.

Adjustment range: 65 mm (2.56 in)

(D) Adjusting fore-and-aft position of seat cushion

- Push in lever (4); set the seat cushion to the desired position; then release the lever.

Amount of adjustment: 60 mm (2.36 in)

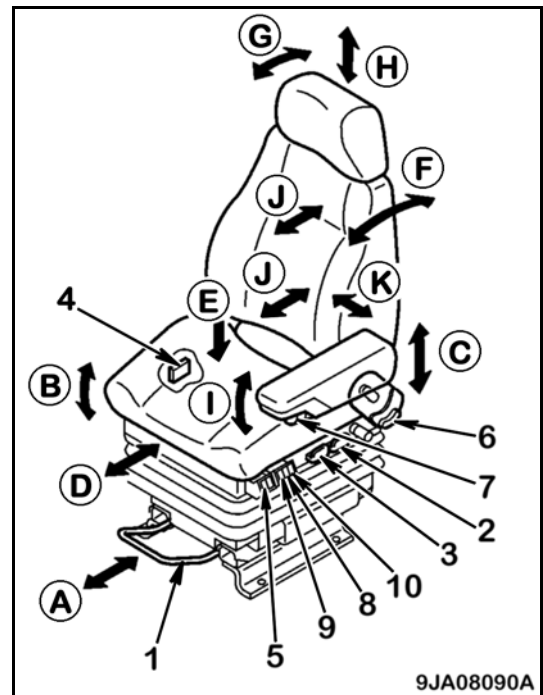
(E) Setting seat for weight

- Sit on the seat; raise your body slightly; then operate switch (5) to adjust the strength of the suspension.

Adjustment range: 50 - 130 kg (110 - 287 lb) (target)

Press (+): Tension becomes stronger.

Press (-): Tension becomes weaker.



(F) Adjusting reclining angle

- Move lever (6) up and move the backrest to the front or rear.
- Push your back against the backrest when carrying out this adjustment.
If your back is not pressing against the backrest, the backrest may suddenly spring forward.

Adjustment range:

Front tilt: Free

Rear tilt: 40 degrees (2 degrees x 20 stages)

(G) Adjusting headrest angle (if equipped)

- Rotate the headrest to the front or rear.

Adjustment range:

Front tilt: 13 degrees

Rear tilt: 13 degrees

(H) Adjusting headrest height (if equipped)

- Move the headrest up and down to the desired height.

Adjustment range: 80 mm (3.15 in)

(I) Adjusting armrest angle

- Rotate knob (7) and adjust the angle of the armrest.

Adjustment range: 73 degrees

Forward: 54 degrees

Backward: 19 degrees

★ If the arm rest is turned, it will spring up.

(J) Lumbar support

- Operate switch (8) to provide a suitable tension to the lower lumbar region.
- Operate switch (9) to provide a suitable tension to the upper lumbar region.

Press (+): Tension becomes stronger.

Press (-): Tension becomes weaker.

(K) Side support

- Operate switch (10) to provide a suitable tension to the left and right lumbar region.

Press (+): Tension becomes stronger.

Press (-): Tension becomes weaker.

OPERATION

Removal and Installation of Headrest

Removal

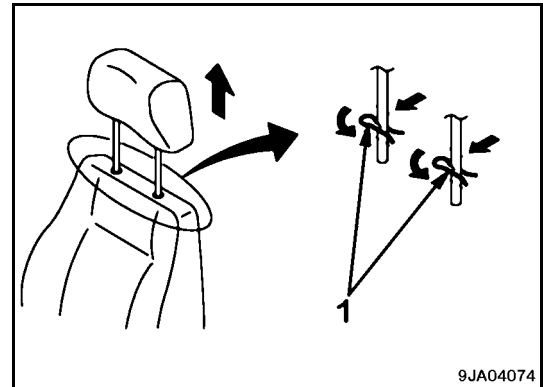
If the headrest is not needed, remove it in the following manner.

1. Pull up the headrest to the position where it stops.
2. From the top of the seat back, turn stopper (1) (under the material at the top of the seat) of the headrest bar on one side in the direction of the arrow, and pull up the headrest.

When stopper (1) is turned, it comes out of groove (2).

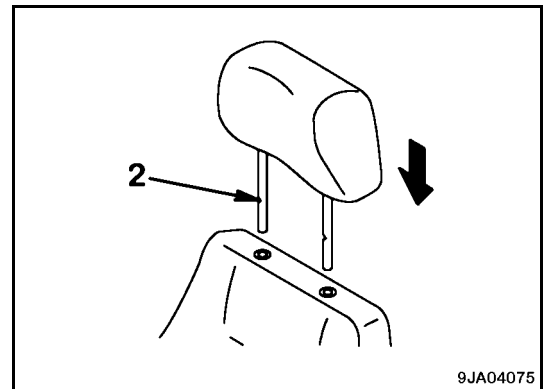
3. Turn stopper (1) on the other side in the direction of the arrow, and pull up the headrest.

When both stoppers (1) come out of groove (2), the headrest can be removed.



Installation

1. Insert the bars into the holes in the top of the seat and push down.



Adjust Seat Belt

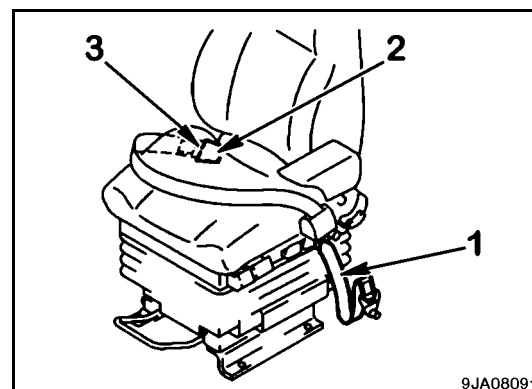
! WARNING

- Before fastening the seat belt, check that there is no abnormality in the seat belt or the seat belt mounting bracket. If the belt is worn or damaged, replace it. See "Seat Belt Inspection" on page 1-21.
- Fasten the seat belt before starting operations.
- Always wear the seat belt during operations.
- Make sure that the left and right belts are not twisted when fastening the seat belt.

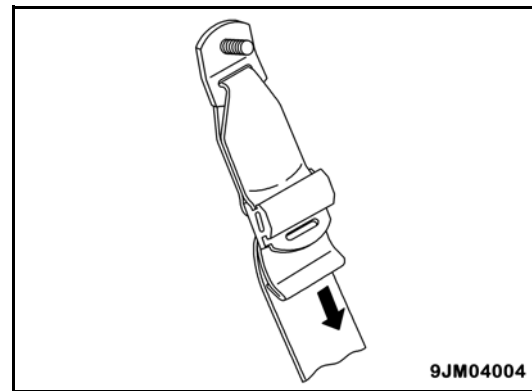
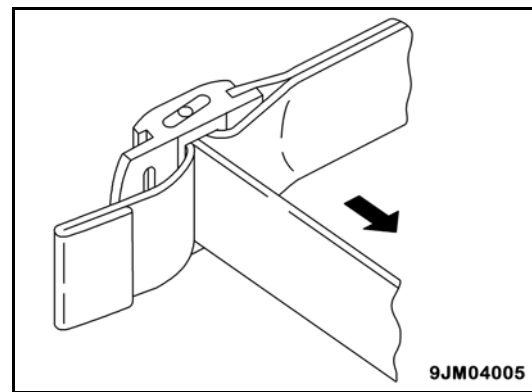
Fastening and Removing Seat Belt

Fasten the belt so that it is tight without being too tight.

1. Sit on the seat; depress the brake pedal fully; and adjust the seat so that your back is pressed against the backrest.
2. After adjusting the seat position, adjust tether belt (1). Tense the tether belt and install it when there is no one sitting on the seat.
3. Sit on the seat; pull the right side of the belt; insert tongue (3) into buckle (2) until you hear a click.
 - Fasten the belt along your body without kinking it.
4. Pull the belt to check that it is securely locked.
 - Adjust the lengths of the belt on both the buckle and the tongue sides so that the buckle is located at the front, mid-point of your body.
5. When removing the belt, press the red button in buckle (2) to free the belt.



Adjusting Belt Length

- ★ To make the belt shorter, pull the free end of the tether belt.
- 
- 9JM04004
- ★ To make the belt longer, set the fixed end of the tether belt at 90 degrees to the holder and pull.
- 
- 9JM04005

OPERATION

Adjust Lever Stand

⚠ WARNING

- When adjusting the lever stand, check that the work equipment lock lever is securely at the LOCK position.
- If the work equipment lock lever is not at the LOCK position and the work equipment control levers are touched by accident when adjusting the lever stand, the work equipment may suddenly move and cause serious personal injury.

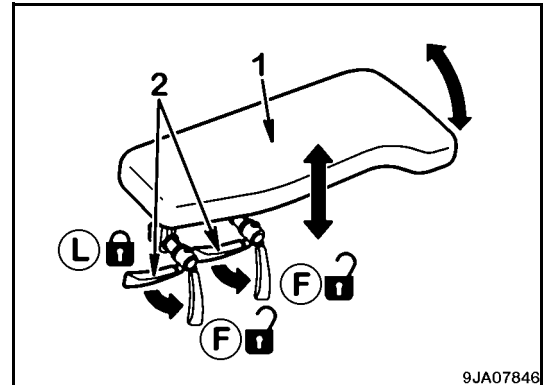
Adjust Height and Angle of Armrest

The height and angle of armrest (1) can be adjusted by loosening lock lever (2).

Height adjustment amount: 30 mm (1.18 in)

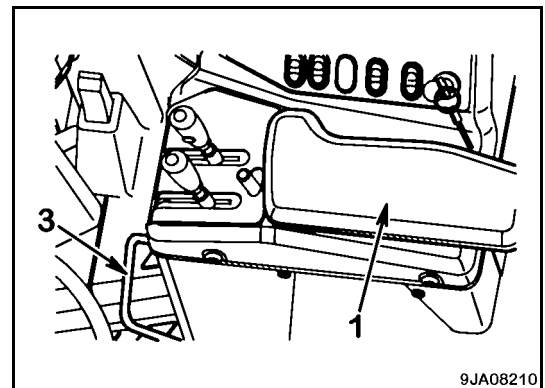
Angle adjustment amount:44 degrees

1. Set lock lever (2) to the FREE position (F). The lock lever is loosened.
2. Hold the armrest at the desired position and move the lock lever to the LOCK position (L) to secure the armrest in position.



Adjust Lever Stand Forward and Backward

1. Pull lever (3) up with your left hand and grip armrest (1) with your right hand.
2. Move the lever stand to the front or rear, then release lever (3).
Amount of adjustment: 180 mm (7.09 in)



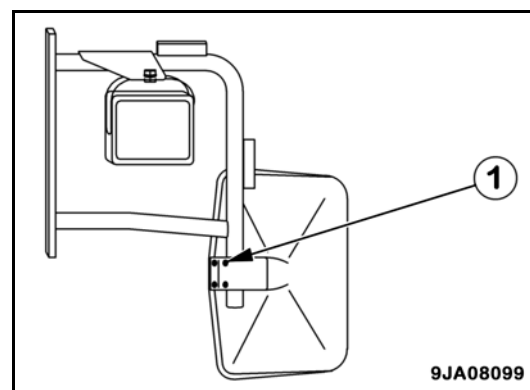
Adjust Mirrors

WARNING

- Be sure to adjust the mirrors before starting work. If the mirrors are not adjusted properly, you cannot ensure good visibility.
- The lack of adequate visibility could result in serious injury to you or anybody in the vicinity of the machine.

Mirrors A, B

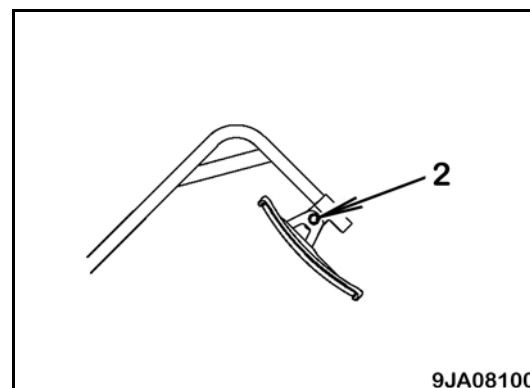
- Loosen bolt (1) of the mirror, then adjust the mirror to a position which gives the best view, from the operator's seat, of the blind spot at the left and right sides at the rear of the machine.
- When installing the mirror, adjust so that it is possible to see any person (or any object of a height of 1 m (3.28 ft) and diameter of 30 cm (11.8 in)) at the rear left or right of the machine.



Mirror C

Adjust mirror C so that it is possible to see the ground around the machine at a range of 1 m (3.28 ft) from the operator's seat.

- ★ If the movement of the mirror is stiff when adjusting it, loosen bolt (2) of the mirror.



OPERATION

Install the mirrors at the position and dimensions shown in the diagram. The following values are reference values for the range of visibility.

Range of view (left):2500 mm (8.20 ft)

Range of view (right):2500 mm (8.20 ft)

- ★ Mirror A: Must be possible to see hatched portion (A).
- ★ Mirror B: Must be possible to see hatched portion (B).
- ★ Mirror C: Must be possible to see hatched portion (C).

Remark

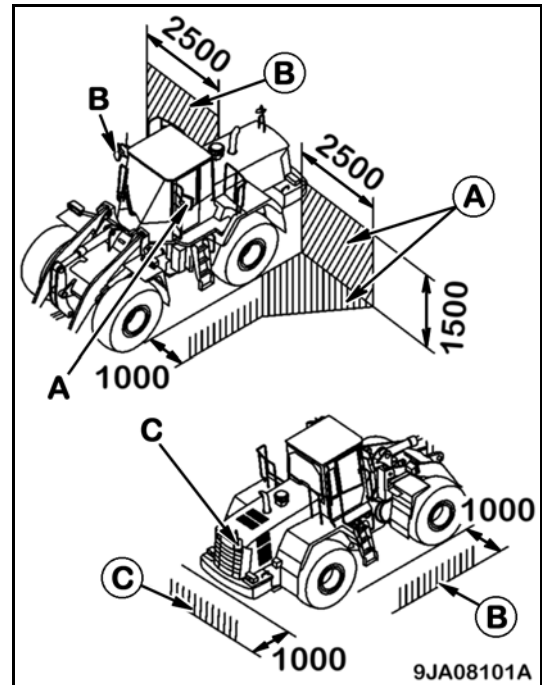
Tighten the mirror mounting bolts securely so that they do not loosen and the mirrors do not come off.

Tightening torque:

Mirrors A, B: 2.0 to 2.5 N•m (17.70 – 22.13 lbf in)

Mirrors C: 8.8 to 9.8 N•m (77.89 – 86.74 lbf in)

- ★ If the tightening torque cannot be controlled, ask your Komatsu distributor to tighten the bolts.

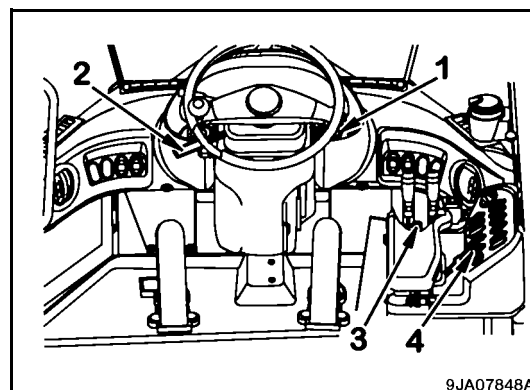


Final Checks Before Starting Engine

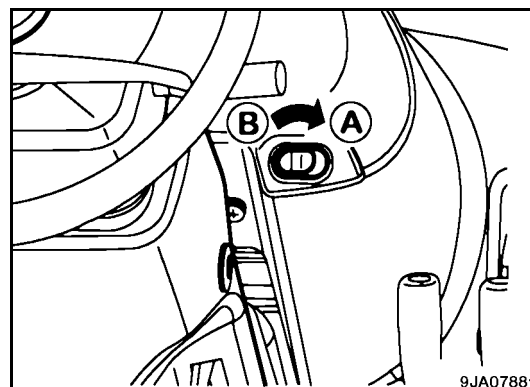
WARNING

- Before starting the engine, check that the work equipment lock lever is securely at the LOCK position.
- If the work equipment control lever is touched accidentally when the engine starts, the work equipment may move unexpectedly, leading to serious damage or personal injury.

1. Check that parking brake switch (1) is at the ON position (A).



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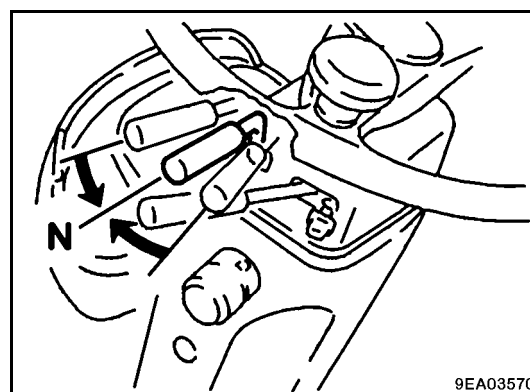


9JA07881

2. Check that directional lever (2) is at the Neutral (N) position.

Remark

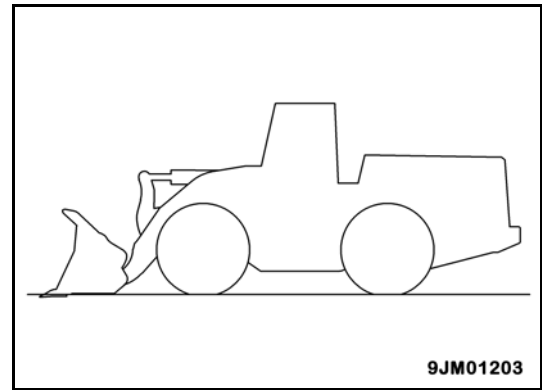
If directional lever (2) is not at the N position, the engine will not start.



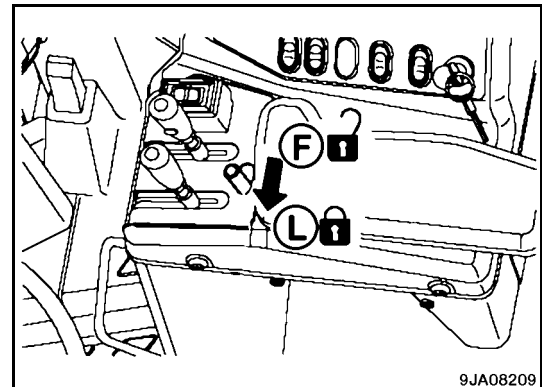
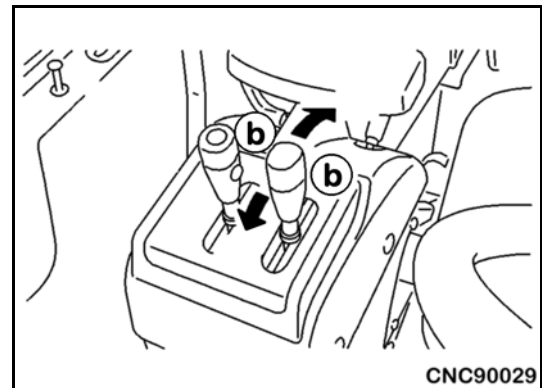
9EA03570

OPERATION

3. Lower the bucket to the ground.
 - Check that the work equipment control lever is at the HOLD position (b), then set the work equipment lock lever to the FREE position (F).
 - Operate the work equipment control lever (3) to lower the bucket to the ground.
 - Check that the work equipment control lever is at the HOLD position, then set the work equipment lock lever to the LOCK position (L).



4. Check that work equipment control lever (3) is at the LOCK position (L).



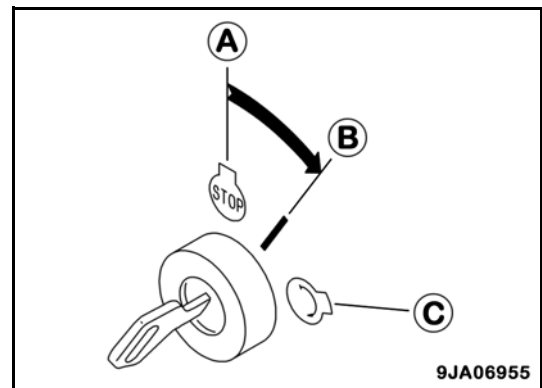
5. Insert the key in starting switch (4); turn the key to the ON position (B); and check that the machine monitor system works.

When the starting switch is at the ON position before starting the engine, all monitors, gauges, and central warning lamps light up for approximately two seconds. The alarm buzzer sounds for two seconds.

If any monitor lamps do not illuminate, there is probably a failure or disconnection. Contact your Komatsu distributor for inspection.

In addition, after all the monitors, gauges, and the central warning lamp light up, a self-check is carried out to verify that the emergency steering function works properly.

- ★ For details, see “Emergency Steering Self-Check Function” on page 2-118.



Starting Engine

Normal Starting

⚠ WARNING

- Sit down in the operator's seat before starting the engine.
- Do not attempt to start the engine by jumping across the engine-starting circuit. Such an act may cause serious bodily injury or fire.
- Check that there are no persons or obstacles in the surrounding area and then sound the horn and start the engine.
- Never use starting-aid fluids as they may cause an explosion.
- Exhaust gas is toxic. When starting the engine in confined spaces, be particularly careful to ensure good ventilation.

Remark

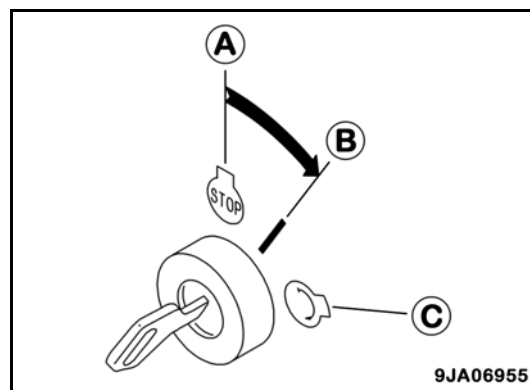
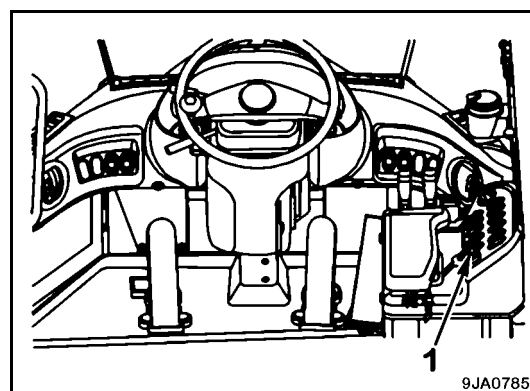
Do not keep the starting motor rotating continuously for more than 20 seconds. If the engine does not start, wait for at least two minutes before trying to start the engine again.

Do not accelerate the engine suddenly before completing the warming-up operation.

- ★ This machine is equipped with an engine automatic preheating device that functions to start the engine preheating automatically.

If the ambient temperature is low, the preheating monitor lights up when the key in starting switch (1) is turned to the ON position. This indicates that preheating has been started automatically.

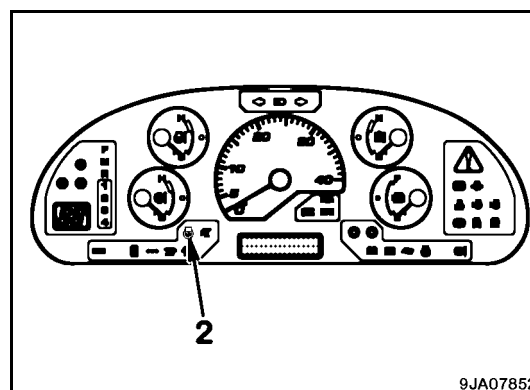
1. Turn the key in starting switch (1) to ON position (B).



If the ambient temperature is low, the preheating pilot lamp (2) lights up and automatic preheating is carried out. Keep the key in starting switch (1) at the ON position until the preheating pilot lamp (2) goes out.

The time that the preheating pilot lamp (2) stays illuminated depends on the ambient temperature as shown in the following table.

Ambient Temperature	Lighting Time
-1° to -15°C (30° to 5°F)	0 seconds to 30 seconds
Below -15°C or less (5°F or less)	30 seconds



OPERATION

- If the preheating pilot lamp (2) does not light up, or if it lights up and then goes out to indicate that the engine preheating has been completed, turn the key in starting switch (1) to the START position (C).

The starting motor will continue to turn and the engine will start.

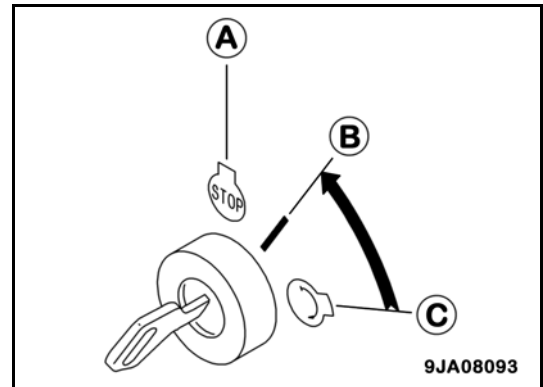
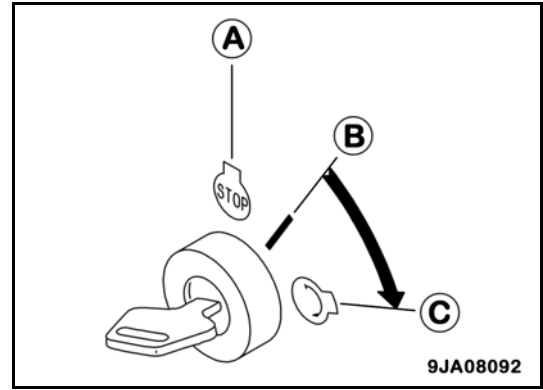
- Keep the key in starting switch (1) at the START position (C) to keep the starting motor running until the engine starts.

Remark

In low temperatures, to ensure lubrication of the engine and to improve its durability, no fuel is supplied to the engine for three seconds after the key in starting switch (1) is turned to the START position (C); the engine does not start during this time.

Keep the key in starting switch (1) at the START position (C) to keep the starting motor running until the engine starts.

- After the engine starts, release the key in starting switch (1). The key automatically returns to the ON position (B).



Starting Engine in Cold Weather

! WARNING

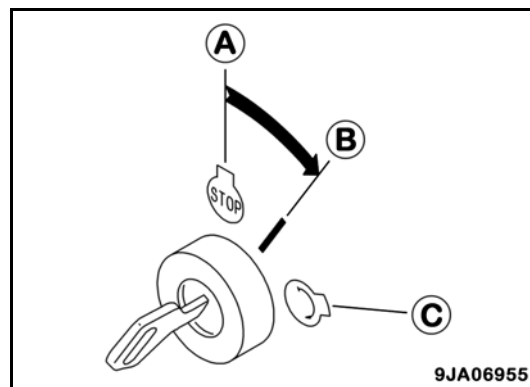
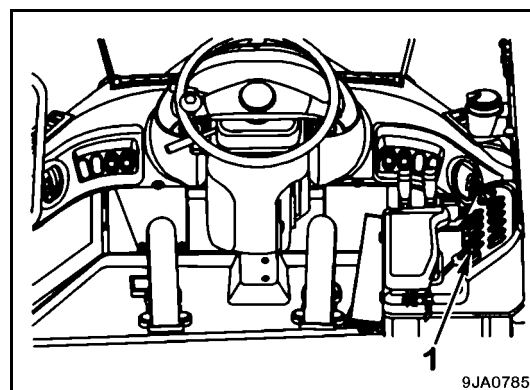
- Sit down in the operator's seat before starting the engine.
- Do not attempt to start the engine by jumping across the engine-starting circuit. Such an act may cause serious bodily injury or fire.
- Check that there are no persons or obstacles in the surrounding area, then sound the horn and start the engine.
- Exhaust gas is toxic. When starting the engine in confined spaces, be careful to ensure good ventilation.

Remark

Do not accelerate the engine suddenly before completing the warming-up operation.

- ★ When starting the engine after the machine has been left for more than half a day in temperatures near -20°C (-4°F), it will take time for the engine to achieve complete combustion. Operate the starting switch in the following manner.

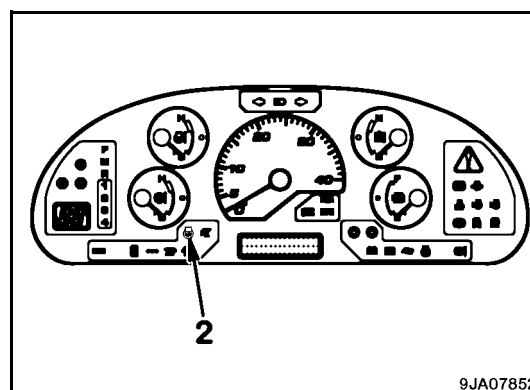
1. Turn the key in starting switch (1) to ON position (B).



If the ambient temperature is low, the preheating pilot lamp (2) lights up and automatic preheating is carried out. Keep the key in starting switch (1) at the ON position until the preheating pilot lamp (2) goes out.

The time that the preheating pilot lamp (2) stays illuminated depends on the ambient temperature as shown in the following table.

Ambient Temperature	Lighting Time
-1° to -15°C (30° to 5°F)	0 seconds to 30 seconds
Below -15°C or less (5°F or less)	30 seconds



OPERATION

2. When preheating pilot lamp (2) goes out, turn the key in starting switch (1) to the START position (C).

3. Keep the key in starting switch (1) at the START position (C) to keep the starting motor running until the engine starts.

The starting motor will continue to turn and the engine will start.

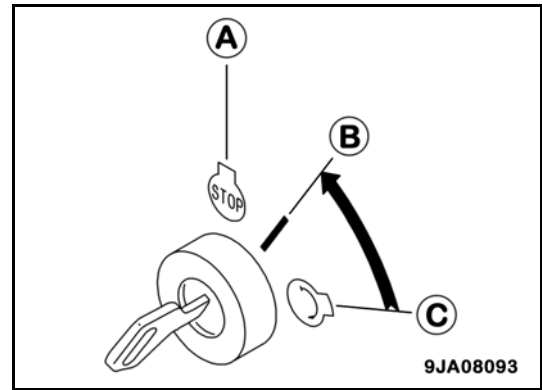
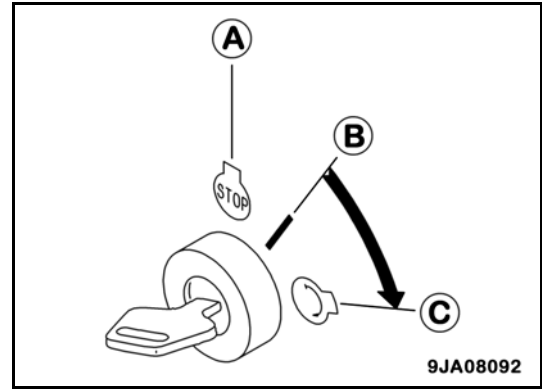
★ If the temperatures is approximately -20°C (-4°F)

A. Keep the engine starting motor running for the maximum 20 seconds, holding the key of engine starting switch (1) in the START position (C), until the engine starts.

B. If the engine fails to start up even after running the engine starting motor for about 20 seconds, stop the engine starting motor once (release the engine starting switch (1) key), and try the same process again after a pause for a minute or so.

C. If the engine still fails to start after the second attempt, try the same process for the third time after a pause for a minute or so.

4. After the engine starts and the engine speed rises, release the key in engine starting switch (1). The key automatically returns to the ON position (B).



Automatic Warming-Up Operation

If the engine water temperature is below -20°C (-4°F) after the engine starts, the automatic warming-up operation is actuated.

★ Engine speed 1000 rpm

When the water temperature rises above 30°C (86°F), the warming-up operation is canceled.

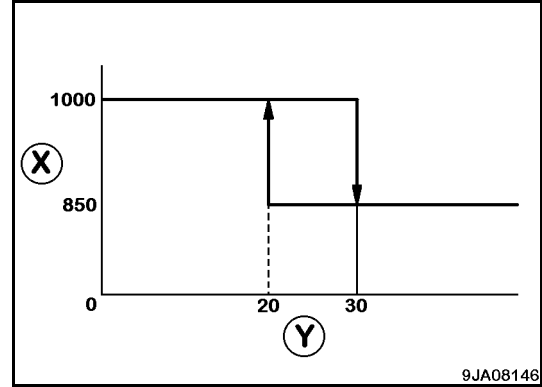
★ Engine speed 850 rpm

Remark

The automatic warming-up operation changes according to the engine water temperature (shown in the diagram to the right).

(X): Engine speed (rpm)

(Y): Water temperature ($^{\circ}\text{C}$)



Operations and Checks After Starting Engine

WARNING

- **Emergency stop:** If the operation is abnormal or any other trouble occurs, turn the key in the starting switch to the OFF position.
- If the work equipment is operated without warming up the machine sufficiently, the response of the work equipment to the movement of the control lever will be slow. The work equipment may not move as the operator desires. Do all warm-up procedures.
- In cold areas, make sure to warm up the machine properly.

Breaking in the Machine

WARNING

- Your Komatsu machine has been thoroughly adjusted and tested before shipment. However, operating the machine under severe conditions at the beginning can adversely affect the performance and shorten the life of the machine.
 - **Be sure to break in the machine for the initial 100 hours (as indicated by the service meter).**
 - **During breaking-in operations, follow the precautions described in this manual.**
-
- Idle the engine for five minutes after starting.
 - Avoid operations with heavy loads or at high speeds.
 - Immediately after starting the engine, avoid sudden starts, sudden acceleration, unnecessary sudden stops, and sudden changes in direction.

Checks After Starting Engine

Check Parking Brake

- Check that the parking brake works properly; see “Check Parking Brake” on page 2-88.
 - If there is any abnormality in the operation of the parking brake or the brake does not provide the proper braking effect, contact your Komatsu distributor for adjustment.

Check Brake Pedal

- Set the machine on level ground with no obstacles in the surrounding area. Drive the machine slowly forward and in reverse and check the braking effect of the brakes.
 - If there is any abnormality in the operation of the brakes, ask your Komatsu distributor to carry out adjustments.

Check Travel of Brake Pedal

- Depress the brake pedal fully and check the distance from the floor. Check that the pedal is not too close to the floor and that there is no abnormal feeling when operating the brake pedal.
 - If any abnormality is found, ask your Komatsu distributor to carry out adjustments.

OPERATION

Check for Ease of Starting Engine, Abnormal Noise

- When starting the engine, check that the engine does not make an abnormal noise and that it starts up easily and smoothly.
- Check that there is no abnormal noise when the engine is idling or when the revolution rises slightly.
 - When there is an abnormal noise at engine start-up and if that condition continues, the engine may be damaged. In that case, ask your Komatsu distributor to check the engine as soon as possible.

Check Engine at Low Speed and When Accelerating

- Check that there is no irregularity in the engine speed and that the engine does not suddenly stop when the machine is stopped during normal travel.
- Check that the engine accelerates smoothly when the accelerator pedal is depressed.
 - Carry out the inspection in a safe place and check that there is no one in the surrounding area.
 - If the condition at low speed or when accelerating is extremely poor and that condition continues, there is danger that the engine may be damaged, that the operation of the machine may become erratic, that the braking effect may deteriorate, or that an unexpected accident may happen.
 - Ask your Komatsu distributor to carry out repairs as soon as possible.

Check Location of Abnormalities from Previous Days

- Check the places where problems occurred when using the machine on previous days.
 - If any abnormality is found, contact your Komatsu distributor for inspection and repair.

Normal Operation

After starting the engine, do not immediately start operations. First, perform the following operations and checks.

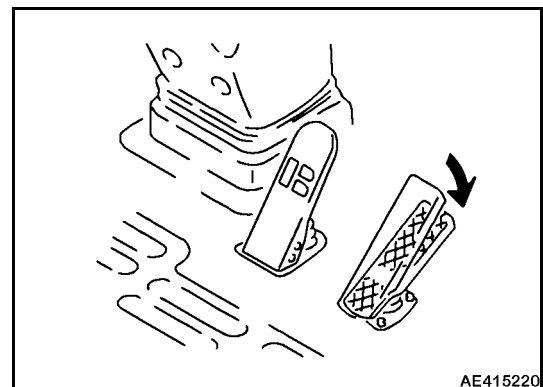
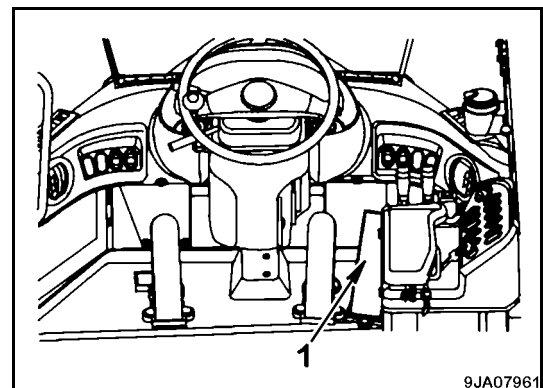
Remark

Do not suddenly accelerate the engine before the warming-up operation is completed.

Do not run the engine at low idle or high idle continuously for more than 20 minutes.

If it is necessary to run the engine at idle, apply a load from time to time or run the engine at a mid-range speed.

1. Depress accelerator pedal (1) lightly and run the engine with no load at mid-range speed for about five minutes.

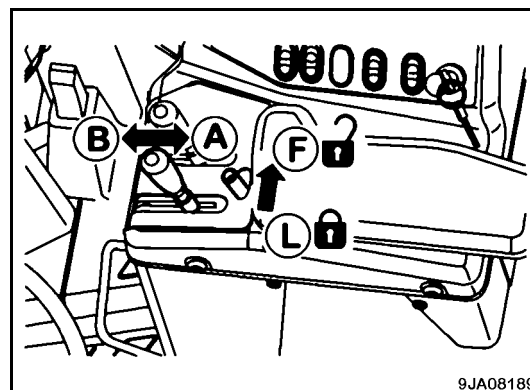


- Carry out the following operation to warm up the hydraulic oil in cold weather.

During the warming-up operation:

- Check that the engine rotation is smooth.
- Set the work equipment lock lever to the FREE position (F).
- Operate the bucket control lever to the TILT position (A) and return it to the HOLD position (B) repeatedly to warm up the hydraulic oil. Relieve the circuit at the TILT position (A) for a maximum of 10 seconds.

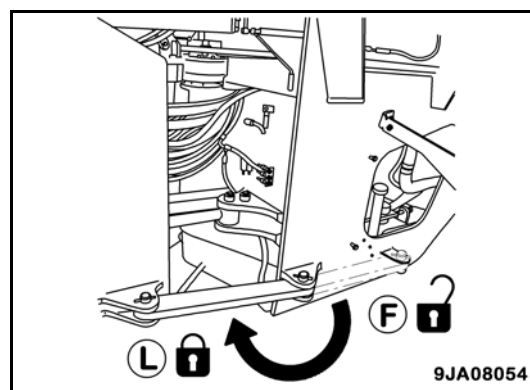
With this operation, the oil reaches the relief pressure and the hydraulic oil warms up more quickly.



- Slowly operate the steering wheel to the left and the right about ten times to warm up the hydraulic oil inside the steering valve.

⚠ WARNING

- If the steering wheel is operated and stopped while the oil temperature is low, there may be a time lag before the machine stops turning.
- In this case, use the frame lock bar to ensure safety, and perform the warm-up operation in a wide place.
- Do not relieve the hydraulic oil in the circuit continuously for more than five seconds.



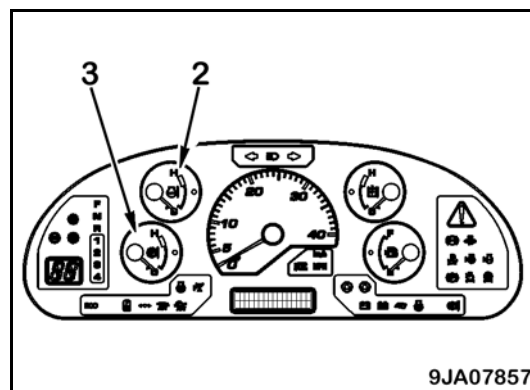
Remark

Turn the steering wheel a little and stop in that position. Confirm that the machine turns by an angle equivalent to the amount that the steering wheel is turned.

- After carrying out the warming-up operation, check that the gauges and caution lamps are normal. If there is an abnormality, carry out maintenance or repair.
- Run the engine under a light load until engine water temperature gauge (2) and torque converter oil temperature gauge (3) are in the green range.
- Check for abnormal exhaust gas color, noise, or vibration. If any problem is found, contact your Komatsu distributor.

- ★ The rotating speed of the cooling fan differs according to the following conditions, but this does not indicate any abnormality.

- The cooling fan speed increases when the hydraulic oil temperature, engine coolant temperature, or transmission oil temperature is high.
- When the cooling fan is rotating in reverse, it rotates at a fixed speed proportional to the engine speed, regardless of any oil or coolant temperature.



OPERATION

Stopping Engine

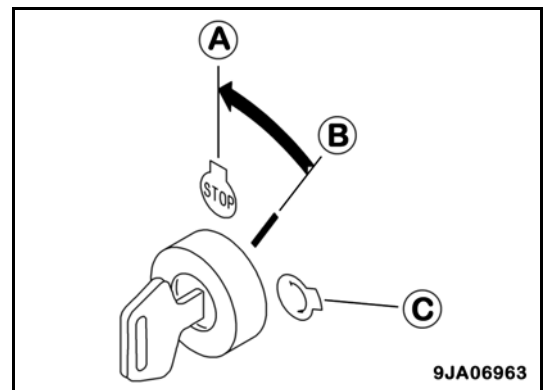
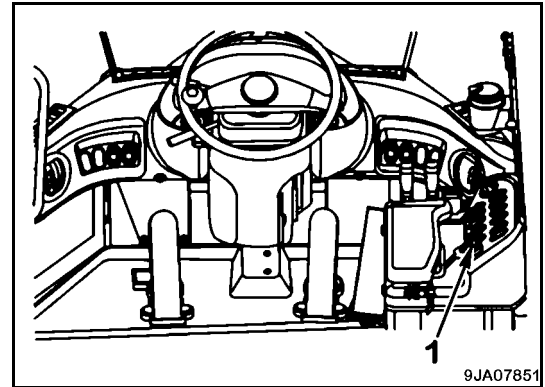
Remark

If the engine is abruptly stopped before it has cooled down, engine life may be greatly shortened.

Do not abruptly stop the engine except for an emergency.

If the engine has overheated, do not abruptly stop it but run it at medium speed to allow it to cool gradually and then stop it.

1. Run the engine at low idle for about five minutes to cool it down gradually.
2. Turn the key of starting switch (1) to the OFF position (A) to stop the engine.
3. Remove the key from starting switch (1).



Check After Stopping Engine

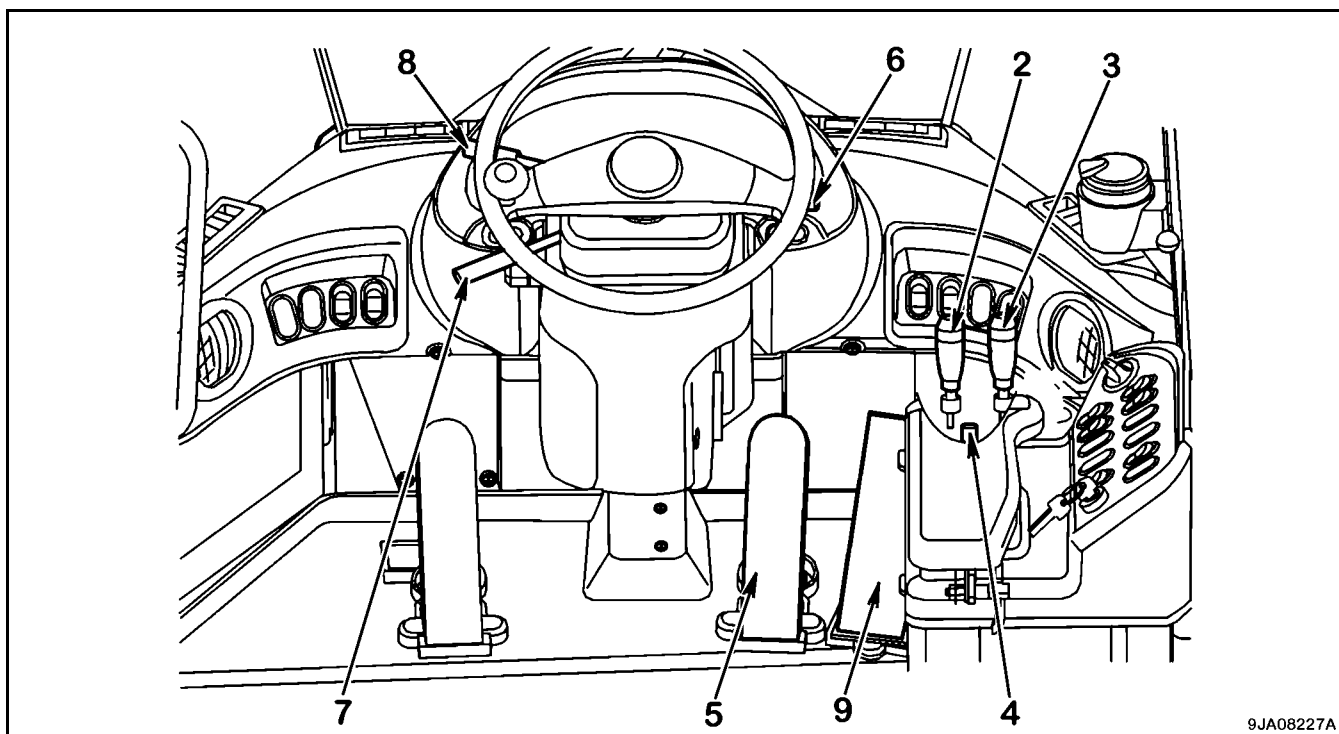
1. Walk around the machine and check the work equipment, bodywork, and undercarriage and check for oil and water leakage.
2. Fill the fuel tank.
3. Check the engine compartment for paper and debris. Clean out any paper and debris to avoid a fire hazard.
4. Remove any mud stuck to the undercarriage.

Moving the Machine (Directional, Speed), Stopping the Machine

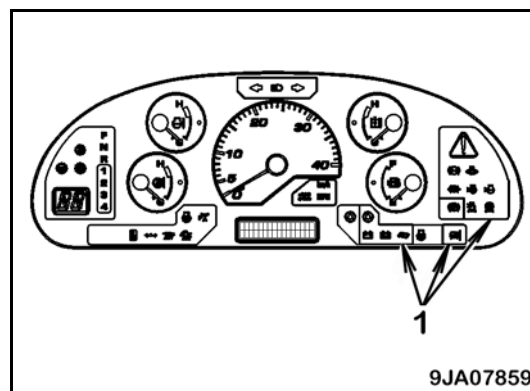
! WARNING

- Always remove the frame lock bar for travel operations. If it is not removed, the steering wheel cannot be used for steering. This may lead to serious damage or injury.
- When moving the machine, check that the area around the machine is safe and then sound the horn before starting.
- Do not allow people to get near the machine.
- Clear obstacles from the machine's travel path.
- The engine hood creates a blind spot at the rear of the machine. Be very careful when traveling in reverse.
- When starting the machine off up a slope, set the transmission cutoff switch to the OFF position and depress the left brake pedal. Then depress the accelerator pedal and gradually release the brake pedal to start the machine off. This makes it possible to prevent the machine from rolling back.

Moving the Machine

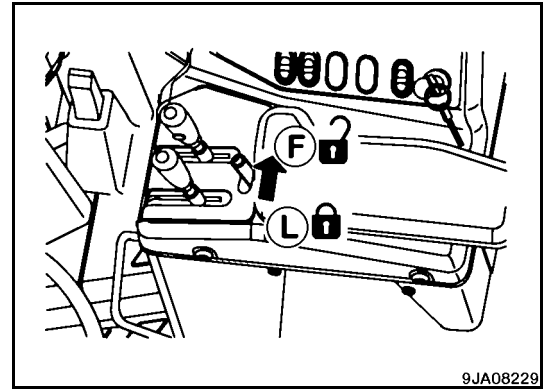


1. Check that caution lamp (1) is not illuminated.

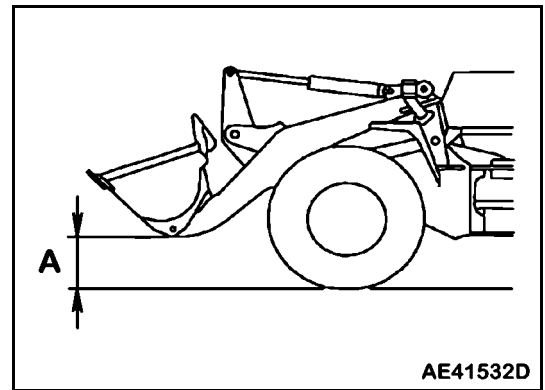


OPERATION

2. Check that the bucket control lever (2) and lift arm control lever (3) are at the HOLD position, then set the work equipment lock lever (4) to the FREE position (F).



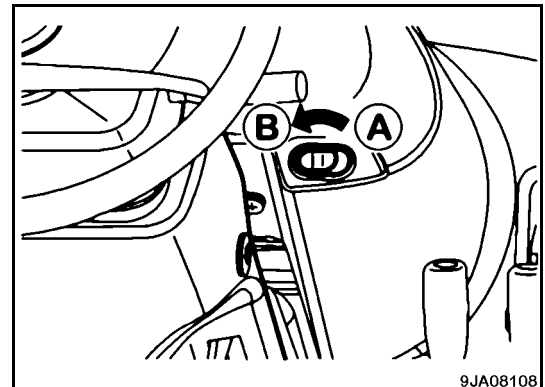
3. Operate lift arm control lever (3) to set the work equipment to travel posture (A).
(A): 40 – 50 cm (16 – 20 in)



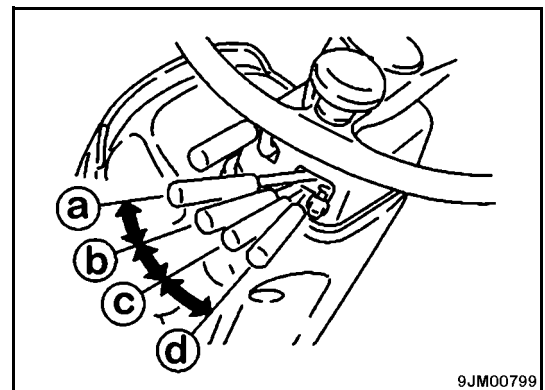
4. Depress right brake pedal (5) and then turn parking brake switch (6) to the OFF position (B) to release the parking brake. Keep right brake pedal (5) depressed.

Remark

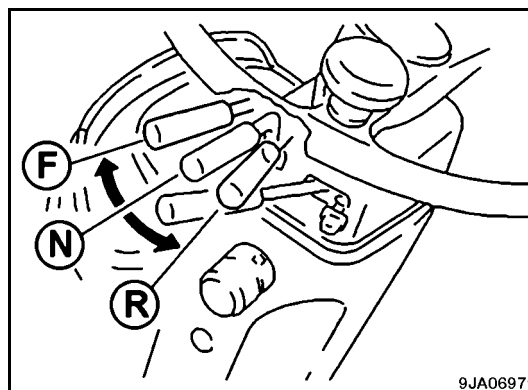
If the parking brake is still actuated when parking brake switch (6) is at the OFF position (B), turn the parking brake switch to the ON position (A), and then turn it to the OFF position (B) again.



5. Set gearshift lever (7) to the desired position.
 - Position (a): 1st
 - Position (b): 2nd
 - Position (c): 3rd
 - Position (d): 4th

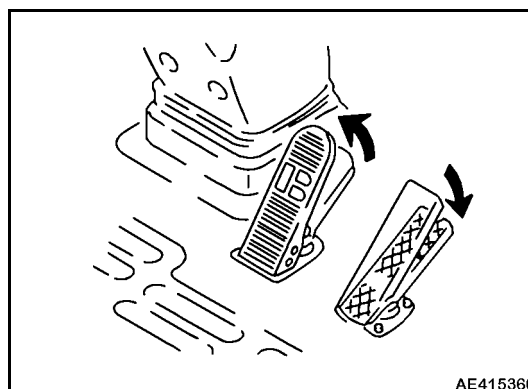


6. Set directional lever (8) to the desired position.
 - Position (F): Forward
 - Position (N): Neutral
 - Position (R): Reverse
- ★ Check that the backup alarm sounds when the directional lever is set to REVERSE. If the backup alarm does not sound, contact your Komatsu distributor for repairs.



9JA06971

7. Release right brake pedal (5) and then depress accelerator pedal (9) to move the machine off.



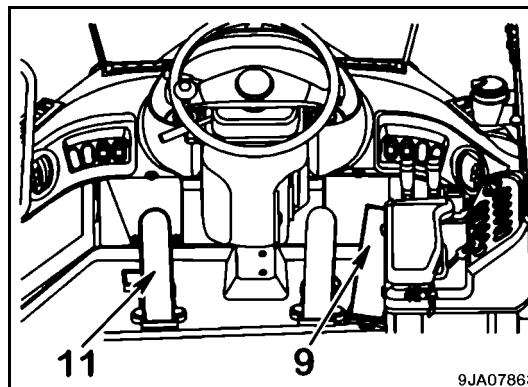
AE415360

Remark

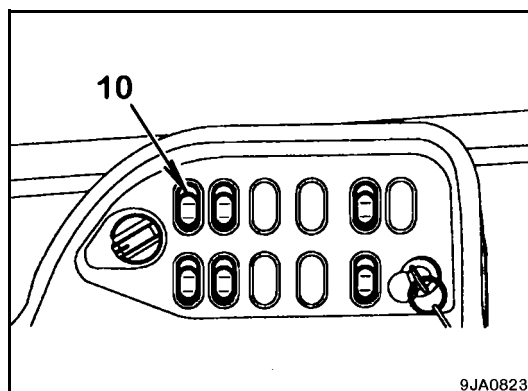
When starting off on a hill, turn the transmission cutoff switch (10) to the OFF position; depress left brake pedal (11); and operate the gearshift lever to the low speed range.

Depress accelerator pedal (9) and gradually release left brake pedal (11) to let the machine move.

This makes it possible to prevent the machine from rolling back.



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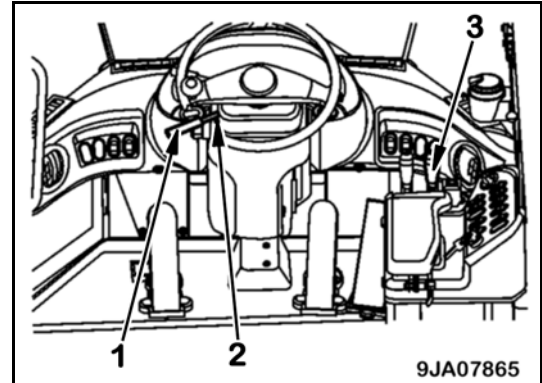
OPERATION

Changing Gear Speed

⚠ WARNING

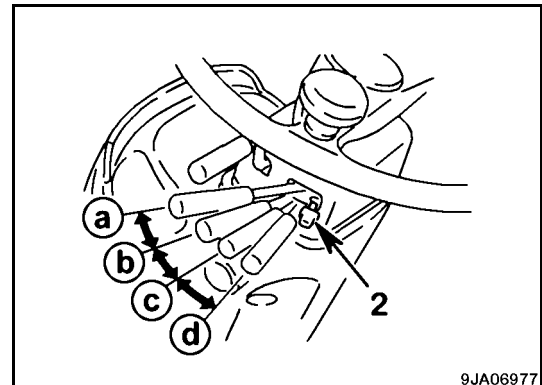
When traveling at high speed, do not shift gear suddenly. Use the brake to reduce the travel speed before shifting gear.

- ★ Shifting gear
- Move the gearshift lever (1) to the desired position.
- When carrying out digging and loading operations, use 1st and 2nd gears. Use the gearshift lever stopper (2).



- Position (a): 1st
- Position (b): 2nd
- Position (c): 3rd
- Position (d): 4th

- ★ This machine is equipped with a kickdown switch (3) that shifts the gear down to 1st if the button at the tip of the lift arm control lever is pushed when the machine is traveling in 2nd gear. We recommend the use of the kickdown switch when carrying out digging or loading operations in 1st or 2nd gear.

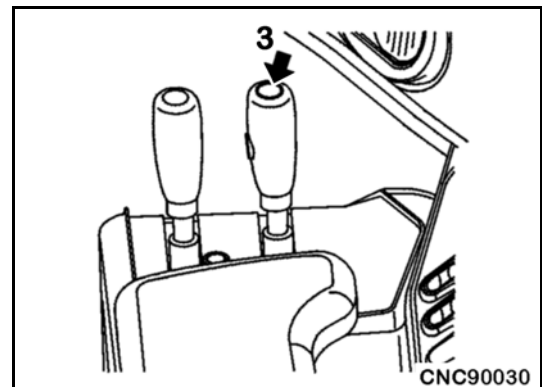


For details, see “Kickdown Switch” on page 2-50.

If the gearshift lever is operated slowly or if it is stopped between gear positions, the central warning lamp may light up and the alarm buzzer may sound. This is not a failure; the gearshift lever must be operated to complete the gearshifting within two seconds.

- ★ This machine is equipped with an auto-shift system that automatically shifts the gear. For details, see “Transmission Shift Mode Selector Switch” on page 2-45 and “Automatic Shift” on page 2-59.

When the machine is traveling at high speed and the gear shift lever is shifted down to a lower speed, such as 4th → 3rd or 4th → 2nd, with the accelerator still depressed, the transmission is not shifted down. This prevents the engine from overrunning.



In this case, the central warning lamp lights up and the alarm buzzer sounds. At the same time, “OVERRUN PROTECT” is displayed on the bottom line of the character display.

If the alarm buzzer sounds, release the accelerator pedal immediately and depress the brake pedal to reduce speed, then carry out the gearshift operation.

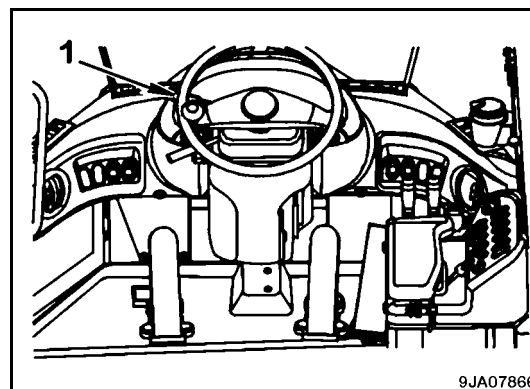
Changing Direction

⚠ WARNING

- When changing direction between FORWARD and REVERSE, check that the new direction of travel is safe. There is a blind spot behind the machine. Be particularly careful when changing direction to travel in reverse.
- Do not switch between FORWARD and REVERSE when traveling at high speed.
- When switching between FORWARD and REVERSE, depress the brake to reduce the travel speed sufficiently and then change the direction of travel. (Maximum speed for changing direction: 12 km/h (7.5 mph))

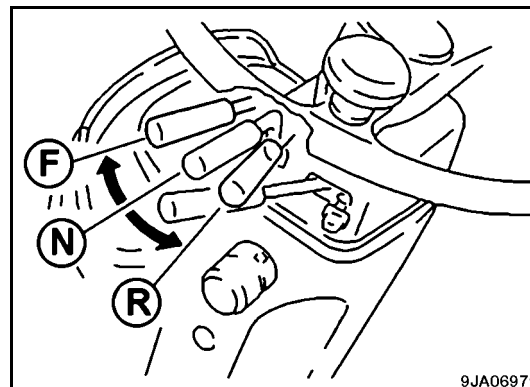
★ There is no need to stop the machine even when switching between FORWARD and REVERSE.

- Place directional lever (1) in the desired position.
 - Position (F): Forward
 - Position (N): Neutral
 - Position (R): Reverse
- Check that the backup alarm sounds when the directional lever is set to REVERSE. If the backup alarm does not sound, contact your Komatsu distributor for repairs.



Remark

If the directional lever is operated slowly or is stopped midway between forward and reverse, "E01 MAINTENANCE" may be displayed on the character display. This is not a failure; operate the directional lever to complete the directional shifting within two seconds.

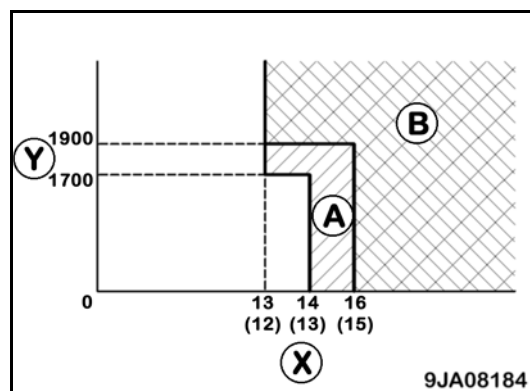


If an attempt is made to switch the direction between FORWARD and REVERSE while traveling at high speed (when using 3rd or 4th), the central warning lamp will light up and the alarm buzzer will sound if the travel speed and engine speed are in ranges (A) or (B) in the chart.

At the same time, "OVERRUN PROTECT" is displayed on the bottom line of the character display.

- If the alarm buzzer sounds, depress the brake pedal immediately to reduce speed, then operate the directional lever to switch between FORWARD and REVERSE.

(X): Travel speed (km/h)
 (Y): Engine speed (rpm)



★ Numbers inside () on chart are for machines fitted with 20.5-20-16PR tires.

OPERATION

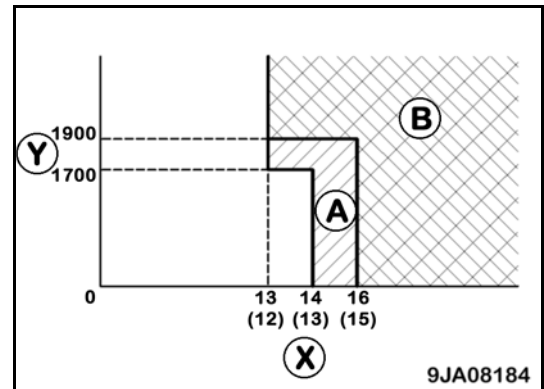
Using Auto-Shift

If an attempt is made to switch the direction between forward and reverse when the auto-shift is ON, normally, the gearshift range will switch F3 → R2, F4 → R2, or R3 → F2, R4 → F2 to make it possible to move the machine off quickly.

However, if an attempt is made to shift between forward and reverse when the machine is traveling at high speed, such as shown in ranges (A) or (B) in the chart, the central warning lamp will light up and the buzzer will sound. At the same time, "OVERRUN PROTECT" is displayed on the bottom line of the character display.

If the alarm buzzer sounds, depress the brake pedal immediately to reduce speed, then operate the directional lever to switch between FORWARD and REVERSE.

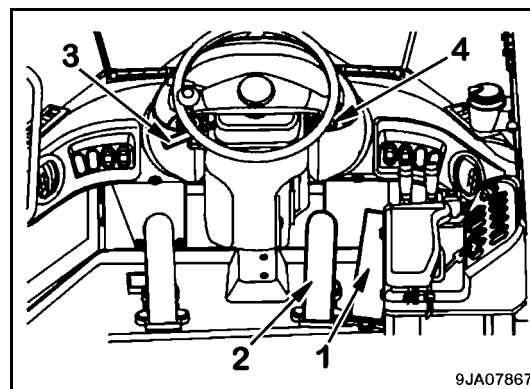
In particular, if an attempt is made to switch between forward and reverse in range (B), the speed range will not shift to 2nd, but will switch F3 → R3, F4 → R4, or R3 → F3, R4 → F4. As a result, the reduction in speed will be less than in range (A) and the machine will not slow down as quickly as you anticipated.



Stopping the Machine

⚠ WARNING

- Avoid stopping suddenly. Allow ample room when stopping.
- Do not park the machine on a slope. If it is necessary to park the machine on a slope, stop the machine facing directly down the slope; fit blocks under the tires; and lower the bucket to the ground to prevent the machine from moving.
- When the parking brake switch is turned ON, it is dangerous to release the brake pedal immediately. Always keep the brake pedal depressed until the parking brake pilot lamp lights up.

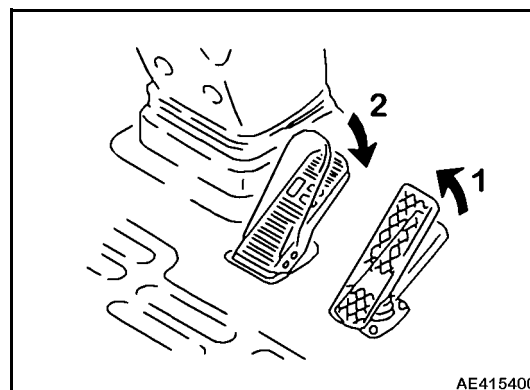


Remark

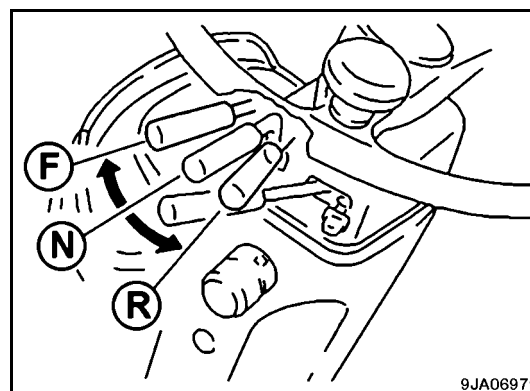
Never use the parking brake switch to brake the machine when traveling, except in an emergency.

Apply the parking brake only after the machine has stopped.

1. Release accelerator pedal (1) and then depress brake pedal (2) to stop the machine.



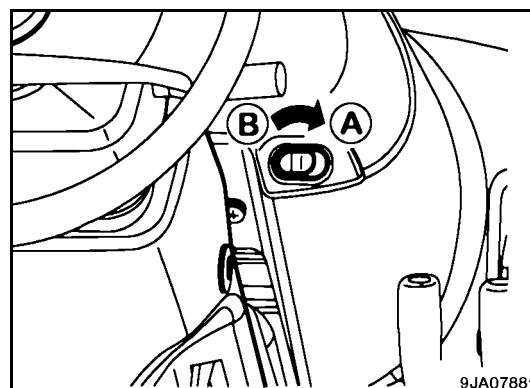
2. Place directional lever (3) in the N (neutral) position.



3. Turn parking brake switch (4) to the ON position (A) to apply the parking brake.

Remark

When the parking brake is applied, the transmission is automatically returned to neutral.



OPERATION

Transmission Cutoff Function

When the transmission cutoff switch is turned ON, the pilot lamp lights up and the transmission cutoff function is actuated.

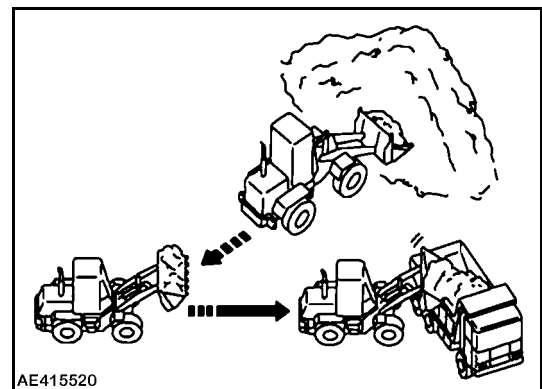
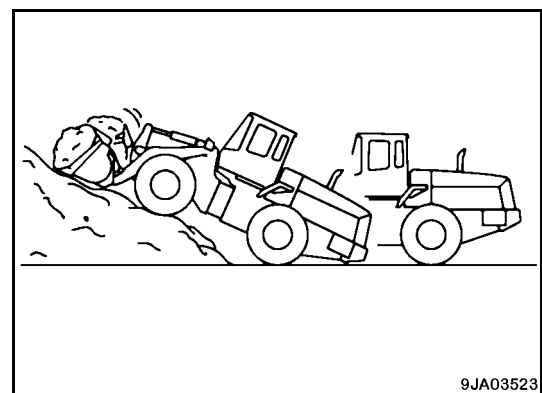
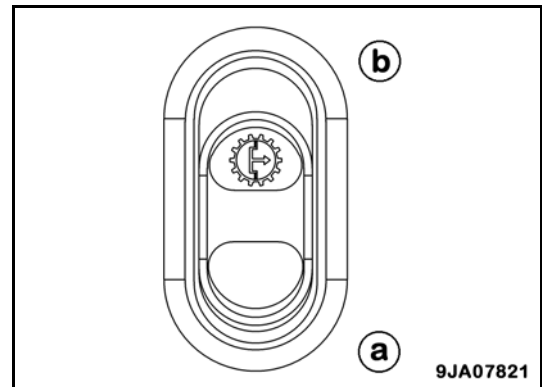
- Position (a): OFF
- Position (b): ON

When the brake pedal is depressed, the brakes are actuated and the transmission is returned to Neutral when the brake pedal is depressed to the set position.

- ★ For details about adjusting the set position for the amount that the brake pedal is depressed, see “Adjusting Transmission Cutoff Position” on page 2-115.

To match the following type of work, adjust the set position to cut off the transmission at a smaller or larger angle.

- When carrying out scooping-up work, lower the brake pedal depression position for the cutoff (transmission shifted to neutral). In this setting, the transmission driving force is cut at a point where there is ample braking force; this prevents the machine from slipping down.
- When approaching dump trucks during loading operations, raise the brake pedal depression position for the cutoff (transmission shifted to neutral). In this setting, the fine control of the braking immediately before dumping the load can be carried out with the brake only. This makes it easy to control and allows the machine to be brought to a soft stop.



Adjusting Transmission Cutoff Position

⚠ WARNING

Apply the parking brake before adjusting the transmission cutoff position.

★ Adjust the amount that the brake pedal is depressed for the set position to return the transmission to Neutral.

1. Start the engine with starting switch (1), then set parking brake switch (2) to the ON position.
2. Set transmission cutoff switch (3) to the ON position.
3. Depress brake pedal (4) and adjust the set position to return the transmission to Neutral.
4. Press transmission cutoff set switch (5), then release it. When the switch is released, the buzzer sounds with a repeated short sound, and the cutoff position is set.

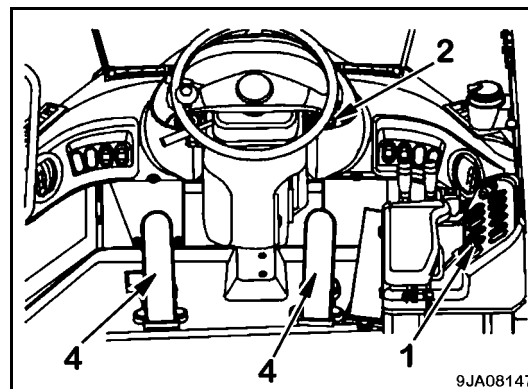
After the buzzer sounds, the transmission cutoff switch flashes for two seconds.

5. To cancel the cutoff position, press transmission cutoff set switch (5) again and release it while the transmission cutoff switch is flashing.

