

Operation & Maintenance Manual

BULLDOZER

D31EX -22 **D31PX -22**

D37EX -22 **D37PX -22**

SERIAL NUMBERS 60541 and up

ecot3

⚠ 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 will come into contact with it.

NOTICE

Komatsu has Operation & Maintenance Manuals written in some other languages. If a foreign language manual is necessary, contact your local distributor for availability.

KOMATSU

FOREWORD

CALIFORNIA

Proposition 65 Warning

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

CALIFORNIA

Proposition 65 Warning

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Wash hands after handling.

BEFORE READING THIS MANUAL

This manual gives details of the operation and methods of inspection and maintenance for this machine that must be obeyed in order to use the machine safely. Most accidents are caused by the failure to follow fundamental safety rules for the operation and maintenance of machines.

Read, understand and follow all precautions and warnings in this manual and on the machine before performing operation and maintenance. Failure to do so may result in serious injury or death.

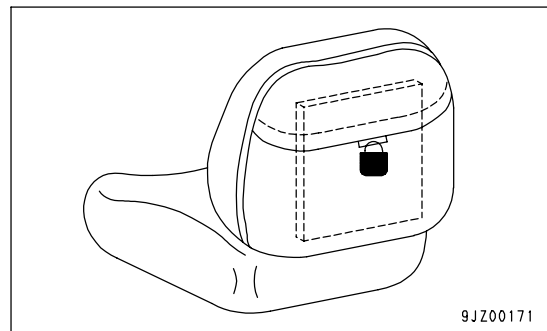
Komatsu cannot predict every circumstance that might involve a potential hazard when the machine is used. Therefore, the safety messages in this manual and on the machine may not include all possible safety precautions. If you carry out any operation, inspection, or maintenance under conditions that are not described in this manual, understand that it is your responsibility to take the necessary precautions to ensure safety. In no event should you or others engage in the prohibited uses or actions described in this manual. Improper operation and maintenance of the machine can be hazardous and could result in serious injury or death.

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

Always keep this Operation and Maintenance Manual in the location shown on the right so that all relevant personnel can read it at any time.

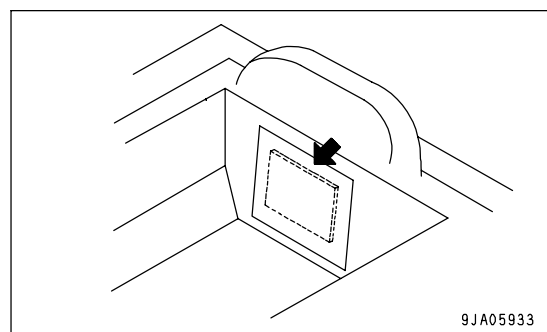
Operation and Maintenance Manual Storing Place

Pocket in the back of the operator's seat (fitted with a lock)



REMARK

If the machine is equipped with an air suspension seat, keep the Operation and Maintenance Manual in the steel pocket behind the seat.



If this manual is lost or damaged, contact your distributor immediately to arrange for its replacement. For details regarding the machine serial No. you will need to provide your Komatsu distributor, see "TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR (PAGE 1-7)".

This manual uses the international units (SI) for units of measurement. For reference, units that have been used in the past are given in ().

The explanations, values, and illustrations in this manual have been prepared based on the latest information available as of the date of its publication. Continuing improvements in the design of this machine may lead to additional changes that are not reflected in this manual. Consult Komatsu or your Komatsu distributor for the latest available information concerning your machine or with questions regarding information contained in this manual.

- The numbers in circles in the illustrations correspond to the numbers in () in the text.

(For example: ① → (1))




Komatsu delivers machines that comply with all applicable regulations and standards of the country to which it has been shipped. If this machine has been purchased in another country, it may lack certain safety devices 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 Komatsu or your Komatsu distributor before operating the machine.

IMPORTANT SAFETY INFORMATION

To enable you to use the machine safely, and to prevent injury to operators, service personnel or bystanders, the precautions and warnings included in this manual and the safety signs attached to the machine must always be followed.

To identify important safety messages in the manual and on the machine labels, the following signal words are used.

The "Safety Alert Symbol" identifies important safety messages on machines, in manuals, and elsewhere. When you see this symbol, be alert to the risk of personal injury or death. Follow the instructions in the safety message.

 DANGER	This signal word indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	This signal word indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	This signal word indicates a potentially hazardous situation exists which, if not avoided, may result in minor or moderate injury.

The following signal words are used to alert you to information that must be followed to avoid damage to the machine.

NOTICE This precaution is given where the machine may be damaged or the service life reduced if the precaution is not followed.

REMARKS This word is used for information that is useful to know.

INTENDED USE

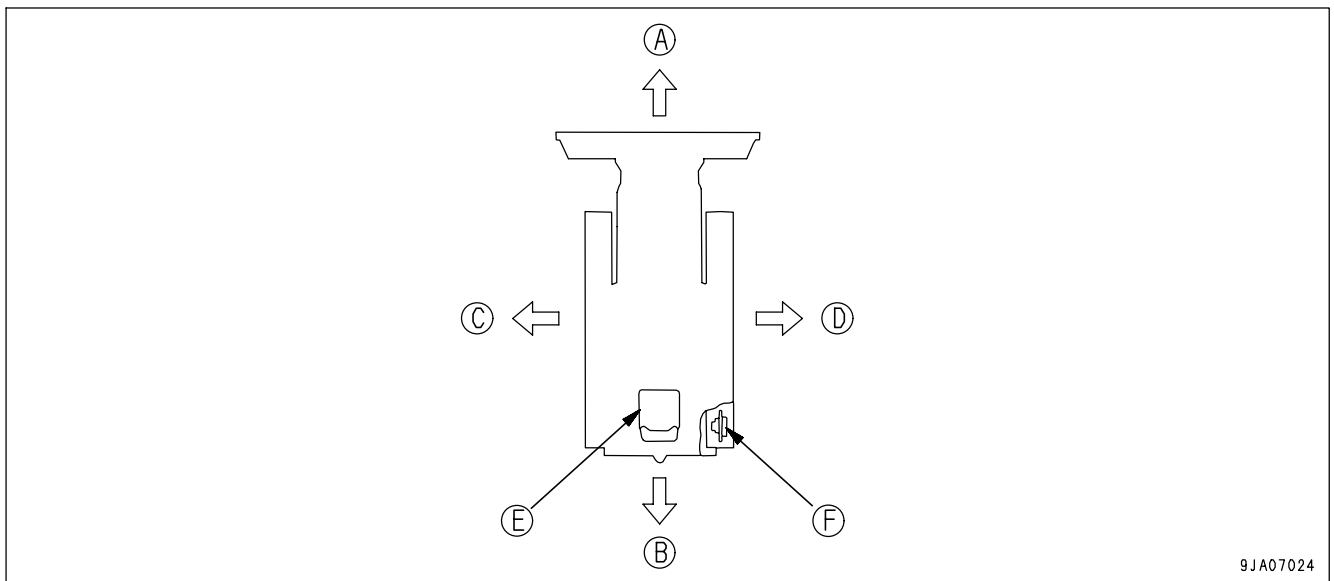
USE OF MACHINE

This Komatsu machine is designed to be used mainly for the following work:

- Dozing
- Smoothing
- Cutting into hard or frozen ground or ditching
- Felling trees, removing stumps

See the section "WORK POSSIBLE USING BULLDOZER (PAGE 3-104)" for further details.

GENERAL VIEW AND DIRECTIONS OF MACHINE



- (A) Front
(B) Rear
(C) Left
(D) Right

- (E) Operator's seat
(F) Sprocket

In this manual, the terms front, rear, left, and right refer to the travel direction as seen from the operator's seat when the operator's seat is facing the front and the sprocket is at the rear of the machine.

VISIBILITY FROM OPERATOR'S SEAT

This machine complies with the visibility standard (ISO 5006).

This machine maintains a close visibility of a height of 1.5 m at a point 1 m away from the outside surface of the machine, and a visibility for a circumference of 12 m.