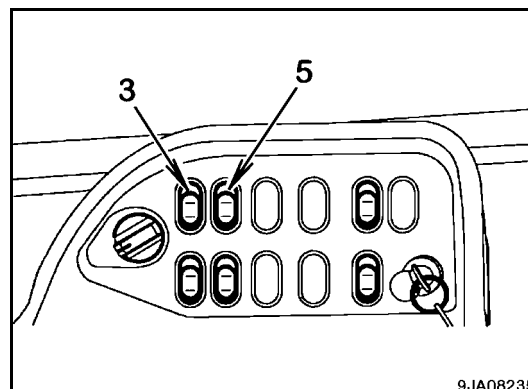
The buzzer will sound with a long sound and the adjusted cutoff position is canceled.

Stopping when Transmission Cutoff is ON

- If the brake pedal is depressed when the transmission cutoff switch is ON, the transmission is returned to Neutral when the brake pedal is depressed to the set position.
- When the transmission cutoff switch is OFF, the transmission is not returned to Neutral.



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OPERATION

Turning

WARNING

- Operating the steering wheel suddenly at high speed or operating the steering wheel on steep slopes is dangerous. Do not operate the steering wheel in such situations.
- If the engine stops when the machine is traveling, the emergency steering is actuated. This system is only for steering in emergencies; never stop the engine.
- It is particularly dangerous if the engine stops when the machine is traveling on slopes. Never let the engine stop when traveling on slopes.
- If the engine stops, stop the machine immediately in a safe place.

- When traveling, use steering wheel (1) to turn the machine.

With this machine, the front frame is joined to the rear frame at the center of the machine by the center pin. The front and rear frames bend at this point, and the rear wheels follow in the same track as the front wheels when turning.

- Turn the steering wheel lightly to follow the machine as it turns.

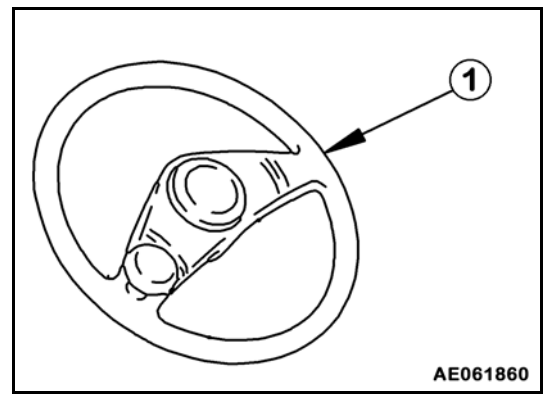
Remark

If the steering wheel reaches the end of its stroke when it is turned fully, do not try to turn it further.

Check that there is a play of 50 to 100 mm (2.0 to 3.9 in) in the steering wheel.

Check that the steering works properly.

If any abnormality is found, contact your Komatsu distributor for inspection.



Emergency Steering (if equipped)

! WARNING

- Never actuate the emergency steering except during emergencies or when checking the function.
- The emergency steering can be used continuously for a maximum of 60 seconds. Operating it continuously for more than 60 seconds may damage the system.
- When using the emergency steering, travel at less than 5 km/h (3.1 mph).
- If the steering becomes heavy, keep the emergency steering switch pressed; move the machine immediately to a safe place; then stop the machine.

The emergency steering system enables the operator to steer the machine under the following conditions.

- The starting switch is at the ON position.
- The steering oil pressure is low or there is no pressure. (When the engine has stopped or there is a failure in the steering oil pressure pump, etc.)

During emergencies or when stopping the engine to check the function, press emergency steering switch (1). Emergency steering pilot lamp (green) (2) lights up to inform the operator that the emergency steering system has been actuated.

When the starting switch is turned to the ON position, the emergency steering automatically carries out a self-check for three seconds. For details, see “Emergency Steering Self-Check Function” on page 2-118.

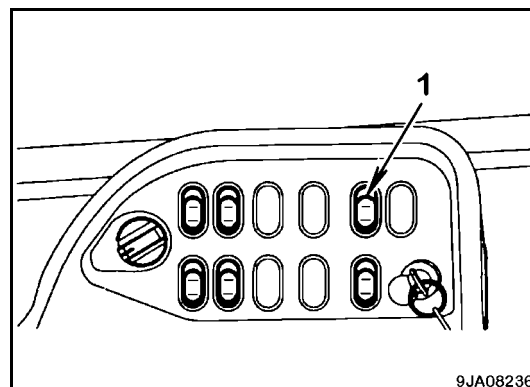
When the emergency steering controller detects lack of oil pressure in the steering system, steering oil pressure caution lamp (red) (3) and central warning lamp (4) light up, and the alarm buzzer sounds intermittently.

- If the machine is traveling at a speed of more than 2 km/h (1.2 mph) when this happens, the electric pump motor is automatically actuated and emergency steering pilot lamp (green) (2) lights up.
- Steering oil pressure caution lamp (red) (3) indicates that there is a failure in the steering system. If this happens:
 - Move the machine immediately to a safe place and stop it.
 - Locate the cause and do not operate the machine until it has been repaired.

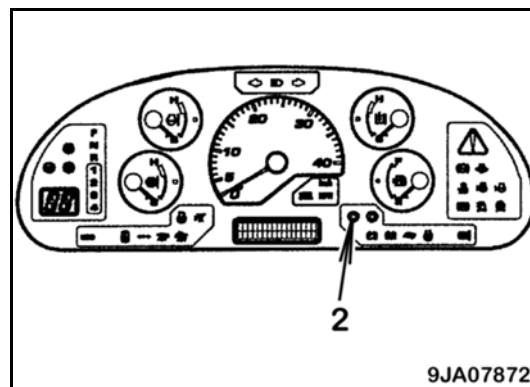
Remark

If any function of the oil pressure system is used when the engine is running at low speed, steering oil pressure caution lamp (red) (3) may light up for a moment; if the lamp goes out again soon, there is no problem.

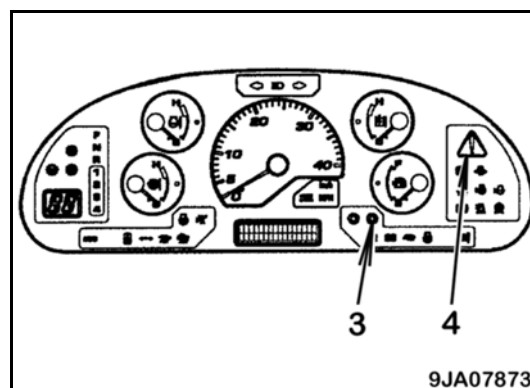
When the emergency steering controller detects that the oil pressure in the steering circuit has been restored, the actuation of the emergency steering system is stopped.



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OPERATION

Emergency Steering Self-Check Function

WARNING

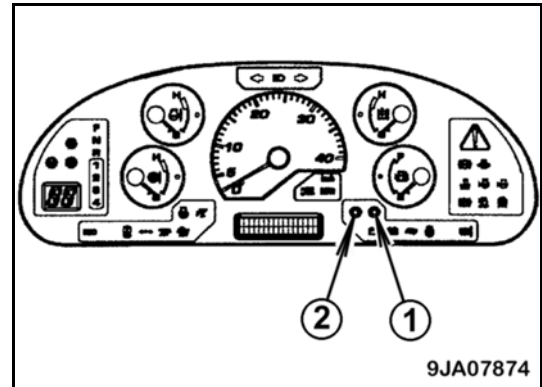
- If the machine is steered during the steering self-check, it may move.
- Do not steer the machine during the steering self-check.

When the starting switch is turned ON, the emergency steering is automatically actuated for approximately three seconds to check that the emergency steering is functioning properly.

When this happens, steering oil pressure caution lamp (red) (1) and emergency steering pilot lamp (green) (2) light up.

The emergency steering function check is not carried out in the following cases:

- If the starting switch is turned ON, turned OFF again without starting the engine, and is then turned ON again.
 - If the starting switch is turned ON again immediately after stopping the engine when the steering oil pressure has not gone down completely.
 - If the engine is being preheated.
- ★ If the engine is being preheated, the emergency steering self-check function is not actuated.
- ★ To check the emergency steering function, press the emergency steering switch after completing the warming-up operation.



Operation of Work Equipment

Lift arm control lever (1) and bucket control lever (2) can be used to operate the lift arm and bucket.

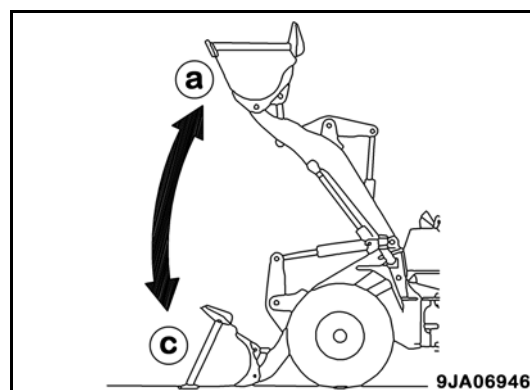
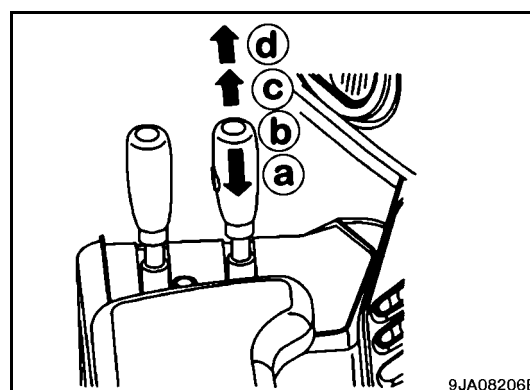
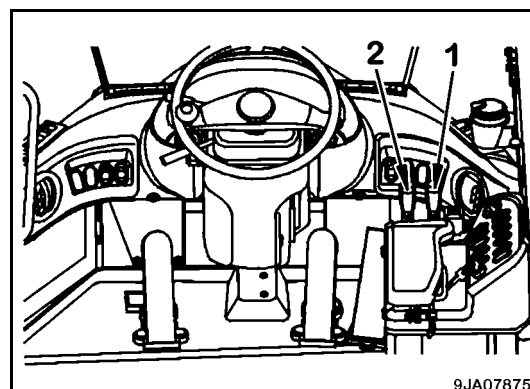
Lift Arm Operation

The lift arm control lever is used to operate the lift arm.

- Position (a): RAISE
 - When the lift arm control lever is pulled further from the RAISE position, the lever is stopped in this position until the lift arm reaches the preset position of the kickout, and the lever is returned to the HOLD position.
- Position (b): HOLD
 - The lift arm is kept in the same position.
- Position (c): LOWER
- Position (d): FLOAT
 - The lift arm moves freely under external force.

Remark

Do not use the FLOAT position when lowering the bucket. Use the FLOAT position when leveling; see "Leveling Operations" on page 2-124.

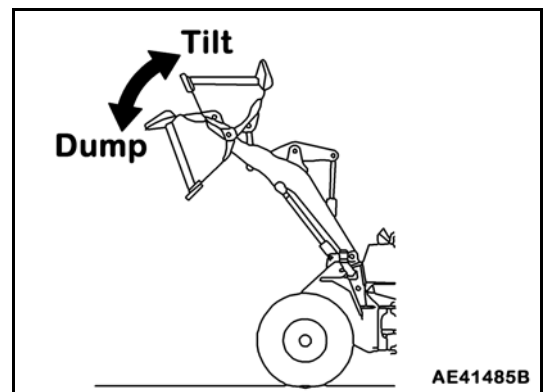
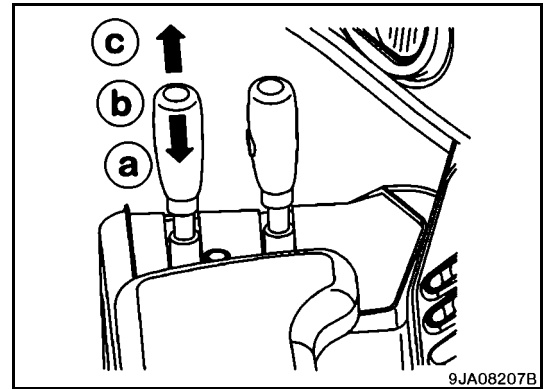


OPERATION

Bucket Operation

The bucket control lever is used to operate the bucket.

- Position (a): TILT
 - When the bucket control lever is pulled further from the TILT position, the lever is stopped in this position until the bucket reaches the preset position of the positioner, and the lever is returned to the HOLD position.
- Position (b): HOLD
 - The bucket is kept in the same position.
- Position (c): DUMP



Work Possible Using Wheel Loader

This section explains general operations. Be sure to operate the machine correctly.

In addition to the following operations, it is possible to further increase the range of applications by using various attachments.

Digging Operations

WARNING

- Never dig or scoop with the machine articulated. There is danger that the machine may tip over. Always set the machine facing directly to the front.
- Never raise the boom with the bucket fully loaded when the machine is articulated. There is danger that the machine may tip over.
- When the machine is traveling or the work equipment is raised, the moment that the travel damper switch is turned ON, the work equipment will move.
- If operations are carried out with the ECSS switch left at the ON position, the moment that the travel damper is actuated, the work equipment will move.

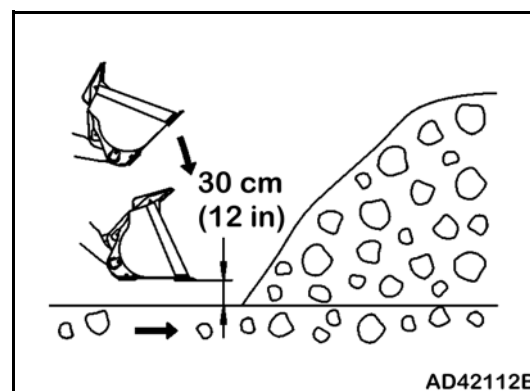
Remark

If the tires slip, the tire life will be reduced. Do not allow the tires to slip during operation.

Loading Piled Soil or Blasted Rock

When loading piled soil or blasted rock, drive the machine forward to load. To prevent cutting the tires caused by the tires slipping, be careful of the following points during the operation.

- Always keep the operating job site flat.
 - Remove any fallen rocks.
 - When working with stockpiles, operate the machine in 1st or 2nd gear.
 - When loading blasted rock, operate the machine in 1st gear.
1. When driving the machine forward and lowering the bucket, stop the bucket about 30 cm (12 in) from the ground and then lower it slowly.



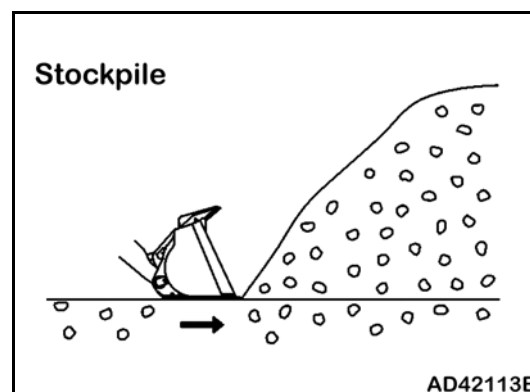
Remark

If the bucket hits the ground, the front tires will come off the ground and the tires will slip.

2. Shift down immediately in front of the material to be loaded. When completing the shift down, depress the accelerator pedal at the same time and thrust the bucket into the material.

Remark

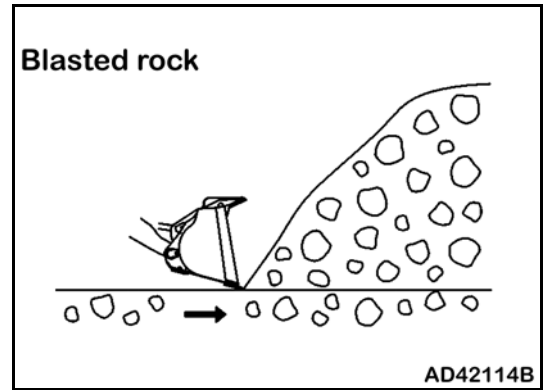
To reduce fuel consumption, depress the accelerator pedal the minimum possible amount. If it is depressed fully, the fuel consumption will increase but there will be no increase in the amount loaded.



OPERATION

3. When the material is in a stockpile, keep the cutting edge of the bucket horizontal; when loading blasted rock, have the bucket tilting slightly down.

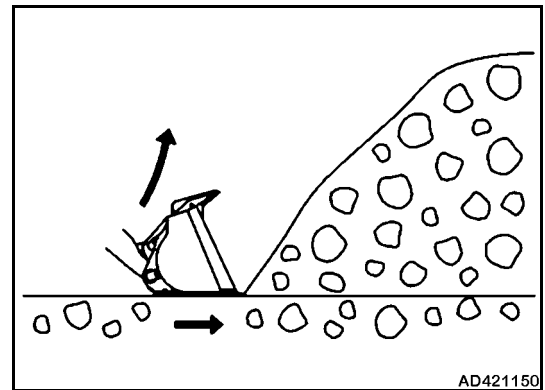
- Be careful not to get blasted rock under the bucket. This will make the front tires come off the ground and slip.
- Try to keep the load in the center of the bucket; if the load is on one side of the bucket, the load will be unbalanced.



4. At the same time as thrusting the bucket into the material, raise the lift arm to prevent the bucket from going in too far. By raising the lift arm, ample traction is produced by the front tires.

Remark

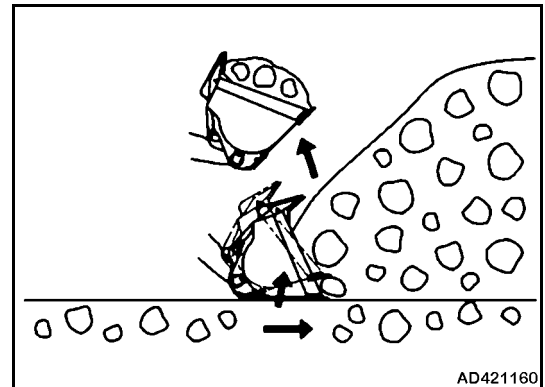
If the bucket is thrust too much and the lift arm stops rising or the machine stops moving forward, release the accelerator pedal a little. Proper operation of the accelerator pedal for each type of soil is effective for saving fuel and preventing tire wear.



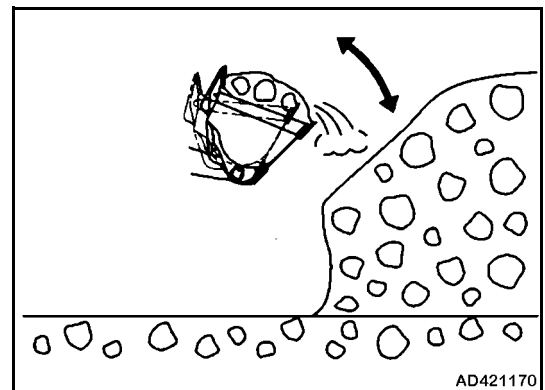
5. Check that there is enough material loaded into the bucket and then operate the bucket control lever to tilt the bucket and load the bucket fully.

Remark

If the bucket edge is moved up and down while pushing in the bucket and digging, the front tires will come off the ground. This will cause the tires to slip.



6. If there is too much material loaded in the bucket, dump and tilt the bucket quickly to remove the excessive load. This prevents spillage of the load during hauling.



Digging and Loading on Level Ground

⚠ WARNING

- Do not set the bucket facing down more than 20 degrees.
- If the bucket hits rocks in the ground first, a large shock is generated; this may damage the machine.

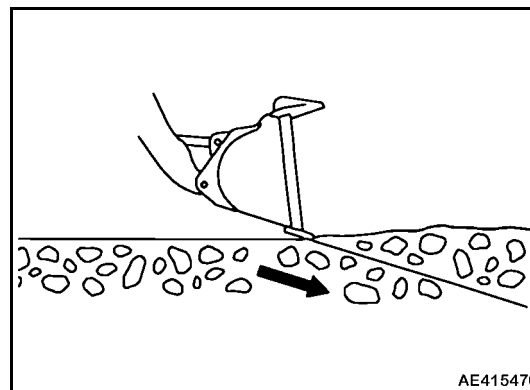
Remark

When digging and loading on level ground, set the bucket edge facing down slightly and drive the machine forward. Be careful not to load the bucket on one side and cause an unbalanced load.

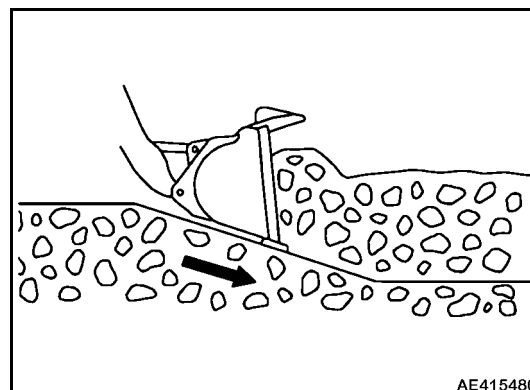
This operation should be carried out in 1st gear.

1. Set the edge of the bucket facing slightly down.
2. Drive the machine slowly forward; operate the lift arm control lever forward to cut a thin layer of the surface each time when excavating the soil.
3. Operate the lift arm control lever slightly up and down to reduce the resistance when driving the machine forward.

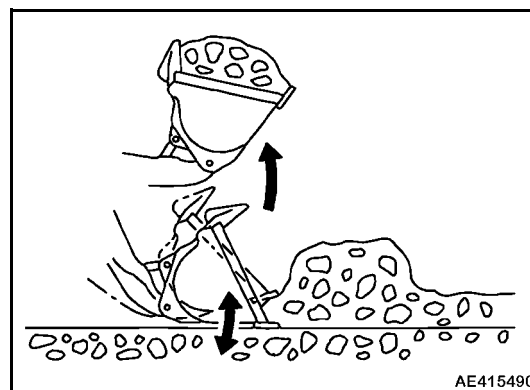
When digging with the bucket, avoid putting the digging force on one side of the bucket.



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OPERATION

Leveling Operations

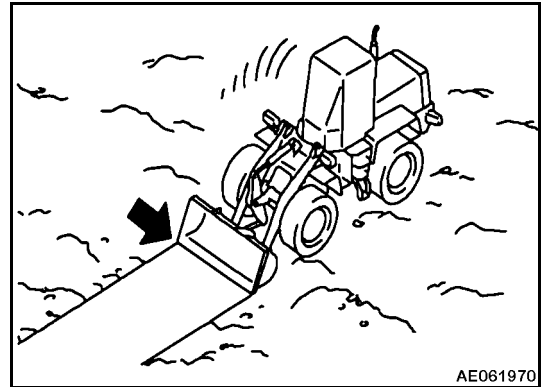
Remark

Always operate the machine in reverse when carrying out leveling operations.

If it is necessary to carry out leveling operations when traveling forward, do not set the bucket dumping angle to more than 20 degrees.

Turn the ECSS OFF when carrying out leveling operations.

1. Scoop soil into the bucket. Move the machine backward while spreading soil from the bucket, little by little.
2. Go over the spread soil with the bucket teeth touching the ground and level the ground by back-dragging.
3. Scoop some more soil into the bucket; put the lift arm control lever in FLOAT position; level the bucket at ground level; and smooth the ground by moving backward.



Pushing Operations

! WARNING

Never set the bucket to the DUMP position when carrying out pushing operations.

- ★ When carrying out pushing operations, set the bottom of the bucket parallel to the ground surface.

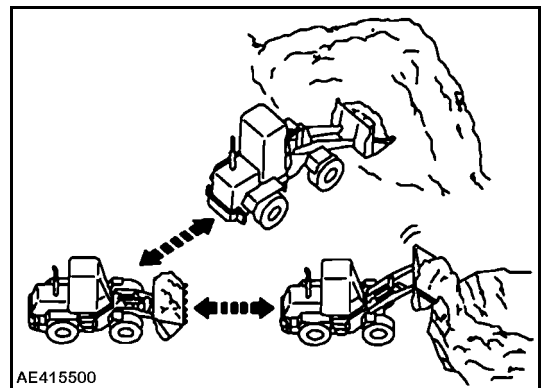
Load-and-Carry Operations

! WARNING

- **When carrying a load, lower the bucket to keep the center of gravity as low as possible when traveling.**
- **When the machine is traveling or the work equipment is raised, the moment that the ECSS switch is turned ON, the work equipment will move.**
- **If operations are carried out with the ECSS switch left at the ON position, the moment that the travel damper is actuated, the work equipment will move.**

The load-and-carry method for wheel loaders consists of a cycle of scooping → hauling → loading (into a hopper, truck, etc.).

- Always keep the travel path properly maintained.
- When using the load-and-carry method, see “Precautions for Using Load-and-Carry Method” on page 2-158.



Loading Operations

! WARNING

- Always keep the working area flat. Do not turn suddenly or apply the brakes suddenly while traveling with a raised load. This is dangerous.
- While loading, never thrust the bucket in soil or crushed rock when traveling at high speed. This is dangerous.
- When the machine is traveling or the work equipment is raised, the moment that the ECSS switch is turned ON, the work equipment will move.
- If operations are carried out with the ECSS switch left at the ON position, the moment that the travel damper is actuated, the work equipment will move.

Select the method of operation which will give the minimum amount of turning and travel in order to provide the most efficient method for the job site.

Remark

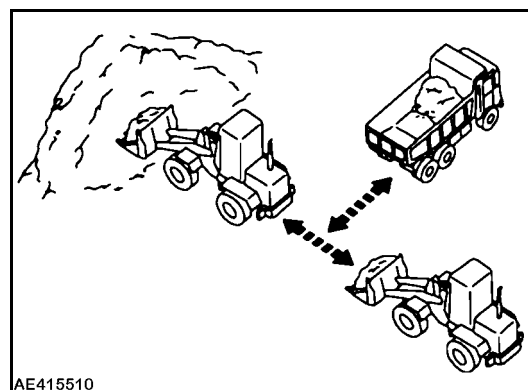
If the tires slip, the tire life will be reduced. Do not allow the tires to slip during operation.

Avoid excessive bucket shaking.

Cross-Drive Loading

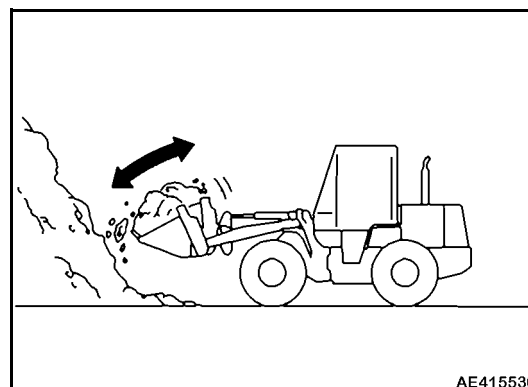
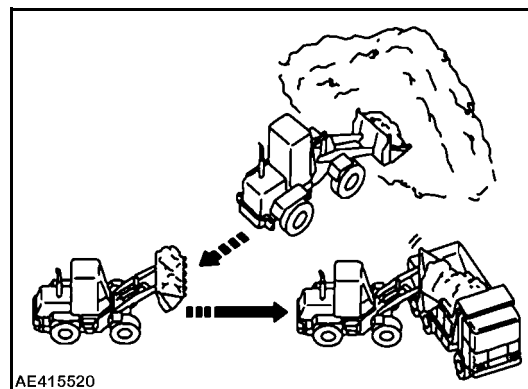
This method requires the least time for loading and is extremely effective in reducing the cycle time.

- Always set the wheel loader facing at a right angle to the stockpile.
- After digging in and scooping up the load, drive the machine straight back in reverse and then bring the dump truck in between the stock pile and the wheel loader.



V-Shape Loading

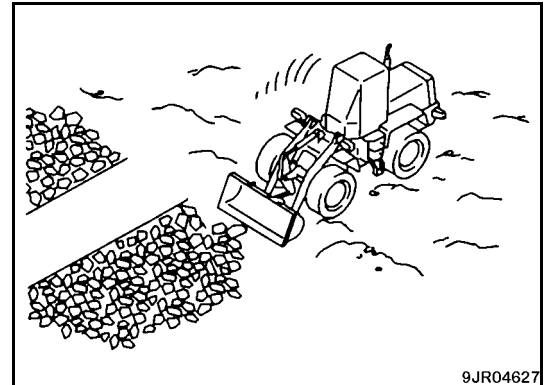
- Position the dump truck so that the direction of approach of the wheel loader is approximately 60 degrees from the direction of approach to the stockpile.
- After loading the bucket, drive the wheel loader in reverse; turn it to face the dump truck; and travel forward to load the dump truck.
 - ★ The smaller the turning angle of the wheel loader, the more efficient the operation becomes.
 - ★ When loading a full bucket and raising it to the maximum height, first shake the bucket to stabilize the load before raising the bucket. This will prevent the load from spilling to the rear.



OPERATION

Preparations for Loading, Gathering Rocks

- ★ Always keep the job area level and remove any rocks or boulders.
 - When gathering rocks, if the operation is carried out over an area longer than the length of the machine, there is danger that the machine will ride up on boulders and incur cuts to the tires. When gathering rocks, always carry out the operation in an area shorter than the length of the machine.
 - When carrying out operations with the bucket in contact with the ground, do not articulate the machine. Articulation will cause tire slippage and damage to the machine.
1. Put the bucket horizontally in contact with the ground; drive forward; and gather the rocks that have been scattered after loading and after splitting or blasting.
 2. After collecting the rocks in an area the length of the machine, change the direction of the machine to gather rocks and increase the area of level ground.



Approaching Facing

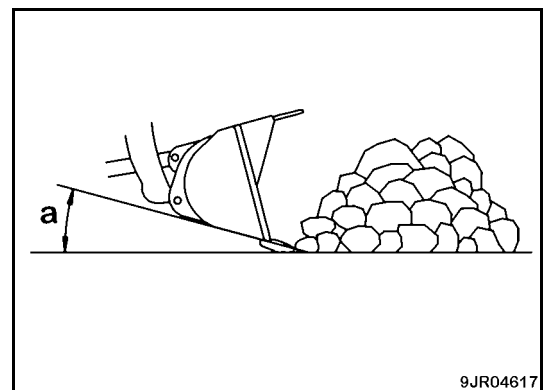
- When approaching the facing and lowering the bucket to the ground, do not drop the bucket suddenly into contact with the ground.

If the bucket is dropped suddenly, the bucket, work equipment, area around the pins, and the machine frame will be subjected to excessive shock. This will lead to damage or deformation of various parts of the machine. In addition, the front wheels will come off the ground and cause the machine to slip.

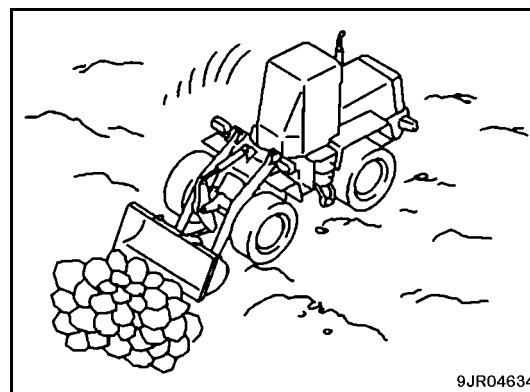
- When lowering the bucket to the ground, reduce the lowering speed of the bucket when it is close to the ground and bring it slowly into contact with the ground.
- Do not set the cutting edge of the bucket at a large angle to the ground surface when digging or lowering the roadbed. Keep the angle between the bucket and the ground surface to a maximum of 8° .

If the angle between the cutting edge of the bucket and the ground surface is more than 8° when digging or lowering the roadbed, there is danger of damage to the work equipment.

- Do not load the bucket or scoop up the load with the load on the corner of the bucket or on one side of the bucket. This will cause the machine to twist and will reduce the service life of the work equipment and the frame.
1. Set the machine to the travel posture.
 2. Set the shift position to F2; gradually depress the accelerator pedal; and raise the travel speed.
 3. When lowering the bucket to the ground, reduce the lowering speed of the bucket when it is close to the ground and bring it slowly into contact with the ground.
 4. Make angle (a) between the bucket and the ground surface a maximum of 8° . Operate the tilt and dump so that only the cutting edge comes in contact with the ground.



5. Drive forward at right angles to the rock and change the direction that the machine is facing.
6. Operate the accelerator to match the condition of the road surface so that the tires do not slip.
7. Scoop up the gathered rock. Load hard-cutting rock or boulders in the middle of the bucket.



Digging

- Do not shift down with the accelerator pedal depressed (with the engine speed raised).

If the transmission is shifted down when the engine speed is high, there will be an excessive load on the engine, torque converter, transmission, axles, final drive, and the whole power train.

- When thrusting the bucket in, shift down to 1st.

If the bucket is thrust in at high speed, there will be an impact load on the machine. This will reduce the service life of the machine.

- When shifting down, release the accelerator pedal to reduce the engine speed before shifting down and then gradually depress the accelerator pedal.

If the accelerator is operated suddenly after shifting down, there will be an excessive load placed on the engine and power train.

- Do not carry out operations with the machine articulated.

If the machine is articulated, the direction of force will be different on the front wheels and rear wheels. As a result, the power, when traveling, will not be transmitted fully to the front wheels. This will reduce the digging force and place an excessive load on the center hinge pin. In addition, even with the front wheels, the power will not be transmitted uniformly to the left and right wheels. The load will be placed on one wheel thus reducing the service life of the tire on one side.

- Do not push the bucket in too far. If it is pushed in too far, a heavy load will be placed on the machine. This will reduce the service life of the work equipment and frame.
- Operate the control lever slowly near the end of the bucket tilt operation.

If the control lever is operated suddenly, an impact load will be placed on the tilt cylinder. There is danger that the cylinder may be damaged.

- When close to a pit excavation, do not let the front wheels rise up on the cutting face. The rocks will cut the tires.

1. Immediately in front of the rock, let the accelerator pedal back and shift down from 2nd to 1st.
2. After shifting down, depress the accelerator pedal gradually and push the rock.

OPERATION

3. Raise the lift arm slightly and increase the driving force of the front wheels. When doing this, do not push the bucket in too far.

Remark

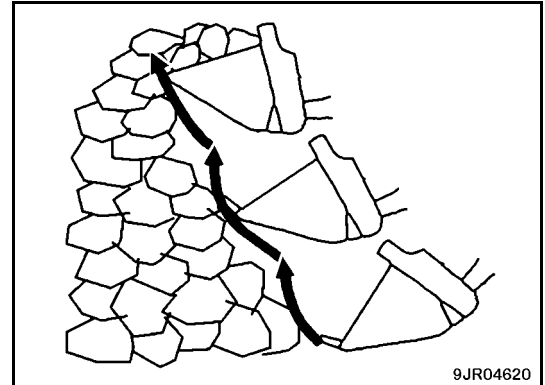
When digging up large rocks, in some cases it may be better not to raise the lift arm too high. If the lift arm is raised too high, the rear wheels may come off the ground.

4. After loading the rock completely into the bucket, operate the bucket tilt and lift two to three times repeatedly to fill the bucket.
5. Let back the accelerator pedal; operate the control levers slowly; and tilt the bucket back fully.
6. To prevent the load from falling out of the bucket, after completing the scooping-up operation operate in the dump and tilt direction when the bucket is near the full tilt in order to stabilize the load.

Remark

If the brakes are operated lightly before traveling in reverse, it is possible to stabilize the load in the bucket.

To prevent generation of heat in the torque converter, keep the standard time for digging to within 10 seconds from the start of pushing the bucket in to the completion of scooping up.



Traveling in Reverse After Excavation

- Do not operate the steering immediately after starting to travel in reverse. The bucket is still thrust into the rock.

If the steering is operated, excessive force will be placed on the bucket or frame. There is danger of damage to the frame.

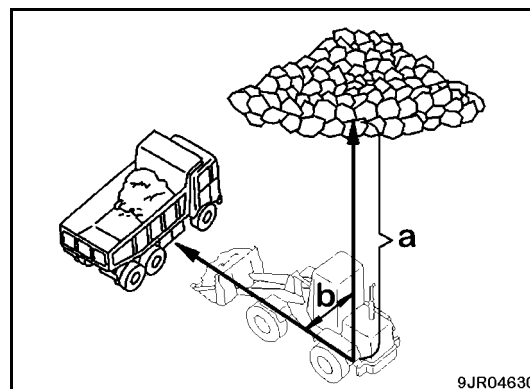
- After shifting the transmission, operate the accelerator pedal slowly.

If the accelerator pedal is operated suddenly, the tires will slip and cause wear or cutting of the tires.

- After completing the excavation, shift to R2 and travel in reverse without operating the steering.

- As a guideline, reverse travel distance (a) should be 1.2 to 1.5 times the length of the machine. At this distance, the rolling of the tires can prevent wear to the tires.

In addition, keep an angle (b) of 60° at the intersection between the straight line from the dilution and the straight line from the dump truck.



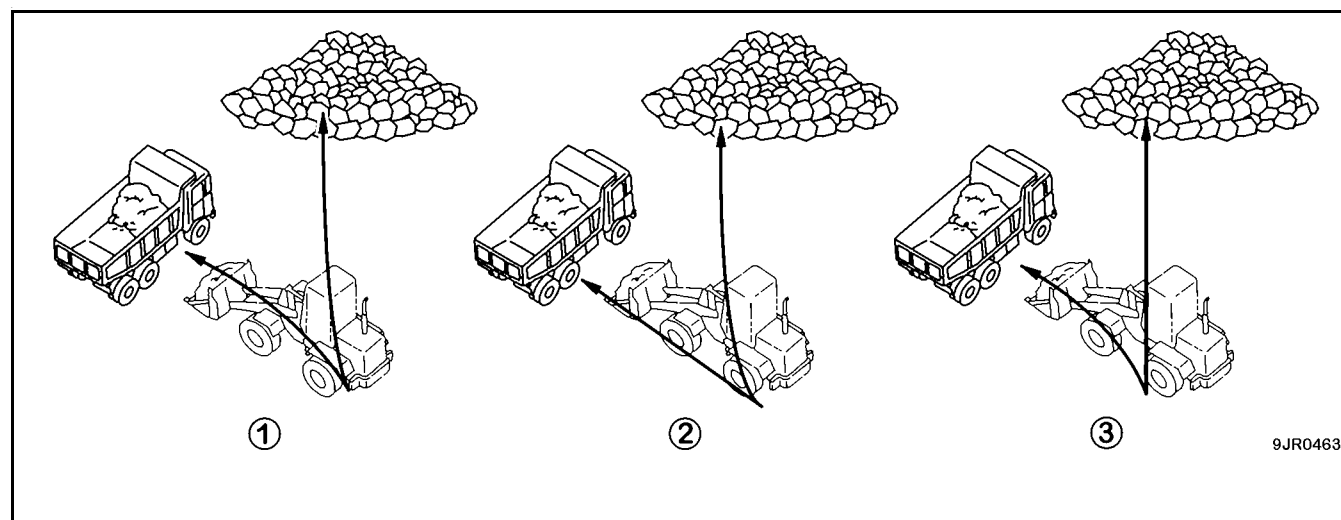
9JR04630

Remark

Decide the steering procedure to match the stopping point of the dump truck and the condition of the dilution. When doing this, decide the stopping point for the dump truck so that the operating angle for the steering is less than 20° .

- When driving in reverse, do not raise the bucket more than necessary.

Consider the position of the dump truck, the condition of the road surface, the travel speed, and the speed of the work equipment when deciding the height of the bucket. However, do not raise the bucket so that the top of the load is higher than the horizontal line of sight from the operator.



9JR04637

- Gradual steering to left or right
- Gradual steering to dilution
- Direct line to dilution

OPERATION

Approaching Dump Truck

WARNING

Do not operate the steering suddenly when the bucket is raised. If the steering is operated when the bucket is raised, there is danger that the machine may tip over and cause serious personal injury.

Remark

- Do not shift down with the accelerator pedal depressed (with the engine speed raised).

If the transmission is shifted down when the engine speed is high, there will be an excessive load on the engine, torque converter, transmission, axles, final drive, and the whole power train. In addition, the tires will slip; this will cause wear of the tires.

- Do not operate the steering immediately after switching between forward and reverse (when the machine is stationary).

If the steering is operated when the machine is stationary, it will cause wear or cuts to the tires.

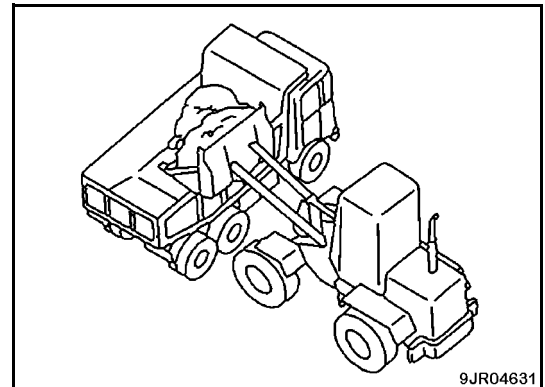
- If a transmission cutoff system is installed, turn the transmission cutoff switch to the OFF position and depress the brake, but do not raise the bucket.

In this condition, the brake is operated. Heat is generated in the brake chamber; this heat will cause heat fatigue to parts inside the axle.

1. Let the accelerator pedal back to reduce the engine speed and then depress the parking brake pedal to stop the machine.
2. Shift gear from R2 to F2.
3. Operate the steering to set the load at right angles to the dump truck and then drive forward.

Remark

Operate the steering in the following order: let accelerator pedal back → switch between forward and reverse → depress accelerator pedal to drive forward → approach dump truck. If these operations are carried out at the same time, the engine acceleration will be poor resulting in poor fuel consumption.



4. Raise the bucket to adjust the bucket height so that when the bucket is tilted down, the cutting edge of the bucket does not hit the bottom face of the dump body or the dilution.

Loading Dump Truck

- Do not load the dump truck suddenly from a high position.

If the dump truck is loaded in this manner, the dump truck will suffer impact load. There is danger that this may damage the body.

- Do not operate the dump or stop operations when the engine is running at high speed.

There is danger of impact pressure being generated in the hydraulic equipment and causing damage to the hydraulic equipment.

- Do not shake the bucket violently to dump the load inside the bucket.

The machine will sway and there is danger of damage to the machine. In addition, there is danger of impact pressure being generated in the hydraulic equipment resulting in damage to the hydraulic equipment.

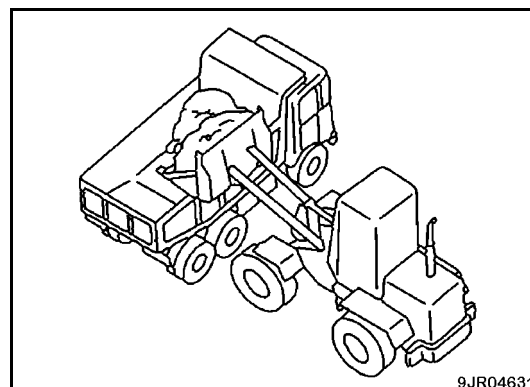
- When loading the dump truck, do not push forcibly with the bucket.

The machine and the dump truck will suffer impact shock, resulting in damage. When pushing the load with the bucket to prevent rocks from falling, carry out the operation gently.

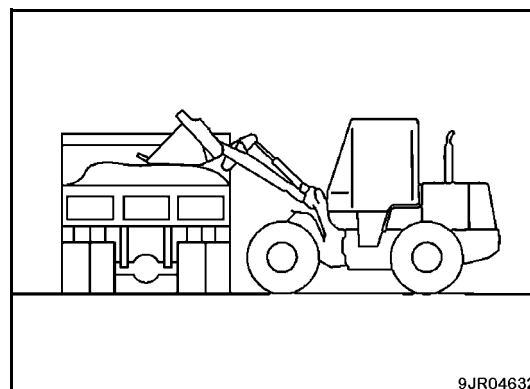
- When loading large rocks, first load with sand or soil to act as a cushion and then load the large rocks on top.

If large rocks are loaded directly, they will cause deformation or damage to the dump body.

1. When loading the dump truck, load at a low point that does not hit the dump truck or dilution.



2. After completing the loading, if there is danger of rocks falling off, push the load softly with the bucket.



OPERATION

Reversing Away From Dump Truck

- Do not shift down with the accelerator pedal depressed (with the engine speed raised).

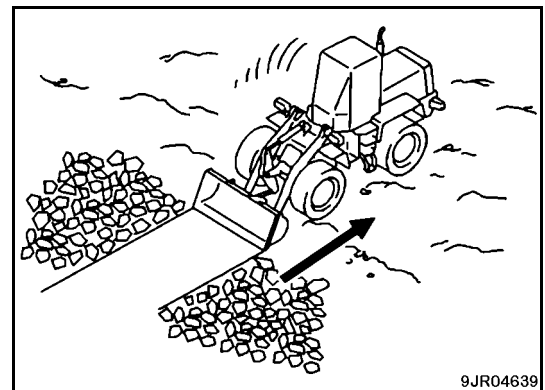
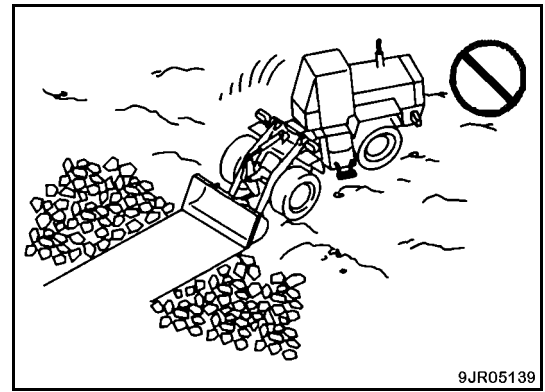
If the transmission is shifted down when the engine speed is high, there will be an excessive load on the engine, torque converter, transmission, axles, final drive, and the whole power train. In addition, the tires will slip and cause wear of the tires.

- Do not operate the steering immediately after switching between forward and reverse (when the machine is stationary).

If the steering is operated when the machine is stationary, it will cause wear or cuts to the tires.

1. Switch to R2 and drive in reverse.
2. While driving in reverse, lower the lift arm and operate the steering to face the position for scooping up.
3. Depress the brake pedal and stop the machine.
4. Let back the accelerator pedal to reduce the engine speed and then switch from R2 to F2.
5. Lower the bucket to the ground and drive forward to clear the surface (remove all boulders).

Do not operate the steering when carrying out the leveling operation. Travel forward with the machine facing directly to the front.



Precautions

When Piling Up Loads

- When forming products into a pile, be careful not to let the rear counterweight come into contact with the ground.
- Do not set the bucket to the DUMP position when piling up loads.

Remark

As much as possible, do not use the transmission cutoff function during scraping-up operations. This will prevent the machine from rolling back.

When Handling Blasted Rock

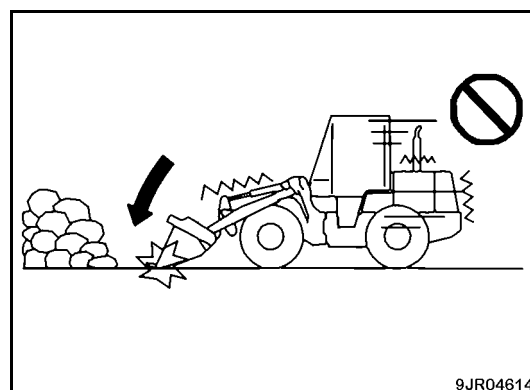
If the target load is blasted rock, pay careful attention to the following items when carrying out the operation in order to extend the service life of the machine.

Handling Bucket

- When approaching the facing and lowering the bucket to the ground, do not drop the bucket suddenly into contact with the ground.

If the bucket is dropped suddenly, the bucket, work equipment, area around the pins, and the machine frame will be subjected to excessive shock. This will lead to damage or deformation of various parts of the machine. In addition, the front wheels will come off the ground and cause the machine to slip.

- When lowering the bucket to the ground, reduce the lowering speed of the bucket when it is close to the ground and bring it slowly into contact with the ground.



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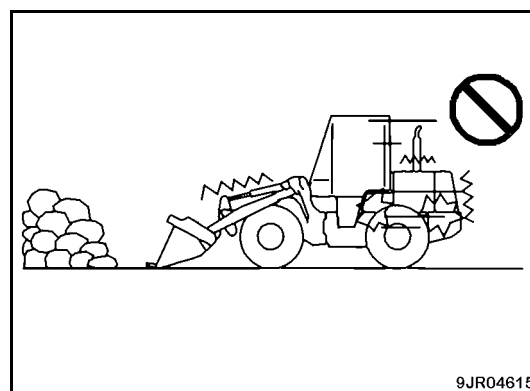
Shifting Transmission When Thrusting Bucket Into Facing

- When thrusting the bucket into the facing to carry out excavation, do not shift down with the accelerator pedal depressed (with the engine speed raised).

If the transmission shifts down when the engine speed is high, there will be an excessive load on the engine, torque converter, transmission, axles, final drive, and the whole power train.

- When shifting down to 1st and thrusting the bucket into the facing, release the accelerator pedal to reduce the engine speed before shifting down and then gradually depress the accelerator pedal.

If the accelerator is operated suddenly after shifting down, there will be excessive load brought to bear on the engine and power train.



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OPERATION

Articulating Machine During Digging Operations

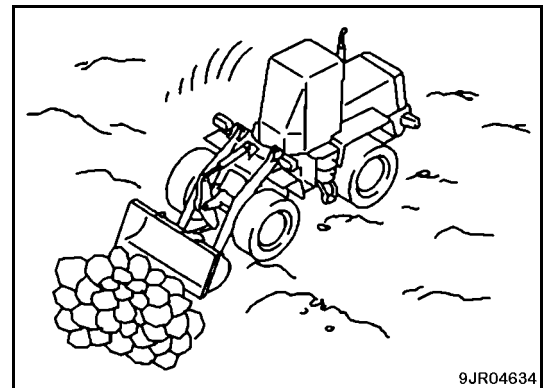
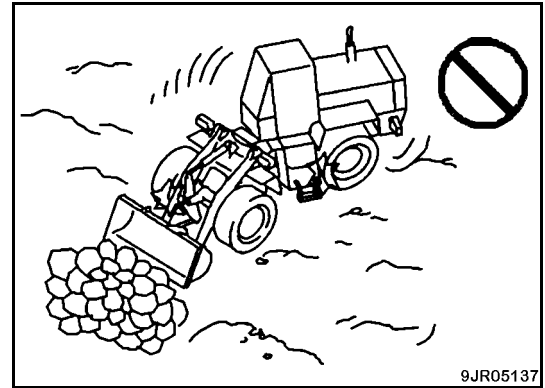
- Do not carry out operations with the machine articulated.

If the machine is articulated, the direction of force will be different for the front wheels and rear wheels. As a result, the power, when traveling, will not be transmitted fully to the front wheels. This will reduce the digging force and bring an excessive load to bear on the center hinge pin. In addition, even with the front wheels, the power will not be transmitted uniformly to the left and right wheels. The load will be brought to bear on one wheel thus reducing the service life of the tire on one side.

If digging work is carried out with the machine articulated, the overall stability of the machine will be poor. There is danger of the machine tipping over.

- When carrying out operations, do not articulate the machine. Drive straight forward and thrust the bucket in.

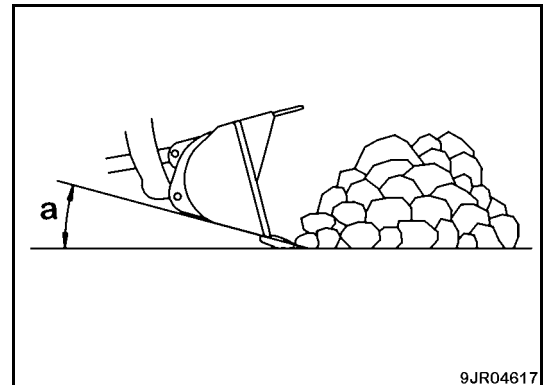
If this is done, the load on the bucket will be uniform. This makes it possible to avoid load on one side and makes it easier to load the bucket.



Bucket Dump Angle When Digging or Lowering Roadbed

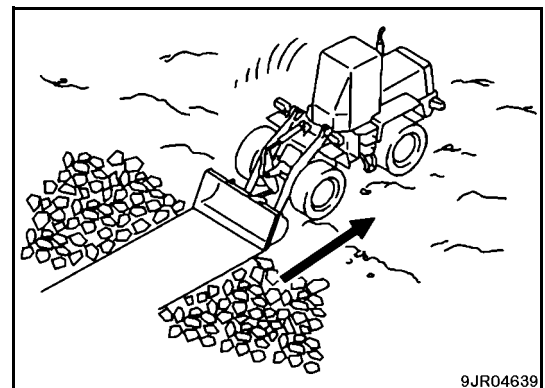
- Do not set the cutting edge of the bucket at a large angle to the ground surface when digging or lowering the roadbed. Keep angle (a) between the bucket and the ground surface to a maximum of 8° .

If angle (a) between the cutting edge of the bucket and the ground surface is more than 8° when digging or lowering the roadbed, there is danger of damage to the work equipment.



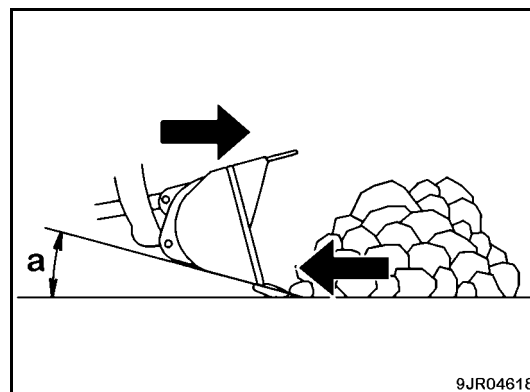
Bucket Dump Angle When Leveling

- Drive the machine in reverse when carrying out leveling operations.



- If leveling operations are carried out with the machine traveling forward, do not make angle (a) between the cutting edge of the bucket and the ground surface facing down more than 8°.

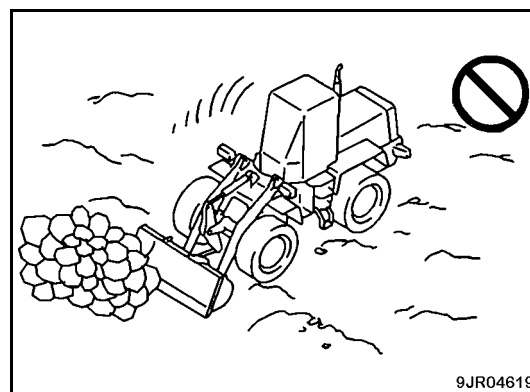
If leveling operations are carried out when driving forward with angle (a) between the cutting edge of the bucket and the ground surface facing down more than 8°, the bucket cylinder will be pushed by the pushing force of the machine. This will cause the cylinder to retract and the bucket will face down at a greater angle. There is danger of the work equipment breaking.



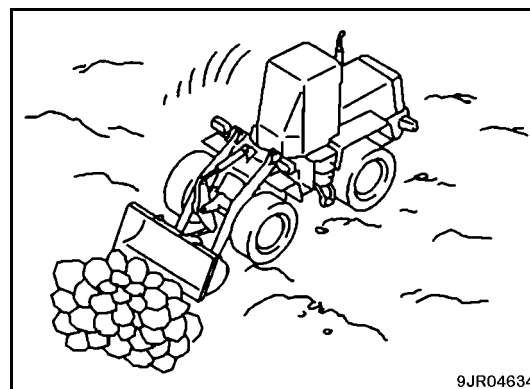
Loading Bucket

- Do not load the bucket or scoop up the load with the load on the corner of the bucket or on one side of the bucket.

This will cause the machine to twist and will reduce the service life of the work equipment and the frame.



- When carrying out digging or scooping-up operations, thrust the center of the bucket into the load.



Bucket Dump Operation When Digging

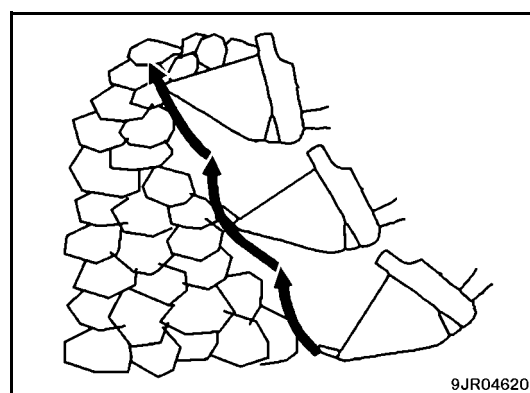
- Do not operate the bucket in the DUMP direction when digging.

If the bucket control lever is operated to the DUMP position during digging, the machine will not be able to travel forward; the tires will slip; and an excessive load will be brought to bear on the work equipment.

Carry out the scooping-up operations as follows.

1. When thrusting the bucket in, raise the lift arm slightly at the same time. Ample driving force will work on the front wheels.
2. To fill the bucket, operate the bucket tilt and lift two to three times repeatedly when thrusting the bucket in.

Operate the control lever slowly near the end of the bucket tilt.



OPERATION

- When the bucket reaches the end of the tilt stroke, depress the brake pedal to stop the machine.

When doing this, do not push the bottom of the bucket against the pile. If the bucket is pushed against the pile, the bucket, cylinders, and work equipment will be damaged.

- When the scooping-up operation is completed, operate the bucket tilt and dump. Apply the brakes when traveling in reverse to stabilize the load inside the bucket and prevent spillage of the load.

Remark

To reduce the generation of heat by the torque converter, keep the target time for the digging operation within 10 seconds from the start of thrusting in to the completion of scooping up.

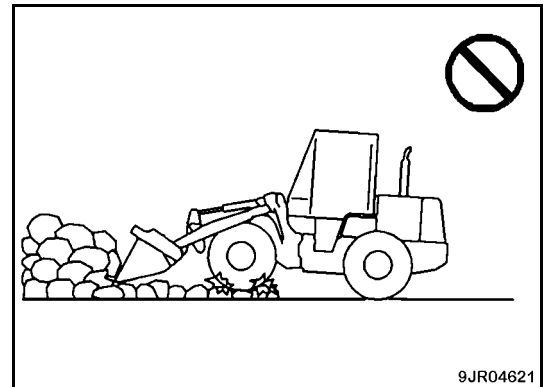
The fuel consumption increases during digging work. Fuel cost is saved by shortening the digging time.

Front Wheels Going on Blasted Rock

- Do not carry out operations that make the front wheels ride up on blasted rock.

If the front wheels go on top of blasted rock, there is danger that the sharp parts of the blasted rock will cut the tires.

- In particular, avoid pushing the bucket in too far. When operating near natural rock after blasting (roots), do not let the front wheels ride up on the natural rock (roots). For scooping-up operations near natural rock (roots), do not use a wheel loader. Use a bulldozer or hydraulic excavator.



Handling Loosened Boulders

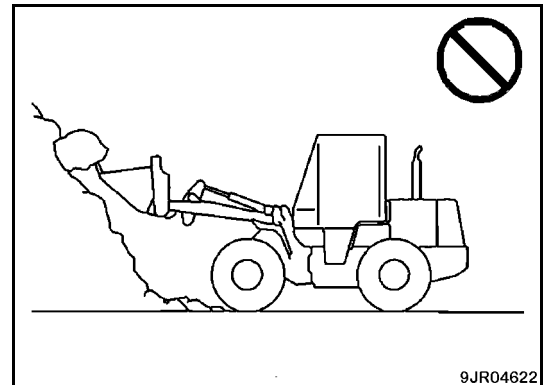
WARNING

Do not use this machine to deal with loosened boulders. If the boulder is dropped by mistake when handling it, there is danger that it may fall on top of the operator's compartment and cause serious personal injury.

- Do not use this machine to handle hanging rocks. There is danger that the rock will fall while moving it and hit the machine or operator's cab.

If dropped boulders hit the work equipment cylinders, there is danger that the cylinder will bend and be unable to move.

If the boulder is dropped on the operator's compartment, there is danger of serious personal injury.

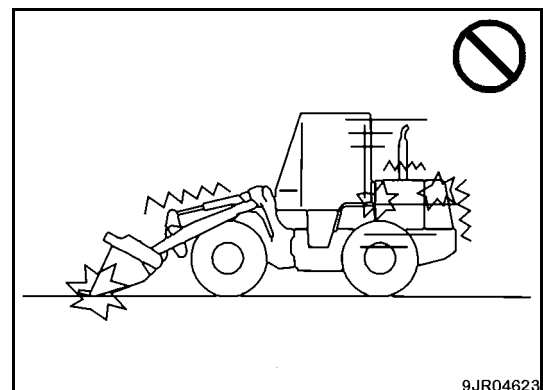


Pit Excavation

- Do not try to shave off natural rock (roots) remaining from blasting.

Excessive force will be applied to the machine and there is danger that this may damage the work equipment or frame.

- For pit excavation operations, do not use a wheel loader. Use a bulldozer or hydraulic excavator.

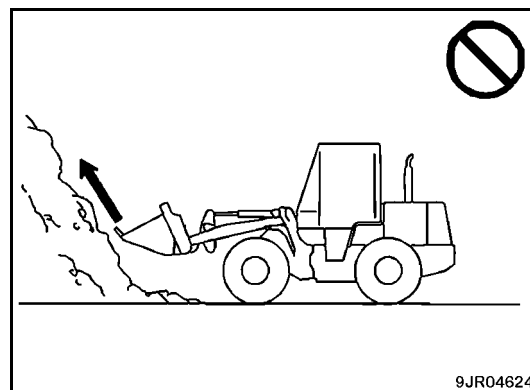


During Cutting Face Operations

- Do not excavate cutting faces.

If the cutting face is excavated, excessive force will be applied to the machine. There is danger that this may damage the bucket, work equipment, or frame.

- In particular, do not excavate with the bucket raised to a height above the travel posture. For excavation of cutting faces, use a hydraulic excavator.

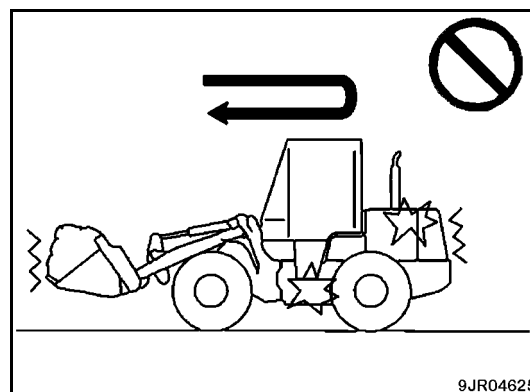


When Switching Between Forward and Reverse

- Do not switch the direction of travel of the machine between forward and reverse when traveling at high speed or when the accelerator pedal is depressed.

When the machine is traveling at high speed or when the accelerator pedal is depressed, the engine speed is high. If the direction of travel is switched between forward and reverse, an excessive load is applied to the engine, torque converter, transmission, and other parts of the power train. This will reduce the service life of the machine.

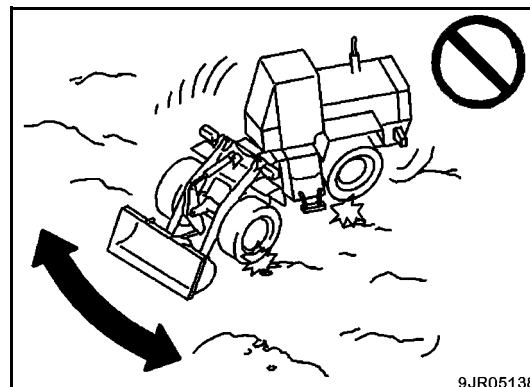
- When switching between forward and reverse, travel at low speed; reduce the engine speed; then stop the machine and switch the direction of travel.



When Turning When Tires Are Stationary

- Do not operate the steering when the machine is stationary.

If the steering is operated when the machine is stationary, it will cause wear or cuts in the tires. In addition, it will reduce the durability of the frame and the undercarriage.



OPERATION

Permissible Water Depth

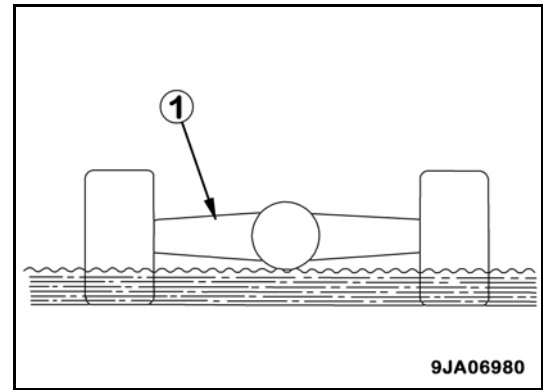
- When working in water or on swampy ground, do not let the water come above the bottom of the axle housing (1).
- After finishing the operation, wash and check the lubricating points.

When Wheel Brake Does Not Work

If the machine does not stop when you depress the brake pedal, use the parking brake to stop the machine.

Remark

If the parking brake has been used as an emergency brake, contact your Komatsu distributor to have the parking brake checked for any abnormality.



When Driving Up or Down Slopes

Braking on Downhill Slope

- If the foot brake is used frequently when traveling downhill, the brake will overheat and may be damaged. To prevent this, shift down to a low speed range and use the braking force of the engine to reduce the speed. Normally, the most suitable speed range when traveling down a slope is the speed range needed when traveling up that slope.
- When braking, use the right brake pedal.
- If the brakes are used excessively, the brake oil temperature caution lamp may light up and the alarm buzzer may sound intermittently. For details of the necessary action to take, see “Brake Oil Temperature Caution Lamp” on page 2-18.
- If the speed range selected by the gearshift lever is not correct, the torque converter oil may overheat. If this happens, shift down one gear range and reduce the oil temperature.
- If the oil temperature does not return to the white range even when the gearshift lever is at 1st, stop the machine; return the directional lever to the N position; and run the engine at a mid-range speed until the gauge returns to the white range.
- When traveling long distances continuously downhill, the frequency of using the brake may increase. As a result, depending on the weight of the machine and the grade of the slope, the machine’s braking capacity may be exceeded and the brakes may overheat.

The following table is a guideline for the braking capacity limit for this machine.

Machine Weight (t)	Slope Grade (%)	Braking capacity limit	
		Average Travel Speed Limit (km/h (mph))	Downhill Distance Limit (continuous) (km (mile))
17.3 - 19.5 (unloaded)	10	40 (24.9)	1.9 (1.2)
	20	38 (23.6)	0.6 (0.4)
22.5 - 24.5 (loaded)	10	38 (23.6)	1.5 (0.9)
	20	32 (19.9)	0.5 (0.3)

- ★ If the braking capacity limit is exceeded, a forced cooling system for the brakes is needed. Consult your Komatsu distributor.

If Engine Stops

If the engine stops on a slope:

- Apply the parking brake immediately.
- Lower the work equipment to the ground.
- Stop the machine.
- Put the directional lever in the neutral position.
- Start the engine again.

When Driving the Machine

When the machine travels at high speed for a long distance, the tires become extremely hot. This causes early wear of the tires. Avoid traveling at high speed for a long distance.

If the machine must be driven for a long distance, take the following precautions:

- Follow the regulations related to this machine and drive carefully.
- Before driving the machine, carry out the checks before starting; see “Check Before Starting Engine” on page 2-81.
- The most suitable tire pressure, travel speed, or tire type differ according to the condition of the travel surface. Contact your Komatsu distributor or tire dealer for information.
- The following table is a guide for suitable tire inflation pressures and appropriate speeds when traveling on a paved surface with the standard tires (23.5–25).

Item	Tire Pressure	Speed
Front tire	310 kPa (3.2 kg/cm ²) [44.96 psi]	14 km/h (8.7 mph)
Rear tire	310 kPa (3.2 kg/cm ²) [44.96 psi]	14 km/h (8.7 mph)

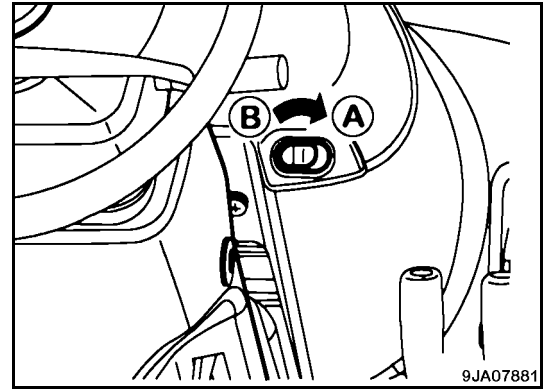
- Check the tire pressure before starting, when the tire is cool.
- After traveling for one hour, stop for 30 minutes. Check the tires and other parts for damage. Check the oil and coolant levels.
- Always travel with the bucket empty.
- Never put calcium chloride or dry ballast in the tires when traveling.
- In cold areas to prevent the radiator water temperature from rising suddenly, do not stop the engine suddenly. Run it at low idle for five minutes to cool it down gradually and then stop it.

OPERATION

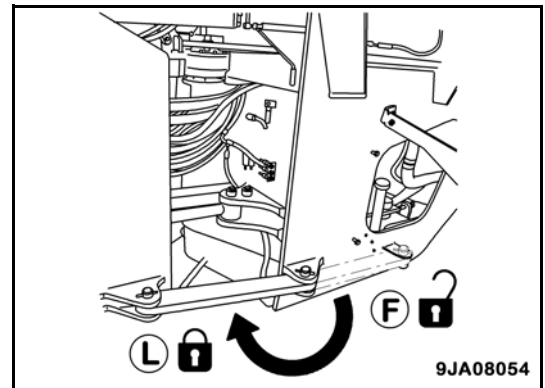
Adjusting Work Equipment

⚠ WARNING

- Stop the machine on flat ground and put blocks in front and behind the wheels.
- Set the parking brake switch to the ON position (A) to apply the parking brake.
- Set the frame lock bar to LOCK position (L) to lock the front and rear frames.
- Attach the warning tag to the work equipment control levers.
- Do not go under the work equipment when the arm is raised.

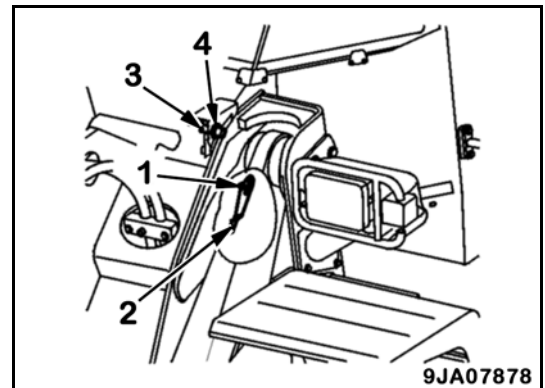


- The boom kickout makes it possible to set the bucket so that it automatically stops at the desired lifting height (lift arm higher than horizontal).
- The bucket positioner makes it possible to set the bucket so that it automatically stops at the desired digging angle.
- The setting can be adjusted to match the working conditions.



Adjusting Boom Kickout

1. Raise the bucket to the desired height; set the lift arm control lever to the HOLD position; and set the work equipment lock lever to the LOCK position.
2. Stop the engine and adjust in this manner:
 - Loosen two bolts (1) and adjust plate (2) so that the bottom edge is in line with the center of the sensing surface of proximity switch (3).
 - Tighten the bolts to hold the plate in position.
3. Loosen two nuts (4) to make a clearance of 3 to 5 mm (0.118 to 0.197 in) between plate (2) and the sensing surface of proximity switch (3). Tighten the nuts to hold in position.
Tightening torque: 17.2 ±2.5 N•m (12.69 ±1.84 lbf ft)



4. After adjusting, start the engine and operate the lift arm control lever. Check that the lever is automatically returned to HOLD when the bucket reaches the desired height.