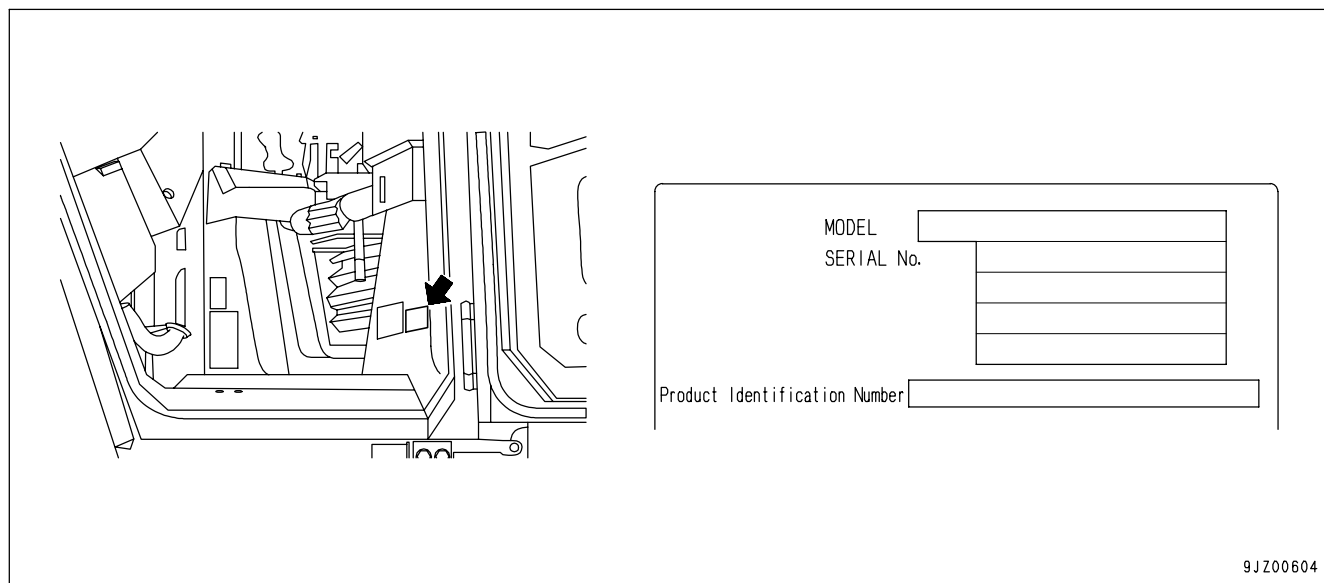
LOCATION OF PLATES, TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR

When requesting service or ordering replacement parts, please inform your Komatsu distributor of the following items.

PRODUCT IDENTIFICATION NUMBER (PIN)/MACHINE SERIAL NO. PLATE

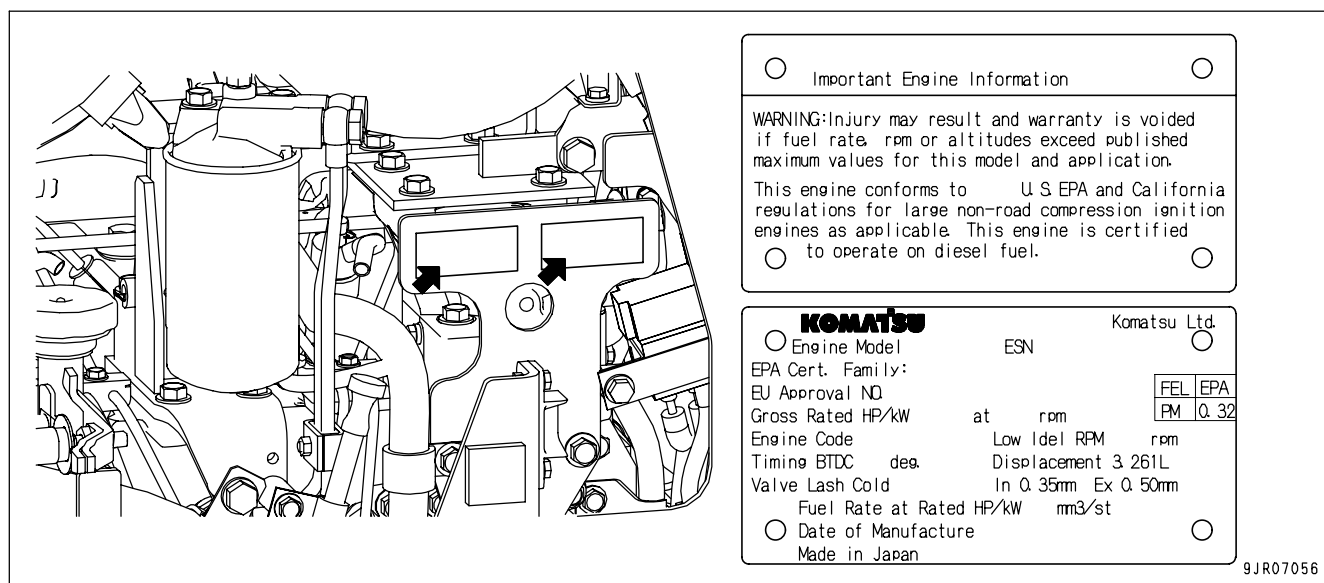
This is at the bottom left at the front of the operator's seat.

The design of the nameplate differs according to the territory.



EPA REGULATION, ENGINE SERIAL NO. PLATE

This is on the bracket on the rear left side of the engine.



EPA: Environmental Protection Agency, U.S.A.

SERVICE METER POSITION

The service meter is provided at the lower part of the monitor panel.

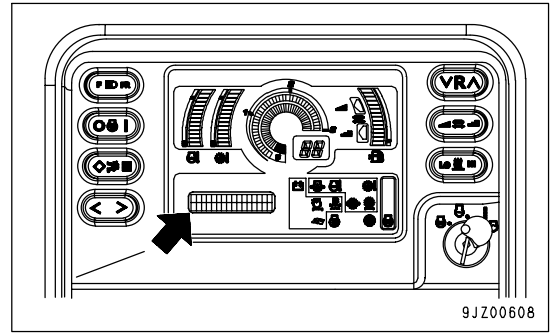


TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR

Machine serial No.	
Engine serial No.	
Product identification number (PIN)	
Distributor name	
Address	-----

Service Personnel	-----
Phone/Fax	

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SAFETY

WARNING

Please read and make sure that you fully understand the precautions described in this manual and the safety labels on the machine. When operating or servicing the machine, always follow these precautions strictly.

SAFETY

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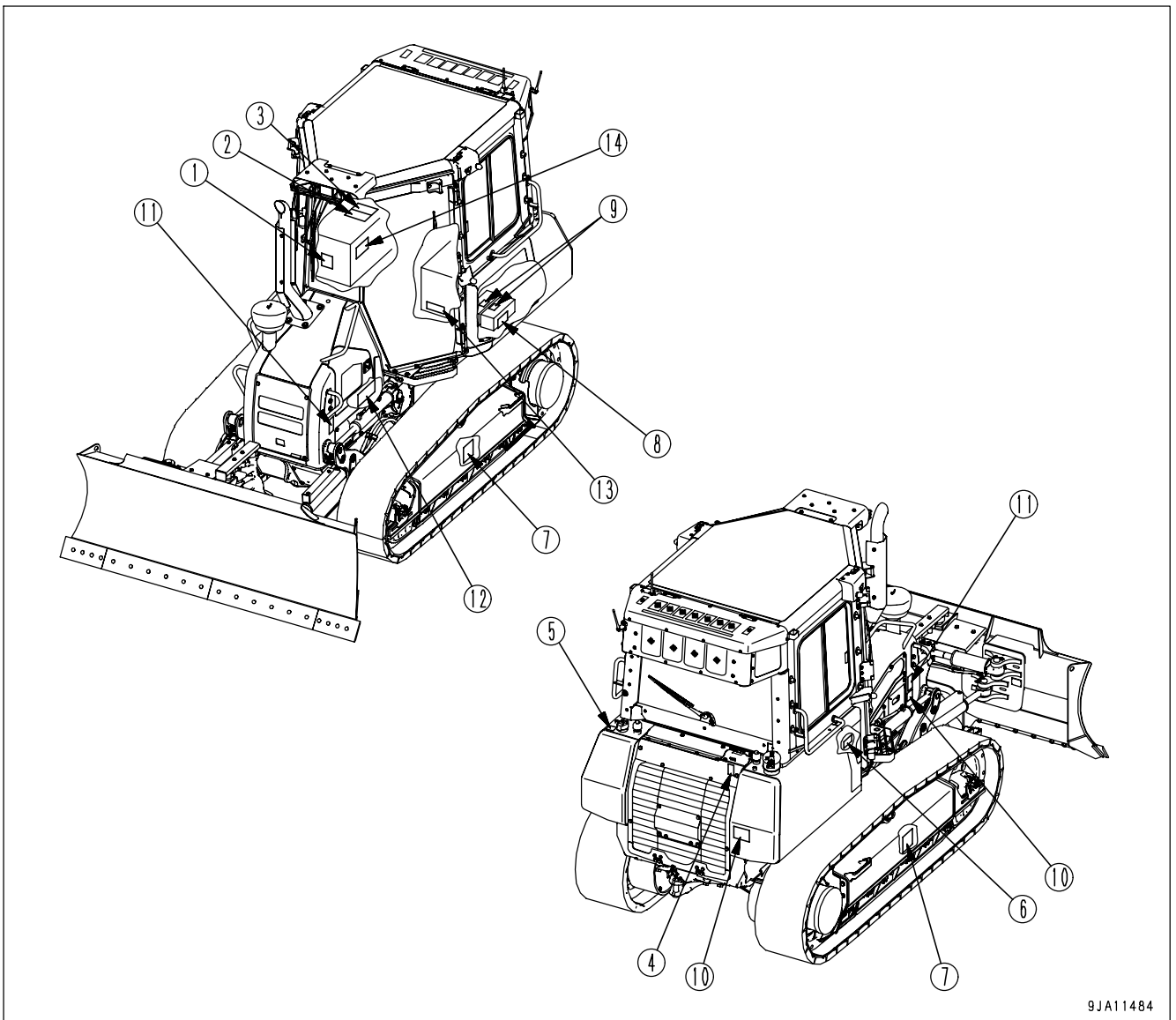
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SAFETY LABELS

The following warning signs and safety labels are used on this machine.

- Be sure that you fully understand the correct position and content of labels.
- To ensure that the content of labels can be read properly, be sure that they are in the correct place and always keep them clean. When cleaning them, do not use organic solvents or gasoline. These may cause the labels to peel off.
- There are also other labels in addition to the warning signs and safety labels. Handle those labels in the same way.
- If the labels are damaged, lost, or cannot be read properly, replace them with new ones. For details of the part numbers for the labels, see this manual or the actual label, and place an order with Komatsu distributor.

POSITIONS OF SAFETY PICTOGRAMS

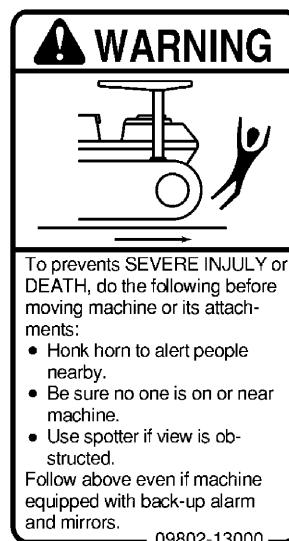


SAFETY LABELS

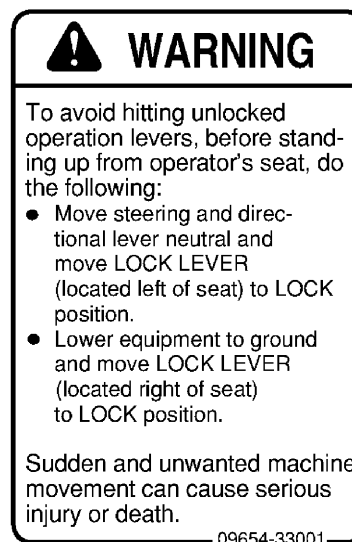
- (1) Caution before operating or maintaining machine
(09651-03001)



- (2) Caution before moving in reverse (09802-13000)



- (3) Caution for leaving operator's seat (09654-33001)



(4) Caution for high-temperature coolant (09668-03001)

	WARNING
Hot water hazard.	
To prevent hot water from spurting out:	
<ul style="list-style-type: none"> • Turn engine off. • Allow water to cool. • Slowly loosen cap to relieve pressure before removing. 	
<small>09668-03001</small>	



(5) Caution for high-temperature oil (09653-03001)

	WARNING
Hot oil hazard.	
To prevent hot oil from spurting out:	
<ul style="list-style-type: none"> • Turn engine off. • Allow oil to cool. • Slowly loosen cap to relieve pressure before removing. 	
<small>09653-03001</small>	

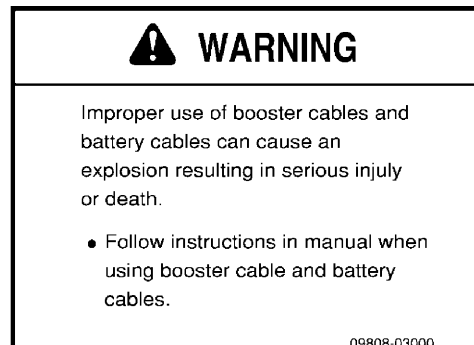
(6) Caution for accumulator (09659-53000)

	WARNING	Explosion hazard
		<ul style="list-style-type: none"> • Keep away from flame • Do not weld or drill
<small>09659-53000</small>		

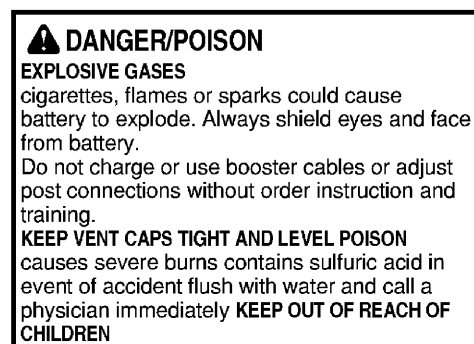
(7) Caution for adjusting track tension (09657-03003)
 The safety label is attached to the rear side of the track adjustment window cover.

	WARNING	
Compressed spring lubricator and grease are under hazardous high pressure and can cause serious injury or death.		
<ul style="list-style-type: none"> • When adjusting track tension, only turn lubricator ONE TURN, turning lubricator further could cause lubricator and grease to fly off and hurt you. See manual for adjustment instructions. • When loosening track shoe, if it does not loosen after turning lubricator ONE TURN, ask Komatsu dealer or distributor to disassemble. 		
<small>09657-03003</small>		

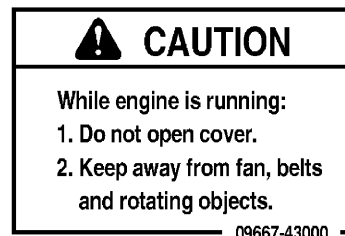
(8) Caution for battery cable (09808-03000)



(9) Caution when handling battery (09664-30011)



(10) Stopping rotation for inspection and maintenance
(09667-43000)



(11) Caution about going close when machine is moving
(11Y-98-31150)



(12) Prohibition of jump start (09842-A0481)



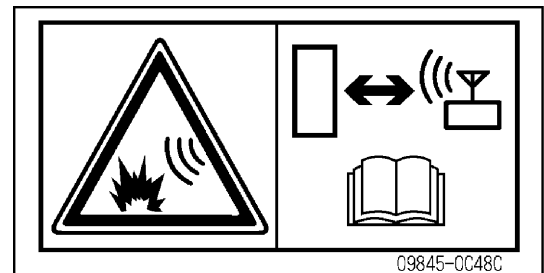
Start the engine only after sitting down in the operator's seat.

Do not attempt to start the engine by short-circuiting the engine starting circuit. Such an act may cause a serious bodily injury or fire.

(13) Caution for ROPS/FOPS (09620-A2000)

KOMATSU ROPS/FOPS CERTIFICATION			
This protective structure complies with the standard provided that it is properly equipped on the machine which mass is less than the specified maximum mass.			
MODEL	ROPS : ISO 3471/1994, SAE J150 3471 MAY'93	FOPS : ISO 3449/1992	FOPS LEVEL No. <input type="checkbox"/>
SERIAL No.	MAX. MASS		kg (Lb)
<p>WARNING</p> <ul style="list-style-type: none"> • If any modification is applied to the ROPS or FOPS, it may affect the strength and may not comply with the standard. Consult Komatsu Distributor before altering. • ROPS or FOPS may provide less protection if it has been structurally damaged or involved roll-over. Consult Komatsu Distributor in that case. • Always wear seat belt when moving. 			
Komatsu Ltd. 2-3-8 Akasaka, Minato-ku, Tokyo, Japan ©2020 A2000			

(14) Caution blast site (09845-00480)
(only when equipped with KOMTRAX)



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 a detonator.

GENERAL PRECAUTIONS COMMON TO OPERATION AND MAINTENANCE

Mistakes in operation, inspection, or maintenance may result in serious personal injury or death. Before carrying out operation, inspection, or maintenance, always read this manual and the safety labels on the machine carefully and obey the warnings.

PRECAUTIONS BEFORE STARTING OPERATION

ENSURING SAFE OPERATION

- Only trained and authorized personnel can operate and maintain the machine.
- Follow all safety, precautions, and instructions in this manual when operating or performing inspection or maintenance on the machine.
- If you are not feeling well, or if you are under the influence of alcohol or medication, your ability to safely operate or repair your machine may be severely impaired, putting yourself and everyone else on your job site in danger.
- When working with another operator or with the person on the worksite traffic duty, discuss the content of the operation beforehand and use the determined signals when carrying out the operation.