Adjusting Bucket Positioner

1. Lower the bucket to the ground; set it to the desired digging angle.
2. Return the bucket control lever to the HOLD position; set the work equipment lock lever to the LOCK position; and stop the engine.
3. Loosen two bolts (1) and adjust mounting bracket (4) of the proximity switch so that the rear tip of bar (2) is in line with the center of the sensing surface of the proximity switch (3).

- Tighten the bolts to hold the bracket in position.

4. Loosen two nuts (5) and adjust to make a clearance of 0.5 to 2 mm (0.020 to 0.079 in) between bar (2) and support (6).

- Tighten bolts (5) to hold in position.

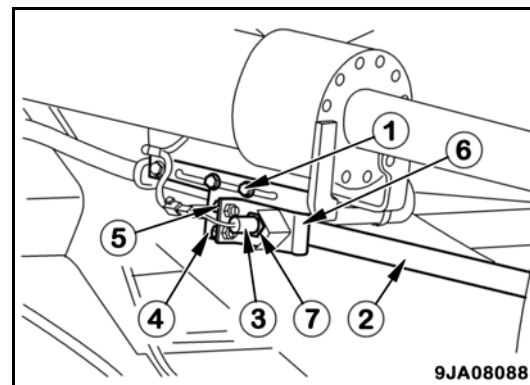
5. Loosen two nuts (7) and adjust to make a clearance of 3 to 5 mm (0.118 to 0.197 in) between bar (2) and the sensing surface of proximity switch (3).

- Tighten the nuts to hold in position.

Tightening torque: 17.2 ±2.5 N•m (12.69 ±1.84 lbf ft)

6. After adjusting, start the engine and raise the lift arm.

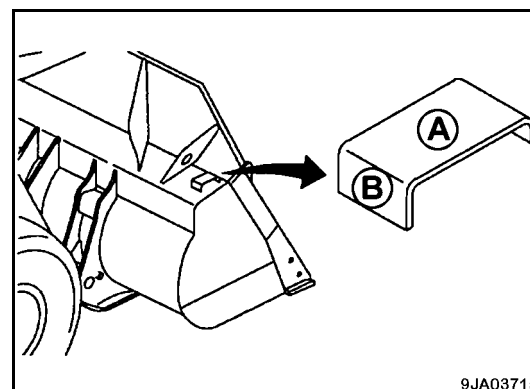
7. Operate the bucket control lever to the DUMP position, then operate it to the TILT BACK position and check that the lever is automatically returned to the HOLD position when the bucket reaches the desired digging angle.



Bucket Level Indicator

Level indicators (A) and (B) are located at the top, rear of the bucket. They check the bucket angle during operation.

- A: Parallel with cutting edge
- B: 90° to cutting edge



OPERATION

Measuring Dump Angle

This procedure describes how to measure the dump angle for the bucket and the coupler. Komatsu does not suggest measuring the coupler dump angle but, if it is necessary to do so, the instructions are provided.

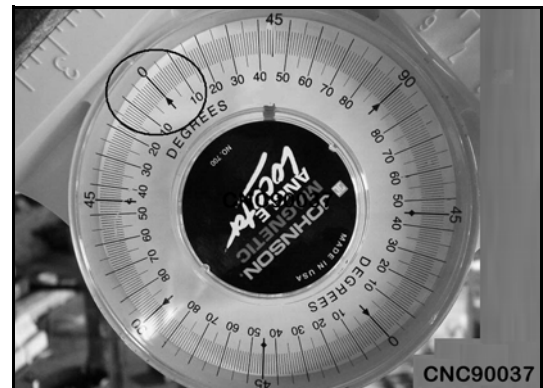
Measuring Bucket Dump Angle

WARNING

- Always stop the machine on level ground before opening or closing the door.
- Before leaving the operator's seat, set the work equipment lock lever securely to the LOCK position. If the work equipment lock lever is not at the LOCK position and the work equipment control lever is touched by mistake, this may lead to a serious accident.
- When operating the work equipment lock lever, check that the work equipment control lever is at the HOLD position.
- When operating the work equipment lock lever, be careful not to touch the work equipment control lever.
- If using the optional multi-function lever:
- Before standing up from the operator's seat, set the work equipment lock switch securely to the LOCK position. If the work equipment lock switch is not at the LOCK position and the work equipment lever is touched by mistake, it may lead to a serious accident.
- When operating the work equipment lock switch, check that the work equipment lever is at the HOLD position.
- When operating the work equipment lock switch, be careful not to touch the work equipment lever.

Required

- Inclinometer
1. Park the machine on level ground and check the surface flatness.
 - Open the cab door and place the inclinometer on the cab floor.
 - The reading must be 0 degrees.
 2. Check that the tire pressure is the same for all four tires.
 - The pressure must be within specification for the tires.
 - See "Tire Pressure" on page 2-157.
 3. Raise the bucket about one foot from the ground.
 4. Place the inclinometer on the bottom of the bucket cutting edge.

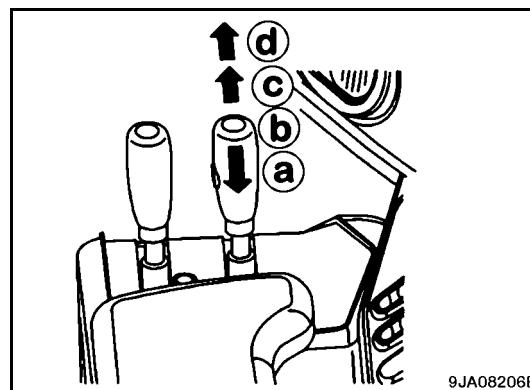


Remark

When the bucket is level with the ground, the bucket dump angle is 0 degrees.

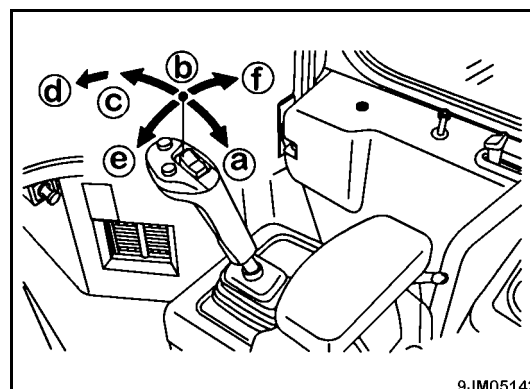
5. Move the lift arm control lever to the RAISE position (a) and lift the boom to its maximum height.

- ★ You can only measure the bucket dump angle at maximum boom height.
- ★ Make sure that the lift arm control lever is at the HOLD position (b) once the boom is at maximum height.



9JA08206B

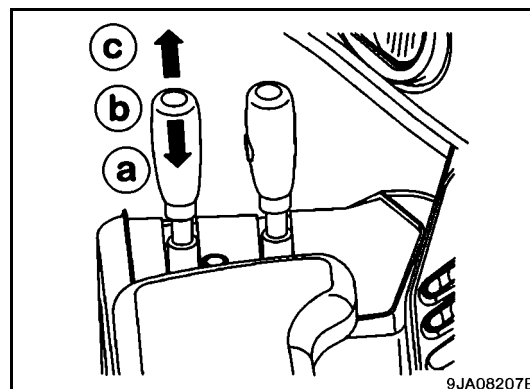
- ★ If you are using the multi-function lever, move the work equipment lever to the RAISE position (a).
 - Make sure that the work equipment lever is at the HOLD position (b) once the boom is at maximum height.



9JM05142

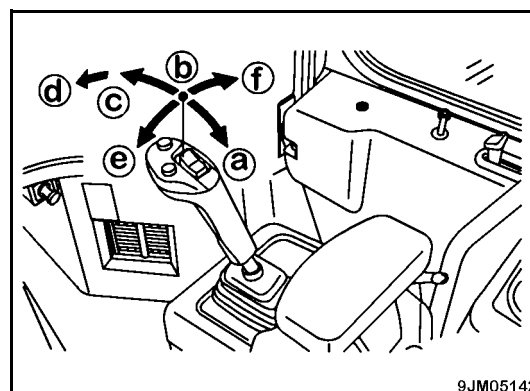
6. Use the bucket control lever and tilt the bucket to the DUMP position (c).

- ★ Make sure that the bucket control lever is at the HOLD position (b) once the bucket tilts.



9JA08207B

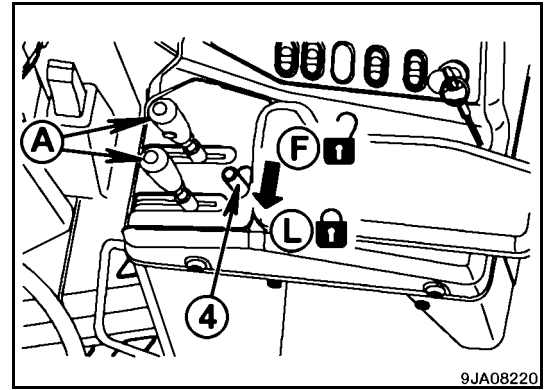
- ★ If you are using the optional multi-function lever, move the work equipment lever to the TILT position (e).
 - The work equipment lever must be at the HOLD position (b) once the bucket tilts.



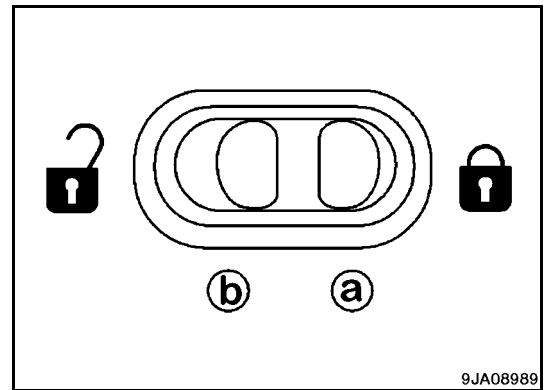
9JM05142

OPERATION

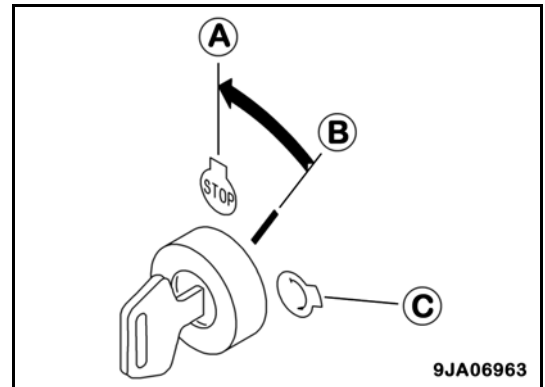
- Set the work equipment lock lever (4) to the LOCK position (L) so that the work equipment levers cannot move.



- ★ If you are using the optional multi-function lever, set the work equipment lock switch to the LOCK position (a).



- Turn the key in the starting switch to the OFF position (A) and remove the key.



- Read the inclinometer and record the bucket dump angle.
 - ★ Read the measurement while facing the left side of the machine.
 - ★ Measure the dump angle of a bucket with a Komatsu-approved bucket only.

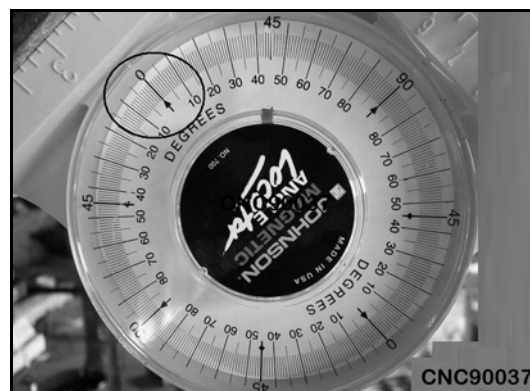
Dump angle:50 degrees



Measuring Coupler Dump Angle

Required

- Inclinometer
1. Park the machine on level ground and check the surface flatness.
 - Open the cab door and place the inclinometer on the cab floor.
 - The reading must be 0 degrees.
 2. Check that the tire pressure is the same for all four tires.
 - The pressure must be within specification for the tires.
 - See “Tire Pressure” on page 2-157.
 3. Raise the coupler about one foot from the ground.

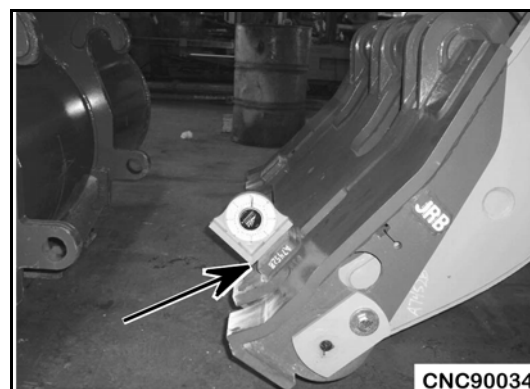


Remark

When the bucket is parallel with the ground, the coupler dump angle is 90 degrees.

4. Place the inclinometer on the coupler at the location indicated by the arrow in the graphic.

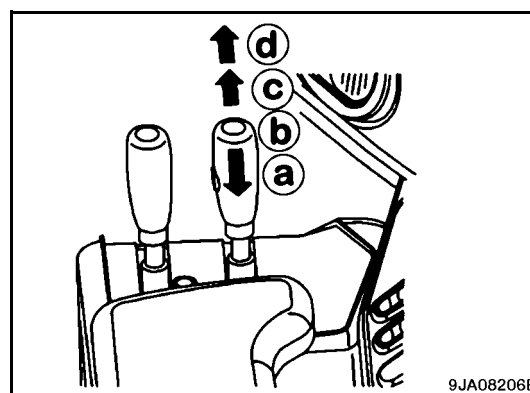
★ This is the only location to place the inclinometer where you can get a reasonably accurate coupler dump angle measurement.



5. Move the lift arm control lever to the RAISE position (a) and lift the boom to its maximum height.

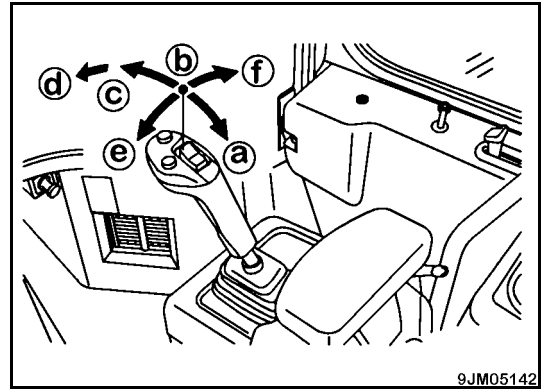
★ You can only measure the coupler dump angle with the boom at maximum height.

★ Make sure that the lift arm control lever is at the HOLD position (b) once the boom is at maximum height.

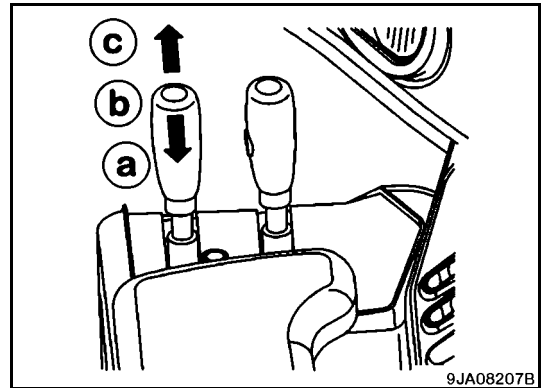


OPERATION

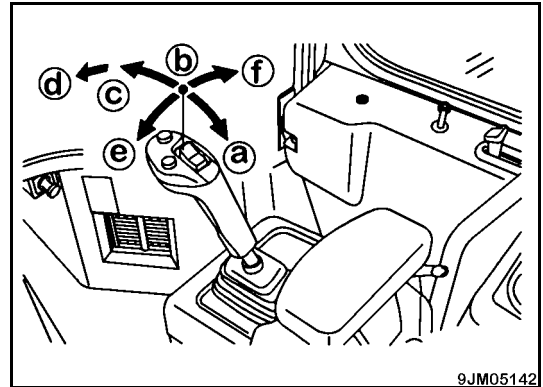
- ★ If you are using the multi-function lever, move the work equipment lever to the RAISE position (a).
 - Make sure that the work equipment lever is at the HOLD position (b) once the boom is at maximum height.



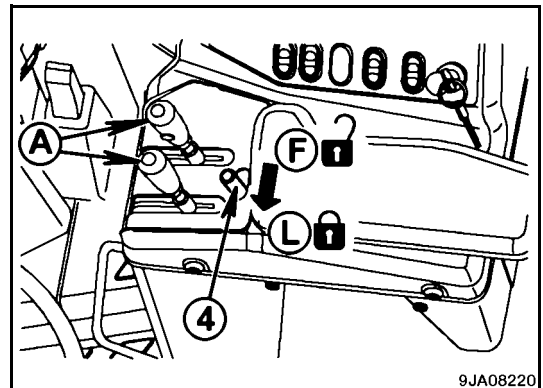
6. Use the bucket control lever and tilt the coupler to the DUMP position (c).
 - ★ You can only measure the coupler dump angle with the coupler at maximum dump angle.
 - ★ Make sure that the bucket control lever is at the HOLD position (b) once the coupler tilts.



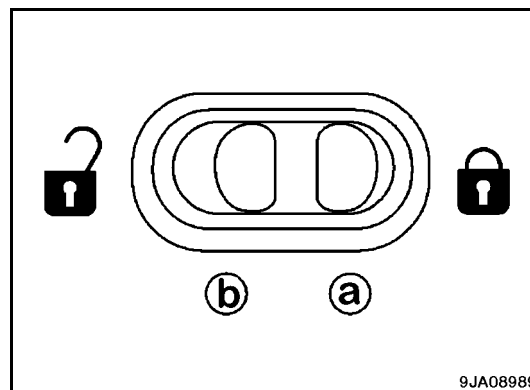
- ★ If you are using the optional multi-function lever, move the work equipment lever to the TILT position (e).
 - The work equipment lever must be at the HOLD position (b) once the coupler tilts.



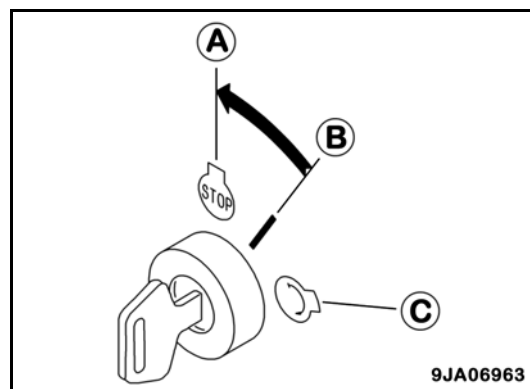
7. Set the work equipment lock lever (4) to the LOCK position (L) so that the work equipment levers cannot move.



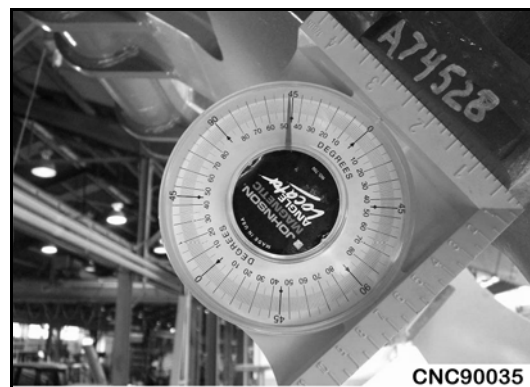
- ★ If you are using the optional multi-function lever, set the work equipment lock switch to the LOCK position (a).



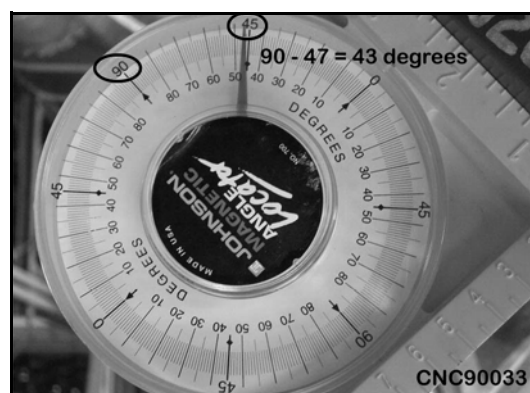
- Turn the key in the starting switch to the OFF position (A) and remove the key.



- Read the inclinometer and record the coupler dump angle.
 - ★ The coupler angle is 90 degrees when the bucket is parallel to the surface. So the 90 degrees on the inclinometer is actually 0 degrees; measure the dump angle from 90 degrees to the needle.



- Example: if the needle reads 47 degrees, then the coupler dump angle is $90 - 47 = 43$ degrees.



OPERATION

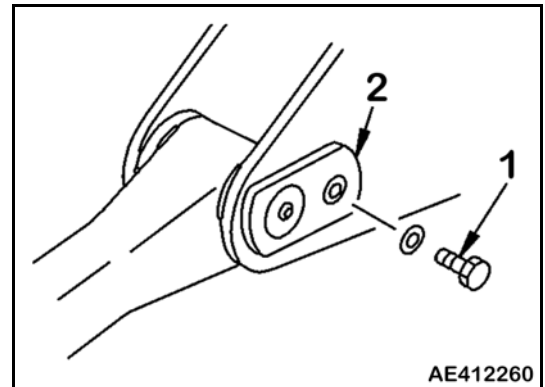
Removing the Bucket

WARNING

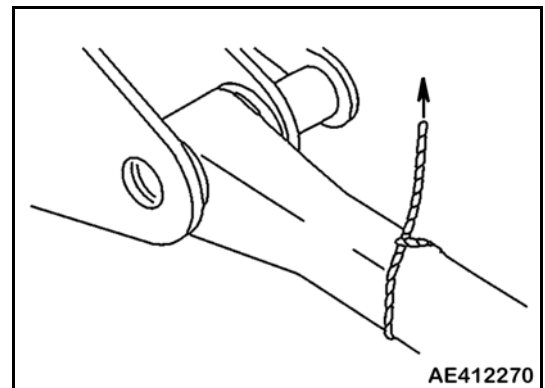
- When removing pins, do not stand behind the bucket.
- Do not put your foot under the bucket while standing at the side for the work.
- If pins are hit with a strong force, there is a hazard that the pin may fly out and injure people in the surrounding area. Make sure that there is no one in the surrounding area before starting the operation.
- When the bucket is removed, place it in a stable condition.
- When removing or inserting pins, be extremely careful not to get your fingers caught.
- Never insert your fingers into the pin holes when aligning the holes.
- When pins are knocked in with a hammer, pieces of metal may fly and cause serious injury. When carrying out this operation, always wear goggles, hard hat, gloves, and other protective equipment.

★ It may be more convenient to remove the bucket when the machine is transported.

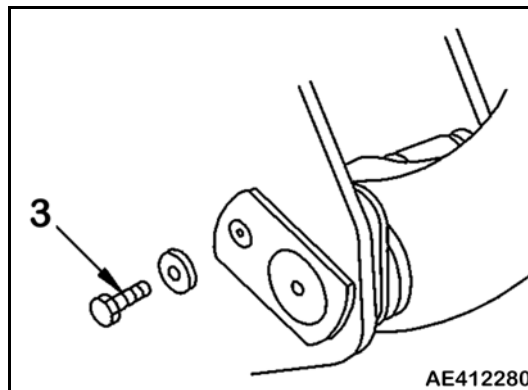
1. Remove mounting bolt (1).
2. Sling the bucket link and then pull out bucket link pin (2).



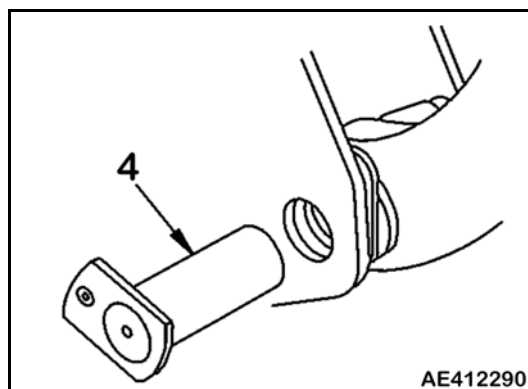
3. Secure the bucket link to the tilt lever with wires.



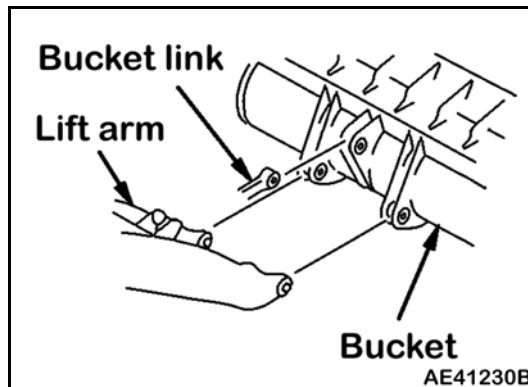
- Remove mounting bolt (3).



- Pull out and remove bucket hinge pin (4) on both sides of the bucket.



- Disconnect the lift arm and bucket.



Installing the Bucket

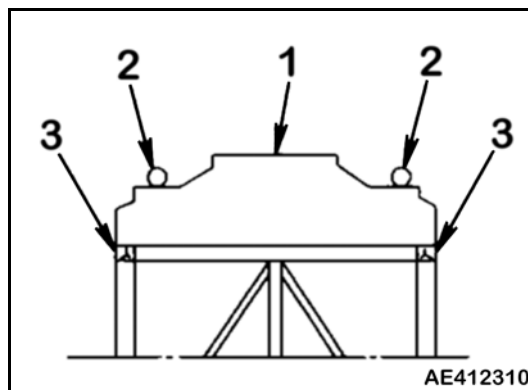
- ★ Read the safety instructions for removing the bucket.

Remark

Before installing the bucket, remove all grease, mud, or sand and clean the pin, pin hole, and area around the boss. (If there is any rust or dirt on the inside surface of the pin hole, use sandpaper and remove it carefully.)

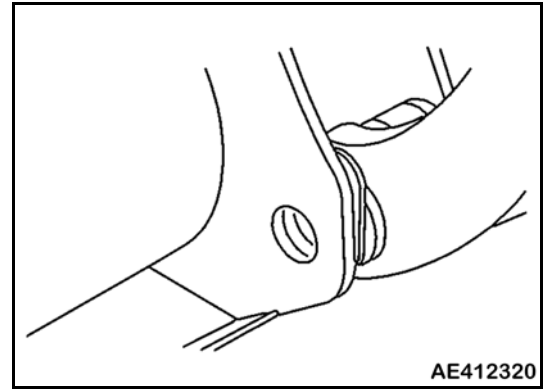
After cleaning, coat the pin and inside surface of the pin hole with fresh grease.

- Set cord ring (2) on top of lift arm boss (1).
- Coat dust seal lip portion (3) with grease.

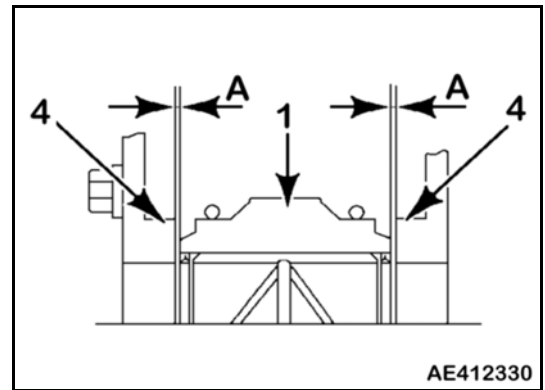


OPERATION

3. Align the left and right bucket pin holes.

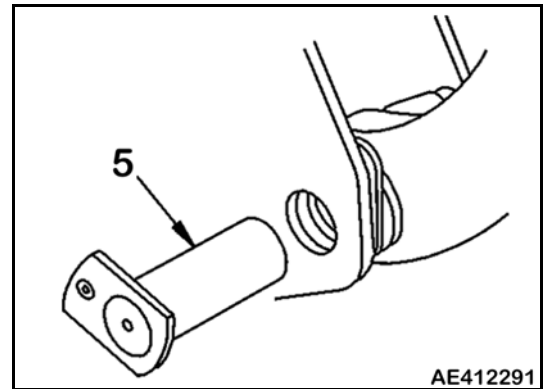


4. Select the number of shims so that clearances (A) between bucket hinge boss (4) and lift arm boss (1) are less than 1.0 mm (0.04 in).

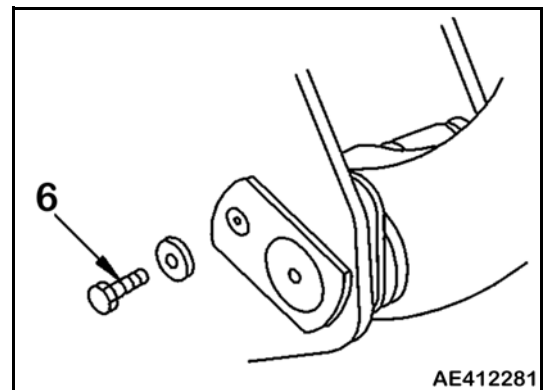


5. Assemble the shims selected in Step 4; align the pin holes; then insert bucket hinge pin (5).

- ★ Coat with grease to prevent damage to the dust seal when inserting the bucket hinge pin.
- ★ Use a bucket hinge pin that has a grease hole.



6. Install mounting bolt (6).

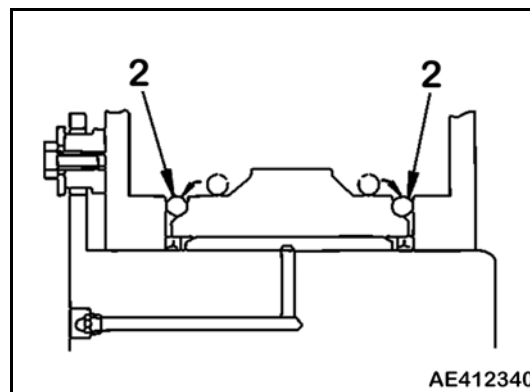


7. Move cord ring (2) down to the groove.
8. Use the same procedure as in Steps 1 to 7 to install the bucket link pin.

Assemble a pin that has no grease hole at the bucket link.

9. Coat the bucket hinge pin and bucket link pin with grease. For details, see "Lubricating" on page 3-58.

★ For additional details about removing and installing the bucket, contact your Komatsu distributor.



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OPERATION

Parking the Machine

WARNING

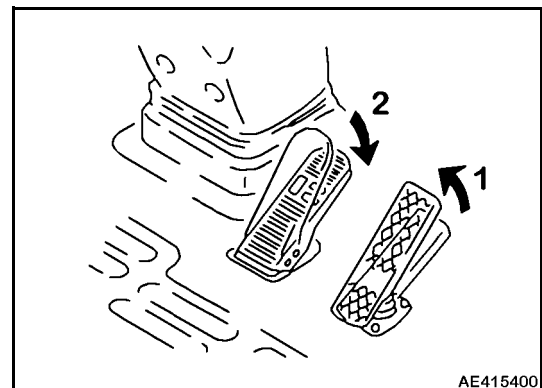
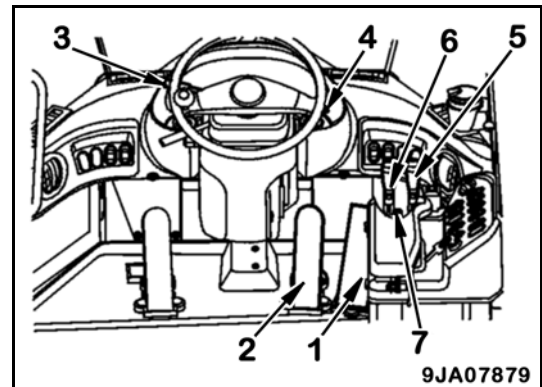
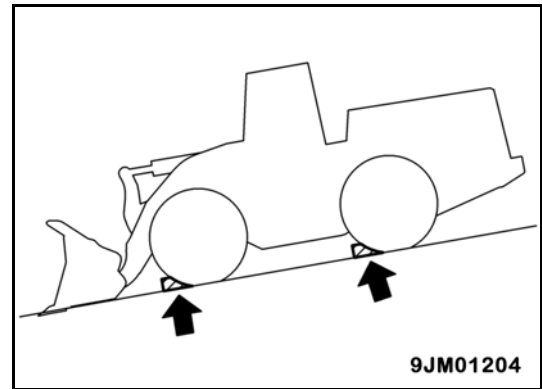
- Avoid stopping suddenly. Give yourself ample room when stopping.
- Do not park the machine on a slope. If the machine must be parked on a slope, set it facing directly down the slope; dig the bucket into the ground; and put blocks under the tires to prevent the machine from moving.
- If the control lever is touched by accident, the work equipment or the machine may move suddenly. This may lead to a serious accident. Before leaving the operator's compartment, always set the work equipment lock lever securely to the LOCK position.
- Even if the parking brake switch is turned ON, there is danger until the parking brake pilot lamp lights up. Keep the brake pedal depressed.

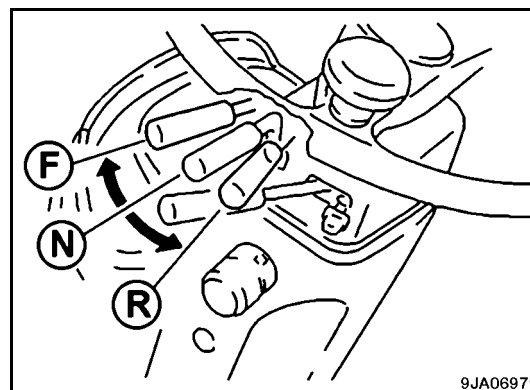
Remark

Never use the parking brake switch to brake the machine when traveling, except in an emergency.

Apply the parking brake only after the machine has stopped.

1. Release accelerator pedal (1) and then depress brake pedal (2) to stop the machine.
2. Place directional lever (3) in the N (neutral) position.



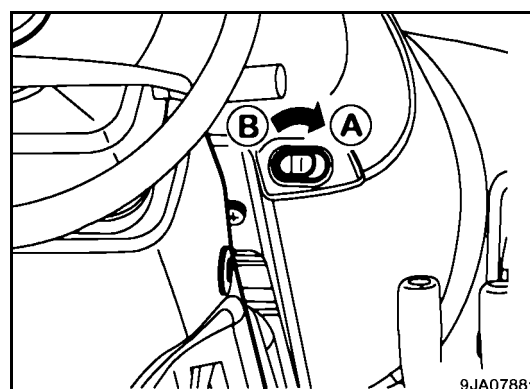


9JA06971

3. Turn parking brake switch (4) to the ON position (A) to apply the parking brake.

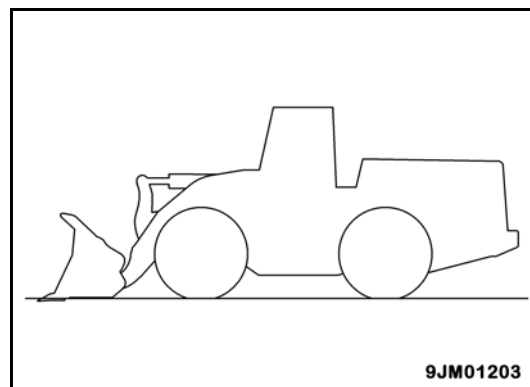
Remark

When the parking brake is applied, the transmission is automatically returned to neutral.



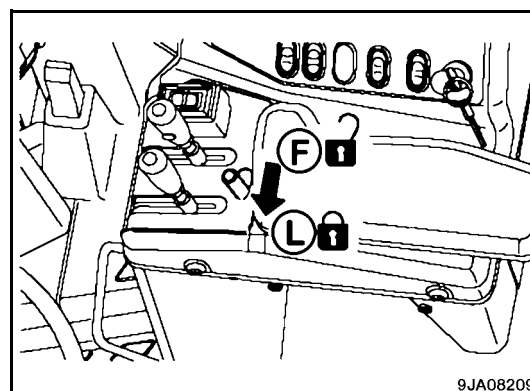
9JA07881

4. Operate lift arm control lever (5) to lower the bucket to the ground.



9JM01203

5. Check that the lift arm control lever (5) and bucket control lever (6) is at the HOLD position, then set the work equipment lock lever (7) to the LOCK position (L).



9JA08209

OPERATION

Checks After Completion of Operation

Before Stopping Engine

- Use the meters and lamps on the machine monitor to check the engine water temperature, engine oil pressure, torque converter oil temperature, and fuel level.
- If the engine has overheated, do not stop it suddenly. Run the engine at a mid-range speed to allow the engine time to cool down before stopping it.

After Stopping Engine

- Walk around the machine and check the work equipment, chassis, and undercarriage.
- Check that there are no loose bodywork mounting bolts.
- Check that there are no cracks in the work equipment or bucket.
- Check for oil and water leakage.
- Fill the fuel tank.
- Check the engine compartment for paper and debris. Clean out any paper and debris to avoid a fire hazard.
- Remove any mud stuck to the undercarriage.

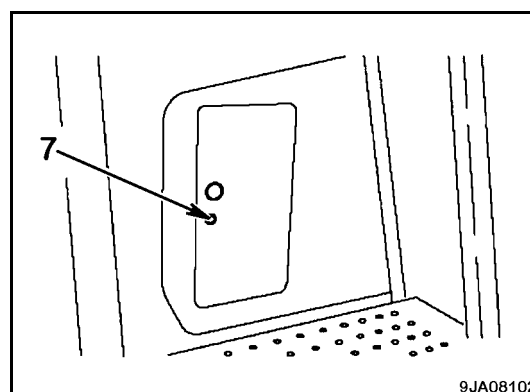
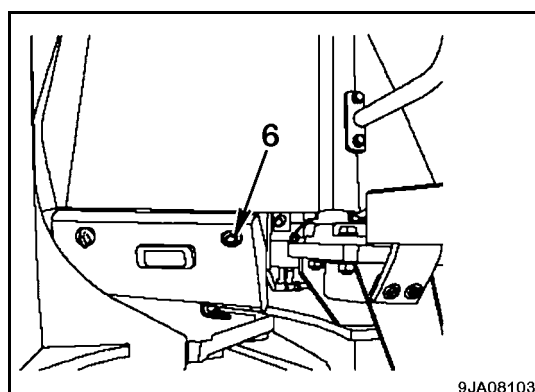
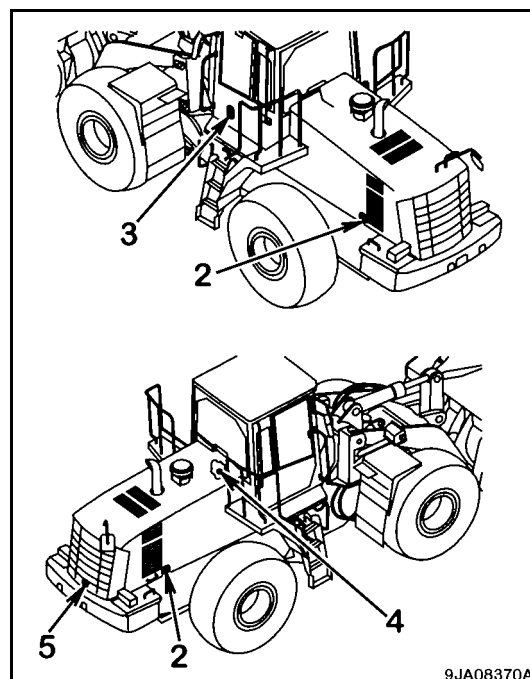
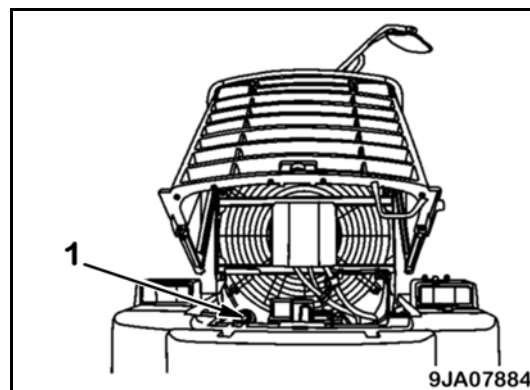
Locking the Machine

Always lock the following parts.

- (1) Fuel tank filler cap
- (2) Engine side panel (two places)
- (3) Cab door
- (4) Hydraulic tank
- (5) Rear grille
- (6) Air conditioner fresh air filter
- (7) Transmission filter cover

Remark

The starting switch key is used for locks (1) to (7).



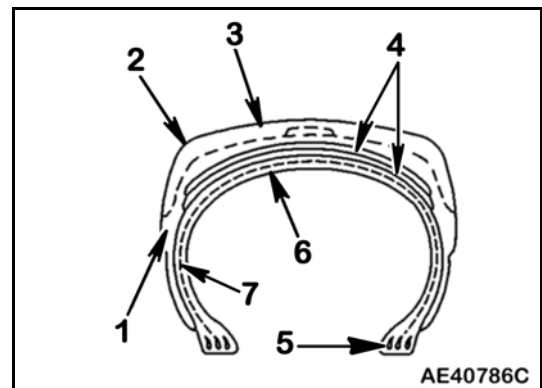
HANDLING TIRES

Precautions When Handling Tires

WARNING

- If a tire has reached any of the following service limits, there is danger that the tire may burst or cause an accident. To ensure safety, replace it with a new tire.
- Service limits for wear:
 - When the remaining depth of the groove on construction equipment tires (at a point approximately 1/4 of the tread width) is 15% of the groove depth on a new tire.
 - When the tire shows marked uneven wear, stepped wear, or other abnormal wear, or when the cord layer is exposed.
- Service limits for damage:
 - When there is external damage extending to the cord or when the cord is broken.
 - When the cord is cut or there is dragging.
 - When the tire is peeling (there is separation).
 - When the bead is damaged.
- For tubeless tires, when there is air leakage or improper repair.
- Do not install a tire protector (mesh chain) to the rear tires.

1. Side wall
2. Shoulder
3. Tread
4. Breaker or belt (cord layer)
5. Bead
6. Inner liner
7. Carcass



Remark

It is dangerous to jack up the machine without taking proper care.

Contact your Komatsu distributor when replacing the tires.

After replacing the tires, carry out the breaking-in operation for approximately 30 hours (the time displayed on the service meter) until the tires and rims are settled.

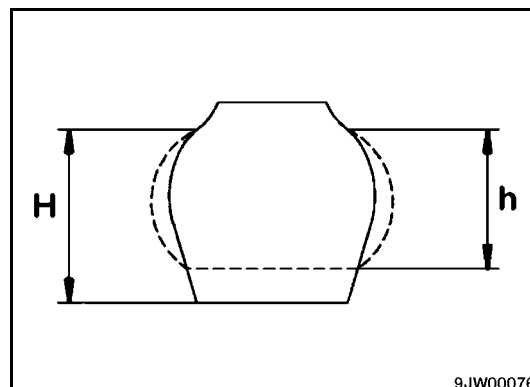
Tire Pressure

- Measure the tire pressure before starting operations, when the tires are cool.

If the tire inflation pressure is too low, there will be overload; if it is too high, it will cause tire cuts and shock burst. To prevent these problems, adjust the tire inflation pressure according to the Air Pressure chart on this page.

★ Deflection ratio = $H - h / H \times 100$

- When checking the tire inflation pressure, check also for small scratches or peeling of the tire, for nails or pieces of metal which may cause punctures, and for any abnormal wear.
- Clearing fallen stones and rocks from the operating area and maintaining the surface will extend the tire life and give improved economy.



Operations on normal road surfaces, rock digging operations:

..... High end of range in Air Pressure chart

Stockpile operations (loading of sand and other loose materials) on soft ground:

..... Average pressure in Air Pressure chart

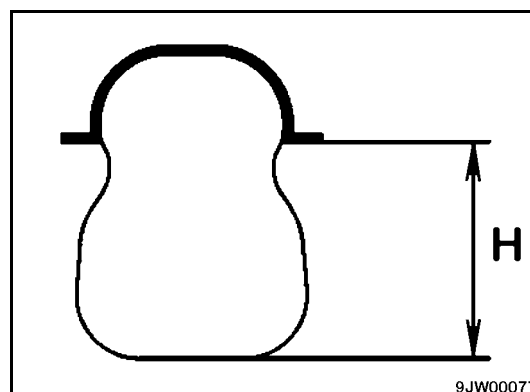
Operations on sand (operations not using much digging force):

..... Low end of range in Air Pressure chart

As a guideline that can be checked visibly, the deflection ratio of the front tire (deflection/free height) is:

When carrying normal load (lift arm horizontal):
 Approximately 15 to 25%

When digging (rear wheels off ground):
 Approximately 25 to 35%



If the deflection of the tire is excessive, raise the inflation pressure within the limits given in the Air Pressure chart in order to get a suitable deflection.

Air Pressure Chart

Tire Size (Pattern)	H Free Height (mm)	Inflation Pressure (kPa [kgf/cm ²] (PSI))			When Shipped from Factory
		Soft Ground (sandy ground)	Normal Road		
			Stockpile	Stockpile	
23.5R25A 23.5-25-16PR (L3: Rock) (Standard) 23.5-25-20PR (L2: Traction) (if equipped)	424 (BS)	240 – 360 [2.45 – 3.67] (34.81 - 52.21)	260 - 360 [2.65 - 3.67] (37.71 - 52.21)	260 - 360 [2.65 - 3.67] (37.71 - 52.21)	Front and Rear tire: 310 [3.16] (44.96)
23.5-25-16PR (L2: Traction) (if equipped) 23.5-25-20PR (L3: Rock) (if equipped)	434 (BS)				

OPERATION

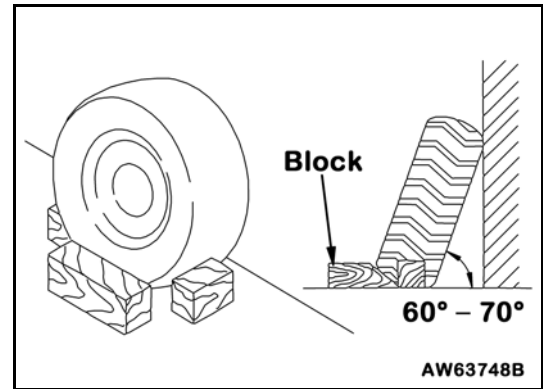
Precautions for Using Load-and-Carry Method

- When traveling continuously with load-and-carry operations, choose the correct tires to match the operating conditions, or choose the operating conditions to match the tires. If this is not done, the tires will be damaged.
- Contact your Komatsu distributor or tire dealer when selecting tires.

Precautions when Storing Tires

Tires for construction equipment are extremely heavy and may cause serious personal injury if handled improperly.

- As a basic rule, store the tires in a warehouse with access restricted to authorized persons only.
- If the tires must be stored outside, store them within a fence and post “No Entry” signs.
- Stand the tire on level ground and block it securely so that it cannot roll or fall over if anybody should touch it.
- Do not lay the tire on its side. This will deform the tire and cause it to deteriorate.
- If the tire should fall over, do not attempt to stop it. Get out of the way quickly.



TRANSPORTATION

When transporting the machine, observe all applicable laws and regulations and be careful to assure safety.

Transportation Procedure

As a general rule, always transport the machine on a trailer.

When selecting a trailer and transporting the machine, choose the optimum transportation method in reference to the weight and dimensions shown in "SPECIFICATIONS" on page 4-2. Note that machine specifications (weight and dimensions) vary depending on the kind of tires and bucket.

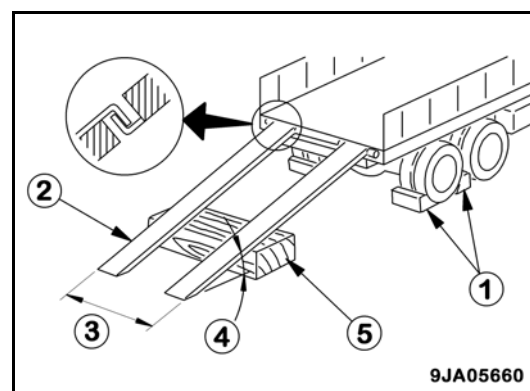
Loading and Unloading Trailers

WARNING

- When loading or unloading the machine, run the engine at low speed; travel at low speed; and operate slowly.
- When loading or unloading the machine, stop the trailer on firm, level ground. Keep well away from the road shoulder.
- Use ramps of ample width, length, thickness, and strength. Install them securely at an angle of less than 15°. When using an embankment, compact the fill soil thoroughly and make sure that the slope face does not collapse.
- Remove the mud stuck to the undercarriage to prevent the machine from slipping to the side on the ramps. Remove any water, snow, ice, grease, or oil from the ramps.
- Never change direction on the ramps. There is danger that the machine may tip over. If it is necessary to change direction, return to the ground surface or the trailer platform; correct the direction; and start again.
- The position of the center of gravity of the machine will change suddenly at the connection of the ramp and trailer. At this point, there is danger of the machine losing its balance. Always drive slowly over the connection point.

Loading Machine

- ★ When loading the machine, always use ramps or a platform.
 - ★ Be sure the loading area is flat and dry.
1. Load on firm, level ground. Maintain a safe distance from the edge of the road.
 2. Apply the brakes on the trailer and insert blocks (1) under the tires to ensure that the trailer does not move.
 3. Set the distance (3) between ramps (2) to match the distance between the left and right tires, and make angle (4) of the ramps a maximum of 15 degrees. If ramps (2) sag appreciably under the weight of the machine, put a wooden block (5) under the ramps to support them.
 - Be sure that the two sides are at the same height.



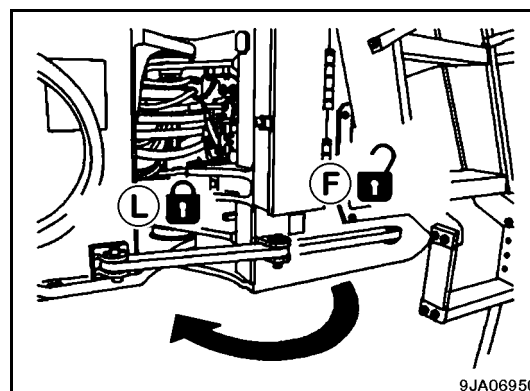
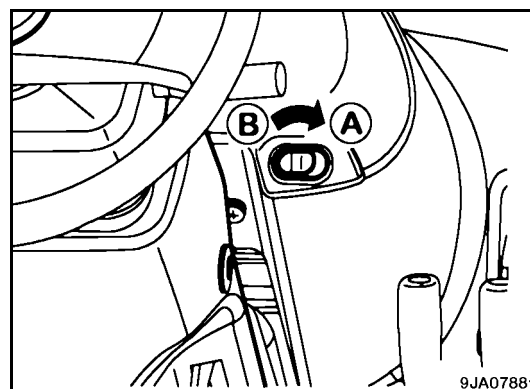
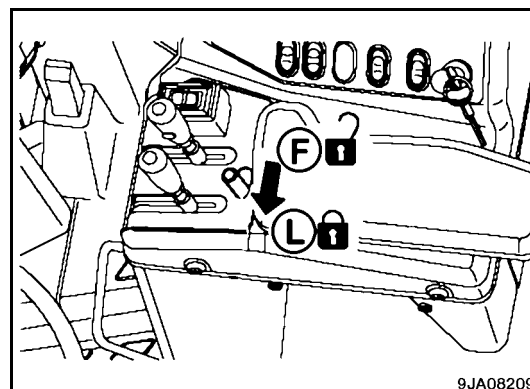
OPERATION

4. Determine the direction of the ramps, then slowly drive the machine up the ramps.
5. Load the machine correctly in the specified position on the trailer.

Securing Machine

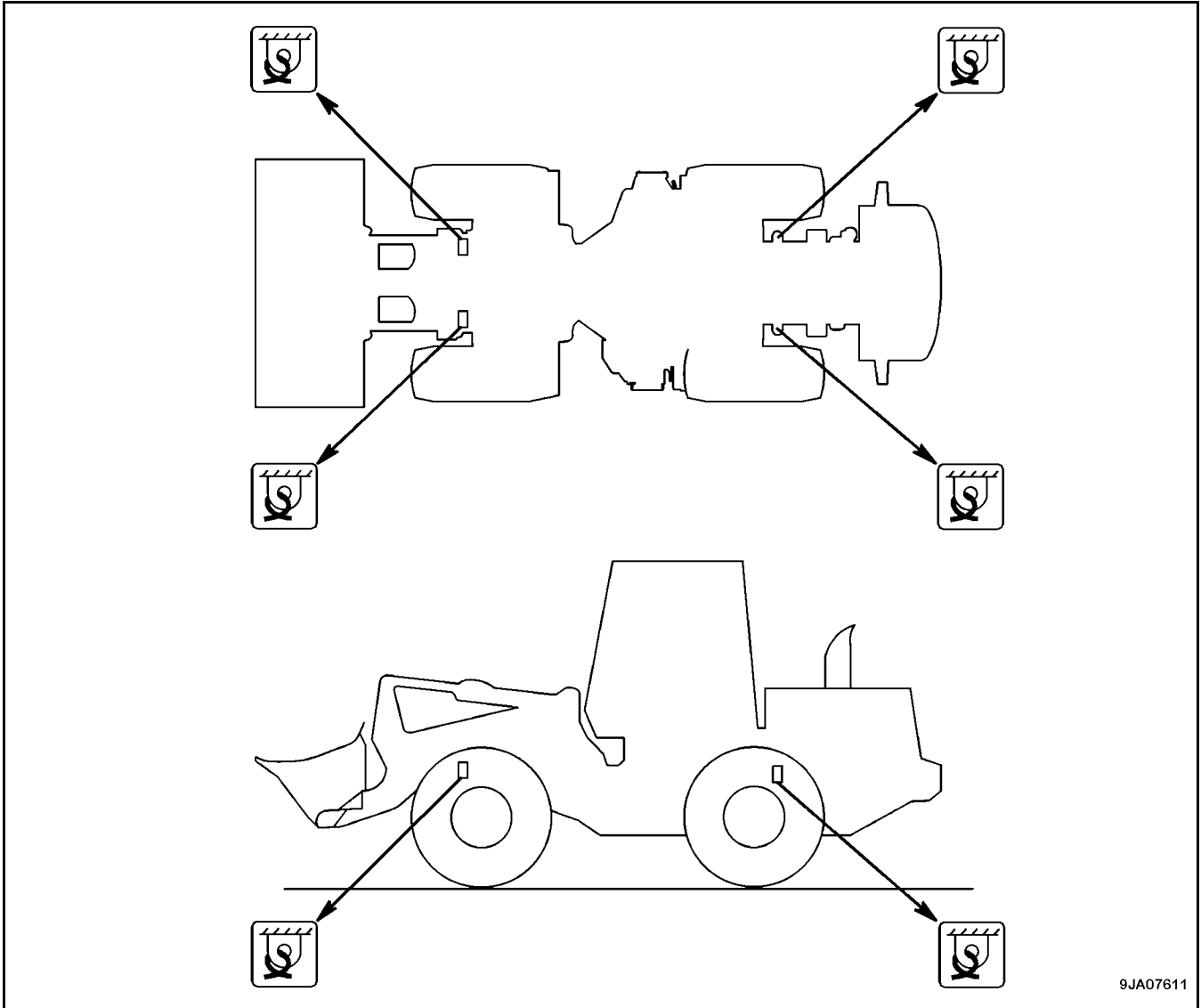
Secure the machine to the trailer in the following manner.

1. Lower the work equipment slowly.
2. Check that the work equipment control lever is at the HOLD position, then set the work equipment lock lever to the LOCK position (L).
3. Set the parking brake switch to the ON position (A) to apply the parking brake.
4. Turn the starting switch to the OFF position to stop the engine.
5. Remove the key from the starting switch.
6. Set the safety lock to the LOCK position (L) to lock the front frame and rear frame.
7. Put blocks in front and behind the wheels.
8. Secure the machine with chains or wire rope of a suitable strength to prevent the machine from moving during transportation.
 - In particular, attach the machine securely to prevent it from slipping sideways. See “Fastening Positions” on page 2-162.
9. Retract the antenna fully.
10. Adjust the mirrors so that they will be within the width of the trailer.
11. Protect the exhaust stack from moisture, if necessary.



OPERATION

Fastening Positions



Unloading Machine

- ★ When unloading the machine, always use ramps or a platform.
- ★ Be sure the loading area is flat and dry.

1. Unload on firm, level ground. Maintain a safe distance from the edge of the road.
2. Apply the brakes on the trailer and insert blocks (1) under the tires to ensure that the trailer does not move.
3. Set the distance (3) between ramps (2) to match the distance between the left and right tires, and make angle (4) of the ramps a maximum of 15 degrees.

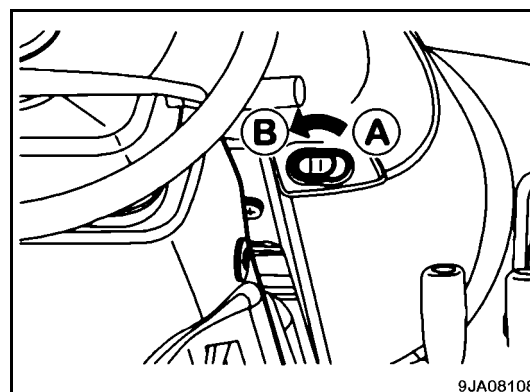
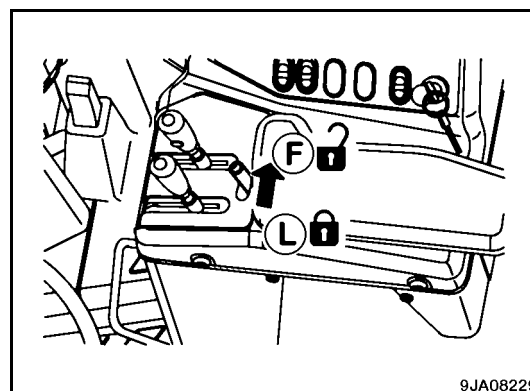
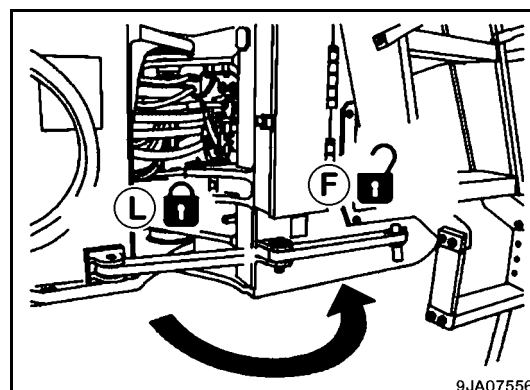
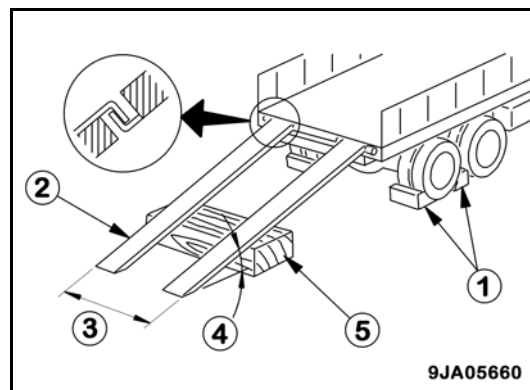
If ramps (2) sag appreciably under the weight of the machine, put a wooden block (5) under the ramps to support them.

- Be sure that the two sides are at the same height.

4. Remove the chains and wire ropes fastening the machine to the trailer.
5. Set the frame lock bar to the FREE position (F).
6. Start the engine. Warm up the engine completely.

7. Check that the work equipment control lever is at the HOLD position, then set the work equipment lock lever to the FREE position (F).

8. Set the parking brake switch to OFF position (B) to cancel the parking brake.
9. Determine the direction of the ramps, then drive the machine slowly down the ramps.



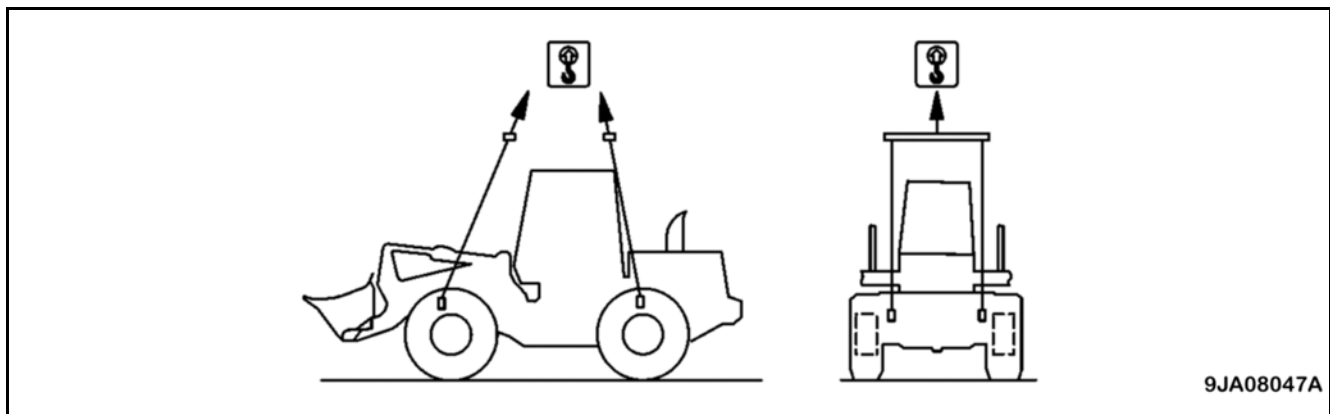
LIFTING MACHINE

! WARNING

- The person using the crane to carry out lifting operations **MUST** be a qualified crane operator.
- Before lifting the machine, do the following steps to prevent the machine from moving unexpectedly.
- Stop the engine.
- Set the parking brake switch to the ON position.
- Set the work equipment lock lever to the LOCK position.
- Set the frame lock bar to the LOCK position to prevent the machine from articulating.
- Never lift the machine with a worker on it.
- Keep the machine horizontal while lifting it.
- Make sure the wire rope used for lifting is of ample strength for the weight of the machine.
- When lifting the machine, the wire rope must be fitted correctly or the machine may fall and cause serious injury or even death.
- Never enter the area under or around a raised machine. There is danger that the machine may lose its balance.

- ★ The lifting procedure applies to machines with standard specifications.
- ★ The method of lifting may differ depending on the attachments and options installed.
- ★ For details about the procedure for lifting machines that do not conform to standard specifications, contact your Komatsu distributor.
- ★ For details of the weight, see “SPECIFICATIONS” on page 4-2.

Lifting Position Marks



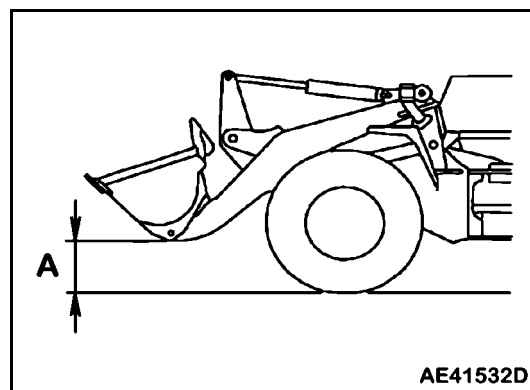
- ★ Lifting work can be carried out only for machines with hook mark labels (lifting marks).
- ★ Before starting the lifting operation, stop the machine on level ground.

Lifting Procedure

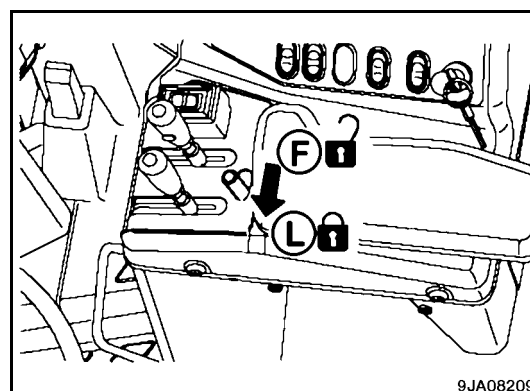
1. Start the engine; make sure that the machine is horizontal; then set the work equipment to the travel posture.

For details, see “Moving the Machine (Directional, Speed), Stopping the Machine” on page 2-107.

(A): 40 – 50 cm (16 – 20 in)



2. Check that the work equipment control lever is at the HOLD position, then set the work equipment lock lever to the LOCK position (L).



3. Stop the engine; check that the area around the operator's compartment is safe; then set the frame lock bar to the LOCK position (L) so that the front frame and rear frame cannot articulate.

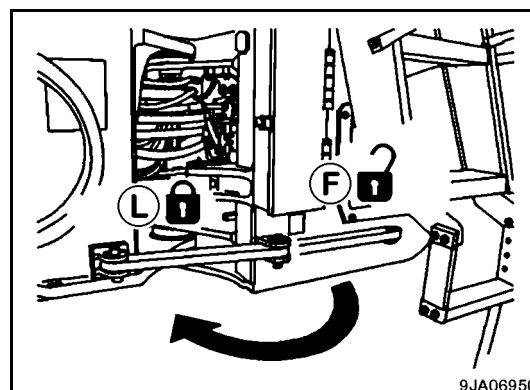
4. Use wire rope and slings that match the weight of the machine.
 - Wind the wire rope and fix it to the lifting hooks (indicated by hook marks) at the front of the front frame and the rear of the rear frame. See “Lifting Position Marks” on page 2-164.

Remark

Use protectors, etc. so that the wire ropes do not break at sharp edges or narrow places.

Use threaders and bars having sufficient width so that the slings and wire ropes do not touch the machine.

For machines equipped with a rear full fender, remove the rear full fender before carrying out the operation.



5. Raise the machine 100 to 200 mm (3.9 to 7.9 in) from the ground; check that the machine is horizontal; that there is no slack in the wire rope; and then continue to lift the machine.

COLD WEATHER OPERATION

Precautions for Low Temperature

If the temperature drops, it becomes difficult to start the engine. The coolant may freeze.

Fuel and Lubricants

Change to fuel and oil with low viscosity for all components.

For details of the specified viscosity, see “RECOMMENDED FUEL, COOLANT, AND LUBRICANTS” on page 3-11.

Coolant

WARNING

- Antifreeze is toxic. Be careful not to get it into your eyes or on your skin. If it should get into your eyes or on your skin, wash it off with a large amount of fresh water and see a doctor immediately.
- Contact your Komatsu distributor for information regarding handling coolant that contains antifreeze (as when draining and changing coolant or repairing the radiator).
- Antifreeze is toxic. Do not let it flow into drainage ditches or spray it on the ground surface.
- Antifreeze is flammable. Do not bring any flame close to the antifreeze. Do not smoke when handling antifreeze.

Remark

Use Komatsu Supercoolant (AF-NAC). We do not recommend the use of any coolant other than Komatsu genuine supercoolant.

When using Komatsu Supercoolant (AF-NAC), there is no need to use a corrosion resistor; see “Clean Inside of Cooling System” on page 3-29.

Never use methanol-, ethanol-, or propanol-based antifreeze.

Do not use any leak-preventing agent, regardless of whether it is sold separately or in antifreeze.

Do not mix one brand of antifreeze with that of a different brand.

- ★ For details of the antifreeze mixture when changing the coolant, see “Clean Inside of Cooling System” on page 3-29.

Battery

WARNING

- The battery generates flammable gas. Do not bring fire or sparks near the battery.
- Battery electrolyte is dangerous. If it gets in your eyes or on your skin, wash it off with a large amount of water and consult a doctor immediately.
- Battery electrolyte dissolves paint. If it gets on the bodywork, wash it off immediately with water.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source. There is danger that the battery may explode.
- Battery electrolyte is toxic. Do not let it flow into drainage ditches or spray it on the ground surface.

When the ambient temperature drops, the battery capacity will drop also. If the battery charge ratio is low, the battery electrolyte may freeze.

- Maintain the battery charge as close as possible to 100%.
- Insulate the battery against cold temperature so that the machine can be started easily the next morning.

Remark

Measure the specific gravity and calculate the rate of charge from the following conversion table.

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

- As the battery capacity drops drastically in low temperatures, cover the battery or remove it from the machine; keep it in a warm place; and install it again the next morning.
- If the electrolyte level is low, add distilled water in the morning before beginning work.
- Do not add water after the day’s work. Diluted electrolyte in the battery may freeze during the night.

Precautions After Completion of Work

Mud and water on the undercarriage can freeze overnight and make machine movement difficult the following morning.

Observe the following precautions.

- Remove all mud and water from the machine body. In particular, wipe the hydraulic cylinder rods clean to prevent damage to the seals caused if mud, dirt, and/or water on the rod surface gets inside the seal.
- Park the machine on hard, dry ground. If this is impossible, park the machine on wooden boards. The boards help protect the tires from freezing to the ground so the machine can be moved the next morning.
- Open the drain valve and drain any water collected in the fuel system to prevent it from freezing.
- Fill the fuel tank to capacity. This minimizes moisture condensation in the tank when the temperature drops.

When Cold Weather Ends

When the season changes and the weather becomes warmer, do the following procedure.

- Replace all oil and fuel with fuel and oil of the specified viscosity.
- For details, see “RECOMMENDED FUEL, COOLANT, AND LUBRICANTS” on page 3-11.

LONG-TERM STORAGE

Before Storage

When putting the machine in storage for a long period (more than one month), do the following procedure.

- Clean and wash all parts and then store the machine indoors.
If the machine must be stored outdoors, select level ground and cover the machine with a sheet.
- Completely fill the fuel tank; this prevents moisture from collecting inside the tank.
- Lubricate and change the oil before storage.
- Apply a thin coat of grease to the exposed portion of the hydraulic cylinder piston rods.
- Disconnect the negative terminals of the battery. Cover the battery or remove it from the machine and store it separately.
- Set the lock lever to the LOCK position to prevent the machine from moving.
- To prevent corrosion, fill the cooling system with Komatsu genuine Supercoolant (AF-NAC) (density between 30% and 68%).

During Storage

WARNING

- **If it is necessary to perform the rust-prevention operation while the machine is indoors, open doors and windows for ventilation since the engine will be running.**
 - **Be sure to provide adequate ventilation in order to prevent gas poisoning.**
-
- During storage, operate and move the machine for a short distance once a month so that a new film of oil coats the moving parts. At the same time, also charge the battery.
 - When operating the work equipment, wipe off all the grease from the hydraulic cylinder rods.
 - If the machine is equipped with an air conditioner, run the air conditioner for three to five minutes once a month to lubricate all parts of the air conditioner compressor.
Always run the engine at low idle when doing this.
 - Check the refrigerant level twice a year.

After Storage

Remark

If the machine has been stored without carrying out the monthly rust-prevention operation, contact your Komatsu distributor before returning the machine to operation.

Before returning the machine to operation after a long-term period of storage, do the following procedure.

- Wipe off the grease from the hydraulic cylinder rods.
- Add oil and grease at all lubrication points.
- When a machine is stored for a long period, moisture in the air mixes with the oil. Check the oil before and after starting the engine.

If there is water in the oil, change the oil.

- Check that there is no rust on the engine pulley and no abnormality in the belt.

If there is excessive rust on the belt contact surface of the pulley, remove it with a wire brush.

- If the air conditioner compressor belt is loose, adjust the belt tension to ensure that there is no slipping.

For details about adjusting the belt tension, see “Check Air Conditioner Compressor Belt Tension, Adjust” on page 3-55.

TROUBLESHOOTING

When Machine Runs Out of Fuel

Always watch the fuel level and be careful not to run out of fuel.