UNDERSTANDING THE MACHINE

Before operating the machine, read this manual thoroughly. If there are any places in this manual that you do not understand, ask the person in charge of safety to give an explanation.

PREPARATIONS FOR SAFE OPERATION

PRECAUTIONS REGARDING SAFETY-RELATED EQUIPMENT

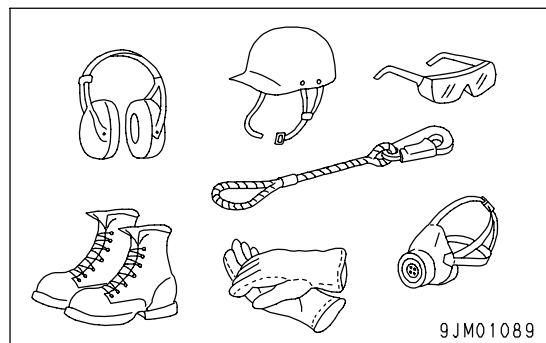
- Be sure that all guards, covers and mirrors are in their proper position. Have guards and covers repaired immediately if they are damaged.
- Understand the method of use of safety features and use them properly.
- Never remove any safety features. Always keep them in good operating condition.

INSPECTING MACHINE

Check the machine before starting operations. If any abnormality is found, do not operate the machine until repairs of the problem location have been completed.

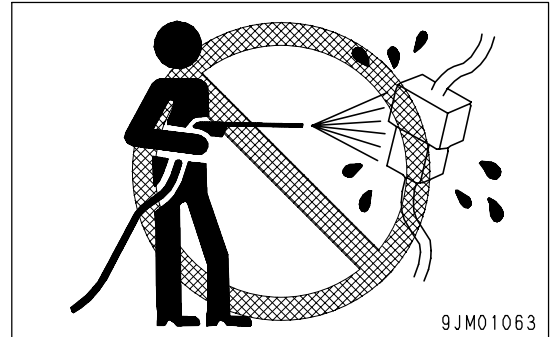
WEAR WELL-FITTING CLOTHES AND PROTECTIVE EQUIPMENT

- Do not wear loose clothes or any accessories. If these catch on the control levers or protruding parts, there is danger that it may cause the machine to move unexpectedly.
- Always wear a hard hat and safety shoes. If the nature of the work requires it, wear safety glasses, mask, gloves, ear plugs, and safety belt when operating or maintaining the machine.
- If you have long hair and it hangs out from your hard hat, there is a hazard that it may get caught up in the machine, so tie your hair up and be careful not to let it get caught.
- Check that all protective equipment functions properly before using it.



KEEP MACHINE CLEAN

- If you get on or off the machine or carry out inspection and maintenance when the machine is dirty with mud or oil, there is a hazard that you will slip and fall. Wipe off any mud or oil from the machine. Always keep the machine clean.
- If water gets into the electrical system, there is a hazard that it will cause malfunctions or misoperation. If there is any misoperation, there is danger that the machine may move unexpectedly and cause serious personal injury or death. When washing the machine with water or steam, do not allow the water or steam to come into direct contact with electrical components.

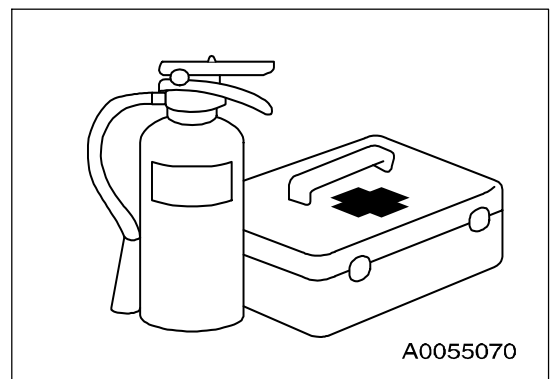
**PRECAUTIONS INSIDE OPERATOR'S COMPARTMENT**

- When entering the operator's compartment, always remove all mud and oil from the soles of your shoes. If you operate the pedal with mud or oil affixed to your shoes, your foot may slip and this may cause a serious accident.
- Do not leave tools or a machine parts lying around inside the operator's compartment. If tools or parts get into the control devices, it may obstruct operation and cause the machine to move unexpectedly, resulting in serious personal injury or death.
- Do not stick suction pads to the window glass. Suction pads act as a lens and may cause fire.
- Do not use a cell phone when driving or operating the machine. This may lead to mistakes in operation, which could cause serious personal injury or death.
- Never bring any dangerous objects such as flammable or explosive items into the operator's compartment.

PROVIDE FIRE EXTINGUISHER AND FIRST AID KIT

Always follow the precautions below to prepare for action if any injury or fire should occur.

- Be sure that fire extinguishers have been provided and read the labels to ensure that you know how to use them in emergencies.
- Carry out periodic inspection and maintenance to ensure that the fire extinguisher can always be used.
- Provide a first aid kit in the storage point. Carry out periodic checks and add to the contents if necessary.

**IF ANY PROBLEM IS FOUND**

If you find any problems in the machine during operation or maintenance (noise, vibration, smell, incorrect gauges, smoke, oil leakage, etc., or any abnormal display on the warning devices or monitor), report to the person in charge and have the necessary action taken. Do not operate the machine until the problem has been corrected.

FIRE PREVENTION

ACTION IF FIRE OCCURS

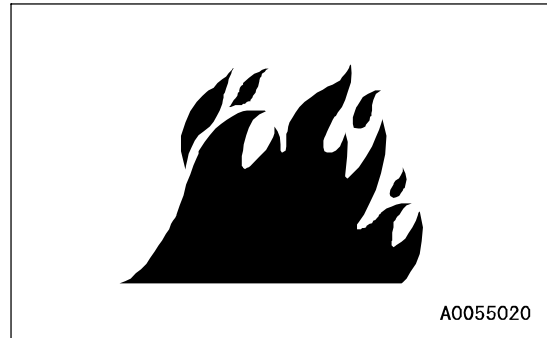
- Turn the start switch OFF to stop the engine.
- Use the handrails and steps to get off the machine.
- Do not jump off the machine. There is the danger of falling and suffering serious injury.

PRECAUTIONS TO PREVENT FIRE

• Fire caused by fuel, oil, COOLANT or window washer fluid

Do not bring any flame or fire close to flammable substances such as fuel, oil, COOLANT or window washer fluid. There is danger that they may catch fire. To prevent fire, always observe the following:

- Do not smoke or use any flame near fuel or other flammable substances.
- Stop the engine before adding fuel.
- Do not leave the machine when adding fuel or oil.
- Tighten all fuel and oil caps securely.
- Be careful not to spill fuel on overheated surfaces or on parts of the electrical system.
- After adding fuel or oil, wipe up any spilled fuel or oil.
- Put greasy rags and other flammable materials into a safe container to maintain safety at the workplace.
- When washing parts with oil, use a non-flammable oil. Do not use diesel oil or gasoline. There is danger that they may catch fire.
- Do not weld or use a cutting torch to cut any pipes or tubes that contain flammable liquids.
- Determine well-ventilated areas for storing oil and fuel. Keep the oil and fuel in the determined place and do not allow unauthorized persons to enter.
- When carrying out grinding or welding work on the machine, move any flammable materials to a safe place before starting.



• Fire caused by accumulation of flammable material.

Remove any dry leaves, chips, pieces of paper, coal dust, or any other flammable materials accumulated or affixed around the engine, exhaust manifold, muffler, or battery, or inside the undercovers.

• Fire coming from electric wiring

Short circuits in the electrical system can cause fire. To prevent fire, always observe the following.

- Keep all electric wiring connections clean and securely tightened.
- Check the wiring every day for looseness or damage. Tighten any loose connectors or wiring clamps. Repair or replace any damaged wiring.

• Fire coming from piping

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. There is danger that this may lead to damage to the hoses and cause high-pressure oil to spurt out, leading to fire, serious personal injury or death.

- **Explosion caused by lighting equipment**
 - When checking fuel, oil, battery electrolyte, or coolant, always use lighting with anti-explosion specifications.
 - When taking the electrical power for the lighting from the machine itself, follow the instructions in this manual.

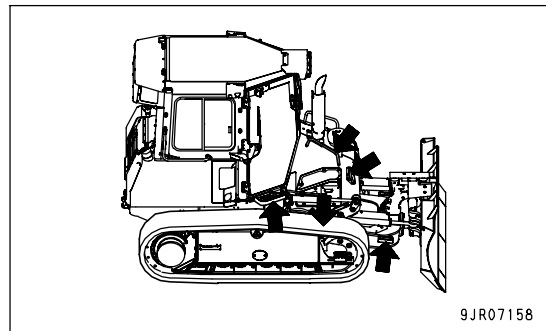
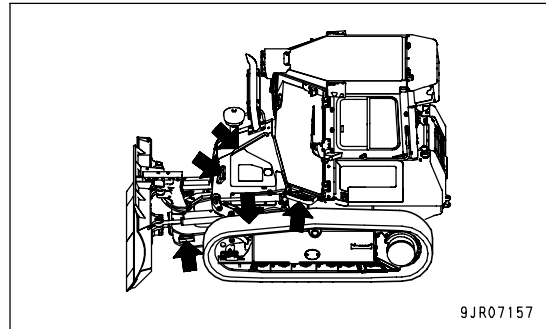
PRECAUTIONS WHEN GETTING ON OR OFF MACHINE

USE HANDRAILS AND STEPS WHEN GETTING ON OR OFF MACHINE

To prevent personal injury caused by slipping or falling off the machine, always do as follows.

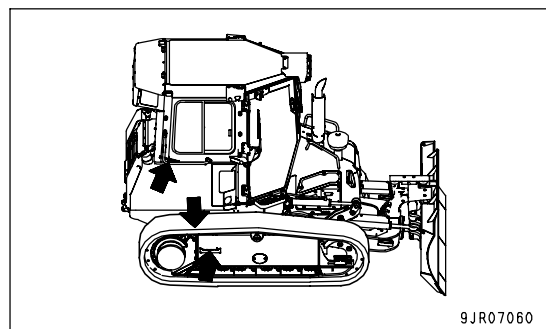
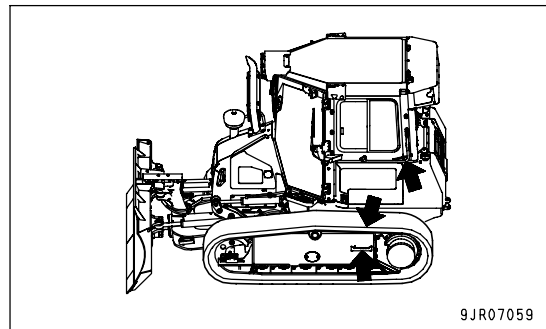
WHEN GETTING ON OR OFF FROM OPERATOR'S SEAT (D31EX, D31PX, D37EX, D37PX)

- Get on or off the operator's seat from the front of the machine and use the handrails and steps marked by the arrow in the diagram on the right.



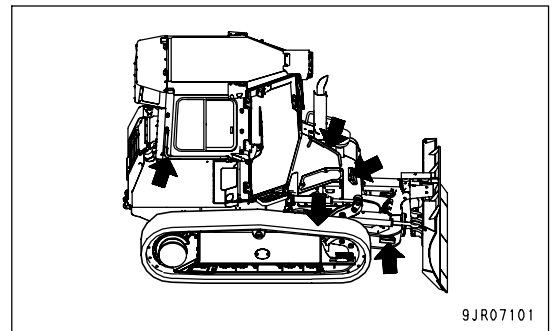
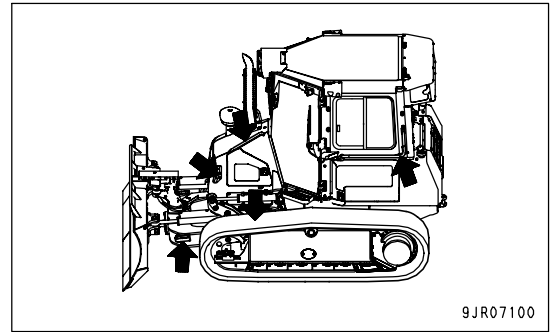
WHEN ADDING FUEL, COOLANT, HYDRAULIC OIL (D31EX, D37EX)

- Use the handrails and steps marked by arrows in the diagram on the right when adding fuel, coolant, or hydraulic oil, and get on or off from the side of the machine.

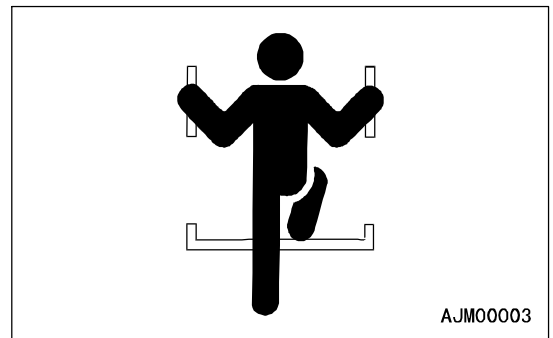


WHEN ADDING FUEL, COOLANT, HYDRAULIC OIL (D31PX, D37PX)

- Use the handrails and steps marked by arrows in the diagram on the right when adding fuel, coolant, or hydraulic oil, and get on or off from the front of the machine.



- Always face the machine and maintain at least three-point contact (both feet and one hand, or both hands and one foot) with the handrail and steps to ensure that you support yourself.



- Before getting on or off the machine, check the handrails and steps, and if there is any oil, grease, or mud on them, wipe it off immediately. In addition, repair any damage and tighten any loose bolts.
- Do not grip the control levers and work equipment lock lever when getting on or off the machine.
- Never climb on the engine hood or covers where there are no non-slip pads.
- Do not get on or off the machine while holding tools in your hand.

NO JUMPING ON OR OFF MACHINE

- Never jump on or off the machine. Never get on or off a moving machine.
- If the machine starts to move when there is no operator on the machine, do not jump on to the machine and try to stop it.

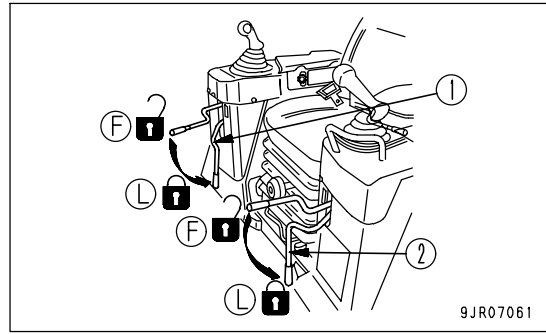
NO PEOPLE ON ATTACHMENTS

Never let anyone ride on the work equipment or other attachments. There is a hazard of falling and suffering serious personal injury or death.

PRECAUTIONS WHEN STANDING UP FROM OPERATOR'S SEAT

When standing up from the operator's seat to adjust the operator's seat, always lower the work equipment completely to the ground, set work equipment lock lever (1) and parking brake lever (2) to the LOCK position (L), and stop the engine.

If the control lever is touched by accident, there is danger that the machine may suddenly move and cause serious personal injury.

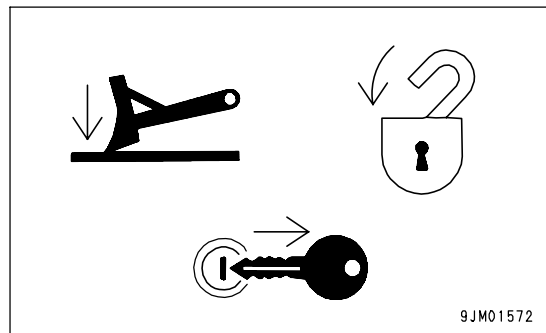
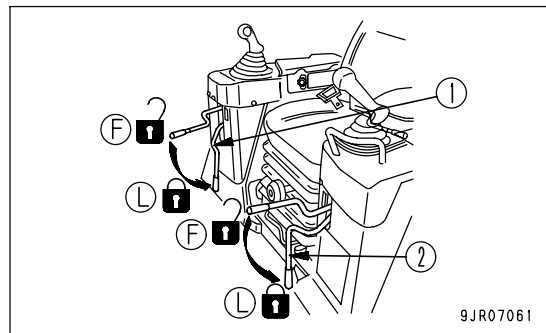


PRECAUTIONS WHEN LEAVING MACHINE

If the proper procedures are not taken when parking the machine, the machine may suddenly move off by itself, and this may lead to serious personal injury or death. Always do the following.

- When leaving the machine, always lower the work equipment completely to the ground, set work equipment lock lever (1) and parking brake lever (2) to the LOCK position (L), and stop the engine.

Always lock all parts, take the key with you and leave it in the specified place.



EMERGENCY EXIT FROM OPERATOR'S CAB

Machines equipped with a cab have doors on the left and right sides. If the door on the one side does not open, escape from the door on the other side.