WARNING

- **When starting the engine after running out of fuel, check carefully that the area around the engine is safe before cranking the engine.**
- ★ When starting the engine after running out of fuel, fill with fuel and bleed the air from the fuel system before starting the engine. See “Bleeding Air from Fuel Line” on page 3-63.

Towing the Machine

WARNING

- **Serious injury or death could result if a disabled machine is towed incorrectly or if there is any mistake in the selection or inspection of the wire rope.**
- **Always be sure to check carefully that the capacity of the wire rope used for towing is ample for the weight of the towed machine.**
- **Never use a wire rope which has cut strands (A), reduced diameter (B), or kinks (C). There is danger that the rope may break during the towing operation.**
- **Always wear leather gloves when handling wire rope.**
- **Never tow a machine on a slope.**
- **During the towing operation, never stand between the towing machine and the machine being towed.**
- **Move the machine gradually to a constant speed. Do not apply any sudden load on the wire rope; the towing wire may break.**
- **If there is a failure in the engine or brake system, the brakes cannot be used. Be extremely careful when towing.**
- **If the steering and the brakes on the disabled machine cannot be operated, do not let anybody ride on the disabled machine.**

Remark

Towing is for moving the machine a short distance to a place where inspection and maintenance can be carried out. The machine must not be towed for long distances.

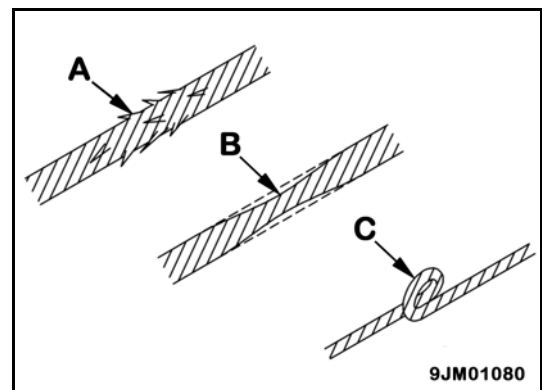
For details of the permissible towing load for this machine, see “SPECIFICATIONS” on page 4-2. Do not tow any load greater than this.

For details about the procedure for towing a machine when it has broken down, contact your Komatsu distributor.

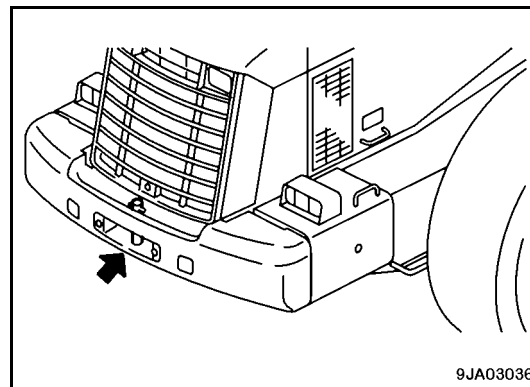
- ★ This machine must not be towed except in emergencies.

When towing the machine, take the following precautions.

- Before releasing the brakes, put blocks under the wheels to prevent the machine from moving. If the wheels are not blocked, the machine may move suddenly.
- If it is impossible to operate the steering and brakes of the machine being towed, do not let anyone ride on the machine.



- Keep the angle of the tow rope as small as possible. Keep the angle between the center lines of the two machines to within 30 degrees.
- Connect a wire rope to the part indicated with the arrow in the diagram to the right.
- The towing machine should normally be of the same class as the machine being towed. Check that the towing machine has ample braking power, weight, and rimpull to allow it to control both machines on a slope or on the tow road.
- When towing a machine, tow it at a low speed of less than 2 km/h (1.2 mph) and for a distance of a few meters to a place where repairs can be carried out.



The machine should be towed only in emergencies. If the machine must be moved long distances, use a transporter.

- Check that the tow rope is of ample strength for the weight of the machine being towed. If the machine being towed must travel through mud or up hills, use a tow rope of a strength of a least 1.5 times the weight of the machine being towed.
- If the machine is moved suddenly, the tow rope will be subjected to excessive load and may break. Start the machine gradually and travel at a constant speed.
- When towing a machine downhill, connect another machine to the rear of the machine being towed in order to provide ample rimpull and braking power. This prevents the towed machine from losing control and turning over.
- Towing may be carried out under different conditions; it is impossible to determine beforehand the requirements for towing.

Towing on flat horizontal roads requires the minimum rimpull; towing on slopes or on uneven road surfaces requires the maximum rimpull.

When Engine Can Be Used

- If the transmission and steering wheel can be operated and the engine is running, it is possible to tow the machine out of mud or to move it for a short distance to the edge of the road.
- The operator should sit in the cab of the machine being towed and operate the steering in the direction that the machine is towed.

When Engine Cannot Be Used

When towing a machine with the engine stopped, use the following procedure.

1. The transmission oil does not lubricate the system; remove the front and rear drive shafts. If necessary, block the tires to prevent the machine from moving.
2. The steering cannot be operated; remove the steering cylinder.
Even if the brakes are in good condition, the brakes can only be used a limited number of times. There is no change in the operating force for the brake pedal but the braking force is reduced each time the pedal is depressed.
3. Connect the towing equipment securely. When carrying out towing operations, use two machines of at least the same class as the machine being towed. Connect one machine to the front and one to the rear of the machine being towed; remove the blocks from the tires; and tow the machine.
4. The parking brake cannot be turned OFF. Release the parking brake; see “Releasing Parking Brake” on page 2-172.

OPERATION

Releasing Parking Brake

⚠ WARNING

- When releasing the parking brake, stop the machine on level ground and check that the surrounding area is safe. If it is necessary to release the brake on a slope in an emergency, block the tires before starting the operation.
- If the parking brake is released, there is no braking force. Ensure that the situation is safe when moving the machine.

★ If the engine does not run, use the following methods to release the parking brake and tow the machine.

Releasing Parking Brake by Using Emergency Parking Brake Cancel Switch

⚠ WARNING

- When the parking brake switch is at the OFF position and the emergency parking brake release valve is opened, the parking brake is released immediately.
- In this condition, even if you sense danger and try to stop the machine, the parking brake will not be applied immediately even if you close the emergency parking brake release valve.

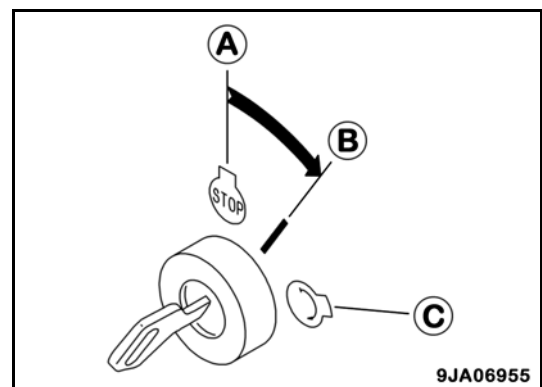
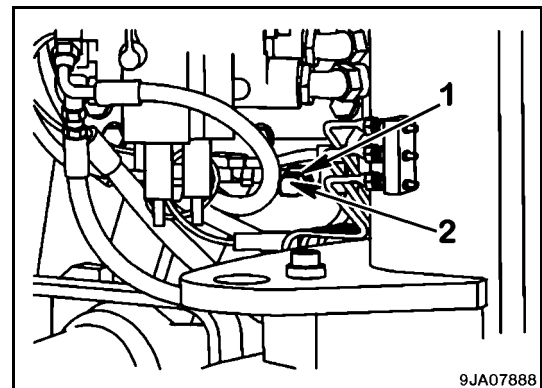
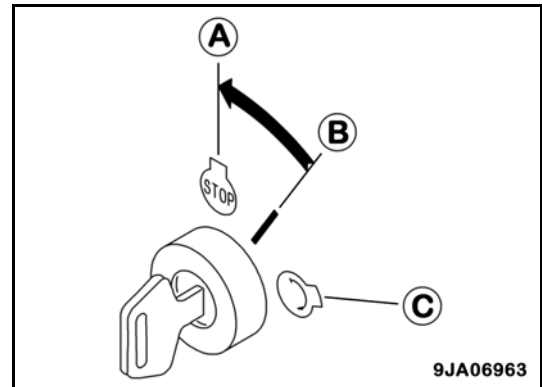
★ If the pressure in the brake accumulator is high, do the following steps.

1. Turn the starting switch to the OFF position (A).
2. Turn locknut (1) of the release valve counterclockwise, then turn grip (2) counterclockwise to open the release valve.

Remark

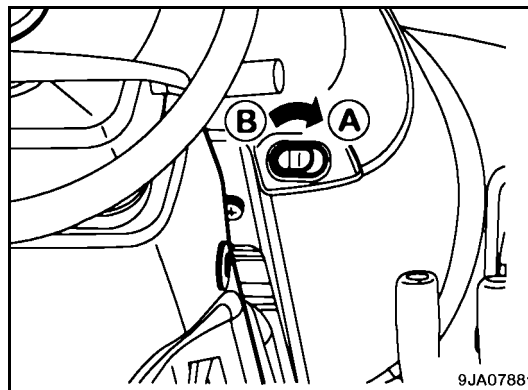
The relief valve is located on the left, front portion inside the rear frame and secured to the accumulator mounting bracket.

3. Turn the starting switch to the ON position (B).



4. Move the parking brake switch to the ON (A) position (actuated), then move it to the OFF (B) position (released).

The parking brake is released.



5. To restore the function of the parking brake, turn grip (2) of the release valve clockwise to close the release valve, then turn locknut (1) clockwise to lock it.

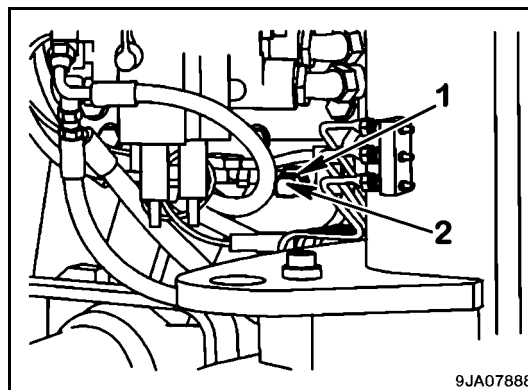
Tightening torque

Grip (2): 20 ±5 N•m (14.75 ±3.69 lbf ft)

Locknut (1): 20 ±5 N•m (14.75 ±3.69 lbf ft)

6. Move the parking brake switch to the ON (A) position. The parking brake is applied.

To release the parking brake again, repeat Steps 1 to 4.



Remark

If the pressure in the brake accumulator is low, the parking brake warning lamp may not go out and the alarm buzzer may sound (a long continuous sound).

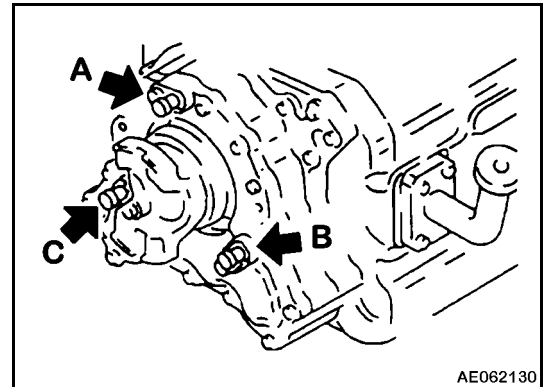
If this happens, release the brake. For details, see "Releasing Parking Brake with Adjustment Screw" on page 2-174.

OPERATION

Releasing Parking Brake with Adjustment Screw

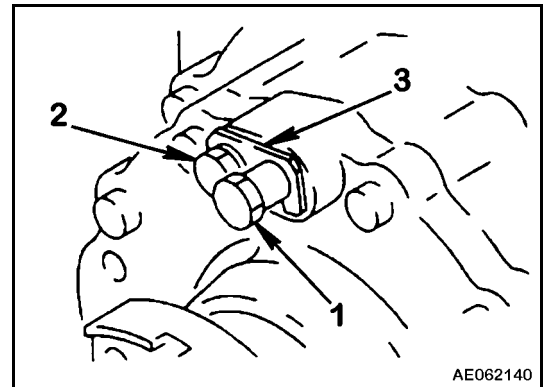
If the brake accumulator pressure is low, do the following procedure.

1. Loosen bolt (2) and adjustment screw (1) at three places (A, B, C) at the front of the transmission case.



2. Rotate lock plate (3) to release the lock, then tighten adjustment screw (1) until it stops.

- ★ If this operation is carried out at the same time at A, B, and C, the parking brake can be released.



Emergency Travel Operation

The normal gearshifting operation is carried out by electric signals.

- ★ If there is a failure in the electrical system and the machine does not move, contact your Komatsu distributor to have the machine moved.

Remark

Always ask your Komatsu distributor to carry out the emergency travel operation.

If Battery is Discharged

Precautions

! WARNING

- It is dangerous to charge a battery when it is mounted on a machine. Make sure that it is removed before charging.
- When checking or handling the battery, stop the engine and turn the starting switch key to the OFF position.
- The battery generates hydrogen gas; there is a hazard of explosion. Do not smoke nor bring lighted cigarettes near the battery, or do anything that will cause sparks.
- Battery electrolyte is dilute sulfuric acid; it will attack your clothes and skin.
- If it gets on your clothes or on your skin, immediately wash it off with a large amount of water.
- If it gets in your eyes, wash your eyes out with copious amounts of fresh water and consult a doctor immediately.
- When handling batteries, always wear safety glasses and rubber gloves.
- When removing the battery, first disconnect the cable from the negative (-) terminal. When installing, connect the positive (+) terminal first.
- If a tool touches the positive terminal and the chassis, there is danger that it will cause a spark. Be extremely careful.
- If the terminals are loose, there is danger that the defective contact may generate sparks that will cause an explosion.
- When removing or installing the terminals, check which is the positive (+) terminal and which is the negative (-) terminal.

Remark

The batteries are on both sides at the rear of the machine.

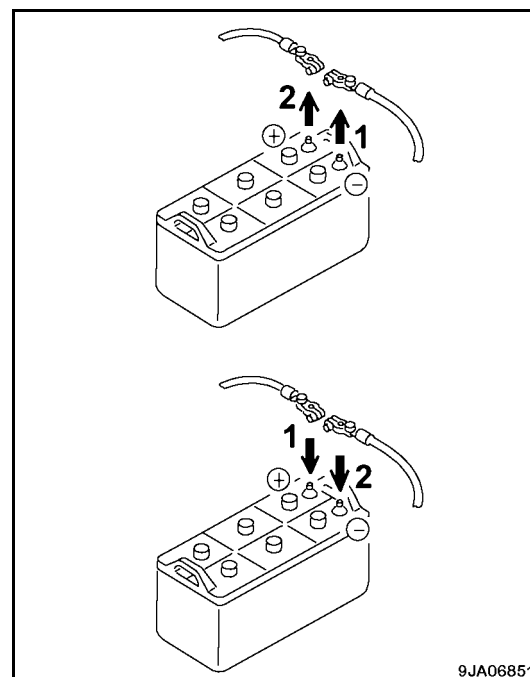
The battery used for the ground is on the left side of the machine.

Removing the Battery

1. Remove the ground cable (normally connected to the negative (-) terminal).
 - Loosen the nuts of the terminal and remove the cable from the battery.
 - ★ If any tool touches between the positive terminal and the chassis, there is danger of sparks being generated.
2. Loosen the nuts and remove the cable from the positive (+) terminal.
3. Remove the battery clamp.
4. Remove the battery.

Installing the Battery

1. Install the battery and fix it securely with the battery clamp.
Tightening torque: 2.0 – 2.9 N•m (17.70 – 25.67 lbf in)
2. Connect the cable to the positive (+) terminal.



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OPERATION

- Insert the hole of the terminal on the battery and tighten the nuts.

Tightening torque: 5.9 – 9.8 N•m (52.22 – 86.74 lbf in)

3. Connect the ground cable to the negative (-) terminal and tighten the nuts.

Precautions for Charging Battery

WARNING

- **If you do not handle the battery correctly when charging it, there is danger that the battery may explode.**
- **Always follow the instructions in “If Battery is Discharged” on page 2-175 and the instruction manual accompanying the charger.**

Observe the following rules.

- Do not use or charge the battery if the battery electrolyte level is below the LOWER LEVEL line. This may cause an explosion.

Check the battery electrolyte level periodically and add distilled water to bring the electrolyte level to the UPPER LEVEL line.

- Set the voltage of the charger to match the voltage of the battery to be charged.

If the correct voltage is not selected, the charger may overheat and cause an explosion.

- Connect the positive (+) charger clip of the charger to the positive (+) terminal of the battery. Connect the negative (-) charger clip of the charger to the negative (-) terminal of the battery.

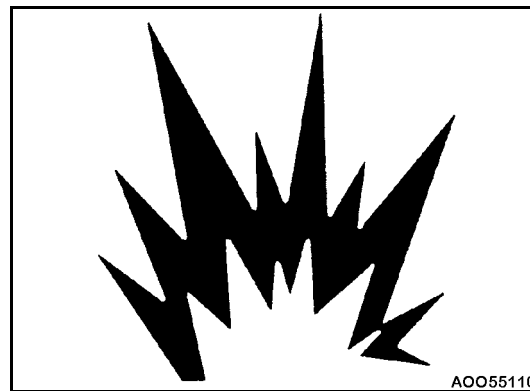
Be sure to fix the clips securely.

- Set the charging current to 1/10 of the value of the rated battery capacity. When carrying out rapid charging, set it to less than the rated battery capacity.

If the charger current is too high, the electrolyte will leak or dry up; this may cause the battery to catch fire and explode.

- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source.

There is danger that this may ignite the battery electrolyte and cause the battery to explode.



OPERATION

Starting Engine With Booster Cable

Precautions When Connecting or Disconnecting Booster Cable

WARNING

- When connecting the cables, never let the positive (+) and negative (-) terminals contact each other.
- When starting the engine with a booster cable, always wear safety glasses and rubber gloves.
- Be careful not to let the normal machine and the problem machine contact each other. This prevents sparks from generating near the battery which could ignite the hydrogen gas given off by the battery.
- Make sure that there is no mistake in the booster cable connections. The final connection is to the engine block of the problem machine. Sparks will be generated when this is done; connect to a place as far as possible from the battery.
- When disconnecting the booster cable, be careful not to bring the clips in contact with each other or with the machine body.

When starting the engine with a booster cable, follow these instructions.

Remark

The size of the booster cable and clips should be suitable for the battery size.

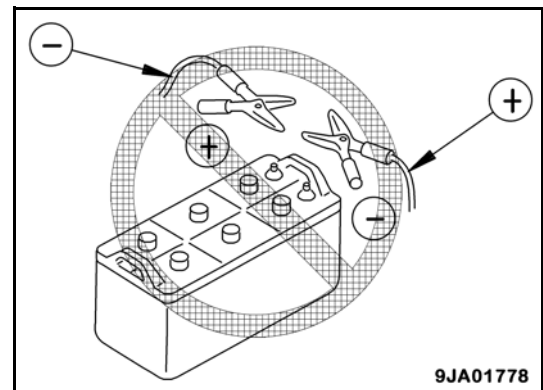
The battery of the normal machine must be the same capacity as the battery on the machine to be started.

Check the cables and clips for damage or corrosion.

Make sure that the cables and clips are firmly connected.

Check that the safety lock levers and the parking brake levers on both machines are in the LOCK position.

Check that each lever is in the NEUTRAL position.

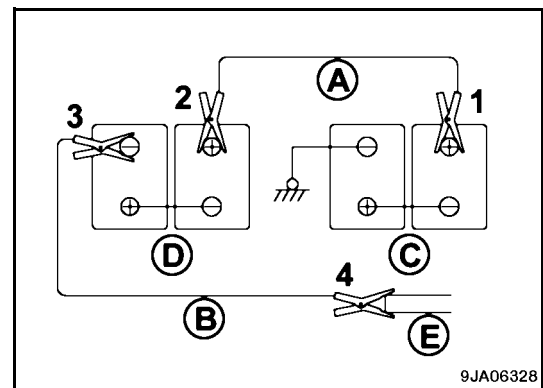


Connecting Booster Cable

Keep the starting switch of the normal machine and problem machine at the OFF position.

Connect the booster cable as follows, in the order of the numbers marked in the diagram.

1. Connect the clip of booster cable (A) to the positive (+) terminal of battery (C) on the problem machine.
2. Connect the clip at the other end of booster cable (A) to the positive (+) terminal of battery (D) on the normal machine.
3. Connect the clip of booster cable (B) to the negative (-) terminal of battery (D) on the normal machine.
4. Connect the clip at the other end of booster cable (B) to engine block (E) on the problem machine.



Starting Engine

⚠ WARNING

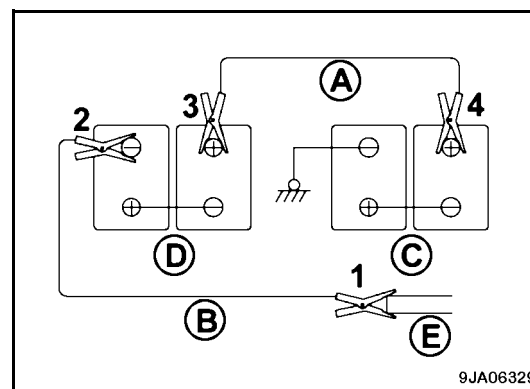
- Always check that the safety lock lever is set to the LOCK position, regardless of whether the machine is working normally or has failed.
- Check that all the control levers are at the HOLD or neutral position.

1. Make sure the clips are firmly connected to the battery terminals.
2. Start the engine of the normal machine and keep it running at high idle speed.
3. Turn the starting switch of the problem machine to the START position and start the engine.
If the engine does not start immediately, wait at least two minutes before trying again.

Disconnecting Booster Cable

After the engine has started, disconnect the booster cables in the reverse order in which they were connected.

1. Remove the clip of booster cable (B) from engine block (E) on the problem machine.
2. Remove the clip of booster cable (B) from the negative (-) terminal of battery (D) on the normal machine.
3. Remove the clip of booster cable (A) from the positive (+) terminal of battery (D) on the normal machine.
4. Remove the clip of booster cable (A) from the positive (+) terminal of battery (C) on the problem machine.



OPERATION

Other Troubleshooting

Electrical System

- (): Always contact your Komatsu distributor when dealing with these items.
- In cases of problems or causes which are not listed below, contact your Komatsu distributor for repairs.

Problem	Main Causes	Remedy
Lamp does not glow brightly even when the engine runs at high speed. Lamp flickers while engine is running.	<ul style="list-style-type: none">• Defective wiring• Defective adjustment of alternator belt tension	<ul style="list-style-type: none">• (Check, repair loose terminals, disconnections.)• Adjust alternator belt tension. * See EVERY 250 HOURS SERVICE.
Even when the engine is rotating, the battery charge circuit caution lamp does not go out.	<ul style="list-style-type: none">• Defective alternator• Defective wiring• Defective adjustment of alternator belt tension	<ul style="list-style-type: none">• (Replace.)• (Check, repair.)• Adjust alternator belt tension. * See EVERY 250 HOURS SERVICE.
Abnormal noise is generated from alternator.	<ul style="list-style-type: none">• Defective alternator	<ul style="list-style-type: none">• (Replace.)
Starting motor does not turn when starting switch is turned ON.	<ul style="list-style-type: none">• Defective wiring• Insufficient battery charge	<ul style="list-style-type: none">• (Check, repair.)• Charge.
Pinion of starting motor keeps going in and out.	<ul style="list-style-type: none">• Insufficient battery charge	<ul style="list-style-type: none">• Charge.
Starting motor turns engine sluggishly.	<ul style="list-style-type: none">• Insufficient battery charge• Defective starting motor	<ul style="list-style-type: none">• Charge.• (Replace.)
Starting motor disengages before engine starts.	<ul style="list-style-type: none">• Defective wiring• Insufficient battery charge	<ul style="list-style-type: none">• (Check, repair.)• Charge.
Preheating pilot lamp does not illuminate.	<ul style="list-style-type: none">• Defective wiring• Defective heater relay, heater controller, temperature sensor• Defective preheating pilot lamp	<ul style="list-style-type: none">• (Check, repair.)• (Replace.)• (Replace.)
Even when engine is stopped, battery charge circuit caution lamp does not illuminate (starting switch at ON position).	<ul style="list-style-type: none">• Defective wiring• Defective monitor	<ul style="list-style-type: none">• (Check, repair.)• (Replace.)

* See "Every 250 Hours Service" on page 3-53.

Chassis

- (): Always contact your Komatsu distributor when dealing with these items.
- In cases of problems or causes which are not listed below, contact your Komatsu distributor for repairs.

Problem	Main Causes	Remedy
Transmission		
Engine is running but machine does not move.	<ul style="list-style-type: none"> • Parking brake applied. • Directional lever is not shifted properly. • Lack of oil in transmission case 	<ul style="list-style-type: none"> • Release parking brake. • Shift lever properly. • Add oil to specified level. * See WHEN REQUIRED.
Even when engine is run at full throttle, machine only moves slowly and lacks power.	<ul style="list-style-type: none"> • Lack of oil in transmission case • Screen is clogged. 	<ul style="list-style-type: none"> • Add or drain oil to specified level. * See WHEN REQUIRED. • (Disassemble, clean.)
Oil overheats.	<ul style="list-style-type: none"> • Too much oil or too little oil in transmission case • Machine is not traveling in correct speed range. • Torque converter is stalled for long periods. • Engine is overheating. 	<ul style="list-style-type: none"> • Add or drain oil to specified level. * See WHEN REQUIRED. • Place in correct speed range. • Reduce stall time. • (Check engine.)
Noise generated.	<ul style="list-style-type: none"> • Lack of oil in transmission case 	<ul style="list-style-type: none"> • Add oil to specified level. * See WHEN REQUIRED.
Axle		
Noise generated.	<ul style="list-style-type: none"> • Lack of oil • Improper oil used (for machines with limited slip differential) 	<ul style="list-style-type: none"> • Add oil to specified level. * See WHEN REQUIRED. • Replace with specified oil.
Brake		
Brake is not applied when pedal is depressed.	<ul style="list-style-type: none"> • Disc has reached wear limit. • Lack of oil in hydraulic tank • Air in brake line 	<ul style="list-style-type: none"> • (Replace disc.) • Add oil to specified level. ** See EVERY 100 HOURS SERVICE. • Bleed air. * See WHEN REQUIRED.
Brake drags or remains applied.	<ul style="list-style-type: none"> • Vent hole of brake valve is clogged. 	<ul style="list-style-type: none"> • Clean
Brakes squeal.	<ul style="list-style-type: none"> • Disc is worn. • Large amount of water in axle oil • Deteriorated axle oil due to overuse of brake 	<ul style="list-style-type: none"> • (Replace disc.) • Change axle oil. • Change axle oil.

* See “When Required” on page 3-26.

** See “Every 100 Hours Service” on page 3-50.

OPERATION

Problem	Main Causes	Remedy
Steering		
Steering wheel is heavy.	<ul style="list-style-type: none"> Lack of oil in hydraulic tank 	<ul style="list-style-type: none"> Add oil to specified level. * See EVERY 100 HOURS SERVICE.
Steering wheel is loose.	<ul style="list-style-type: none"> Play in steering cylinder pin Lack of oil in hydraulic tank 	<ul style="list-style-type: none"> Grease bearing or replace pin and bushing where there is play. Add oil to specified level. * See EVERY 100 HOURS SERVICE.
Parking brake		
Brake does not work well.	<ul style="list-style-type: none"> Disc is worn. 	<ul style="list-style-type: none"> (Replace disc.)
Brake drags or remains applied.	<ul style="list-style-type: none"> Lack of oil in transmission case Screen is clogged. 	<ul style="list-style-type: none"> Add oil to specified level. ** See WHEN REQUIRED. (Disassemble, clean.)
Hydraulic system		
Lacks bucket lifting power. Takes time to lift the bucket.	<ul style="list-style-type: none"> Lack of oil in hydraulic tank Clogged hydraulic tank filter 	<ul style="list-style-type: none"> Add oil to specified level. * See EVERY 100 HOURS SERVICE. Replace filter. *** See EVERY 2000 HOURS SERVICE.
Excessive bubbles in oil	<ul style="list-style-type: none"> Low quality oil being used Lack of oil in hydraulic tank Air in oil line 	<ul style="list-style-type: none"> Replace with good quality oil. Add oil to specified level. * See EVERY 100 HOURS SERVICE. Bleed air. ** See EVERY 2000 HOURS SERVICE.
Hydraulic pressure is low.	<ul style="list-style-type: none"> Lack of oil in hydraulic tank causes pump to suck in air. 	<ul style="list-style-type: none"> Add oil to specified level. * See EVERY 100 HOURS SERVICE. Then bleed air. ** See EVERY 2000 HOURS SERVICE.
Movement of cylinder is irregular.	<ul style="list-style-type: none"> Lack of oil in hydraulic tank 	<ul style="list-style-type: none"> Add oil to specified level. * See EVERY 100 HOURS SERVICE.

* See "Every 1000 Hours Service" on page 3-65.

** See "When Required" on page 3-26.

*** See "Every 2000 Hours Service" on page 3-71.

Engine

- (): Always contact your Komatsu distributor when dealing with these items.
- In cases of abnormalities or causes which are not listed below, contact your Komatsu distributor for repairs.

Problem	Main Causes	Remedy
Engine oil pressure caution lamp illuminates.	<ul style="list-style-type: none"> • Low oil level in engine oil pan (sucking in air). • Clogged oil filter cartridge • Defective tightening of oil pipe joint; oil leakage from damaged part • Defective monitor 	<ul style="list-style-type: none"> • Add oil specified level. * See CHECK BEFORE STARTING. • Replace cartridge. ** See EVERY 500 HOURS SERVICE. • (Check, repair.) • (Replace.)
<p>Steam is emitted from top part of radiator (pressure valve).</p> <p>Engine water temperature gauge is in red range.</p> <p>Engine cooling water temperature caution lamp lights up.</p>	<ul style="list-style-type: none"> • Cooling water level low, water leakage • Defective fan pump or motor • Dirt or scale accumulated in cooling system • Clogged radiator fin or damaged fin • Defective thermostat • Defective thermostat seal • Loose radiator filler cap (high altitude operation) • Defective monitor 	<ul style="list-style-type: none"> • Check, add cooling water, repair. *** See WHEN REQUIRED. • (Check, repair.) • Change cooling water, clean inside of cooling system. *** See WHEN REQUIRED. • Clean or repair. *** See WHEN REQUIRED. • (Replace thermostat.) • (Replace thermostat seal.) • Tighten cap or replace packing. • (Replace.)
Engine water temperature gauge is in white range on left.	<ul style="list-style-type: none"> • Defective thermostat • Defective monitor 	<ul style="list-style-type: none"> • (Replace thermostat.) • (Replace.)
Engine does not start when starting motor is turned.	<ul style="list-style-type: none"> • Lack of fuel • Air in fuel system • No fuel in fuel filter • Defective injection pump or injector • Starting motor cranks engine too slowly. • Starting motor does not turn. • Preheating pilot lamp does not illuminate. • Defective valve clearance (Defective compression) 	<ul style="list-style-type: none"> • Add fuel. * See CHECK BEFORE STARTING. • Repair place where air is sucked in. • Add fuel to fuel filter. ** See EVERY 500 HOURS SERVICE. • (Replace pump or injector.) • **** See ELECTRICAL SYSTEM • **** See ELECTRICAL SYSTEM • **** See ELECTRICAL SYSTEM • (Adjust valve clearance.)
Exhaust gas is white or blue.	<ul style="list-style-type: none"> • Too much oil in oil pan • Improper fuel 	<ul style="list-style-type: none"> • Add oil to specified level. * See CHECK BEFORE STARTING. • Change to specified fuel.
Exhaust gas occasionally turns black.	<ul style="list-style-type: none"> • Clogged air cleaner element • Defective injector • Defective compression • Defective turbocharger 	<ul style="list-style-type: none"> • Clean or replace. *** See WHEN REQUIRED. • (Replace injector.) • (See Defective Compression in this table) • (Clean or replace turbocharger.)
Combustion noise occasionally makes breathing sound.	<ul style="list-style-type: none"> • Defective nozzle 	<ul style="list-style-type: none"> • (Replace nozzle.)

OPERATION

Problem	Main Causes	Remedy
Abnormal noise generated (combustion or mechanical).	<ul style="list-style-type: none">• Low grade fuel being used• Overheating• Damage inside muffler• Excessive valve clearance	<ul style="list-style-type: none">• Change to specified fuel.• Refer to "Water temperature gauge is in red range" in this table.• Replace muffler.• (Adjust valve clearance.)

Notes

* See "Check Before Starting" on page 3-49.

** See "Every 500 Hours Service" on page 3-59.

*** See "When Required" on page 3-26.

**** See "ELECTRICAL" on page 2-74.

MEMORANDUM

MAINTENANCE

GUIDES TO MAINTENANCE

Remark

Do not perform any inspection or maintenance operation that is not found in this manual.

WARNING

Due to the high voltage/amps and high-pressure fuel, avoid any contact with the engine electrical system (1) and the fuel injection system (2) when the engine is running. Severe injury may result.

Check Service Meter

- Check service meter reading every day to see if it is time for any necessary maintenance to be performed.

Komatsu Genuine Replacement Parts

- Use Komatsu genuine parts specified in the *Parts Book* as replacement parts.

Komatsu Genuine Oils

- Use Komatsu genuine oils and greases.
- Choose oils and greases with the proper viscosities specified for the ambient temperature.

★ See “RECOMMENDED FUEL, COOLANT, AND LUBRICANTS” on page 3-11.

Always Use Clean Washer Fluid

- Use automobile window washer fluid.
- Be careful not to let any dirt get into the fluid.

Always Use Clean Oil and Grease

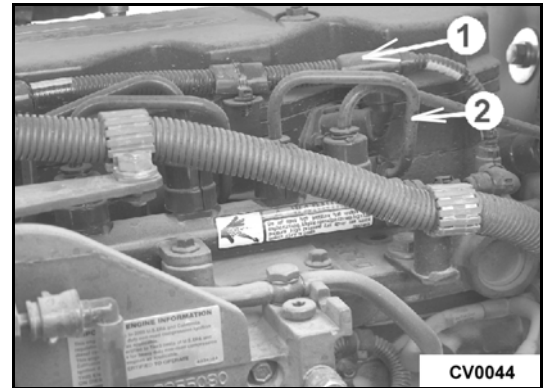
- Use clean oil and grease.
- Keep containers for the oil and grease clean.
- Keep foreign materials away from oil and grease.

Checking for Foreign Materials in Drained Oil and On Filters

- After oil is changed or filters are replaced, check the old oil and filters for metal particles and foreign materials.
- If large quantities of metal particles or foreign materials are found, always report to the person in charge and take suitable action.

Fuel Strainer

- Do not remove the fuel strainer from the filler port when adding fuel.



Welding Instructions

- Turn the engine starting switch off; wait for approximately one minute; then disconnect the battery negative (-) terminal.
- Do not apply more than 200V continuously.
- Connect grounding cable within 1 m (3.3 ft) of the area to be welded.
 - If the grounding cable is connected near instruments, connectors, etc., the instruments may malfunction.
 - Avoid seals or bearings located between the area to be welded and the grounding point.
 - Do not use the area around the work equipment pins or hydraulic cylinders as the grounding point.

Do Not Drop Things Inside Machine

- When opening inspection windows or the oil filler port of the tank, be careful not to drop nuts, bolts, or tools inside the machine.
 - If such things are dropped inside the machine, it may cause damage and/or malfunction of the machine and lead to failure.
 - If you drop anything inside the machine, always remove it immediately.
- Do not put unnecessary things in your pockets. Carry only things which are necessary for inspection.

Dusty Work Sites

When working at dusty work sites, do the following:

- Check the air cleaner clogging caution pilot lamp frequently to see if the air cleaner is clogged. Clean the air cleaner element at a shorter interval than specified.
 - ★ Applies only to machines equipped with KOMTRAX.
- Clean the radiator core frequently to avoid clogging.
- Clean and replace the fuel filter frequently.
- Clean electrical components, especially the starting motor and alternator, to avoid an accumulation of dust.
- When inspecting or changing oil, move the machine to a place that is free of dust to prevent dirt from getting into the oil.

Avoid Mixing Oil

- Never mix different brands or grades of oil.
- If a different brand or grade of oil has to be added, drain the old oil and replace all the oil with the new brand or grade of oil.

Locking Inspection Covers

- Lock the inspection cover in position securely with the lock bar.
 - If inspection or maintenance is performed with the inspection cover open and not locked into position, there is a danger that it may suddenly be blown shut by the wind and injure the worker.

MAINTENANCE

Bleeding Air from Hydraulic Circuit

- If the hydraulic oil equipment has been repaired or replaced and if the hydraulic hoses, pipes, etc. have been disconnected, it is necessary to bleed air from the circuit.
- ★ See “Change Oil in Hydraulic Tank, Replace Hydraulic Tank Filter Element” on page 3-71.

Precautions When Installing Hydraulic Hoses

- When removing parts at locations where there are O-rings or gasket seals, clean the mounting surface and replace with new parts.
 - When doing this, do not forget to assemble the O-rings and gaskets when installing the hoses.
- When installing the hoses, do not twist or bend them sharply. If installed in this manner, the hose will be damaged and its service life drastically reduced.

Checks After Inspection and Maintenance

If you forget to perform the checks after inspection and maintenance, unexpected problems may occur. This may lead to serious injury or property damage. Always do the following checks.

Checks after Operation (with engine stopped)

- Have any inspection and maintenance points been forgotten?
- Have all inspection and maintenance items been performed correctly?
- Have any tools or parts been dropped inside the machine?
 - It is particularly dangerous if parts are dropped inside the machine and get caught in the lever linkage mechanism.
- Are there any coolant or oil leaks?
- Have all nuts and bolts been tightened?

Checks When Engine is Running

- Be extremely careful to ensure safety during this operation.
 - When checking the operation of the engine, see “Running the Machine During Maintenance” on page 1-38..
- Check that the inspected and maintenance area is working properly.
- Increase the engine speed and check for coolant, oil, and fuel leaks.

OUTLINES OF SERVICE

- Always use Komatsu genuine parts for replacement parts, grease, or oil.
- When changing or adding oil, do not mix different types of oil.
- When changing the type of oil, drain all the old oil and fill completely with the new oil.
- Always replace the filter at the same time.
 - There is no problem if the small amount of oil remaining in the piping mixes with the new oil.
- Unless otherwise specified, when the machine is shipped from the factory, it is filled with the oil and coolant listed in the following table.

Item	Type
Engine oil pan	Engine oil EO15W40-DH (Komatsu genuine parts)
Transmission case	Power train oil TO10 (Komatsu genuine parts)
Hydraulic oil system	Power train oil TO10 (Komatsu genuine parts)
Axle	Axle oil AXO80 (Komatsu genuine parts)
Radiator	Supercoolant AF-NAC (Komatsu genuine parts) (density: 30% or above)

Handling Oil, Fuel, Coolant, and Performing Oil Clinic

Oil

- Oil is used in the engine and hydraulic equipment under extremely severe conditions (high temperature, high pressure); it deteriorates with use.
- Always use oil that matches the grade and maximum and minimum ambient temperatures recommended in this manual.
 - ★ See “RECOMMENDED FUEL, COOLANT, AND LUBRICANTS” on page 3-11.
- Even if the oil is not dirty, always change the oil after the specified interval.
- Oil corresponds to blood in the human body; it provides life-sustaining properties. Always be careful when handling it to prevent any impurities (water, metal particles, dirt, etc.) from getting into the oil.
 - The majority of problems with machines are caused by the entry of such impurities.
 - Be very careful not to contaminate the oil when storing or adding it.
- Never mix oils of different grades or brands.
- Always add the specified amount of oil.
 - Having too much oil or too little oil both cause problems.
- If the oil in the work equipment is not clear, there is probably water or air getting into the circuit.
 - ★ In such cases, contact your Komatsu distributor for inspection and repair.
- When changing the oil, always replace the related filters at the same time.

MAINTENANCE

- Komatsu strongly recommends that you have an analysis made of the oil periodically to check the condition of your machine.
 - ★ For details of this service, contact your Komatsu distributor.
 - ★ See “KOWA Analysis Items” on page 3-8.
- When using commercially available oil, it may be necessary to reduce the oil change interval.
 - We recommend that you use the Komatsu oil clinic to carry out a detailed check of the characteristics of the oil.

Fuel

- To prevent the moisture in the air from condensing and forming water inside the fuel tank, always fill the fuel tank after completing the day’s work.
- The fuel pump is a precision instrument. If fuel containing water or dirt is used, the fuel pump cannot work properly.
- Be extremely careful not to let impurities get into the fuel when storing or adding it.
- Always use the fuel specified for the temperature.
 - ★ See “RECOMMENDED FUEL, COOLANT, AND LUBRICANTS” on page 3-11.
 - The fuel will solidify if it is used at temperatures lower than the specified temperature (particularly at temperatures below -15°C (5°F)).
 - If the fuel is used at temperatures higher than the specified temperature, the viscosity will drop. This may result in problems such as a drop in output.
- Before starting the engine, or when 10 minutes have passed after adding fuel, drain the sediment and water from the fuel tank.
- If the engine runs out of fuel, or if the filters have been replaced, it is necessary to bleed the air from the circuit.
- If there is any foreign material in the fuel tank, wash the tank and fuel system.

Remark

Always use diesel fuel.

The engine mounted on this machine uses an electronically controlled, high-pressure fuel injection device to ensure good fuel consumption and exhaust gas characteristics.

This device requires high-precision parts and lubrication. If low-viscosity fuel with low lubricating ability is used, the durability of the engine may drop markedly.

Coolant and Water for Dilution

- Coolant prevents corrosion and freezing.
- Even in areas where it is not necessary to prevent freezing, the use of antifreeze coolant is essential.
- Komatsu machines are supplied with Komatsu Supercoolant (AF-NAC). Komatsu Supercoolant (AF-NAC) has excellent anti-corrosion, antifreeze, and cooling properties and can be used continuously for two years or 4,000 hours.
- Komatsu Supercoolant (AF-NAC) is strongly recommended.
 - We do not recommend the use of any coolant other than Komatsu genuine Supercoolant (AF-NAC).
 - If you use another coolant, it may cause serious problems such as corrosion of the engine and parts of the cooling system that use light metals, such as aluminum.

- When using Komatsu Supercoolant (AF-NAC), there is no need to use a corrosion resistor. For details, see “Clean Inside of Cooling System” on page 3-29.
- When diluting the antifreeze coolant, use distilled water or tap water (soft water).
 - Natural water, such as river water or well water (hard water), contains large amounts of minerals (calcium, magnesium, etc.). This makes it easier for scale to form inside the engine or radiator. Once scale is deposited inside the engine or radiator, it is extremely difficult to remove it. The deposition of scale also causes overheating due to poor heat exchange.
 - When you dilute the coolant, we recommend that you use water with an overall hardness of less than 100 PPM.
- When using antifreeze, always observe the precautions given in Section 1 of this manual. See “Cooling System Precautions” on page 1-39. and “Disposal of Waste Materials” on page 1-45..
- Antifreeze coolant is flammable; be sure to keep it away from flames.
- The ratio of Supercoolant (AF-NAC) to water differs according to the ambient temperature.
 - For details of the ratio when mixing, see “Clean Inside of Cooling System” on page 3-29.
 - Supercoolant (AF-NAC) may be supplied already mixed. In such cases, never dilute with water.
- If the engine overheats, wait for the engine to cool before adding coolant.
- If the coolant level is low, it will cause overheating; it will also cause problems with corrosion due to air entering the coolant.

Grease

- Grease is used to prevent seizure and noise at the joints.
- This construction equipment is used under heavy-duty conditions. Always use the recommended grease and follow the change intervals and ambient temperatures given in this manual.
- Grease fittings not included in the MAINTENANCE section are grease fittings that are used at the time of overhaul; there is no need to grease these points.
- When using the machine after it has been in storage for a long time, carry out greasing if there is any stiffness or screeching.
- If any part becomes stiff or makes noise after being used for a long time, apply grease.
- Always wipe off all of the old grease that is pushed out when greasing.
 - Be particularly careful to wipe off the old grease in places where sand or dirt sticking in the grease would cause wear of the rotating parts.

MAINTENANCE

Performing KOWA (Komatsu Oil Wear Analysis)

KOWA (Komatsu Oil Wear Analysis) is a maintenance service that makes it possible to prevent machine failures and downtime. With KOWA, the oil is periodically sampled and analyzed. This enables early detection of wear of the machine drive parts and other abnormalities.

- We strongly recommend that you use the KOWA service.
- The results of the analysis are reported, together with recommendations which will reduce repair costs and machine downtime.
- The oil analysis is done at low cost (only the actual expenses are charged).

KOWA Analysis Items

The analysis of the following items enables you to obtain a very precise diagnosis of the health of the machine.

- Measurement of density of metal wear particles

This uses an ICP (Inductively Coupled Plasma) analyzer to measure the density of iron, copper, and other metal wear particles in the oil.

- Measurement of particle quantity

This uses a PQI (Particle Quantifier Index) measurer to measure the quantity of large iron particles (larger than 5 microns) in the oil, which enables the early detection of failures.

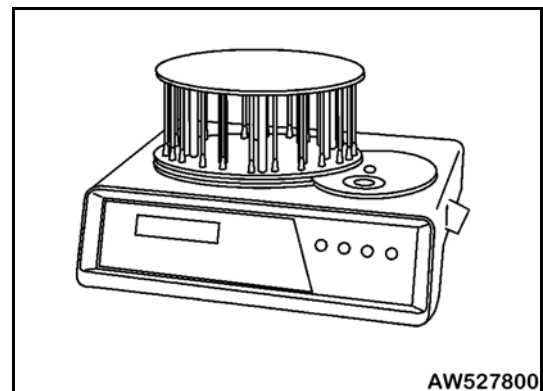
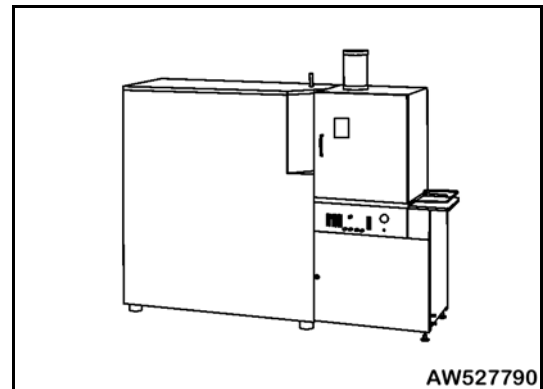
- Others

Measurements are made of items such as the ratio of water in the oil, density of the antifreeze coolant, ratio of fuel in the oil, and dynamic viscosity.

Oil Sampling

- Sampling interval:
 - 250 hours: Engine
 - 500 hours: Other components
- Precautions when sampling:
 - Make sure that the oil is well mixed before sampling.
 - Perform sampling at regular fixed intervals.
 - Do not perform sampling on rainy or windy days when water or dust can get into the oil.

★ For further details about KOWA, contact your Komatsu distributor.



Storing Oil and Fuel

- Keep oil or fuel indoors to prevent any water, dirt, or other impurities from getting into it.
- When keeping a drum for a long period, put the drum on its side so that the filler port of the drum is at the side. This prevents moisture from being sucked into the drum.
- If the drum must be stored outside, cover it with a waterproof sheet or take other measures to protect it.
- To prevent any change in quality during long-term storage, be sure to use the oil or fuel in the order of “first in - first out” (use the oldest oil or fuel first).

Filters

- Filters are extremely important safety parts. Filters prevent impurities in the fuel and air circuits from entering important equipment where they could cause problems.
 - Replace all filters periodically. Details are provided in the (“SERVICE PROCEDURE” on page 3-25) section of this manual.
 - When working in severe conditions, replace the filters at shorter intervals according to the oil and fuel (sulfur content) being used.
- Never try to clean the filters (cartridge type) and use them again.
 - Always replace with new filters.
- When replacing oil filters, check if any metal particles are attached to the old filter.
 - If you find any metal particles, contact your Komatsu distributor.
- Do not open packs of spare filters until just before they are to be used.
- Always use Komatsu genuine filters.

Outline of Electric System

- It is extremely dangerous if the electrical equipment becomes wet or the covering of the wiring is damaged. This situation will cause an electrical short circuit and may cause the machine to malfunction.
 - Do not wash the inside of the operator’s cab with water.
 - When washing the machine, be careful not to let water get into the electrical components.
- Service relating to the electric system:
 - Checking fan belt tension
 - Checking damage or wear to the fan belt
 - Checking the battery fluid level
- Never install any electric components other than those specified by Komatsu.
- External electromagnetic interference may cause malfunction of the control system controller.
 - Before installing a radio receiver or other wireless equipment, contact your Komatsu distributor.
- When working at the seashore, carefully clean the electrical system to prevent corrosion.
- The optional power source must never be connected to the fuse, starting switch, or battery relay.

MAINTENANCE

WEAR PARTS

- Replace wear parts (such as the filter element, air cleaner element, bucket tooth, etc.) at the time of periodic maintenance or before they reach the wear limit.
- The wear parts should be replaced correctly in order to ensure more economical use of the machine.
- Always use Komatsu genuine, high quality parts.
- As a result of Komatsu's continuous efforts to improve product quality, part numbers may change.
- When ordering parts, always inform your Komatsu distributor of your machine serial number so he can check for the latest part number.

Wear Parts List

The parts in parentheses are to be replaced at the same time.

Item	Part Name	Qty	Replacement Frequency	
Engine oil filter	Cartridge	1	EVERY 500 HOURS	
Fuel filter	Cartridge	1	EVERY 1000 HOURS	
Corrosion resistor	Cartridge	1	–	
Fuel prefilter	Cartridge	1	EVERY 500 HOURS	
Transmission oil filter	Cartridge	1	EVERY 1000 HOURS	
Transmission strainer	Strainer (O-ring)	1 (1)	–	
Hydraulic filter	Element (O-ring)	1 (1)	EVERY 2000 HOURS	
Hydraulic tank breather	Element	1	EVERY 2000 HOURS	
Hydraulic oil strainer	Strainer	1	–	
Air cleaner	Element ass'y	1	–	
Air conditioner filter	Fresh	Element	1	EVERY 2000 HOURS
	Recirc	Element	1	EVERY 2000 HOURS
PPC accumulator	Accumulator (O-ring)	1	EVERY 4000 HOURS	
Bolt-on cutting edge	Standard type	Center edge	1	–
		Side edge (Bolt) (Nut) (Washer)	2 (14) (14) (14)	
	Long life type	Center edge	2	
Side edge (Bolt) (Nut) (Washer)		2 (14) (14) (14)		
Segment type	Edge (Bolt) (Nut) (Washer)	7 (14) (14) (14)	–	

RECOMMENDED FUEL, COOLANT, AND LUBRICANTS

- Komatsu genuine oils are formulated to maintain the reliability and durability of Komatsu construction equipment and components.
- In order to keep your machine in the best condition for long periods of time, it is essential to follow the instructions in this manual.
 - Failure to follow these recommendations may result in the shortened life or excess wear of the engine, power train, cooling system, and/or other components.
- Commercially available lubricants and additives may be good for the machine, but they may also cause harm.
 - Komatsu does not recommend any commercially available lubricants and/or additives.
- Use the oil recommended according to the ambient temperature listed in the “Fuel, Coolant, and Lubricant Ambient Temperature Chart” on page 3-12.
- *Specified capacity* means the total amount of oil in the tank and the piping. *Refill capacity* means the amount of oil required to refill the system during inspection and maintenance.
- When starting the engine in temperatures below 0°C (32°F), be sure to use the recommended multi-grade oil, even if the ambient temperature may become higher during the day.
- If the machine is operated at a temperature below -20°C (-4°F), a separate device is required. Consult your Komatsu distributor.
- When the fuel sulfur content is less than 0.5%, change the engine oil according to the Maintenance Schedule chart; see “MAINTENANCE SCHEDULE CHART” on page 3-23.
- If the fuel sulfur content is more than 0.5%, change the oil according to the following table.

Fuel Sulfur Content (%)	Engine Oil Change Interval
Less than 0.5	500 hours
0.5 to 1.0	250 hours
1.0 and up	Not recommended ★

- ★ If these fuels are used, there is danger that serious problems may occur because of early deterioration of the engine oil or early wear of the internal parts of the engine. If the local situation makes it necessary to use these fuels, always remember the following points.
 - Be sure to check the Total Basic Number (TBN) of the oil frequently by using a TBN handy checker, etc., and change oil based on the result.
 - Be aware that the oil change interval is much shorter than the standard.
 - Be sure to carry out periodic engine inspections by the distributor’s expert since the change interval of the periodic replacement parts and the overhaul interval are also shorter.

MAINTENANCE

Fuel, Coolant, and Lubricant Ambient Temperature Chart

RESERVOIR	FLUID TYPE	AMBIENT TEMPERATURE									
		-22 -30	-4 -20	14 -10	32 0	50 10	68 20	86 30	104 40	122°F 50°C	
Engine oil pan	Engine oil (Note 7)	Komatsu EO10W30-DH									
		Komatsu EO15W40-DH									
		Komatsu EO30-DH									
Transmission case	Power train oil (Note 1)	TO10									
Hydraulic system	Power train oil	TO10									
	Hydraulic oil	HO46-HM									
	Engine oil	Komatsu E010W30-DH									
Axle	Axle oil (Note 2)	AX080									
	Power train oil (Note 3)	TO50									
Pin / Bushing Grease fitting (Note 4)	Hyper grease (Note 5)	G2-T, G2-TE									
	Lithium EP grease	G2-L1									
Cooling system	Supercoolant (Note 6)	AF-NAC									
Fuel tank	Diesel fuel	ASTM Grade #1-DS15 / DS500									
		ASTM Grade # 2-DS15 / DS500									

Reservoir Capacity		Engine Oil Pan	Transmission Case	Hydraulic System	Axle (front and rear) (each)	Pins	Fuel Tank	Cooling System
Specified	Liters	25.5	47	210	40	–	300	30.5
	US gal	6.7	12.4	55.5	10.6	–	79.3	8.1
Refill	Liters	23	38	139	40	–	–	–
	US gal	6.1	10.0	36.7	10.6	–	–	–

Remark

Use diesel fuel only.

This engine uses an electronically controlled, high-pressure fuel injection system to obtain good fuel economy and low emissions. For this reason, it requires high-precision parts and good lubrication.

If kerosene or other fuel with low lubricating ability is used, the durability may drop markedly.

Note	Explanation
1	Power train oil has different properties from engine oil. Be sure to use the recommended oil.
2	Axle oil AX080 prevents squealing from the brakes and LSD (Limited Slip Differential). If only AX080 is recommended, use Komatsu genuine AX080 or equivalent.
3	When the ambient temperature is higher than 45°C (113°F) and the machine operation hour is longer than 12 hours/day, use TO50 instead of AX080. Squealing of the brakes may occur with the use of TO50 but there is no problem with the brake performance or durability. For machines with LSD, use AX080 regardless of the ambient temperature. Do not use TO50.
4	If the machine is equipped with an automatic greasing system, see details about the system.
5	Hypergrease (G2-T, G2-TE) is a high-performance grease. When it is necessary to improve the lubricating ability of the grease in order to prevent squealing of pins and bushings, the use of G2-T or G2-TE is recommended.
6	<p>Supercoolant (AF-NAC)</p> <ul style="list-style-type: none"> • The coolant has the important function of preventing corrosion as well as preventing overheating and freezing. • Even in areas where freezing is not an issue, the use of antifreeze coolant is essential. • Komatsu machines are supplied with Komatsu Supercoolant (AF-NAC). Komatsu Supercoolant (AF-NAC) has excellent anticorrosion, antifreeze, and cooling properties and can be used continuously for two years or 4,000 hours. • Komatsu Supercoolant (AF-NAC) is strongly recommended wherever available. • For details about the ratio when diluting supercoolant with water, see “Clean Inside of Cooling System” on page 3-29. • When the machine is shipped from the factory, it may be filled with coolant containing 30% or more Supercoolant (AF-NAC). In this case, no adjustment is needed for temperatures down to -10°C (14°F) (never dilute with water). • To maintain the anticorrosion properties of Supercoolant (AF-NAC), always keep the density of Supercoolant between 30% and 68%. • On machines equipped with an aluminum alloy radiator, not using Komatsu genuine Supercoolant may cause the corrosion of the tubes in the radiator core resulting in leakage. Only Komatsu genuine Supercoolant provides both high freezing protection and high corrosion protection for aluminium alloy systems as well as cylinder liner cavitation protection.
7	HTHS (High-Temperature High-Shear Viscosity 150°C [302°F]), specified by ASTM D4741 must be equal to or higher than 3.5 mPa·S. Komatsu EOS0W30 and EOS5W40 are the most suitable oils.

Recommended Brands, Other Than Komatsu Genuine Oil

When using commercially available oils other than Komatsu genuine oil, consult your Komatsu distributor.

MAINTENANCE

Biodiesel Usage

With increased interest in emissions and reduced usage of petroleum distillate-based fuels, some governments and regulating bodies are encouraging the use of biofuels. Biofuels are a class of fuels derived from recently dead biological material. This fuel may be in solid, liquid, or gaseous form. Biodiesel belongs to the first generation biofuels which are made from starch, sugar, vegetable oil, or animal fat using conventional technology.

Governmental incentives and/or environmental legislation requiring the use of biofuels may have an impact on the use of Komatsu engines. This section outlines Komatsu's criteria and parameters for the use of biodiesel fuel.

Biodiesel Recommendation for Komatsu Engines

The recommendation is submitted for those wishing to use biodiesel blends from B5 to B20. In the broad sense, the quality of available biodiesel blends remains inconsistent. Komatsu recommends that you follow the parameters as listed. In addition, Komatsu suggests that you contact your local Komatsu representative to periodically report engine conditions and machine performance, when using biodiesel blends from B5 to B20.

Biodiesel Terminology

Term	Description
Biofuels	Fuels produced from renewable resources
Biodiesel	A non-petroleum-based diesel fuel comprised of methyl or ethyl ester-based oxygenates of long chain fatty acids derived from the transesterification of vegetable oils, animal fats, and cooking oils. These fuels are commonly known as Fatty Acid Methyl Esters (FAME) or Fatty Acid Ethyl Esters (FAEE). Biodiesel properties are similar to those of diesel fuel, as opposed to gasoline or gaseous fuels, and thus are capable of being used in compression ignition (diesel) engines.
B100	A fuel containing 100% biodiesel - pure biodiesel
Biodiesel Blend	A fuel comprised of a mixture of petrodiesel and B100 biodiesel. A biodiesel blend is typically designated by the percentage of biodiesel in the blend. Example: B5 contains 95% petrodiesel and 5% B100 biodiesel.
BQ-9000	The National Biodiesel Accreditation program, BQ-9000, is a cooperative and voluntary program for the accreditation of producers and marketers of biodiesel fuel. The program is a unique combination of the ASTM standard for biodiesel, ASTM D6751, and a quality systems program that includes storage, sampling, testing, blending, shipping, distribution, and fuel management practices.
Cloud point	Fuel cloud point is the temperature at which wax begins to form in the fuel. If the atmospheric temperature is lower than the cloud point of the fuel, wax will form and plug the fuel filter.
Petrodiesel	Diesel fuel produced purely from petroleum. Petrodiesel can also be referred to as distillate diesel.
Rapeseed Methyl Ester (RME) diesel	Biodiesel derived from rapeseed oil. RME diesel is the most common biodiesel used in Europe.
Soy Methyl Ester (SME or SOME) diesel	Biodiesel derived from soybean oil. SME diesel is the most common biodiesel used in United States.

Certification and Standards

Komatsu certifies its engines based on the use of the prescribed EPA and European Certification Fuels. Komatsu does not certify its engines on any other fuels.

It is the user's responsibility to use the correct fuel as recommended by Komatsu and allowed by the EPA or other local regulatory agencies. In the United States, the EPA allows only registered fuels and fuel additives to be used in commerce. The EPA has provided a web site for additional alternative fuel information at:

<http://www.epa.gov/otaq/consumer/fuels/altfuels/altfuels.htm>.

The specifications for biodiesel are described in the ASTM D6751 Standard in North America and the EN14214 Standard in Europe. These specifications do not cover the fuel blends that may be purchased by the end user. Despite the specifications and standards, the quality of available biodiesel remains inconsistent.

WARNING

- **To use biodiesel in Komatsu engines, it is imperative that the biodiesel fuel be of high quality.**
 - **The biodiesel fuel must meet or exceed the specifications outlined by Komatsu or engine damage will occur.**
-
- In order for the customer to successfully use biodiesel, it is recommended that the fuel be of high quality.
 - The biodiesel fuel must meet or exceed the specifications outlined by Komatsu.
 - It is the responsibility of the customer/user to verify/obtain the proper local, regional, or national exemptions required for the use of biodiesel in any emissions-regulated Komatsu engine.
 - ★ If these items are disregarded, engine damage may occur.

Warranty and Use of Biodiesel Fuel in Komatsu Engines

The Komatsu warranty covers failures that are a result of defects in material or factory workmanship. Engine damage, service issues, and/or performance issues, determined by Komatsu to be caused by use of biodiesel fuel not meeting the specifications as outlined here, are not considered to be defects in material or workmanship and are not covered under the Komatsu warranty.

Requirements for Using Biodiesel Fuel in Komatsu Engines

Applications for diesel and biodiesel fuel blends of up to B5 must meet the requirements of ASTM D975 D1 and D2 fuels. An acceptable biodiesel fuel blend of up to 20% volume concentrate (B20) biodiesel with 80% petrodiesel can be used for all Komatsu engines.

End users must adhere to the following Komatsu requirements when using biodiesel blends above B5 and up to B20.

Remark

Komatsu requires that biodiesel blends be purchased from a BQ-9000 Certified Marketer. The B100 biodiesel fuel used in the blend must be sourced from a BQ-9000 Accredited Producer. Certified Marketers and Producers can be found at this web site: <http://www.bq-9000.org>.

Oil Sampling

Under certain biodiesel operating conditions, fuel dilution of lubricating oil has been observed. Monitoring fuel dilution can be accomplished by performing oil sampling. Fuel levels in lubricating oil must not exceed 5%.

In order to determine if the oil change interval needs to be modified, the end user is required to use oil sampling during the first six months of operation to monitor engine oil condition and fuel dilution of lubricating oil.

MAINTENANCE

Fuel Water Separation

Biodiesel has a natural affinity to water and water leads to accelerated microbial growth. Storage tanks must be equipped with a fuel water separator to make sure water is eliminated before entering the machine's fuel tank. The machine should be equipped with a water separator as well. It is recommended that storage and machine fuel tanks are kept full in order to reduce potential condensation.

Due to the solvent nature of biodiesel and the potential for *cleaning* of the vehicle fuel tank and lines when using biodiesel, new fuel filters must be installed when switching to biodiesel. Fuel filters must be replaced more frequently. Specifically, the first two fuel filter changes, after biodiesel introduction, must be done at one half the standard interval; that is, if the standard interval is 500 hours then the fuel filter must be changed at 250 hours.

Komatsu Genuine fuel filters must be used for fuel filter changes.

Biodiesel Fuel Storage

Biodiesel fuel must be used within six months of its manufactured date. Long-term storage problems have occurred with biodiesel due to its poor oxidation stability. This poor oxidation stability is accelerated with increased ambient temperature. For this reason, Komatsu does not recommend using biodiesel for low use applications, such as standby power or seasonal applications. Your fuel supplier can recommend oxidation stability additives.

WARNING

Avoid storing equipment with biodiesel blends in the fuel system for more than three months or fuel system damage can occur.

When using biodiesel for seasonal applications, the engine and fuel systems must be purged before storage by running the engine on pure diesel fuel for a minimum of 30 minutes.

When storing biodiesel in bulk storage tanks, the systems must be properly cleaned and maintained. Steps must be taken to minimize moisture and microbial growth in storage tanks. Consult your fuel supplier for assistance in storing and handling biodiesel.

Properties of Biodiesel

Energy Content

B100 biodiesel provides approximately 7% to 10% less energy per gallon of fuel when compared to conventional diesel fuels. Depending on the application, operating with B20 biodiesel blends can result in a slight decrease in fuel economy and power.

Engine Material Compatibility

Biodiesel may affect engine elastomers; periodic checks of seals and hoses is required.

As previously mentioned, biodiesel has excellent cleaning properties and fuel filters must be replaced and inspected more frequently. Specifically, the first two fuel filter changes, after biodiesel introduction, must be done at one half the standard interval. When replacing fuel filters at any time, Komatsu strongly recommends that fuel filters be inspected, especially for metal particles.

Low Temperature Performance

Biodiesel properties change with ambient temperature change. In low ambient temperature, biodiesel will start turning waxy or gelling. Precautions must be taken when storing this fuel at low temperatures by using a heated building or a heated storage tank. Additives can be used for low ambient operation.

The fuel system may require heated fuel lines, filters, and tanks to avoid being plugged by biodiesel fuel solidifying in low ambient temperatures. A fuel heater is recommended for ambient temperatures below -5°C (23°F). Consult your fuel and additive supplier for assistance in attaining proper cloud point fuel.

Microbial Growth

Biodiesel fuel is an excellent medium for microbial growth. Microbes cause fuel system corrosion and premature filter plugging. The effectiveness of all commercially available conventional anti-microbial additives, when used in biodiesel, is not known. Consult your fuel and additive supplier for assistance.

Komatsu Biodiesel Blend Specification for B5 to B20

Final Blend Fuel Requirements (at point of delivery)

Item	Performance Characteristics	Requirements		Test Procedure
		D1 Blends	D2 Blends	
1	Flash Point, minimum	38°C (100°F)	52°C (125°F)	ASTM D93
2	Water and sediment volume, maximum	0.05%	0.05%	ASTM D2709 or D1796
3	Physical Distillation, T90°C (T194°F), maximum	343	343	ASTM D86
4	Kinematics Viscosity, cSt at 40°C (104°F)	1.3 – 4.1	1.9 – 4.1	ASTM D445
5	Ash, mass%, maximum	0.01	0.01	ASTM D482
6	Sulfur, st% maximum	Per regulation	Per regulation	ASTM D482
7	Copper strip corrosion rating, maximum	Number 3	Number 3	ASTM D130
8	Cetane Number, minimum	43	43	ASTM D613
9	Cloud Point ¹	Per foot note	Per foot note	ASTM D2500
10	Rams bottom carbon residue on 10% distillation residue, wt%, maximum	0.15	0.35	ASTM D524
11	Lubricity, HFRR at 60°C (140°F), micron, maximum	460	460	ASTM D6079
12	Acid number, mgKOH/g, maximum	0.3	0.3	ASTM D664
13	Phosphorus, wt%, maximum	0.001	0.001	ASTM D4951
14	Total Glycerin	–	–	N/A
15	Alkali metals (Na+K), ppm, maximum	Nd	Nd	EN14108
16	Alkali metals (Mg+Ca), ppm, maximum	Nd	Nd	EN14108
17	*Blend fraction, volume% ²	±2%	±2%	EN14078
18	Thermo-oxidative stability, insolubles, mg/100 mL, maximum	10	10	Modified ASTM D2274 ³
19	Oxidation stability, Induction time, hours, minimum	6	6	EN14112 (Rancimat)

* Blend fraction refers to the variation in volume percent of B100 in diesel fuel claimed.

★ The maximum cloud point temperature shall be equal to or lower than the tenth percentile minimum ambient temperature in the geographical area and seasonal time frame as defined by ASTM D975.

★ Use glass fiber filter.

Summary of Recommendations

WARNING

- **It is imperative that the end user read and understand the information provided in the Biodiesel Usage section.**
 - **It is not sufficient to read and rely on just the following summary.**
-
- The user is required to purchase biodiesel blends from BQ-9000 Certified Marketers.
 - Biodiesel blends must be used within six months of manufactured date.
 - Fuel put into storage tanks of vehicles must be used within three months; a period longer than three months will cause engine damage.
 - Storage and vehicle fuel tanks must be equipped with water separators to prevent water from entering engine fuel lines.
 - When switching from conventional diesel fuel to biodiesel blends, fuel filters must be changed with new Komatsu genuine fuel filters. Specifically, the first two fuel filter changes, after biodiesel introduction, must be changed at one half the standard interval; that is, if the standard interval is 500 hours, then the filter must be changed at 250 hours.
 - During the first six months of biodiesel usage, the user must perform oil sampling on the engine numerous times to ensure that fuel dilution of lubricating oil is not greater than 5%. The user will also determine what oil change interval is appropriate.
 - Komatsu requires periodical inspection of seals and hoses made of elastomers for any degradation in performance. These inspections are also required on the fuel system, looking for corrosion and premature filter plugging.
 - Special precautions are required when using biodiesel at low temperatures.

Remark

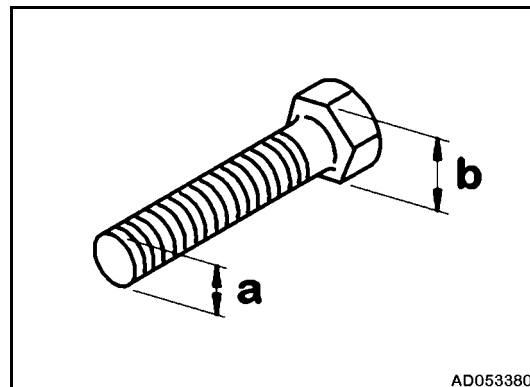
*Komatsu certifies its engines using the prescribed EPA and European Certification Fuels.
Komatsu does not certify engines on any other fuel.*

STANDARD TIGHTENING TORQUES FOR BOLTS AND NUTS

⚠ WARNING

- If nuts, bolts, or other parts are not tightened to the specified torque, it will cause looseness or damage to the tightened parts. This will cause failure of the machine or problems with operation.
- Always pay careful attention when tightening parts

- Unless otherwise specified, tighten the metric nuts and bolts to the torque shown in the following table.
- If it is necessary to replace any nut or bolt, always use a Komatsu genuine part of the same size as the part that was replaced.



Tightening Torque Table

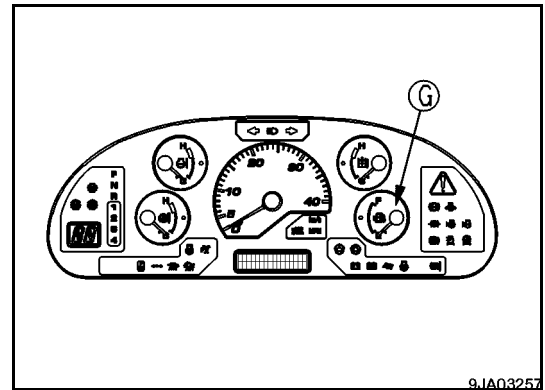
Thread Diameter of Bolt (a)	Width across Flats (b)	Tightening Torque					
		Target Value			Service Limit		
mm	mm	N•m	kgm	lbf ft	N•m	kgm	lbf ft
6	10	13.2	1.3	9.7	11.8 – 14.7	1.2 – 1.5	8.7 – 10.8
8	13	31	3.2	22.9	27 – 34	2.8 – 3.5	19.9 – 25.1
10	17	66	6.7	48.7	59 – 74	6.0 – 7.5	43.5 – 54.6
12	19	113	11.5	83.3	98 – 123	10.0 – 12.5	72.3 – 90.7
14	22	172	17.5	126.9	153 – 190	15.6 – 19.4	112.8 – 140.1
16	24	260	26.5	191.8	235 – 285	24.0 – 29.1	173.3 – 210.2
18	27	360	36.7	265.5	320 – 400	32.6 – 40.8	236.0 – 295.0
20	30	510	52.0	376.2	455 – 565	46.4 – 57.6	335.6 – 416.7
22	32	688	70.2	507.4	610 – 765	62.2 – 78.0	450.0 – 564.2
24	36	883	90.0	651.3	785 – 980	80.0 – 100.0	579.0 – 722.8
27	41	1295	132.1	955.1	1150 – 1440	117.3 – 146.8	848.2 – 1062.1
30	46	1720	175.4	1268.6	1520 – 1910	155.0 – 194.8	1121.1 – 1408.7
33	50	2210	225.4	1630.0	1960 – 2450	199.9 – 249.8	1445.6 – 1807.0
36	55	2750	280.4	2028.3	2450 – 3040	249.8 – 310.0	1807.0 – 2242.2
39	60	3280	334.5	2419.2	2890 – 3630	294.7 – 370.2	2131.6 – 2677.3

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Taper Seal

★ Use the following table for hydraulic hoses.

Nominal - No. of Threads (a)	Width across Flats (b) (mm)	Tightening Torque					
		Target Value			Permissible Range		
		Nm	kgm	lbf ft	Nm	kgm	lbf ft
9/16 -18UNF	19	44	4.5	32.5	35 - 63	3.6 - 6.4	25.8 - 46.5
11/16 -16UN	22	74	7.5	54.6	54 - 93	5.5 - 9.5	39.8 - 68.6
13/16 -16UN	27	103	10.5	76.0	84 - 132	8.6 - 13.5	62.0 - 97.4
1 -14UNS	32	157	16.0	115.8	128 - 186	13.1 - 19.0	94.4 - 137.2
13/16 -12UN	36	216	22.0	159.3	177 - 245	18.0 - 25.0	130.5 - 180.7



PERIODIC REPLACEMENT OF SAFETY-CRITICAL PARTS

To ensure safety at all times when operating or driving the machine, the user of the machine must always perform periodic maintenance. In addition, to further improve safety, the parts in the (“Safety Critical Parts List” on page 3-22) must also be replaced at the specified interval. These parts are closely related to safety and fire prevention; please contact your Komatsu distributor to have them replaced.

The material quality of these parts can change as time passes; they are likely to wear out or deteriorate. It is difficult to determine the extent of wear or deterioration at the time of periodic maintenance.

- ★ You must replace these parts with new ones regardless of their condition after a certain period of usage. This is important in order to ensure that these parts maintain their full performance at all times.
- Should anything abnormal be found on any of these parts, replace it with a new one even if the periodic replacement time for the part has not yet arrived.
- If any of the hose clamps show deterioration such as deformation or cracking, replace the clamps at the same time as the hoses.
- Perform checks of the hydraulic hoses which need to be replaced periodically. Tighten all loose clamps and replace defective hoses, as required.
- When replacing hoses, always replace O-rings, gaskets, and other such parts at the same time.
- Have your Komatsu distributor replace the critical parts.

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Safety Critical Parts List

No.	Safety Critical Parts	Qty	Replacement Interval
1	Fuel hose (fuel tank - fuel prefilter)	1	Every 2 years or 4,000 hours, whichever comes sooner
2	Fuel hose (fuel prefilter - supply pump)	1	
3	Fuel hose (supply pump - fuel main filter)	1	
4	Fuel hose (fuel main filter - supply pump)	1	
5	Fuel hose (supply pump - common rail overflow)	1	
6	Fuel hose (engine - fuel tank)	1	
7	Steering hose (pump - steering valve)	2	
8	Steering hose (steering valve - steering cylinder)	6	
9	Steering hose (steering valve - hydraulic tank)	2	
10	Steering hose (steering valve - hydraulic tank: seal drain circuit)	2	
11	Steering hose (steering valve - pump: LS)	1	
12	Brake hose (pump - charge valve)	1	
13	Brake hose (charge valve - hydraulic tank)	2	
14	Brake hose (charge valve - accumulator)	2	
15	Brake hose (accumulator - brake valve)	2	
16	Brake hose (brake valve - front axle)	3	
17	Brake hose (brake valve - rear axle)	2	
18	Brake hose (brake valve - hydraulic tank)	1	
19	Brake hose (accumulator - emergency release valve)	1	
20	Brake hose (emergency release valve - transmission valve)	1	
21	Transmission hose (pump - transmission valve)	1	
22	Transmission hose (transmission valve - transmission filter)	1	
23	Transmission hose (transmission filter - transmission main valve)	1	
24	Transmission hose (transmission - torque converter cooler)	1	
25	Transmission hose (torque converter cooler - transmission)	1	
26	Accumulator (for PPC)	1	
27	Alarm	2	
28	Engine high-pressure piping clamp	1 set	Every 8,000 hours
29	Fuel spray prevention cap	1 set	
30	Seat belt. Refer to "Seat Belt Inspection" on page 1-21.	1	Every 3 years of usege or 5 years from manufacture date.

MAINTENANCE SCHEDULE CHART

This schedule outlines the maintenance to be performed on the machine according to the hours accumulated on the machine. Following this schedule will prolong the life of the machine.

Maintenance Interval and Item	Section - Page
INITIAL 250 HOURS SERVICE	
(ONLY AFTER THE FIRST 250 HOURS)	
CHANGE TRANSMISSION OIL FILTER CARTRIDGE	3-67
REPLACE HYDRAULIC TANK FILTER ELEMENT	3-71
INITIAL 1000 HOURS SERVICE	
(ONLY AFTER THE FIRST 1000 HOURS)	
CHECK ENGINE VALVE CLEARANCE, ADJUST	3-77
WHEN REQUIRED	
CLEAN, REPLACE AIR CLEANER ELEMENT	3-26
CLEAN INSIDE OF COOLING SYSTEM	3-29
CHECK TRANSMISSION OIL LEVEL, ADD OIL	3-33
CHECK AXLE OIL LEVEL, ADD OIL	3-34
CLEAN AXLE CASE BREATHER	3-36
CLEAN AIR CONDITIONER CONDENSER	3-37
CHECK WINDOW WASHER FLUID LEVEL, ADD FLUID	3-37
CLEAN RADIATOR FINS AND OIL COOLER FINS	3-38
TURN, REPLACE BOLT-ON CUTTING EDGE	3-41
REPLACE BUCKET TEETH	3-42
CHECK AIR CONDITIONER	3-43
REPLACE SLOW-BLOW FUSE	3-45
CHECK ACCUMULATOR FUNCTION	3-46
SELECT TIRES	3-47
CHECK TIRE PRESSURE	3-48
CHECK BEFORE STARTING	3-49
EVERY 50 HOURS SERVICE	
DRAIN WATER, SEDIMENT FROM FUEL TANK	3-50
EVERY 100 HOURS SERVICE	
LUBRICATE REAR AXLE PIVOT PIN	3-50
CLEAN ELEMENT IN AIR CONDITIONER FRESH AIR FILTER	3-51
CHECK OIL LEVEL IN HYDRAULIC TANK, ADD OIL	3-52
EVERY 250 HOURS SERVICE	
CHECK BATTERY ELECTROLYTE LEVEL	3-53
CHECK PARKING BRAKE	3-55
CHECK AIR CONDITIONER COMPRESSOR BELT TENSION, ADJUST	3-55
CHECK FOR LOOSE WHEEL HUB NUTS, TIGHTEN	3-56
CLEAN ELEMENT IN AIR CONDITIONER RECIRCULATION FILTER	3-56
CHECK ACCUMULATOR FUNCTION	3-57
LUBRICATING	3-58

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EVERY 500 HOURS SERVICE

CHANGE OIL IN ENGINE OIL PAN, REPLACE ENGINE OIL FILTER CARTRIDGE	3-59
REPLACE FUEL PREFILTER CARTRIDGE	3-61

EVERY 1000 HOURS SERVICE

REPLACE FUEL MAIN FILTER CARTRIDGE	3-65
CHANGE OIL IN TRANSMISSION CASE, CHANGE OIL FILTER CARTRIDGE, CLEAN STRAINER	3-67
CLEAN TRANSMISSION CASE BREATHER	3-69
LUBRICATING	3-69
CHECK ENGINE AIR INTAKE PIPING CLAMPS FOR LOOSENESS	3-69
CHECK ALTERNATOR DRIVING BELT TENSION, REPLACE	3-70
REPLACE CORROSION RESISTOR CARTRIDGE	3-70

EVERY 2000 HOURS SERVICE

CHANGE OIL IN HYDRAULIC TANK, REPLACE HYDRAULIC TANK FILTER ELEMENT	3-71
REPLACE HYDRAULIC TANK BREATHER ELEMENT	3-74
CHANGE AXLE OIL (*).	3-75
REPLACE ELEMENT IN AIR CONDITIONER RECIRCULATION AIR FILTER, FRESH AIR FILTER	3-75
CHECK BRAKE DISC WEAR	3-76
CHECK ACCUMULATOR FUNCTION	3-77
CHECK ALTERNATOR	3-77
CHECK ENGINE VALVE CLEARANCE, ADJUST	3-77
CHECK VIBRATION DAMPER.	3-77

* The interval of 2,000 hours for changing the axle oil is for standard operations. If the brakes are used more frequently or the brakes make a sound, change the oil at shorter intervals.

EVERY 4000 HOURS SERVICE

LUBRICATING	3-78
CHECK WATER PUMP.	3-79
CHECK STARTING MOTOR	3-79
CHECK AIR CONDITIONER COMPRESSOR, ADJUST	3-79
CHECK FOR LOOSE ENGINE HIGH-PRESSURE CLAMPS, HARDENING OF RUBBER	3-80
CHECK FOR MISSING FUEL SPRAY PREVENTION CAPS, HARDENING OF RUBBER	3-81

EVERY 8000 HOURS SERVICE

REPLACE HIGH-PRESSURE PIPING CLAMPS	3-82
REPLACE FUEL SPRAY PREVENTION CAPS	3-82

SERVICE PROCEDURE

Initial 250 Hours Service

Perform the following maintenance only after the first 250 hours.

- Replace transmission oil filter element.
 - For details, see “Change Oil in Transmission Case, Change Transmission Oil Filter Cartridge, Clean Strainer” on page 3-67.
- Replace hydraulic tank filter element.
 - For details, see “Change Oil in Hydraulic Tank, Replace Hydraulic Tank Filter Element” on page 3-71.

Initial 1000 Hours Service

Perform the following maintenance only after the first 1,000 hours.

- Check engine valve clearance, adjust.
 - For details, see “Check Engine Valve Clearance, Adjust” on page 3-77.

MAINTENANCE

When Required

Clean, Replace Air Cleaner Element

WARNING

- If inspection, cleaning, or maintenance is carried out with the engine running, dirt will get into the engine and damage it. Always stop the engine before carrying out these operations.
- When using compressed air, there is a danger that dirt may be blown around and cause serious injury. Always use protective glasses, dust mask, and other protective equipment.

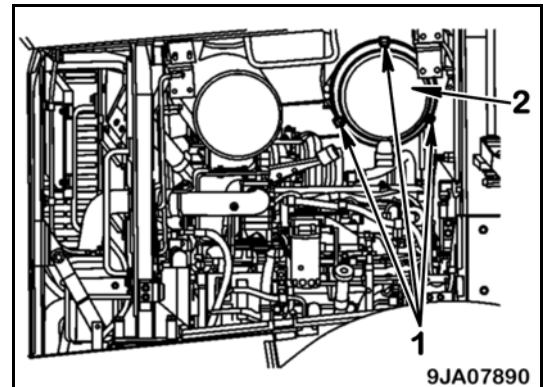
Remark

When the yellow piston of the dust indicator enters the red range (7.5 kPa) or the air cleaner clogging caution lamp of the machine monitor lights up, clean the air cleaner element.

- ★ For inspection method, see “Check Air Cleaner” on page 2-86..

Cleaning Outer Element

1. Stop the engine.
2. Open the engine side cover on the right side of the chassis.
3. Remove three clips (1), then remove cover (2).

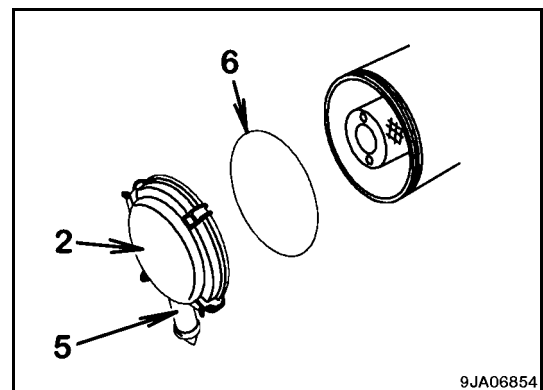
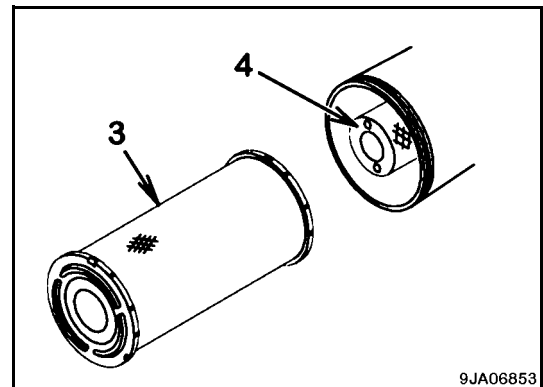


Remark

When cleaning just the outer element, do not remove inner element (4). If it is removed, dust will enter and cause engine problems. The inner element cannot be cleaned.

When replacing the outer element, you must replace the inner element at the same time. See “Replacing Element” on page 3-28.

4. Remove outer element (3).
5. Clean the interior of the air cleaner body, cover (2), and evacuator valve (5).



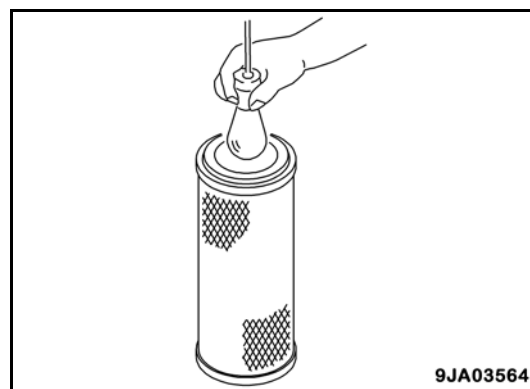
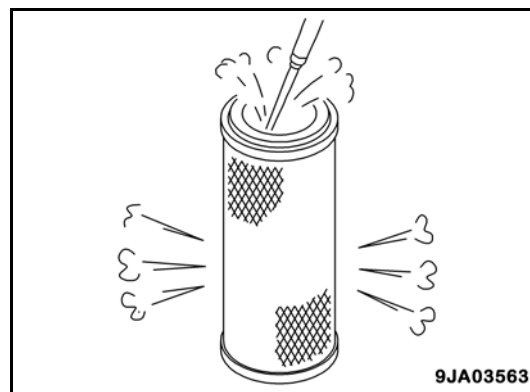
- Direct dry compressed air (less than 0.69 MPa (100.1 psi)) from the inside of the outer element along its folds. Then direct the compressed air from the outside along the folds, and again from the inside.

Remark

When cleaning the element, do not hit or beat it against anything.

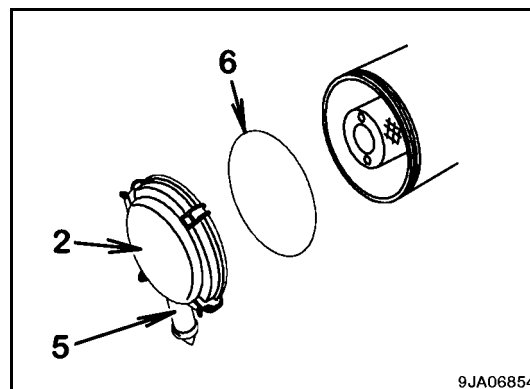
Do not use an element whose folds, gasket, or seal are damaged.

- After cleaning and drying the element, check it by shining a light through it. If any small holes or thin parts are found, replace the element.



⚠ WARNING

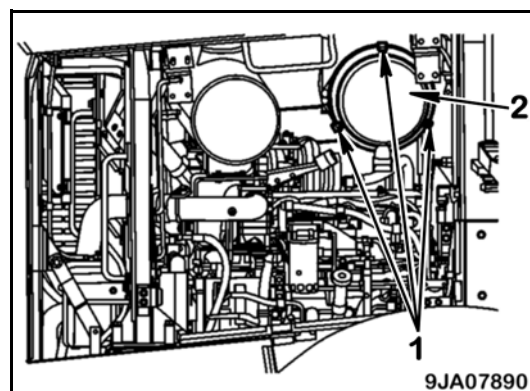
When installing cover (2), check O-ring (6) and replace it if there are any scratches or damage.



- Set the cleaned outer element in position, then secure cover (2) with mounting clips (1).
- Press the dust indicator button to return the yellow piston to its original position.
- Close the engine side cover on the right side of the machine.

After cleaning, if the air cleaner clogging caution lamp lights up immediately or the yellow piston reaches the red line (7.5 kPa), replace both the inner and outer elements.

★ For details, see “Replacing Element” on page 3-28.



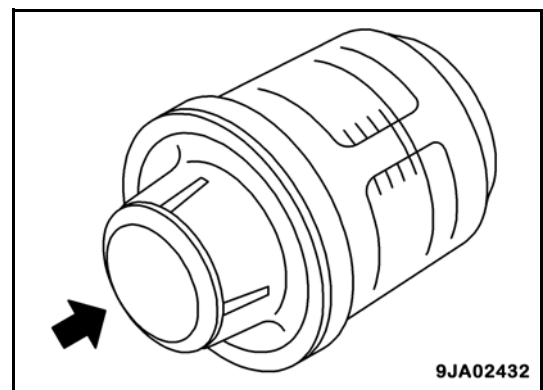
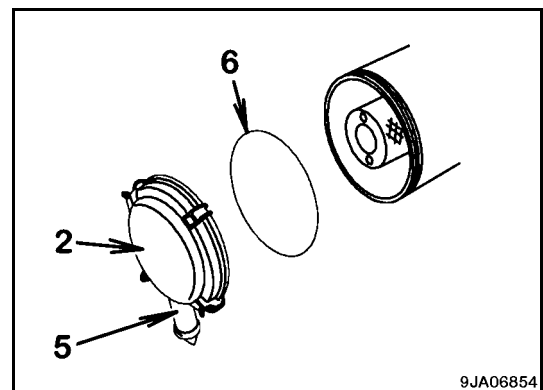
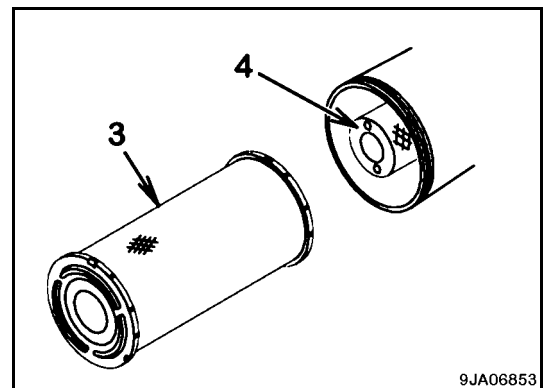
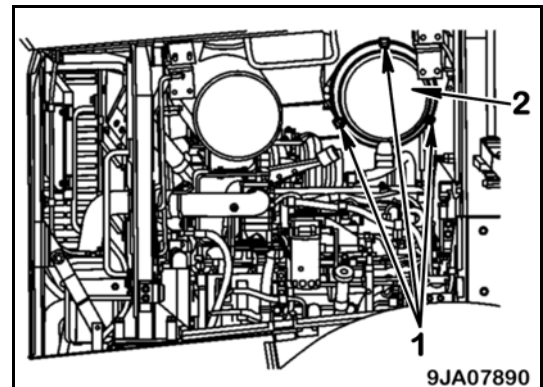
MAINTENANCE

Replacing Element

Remark

When replacing the outer element, you must replace the inner element at the same time.

1. Stop the engine.
2. Open the engine side cover on the right side of the chassis.
3. Remove three clips (1), then remove cover (2).
4. Remove outer element (3).
★ Do not remove inner element (4) at this time.
5. Clean the inside of the air cleaner body and dust cup.
6. Remove inner element (4), then install a new inner element immediately.
7. Fit new outer element (3) and replace O-ring (6) with a new part.
8. Install cover (2), then secure with clips (1).
9. Press the dust indicator button to return the yellow piston to its original position.
10. Close the engine side cover on the right side of the machine.



Clean Inside of Cooling System

WARNING

- Start the engine and flush the system.
- Immediately after stopping the engine, the engine coolant is VERY HOT and the pressure inside the radiator is high. Removing the cap and draining the coolant under this condition could cause burns. Allow the engine to cool down and then turn the cap slowly to release the pressure.
- When standing up or leaving the operator's seat, set the work equipment lock lever to the LOCK position.
- For details about starting the engine, see "Check Before Starting Engine" on page 2-81., "Adjusting Work Equipment" on page 2-140., and "Starting Engine" on page 2-99. in this manual.
- When the undercover is removed, there is danger of touching the fan. Never enter the rear of the machine when the engine is running.

- ★ Stop the machine on level ground when cleaning or changing the coolant.
- ★ Clean the inside of the cooling system; change the coolant; and replace the corrosion resistor according to the following table.

Antifreeze Coolant	Interval for Cleaning Interior of Cooling system and Changing Antifreeze Coolant	Replacing Corrosion Resistor
Komatsu Supercoolant (AF-NAC)	Every two years or every 4,000 hours, whichever comes first	Unnecessary
Permanent-type antifreeze (All-season type) *	Every year (autumn) or every 2,000 hours, whichever comes first	Every 1,000 hours; when cleaning the interior of the cooling system; when changing coolant

* Permanent-type antifreeze must meet the requirements of ASTM D3306-03.

- The coolant prevents corrosion as well as freezing.
- Even in areas where freezing is not an issue, the use of an antifreeze coolant is essential. Use Supercoolant (AF-NAC) at a mixing ratio of at least 30% to prevent corrosion of the cooling system.
- Komatsu machines are supplied with Komatsu Supercoolant (AF-NAC).
 - Komatsu Supercoolant (AF-NAC) has excellent anti-corrosion, antifreeze, and cooling properties and can be used continuously for two years or 4,000 hours.
- As a basic rule, we do not recommend the use of any coolant other than Komatsu genuine Supercoolant (AF-NAC).
 - If you use another coolant, it may cause serious problems such as corrosion of the engine and parts of the cooling system that use light metals, such as aluminum.
- When using Komatsu Supercoolant (AF-NAC), there is no need to use a corrosion resistor.
 - When no corrosion resistor is used, use the special cover (600-411-9000). Please consult your Komatsu distributor about the method of installing.
- To maintain the anti-corrosion properties of Supercoolant (AF-NAC), always keep the density of the Supercoolant between 30% and 68%.
- It is better to estimate a temperature about 10°C (50°F) lower than the minimum temperature.

MAINTENANCE

- The mixing ratio depends on the ambient temperature, but it should always be a minimum of 30% by volume (amount of antifreeze/total amount of coolant in system x 100).
- The freezing temperature of 100% undiluted Supercoolant is -15°C (5°F). Do not store undiluted Supercoolant at a temperature below -15°C (5°F).
- When deciding the proportions for mixing the coolant with water, check the lowest recorded temperature for your area and use the Water and Supercoolant Mix Ratio table to decide the mixing ratio.

Water and Supercoolant Mix Ratio Table

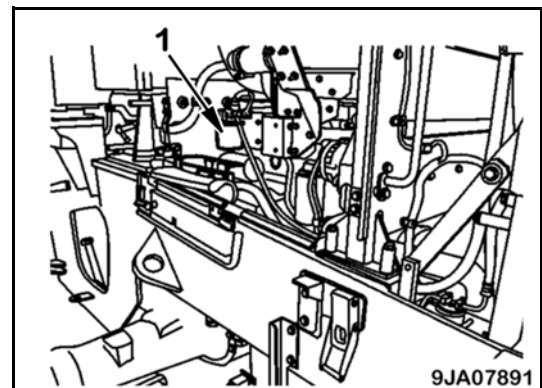
Min. atmospheric temperature	°C	Above -10	-15	- 20	- 25	- 30
	°F	Above 14	5	- 4	- 13	- 22
Amount of antifreeze	Liters	10.8	12.6	14.4	16.2	18.0
	US gal	2.85	3.33	3.80	4.28	4.76
Amount of water	Liters	25.2	23.4	21.6	19.8	18.0
	US gal	6.66	6.18	5.71	5.23	4.76
Ratio	%	30	36	41	46	50

WARNING

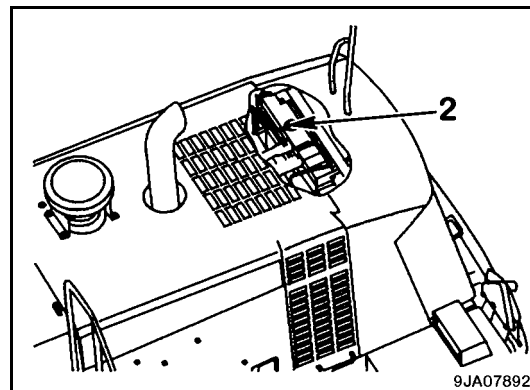
- Antifreeze is flammable. Keep it away from flame.
- Antifreeze is toxic. When removing the drain plug, be careful not to get water containing antifreeze on yourself.
- If antifreeze gets in your eyes, flush your eyes with a large amount of fresh water and see a doctor immediately.

Required

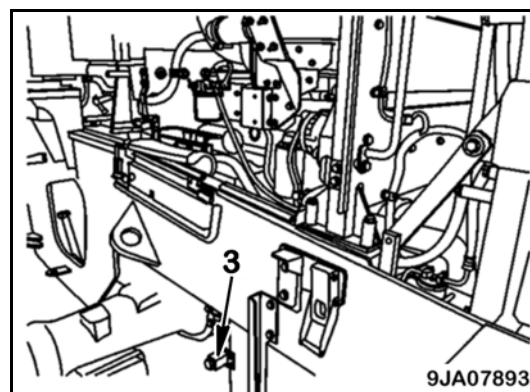
- Suitable water: To dilute the antifreeze; for details, see “Coolant and Water for Dilution” on page 3-6.
 - Antifreeze density gauge: To control the mixing proportions
 - Container: To catch the drained coolant; capacity must be larger than the specified coolant volume
 - Hose: To fill the machine with coolant and water
1. Park the machine on a level surface and stop the engine.
 2. Open the engine door.
 3. Tighten two valves (1) of the corrosion resistor.
 - ★ Only if corrosion resistor is used.



4. Check that the surface of the radiator cap is cool enough to be touched by hand.
5. Push radiator cap (2) and turn it slowly until it contacts the stopper to release the pressure, then remove it.



6. Set a container in position to catch the coolant.
7. Open drain valve (3) at the left side of the fuel tank and drain the coolant.
8. After draining the coolant, close drain valve (3) and fill the radiator with tap water.
9. When the radiator is full, start the engine and run it at low idle.
 - Keep the engine running at low idle for 10 minutes until the coolant temperature reaches more than 90°C (194°F).



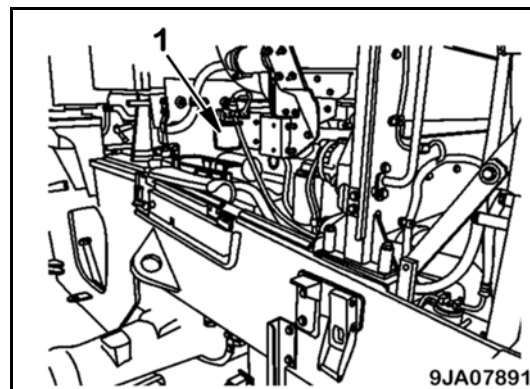
10. Stop the engine.
11. Open drain valve (3); drain the water; then tighten the drain valve again.
12. After draining the water, clean the cooling system with cleaning agent.
 - Follow the instructions provided with the cleaning agent.

13. Replace the corrosion resistor cartridge (if equipped) then open two valves (1)

- ★ Only if corrosion resistor is used.
- For details see “Replace Corrosion Resistor Cartridge” on page 3-70.

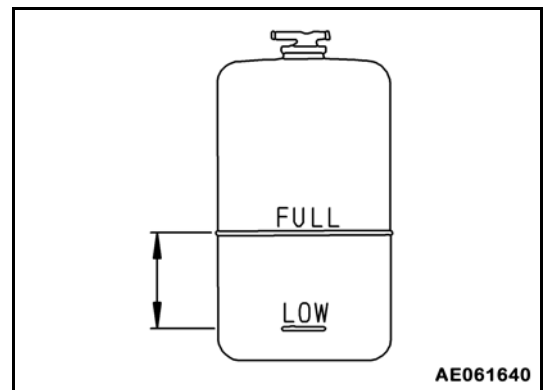
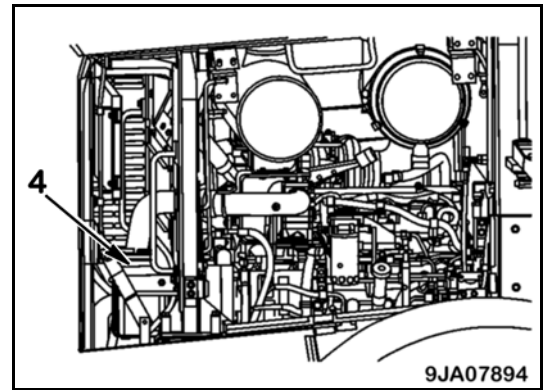
14. Add the coolant and water mix through the water filler port until it overflows.

- Respect the proportions of antifreeze and water shown in the “Water and Supercoolant Mix Ratio Table” on page 3-30.



MAINTENANCE

15. To bleed air from the cooling system, run the engine at low idle for five minutes, and for a further five minutes at high idle. Leave the radiator cap off while running the engine.
16. Drain the coolant from subtank (4), then wash the inside of the subtank.
17. Add water to the subtank until the level is between the FULL and LOW marks.
18. Stop the engine and wait three minutes.
19. Add coolant until the coolant level is near the coolant filler port.
20. Tighten the radiator cap.
21. Check the coolant level and add more coolant, if necessary.



Check Transmission Oil Level, Add Oil

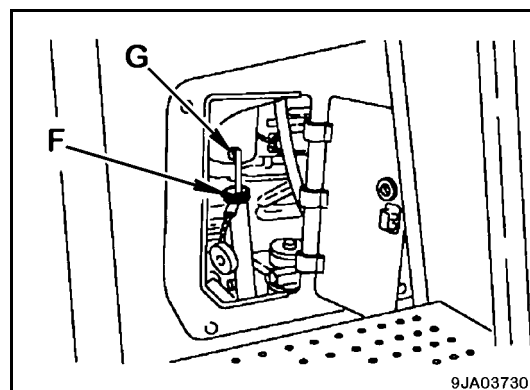
! WARNING

- The parts and oil are VERY HOT immediately after the engine is stopped and may cause burns, if touched.
- Wait for the temperature to drop before starting the work.

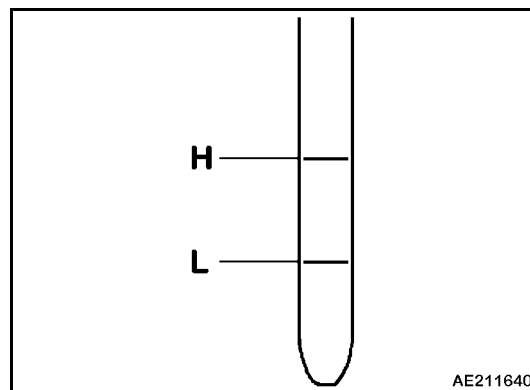
★ Do this procedure if there is any sign of oil on the transmission case or if there is oil mixed with the cooling water.

Required

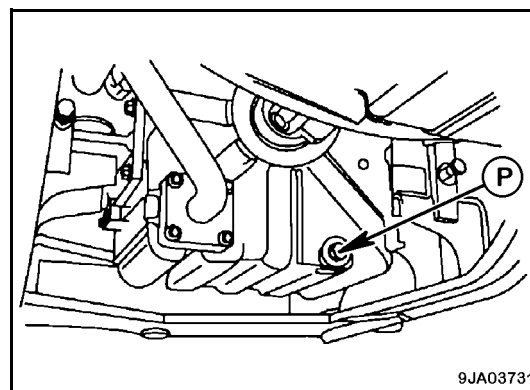
- Container: To catch the drained oil
1. Start the engine and run it for at least five minutes.
 2. Open the cap of oil filler port (F); remove dipstick (G); and use a cloth to wipe the oil off the dipstick.



3. Fully insert dipstick into the filler pipe, then remove it.
 - ★ The oil level should be between the H and L marks on dipstick (G).
 - If the oil level is below the L mark: add oil through oil filler port (F).



- If the oil level is above the H mark: drain the excess oil from drain plug (P) and check the oil level again.
- If the oil level is correct: insert dipstick (G) in the dipstick guide and tighten the cap.



MAINTENANCE

Check Axle Oil Level, Add Oil

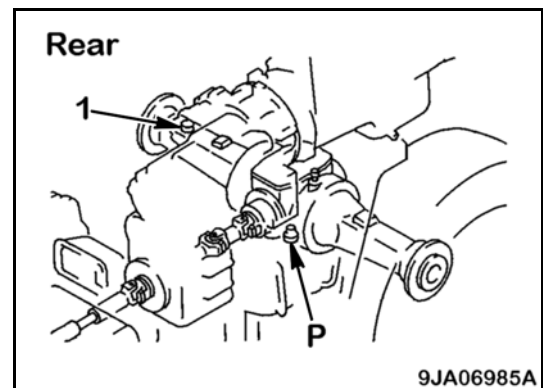
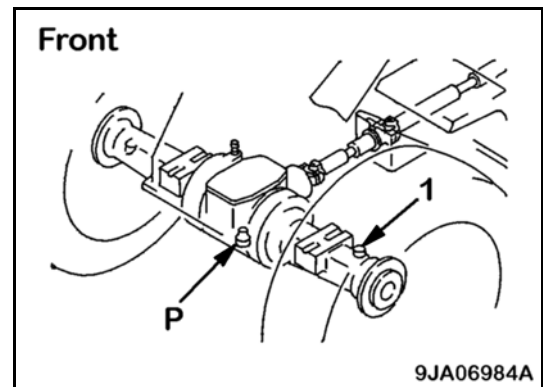
WARNING

- When checking the oil level, apply the parking brake and lock the front and rear frames with the frame lock bar.
- After stopping the engine, the parts and oil are VERY HOT. Wait for the temperature to go down before starting this operation.

- ★ Do this procedure if there is any sign of oil on the axle case.
- ★ The machine must be parked on a horizontal road surface. If the road surface is at an angle, the oil level cannot be checked correctly.

Required

- Container: To catch the drained oil
1. Stop the engine and wait for the oil temperature to go down.
 2. Remove the mud and dirt from around plug (1), then remove the plug.
 3. Use a cloth to wipe off any oil adhering to the oil level gauge attached to plug (1).



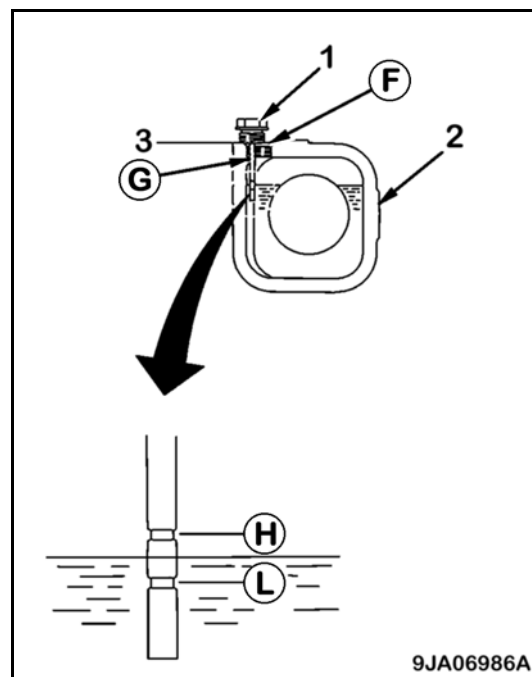
4. Set the oil level gauge (G) as shown in the diagram.
 - (2): Axle
 - (3): Spot facing face
5. Read the oil level gauge. The oil level should be between the two lines (H) and (L) on the gauge.
 - ★ If the oil is below the (L) line, add axle oil through oil filler port (F).

Remark

For axles with LSD (Limited-Slip Differential), the brand of lubricating oil is different. Use the specified lubricating oil.

- ★ If the oil level is above the (H) line, drain the excess oil through drain plug (P), then check the oil level again.
- ★ If the oil level is correct, install plug (1).

Tightening torque: 127 – 177 N•m (93.67 – 130.55 lbf ft)



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MAINTENANCE

Clean Axle Case Breather

WARNING

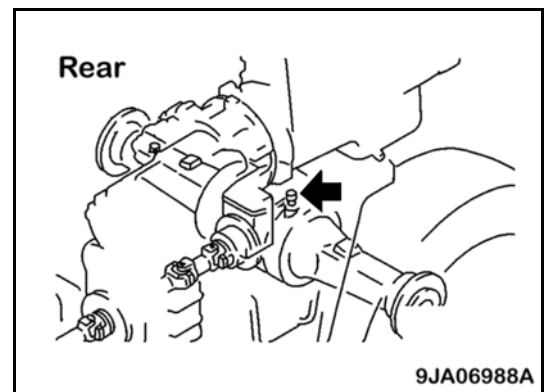
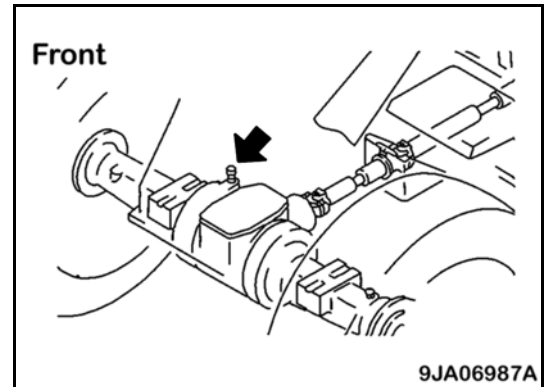
When cleaning the axle breather, apply the parking brake and lock the front and rear frames with the frame lock bar.

1. Park the machine on a horizontal surface and stop the engine.
2. Use a brush to clean off the mud and dirt from around the breather.
3. Remove the breather.

Remark

When removing the breather, be careful that dirt and dust do not get into the axle case.

4. Soak the breather in cleaning fluid and clean it.
5. Clean the breather at two places (front and rear).
6. Install the breather.



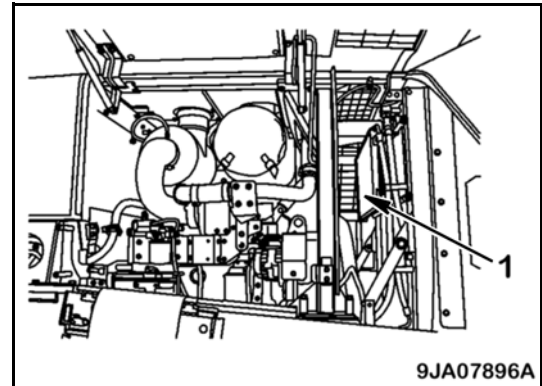
Clean Air Conditioner Condenser

WARNING

- Do not wash the condenser using a steam cleaner. There is danger that the condenser could overheat.
- If high-pressure water hits your body directly or the water sends dirt flying, there is danger of personal injury.
- Always wear protective glasses, dust mask, and other protective equipment.

★ The air conditioner condenser is located under the engine cover on the left side of the machine.

1. Park the machine on a horizontal surface and stop the engine.
2. Open the engine side cover on the left side of the machine.
3. If there is mud or dust on the air conditioner condenser, clean it with water.
 - If the water pressure is too high, the fins may get deformed.
 - When washing with a high-pressure washer, apply the water from a reasonable distance.
4. Wash the top of condenser (1) with water.

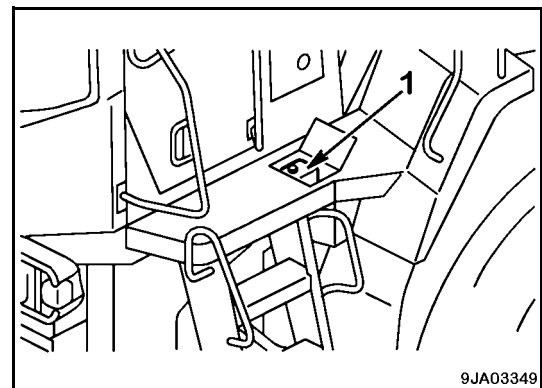


Check Window Washer Fluid Level, Add Fluid

1. Open the cover to access the washer tank (1).
2. Check the washer fluid level in the tank.
3. Add automotive window washer fluid as required.

Remark

Be careful not to let dirt and dust get into the fluid.



MAINTENANCE

Clean Radiator Fins and Oil Cooler Fins

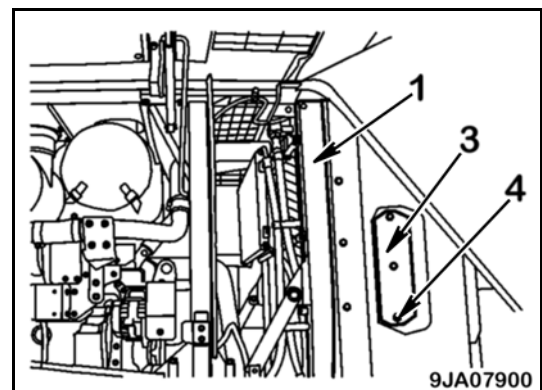
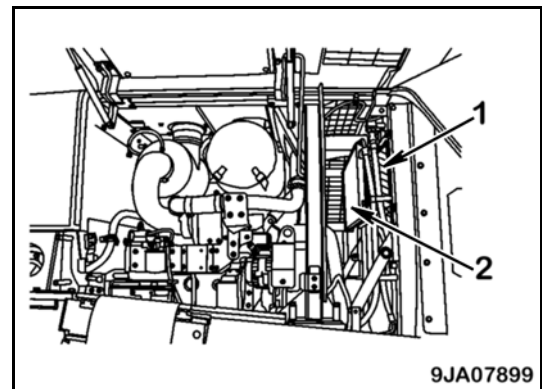
WARNING

- Never open the engine side cover when the engine is running. Stop the engine completely before starting the cleaning operation.
- If compressed air, pressurized water, or steam hits your body directly or causes dirt to fly, there is danger of personal injury.
- Always wear safety glasses, dust mask, or other protective equipment.

- ★ Clean the radiator fins if any mud or dirt is stuck to the radiator or oil cooler.
- ★ You can clean the radiator fins by the following methods:
 - Using compressed air
 - Using the rotating cooling fan in reverse

Cleaning Fins with Compressed Air

1. Park the machine on a horizontal surface and stop the engine.
2. Insert the jet nozzle through the gap between the radiator, oil cooler, aftercooler (1), and air conditioner condenser (2) to clean the fins.
3. When cleaning the face behind the radiator, or oil cooler, and aftercooler (1), remove bolt (4) and plate (3), then insert the jet nozzle through the opening to clean the fins.



Remark

If the steam jet nozzle is brought too close to the radiator fins, it may damage the fins. Keep the nozzle a suitable distance away from the fins when cleaning them.

Work under the following rough conditions:

Injection pressure:Max. 9.8 MPa (1420.37 psi)

Nozzle diameter:Max. 2 mm (0.08 in)

Distance between nozzle and radiator fins: . Min. 100 mm (3.94 in)

4. Examine the rubber hoses. If any hose is cracked or deteriorated, replace it.
5. Check that there are no loose hose clamps.

Cleaning Fins by Rotating Cooling Fan in Reverse

! WARNING

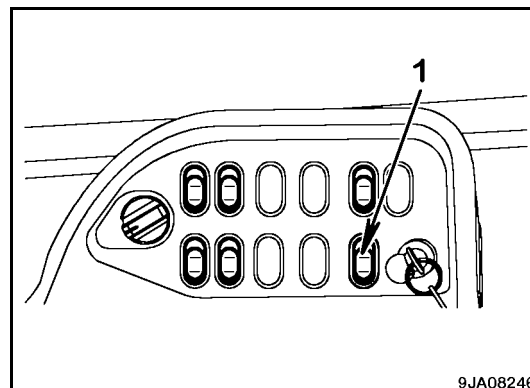
- When rotating the fan in reverse, be careful of flying dust.
- Be careful that no cloth gets caught in the fan.
- Dust may be stirred up by the fan. Check that there is no one in the surrounding area when rotating the fan in reverse.

★ On jobsites where it is easy for dirt to stick to the radiator or cooler, turn cooling fan reverse rotation switch (1) ON to rotate the fan in reverse. This will blow off the dirt and dust stuck to the radiator or cooler, and can extend the cleaning interval.

Remark

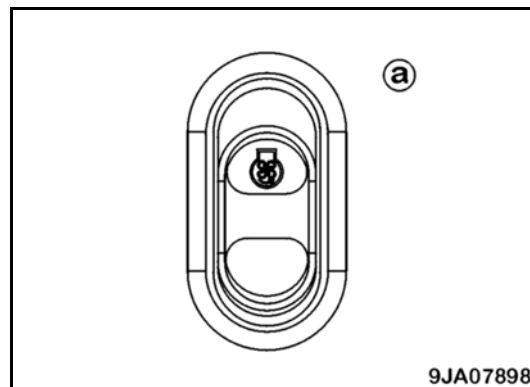
Never rotate the fan in reverse by hand when carrying out the operation.

Before operating the fan reverse rotation switch, run the engine at low idling.



Manual Fan Reversing Method

1. Set the directional lever to the Neutral position.
2. Set the parking brake switch to the ON position to apply the parking brake.
3. Run the engine at low idling.
4. Press position (a) (manual reverse rotation ON) of cooling fan reverse rotation switch (1).

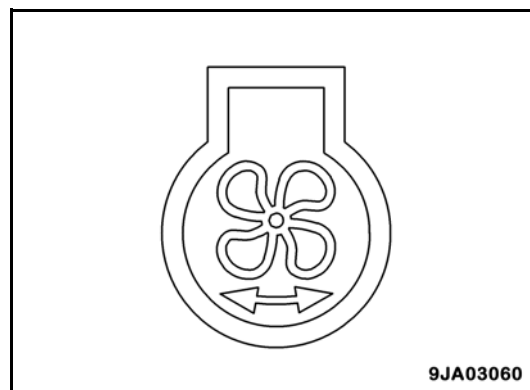


5. After the cooling fan reverse rotation pilot lamp on the machine monitor flashes, check that it lights up. At the same time, "COOLING FAN REVERSE" is displayed on the character display and the fan is set to rotate in reverse.

6. Run the engine at high idling. Select the time for running the engine at high idle dependent on the condition of clogging.

Normal clogging: 1 to 2 minutes
 Excessive clogging: 2 to 3 minutes

7. When the cleaning is completed, run the engine at low idling.



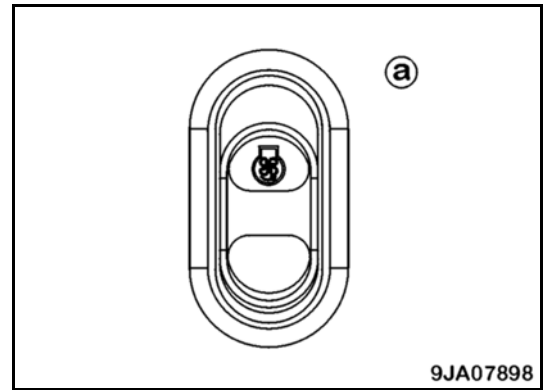
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8. Press position (a) (manual reverse rotation ON) of cooling fan reverse rotation switch (1).

9. After the cooling fan reverse rotation pilot lamp on the machine monitor flashes, check that it goes out.

The fan is set to rotate in the normal direction.

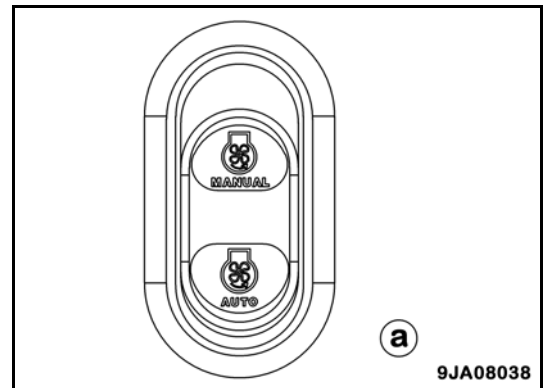
10. Run the engine at low idling for approximately 10 seconds.



Automatic Fan Reversing Method

(If equipped)

1. Run the engine at low idling.
2. Press position (a) (auto-reverse rotation ON) of cooling fan reverse rotation switch (1).



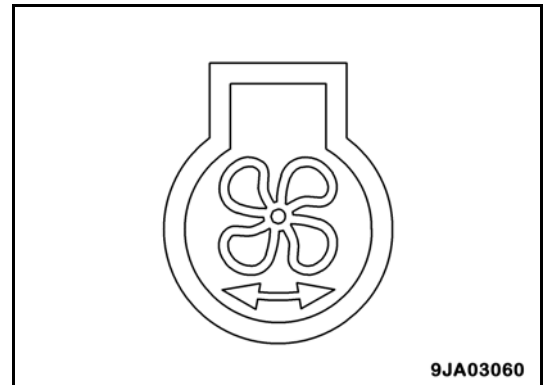
3. Check that pilot lamp inside of the switch and the cooling fan reverse rotation pilot lamp on the machine monitor light up.

The fan automatically rotates in reverse for two minutes every two hours.

Remark

When the fan direction is switched, the reverse rotation pilot lamp flashes.

When the machine is operating under high load or in low temperatures, the direction of rotation of the fan may not change. This is to protect the machine.



4. If the oil or water temperature is high, run the engine at low idling and wait for the oil temperature or water temperature to go down before operating the switch.

Turn, Replace Bolt-On Cutting Edge

WARNING

- It is extremely dangerous if the work equipment moves by mistake when doing this procedure.
- Set the work equipment in a stable condition; stop the engine; and set the safety lock for the work equipment lock lever securely to the LOCK position.

Remark

Turn or replace the cutting edge before the wear reaches the edge of the bucket.

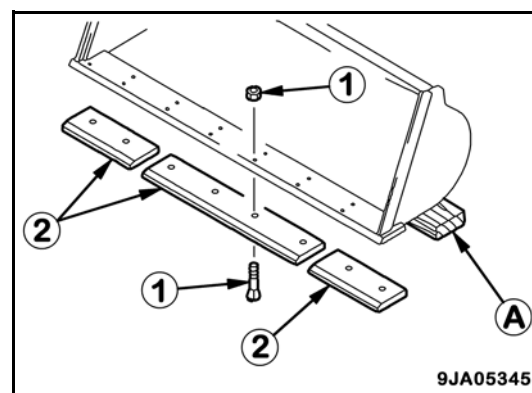
Required

- Blocks to place under the bucket
1. Raise the bucket to a suitable height, then put blocks (A) under the bucket to prevent the bucket from coming down.

Raise the bucket so that the bottom surface of the bucket is horizontal.

2. Remove nuts and bolts (1), then remove cutting edge (2).
3. Clean the mounting surface of cutting edge (2).
4. Turn cutting edge (2) and install it to the bucket. When turning the edge, install it to the opposite side (left edge to right side, right edge to left side).

- ★ If both sides of the cutting edge are worn, replace with a new part.
- ★ If the wear extends to the mounting surface, repair the mounting surface before installing the cutting edge.



5. Tighten nuts and bolts (1) uniformly so that there is no gap between the bucket and cutting edge.

Tightening torque: 745 – 1200 N•m (549.5 – 885.1 lbf ft)

6. After operating the machine for a few hours, tighten the mounting nuts again.

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Replace Bucket Teeth

(If equipped)

WARNING

- It is extremely dangerous if the work equipment moves when the teeth are being replaced. Set the work equipment in a stable position; stop the engine; and set the work equipment lock lever securely to the LOCK position to lock the work equipment control levers.
- If the pin is hit with a strong force, there is danger that the pin may fly out. Check that there is no one in the surrounding area.
- There is danger of pieces flying during the replacement operation. Always wear protective clothing, such as safety glasses and gloves.

★ If the bucket teeth are worn, replace them.

1. Raise the bucket to a suitable height, then put blocks (A) under the bucket to prevent the bucket from coming down.

Raise the bucket so that the bottom surface of the bucket is horizontal.

2. Remove the bolt and nuts (1) and (2), then remove bucket teeth (3).

3. Clean the installation surface of bucket teeth (3).

4. Install new teeth to the bucket.

- When doing this, insert shims so that there is no clearance between the teeth and the top surface of the bucket. Continue to add shims until it becomes impossible to add a 0.5 mm (0.02 in) shim.
- If the mounting surface is worn, fix the mounting surface before installing the teeth.

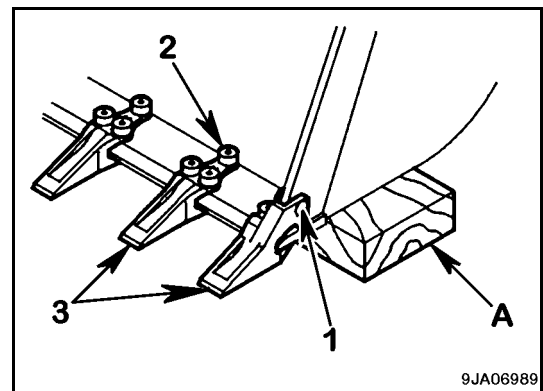
5. To prevent any gap from forming between the teeth and tip of the bucket, tighten bolts and nuts (1) and (2) temporarily, then hit the tip of the tooth with a hammer.

Tightening torque:

Mounting bolt: 637 ±853 N•m (469.8 ±629.1 lbf ft)

Nut: 618 N•m (455.8 lbf ft)

6. After operating the machine for a few hours, tighten the mounting bolts again.



Check Air Conditioner

! WARNING

- If the refrigerant used in the air conditioner gets into your eyes or on your hands, it may cause loss of sight or frostbite.
- Do not touch the refrigerant.
- Never loosen any part of the refrigerant circuit.
- Do not bring any flame close to any point where the refrigerant gas is leaking.

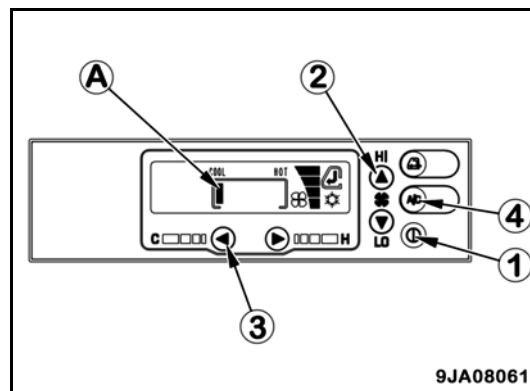
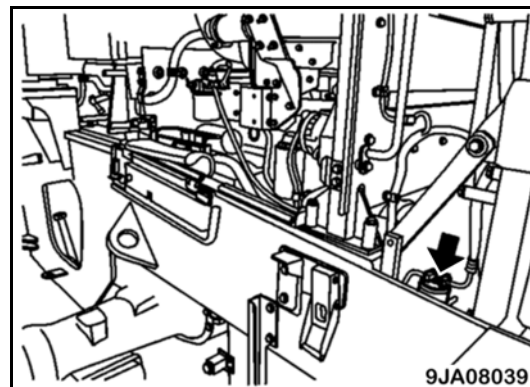
Check Level of Refrigerant (Gas)

If the cooling effect of the air conditioner is poor, there may be a lack of refrigerant gas.

- ★ To determine the condition and volume of the refrigerant, check the sight glass.

Before carrying out inspection, set the following conditions.

1. Start the engine and run it at approximately 1,500 rpm.
2. Press main power switch (1) of the air conditioner to turn the power ON.
3. Press fan switch (2) and set the air flow to HI.
4. Press temperature control switch (3) and set the display monitor to COOL (A).
5. Open the doors and windows fully.



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6. Use sight glass (6) (inspection window) of receiver drier (5) to check the condition of the refrigerant gas (freon 134a) flowing in the refrigerant circuit.

A: Quantity of refrigerant

B: Condition of sight glass

a: Proper: After air conditioner switch is turned ON, few bubbles are seen and refrigerant becomes milky white and then becomes pale milky white.

b: Insufficient refrigerant: After air conditioner switch is turned ON, bubbles are seen continuously.

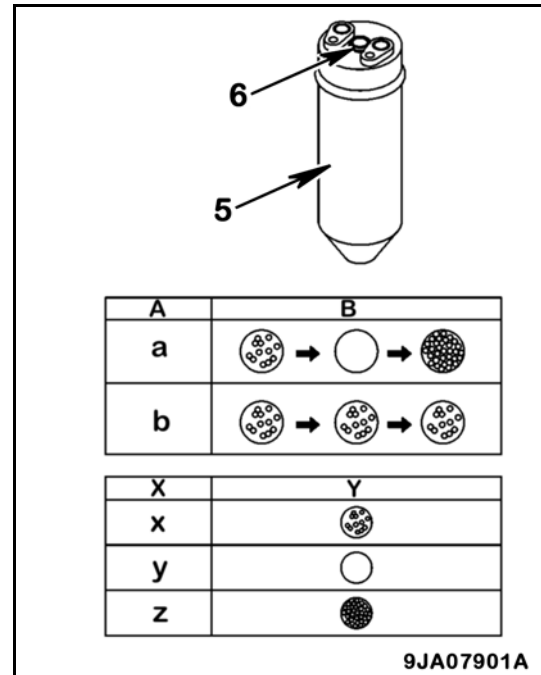
X: Condition of refrigerant flow

Y: Condition of sight glass

x: There are bubbles: Gas and liquid of refrigerant are mixed.

y: There are no bubbles: All refrigerant is liquefied and transparent.

z: Refrigerant is milky white: Oil and refrigerant are separated from each other and their mixture is pale milky white.



Inspection and Maintenance Interval

Inspection Location	Check for	Maintenance Interval		
		Check before Operating	6 Months	Replacement Interval
Filter	Clogging, dirt	Carry out check	–	2 years
Condenser	Clogging, dirt	Carry out check	–	–
Belt	Looseness, damage	Carry out check	–	2 years
Refrigerant gas	Amount	–	Carry out check	–
Piping	Looseness, damage, leakage	–	Carry out check	–
Receiver drier	–	–	–	2 years

Operating the Air Conditioner Off-Season

Even during the off-season, operate the air conditioner for three to five minutes once a month to lubricate all parts of the air conditioner compressor.

Run the engine at low idle when doing this.

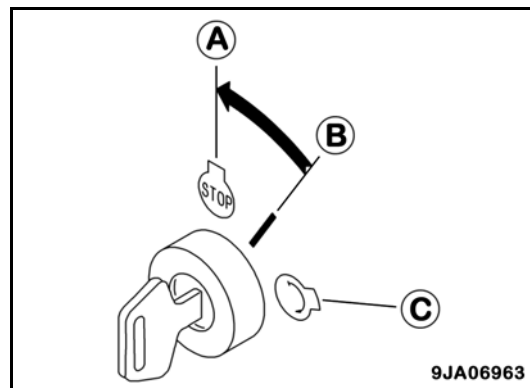
Replace Slow-Blow Fuse

Remark

Always turn the power OFF when replacing the slow-blow fuse (turn the starting switch to the OFF position).

Always replace the slow-blow fuse with one of the same capacity.

1. Turn the starting switch to the OFF position (A).
2. Remove the slow-blow fuse box from the chassis.



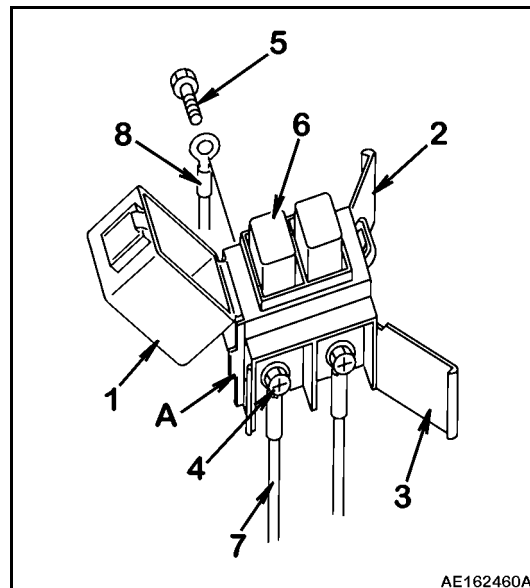
3. Open covers (1), (2), and (3) of the slow-blow fuse box.

Covers (2) and (3) can be removed easily by using protrusion (A) on the body as a fulcrum and levering the catch of the cover with a flat-headed screwdriver to release it.

4. Loosen screws (4) and (5) and remove them.

When screws (4) and (5) are removed, slow-blow fuse (6) will also come off, together with electric wiring (7) and (8).

5. Using screws (4) and (5), install a new slow-blow fuse together with electric wiring (7) and (8) in the slow-blow fuse box; then close covers (1), (2), and (3).
6. Install the slow-blow fuse box to the chassis.



MAINTENANCE

Check Accumulator Function

For details about handling the accumulator, see “Handling Accumulator and Gas Spring” on page 1-45..

Accumulator for Travel Damper

When the travel damper switch (ECSS switch) is ON, the hydraulic spring effect of the accumulator absorbs the up-and-down motion of the machine during travel and reduces the swaying.

- Drive the machine and compare the up-and-down movement of the machine during travel when the travel damper switch is ON and when it is OFF.

If there is no change in the up-and-down movement of the machine, the gas pressure in the accumulator has probably dropped.

- Contact your Komatsu distributor to have the accumulator inspected.

Remark

Carry out the inspection with the speed range set to 2 - 4, with the machine traveling at a speed of at least 5 km/h (3 mph). If the speed range is 1st or if the machine is traveling at a speed of less than 5 km/h, the ECSS will not be actuated even if the ECSS switch is turned ON.

Accumulator for Brake Damper

When the brake pedal is depressed, the hydraulic spring effect of the accumulator actuates the brake smoothly.

- Check the smoothness of the braking action.

If any change is felt in the smoothness of the brake operation during daily operations, the gas pressure in the accumulator has probably dropped.

- Contact your Komatsu distributor to have the accumulator inspected.

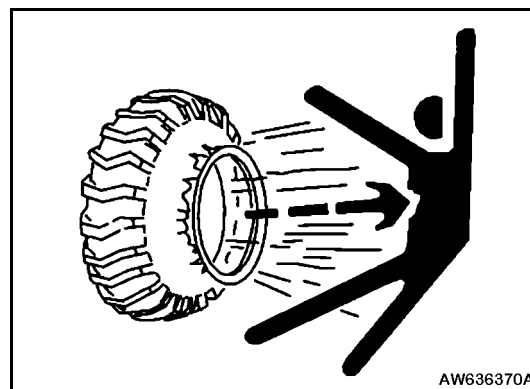
Remark

Even if there is a change in the smoothness, there is no drop in the braking force or brake performance.

Select Tires

⚠ WARNING

- If a tire or a rim is handled improperly, the tire may burst or be damaged and the rim may be broken and scattered. This can cause serious injury or death.
- Because maintenance, disassembly, repair, and assembly of the tires and rims require special equipment and skill, make sure to ask a tire repair shop to do the work.
- Do not heat or weld the rim to which the tire is installed. Do not make a fire near the tire.



⚠ WARNING

- Select the tires according to the conditions of use and the weight of the attachments on the machine.
- Use only specified tires and inflate them to the specified pressure. See “Check Tire Pressure” on page 3-48.

- Use the following table to select the tires according to the conditions of use and the weight of the attachments of the machine.
- Since the travel speed indicated on the speedometer varies with the tire size, consult your Komatsu distributor when using optional tires.

Tire		Tire Size	Maximum Load [kg (lb)]
Standard	Front and rear	23.5R25A	9,095 (20,051)

MAINTENANCE

Check Tire Pressure

WARNING

- When inflating a tire, check that no one enters the working area.
- Use an air chuck which has a clip and can be fixed to the air valve.
- While inflating the tire, check the inflation pressure occasionally so that it does not rise too high.
- If the rim is not fitted normally, it may be broken and scattered while the tire is inflated. To ensure safety, place a guard around the tire and do not work in front of the rim; work on the tread side of the tire.
- Abnormal drop of inflation pressure and abnormal fitting of the rim indicate a problem in the tire or rim. In this case, be sure to ask a tire repair shop to do the repairs.
- Be sure to observe the specified inflation pressure.
- Do not adjust the inflation pressure of the tires immediately after high-speed travel or heavy-duty work.

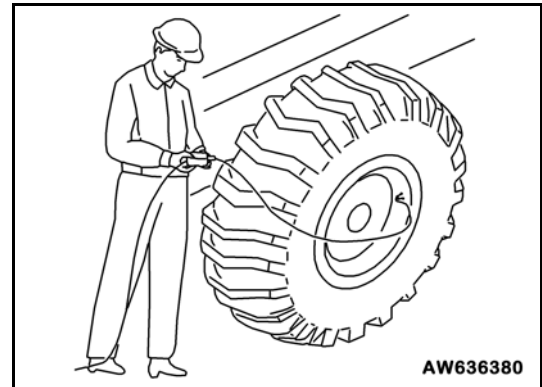
★ Measure the inflation pressure with a tire pressure gauge while the tires are cool, before starting work.

Inflation of Tires

- Adjust the inflation pressure properly.
- When inflating a tire, use an air chuck which can be fixed to the air valve of the tire as shown in the graphic.
- Do not work in front of the rim; work on the tread side of the tire.

Remark

The optimum inflation pressure differs according to the type of work being performed. For details, see "HANDLING TIRES" on page 2-156..



The proper inflation pressure is shown in the following table.

Tire	Tire Size	Inflation Pressure
Standard	23.5R25A	Front Tire: 310 kPa (3.1kgf/cm ²) [44.96 psi]
Standard	23.5R25A	Rear Tire: 310 kPa (3.1kgf/cm ²) [44.96 psi]

Check Before Starting

For the following items, see “Check Before Starting Engine” on page 2-81..

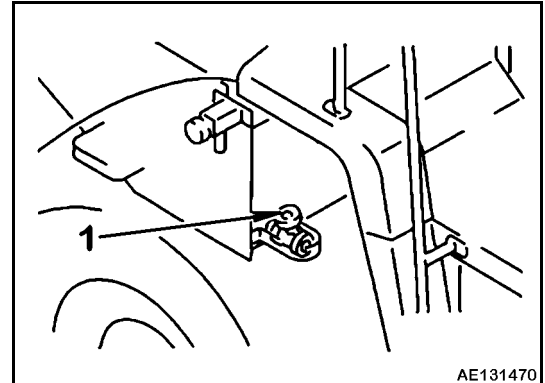
- Check machine monitor
- Check coolant level, add coolant
- Check oil level in engine oil pan, add oil
- Check water separator
- Check air cleaner
- Check fuel level, add fuel
- Check electric wiring
- Check inflation pressure of tires
- Check parking brake
- Check brake pedal
- Check condition of window washer spray
- Check wiping efficiency of wiper
- Check horn
- Check defroster function
- Check locks
- Check emergency exit

MAINTENANCE

Every 50 Hours Service

Drain Water, Sediment from Fuel Tank

1. Prepare a container to catch the fuel and place it under the drain valve of the fuel tank.
2. Loosen drain valve (1) on the right side of the fuel tank.
3. Drain out all the water and sediment collected at the bottom of the tank.
4. When all the water and sediment have drained out, close the drain valve.



Every 100 Hours Service

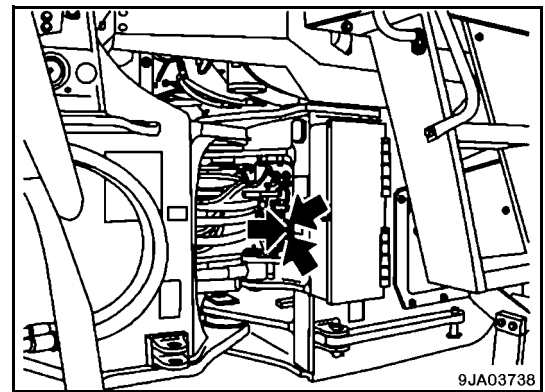
- ★ Maintenance for every 50 hours service should be performed at the same time.

Lubricate Rear Axle Pivot Pin

Remark

There are three lubrication points.

1. Using a grease pump, pump grease in through the grease fittings marked by the arrows.
2. After greasing, wipe off any grease that was pushed out.



Clean Element in Air Conditioner Fresh Air Filter

WARNING

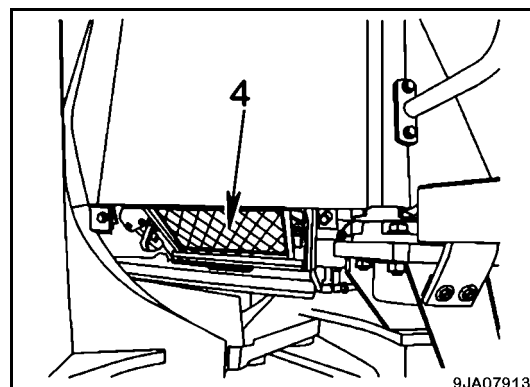
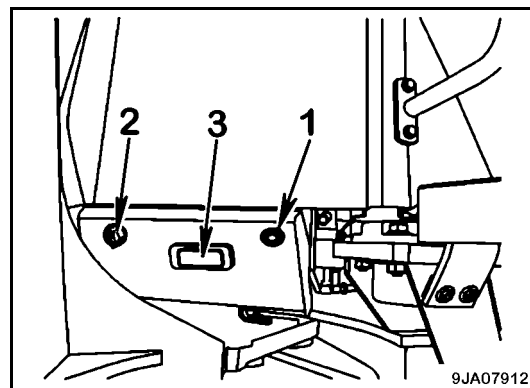
- If compressed air is used, there is danger that dirt may fly and cause personal injury.
- Always wear safety glasses, dust mask, and other protective equipment.

- ★ If the air conditioner has been used, the air filter should be cleaned.
- ★ Stop the air conditioner before cleaning the element.
- ★ Articulate the machine fully to the right before replacing the air filter element.

1. Insert the starting key into key slot (1); release the lock; loosen knob (2); and open cover (3).
2. Remove element (4) and clean it.
3. Direct dry compressed air (less than 0.69 MPa (7 kg/cm²) [100 psi] to the element from inside along its folds, and then direct it from outside along its folds and again from inside.
4. Replace the filter with a new part if the clogging cannot be removed with compressed air, or if it has been used for one year.
5. After cleaning, return filter (4) to its original position and close the cover. Use the starting switch key to lock the cover. Do not forget to remove the starting switch key.