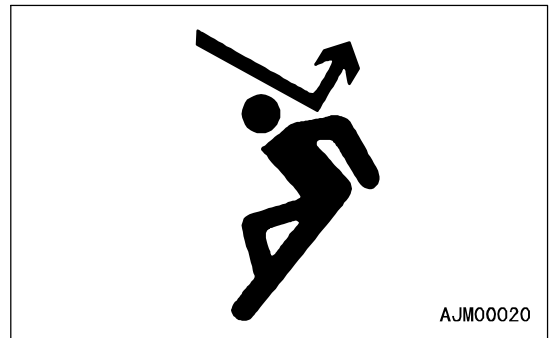
DO NOT GET CAUGHT IN WORK EQUIPMENT

The clearance in the area around the work equipment changes according to the movement of the link. If you get caught, you may suffer serious personal injury or death. Do not allow anyone to come close to any rotating or extending/retracting portion.

PRECAUTIONS RELATED TO PROTECTIVE STRUCTURES

The operator's compartment is equipped with a structure (such as ROPS, FOPS) to protect the operator by absorbing the impact energy. As for the machine equipped with ROPS, if the machine weight (mass) exceeds the certified value (shown on the ROLL-OVER PROTECTIVE STRUCTURE (ROPS) CERTIFICATION plate), ROPS will not be able to fulfill its function. Do not increase machine weight beyond the certified value by modifying the machine or by installing attachments to the machine. Also, if the function of the protective equipment is impeded, the protective equipment will not be able to protect the operator, and the operator may suffer injury or death. Always observe the following.

- If the machine is equipped with a protective structure, do not remove the protective structure and carry out operations without it.
- If the protective structure is welded, or holes are drilled in it, or it is modified in any other way, its strength may drop. Consult your Komatsu distributor before carrying out any modifications.
- If the protective structure is damaged or deformed by falling objects or by rolling over, its strength will be reduced and it will not be able to fulfill its function properly. In such cases, always contact your Komatsu distributor for advice on the method of repair.
- Even if the protective structure is installed, always fasten your seat belt properly when operating the machine. If you do not fasten your seatbelt properly, it cannot display its effect.



UNAUTHORIZED MODIFICATION

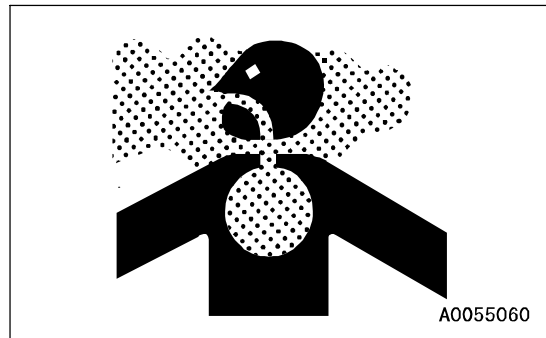
- Komatsu will not be responsible for any injuries, accidents, product failures or other property damages resulting from modifications made without authorization from Komatsu.
- Any modification made without authorization from Komatsu can create hazards. Before making a modification, consult your Komatsu distributor.

PRECAUTIONS RELATED TO ATTACHMENTS AND OPTIONS

- Any injuries, accidents, product failures or other property damages resulting from the use of unauthorized attachments or parts will not be the responsibility of Komatsu.
- When installing optional parts or attachments, there may be problems with safety or legal restrictions. Therefore contact your Komatsu distributor for advice.
- When installing and using optional attachments, read the instruction manual for the attachment, and the general information related to attachments in this manual.

PRECAUTIONS WHEN RUNNING ENGINE INSIDE BUILDING

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 under ground, where the ventilation is poor, take steps to ensure that the engine exhaust gas is removed and that ample fresh air is brought in.



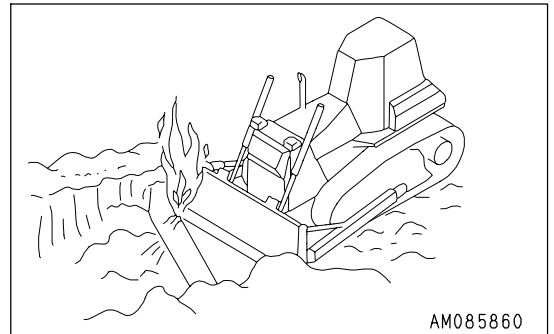
PRECAUTIONS FOR OPERATION

PRECAUTIONS FOR JOBSITE

INVESTIGATE AND CONFIRM JOBSITE CONDITIONS

On the jobsite, there are various hidden dangers that may lead to personal injury or death. Before starting operations, always check the following to confirm that there is no danger on the jobsite.

- When carrying out operations near combustible materials such as thatched roofs, dry leaves or dry grass, there is a hazard of fire, so be careful when operating.
- Check the terrain and condition of the ground at the worksite, 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 worksite, contact each utility and identify their locations. Be careful not to sever or damage any of these lines.
- Take necessary measures to prevent any unauthorized person from entering the operating area.
- In particular, if you need to operate on a road, protect pedestrian and cars by designating a person for worksite traffic duty or by installing fences around the worksite.
- When traveling or operating in water or on soft ground, check the water depth, speed of the current, bedrock, and shape of the ground beforehand and avoid any place that will obstruct travel.



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 should 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 after heavy rain or blasting or after earthquakes is weak in these areas.
- When working on embankments or near excavated ditches, there is a hazard that the weight and vibration of the machine will 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.

DO NOT GO CLOSE TO HIGH-VOLTAGE CABLES

Do not travel or operate the machine near electric cables. There is a hazard of electric shock, which may cause serious personal injury or death. On jobsites where the machine may go close to electric cables, always do as follows.

- Before starting work near electric cables, inform the local power company of the work to be performed, and ask them to take the necessary action.
- Even going close to high-voltage cables can cause electric shock, which may cause serious burns or even death. Always maintain a safe distance (see the table on the right) between the machine and the electric cable. Check with the local power company about safe operating procedure before starting operations.
- To prepare for any possible emergencies, wear rubber shoes and gloves. Lay a rubber sheet on top of the seat, and be careful not to touch the chassis with any exposed part of your body.
- Use a signalman to give warning if the machine approaches too close to the electric cables.
- When carrying out operations near high voltage cables, do not let anyone near the machine.
- If the machine should come too close or touch the electric cable, to prevent electric shock, the operator should not leave the operator’s compartment until it has been confirmed that the electricity has been shut off.
Also, do not let anyone near the machine.

Voltage of Cables	Safety Distance
100V - 200V	Over 2 m (7 ft)
6,600V	Over 2 m (7 ft)
22,000V	Over 3 m (10 ft)
66,000V	Over 4 m (14 ft)
154,000V	Over 5 m (17 ft)
187,000V	Over 6 m (20 ft)
275,000V	Over 7 m (23 ft)
500,000V	Over 11 m (36 ft)

ENSURE GOOD VISIBILITY

This machine is equipped with mirrors to ensure good visibility, but even then there are places that cannot be seen from the operator’s seat, so be careful when operating.

When traveling or carrying out operations in places with poor visibility, it is impossible to check for obstacles in the area around the machine and to check the condition of the jobsite. This leads to danger of serious personal injury or death. When traveling or carrying out operations in places with poor visibility, always observe the following.

- Position a signalman if there are areas where the visibility is not good.
- Only one signalman should give signals.
- When working in dark places, turn on the working lamp and front lamps installed to the machine, and set up additional lighting in the work area if necessary.
- Stop operations if the visibility is poor, such as in mist, snow, rain, or dust.
- When checking the mirrors installed to the machine, remove all dirt and adjust the angle of the mirror to ensure good visibility.

CHECKING SIGNS AND SIGNALMAN'S SIGNALS

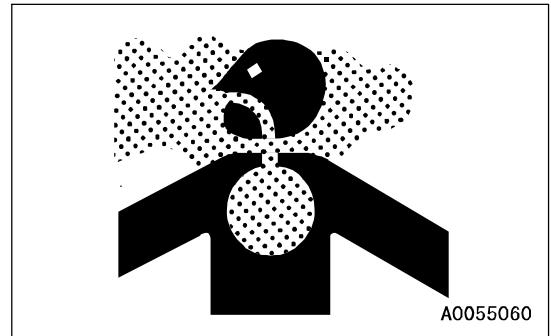
- Set up signs to inform of road shoulders and soft ground. If the visibility is not good, position a signalman if necessary. Operators should pay careful attention to the signs and follow the instructions from the signalman.
- Only one signalman should give signals.
- Make sure that all workers understand the meaning of all signals and signs before starting work.