Remark

If the filter becomes clogged, the air flow will be reduced and there will be an abnormal noise from the air conditioner unit.



MAINTENANCE

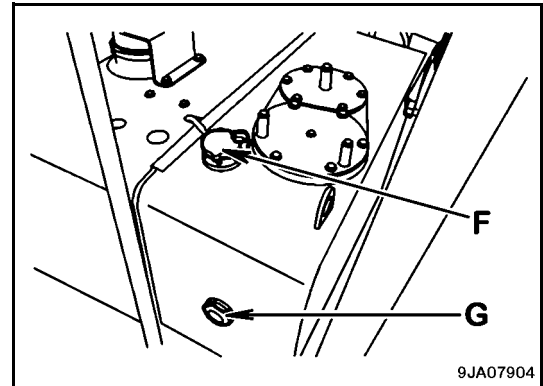
Check Oil Level in Hydraulic Tank, Add Oil

WARNING

- The parts and oil are **VERY HOT** immediately after stopping the engine and may cause burns. Wait for the temperature to decrease before starting the work.
- **When removing the oil filler cap, turn it slowly to release any internal pressure and then remove it.**

1. Lower the bucket to the ground; stop the engine; and wait for approximately five minutes.
2. Check the oil level with sight gauge (G) on the hydraulic tank.

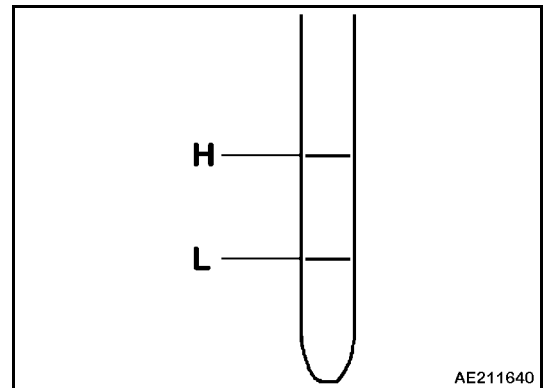
The oil level should be between the H and L marks.



Remark

If the oil level is above the H level, drain the excess oil from the drain plug. Using the machine with excess oil in the circuit will damage the hydraulic circuit or cause the oil to spurt out.

3. If the oil is below the L level, add oil through oil filler (F).



Every 250 Hours Service

- ★ Maintenance for every 50 and 100 hours service should be performed at the same time.

Check Battery Electrolyte Level

⚠ WARNING

- Do not use the battery if the battery electrolyte level is below the LOWER LEVEL line. This situation will accelerate deterioration of the inside of the battery and reduce the service life of the battery. In addition, it may cause an explosion.
- The battery generates flammable gas and there is danger of explosion. Do not bring fire or sparks near the battery.
- Battery electrolyte is dangerous. If it gets in your eyes or on your skin, wash it off with a large amount of water and consult a doctor immediately.
- When adding distilled water to the battery, do not allow the battery electrolyte to go above the UPPER LEVEL line. If the electrolyte level is too high, it may leak and damage the paint surface or corrode other parts.

- ★ Inspect the battery electrolyte level at least once a month.
- ★ Always follow the basic safety procedures. See “Battery Precautions” on page 1-39..

When Checking Electrolyte Level from Side of Battery

If it is possible to check the electrolyte level from the side of the battery, do this procedure.

1. Open the cover of the battery box.

There are two battery boxes: One on each side at the rear of the machine.

2. Use a wet cloth to clean the area around the electrolyte level lines and check that the electrolyte level is between the UPPER LEVEL (UL) and LOWER LEVEL (LL) lines.

- ★ If you wipe the battery with a dry cloth, static electricity may cause a fire or explosion.

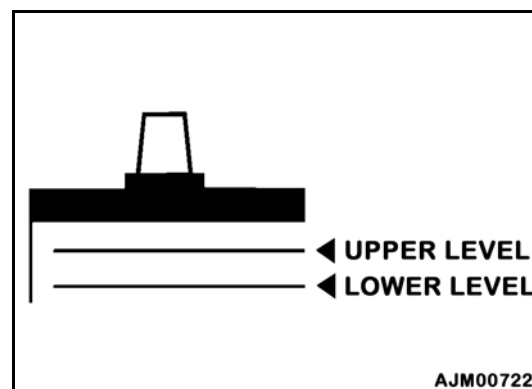
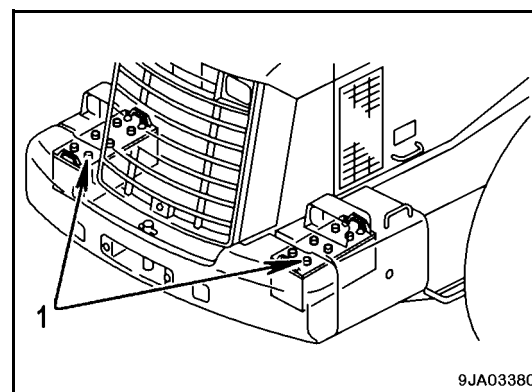
3. If the electrolyte level is below the midway point between the UPPER LEVEL (UL) and LOWER LEVEL (LL) lines, remove cap (1) and add distilled water up to the UL line.

Remark

If adding distilled water in cold weather, add it before starting operations in the morning to prevent the electrolyte from freezing.

4. If distilled water has been added to any cell of cap (1), add distilled water also to the other cells.
5. Clean the vents of the battery caps, then close the caps securely.
6. Keep the top of the battery clean and wipe it with a wet cloth.

Remark



MAINTENANCE

If distilled water is added above the UPPER LEVEL (UL) line, use a syringe to lower the level to the UPPER LEVEL (UL) line. Neutralize the fluid that is removed with baking soda (sodium bicarbonate) and then flush it away with a large amount of water, or consult your Komatsu distributor or battery manufacturer.

When It Is Impossible to Check Electrolyte Level from Side of Battery

If it is impossible to check the electrolyte level from the side of the battery or there is no display of the UPPER LEVEL line on the side of the battery, use this procedure to check the level.

1. Open the cover of the battery box.

There are two battery boxes: One on each side at the rear of the machine.

2. Remove cap (1) at the top of the battery; look through the water filler port (2); and check the electrolyte surface.

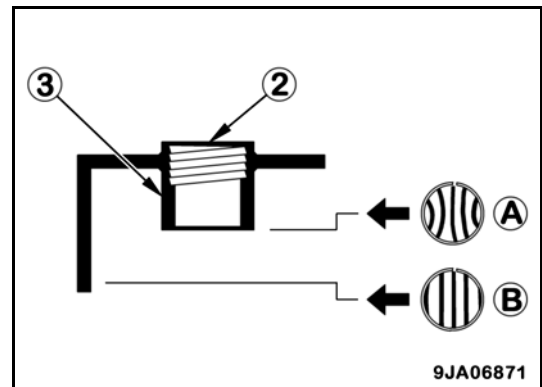
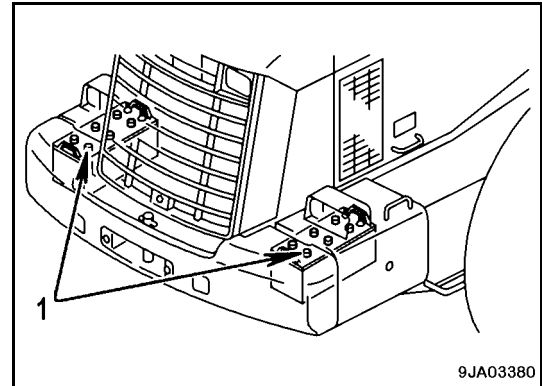
If the electrolyte does not reach the sleeve (3), add distilled water so that the level reaches the bottom of the sleeve (UPPER LEVEL line).

- A: Suitable level

Electrolyte level is up to bottom of sleeve; surface tension causes electrolyte surface to bulge and poles appear bent.

- B: Low

Electrolyte level is not up to bottom of sleeve; poles appear straight and not bent.



Remark

If adding distilled water in cold weather, add it before starting operations in the morning to prevent the electrolyte from freezing.

3. If distilled water has been added to any cell of cap (1), add distilled water also to the other cells.
4. Clean the vents of the battery caps, then close the caps securely.
5. Keep the top of the battery clean and wipe it with a wet cloth.

Remark

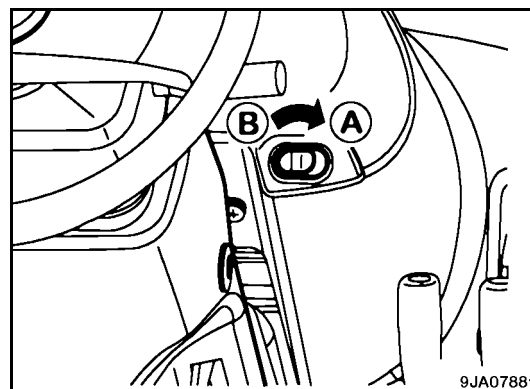
If water is added above the bottom of the sleeve, use a syringe to remove the electrolyte and lower the level to the bottom of the sleeve. Neutralize the removed fluid with baking soda (sodium bicarbonate) and then flush it away with a large amount of water, or consult your Komatsu distributor or battery manufacturer.

When It Is Possible to Use Indicator to Check Electrolyte Level

If it is possible to use an indicator to check the electrolyte level, follow the instructions provided with the indicator.

Check Parking Brake

1. Stop the machine on a dry, downhill slope.
2. Set the parking brake switch to the ON position (A) and check if the parking brake holds the machine in position.
 - Position (A): ON
 - Parking brake is actuated and parking brake pilot lamp illuminates.
 - Position (B): OFF
 - The parking brake is released.
3. If there is a problem, contact your Komatsu distributor.



Check Air Conditioner Compressor Belt Tension, Adjust

Checking

The standard deflection between the air conditioner compressor pulley and the crank pulley should be 11 – 16 mm (0.43 – 0.63 in) when pressed with a thumb force of approximately 98 N (22.03 lbf) at a midway point.

When a belt tension gauge is used, the standard tension is within a range of 353 – 530 N (79.36 – 119.15 lbf).

Checking When Changing the V-Belt

The standard deflection between the air conditioner compressor pulley and the fan pulley should be 8 – 11.5 mm (0.31 – 0.45 in) when pressed with a thumb force of approximately 98 N (22.03 lbf) at a midway point.

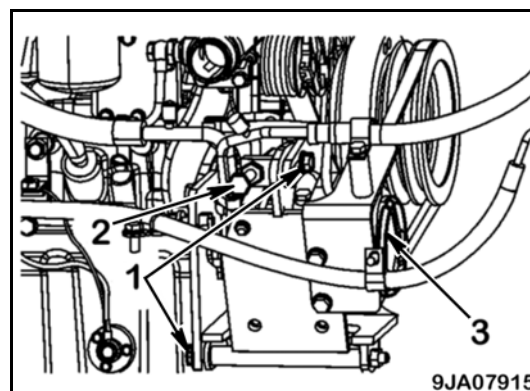
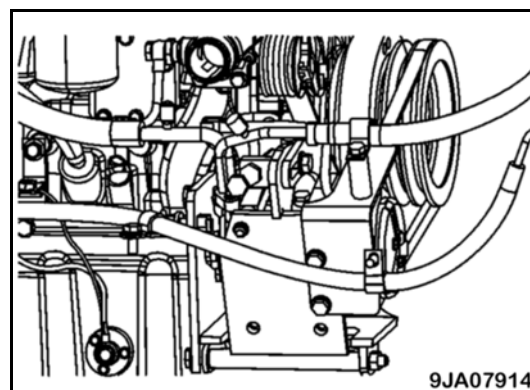
When a belt tension gauge is used, the standard tension is within a range of 530 – 745 N (119.15 – 167.48 lbf).

Remark

When the belt has been replaced with a new one, high tension is necessary. These are the initial tension values.

Adjusting

1. Loosen bolt (1) and loosen locknut (2).
2. Tighten bolt (2) and move compressor (3) to adjust.
3. Tighten bolt (1) and the locknut of bolt (2) to hold the compressor (3) in position.
4. Check each pulley for damage, wear of the V-groove, and wear of the V-belt.
 - ★ Be particularly careful to check that the V-belt does not touch the bottom of the V-groove.



MAINTENANCE

5. If any of the following occurs, ask the Komatsu distributor in your territory to replace the belts with new ones:
 - The fan belt has elongated, leaving little allowance for adjustment.
 - A cut or crack is found on the belt.
 - Slipping or creaking sound is heard coming from the belt.
- ★ If you have replaced the V-belt, operate the machine for one hour and then adjust the belt again. The V-belt elongates when first used.

Check for Loose Wheel Hub Nuts, Tighten

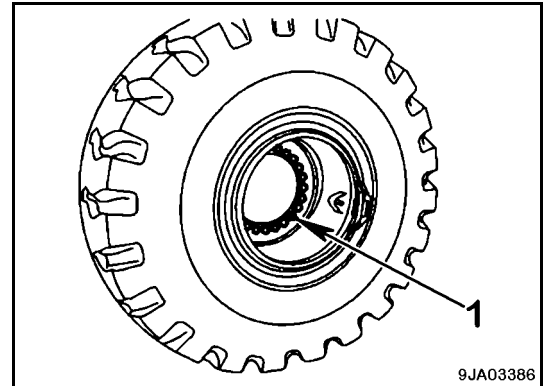
If wheel hub bolts (1) are loose, tire wear will increase and accidents might happen.

1. Check for loose nuts and tighten, if necessary.

When checking for loose nuts, always turn the nuts in the tightening direction.

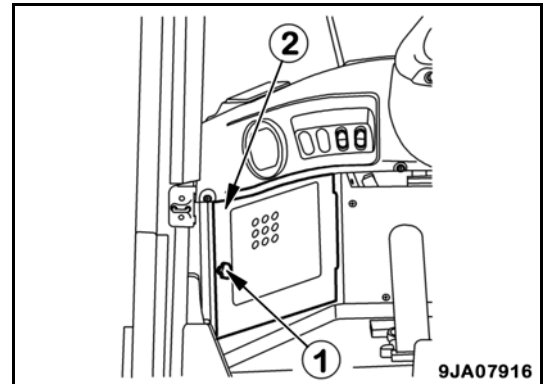
Tightening torque: 825 – 030 N•m (608.49 – 759.69 lbf ft)

2. If any stud bolt is broken, replace **all** the stud bolts for that wheel.

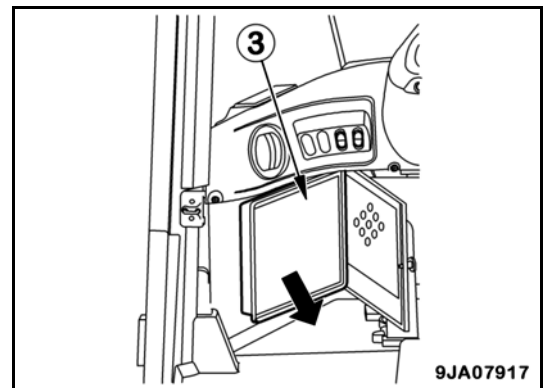


Clean Element in Air Conditioner Recirculation Filter

1. Loosen knob (1), then remove filter inspection cover (2).



2. Remove filter (3) in the direction shown by the arrow.
3. Direct dry compressed air (less than 0.69 MPa (7 kg/cm²) [100 psi] to the element from inside along its folds, and then direct it from outside along its folds and again from inside.
4. Replace the filter with a new part if the clogging cannot be removed with compressed air, or if it has been used for one year.



Remark

If the filter becomes clogged, the air flow will be reduced and there will be an abnormal noise from the air conditioner unit.

Check Accumulator Function

For details of handling the accumulator, see “Handling Accumulator and Gas Spring” on page 1-45..

Brake Accumulator

If the engine stops when the machine is traveling, the oil pressure in the accumulator can be used to apply the brake as an emergency measure.

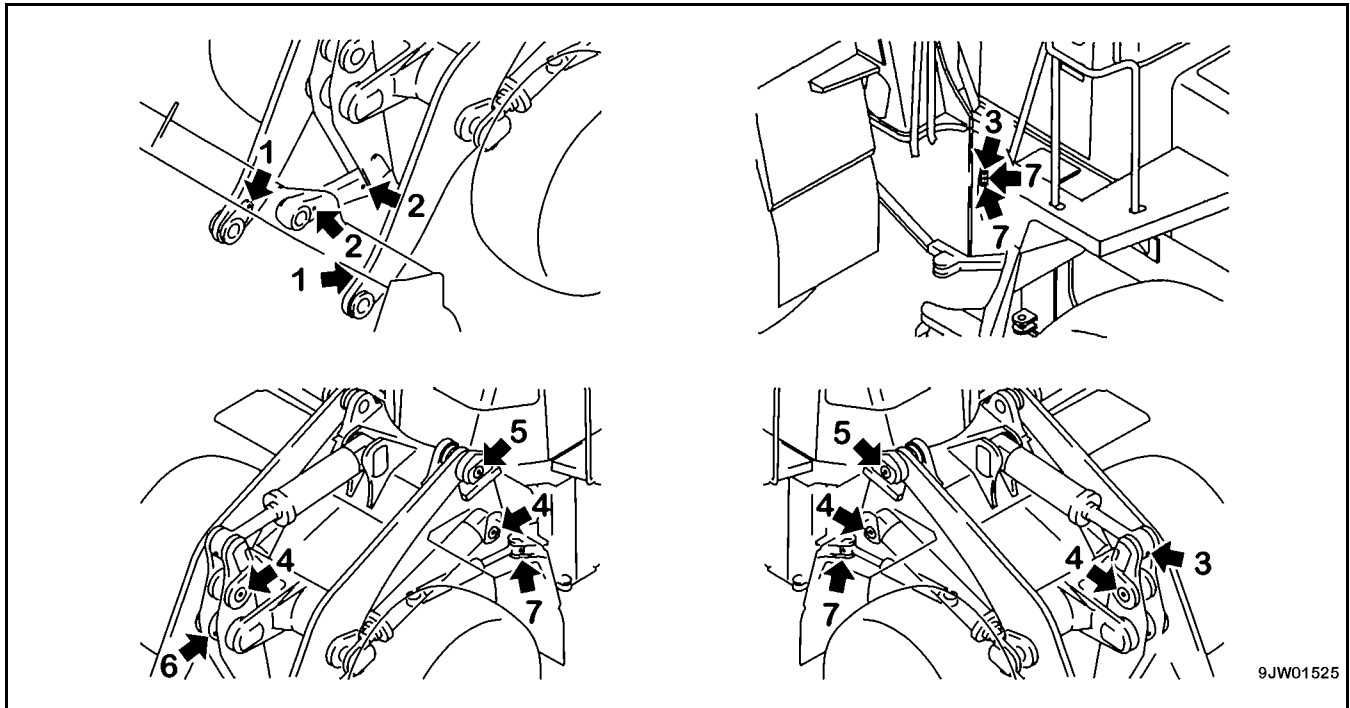
1. Stop the machine on level ground and lower the work equipment completely to the ground.
2. Apply the parking brake.
3. Start the engine; run it at a mid-range speed for one minute; then stop the engine.
4. Turn the starting switch key to the ON position and depress the brake pedal repeatedly.
 - If the brake oil pressure caution lamp does not light up even when the brake is depressed six times, the gas pressure in the accumulator is normal.
 - If the brake oil pressure caution lamp lights up when the brake has been depressed five times or less, the gas pressure in the accumulator has probably dropped. Contact your Komatsu distributor to have the accumulator inspected.

Remark

Carry out the check within five minutes after stopping the engine. If the machine is left with the engine stopped, the accumulator pressure will drop and it will be impossible to check the cause of the problem.

MAINTENANCE

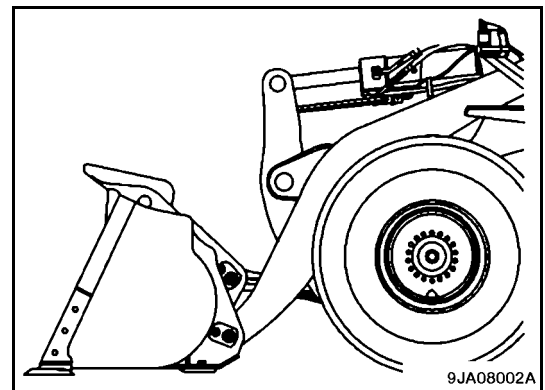
Lubricating



- | | |
|-----------------------------|---------------------------------|
| 1. Bucket pin (two) | 5. Lift arm pivot pin (two) |
| 2. Bucket link pin (two) | 6. Bell crank pin (one) |
| 3. Dump cylinder pin (two) | 7. Steering cylinder pin (four) |
| 4. Lift cylinder pin (four) | |

1. Using a grease pump, pump in grease through the grease fittings marked by the arrows.
2. After greasing, wipe off any grease that was pushed out.

- ★ When carrying out greasing of bucket pin (1), lift arm pivot pin (5), and bell crank pin (6), lower the bucket to the ground and set it horizontally.



Every 500 Hours Service

★ Maintenance for every 50, 100, and 250 hours service should be performed at the same time.

Change Oil in Engine Oil Pan, Replace Engine Oil Filter Cartridge

⚠ WARNING

- The engine parts and oil are **VERY HOT** immediately after the engine is stopped and may cause serious burns. Wait for the temperature to cool down before starting the work.
- When removing the oil filler cap, turn it slowly to release internal pressure and then remove it.

Required

- Filter wrench
- Container to catch engine oil

Refill capacity: 23 liters (6.08 US gallons)

1. Stop the engine and wait for the temperature of all parts to go down.
2. Open the engine side cover on the right side of the chassis.

3. Open oil filler (F).

4. Place a container under drain plug (P) to catch the oil.

5. Loosen drain plug (P) and drain the oil.

6. Check the drained oil.

★ If there are excessive metal particles or foreign material, contact your Komatsu distributor.

7. Install drain plug (P).

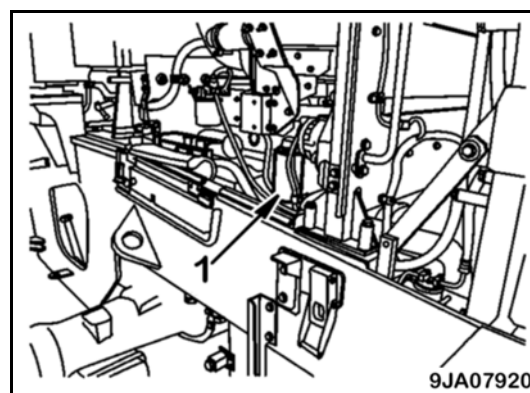
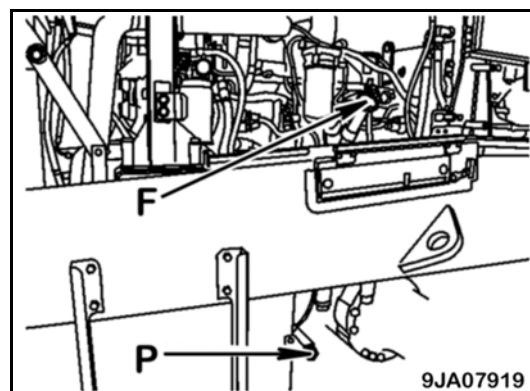
8. Open the engine side cover on the left side of the chassis.

9. Using the filter wrench, turn filter cartridge (1) counterclockwise to remove it.

★ If this operation is carried out immediately after stopping the engine, a large amount of oil will come out. Wait 10 minutes before starting the operation.

10. Clean the filter holder.

11. Fill a new filter cartridge with clean engine oil; coat the seal and the threaded portion of the filter cartridge with engine oil.



MAINTENANCE

12. Install the new filter cartridge to the filter holder.

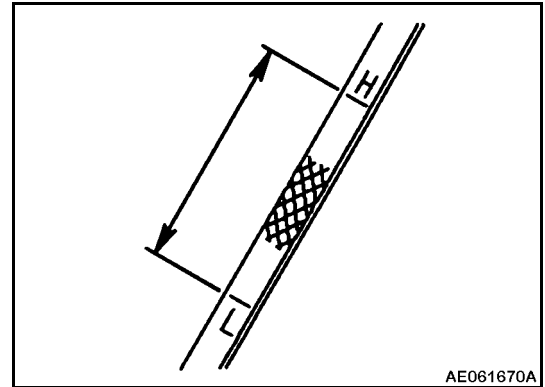
- ★ When installing the cartridge, bring the seal surface into contact with the filter holder and then tighten a further 3/4 turn by hand.
- ★ If you use a filter wrench to tighten the filter, be careful not to scratch or deform the filter.

13. After replacing the filter cartridge, add engine oil through oil filler (F) until the oil level is between the H and L marks on the dipstick.

14. Run the engine for a short time at low idling.

15. Stop the engine and check that the oil level is between the H and L lines on the dipstick.

- ★ For details, see “Check Oil Level in Engine Oil Pan, Add Oil” on page 2-83..



Replace Fuel Prefilter Cartridge

WARNING

- Immediately after the engine is stopped, all parts are VERY HOT. Do not replace the filter immediately. Wait for the engine to cool down before starting the operation.
- High pressure is generated inside the engine fuel piping system when the engine is running. When replacing the filter, wait for at least 30 seconds after the engine stops to let the internal pressure go down before replacing the filter.
- Do not bring any fire or spark close to the machine.

Remark

Genuine Komatsu fuel filter cartridges use a special filter that has a highly efficient filtering ability. When replacing the filter cartridge, always use a genuine Komatsu part.

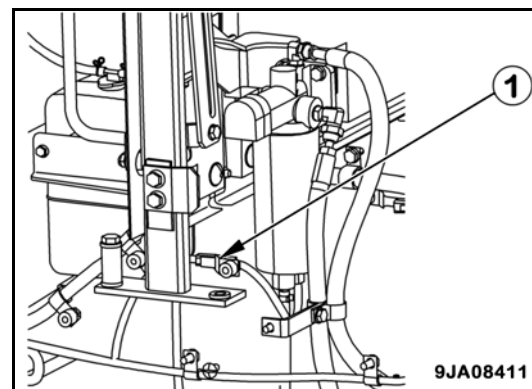
The common rail fuel injection system used on this machine consists of more precise parts than the conventional injection pump and nozzle. If any part other than a genuine Komatsu filter cartridge is used, dust or dirt may get in and cause problems with the injection system. Never use substitute parts.

When performing inspection or maintenance of the fuel system, pay more attention than normal to the entry of dirt. If dirt is stuck to any part, use fuel to wash it off completely.

Required

- Container to catch fuel
 - Filter wrench
- ★ The fuel prefilter forms one unit with the water separator and is at the rear of the engine.
1. Stop the engine on level ground and lower the work equipment to the ground.
 2. Open the engine side cover on the right side of the chassis.
 3. Remove connector (1).

After removing the connector, cover the connector terminals with a vinyl bag or tape to protect them and prevent them from becoming dirty.

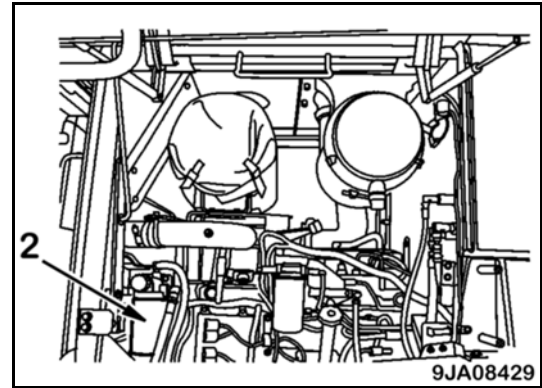


9JA08411

4. Set the container to catch the fuel under the filter cartridge.

MAINTENANCE

- Using a filter wrench, turn filter cartridge (2) counterclockwise to remove it.



- There is a water separator cup (3) installed on the bottom of the cartridge. Turn this cup to the left to remove it.

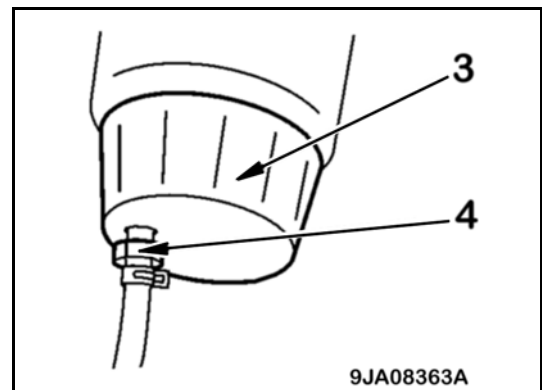
- ★ This cup is used again. If it is damaged, replace it with a new part.

- Install cup (3) to the bottom of the new fuel prefilter cartridge.

- ★ When doing this, always replace the seal ring with a new part.

Tightening torque for cup: 10 N•m (88.51 lbf in)

- When replacing the seal ring, coat the surface with clean fuel before installing it.



- Check that drain plug (4) at the bottom of cup (3) of the fuel prefilter is tightened securely.

Tightening torque: 0.2 – 0.45 N•m (1.77 – 3.98 lbf in)

- Clean the filter holder.

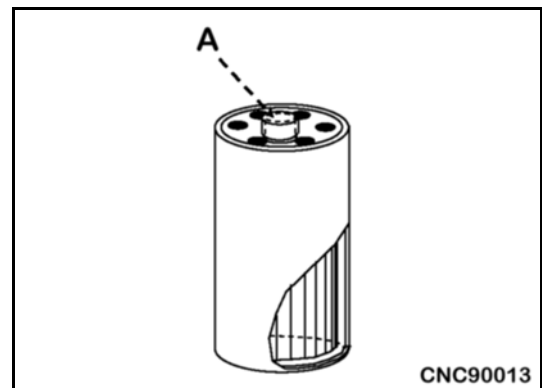
- Make sure that cap (A) is attached to the filter.

Remark

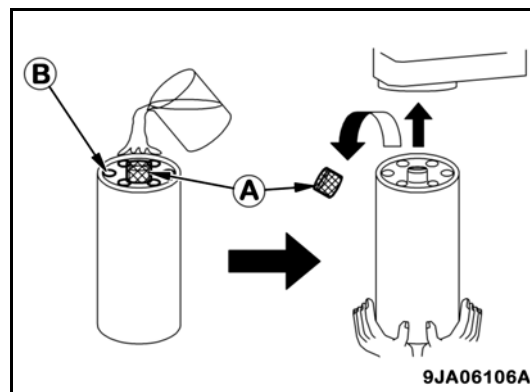
Cap (A) prevents the entry of dirt or dust into the filter cartridge. If fuel dust gets into the filter, it may result in a failure of the fuel injection system.

- Fill the filter cartridge with clean fuel through the eight small holes (B) in the new filter cartridge.

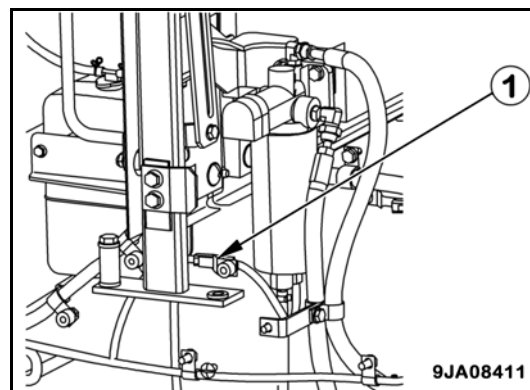
- Coat the packing surface of the filter cartridge with oil.



14. Remove filter cartridge cap (A) and throw it away.
15. Install the filter to the filter holder. Tighten the filter cartridge until the packing surface contacts the seal surface of the filter holder, and then tighten it 3/4 of a turn.
 - ★ If the filter cartridge is tightened too much, the packing will be damaged; this will result in leakage of fuel. If the filter cartridge is too loose, fuel will leak from the packing. Always tighten the filter cartridge the correct amount.
 - ★ When tightening with a filter wrench, be very careful not to dent or damage the filter.



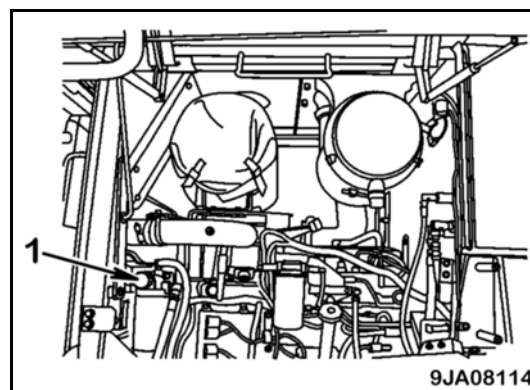
16. Remove the vinyl bag or tape that you used to cover the connector terminals in Step 3, then connect connector (1).
17. Bleed air from the fuel line. See “Bleeding Air from Fuel Line” on page 3-63.
18. When carrying out standard replacement of the fuel filter cartridge (EVERY 1000 HOURS), replace the cartridge and bleed the air.
 - ★ For details, see “Replace Fuel Main Filter Cartridge” on page 3-65.



19. After replacing the filter cartridge, start the engine and check that there is no leakage of fuel from the filter seal surface or water separator mounting surface.
 - ★ Run for 10 minutes at low idling.
 - If there is leakage of fuel, check that the filter cartridge is tightened properly.
 - If the fuel still leaks, repeat Steps 3 - 6 to remove the filter cartridge, then check the packing surface for damage or embedded dirt.
 - If any problem is found, replace the cartridge with a new part, then repeat Steps 7 - 19 to install the new cartridge.

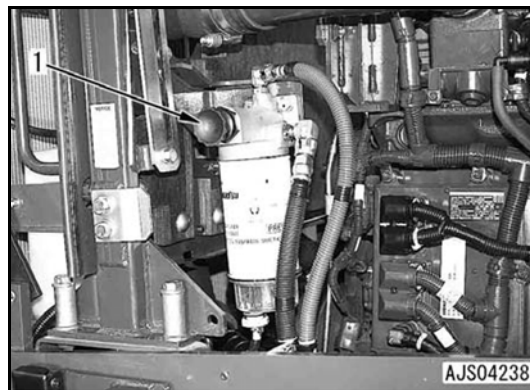
Bleeding Air from Fuel Line

1. Fill the fuel tank with fuel.
2. Open the engine side cover on the right side of the chassis.
3. Loosen and pull out feed pump knob (1) and move it forward and backward.
 - ★ The plug on the side surface of the fuel prefilter head does not need to be removed.
4. Keep moving knob (1) until it becomes heavy.



MAINTENANCE

5. After bleeding air, push in and tighten knob (1).



Every 1000 Hours Service

★ Maintenance for every 50, 100, 250, and 500 hours service should be performed at the same time.

Replace Fuel Main Filter Cartridge

⚠ WARNING

- Immediately after the engine is stopped, all parts are VERY HOT. Do not replace the filter immediately. Wait for the engine to cool down before starting the operation.
- High pressure is generated inside the engine fuel piping system when the engine is running. When replacing the filter, wait for at least 30 seconds after the engine stops to let the internal pressure go down before replacing the filter.
- Do not bring any fire or spark close to the machine.

Remark

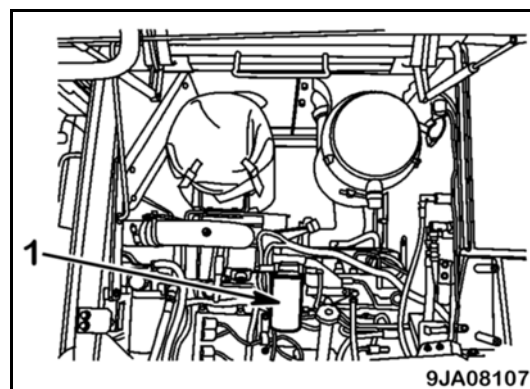
Genuine Komatsu fuel filter cartridges use a special filter that has a highly efficient filtering ability. When replacing the filter cartridge, always use a genuine Komatsu part.

The common rail fuel injection system used on this machine consists of more precise parts than the conventional injection pump and nozzle. If any part other than a genuine Komatsu filter cartridge is used, dust or dirt may get in and cause problems with the injection system. Never use substitute parts.

When performing inspection or maintenance of the fuel system, pay more attention than normal to the entry of dirt. If dirt is stuck to any part, use fuel to wash it off completely.

Required

- Container to catch fuel
 - Filter wrench
1. Stop the engine on level ground and lower the work equipment to the ground.
 2. Open the engine side cover on the right side of the chassis.
 3. Set the container to catch the fuel under the filter cartridge.
 4. Using a filter wrench, turn filter cartridge (1) counterclockwise to remove it.
 5. Clean the filter holder.
 6. Make sure that cap (A) is attached to the new filter.



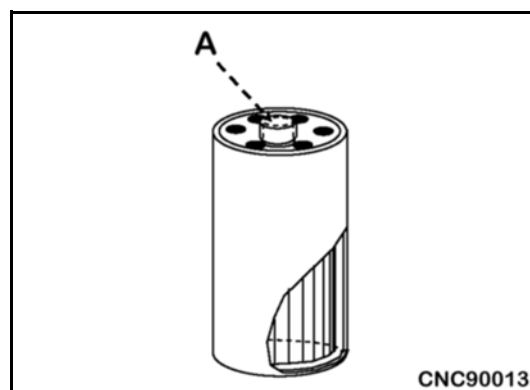
9JA08107

Remark

Cap (A) prevents the entry of dirt or dust into the filter cartridge. If fuel dust gets into the filter, it may result in a failure of the fuel injection system.

DO NOT fill the filter cartridge with fuel.

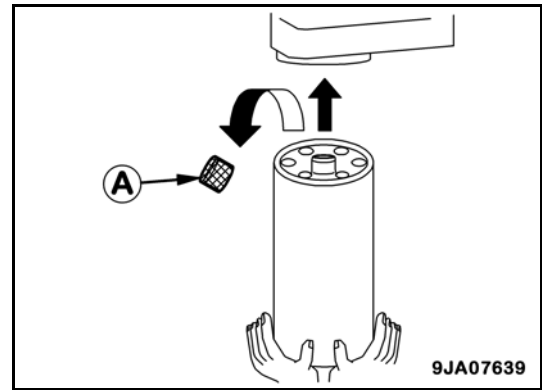
7. Coat the packing surface of the filter cartridge with oil.



CNC90013

MAINTENANCE

8. Remove filter cartridge cap (A) and throw it away.
9. Install the filter to the filter holder. Tighten the filter cartridge until the packing surface contacts the seal surface of the filter holder, and then tighten it 3/4 of a turn.
 - ★ If the filter cartridge is tightened too much, the packing will be damaged; this will result in leakage of fuel. If the filter cartridge is too loose, fuel will leak from the packing. Always tighten the filter cartridge the correct amount.
 - ★ When tightening with a filter wrench, be very careful not to dent or damage the filter.



10. Bleed air from the fuel line. See “Bleeding Air from Fuel Line” on page 3-63.
11. After bleeding the air, start the engine and check that there is no leakage of fuel from the filter seal surface.
 - If there is leakage of fuel, check that the filter cartridge is tightened properly.
 - If the fuel still leaks, repeat Step 4 to remove the filter cartridge, then check the packing surface for damage or embedded dirt.
 - If any problem is found, replace the cartridge with a new part, then repeat Steps 6 - 10 to install and test the new cartridge.

Change Oil in Transmission Case, Change Transmission Oil Filter Cartridge, Clean Strainer

⚠ WARNING

- Immediately after stopping the engine, the parts and oil are VERY HOT and may cause burns. Wait for the temperature to go down before starting the work.
- When removing the oil filler cap, turn it slowly to release the internal pressure and then remove the cap.

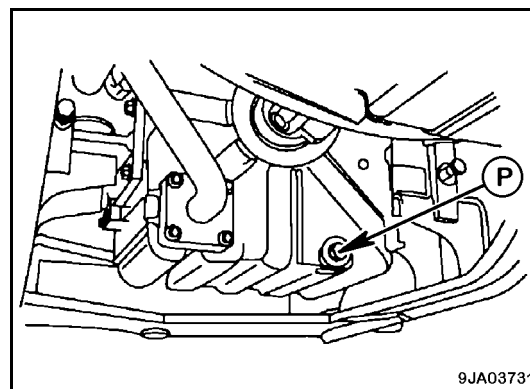
Required

- Filter wrench

- Container to catch oil

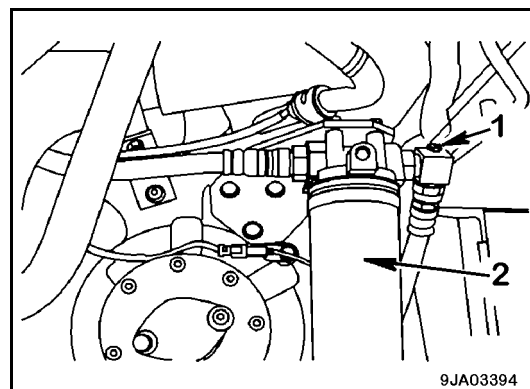
Refill capacity: 38 liters (10.04 US gallons)

1. Stop the engine and wait for the temperature of all parts to go down.
2. Set a container to catch the oil directly under drain plug (P).
3. Remove drain plug (P) and drain the oil.
 - ★ To prevent the oil from spurting out, loosen drain plug (P) slowly and then gradually remove it.



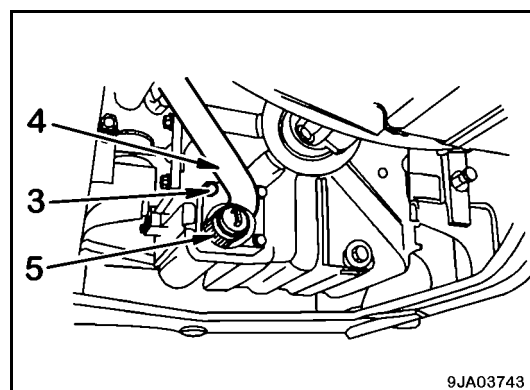
4. After draining the oil, install drain plug (P).

Tightening torque $68.6 \pm 9.8 \text{ N}\cdot\text{m}$ ($50.6 \pm 7.2 \text{ lbf}\cdot\text{ft}$)



5. Set a container to catch the oil under the transmission filter.
6. Remove drain plug (1) of the transmission filter; drain the oil; then tighten the plug again.
7. Using a filter wrench, turn filter cartridge (2) to the left to remove it.
8. Clean the filter holder; coat the seal surface and thread of the new filter cartridge with engine oil; then install it.

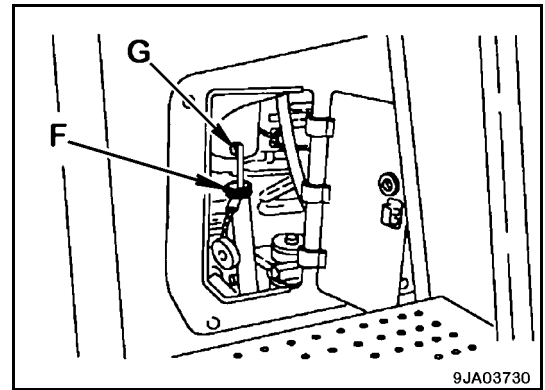
9. When the seal surface comes into contact with the filter holder, tighten a further 2/5 turns with the filter wrench.
10. Remove four bolts (3); move tube (4); then remove strainer (5).
11. Remove any dirt stuck to strainer (5), then wash it in clean diesel fuel or flushing oil.
 - ★ If strainer (5) is damaged, replace it with a new part.



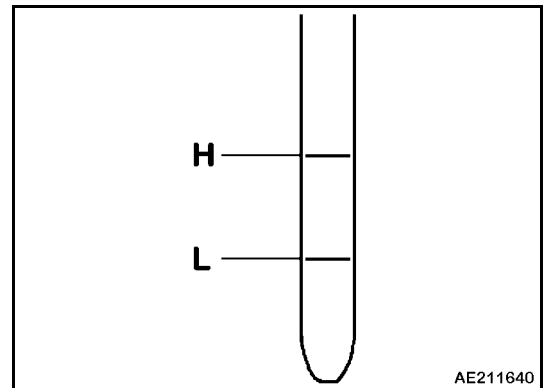
12. Install strainer (5) in the case.
13. Replace the O-ring of tube (4) with a new part, then install tube (4).

MAINTENANCE

14. Refill the specified quantity of oil through oil filler (F).
15. After filling with oil, check that the oil is at the specified level.

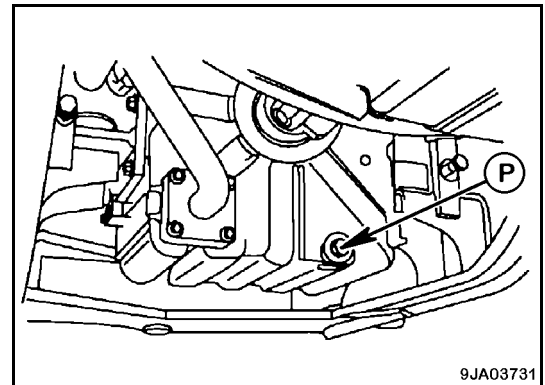


- ★ The oil level should be between the H and L marks on dipstick (G).
 - If the oil level is below the L mark: add oil through oil filler port (F).



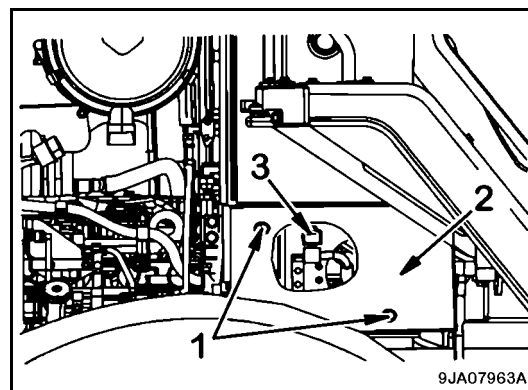
- If the oil level is above the H mark: drain the excess engine oil from drain plug (P) and check the oil level again.
- If the oil level is correct: insert dipstick (G) in the dipstick guide and tighten the cap.

16. Check that there is no leakage of oil from the transmission case or oil filter.



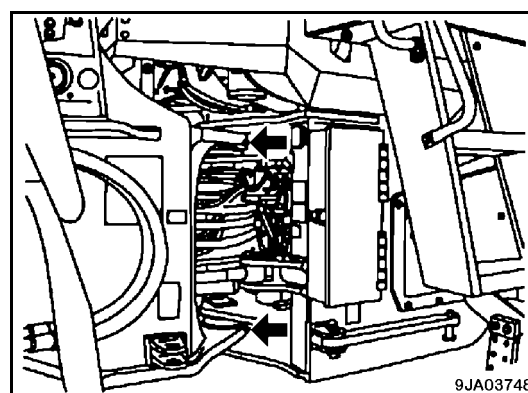
Clean Transmission Case Breather

1. Stop the engine and wait for the temperature of all parts to go down.
2. Loosen bolt (1) and remove cover (2).
3. Remove all mud and dirt from around the breather.
4. Remove breather (3) and fit a cover to the breather mounting hole to prevent dirt from entering.
5. Soak the breather in flushing fluid and wash it.
6. Install the breather.

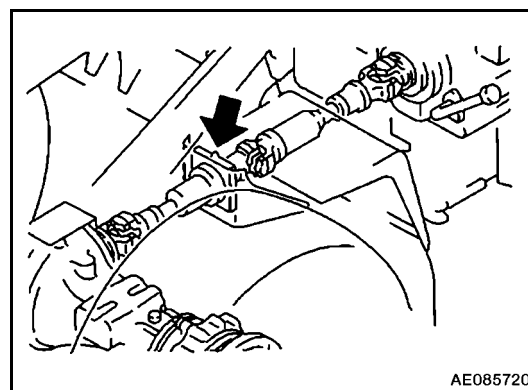


Lubricating

1. Park the machine on a flat, level surface and lower the work equipment to the ground.
2. Shut off the engine and cycle the controls to remove any residual hydraulic pressure from the work equipment circuits.
3. Using a grease pump, pump in grease through the grease fittings marked by the arrows.
4. After greasing, wipe off any grease that was pushed out.



- ★ (1) Center hinge pin (two places)
- ★ (2) Drive shaft center support (one place)



Check Engine Air Intake Piping Clamps for Looseness

Please ask your Komatsu distributor to check the tightening of the clamps between the air cleaner, turbocharger, aftercooler, and engine.

MAINTENANCE

Check Alternator Driving Belt Tension, Replace

Since inspection and replacement of the fan belt requires special tools, contact your Komatsu distributor.

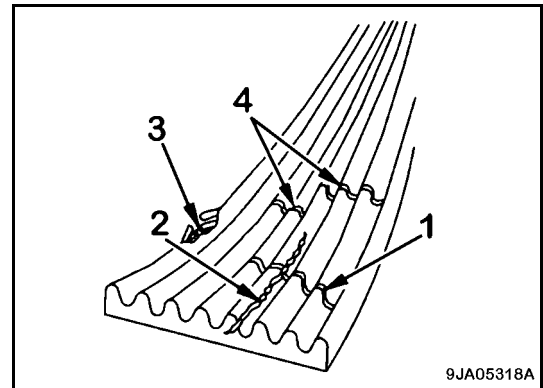
- ★ The machine is equipped with an auto tensioner; there is no need to adjust the tension.

If the alternator drive belt is in the following condition, the belt must be replaced. Ask your Komatsu distributor to replace the belt.

- When horizontal scratch (1) crosses vertical scratch (2)
- When there are tears (3) in part of the belt

Remark

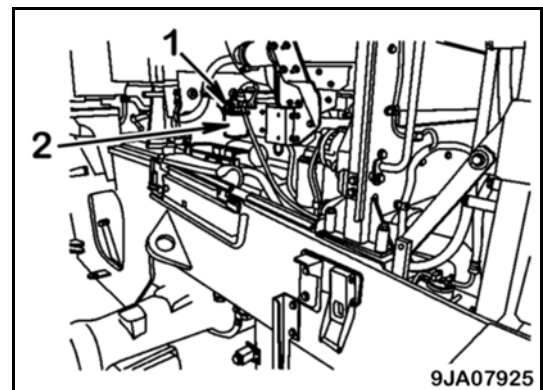
In case (4) where there are horizontal scratches only, there is no need to replace the belt.



Replace Corrosion Resistor Cartridge

- ★ Only when corrosion resistor is used.

1. Close valve (1) of the corrosion resistor at two points.
2. Using a filter wrench, turn cartridge (2) to the left to remove it.
3. Apply engine oil to the sealing surface of a new cartridge and then install it to the filter holder.
4. When installing the cartridge, bring the packing surface into contact with the seal surface of the filter holder and then tighten it further approximately 2/3 of a turn.
5. Open valve (1) of the corrosion resistor at two points.
6. After replacing the cartridge, start the engine and check that there is no leakage of water from the cartridge seal surface.



Every 2000 Hours Service

★ Maintenance for every 50, 100, 250, 500, and 1,000 hours service should be performed at the same time.

Change Oil in Hydraulic Tank, Replace Hydraulic Tank Filter Element

⚠ WARNING

- The parts and oil are at high temperature immediately after the engine is stopped and may cause burns. Wait for the temperature to go down before starting the work.
- When removing the oil filler cap, turn it slowly to release the internal pressure and then remove it.

Required

- Container to catch oil.

Refill capacity: 139 liters (36.72 US gallons)

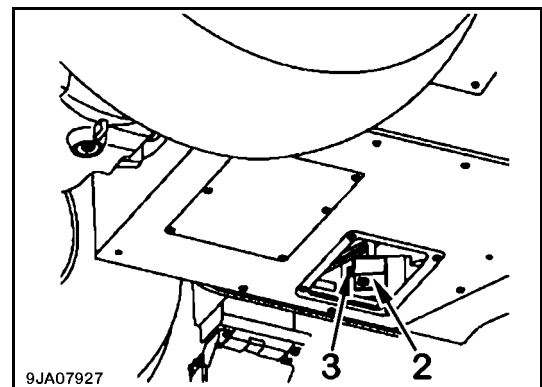
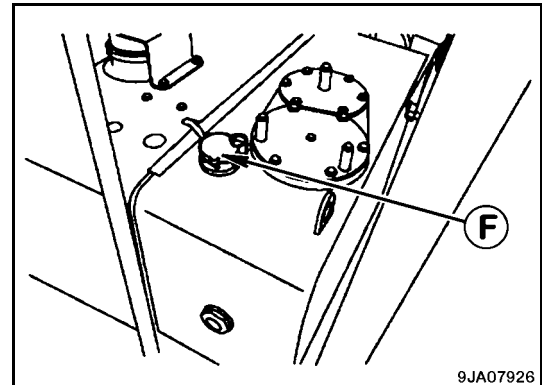
★ Before removing the oil filter cap for filter or oil change, clean around the filter cap to avoid any dust or dirt from entering the hydraulic system. Dust or dirt can damage the system.

1. Lower the bucket horizontally to the ground and apply the parking brake.
2. Stop the engine and wait for the temperature of all parts to go down.
3. Remove oil filler cap (F).
4. Set a container to catch the oil under drain plug (2).
5. Remove drain plug (2).
6. Loosen drain valve (3) then gradually pull it out to drain the oil.
7. After draining the oil, close drain valve (3); install drain plug (2) and tighten it.

Tightening torque

Drain plug (2): 68.6 ±9.8 N•m (50.60 ±7.23 lbf ft)

Drain valve (3): 63.7 ±14.7 N•m (46.98 ±10.84 lbf ft)



MAINTENANCE

8. Remove mounting bolts (5) of filter cover (4) at the top of the tank, then remove the cover.

- ★ When the cover is removed, the force of spring (6) may make the cover fly off; keep the cover pushed down when removing the bolts.

9. Remove spring (6) and bypass valve (7), then remove element (8).

10. Check that there is no foreign material inside the tank, then clean it.

11. Install the new element (8), then set bypass valve (7), spring (6), and cover (4) on the tank.

- ★ If the O-ring of the cover is damaged or deteriorated, replace it.

12. Remove six bolts (10), then remove cover (9).

13. Pull the top of rod (11) from the top and remove strainer (12).

14. Remove any dirt stuck to strainer (12), then wash it in flushing oil.

- ★ If strainer (12) is damaged, replace it with a new part.

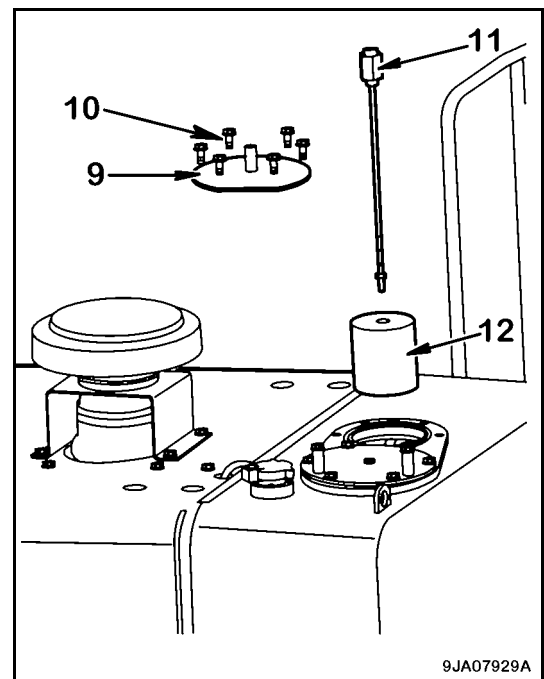
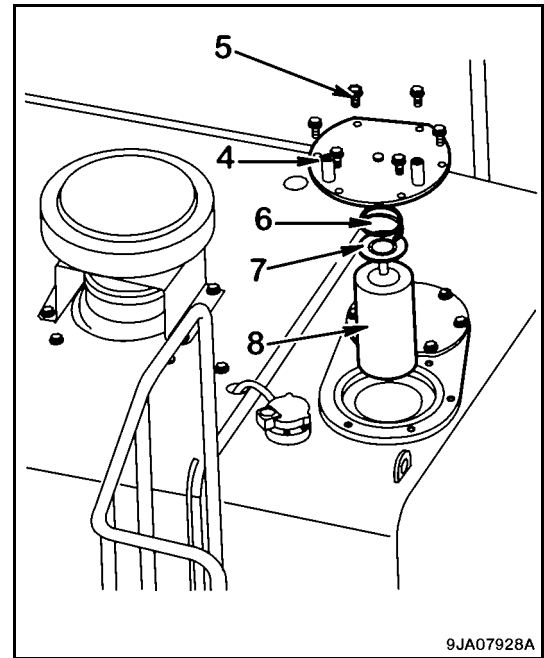
15. When installing the cover bolts, push down the cover and tighten the bolts evenly.

16. Add engine oil through oil filler port (F) to the specified level, then install cap (F).

17. Check that the hydraulic oil is at the standard level. For details, see "Check Oil Level in Hydraulic Tank, Add Oil" on page 3-52.

18. Run the engine at low idling and extend and retract the steering, bucket and lift arm cylinders four to five times.

- ★ Be careful not to operate the cylinder to the end of its stroke; stop approximately 100 mm (3.9 in) before the end of the stroke.



Remark

If the engine is run at high speed immediately after startup or a cylinder is operated to the end of its stroke, the air taken inside the cylinder will damage the piston packing.

19. Operate the steering, bucket, and lift arm cylinders to the end of their stroke three to four times, then stop the engine and loosen bleed plug (13) to bleed the air from the hydraulic tank. After bleeding the air, tighten plug (13) again.

★ Keep the engine running at low idling when bleeding the air.

20. Check that the hydraulic oil is at the standard level. For details, see “Check Oil Level in Hydraulic Tank, Add Oil” on page 3-52.

21. Increase the engine speed and repeat the procedure in Step 19 to bleed the air. Continue this operation until no more air comes out from plug (13).

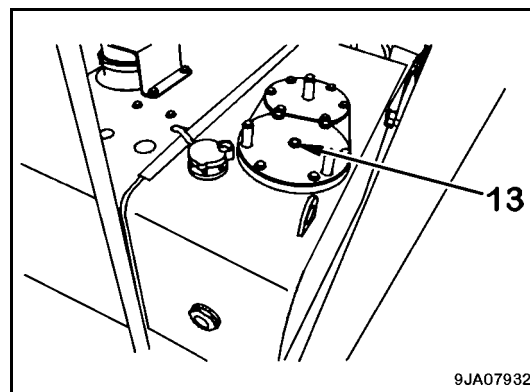
22. After completing the air bleed operation, tighten plug (13).

Tightening torque: 11.3 ±1.5 N•m (100.01 ±13.28 lbf in)

23. Check that the hydraulic oil is at the standard level.

★ For details, see “Check Oil Level in Hydraulic Tank, Add Oil” on page 3-52.

24. Check that there is no leakage of oil from the filter cover mount.



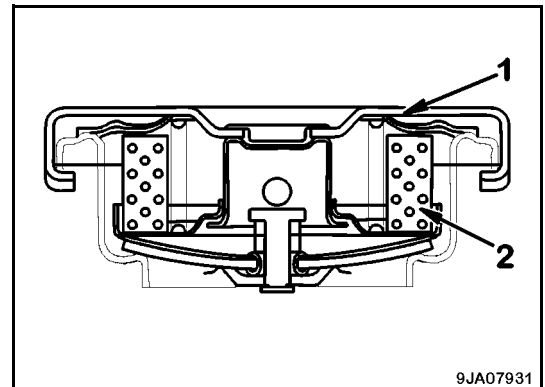
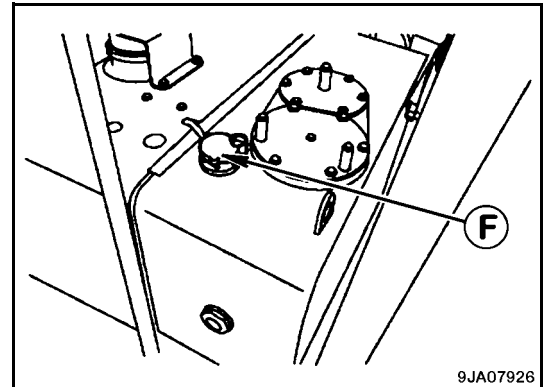
MAINTENANCE

Replace Hydraulic Tank Breather Element

WARNING

- The parts and oil are **VERY HOT** immediately after the engine is stopped, and may cause serious burns. Wait for the temperature to go down before starting the work.
- When removing the oil filler cap, turn it slowly to release the internal pressure and then remove it.

1. Lower the bucket horizontally to the ground and apply the parking brake.
2. Stop the engine and wait for the temperature of all parts to go down.
3. Before removing the oil filter cap (F), clean around the filter cap to avoid any dust or dirt from entering the hydraulic system. Dust or dirt can damage the system.
4. Remove the cap of oil filler (F).
5. Remove breather (1) built into the cap.
6. Replace the filter element (2) built into the breather with a new part, then install breather (1) to the cap.
7. Tighten the cap of oil filler (F).



Change Axle Oil

⚠ WARNING

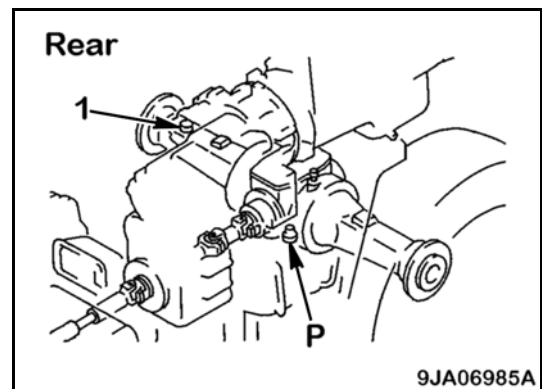
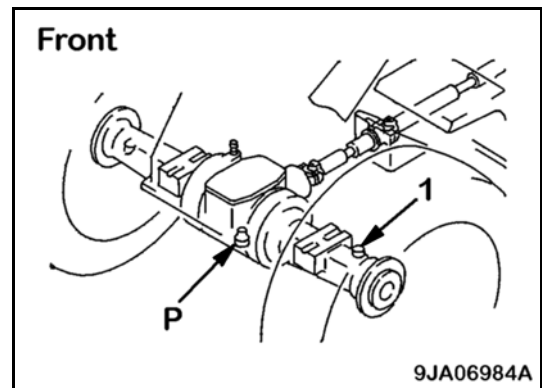
- When changing the oil, apply the parking brake and secure the front and rear frames with the frame lock bar.
- Immediately after stopping the engine, the parts and oil are VERY HOT and may cause serious burns. Wait for the temperature to go down before starting the operation.
- When the plug is removed, oil may spurt out. Turn the plug slowly to release the internal pressure and then remove the plug carefully.

Remark

For operations where the brake is used frequently, change the axle oil at shorter intervals.

Required

- Container to catch oil.
- Refill capacity (front axle): 40 liters (10.57 US gallons)
 Refill capacity (rear axle): 40 liters (10.57 US gallons)
1. Set a container to catch the oil under drain plug (P).
 2. Remove the mud and dirt from around plugs (1).
 3. Remove front and rear oil filler plugs (1), then remove drain plug (P) to drain the oil.
 4. After draining the oil, clean drain plug (P) and install it again.
 5. Add oil through plug hole (1) at the refill level.



Remark

Be sure to use only the specified lubricating oil for the axle with the LSD (Limited Slip Differential).

6. After adding oil, check at level plug (1) that the oil is at the specified level. For details, see “Check Axle Oil Level, Add Oil” on page 3-34.

Replace Element in Air Conditioner Recirculation Air Filter, Fresh Air Filter

- Remove both the recirculation air filter and fresh air filter in the same manner as when performing the cleaning procedure.
 - ★ For details about the recirculation air filter, see “Clean Element in Air Conditioner Recirculation Filter” on page 3-56.
 - ★ For details about the fresh air filter, see “Clean Element in Air Conditioner Fresh Air Filter” on page 3-51.
- Replace both filters with new parts.

MAINTENANCE

Check Brake Disc Wear

⚠ WARNING

- When checking the brake disc wear, apply the parking brake and secure the front and rear frames with the frame lock bar.
- Make sure that the brake oil temperature is less than 60°C (140°F) before checking the brake wear.
- If the disc is near the wear limit, carry out inspection at shorter intervals regardless of the specified inspection interval.

★ There are four places (front axle and rear axle, left and right) to be checked; use the same procedure to check the four places.

1. Remove cap nut (1).

2. Depress the brake pedal and push in rod (2) fully.

- (A): Amount of wear – the amount that end face (C) of the rod protrudes from end face (D) of the guide.

Measure the amount of protrusion.

- (B): Permitted wear limit of the disc – the point where groove (E) of the rod is in line with end face (D) of the guide.

When this point is reached, ask your Komatsu distributor to carry out inspection and replacement of parts.

- ★ If the disc is near the wear limit, carry out inspection at shorter intervals, regardless of the specified inspection interval.

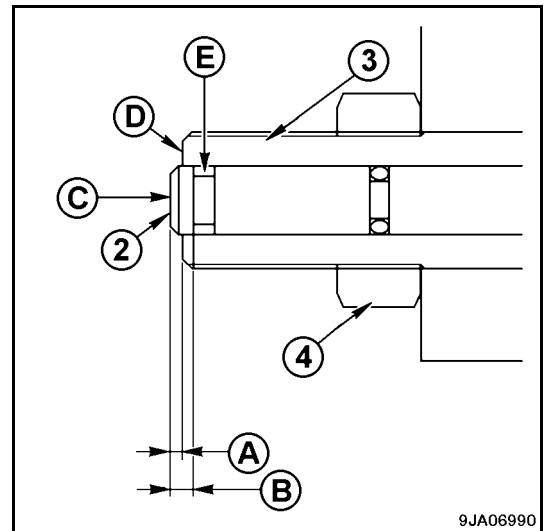
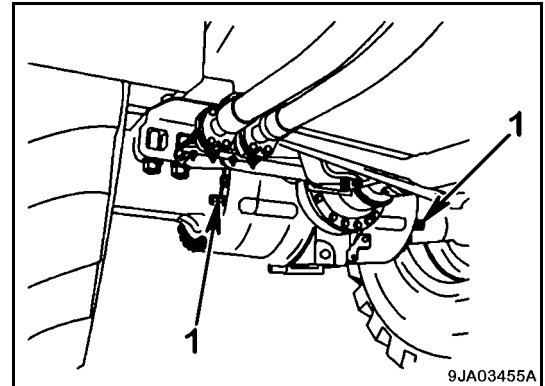
Remark

On new machines, the position of the guide is adjusted so that the end face of rod (2) comes to the end face of guide (3). For this reason, do not loosen locknut (4) except when replacing the disc.

Carry out the operation with two workers: one worker depresses the brake pedal and the other worker pushes in rod (2).

3. Install cap nut (1).

Tightening torque: 29.4 – 39.2 N•m (21.68 – 28.91 lbf ft)



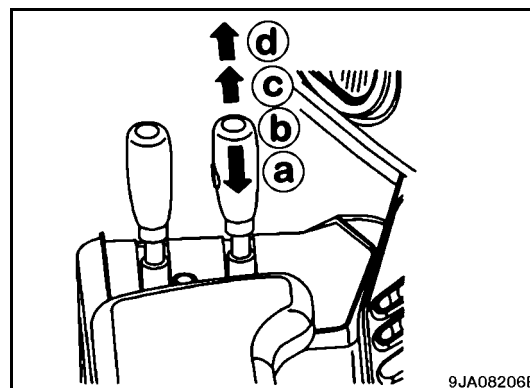
Check Accumulator Function

★ For details about handling the accumulator, see “Handling Accumulator and Gas Spring” on page 1-45..

PPC Accumulator

★ Replace the accumulator every 4,000 hours or every two years.

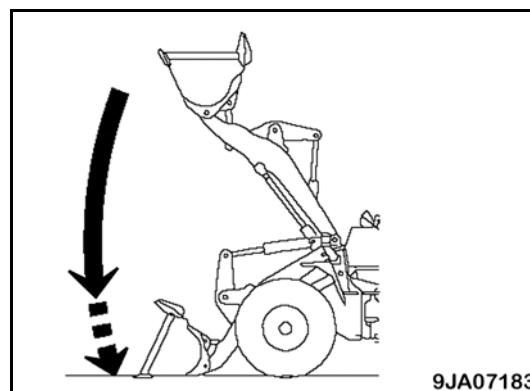
1. Stop the machine on level ground.
2. Apply the parking brake.
3. Raise the work equipment to the maximum height and then place the lift arm control lever at the HOLD position (b).
4. Stop the engine.



Remark

Carry out the check within two minutes after stopping the engine. If the machine is left with the engine stopped, the accumulator pressure will drop and it will be impossible to determine the cause of the problem.

5. Leave the work equipment lock lever in the FREE position.
6. Confirm that the area around the machine is safe; then set the lift arm control lever to the FLOAT position (d) and lower the work equipment to a position 1 meter (3.28 ft) from the ground.
7. When the work equipment reaches the 1-meter position, move the lift arm control lever to the LOWER position (c) and lower the work equipment slowly to the ground.



Remark

If the work equipment stops moving during the inspection, the gas pressure in the accumulator has probably dropped. Contact your Komatsu distributor to have the accumulator inspected.

Check Alternator

- ★ If the engine is started frequently, carry out inspection every 1,000 hours.
- Contact your Komatsu distributor to have the alternator inspected.

Check Engine Valve Clearance, Adjust

★ A special tool is required for removing and adjusting the parts; ask your Komatsu distributor for service.

Check Vibration Damper

Check if there are any cracks or peeling in the outside surface of the rubber.

★ If any cracks or peeling are found, contact your Komatsu distributor to have the parts replaced.

MAINTENANCE

Every 4000 Hours Service

★ Maintenance for every 50, 100, 250, 500, 1,000, and 2,000 hours service should be performed at the same time.

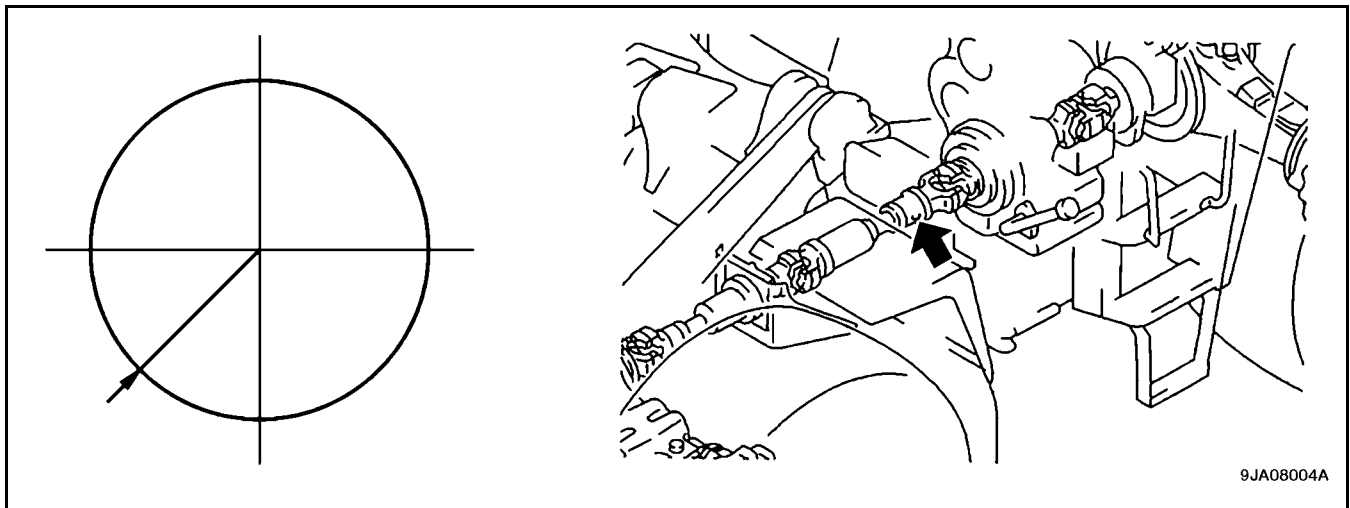
Lubricating

Carry out the greasing once every two years, regardless of whether the 4,000 hour interval has passed.

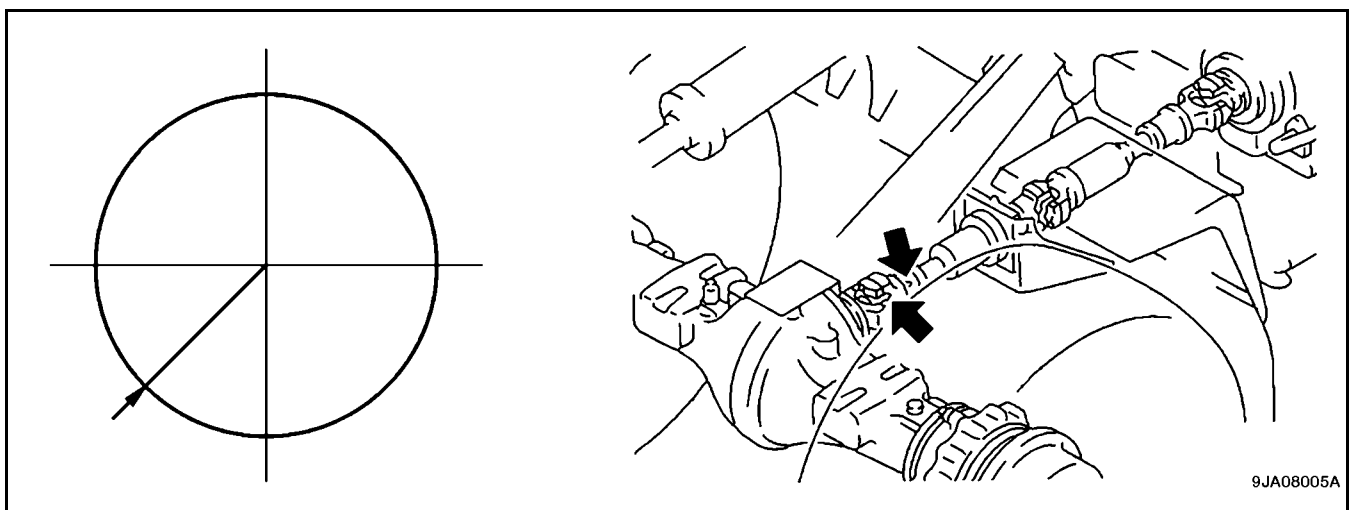
1. Using a grease pump, apply grease through the grease fittings marked by arrows in the graphics.
 - ★ All views are from the rear of the machine.
2. After greasing, wipe off any old grease that was pushed out.
3. When lubricating, stop the drive shaft so that the grease fitting of center drive shaft spline (1) is as shown in the figure and supply grease from under the machine.

At this time, the grease fitting is at the position indicated by the arrow at the circle below, seen from the rear of the machine.

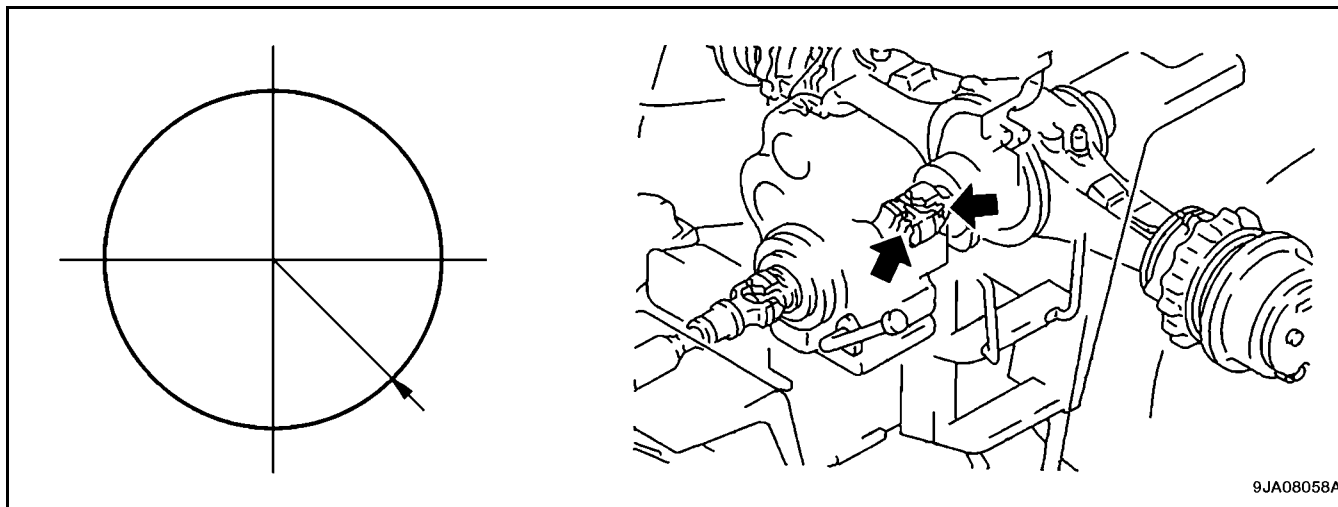
- ★ (1) Center drive shaft spline (1 place)



- ★ (2) Front drive shaft (2 places)

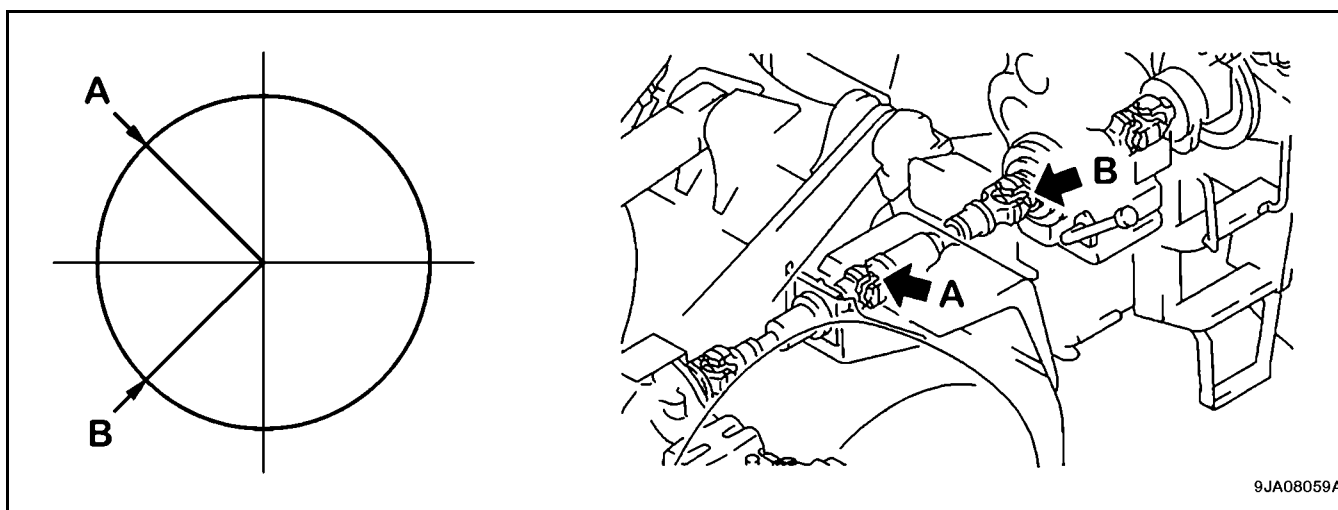


★ (3) Rear drive shaft (2 places)



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★ (4) Center drive shaft (2 places)



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Check Water Pump

- Check the water pump and its related parts for water or grease leakage.
- ★ If any abnormality is found, contact your Komatsu distributor for repairs or replacement.

Check Starting Motor

If the engine is started frequently, have this inspection carried out every 1,000 hours.

- ★ Contact your Komatsu distributor to have the starting motor checked.

Check Air Conditioner Compressor, Adjust

- ★ As a special tool is required for checking and adjusting the parts of the air conditioner compressor, ask your Komatsu distributor for service.

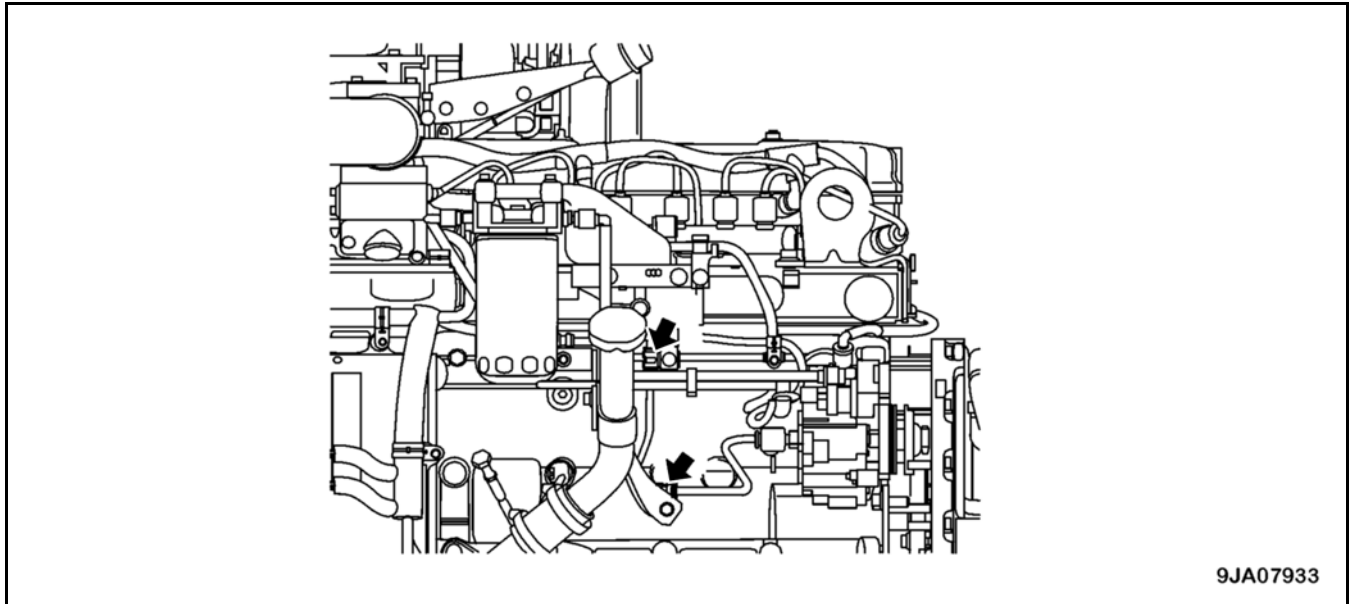
MAINTENANCE

Check for Loose Engine High-Pressure Piping Clamps, Hardening of Rubber

- Check visually and then use your hand to check if there is any hardening of the rubber for the high-pressure piping between the supply pump and the common rail.
 - Check visually and then use your hand to check if there is any loose bolts of the mounting clamps (two places) for the high-pressure piping between the supply pump and the common rail.
- ★ If any problem is found, the parts must be replaced. Ask your Komatsu distributor to carry out the replacement.

Remark

If the engine continues to be used when there are loose bolts, hardened rubber, or missing parts, there is danger of damage or breakage occurring due to vibration and wear at the connections of the high-pressure piping. Always check that the proper high-pressure piping clamps are correctly installed.



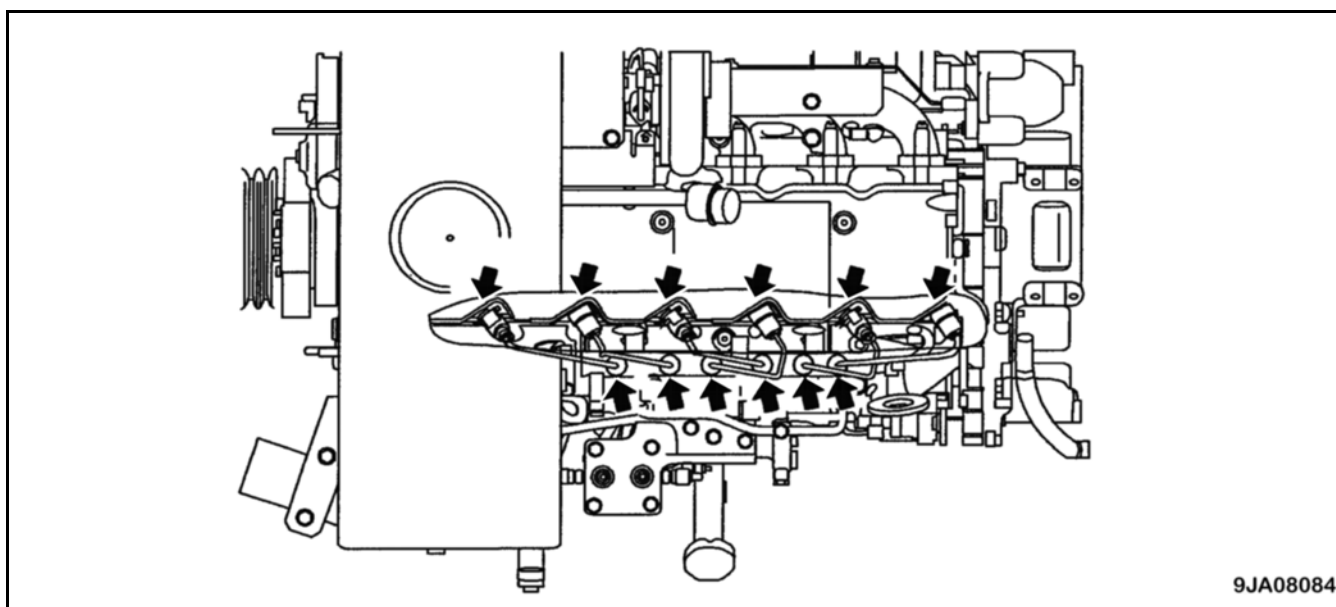
Check for Missing Fuel Spray Prevention Caps, Hardening of Rubber

The fuel spray prevention caps (12 places) on the fuel injection piping and both ends of the high-pressure piping act to prevent the fuel from coming into contact with high-temperature parts of the engine and causing a fire if the fuel should leak or spray out.

Remark

The fuel spray prevention caps must be installed correctly.

- Check visually and then use your hand to check if there is any hardening of the rubber.
- Check visually and then use your hand to check if there is any missing caps or loose bolts.
- ★ If there are any problems, the parts must be replaced. Ask your Komatsu distributor to carry out the replacement.



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MAINTENANCE

Every 8000 Hours Service

- ★ Maintenance for every 50, 250, 500, 1,000, 2,000, and 4,000 hours service should be performed at the same time.

Replace High-Pressure Piping Clamps

- ★ Ask your Komatsu distributor to replace the engine high-pressure clamps.

Replace Fuel Spray Prevention Caps

- ★ Ask your Komatsu distributor to replace the fuel spray prevention caps.

SPECIFICATIONS

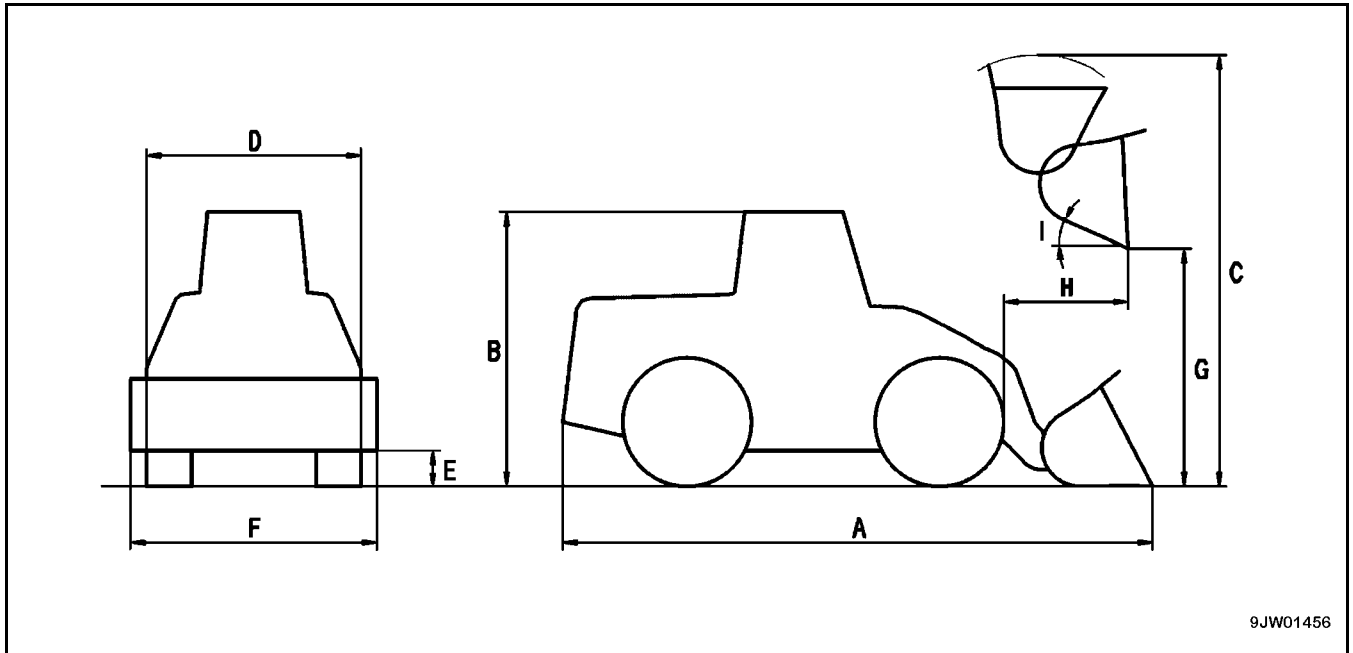
SPECIFICATIONS

SPECIFICATIONS

★ Machines fitted with 23.5R25A L3 tires

Item		Item	WA380-6 Standard Specification Machine (when using POWER mode)		
Machine weight (with bolt-on cutting edge)		kg (lb)	17,500 (38,581)		
Normal load		kg (lb)	5,280 (11,640)		
Bucket capacity	Heaped	m ³ (cu. yd)	3.3 (4.3)		
Engine model		–	Komatsu SAA6D107E-1		
Flywheel horse power		kW (HP)/rpm	142 (191)/2,100		
A	Overall length	mm (ft in)	8,140 (26 ft 8 in)		
B	Overall height	mm (ft in)	3,390 (11 ft 1 in)		
C	Maximum dimension when shaking bucket	mm (ft in)	5,600 (18 ft 4 in)		
D	Overall width	mm (ft in)	2,780 (9 ft 1 in)		
E	Minimum ground clearance	mm (ft in)	455 (1 ft 6 in)		
F	Bucket width	mm (ft in)	2,905 (9 ft 6 in)		
G	Clearance	Cutting edge [BOC tip]	mm (ft in)	3,035 (9 ft 11 in) [2,950 (9 ft 8 in)]	
H	Reach	Cutting edge [BOC tip]	mm (ft in)	1,105 (3 ft 8 in) [1,150 (3 ft 9 in)]	
I	Dump angle		degrees	49	
Minimum turning radius		Out of chassis	mm (ft in)	7,190 (23 ft 7 in) [7,220 (23 ft 8 in)]	
		Center of outside tire	mm (ft in)	6,320 (20 ft 9 in)	
Permissible towing load		kN (kg)	115 (11,727)		
Travel speed		Forward	1st	km/h (mph)	6.6 (4.1)
			2nd	km/h (mph)	11.5 (7.1)
			3rd	km/h (mph)	20.2 (12.6)
			4th	km/h (mph)	34.0 (21.1)
		Reverse	1st	km/h (mph)	7.1 (4.4)
			2nd	km/h (mph)	12.3 (7.6)
			3rd	km/h (mph)	21.5 (13.4)
			4th	km/h (mph)	35.5 (22.1)

★ BOC = Bolt-On Cutting edge



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MEMORANDUM

OPTIONS, ATTACHMENTS

OPTIONS, ATTACHMENTS

BUCKET AND TIRES

Select the most suitable bucket and tires for the type of work and ground conditions on the job site.

Type of Work	Bucket	Ground Conditions	Tire
Loading products Loading and carrying products	Stockpile bucket (with bolt-on cutting edge) (3.3 m ³ (4.3 cu.yd))	General ground conditions	23.5-25-16PR (L3 Rock)
		Leveled ground	23.5-25-16PR (L2 Traction)
	Stockpile bucket (without teeth) (3.1 m ³ (4.1 cu.yd)) Light material bucket (with bolt-on cutting edge) (3.8 m ³ (5.0 cu.yd))	Soft ground	23.5-25-16PR (L2 Traction)
Loading crushed rock	Excavating bucket (with segment edge) (2.7 m ³ (3.5 cu.yd))	General ground conditions	23.5-25-20PR (L3 Rock)
		Soft ground	23.5-25-16PR (L3 Rock)
		Ground with many light rocks	23.5-25-16PR (L3 Rock)
		Soft ground with many light rocks	23.5-25-16PR (L3 Rock)

- ★ BOC = bolt-on cutting edge
- ★ The displayed travel speed changes according to the tire size.
- ★ When installing optional tires, contact your Komatsu distributor.

TORQUE CONVERTER LOCKUP

! WARNING

- When traveling down slopes with a grade of more than 6 degrees, never depress the accelerator pedal fully, regardless of whether the torque converter lockup switch is ON or OFF.
- It is extremely dangerous to drive too fast.

- ★ The travel speed mentioned in this section is applicable when the 23.5-20 tire is used.
- ★ The travel speed is shown as { } when the tire size is 20.5-20.
- ★ The travel speed is subject to working conditions and the road condition.

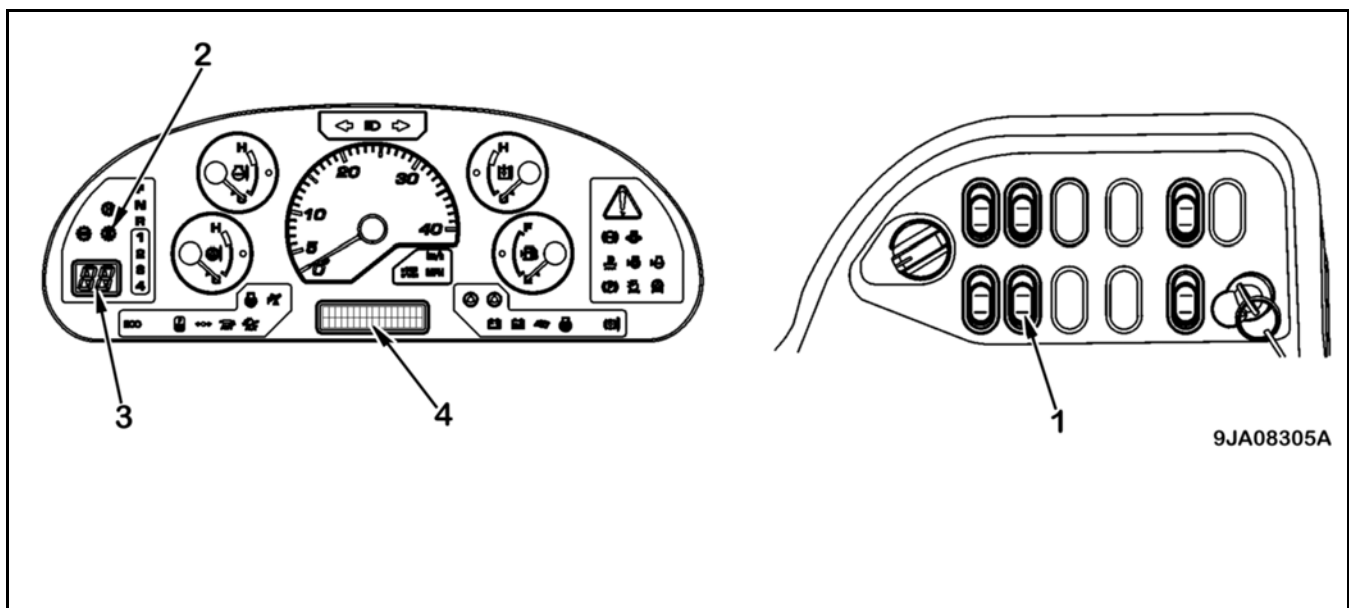
To prevent overrunning when traveling at high speed in the following cases, do not downshift gears.

- When traveling in F3 at a speed of more than 18.0 km/h (11.2 mph) {16.0 km/h (9.9 mph)}, do not downshift to F2.
- When traveling in F4 at a speed of more than 28 km/h (17.4 mph) {26.0 km/h (16.2 mph)}, do not downshift to F3.

When the actual speed range is 3rd or 4th in either FORWARD or REVERSE, the torque converter lockup function is actuated dependent on travel speed and sets to direct drive.

To prevent overrun, the lockup is automatically canceled to prevent the travel speed from going above 40 km/h (24.9 mph) {36.5 km/h (22.7 mph)}.

Components



1. Torque converter lockup switch
2. Torque converter lockup pilot lamp
3. Shift indicator (displays actual speed range)
4. Character display (Action code display)

OPTIONS, ATTACHMENTS

Torque Converter Lockup Switch

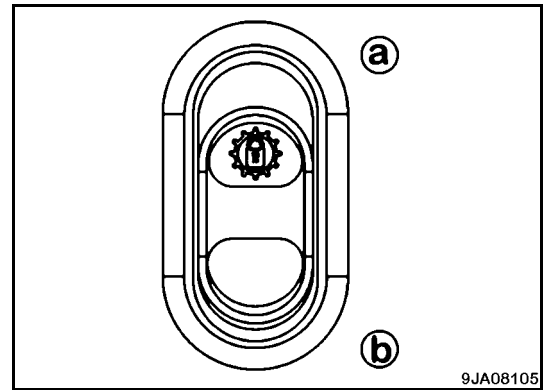
The torque converter lockup switch (1) is the control switch for the torque converter lockup function.

- Position (a): ON

The pilot lamp inside the switch lights up and the lockup is actuated dependent on travel speed. While the lockup is engaged, the lockup pilot lamp on the machine monitor lights up.

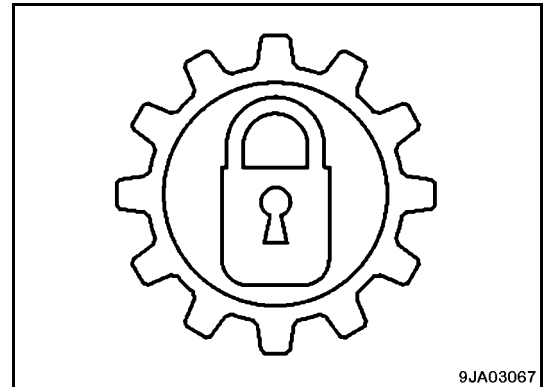
- Position (b): OFF

The lockup does not function.



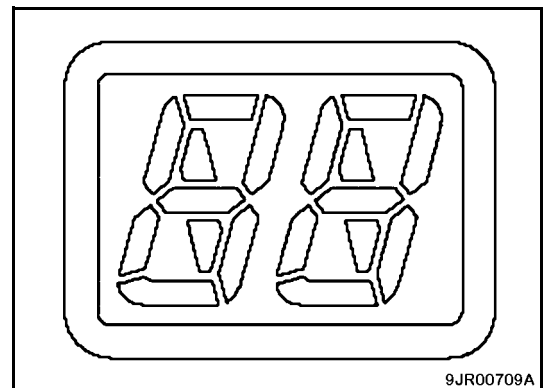
Torque Converter Lockup Pilot Lamp

The torque converter lockup pilot lamp (2) lights up when the torque converter lockup is engaged and the transmission actually enters direct drive.



Shift Indicator

The shift indicator (11) indicates the transmission gear range (actual travel speed range).



Character Display

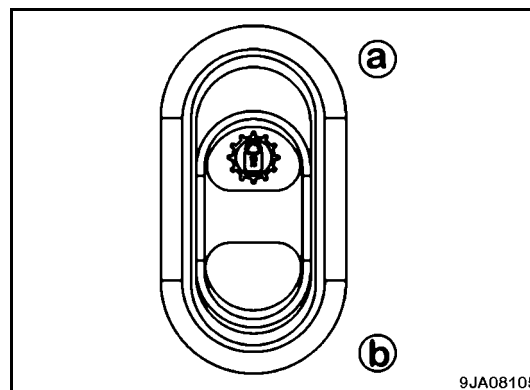
See “Action Code Display” on page 2-10 for additional information.

Method of Operation

1. Press the top (a) of the torque converter lockup switch to turn it ON.

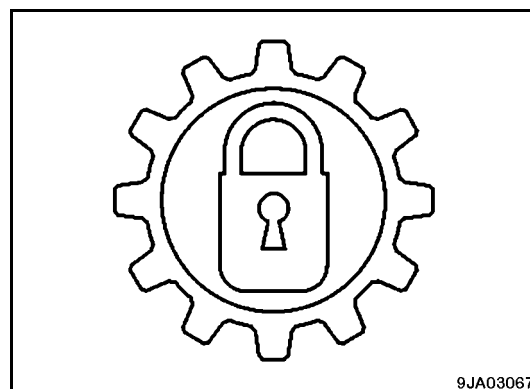
The pilot lamp inside the switch lights up.

- ★ When the actual speed range is 3rd or 4th in either FORWARD or REVERSE, the torque converter lockup function is actuated according to the travel speed and sets to direct drive.
- ★ When the gearshift lever is at 4th in auto-shift mode, the lockup is not actuated if the actual speed range is 3rd. The lockup is actuated only when the actual speed range is 4th.
- ★ When the lockup is actuated, the lockup pilot lamp on the machine monitor lights up.



2. To cancel the lockup function, press the bottom (b) of the torque converter lockup switch to turn it OFF.

The lockup function is canceled.



Remark

The travel speed for actuation and cancellation of the lockup function is shown in the following table.

Lockup Speed Range	FORWARD Travel Speed (km/h (mph))		REVERSE Travel Speed (km/h (mph))	
	Actuated	Canceled	Actuated	Canceled
3rd	13 to 15 (8.1 to 9.3) {12 to 14} {(7.5 to 8.7)}	13 to 14 (8.1 to 8.7) {12 to 13} {(7.5 to 8.1)}	14 to 16 (8.7 to 9.9) {13 to 15} {(8.1 to 9.3)}	14 to 15 (8.7 to 9.3) {13 to 14} {(8.1 to 8.7)}
4th	22 to 25 (13.7 to 15.5) {20 to 23} {(12.4 to 14.3)}	21 (13.0) {19} {(11.8)}	23 to 27 (14.3 to 16.8) {21 to 25} {(13.0 to 15.5)}	23 (14.3) {21} {(13.0)}

- ★ { } = The travel speed when the 20.5-20 tire is used.

Travel Speed Functions

Travel Speed Warning Function

- ★ This function works even when the torque converter lockup switch is OFF.

When the travel speed goes above 40.0 km/h (24.9 mph) {36.5 km/h (22.7 mph)}, the central warning lamp lights up and the alarm buzzer sounds.

At the same time, “OVERRUN PROTECT” is displayed on the character display.

- ★ If the alarm buzzer sounds, depress the brake immediately to slow the machine down.

When the travel speed goes below 39.5 km/h (24.5 mph) {36.0 km/h (22.4 mph)}, the alarm buzzer stops.

Travel Speed Limit Function

- ★ This function works only when the torque converter lockup switch is ON.

To prevent the travel speed from going above 40.0 km/h (24.9 mph) {36.5 km/h (22.7 mph)}, the lockup is automatically canceled.

The lockup cancel continues until the travel speed goes below 38.0 km/h {23.6 mph} [35.0 km/h {21.7 mph}].

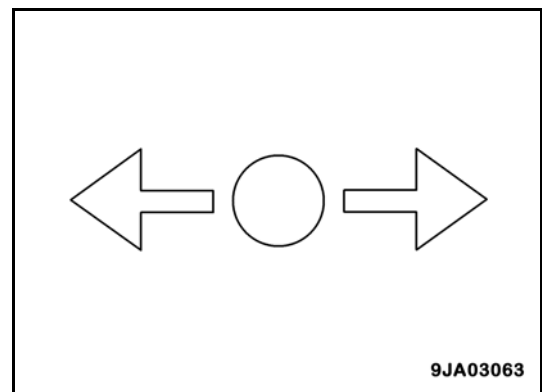
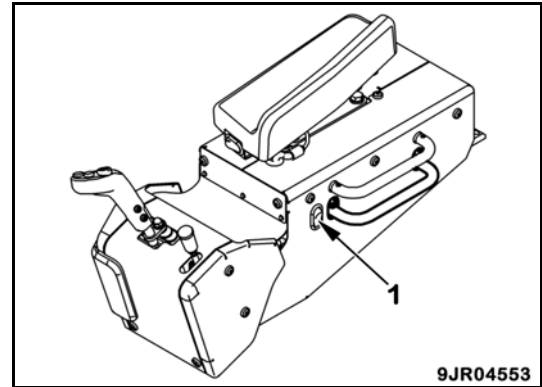
JOYSTICK STEERING SYSTEM

To enable you to use the joystick steering safely and efficiently, read the information in this section before using the system.

Structure and Function

The joystick steering system is used to steer wheel loaders with a lever instead of a steering wheel.

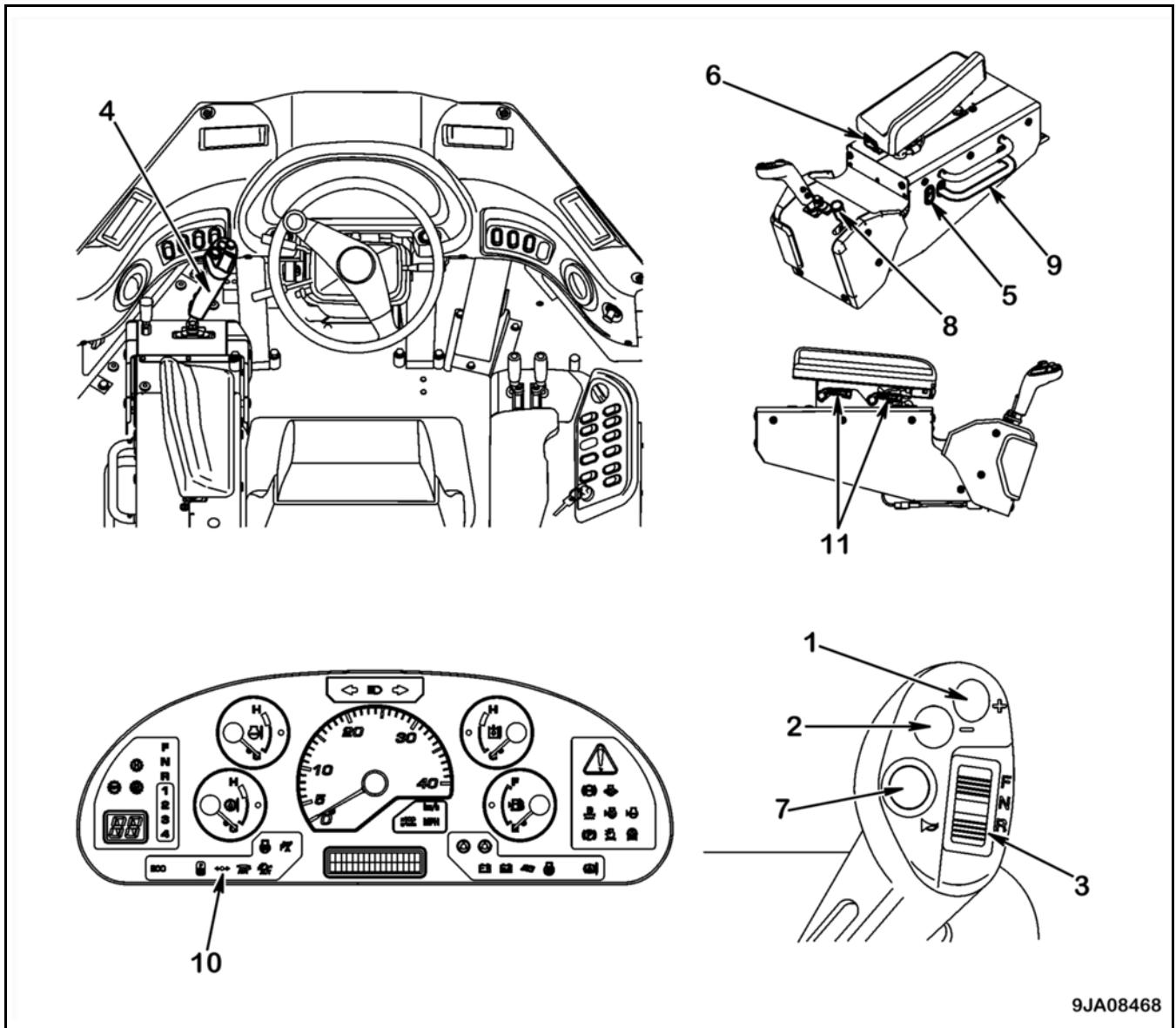
- The joystick enables steering with small, light movements and helps to reduce operator fatigue.
- When joystick ON/OFF switch (1) is turned ON, it is possible to operate the steering with the joystick.
- If the joystick steering system is installed, the steering and transmission control methods can be selected with the joystick ON/OFF switch.
- Before turning the joystick ON/OFF switch ON, adjust the position of the joystick console and check that there is no play in the console. See “Adjusting Joystick Console” on page 5-18.
- When the joystick steering is in use, the joystick pilot lamp on the machine monitor lights up.
- The functional difference between steering with the joystick steering system as opposed to the steering wheel is shown in the following table.



Selection		Operation Using Joystick		Operation Using Steering Wheel	
Joystick ON/OFF Switch		ON		OFF	
Steering		Steering using joystick (steering with steering wheel is also possible)		Steering using steering wheel	
Transmission	Changing direction	Operation using directional selector switch at top of joystick		Operation using transmission directional lever	
	Transmission auto-shift/manual shift selector switch	Manual	Auto (L, H)	Manual	Auto (L, H)
	Selection of speed range	Speed range selection using shift UP, shift DOWN switches at top of joystick*	Automatic gearshifting according to travel speed	Operation using gearshift lever	Automatic gearshifting according to travel speed
		1st - 3rd	2nd - 3rd	1st - 4th	2nd - 4th

* Does not shift up above speed range of gearshift lever.

Components



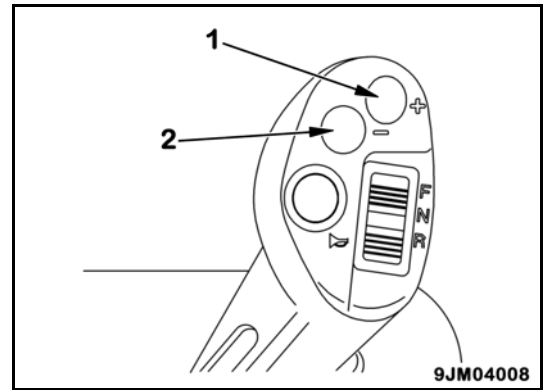
- | | |
|--------------------------------|--|
| 1. Shift UP switch | 7. Horn switch |
| 2. Shift DOWN switch | 8. Console tilt lever |
| 3. Directional selector switch | 9. Console fore-and-aft adjustment lever |
| 4. Joystick steering lever | 10. Joystick pilot lamp |
| 5. Joystick ON/OFF switch | 11. Armrest adjustment lever |
| 6. HI/LOW selector switch | |

Shift UP, Shift DOWN Switches

The shift UP/Shift DOWN switches (1) and (2) are used to shift up or down in the manual shift mode.

- Press (1): Shift UP
- Press (2): Shift DOWN

These switches are not used in the auto-shift mode.

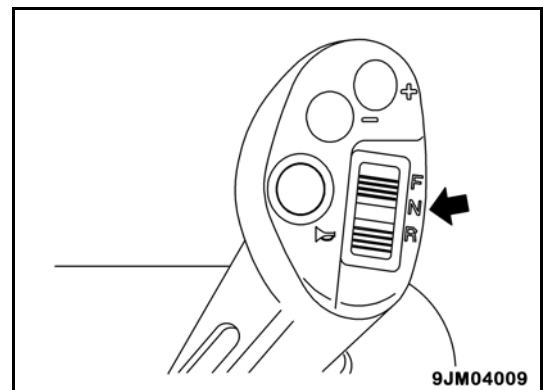


Directional Selector Switch

The directional selector switch (3) on the head of the joystick steering lever is used to switch the transmission between forward and reverse.

- (F) position: FORWARD
- (N) position: NEUTRAL
- (R) position: REVERSE

In the manual shift mode, use the shift UP and shift DOWN switches on the head of the joystick steering lever to shift the speed range.

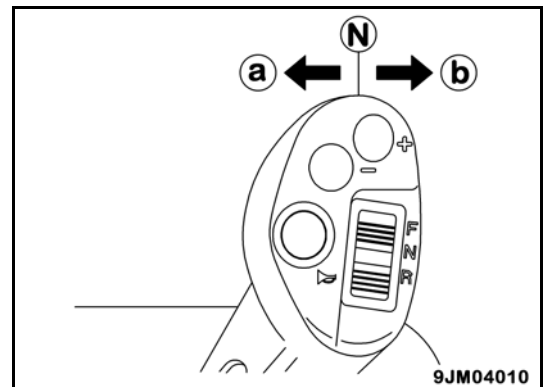


Joystick Steering Lever

The joystick steering lever (4) is used to steer the machine to the left or right.

When traveling, operate this lever in the direction that you want to turn the machine.

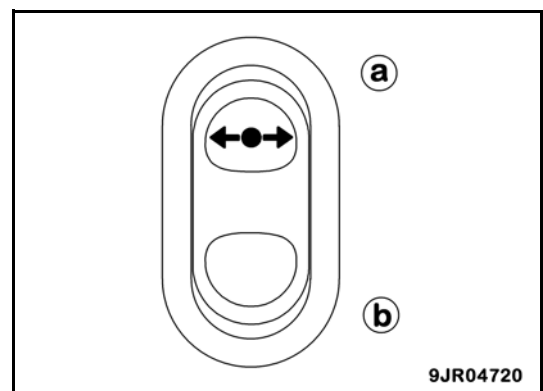
- (a): Left turn
- (b): Right turn
- (N): Neutral



Joystick ON/OFF Switch

The joystick ON/OFF switch (5) is used to switch the joystick steering function ON or OFF.

- Position (a): ON (possible to steer with joystick)
- Position (b): OFF (impossible to steer with joystick)



OPTIONS, ATTACHMENTS

HI/LOW Selector Switch

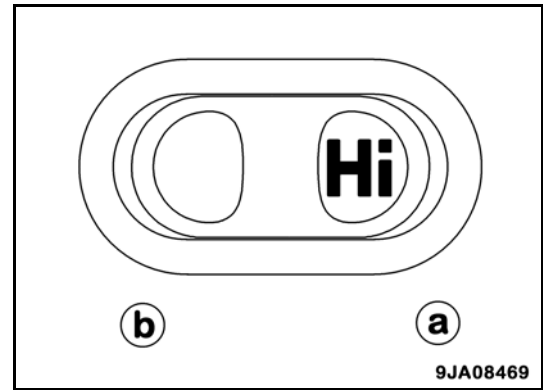
The HI/LOW selector switch (6) is used to switch the steering speed between HIGH and LOW.

- Position (a): HI

The articulating speed of the machine is high in relationship to the operation of the joystick. This setting is suitable for comparatively fast cycle times.

- Position (b): LOW

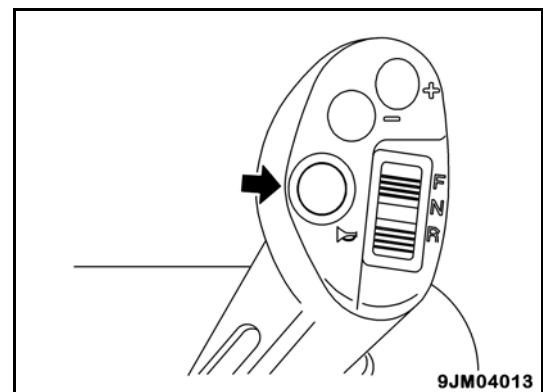
The articulating speed of the machine is low in relationship to the operation of the joystick. This setting is suitable for operations loading loose materials and materials that spill easily.



Horn Switch

The horn switch (7) is used to sound the horn.

This switch is located at the top of the joystick and can be used to sound the horn without taking your hand off the joystick.

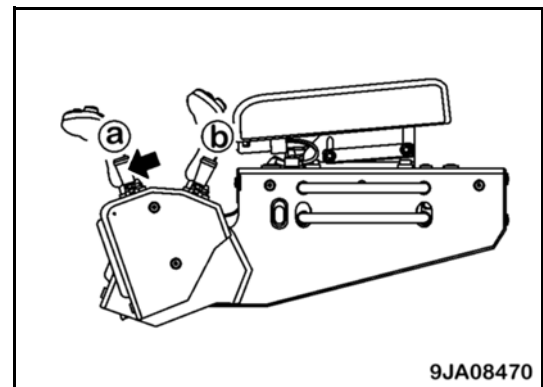


Console Tilt Lever

The console tilt lever (8) is used to release the tilt lock for the joystick console lever.

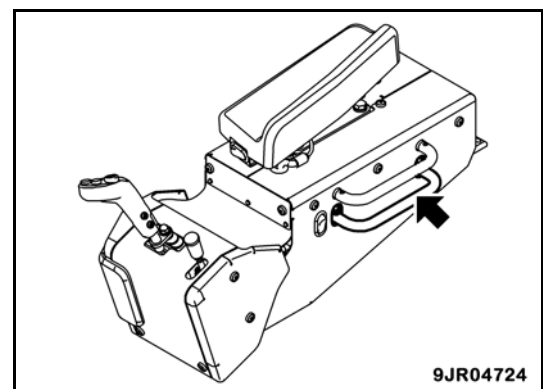
Push the console tilt lever to the front to release the tilt lock, then tilt the console.

- Position (a): Joystick steering system is actuated.
- Position (b): Joystick steering system is not actuated (system is turned OFF).



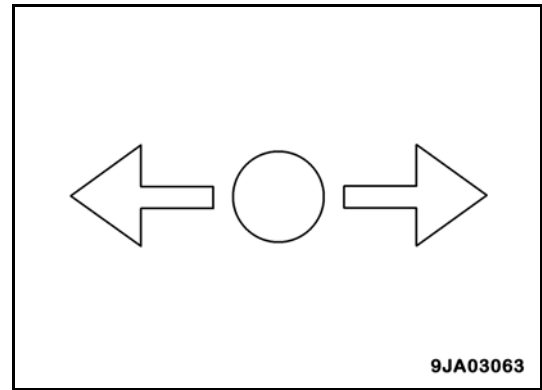
Console Fore-and-Aft Adjustment Lever

The console fore-and-aft adjustment lever (9) is used to slide the whole joystick console to the front or rear. For details, see “Adjusting Joystick Console” on page 5-18.



Joystick Pilot Lamp

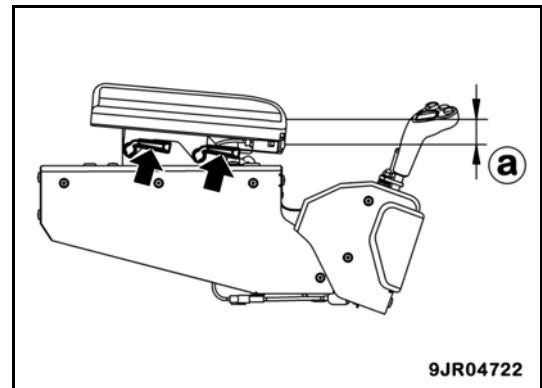
The joystick pilot lamp (10) lights up when the joystick ON/OFF switch is at the ON position and the joystick console is moved to the front to make it possible to use the joystick.



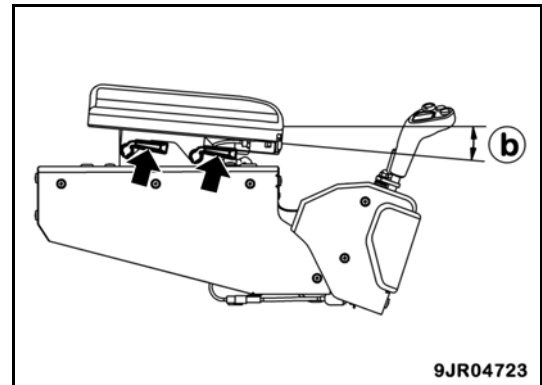
Armrest Adjustment Lever

The armrest adjustment lever (11) is used to adjust the height of the armrest within range (a) of 26 mm (1.0 in).

Pull the lever to adjust the angle.



It is possible to adjust the angle within range (b) of approximately 7 degrees.



Steering with Joystick Lever or Steering Wheel

WARNING

- Set the joystick lever to the Neutral position when starting the engine.
 - If the directional lever and joystick directional selector switch are not at the neutral position, the neutral interlock circuit makes it impossible to switch the transmission directional control (when the joystick ON/OFF switch is ON, it is switched from the directional lever to the joystick directional selector switch; when the joystick ON/OFF switch is OFF, it is switched from the joystick directional selector switch to the directional lever).
 - Never use the joystick when traveling on public roads.
 - When traveling on public roads, turn the joystick ON/OFF switch to the OFF position, then tilt the joystick console lever portion to the rear.
 - If the engine is running and the joystick lever is touched by accident, there is danger that it may cause the machine to articulate unexpectedly. To avoid this when the machine is not being operated, always move the joystick ON/OFF switch to the OFF position and tilt the joystick console lever portion to the rear.
 - Use the joystick only when carrying out continuous loading operations.
 - Never use the joystick when carrying out load-and-carry operations.
-

Select joystick operation or steering wheel operation according to the type of work.

- ★ Before using the joystick steering, read the precautions in “Precautions for Steering with Joystick” on page 5-13.

Steering Using Joystick

- This is suited for continuous loading operations on job sites with ample space, where the loading operation can be carried out with a comparatively relaxed cycle time.
- Because operations can be carried out with small movements and light operating effort, this is also suitable for reducing operator fatigue when operating continuously.
- When the joystick is actuated, the transmission will not enter the 4th speed range.

Steering Using Steering Wheel

- This provides excellent fine control and ability to travel in a straight line.
- It is suitable for travel between job sites and for load-and-carry operations.
- It is also suitable for short-cycle loading operations because the upper part of the operator’s body is supported by the steering wheel when frequently switching between FORWARD and REVERSE.
- Always steer with the steering wheel when driving the machine on public roads.

Precautions for Steering with Joystick

WARNING

- If using the joystick lever to operate the steering and transmission but the operation of the machine does not match the operation performed by the operator and the warning lamp lights up, do these steps.
- Use the steering wheel to steer, if necessary; apply the brakes immediately; turn the joystick ON/OFF switch OFF; operate the steering wheel and the directional lever to move the machine to a safe place; then stop the machine.
- Before starting the operation of the machine again, find the problem part and repair it then confirm that the function is normal. For troubleshooting and repair, contact your Komatsu distributor.
- Never operate the machine before it is repaired completely.

-
- If the machine is steered with the steering wheel, its turning angle is fixed when turning of the steering wheel stops.
 - If the machine is steered with the joystick and the joystick is held in a turning position, the machine is steered to the articulate end.
 - ★ Since the feel of steering with the joystick is different from using the steering wheel, be very careful until you are accustomed to the joystick.
 - If the joystick ON/OFF switch is turned OFF and the directional selector switch and directional lever are not at the N position, the neutral interlock circuit is actuated; the central warning lamp lights up; and the alarm buzzer sounds.

Return the directional selector switch and directional lever to the N position.

- If there is a problem with the electric circuit of the joystick steering system or transmission control system, the central caution lamp (red) on the left side of the machine monitor flashes to notify the operator of the problem.

Since both steering system and transmission are set in the respective neutral positions, turn off the joystick ON/OFF switch, then use the steering wheel and the directional lever to drive the machine.

Operating the Joystick Steering System

! WARNING

- It is dangerous to turn the machine suddenly at high speed, or to turn on steep hills. Do not operate the steering in such conditions.
- When turning, the articulation stops at the position to which the steering wheel is turned, but if the joystick is held in the tilted position, the body will articulate fully.
- The feeling when operating the steering with the joystick is different from when operating with the steering wheel. Be extremely careful until you have become used to operating the joystick.
- If the joystick ON/OFF switch is at the ON position and the directional lever is operated to F or R, the machine will travel in forward or reverse according to the operation of the directional lever, regardless of the position of the directional selector switch on the head of the joystick lever. Priority is given to the operation of the directional lever; be careful when operating the directional lever.
- When this is done, the central warning lamp lights up and the alarm buzzer sounds.
- Set the directional lever and directional selector switch on the head of the joystick to the N position.

★ Check the adjustment and operation before starting the engine. See “Check Before Starting Engine” on page 2-81.

1. When starting the engine, check that the joystick lever is at the N position, that the transmission directional lever is at the N position, and that the surrounding area is safe.

2. Under the following conditions, a warning may be given when the engine is started.

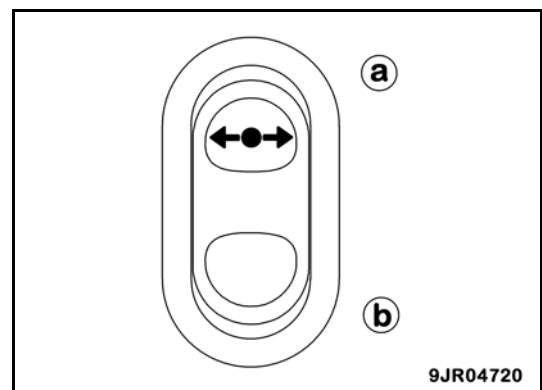
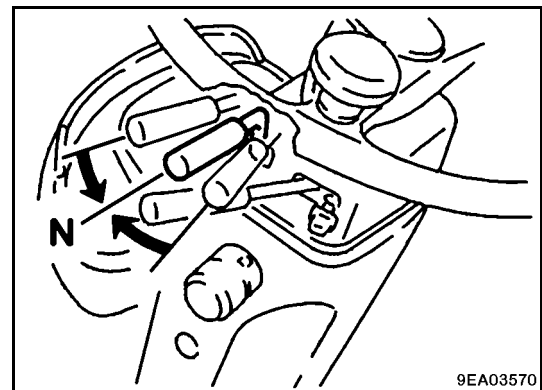
- If the directional selector switch on the joystick is at F or R, the joystick pilot lamp flashes; the central warning lamp lights up; and the alarm buzzer sounds.

In this condition, the engine will not start. Set the directional selector switch to N.

- If the joystick is not at the N position, the joystick pilot lamp flashes; the central warning lamp lights up; and the alarm buzzer sounds.

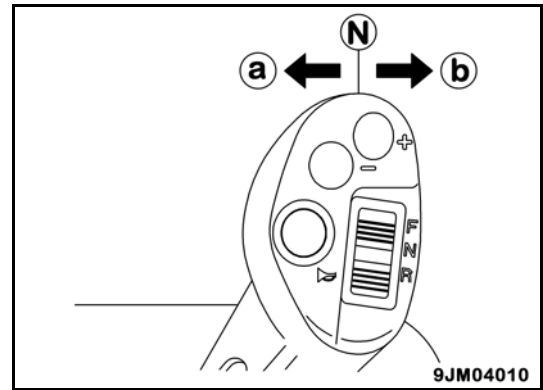
In this condition, the engine will not start. Set the joystick to the N position.

3. When using the joystick, set the joystick ON/OFF switch to position (a) to activate the joystick steering system.



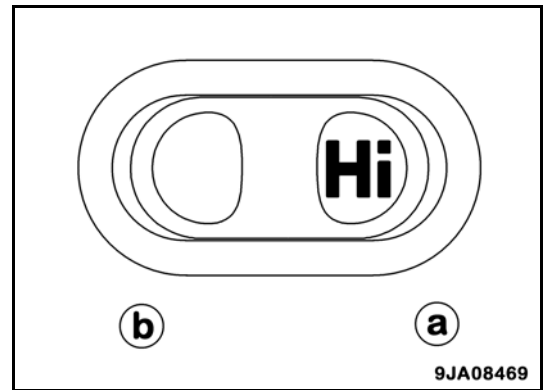
- Operate the joystick in direction (b) to turn the machine to the right; operate it in direction (a) to turn the machine to the left.

The greater the angle of operation, the faster the articulating speed becomes.



- It is possible to switch the articulating speed with the HI/LOW selector switch. Select the speed to match the operation.
- When the machine has articulated to the desired angle, return the joystick to the N position.

The joystick will return automatically to the N position.

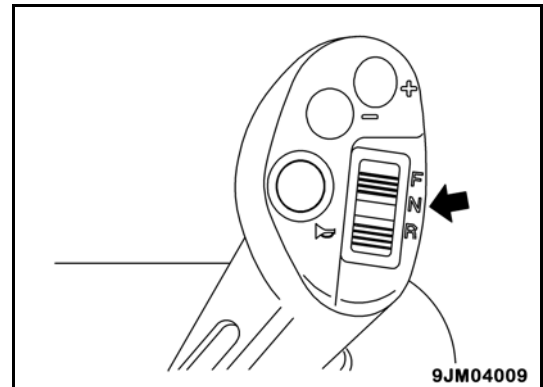


- To return the direction of travel of the machine so that it travels in a straight line, operate the joystick in the opposite direction from the N position (for example, when the machine is articulated to the right, operate the joystick to the left).
- Use the directional selector switch at the top of the joystick lever to set the transmission to the direction of travel.

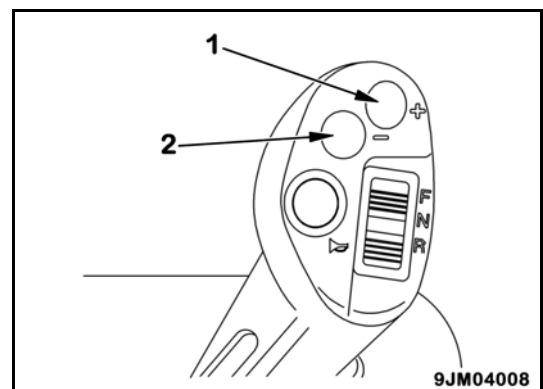
- N position: NEUTRAL
- F position: FORWARD
- R position: REVERSE

If the position of the directional lever and the directional selector switch are different, the joystick pilot lamp flashes; the warning lamp lights up; and the alarm buzzer sounds.

In this condition, the machine moves to the front or rear according to the position of the directional lever. Place the directional lever at the N position.



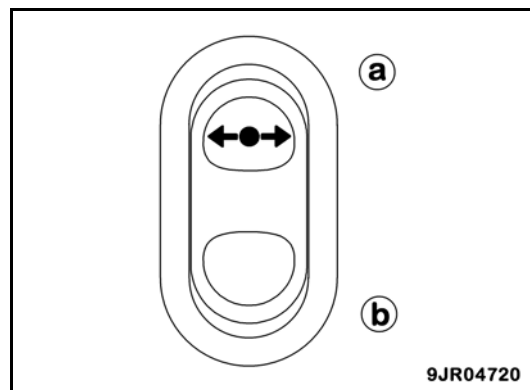
- When the shift mode is in manual, use shift UP switch (1) and shift DOWN switch (2) on the joystick lever to shift the travel speed range.



OPTIONS, ATTACHMENTS

10. When not using the joystick, set the joystick ON/OFF switch to position (b).

The activation of the joystick is cancelled.



Getting In and Out of Operator's Cab

! WARNING

- Before getting in or out of the operator's cab, turn the joystick ON/OFF switch to the OFF position.
- Grip console fore-and-aft adjustment lever (A) and slide the joystick console fully to the rear.

When the console fore-and-aft adjustment lever is gripped, the joystick console lever portion moves together and tilts to the rear; the joystick steering system power is turned OFF; and the joystick becomes inactive.

To make it easier to get in or out of the operator's cab, the joystick console can slide 220 mm (8.66 in) to the front and rear.

- When not using joystick:

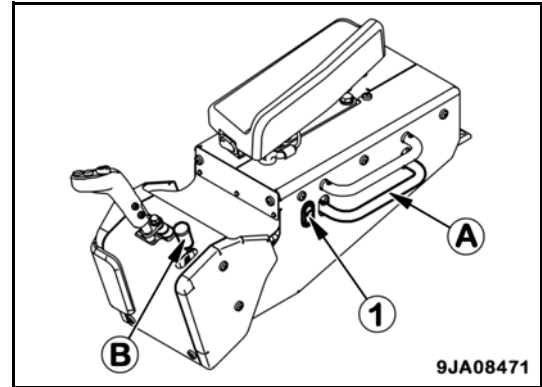
Always turn the joystick ON/OFF switch (1) to the OFF position; push lever (B) to the front; and tilt the joystick console lever portion to the rear.

The electric power is turned OFF and the joystick steering system becomes inactive.

- When using joystick:

When operating the machine, push lever (B) to the front; tilt the joystick console lever portion to the front; and set joystick ON/OFF switch (1) to the ON position.

The electric power is turned ON and the joystick steering becomes active.



9JA08471

Adjustments

⚠ WARNING

- Stop the machine on level ground in a safe place when carrying out the adjustment.
- Carry out the adjustment before starting operations or when changing operator shifts.
- Put your back against the backrest of the operator's seat and adjust the seat so that it is possible to depress the brake fully, then adjust the console.

Adjusting Joystick Console

1. Grip console fore-and-aft adjustment lever (1) and adjust the position of the joystick console to the front or rear.

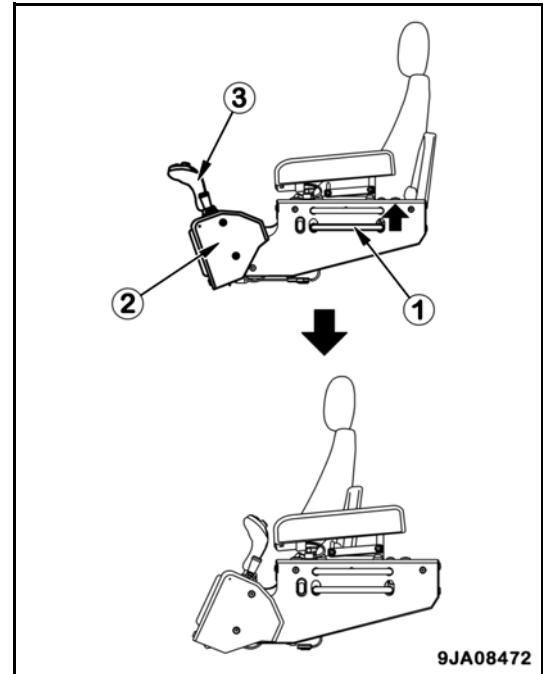
If you grip the console fore-and-aft adjustment lever (1), lever portion (2) of the joystick console automatically tilts to the rear.

Maximum slide to rear when getting on or off: 220 mm (8.7 in)

Fore-and-aft adjustment when operating joystick: . 160 mm (6.3 in)

..... (16 mm (0.6 in) x 10 stages)

2. When using the joystick, adjust the fore-and-aft position, then push console tilt lever (3) to the front and tilt lever portion (2) fully from the rear to the front.
3. After doing this, set the joystick ON/OFF switch to the ON position.



Adjusting Seat

⚠ WARNING

- Stop the machine in a safe place before adjusting the operator's seat.
- Adjust the seat position at the beginning of each shift or when operators change.
- Put your back against the backrest of the operator's seat and adjust the seat so that it is possible to depress the brake fully.

- (A) Fore-and-aft adjustment

Move lever (1) up; move the seat to the desired position; then release the lever.

Fore-and-aft adjustment: 210 mm (10 mm x 21 stages)
 (8.27 in [0.39 in x 21 stages])

- (B) Adjusting seat angle

Move lever (2) up; move the seat cushion at the front up or down to set to the desired position; then release the lever.

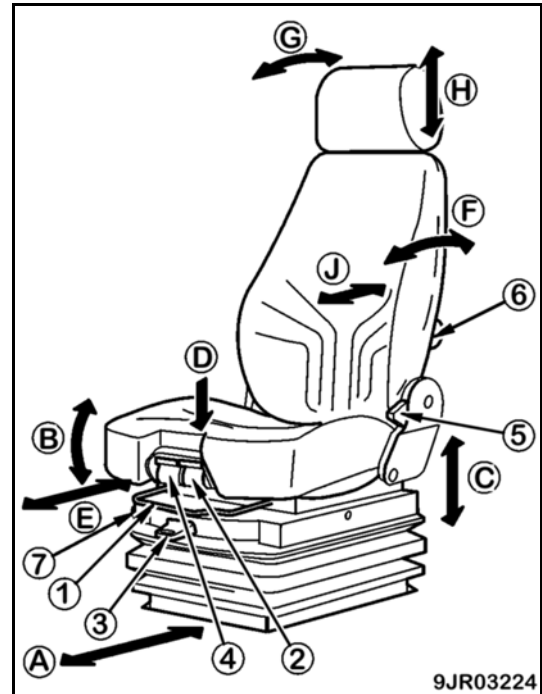
Adjustment range:

Forward tilt: 3 degrees
 Rear tilt: 11 degrees

Remark

An air compressor built into the seat is used for adjustments (C) and (D). Turn the engine starting switch to the ON position before starting the adjustment.

There is danger of damage to the air compressor. Do not keep lever (3) operated continuously for more than one minute.



9JR03224

- (C) Adjusting seat height

The seat height adjustment uses an air system and can be adjusted steplessly.

When adjusting the height, pull lever (3) up fully or push it down fully (when pulling it up, pull it until you feel a click). When the seat is set at the desired height, release the lever. If the lever is kept pulled up, the position where the seat does not rise any further is the maximum height. When the seat reaches the maximum height, the suspension automatically goes down slightly to secure the amount of movement of the lever.

If the operator raises his body from the seat or changes the amount of weight applied to the seat during adjustment, the air in the suspension may be discharged.

Adjustment range: 80 mm (3.15 in)

Remark

If the lever is operated in the RAISE direction from the maximum height, the compressor may continue to operate for approximately eight seconds. This does not indicate any abnormality with the seat.

If this happens, the compressor will stop automatically after approximately eight seconds. The compressor will also stop if the height control lever is operated in the LOWER direction.

OPTIONS, ATTACHMENTS

- (D) Adjusting seat for operator's weight

Pull lever (3) up fully (pull it until you feel a click). When the lever is released, the weight adjustment is carried out automatically. To ensure that the weight adjustment is carried out correctly, the operator should sit in the normal operating position when operating the lever. If the operator raises his body from the seat or changes the amount of weight applied to the seat during adjustment, the air in the suspension may be discharged.

When operators change shifts, the new operator should pull lever (3) up fully (pull it until he hears a click). When the lever is released, the weight adjustment is carried out automatically.

If lever (3) is pulled lightly, the weight adjustment starts, but always pull the lever up fully (pull it until you hear a click) before releasing it.

Remark

When making the initial adjustment or when adjusting the weight settings when operators change shifts, set the damping force of the suspension damper to the soft setting (for details, see "(K) Adjusting hardness of suspension damper" on page 5-21), then adjust it to match the operator's weight. If the damping force of the suspension damper is left set to the hard setting and the height of the seat is adjusted, even if the height is raised, the seat may go down. If the seat goes down, set the damping force of the suspension damper to the soft setting; lower the seat; then adjust the weight again. After completing adjustment of the weight and height, set the damping force of the suspension damper to the desired strength.

To protect the operator, the suspension must be adjusted to match the operator's weight. Adjust the weight before starting operations.

When adjusting, do not remove your weight from the seat or change the load in any other way. If this is done, the air may be released from the suspension seat.

- (E) Fore-and-aft adjustment of seat cushion

Operate lever (4) up; set the seat cushion to the desired position; then release the lever.

Adjustment range: 60 mm (2.36 in)

- (F) Adjusting reclining angle

Operate lever (5) up and move the back cushion to the front or rear.

Put your back firmly against the seat back when carrying out this adjustment. If you move your back away from the seat back, the seat back may suddenly spring forward.

Adjustment range:

Forward tilt: 10 degrees (over 10 degrees is free)

Rear tilt: 36 degrees

Remark

If the seat back is reclined too far, the seat back may hit the rear glass. Use it in a position where it does not contact the glass.

- (G) Adjusting headrest angle

Rotate the headrest to the front or rear.

Adjustment range: 38 degrees

- (H) Adjusting headrest height

Move the headrest up or down and set to the desired height.

Adjustment range: 100 mm (3.94 in)

- (J) Adjusting lumbar support

Turn the knob (6) to the right or left to give the suitable amount of lumbar support.

- (K) Adjusting hardness of suspension damper

Operate knob (7) to adjust the strength of the suspension damper.

Turn knob (7) towards the front of the seat (a) to make the damping force harder; turn it towards the rear of the seat (b) to make the damping force softer.