BEWARE OF ASBESTOS DUST

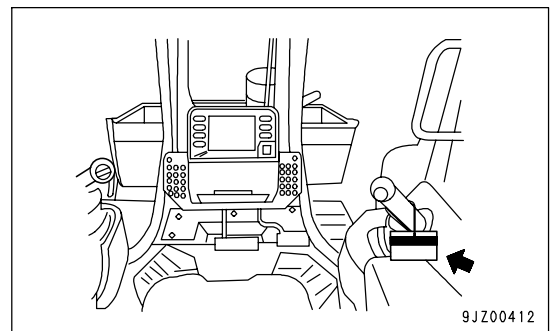
Asbestos dust in the air can cause lung cancer if it is inhaled. There is danger of inhaling asbestos when working on jobsites handling demolition work or work handling industrial waste. Always observe the following.

- Spray water to keep down the dust.
- Do not use compressed air.
- If there is danger that there may be asbestos dust in the air, always operate the machine from an upwind position, and make sure that all workers operate on the upwind side.
- All workers should use anti-dust masks.
- Do not allow other persons to approach during the operation.
- Always observe the rules and regulations for the work site and environmental standards.

This machine does not use asbestos, but there is a danger that imitation parts may contain asbestos, so always use genuine Komatsu parts.

**STARTING ENGINE****USE WARNING TAGS**

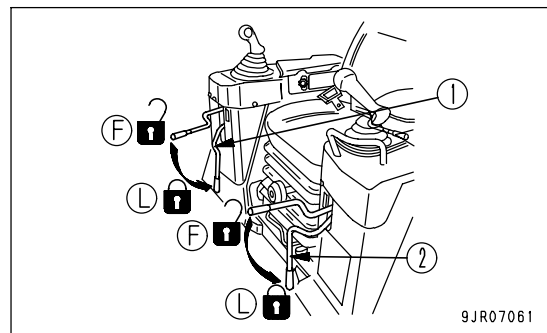
If there is any "DANGER! Do NOT operate!" warning tag displayed, it means that someone is carrying out inspection and maintenance of the machine. If the warning sign is ignored and the machine is operated, there is danger that the person carrying out inspection or maintenance may be caught in the rotating parts or moving parts and suffer serious personal injury or death. Do not start the engine or touch the levers.



CHECKS BEFORE STARTING ENGINE

Carry out the following checks before starting the engine at the beginning of the day's work to ensure that there is no problem with the operation of the machine. If this inspection is not carried out properly problems may occur with the operation of the machine, and there is danger that this may lead to serious personal injury or death.

- Remove all dirt from the surface of the window glass to ensure a good view.
- Be sure to carry out "WALK-AROUND CHECK (PAGE 3-64)".
- Remove all dirt from the surface of the lens of the front lamps and working lamps, and check that they light up correctly.
- Check the coolant level, fuel level, and oil level in engine oil pan, check for clogging of the air cleaner, and check for damage to the electric wiring.
- Check that there is no mud or dust accumulated around the movable parts of any pedals, and check that the pedals work properly.
- Adjust the operator's seat to a position where it is easy to carry out operations, and check that there is no damage or wear to the seat belt or mounting clamps.
- Check that the gauges work properly, check the angle of the mirror, and check that the control levers are all at the Neutral position.
- Before starting the engine, check that work equipment lock lever (1) and parking brake lever (2) are in LOCK position (L).
- Adjust the mirror so that the rear of the machine can be seen easily from the operator's seat.
For details of the adjustment procedure, see "ADJUST MIRROR (PAGE 3-81)".
- Check that there are no persons or obstacles above, below, or in the area around the machine.



PRECAUTIONS WHEN STARTING

- Start and operate the machine only while seated.
- When starting the engine, sound the horn as a warning.
- Do not allow anyone apart from the operator to ride on the machine.
- Do not attempt to start the engine by short-circuiting the engine starting circuit. This may cause fire, serious personal injury or death.

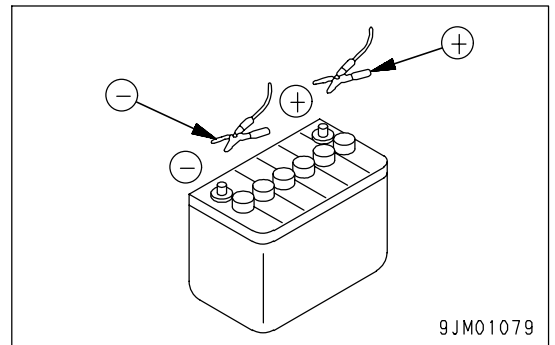
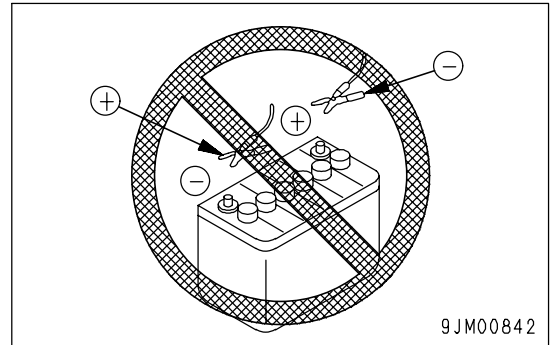
PRECAUTIONS IN COLD AREAS

- Carry out the warming-up operation thoroughly. If the machine is not thoroughly warmed up before the control levers are operated, the reaction of the machine will be slow, and this may lead to unexpected accidents.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source. There is a hazard that this will ignite the battery and cause the battery to explode.
Before charging or starting the engine with a different power source, melt the battery electrolyte and check that there is no leakage of electrolyte before starting.

STARTING WITH BOOSTER CABLES

If any mistake is made in the method of connecting the booster cables, it may cause the battery to explode, so always do as follows.

- Always wear safety goggles and rubber gloves when starting the engine with booster cable.
- When connecting a normal machine to a problem machine with booster cables, always use a normal machine with the same battery voltage as the problem machine.
- When starting with a booster cable, carry out the starting operation with two workers (one worker sitting in the operator's seat and the other working with the battery).
- When starting from another machine, do not allow the two machines to touch.
- When connecting the booster cables, turn the starting switch to the OFF position for both the normal machine and problem machine. There is a hazard that the machine will move when the power is connected.
- Be sure to connect the positive (+) cable first when installing the booster cables. Disconnect the negative (-) cable (ground side) first when removing them.
- When removing the booster cables, be careful not to let the booster cable clips touch each other or to let the clips touch the machine.
- For details of the starting procedure when using booster cables, see "STARTING ENGINE WITH BOOSTER CABLE (PAGE 3-127)" in the OPERATION section.



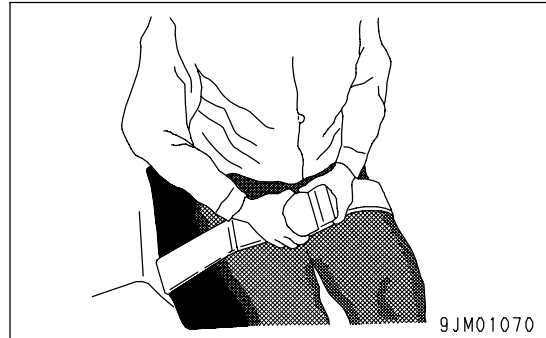
OPERATION

CHECKS BEFORE OPERATION

If the checks before starting are not carried out properly, the machine will be unable to display its full performance, and there is also danger that it may lead to serious personal injury or death.

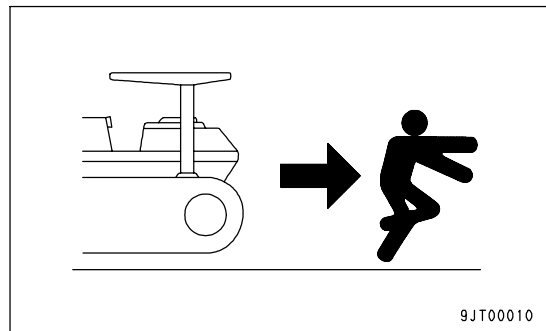
When carrying out the checks, move the machine to a wide area where there are no obstructions, and pay careful attention to the surrounding area. Do not allow anyone near the machine.

- Always wear the seatbelt. There is danger that you may be thrown out of the operator's seat and suffer serious injury when the brakes are applied suddenly.
- Check the operation of travel, steering and brake systems, and work equipment control system.
- Check for any problem in the sound of the machine, vibration, heat, smell, or gauges; check also that there is no leakage of oil or fuel.
- If any problem is found, carry out repairs immediately.