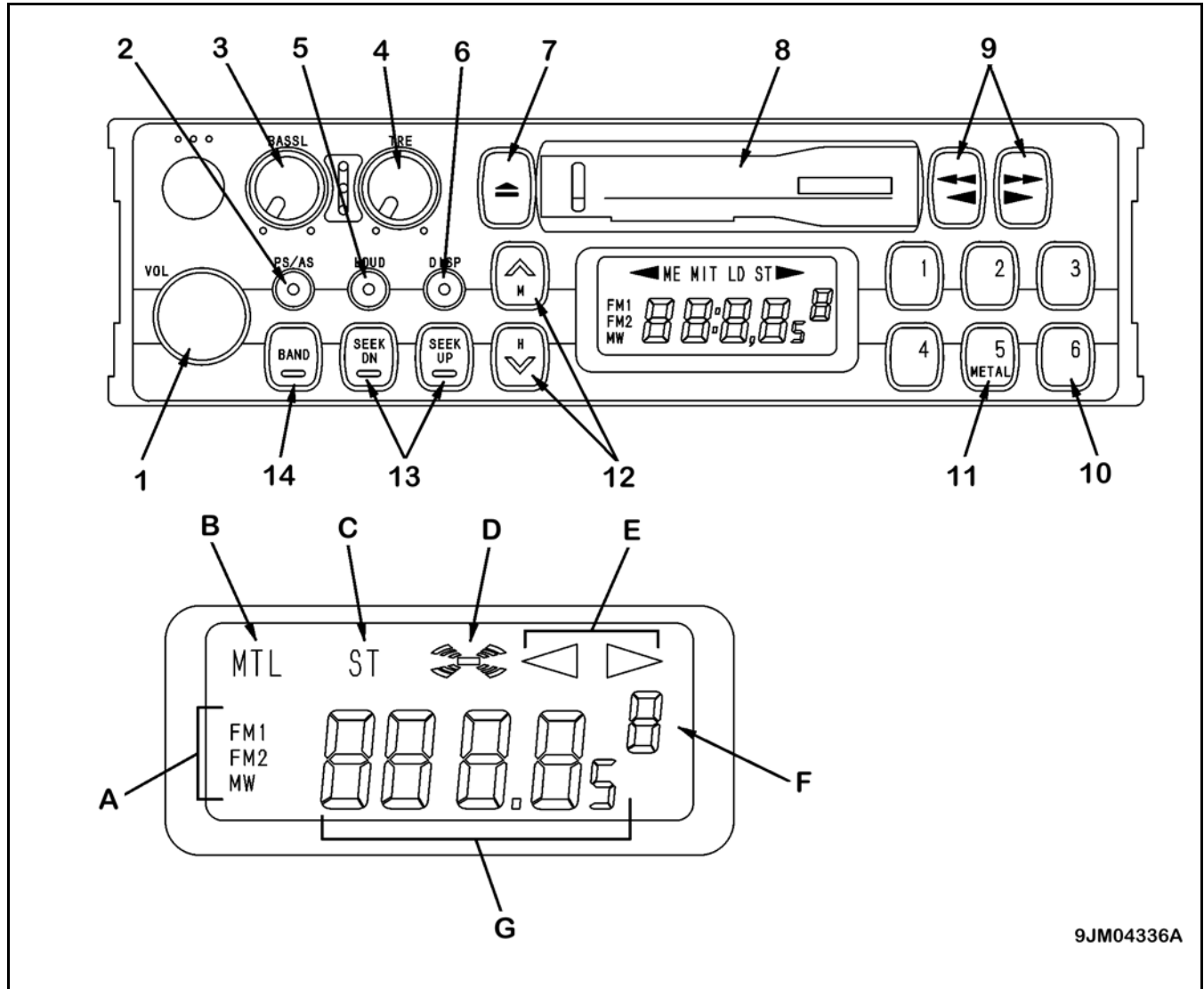
Amount of adjustment: 5 stages

OPTIONS, ATTACHMENTS

AM/FM RADIO CASSETTE STEREO SOUND SYSTEM

Your machine may be equipped with an AM/FM radio-cassette stereo sound system.

Using the radio during machine operations may lead to distractions. When using the radio, always be aware of what you are doing and your operating environment. Do not allow yourself to become distracted.



9JM04336A

1. Power switch/Volume
2. Auto-store/Preset scan button
3. Bass control knob
4. Treble control knob
5. Loudness button
6. Time/Radio display selector button
7. Tape eject button
8. Cassette door
9. Fast forward/Rewind buttons
10. Preset buttons
11. Metal tape button
12. Manual tuning buttons
13. Seek tuning buttons
14. Band selector button

- A. Band display
- B. Metal tape display
- C. FM stereo reception display
- D. Loudness display
- E. Tape direction display
- F. Preset channel display
- G. Time/Frequency display

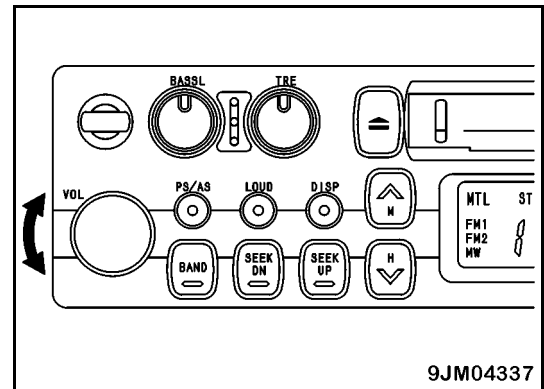
OPTIONS, ATTACHMENTS

Sound System Components

Power Switch/Volume

Turn the power switch/volume knob (1) to the right to turn the power ON; you will hear a click.

- To increase the volume, turn the knob to the right.
- To decrease the volume, turn the knob to the left.



Auto-Store/Preset Scan Button

Use the auto-store/preset scan button (2) to actuate the preset scan and auto-store functions.

Auto-Store

Each time this button is pressed for more than two seconds while in radio reception, the auto-store function automatically starts to search for the desired station within a receivable band, and memorizes the frequency in the preset memory. During this scanning process, the frequency shown in the right side of the display continues to change. This indicates that each frequency is memorized in auto-store.

Remark

The auto-store function cannot be used when the channel display is flashing. When the display is flashing, the preset scan function is being used.

Preset Scan

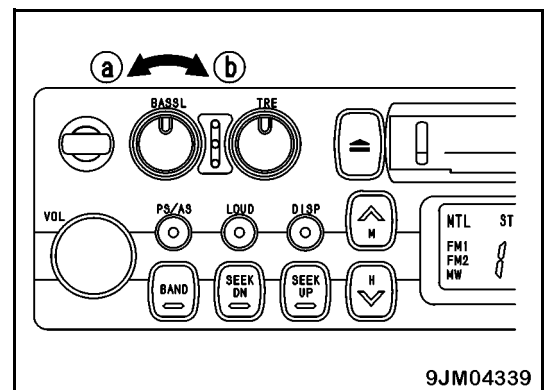
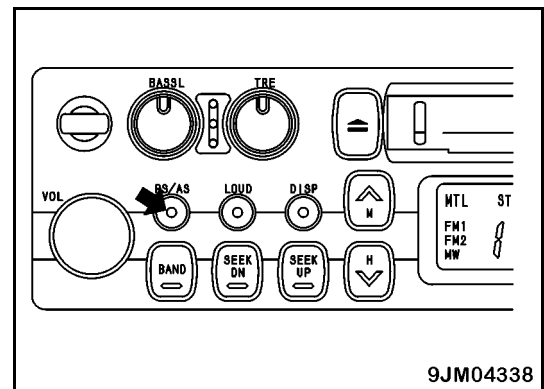
If this button is pressed for less than 0.5 second while in radio reception, programs from the six preset stations in the same band will be broadcast one after another for five seconds each, starting from No. 1 through 6 stations consecutively.

When the desired station is reached, press the button again. This stops the preset scan tuning process and switches to ordinary broadcasting. The same process will be repeated continuously until the button is pressed again.

Bass Control Knob

Use the bass control knob (3) to control the low tones.

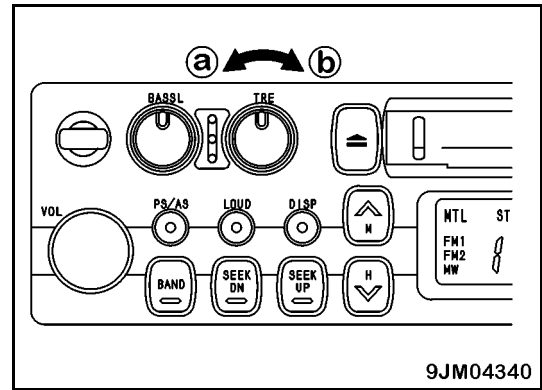
- Direction (a): Low tone reduced
- Direction (b): Low tone emphasized



Treble Control Knob

Use the treble control knob (4) to control the high tones.

- Direction (a): High tone reduced
- Direction (b): High tone emphasized

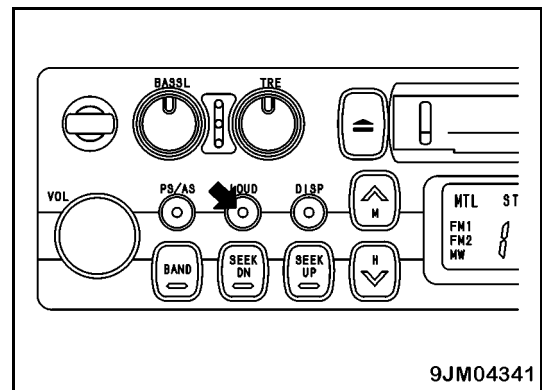


Loudness Button

Use the loudness button (5) to play the stereo at low volume.

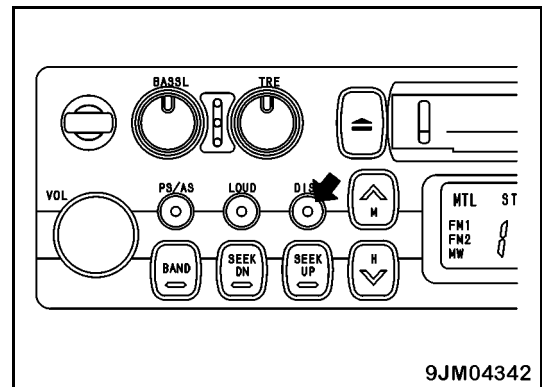
This makes it possible to hear more easily by emphasizing the low tone when the low tones are weak.

- Push button: Actuated (ON)
- Push button again: Canceled (OFF)



Time/Radio Display Selector Button

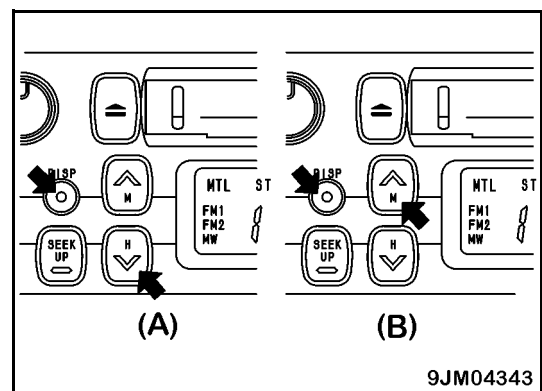
Use the time/radio display selector button (6) to switch between the Radio/Tape display and the Time display.



Correcting the Time

Press the button to set the time display.

- (A) Correcting Hour
 - Keep the DISP button pressed and press the bottom (H) of the TUNING button to correct the hour.
- (B) Correcting Minute
 - Keep the DISP button pressed and press the top (M) of the TUNING button to correct the minute.

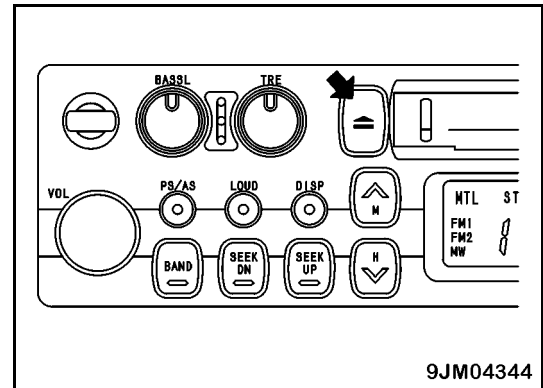


OPTIONS, ATTACHMENTS

Tape Eject Button

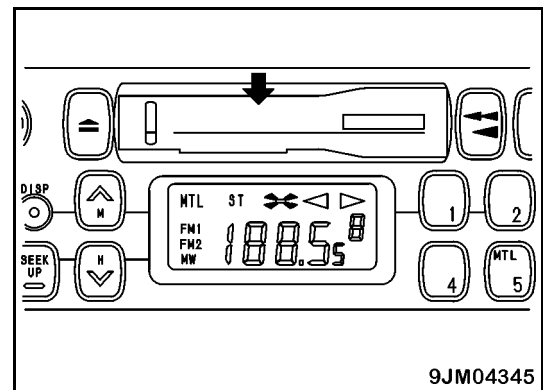
Use the tape eject button (7) to stop the tape and to eject the cassette.

When the tape is ejected, the radio plays.



Cassette Door

Set the cassette with the exposed portion of the tape on the right side and insert it in cassette door (8).



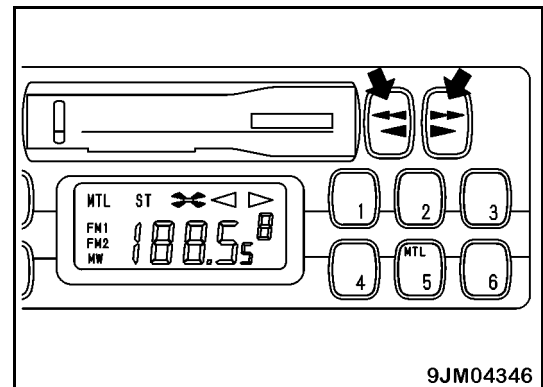
Fast-Forward, Rewind Buttons

Use the fast-forward button (9) to fast forward the tape. Use the rewind button (9) to rewind the tape.

If you press the button pointing in the same direction as the illuminated arrow (indicating the direction of play), the tape will fast forward; if you press the button pointing in the opposite direction, the tape will rewind.

To stop the tape, lightly press the button that is not locked. The fast-forward or rewind operation will be canceled.

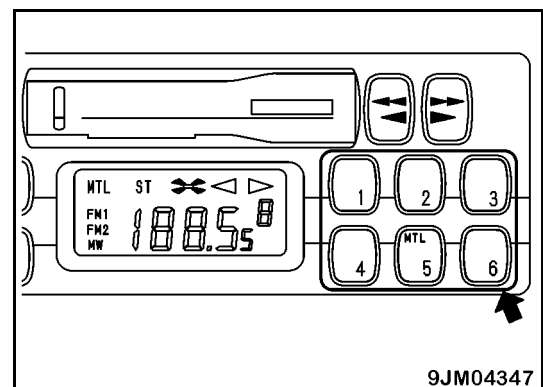
If the fast-forward and rewind buttons are pressed at the same time, the tape will change sides.



Preset Buttons

Use the preset buttons (10) to obtain the broadcast station frequencies preset in memory for each of buttons No. 1 to No. 6.

It is possible to preset 18 stations (FM: 12; AM: 6) with these buttons.



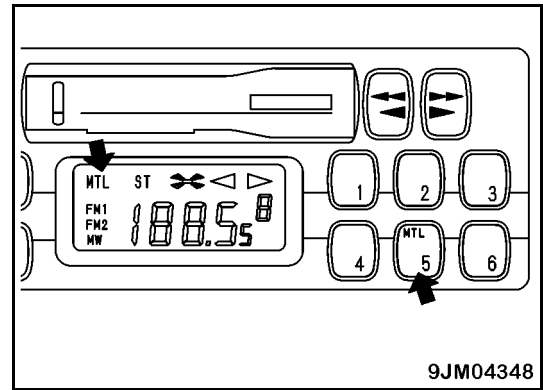
Metal Tape Button

Use the metal tape button (11) to play a metal or chrome tape.

When it is pressed, “MTL” appears on the display.

Remark

This button is used also for preset button No. 5.

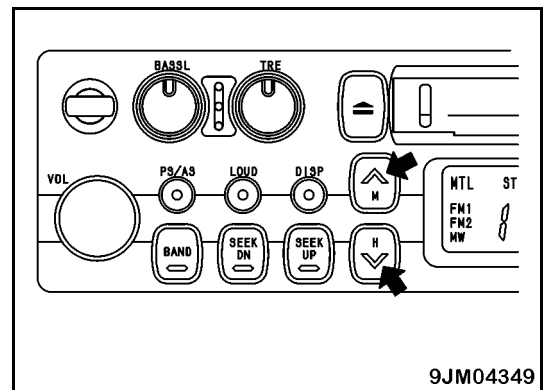


Manual Tuning Buttons

Use the manual tuning buttons (12) to change the frequency manually.

When the **TUN ^** button is pressed, the frequency goes up 9 kHz for AM and 0.1 MHz for FM; when the **TUN v** button is pressed, the frequency goes down 9 kHz for AM and 0.1 MHz for FM.

If the button is pressed and held, the frequency changes continuously.

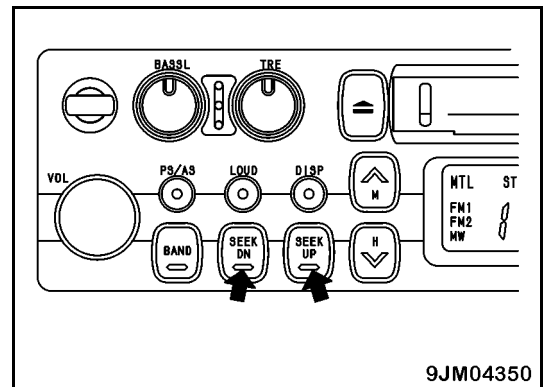


Seek Tuning Buttons

Use the SEEK tuning buttons (13) to find stations within your broadcasting range.

When the SEEK UP button is pressed, the frequency goes up automatically; when the SEEK DOWN button is pressed, the frequency goes down automatically.

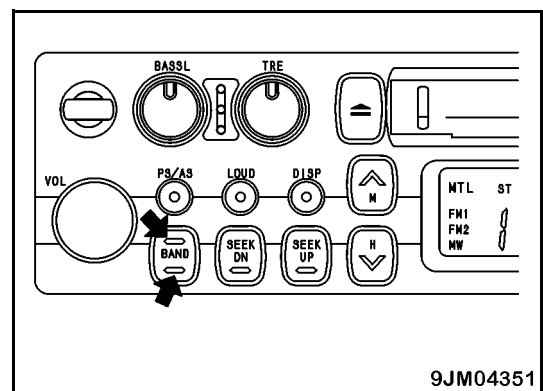
When the next station within broadcasting range is found, seeking stops automatically.



Band Selector Button

Press the band selector button (14) to switch the band between FM1, FM2, and MW (AM).

The band is shown on the display.



OPTIONS, ATTACHMENTS

Method of Operation

Setting Preset Buttons

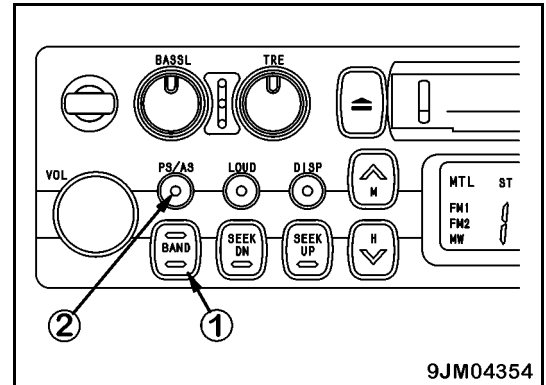
It is possible to preset six MW (AM) stations and 12 FM stations (FM1: six stations, FM2: six stations).

Remark

If you are playing the cassette, press the tape eject button to stop the tape.

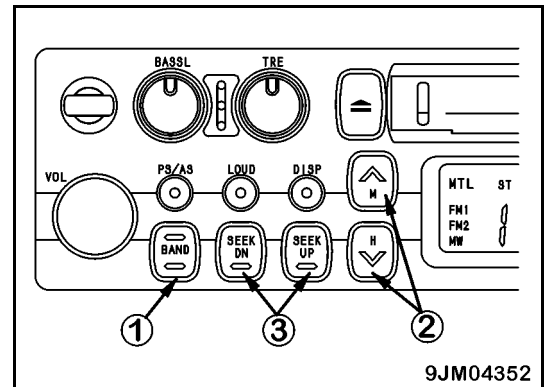
Using Auto-Preset

1. Use band selector button (1) to select MW (AM), FM1, or FM2.
2. Press auto-store/preset scan button (2) for less than 0.5 second.
3. The preset scan tuning function automatically searches for the desired station within the same band and can memorize as many as six stations in the preset memory.



Using Manual Preset

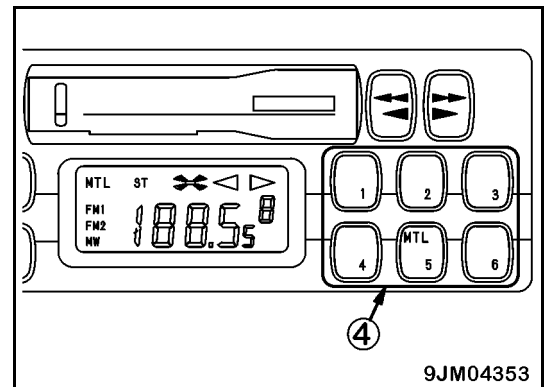
1. Use band selector button to select MW (AM), FM1, or FM2.
2. Press manual tuning buttons (2) or SEEK tuning buttons (3) to select the station to be preset.
3. Keep one of the preset buttons (4) pressed for two seconds while the frequency display is shown on the display. (The preset channel and frequency are displayed and the presetting is completed.)
4. Repeat Steps 2 and 3 to preset other stations to the subsequent numbers.
5. If you want to preset a station in the other bands, follow Steps 1 to 4.



Remark

Use Steps 2 and 3 when changing the setting of a preset switch to another station.

When the power is disconnected, such as when the battery is replaced, all the settings are deleted. You must preset the stations again.



Listening to Radio

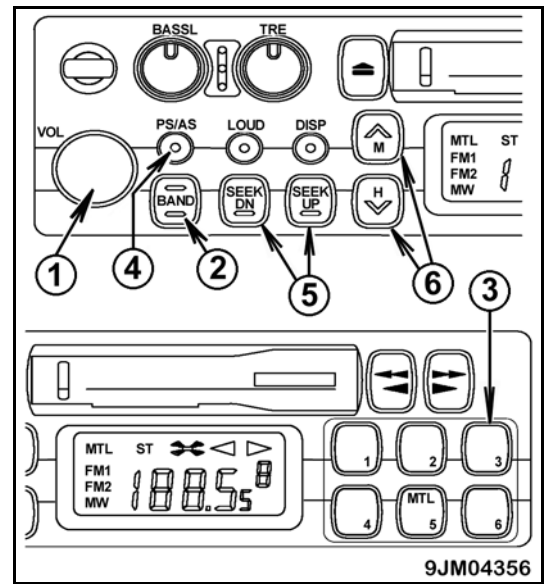
1. Turn the starting switch ON and then turn power switch (1) ON.
2. Set band selector button (2) to MW (AM), FM1, or FM2.
3. Select the station with the preset buttons (3).
 - ★ If you want to tune to a station that is not preset, use either seek tuning buttons (5) or manual tuning buttons (6).

Remark

In case you do not remember the number assigned to a certain preset station, press the auto-store/preset scan button (4) for less than 0.5 second.

The six preset stations will broadcast one after another for five seconds each. When the desired station broadcasts, press the button again and scan tuning stops at that station.

4. Adjust the volume, balance, and tone as desired.
5. When turning the radio OFF, turn power switch (1) to the left until you hear a click.



Remark

To switch to the radio when listening to a cassette, press the cassette eject button to stop the tape.

If you insert a cassette when listening to the radio, the tape will start to play.

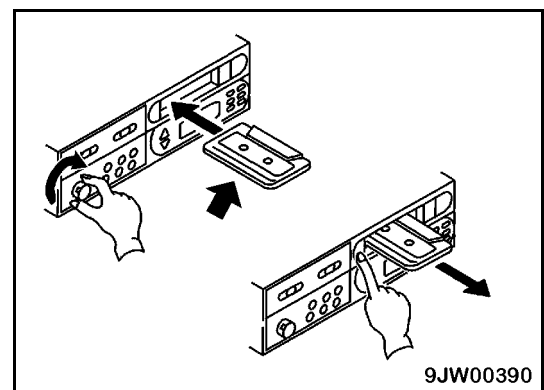
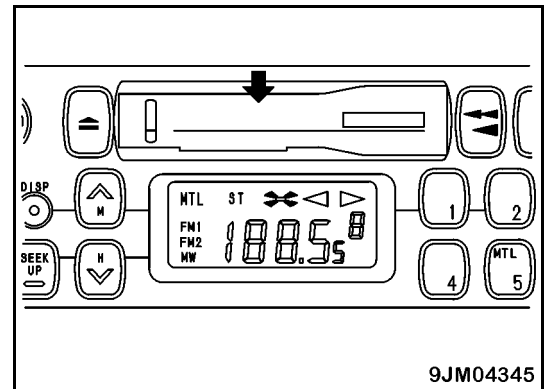
Listening to Cassette Tape

1. Turn the starting switch ON and then turn power switch (1) ON.
2. Set the cassette with the exposed portion of the tape on the right side and push it through the cassette door. The tape starts to play automatically.

If the arrow indicating the direction of play is pointing to the right, the top side is being played; if the arrow is pointing to the left, the bottom side is being played.

When the tape reaches the end, it reverses automatically and the other side starts to play.

3. When you have finished with the tape, press the cassette eject button to eject the tape and automatically switch to the radio.

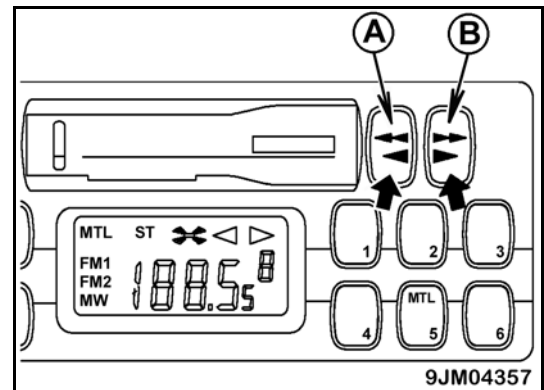


OPTIONS, ATTACHMENTS

Reversing the Tape

If you want to reverse the tape while listening to it, press both FAST FORWARD, REWIND buttons (A) and (B) at the same time lightly.

When this is done, the tape direction display will be reversed.



Precautions When Using

! WARNING

- If a voltage greater than the specified voltage is input, it may cause fire, electrocution, or other failure. Never input any voltage other than the specified voltage.
- Places inside the radio are under high voltage. Do not remove the cover.
- Do not carry out any modifications. This may cause fire, electrocution, or other failure.
- If you cannot hear any sound or nothing is displayed, or any other problem occurs, turn off the power switch and ask your Komatsu distributor to make repairs without delay.

- Stow the antenna when traveling in places with low overhead clearance.
- To ensure safety, always keep the volume at a level where it is possible to hear outside sounds during operation.
- If water gets inside the speaker case or radio, it may cause a serious problem. Be careful not to get water on the equipment.
- Do not wipe the display panel or buttons with solvents such as benzene or thinner. Wipe with a soft, dry cloth. Use a cloth soaked in alcohol if the equipment is extremely dirty.

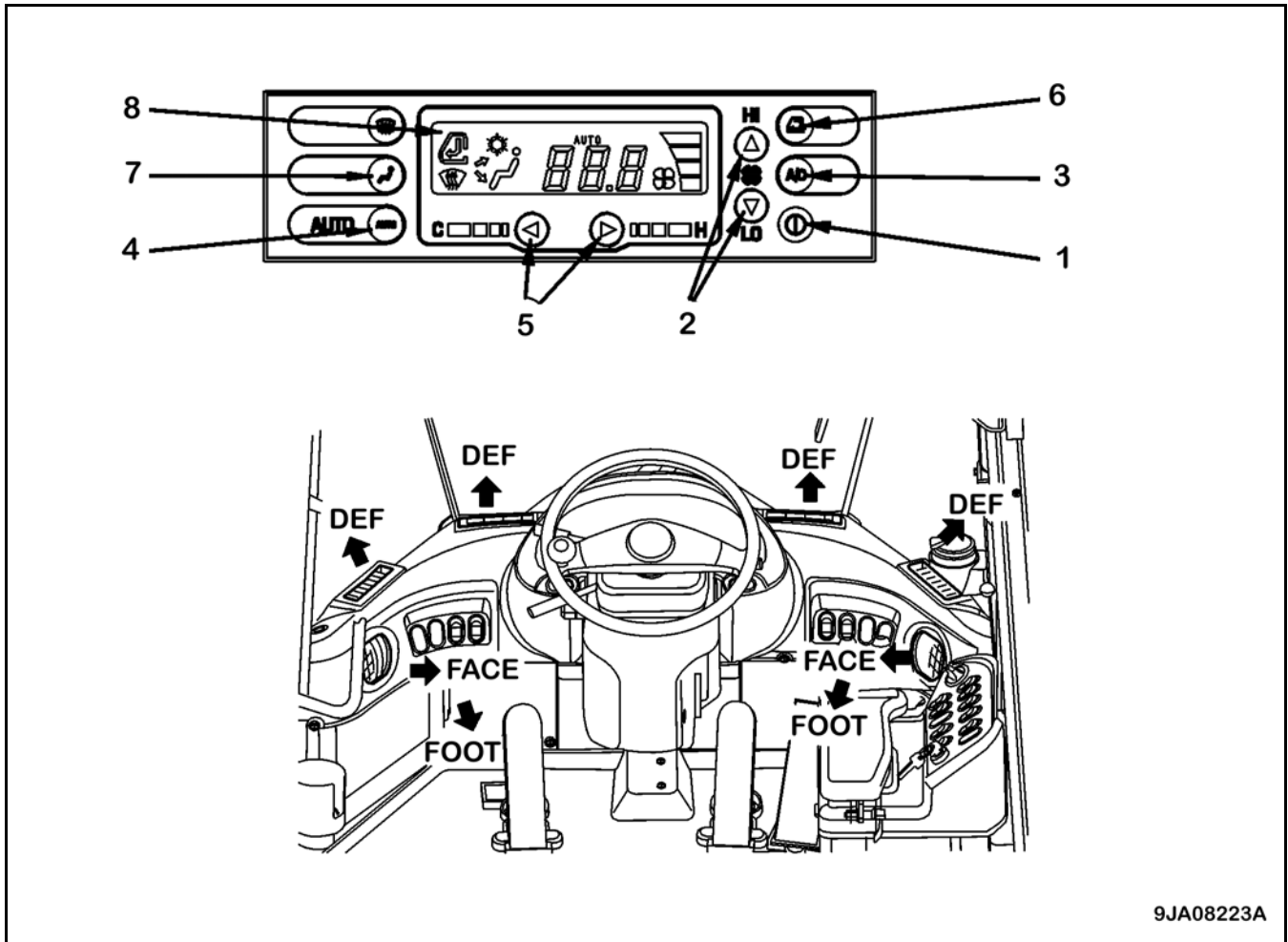
Handling Cassette Tape

- Clean the tape head approximately once a month with a commercially available head cleaning tape.
- Do not leave the tape in a place where it is exposed to direct sunlight; all tape is sensitive to fluctuating temperature and humidity.
- Do not leave the tape in a place that is excessively dusty.
- Do not leave the tape near a magnetic field. A magnetic field is capable of erasing a tape.
- Do not use a 120-minute tape. This tape is thin and can easily get caught inside the machine.
- If the tape is slack, it can easily get caught inside the machine. Use a pencil to wind the tape to remove any slack.
- Do not use a cassette tape if the label has started to come off. It may cause defective rotation, or it may be impossible to get the tape out of the machine.

AUTOMATIC AIR CONDITIONER

★ Your machine may be equipped with an automatic air conditioner.

Control Panel



9JA08223A

1. Main motor switch
2. Fan switch
3. Air conditioner switch
4. Auto switch
5. Temperature control switch
6. FRESH/RECIRC selector switch
7. Mode selector switch
8. Display monitor

OPTIONS, ATTACHMENTS

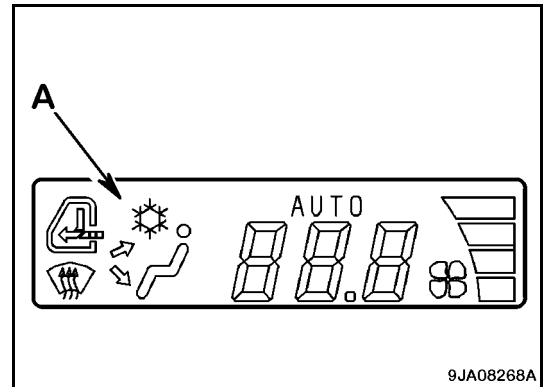
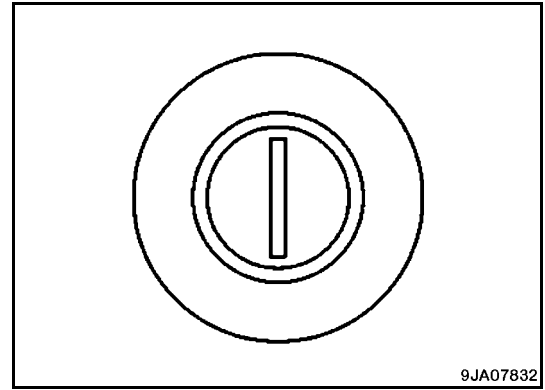
Main Power Switch

The main power switch (1) is used to turn the main power of the air conditioner ON and OFF.

- When the switch is pressed, display monitor (A) lights up. The fan begins operation.
- When the switch is pressed again, the air conditioner is turned OFF and the display monitor goes out. The fan stops.

Remark

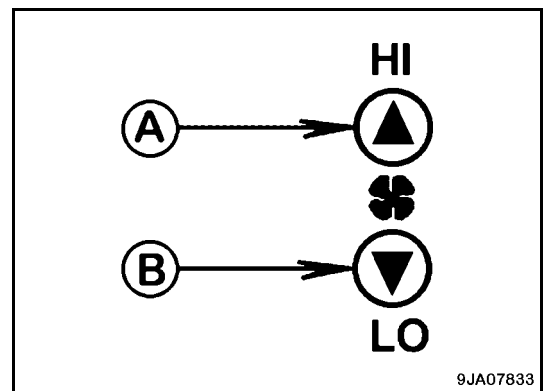
When the switch is turned ON, the setting displayed is the same as when the air conditioner was turned OFF.



Fan Switch

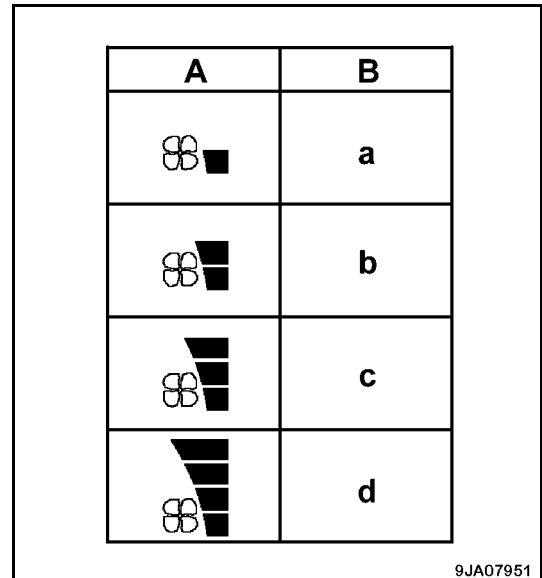
The fan switch (2) is used to adjust the airflow from the fan. The air flow can be adjusted to four levels.

- When switch (A) is pressed, the air flow increases.
- When switch (B) is pressed, the air flow decreases.



The setting for the air flow is displayed on the display monitor.

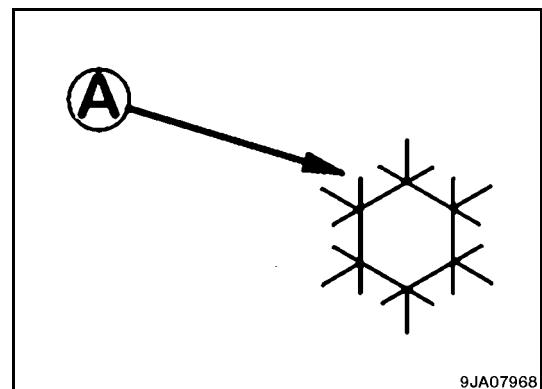
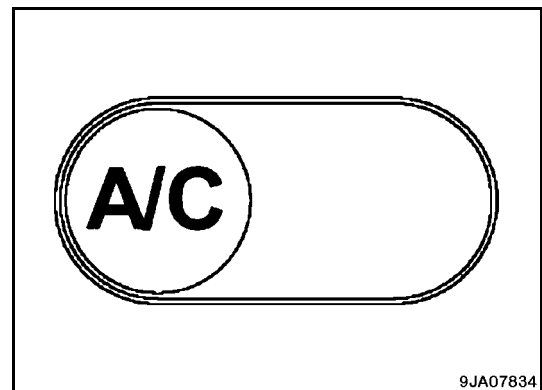
- A: Monitor display
- B: Air flow
 - a: Air flow: Lo
 - b: Air flow: M1
 - c: Air flow: M2
 - d: Air flow: Hi



Air Conditioner Switch

The air conditioner switch (3) is used to start or stop the cooling or dehumidifying/heating function.

- If the main power switch is ON and the air conditioner switch is pressed, the air conditioner is turned ON and (A) is displayed on the display monitor.
- If the switch is pressed again, the switch is turned OFF and display monitor (A) goes out.

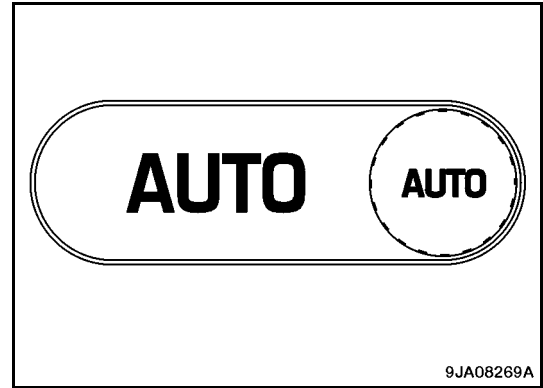


OPTIONS, ATTACHMENTS

Auto Switch

The auto switch (4) is used for automatic operation of the air conditioner (actuation of the cooling and dehumidifying/heating functions, stopping operation).

- When the main power switch is turned ON and the AUTO air conditioner switch is pressed, the air conditioner is turned ON and the display monitor shows “AUTO.”
- If the switch is pressed again, the air conditioner is turned OFF and the “AUTO” sign on the display monitor goes out.

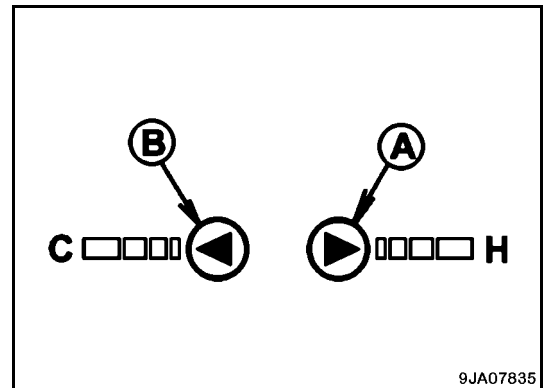


Temperature Switch

The temperature switch (5) is used to adjust the temperature.

- When switch (A) is pressed, the temperature of the air blowing out the vents increases.
- When switch (B) is pressed, the temperature of the air blowing out the vents decreases.

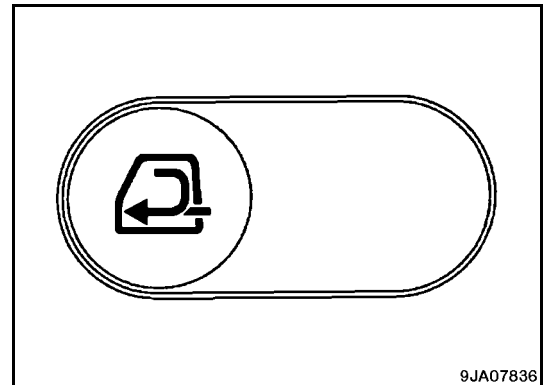
The set temperature is displayed on the display monitor.



FRESH/RECIRC Selector Switch

The FRESH/RECIRC switch (6) is used to select between recirculating air inside the cab or taking in fresh air from outside.

- When this switch is pressed, recirculation of inside air is selected and (A) lights up on the display monitor.
- If the switch is pressed again, intake of fresh air is selected and (B) lights up on the display monitor.

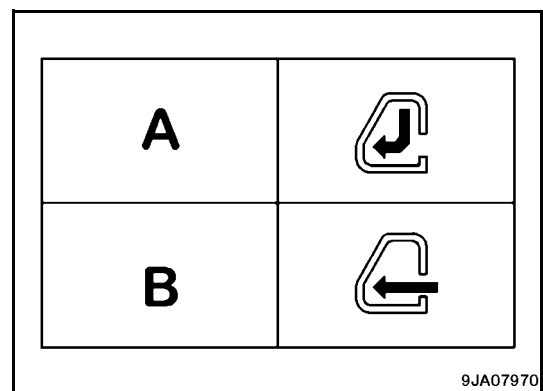


- Recirculation of air inside cab

Only the air inside the cab is circulated. Use this setting when carrying out quick cooling or heating of the cab, or when the outside air is dirty.

- Intake of fresh air from outside

Air from the outside is taken into the cab. Use this setting when taking in fresh air from outside or when removing the mist from the windows.



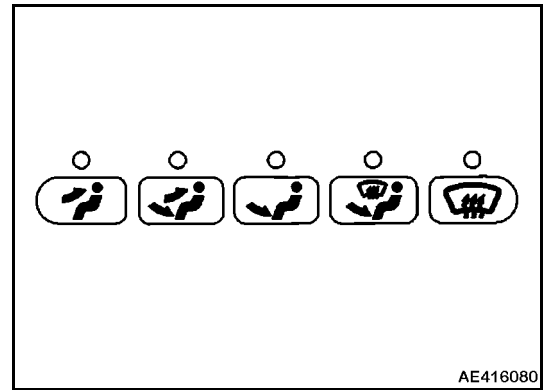
Mode Selector Switch

The mode selector switch (7) is used to select the vents.

The following five vent modes are available:

- FACE
- FACE/FOOT
- FOOT
- FOOT/DEF
- DEF

When the switch is pressed, the indicator lamp above the switch lights up and displays the vent mode.



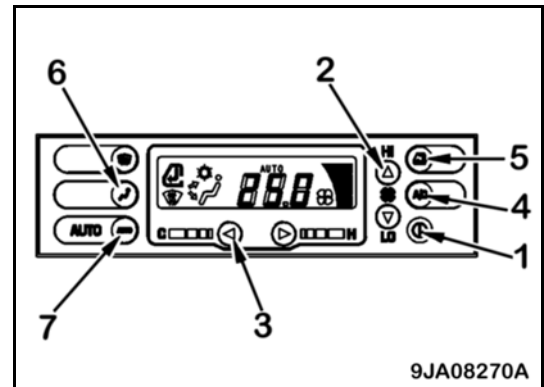
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OPTIONS, ATTACHMENTS

Method of Operation

Cooling Operation

1. Press main power switch (1) of the air conditioner to turn the power ON.
 2. Press fan switch (2) and set the air flow to Hi.
 3. Press temperature control switch (3) to set to the desired temperature.
 4. Press air conditioner switch (4) to turn the air conditioner switch ON.
 5. Press RECIRC/FRESH selector switch (5) to select RECIRC.
 6. Press mode selector switch (6) to set the vents to FACE.
 7. When the temperature inside the cab decreases, use the temperature control switch and the fan switch to set to the desired temperature.
- ★ When the AUTO switch is pressed, the temperature and location of the vents are automatically selected.



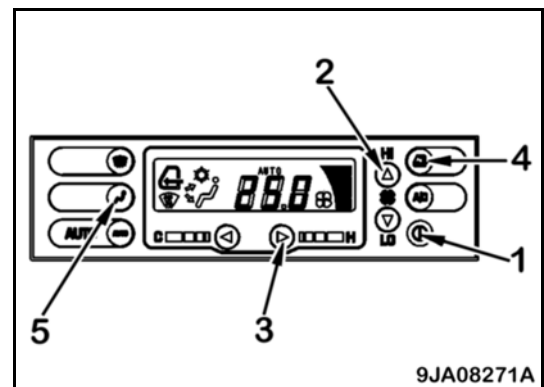
Remark

If the temperature control switch is pressed to set the temperature to the lowest position and the air conditioner is run for a long time with the air flow at Lo, in rare cases, the evaporator may freeze.

If the evaporator freezes and no cold air comes out, turn the air conditioner switch OFF; raise the temperature setting; run it for a short time with the air flow at Hi; then turn the air conditioner switch ON again.

Heating Operation

1. Press main power switch (1) of the air conditioner to turn the power ON.
2. Press fan switch (2) and set the air flow to Hi.
3. Press temperature control switch (3) to set to the desired temperature.
4. Press RECIRC/FRESH selector switch (4) to select FRESH.
5. Press mode selector switch (5) to set the vents to FOOT.
6. When the temperature inside the cab increases, use the temperature control switch and the fan switch to set to the desired temperature.



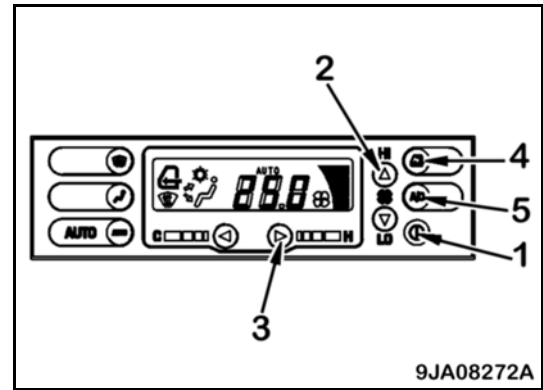
- ★ When the AUTO switch is pressed, the temperature and location of the vents are automatically selected.

Remark

Heating is carried out using the engine cooling water; it can be carried out when the cooling water temperature is high.

Drying-Heating and Demisting Operation

1. Press main power switch (1) of the air conditioner to turn the power ON.
2. Press fan switch (2) and set the air flow to the desired setting.
3. Press temperature control switch (3) and set to the desired temperature.
4. Press RECIRC/FRESH selector switch (4) to select FRESH.
5. Press air conditioner switch (5) to turn the air conditioner ON.



Remark

When the outside temperature is below 0°C (32°F), the air conditioner (compressor) may not operate.

When Not Using the Air Conditioner Regularly

To prevent leakage of the refrigerant from the air conditioner cooling circuit, operate the air conditioner for several minutes two or three times a month during the off-season. If the air conditioner is left for a long time when the refrigerant is leaking, it may cause internal rust.

Run the air conditioner in cooling or dehumidification plus heating mode for several minutes from time to time to prevent the loss of the oil film in various parts of the compressor.

If the temperature inside the cab is low, the air conditioner may not work. In such cases, use the recirculated air to warm up the inside of the cab, then turn the air conditioner switch on. The air conditioner will run.

Precautions When Using Air Conditioner

- To prevent an excessive load on the engine or compressor, use the air conditioner only when the engine is running.
- If the machine is used in places where there is dust or a bad odor, recirculate the air inside the cab when using the air conditioner.
- When turning the cooling on, if the temperature inside the cab is high, open the doors and windows to bring in fresh air before starting the air conditioner.
- If you smoke when using the cooling, your eyes may sting. If this happens, switch temporarily to cooling and ventilation to remove the smoke.
- When using the air conditioner for a long time, carry out ventilation and cooling once every hour.
- For reasons of health, the optimum setting for cooling is considered to be when it feels slightly cool (5 or 6°C (9 or 10.8°F) lower than the ambient temperature) when you enter the cab. Do not make the temperature inside the cab too low or direct the air flow directly onto your skin.

OPTIONS, ATTACHMENTS

Inspection and Maintenance

To prevent loss of the oil film at various parts of the compressor when the air conditioner is not being used, run the compressor at low speed for several minutes once a week.

- ★ Run the engine at low speed and set the temperature to a medium temperature.

For information about cleaning the air filter and inspecting the refrigerant, see the following procedures:

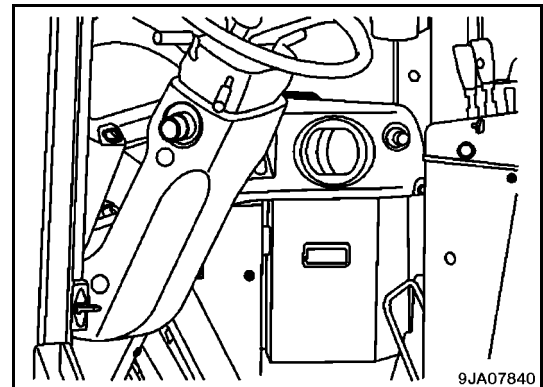
- “Check Air Conditioner” on page 3-43
- “Clean Element in Air Conditioner Fresh Air Filter” on page 3-51
- “Clean Element in Air Conditioner Recirculation Filter” on page 3-56
- “Check Air Conditioner Compressor, Adjust” on page 3-79
- “Clean Air Conditioner Condenser” on page 3-37

To allow the air conditioner to deliver its full performance and provide a comfortable environment, have inspection and maintenance carried out periodically.

When adding refrigerant or carrying out other maintenance, special tools and instruments are needed. Ask your Komatsu distributor to carry out inspection and repair.

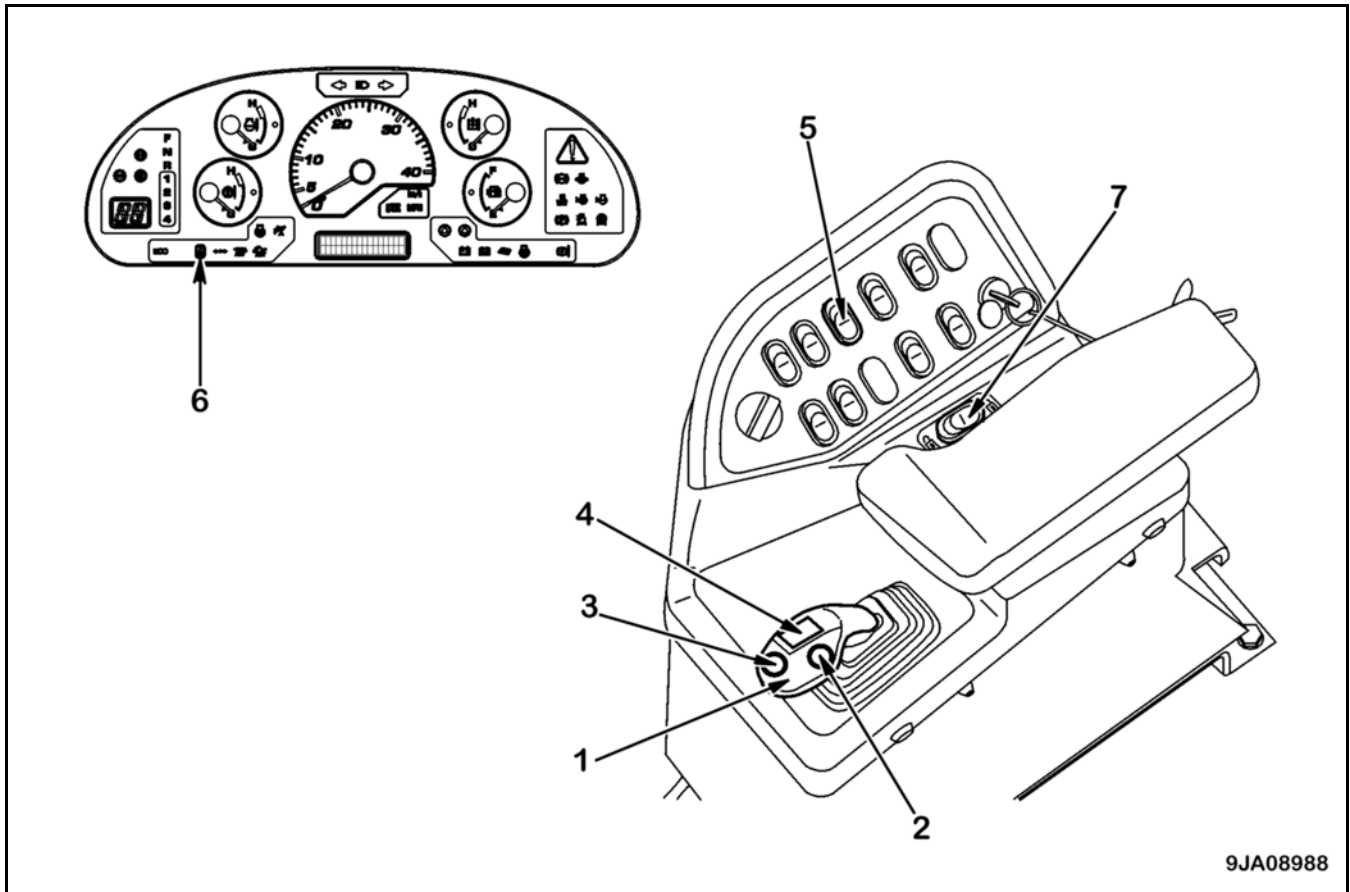
Cool Box

- When the cooling is being used, this function can be used for keeping drinks and other things cool.
- When the heating is being used, it can be used to keep things warm.
- Do not use the cool box for things which smell, leak water, or break easily.
- Do not use it as a holder for tools or other small objects.



MULTI-FUNCTION LEVER

Components



1. Work equipment lever
2. Kickdown switch
3. Hold switch
4. FNR switch
5. Directional selector switch actuation switch
6. Directional selector pilot lamp
7. Work equipment lock switch

OPTIONS, ATTACHMENTS

Work Equipment Lever

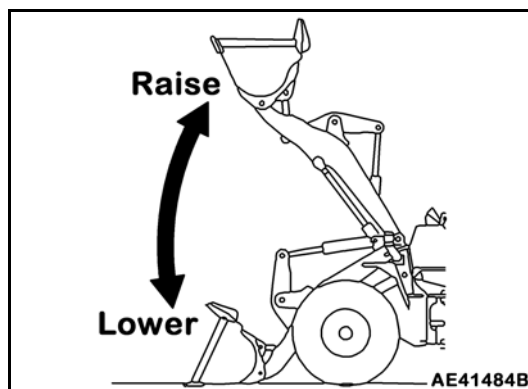
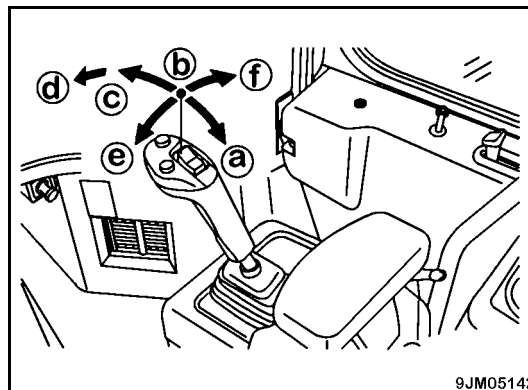
The work equipment lever (1) is used to control the lift arm and bucket.

Lift Arm Operation

Remark

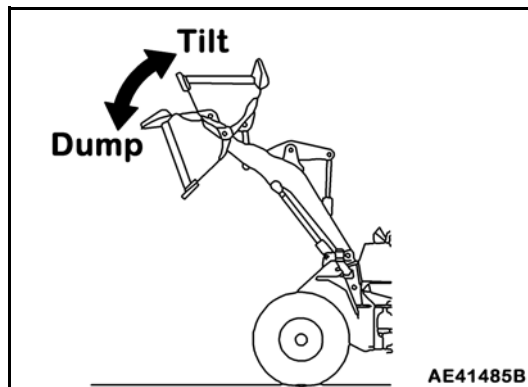
Do not use the FLOAT position when lowering the bucket. Use the FLOAT position when leveling, see "Leveling Operations" on page 2-124.

- Position (a): RAISE
 - When the work equipment control lever is pulled further beyond the RAISE position, the lever is stopped in this position until the lift arm reaches the preset position of the kickout, and the lever is returned to the HOLD position.
- Position (b): HOLD
 - The lift arm is kept in the same position.
- Position (c): LOWER
- Position (d): FLOAT
 - The lift arm moves freely under external force.



Bucket Operation

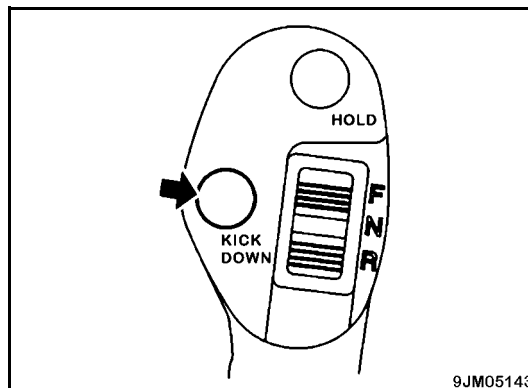
- Position (e): TILT
 - When the work equipment control lever is pulled further beyond the TILT position, the lever is stopped in this position until the bucket reaches the preset position of the positioner, and the lever is returned to the HOLD position.
- Position (b): HOLD
 - The bucket is kept in the same position.
- Position (f): DUMP



Kickdown Switch

- If the gearshift lever is in 2nd and kickdown switch (2) is pressed, the transmission will downshift to 1st.
Use this when you need to increase the drawbar pull in digging operations.
- If the transmission is in auto-shift and the travel speed is below 10.5 km/h (6.5 mph) in any speed range when traveling in either forward or reverse, the kickdown switch is actuated. It is possible to downshift to 1st.

This makes it easy to carry out load and carry operations.



Even if the travel speed is more than 10.5 km/h (6.5 mph), this switch can be used to downshift the transmission. Each time the kickdown switch is pressed, the speed range will downshift one range at a time (F4 → F3 → F2).

When the torque converter is in the lockup condition (if equipped), the lockup is canceled.

Remark

When canceling the kickdown, operate the directional lever or the FNR switch. In manual shift, it can be canceled by operating the speed lever to any position other than 2nd. It is also possible to cancel the kickdown by turning the starting switch OFF.

In auto-shift, if the travel speed increases after the kickdown, the gear will be shifted up by the auto-shift.

In auto-shift, when traveling at more than 18 km/h (11.2 mph) in 3rd or at more than 28 km/h (17.4 mph) in 4th, even if the kickdown switch is pressed, the transmission will not downshift. This prevents the engine from overrunning.

Hold Switch

The hold switch (3) is used to fix the speed range when traveling while using the automatic transmission.

- When the switch is pressed, the transmission is fixed in the speed range displayed on shift indicator (A) on the machine monitor and shift hold pilot lamp (B) will light up.
- When the switch is pressed again, the display goes out.

Use this function to select the desired speed range when traveling up or down hills or when carrying out operations such as grading.

Remark

When the torque converter is in the lockup condition (if equipped), the transmission cannot be fixed.

When canceling the shift hold, operate the directional lever or the FNR switch. It can also be canceled by operating the speed lever and by switching the shift/manual selector switch to MANUAL. It is also possible to cancel the shift hold by turning the starting switch OFF.

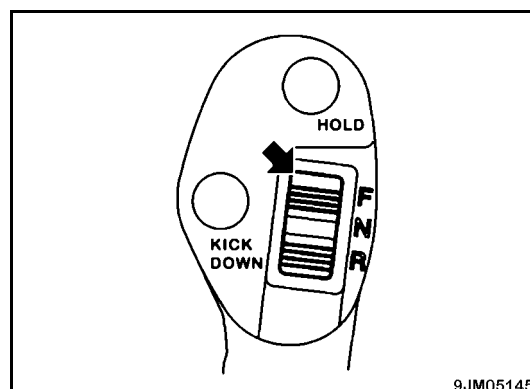
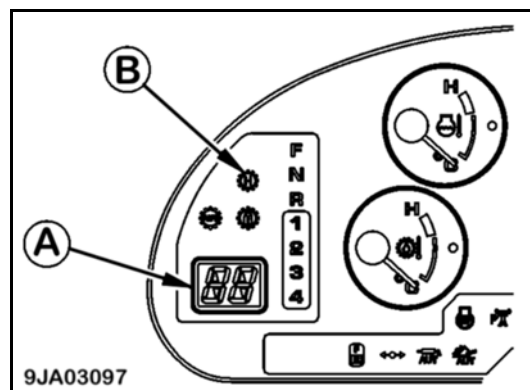
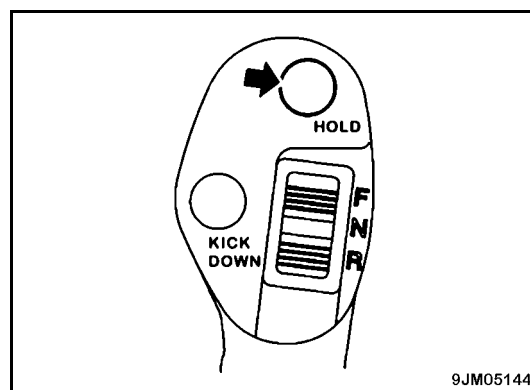
FNR Switch

The FNR switch (4) is used to change the direction of travel of the machine.

- Position (F): FORWARD
- Position (N): Neutral
- Position (R): REVERSE

Before operating this switch, check that the following conditions are present:

- Directional lever is at N.
- Directional selector switch actuation switch is at ON.
- ★ If the conditions are not present, the switch will not work.

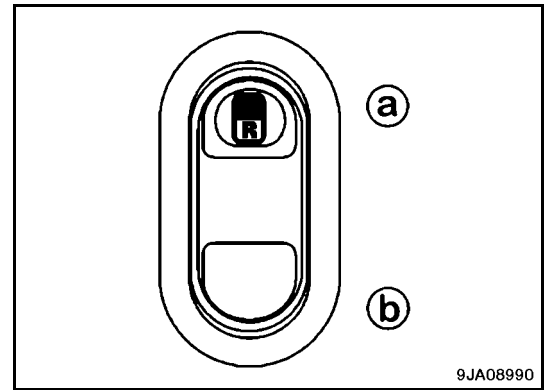


OPTIONS, ATTACHMENTS

Directional Selector Switch Actuation Switch

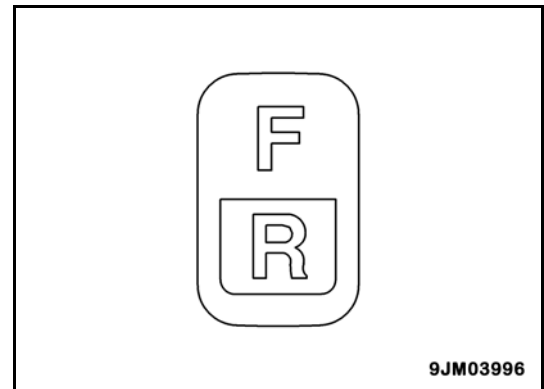
The directional selector switch actuation switch (5) is used to activate the FNR switch on the head of the multi-function lever.

- Position (a): ON
 - The pilot lamp inside the switch and the directional selection pilot lamp on the machine monitor light up, and the FNR switch is activated.
- Position (b): OFF
 - The FNR switch is not activated.



Directional Selector Pilot Lamp

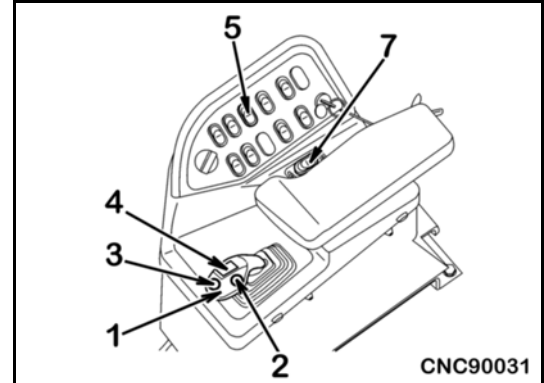
The directional selector pilot lamp (6) lights up when the directional selector switch actuation switch on the right switch panel is turned ON. It indicates that it is possible to operate the travel direction of the machine with the FNR switch on the head of the multi-function lever.



Work Equipment Lock Switch

WARNING

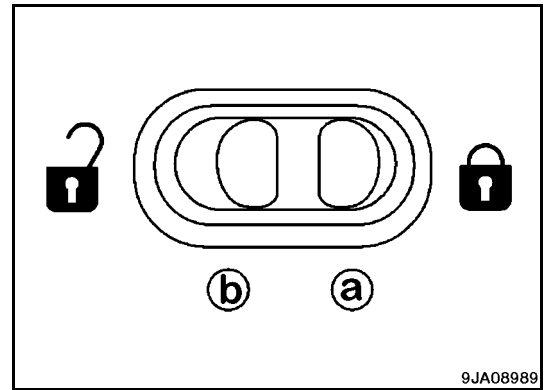
- Before standing up from the operator's seat, set the work equipment lock switch securely to the LOCK position. If the work equipment lock switch is not at the LOCK position and work equipment control lever (1) is touched by mistake, it may lead to a serious accident.
- If the work equipment lock switch is not placed securely at the LOCK position, the work equipment may move; this may lead to a serious accident or personal injury. Check that the lever is in the position shown in the diagram.
- When operating the work equipment lock switch, check that work equipment control lever (1) is at the HOLD position.
- When operating the work equipment lock switch, be careful not to touch work equipment control lever (1).



OPTIONS, ATTACHMENTS

The work equipment lock switch (7) is used to switch the work equipment lock system between LOCK and FREE.

- Position (a): LOCK
- Position (b): FREE

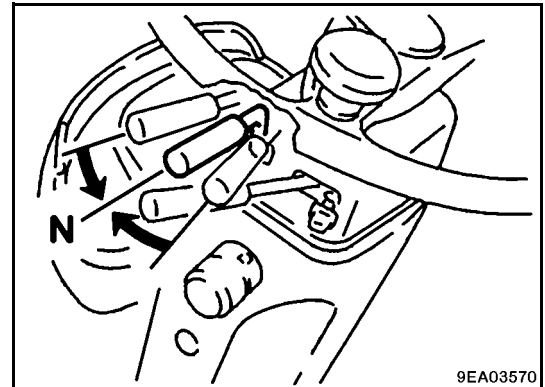


Using FNR Switch to Change Between Forward and Reverse

WARNING

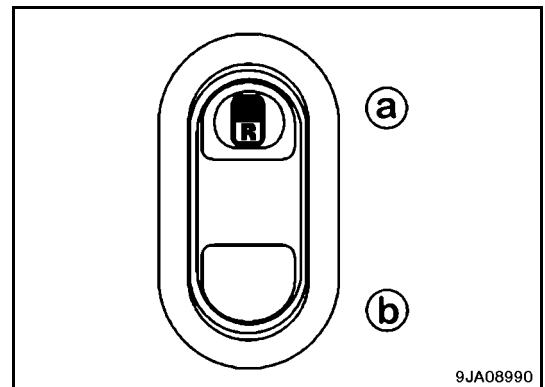
- When changing direction between FORWARD and REVERSE, check that the new direction of travel is safe. There is a blind spot behind the machine. Be particularly careful when changing direction to travel in reverse.
- If the directional selector switch actuation switch is at the ON position and the directional lever is operated to F or R, the machine will travel in forward or reverse according to the operation of the directional lever, regardless of the position of the FNR switch on the head of the multi-function lever.
- Priority is given to the operation of the directional lever. Be careful when operating the machine.
- Do not switch between FORWARD and REVERSE when traveling at high speed.
- When switching between FORWARD and REVERSE, depress the brake to reduce the travel speed sufficiently, then change the direction of travel. (Maximum speed for changing direction: 10.5 km/h (6.5 mph))

1. Place the directional lever at the N position.

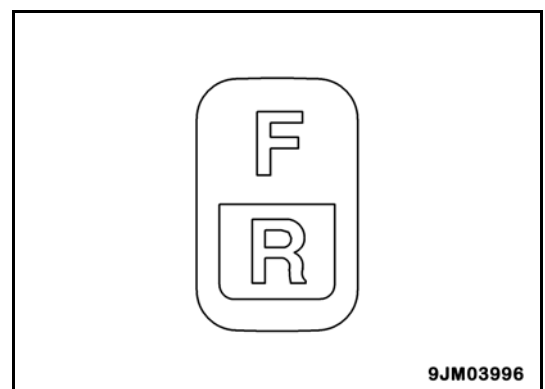


2. Turn on the directional selector switch on the right side of the switching panel to enable directional selection.

- Position (a): ON
- Position (b): OFF



The pilot lamp inside the switch and the directional selection pilot lamp on the machine monitor light up, and the FNR switch is activated.



3. Push the FNR switch on the head of the multi-function lever to the desired position.

If the directional selector pilot lamp on the machine monitor flashes, the switch or the lever is in one of the following conditions.

- If the directional selector switch actuation switch is at the OFF position and the FNR switch is operated to F (or R):

The pilot lamp flashes and, at the same time, the central warning lamp lights up and the alarm buzzer sounds.

- ★ Set the FNR switch to the N position.

- If the engine is started and the directional selector switch is at the ON position and the directional lever is at N, and the FNR switch is operated to F (or R):

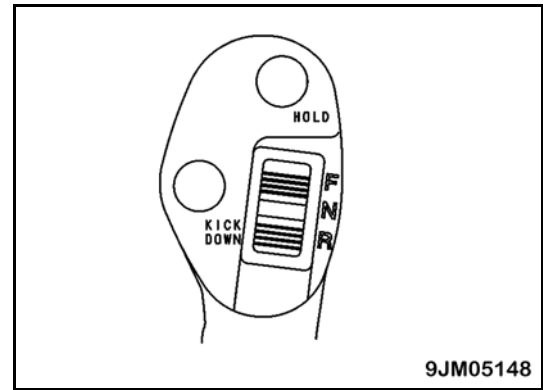
The pilot lamp flashes and, at the same time, the central warning lamp lights up and the alarm buzzer sounds.

- ★ Set the FNR switch to the N position.

- If the directional selector switch is at the ON position and the FNR switch is operated to F (or R):

The pilot lamp flashes and, at the same time, the central warning lamp lights up and the alarm buzzer sounds. In this condition, the machine will travel in forward or reverse according to the operation of the directional lever.

- ★ Set the directional lever and the FNR switch on the head of the multi-function lever to the N position.



MACHINES EQUIPPED WITH KOMTRAX

- ★ Your machine may be equipped with the KOMTRAX system.
- KOMTRAX is a machine management system that uses wireless communications.
- A contract with your Komatsu distributor is necessary before the KOMTRAX system can be used. A customer who wishes to use the KOMTRAX system should consult his/her Komatsu distributor.
- The KOMTRAX equipment is a wireless device using radio waves. It is necessary to obtain authorization and conform to the laws of the country or territory where the machine equipped with KOMTRAX is being used. Always contact your Komatsu distributor before selling or exporting any machine equipped with KOMTRAX.
- When selling or exporting the machine, or at other times when your Komatsu distributor considers it necessary, it may be necessary for your Komatsu distributor to remove the KOMTRAX equipment or to carry out action to stop communications.
- If you do not obey the above precautions, neither Komatsu nor your Komatsu distributor can take any responsibility for any problem that is caused or for any loss that results.

Basic Precautions

WARNING

- **Never disassemble, repair, modify, or move the communications terminal, antenna, or cables. This may cause failure or fire on the KOMTRAX equipment or the machine itself. (Your Komatsu distributor will carry out removal and installation of KOMTRAX.)**
- **Do not allow cables or cords to become caught; do not damage or pull cables or cords by force. Short circuits or disconnected wires may cause failure or fire on the KOMTRAX equipment or the machine itself.**
- **For anyone wearing a pacemaker, make sure that the communications antenna is at least 22 cm (8.7 in) from the pacemaker. The radio waves may have an adverse effect on the operation of the pacemaker.**

Remark

Even when the key in the starting switch of the KOMTRAX system is at the OFF position, a small amount of electric power is consumed.

When putting the machine into long-term storage, follow the directions given in "LONG-TERM STORAGE" on page 2-168.

Contact your Komatsu distributor before installing a top guard or other attachment that covers the cab roof.

Be careful not to get water on the communications terminal or wiring.

- The KOMTRAX system uses wireless communications. It cannot be used inside tunnels, underground, inside buildings, or in mountainous areas where radio waves cannot be received.
- Even when the machine is outside, it cannot be used in areas where the radio signal is weak or in areas outside the wireless communications service area.
- There is absolutely no need to inspect or operate the KOMTRAX communications terminal. If any abnormality is found, consult your Komatsu distributor.