PRECAUTIONS WHEN TRAVELING IN FORWARD OR REVERSE

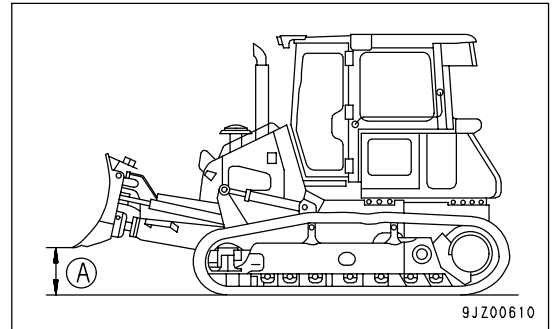
- Lock the cab door and windows securely, both when they are open and when they are closed.
- Do not allow anyone apart from the operator to ride on the machine.
- If there are any persons in the area around the machine, there is danger that they may be hit or caught by the machine, and this may lead to serious personal injury or death. Always observe the following before traveling.
 - Always operate the machine only when seated.
 - Before moving off, check again that there is no person or obstruction in the surrounding area.
 - Before moving, sound the horn to warn people in the surrounding area.
 - Check that the backup alarm (alarm buzzer when machine travels in reverse) works properly.
 - If there is an area to the rear of the machine which cannot be seen, position a signalman.



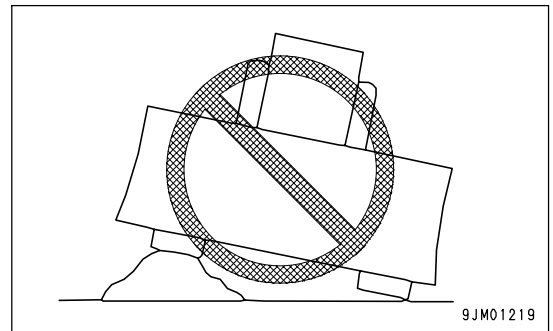
Always be sure to carry out the above precautions even when the machine is equipped with mirrors.

PRECAUTIONS WHEN TRAVELING

- Never turn the starting switch key to the OFF position when the machine is traveling. If the engine stops when the machine is traveling, it may become impossible to operate the steering, and this may cause serious personal injury or death. If the engine stops, depress the brake pedal immediately to stop the machine.
- When traveling or carrying out operations, always keep a safe distance from people, structures, or other machines to avoid coming into contact with them.
- When traveling the machine on a flat land, hold the work equipment at height (A) of 40 cm to 50 cm (16 in to 20 in) above the ground. If that height is not maintained between the work equipment and the ground, the work equipment may get stuck in the ground and tip over.



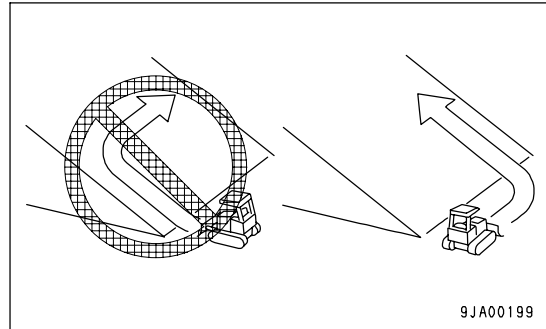
- Avoid traveling over obstacles when possible. If the machine has to travel over an obstacle, keep the work equipment close to the ground and travel at low speed. There is more danger of the machine tipping over to the left or right than tipping over to the front or rear, so do not travel over obstacles which make the machine tilt strongly to the left or right sides.
- When traveling on rough ground, travel at low speed and do not operate the steering suddenly. There is danger that the machine may turn over. The work equipment may hit the ground surface and cause the machine to lose its balance, or may damage the machine or structures in the area.
- When using the machine, to prevent personal injury caused by damage to the work equipment or by the machine overturning due to overloading, do not exceed the permitted performance of the machine or the maximum permitted load for the structure of the machine.
- When passing over bridges or structures, check first that the structure is strong enough to support the weight of the machine.
- When operating in tunnels, under bridges, under electric wires, or other places where the height is limited, operate slowly and be extremely careful not to let the machine body or work equipment hit anything.



TRAVELING ON SLOPES

To prevent the machine from tipping over or slipping to the side, always do as follows.

- Keep the work equipment approx. 20 to 30 cm (8 to 12 in) above the ground. In case of emergency, lower the work equipment to the ground immediately to help stop the machine.
- Always travel straight up or down a slope. Traveling at an angle or across the slope is extremely dangerous.
- 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 on grass, fallen leaves, or wet steel plates with low speed. Even with slight slopes there is a hazard that the machine may slip.
- When traveling downhill, never shift gear or place the transmission at neutral. It is dangerous not to use the braking force of the engine. Always place the transmission in a low gear before starting to travel downhill.
- Depress the brake or use the braking effect of the engine as necessary.



PRECAUTIONS WHEN OPERATING

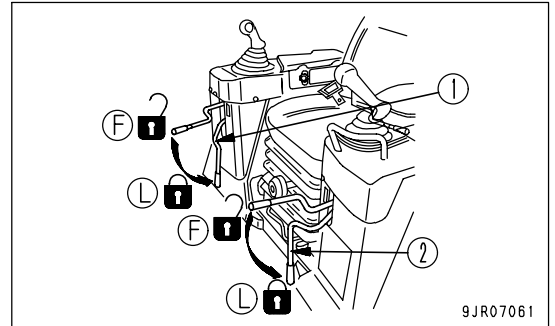
- When using the machine, to prevent personal injury caused by damage to the work equipment or by the machine overturning due to overloading, do not exceed the permitted performance of the machine or the maximum permitted load for the structure of the machine.
- Be careful not to approach too close to the edge of cliffs. When making embankments or 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 danger that the travel speed will suddenly increase, so be sure to reduce the speed.
- If the machine moves with only either side of the blade loaded, its tail may swing. Take care.

TRAVELING ON SNOW-COVERED OR FROZEN SURFACES

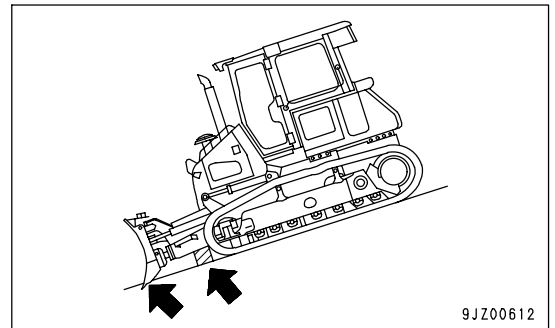
- Snow-covered or frozen surfaces are slippery, so be extremely careful when traveling or operating the machine, and do not operate the levers suddenly. Even a slight slope may cause the machine to slip, so be particularly careful when working on slopes.
- With frozen ground surfaces, the ground becomes soft when the temperature rises, and this may cause the machine to tip over or make it impossible for the machine to escape.
- If the machine enters deep snow, there is a hazard that it may tip over or become buried in the snow. Be careful not to leave the road shoulder or to get trapped in a snow drift.
- When clearing snow, the road shoulder and objects placed beside the road are buried in the snow and cannot be seen. There is a hazard of the machine tipping over or hitting covered objects, so always carry out operations carefully.
- When traveling on snow-covered slopes, never apply the foot brake suddenly. 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.

PARKING MACHINE

- Park the machine on firm, level ground.
- Select a place where there is no hazard of landslides, falling rocks, or flooding.
- Lower the work equipment completely to the ground.
- When leaving the machine, set work equipment lock lever (1) to the LOCK position and parking brake lever (2) to the LOCK position (L), and stop the engine.
- Always close the operator's cab door, and use the key to lock all the equipment in order to prevent any unauthorized person from moving the machine. Always remove the key, take it with you, and leave it in the specified place.



- If it is necessary to park the machine on a slope, always do as follows.
 - Set the work equipment on the downhill side and dig it into the ground.
 - In addition, put blocks under the tracks to prevent the machine from moving.



TRANSPORTATION

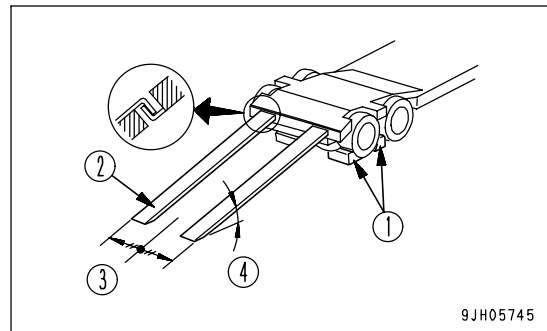
When the machine is transported on a trailer, there is danger of serious personal injury or death during transportation. Always do as follows.

- Always check the machine dimensions carefully. Depending on the work equipment installed, the machine weight, transportation height, and overall length may differ.
- Check beforehand that all bridges and other structures on the transportation route are strong enough to withstand the combined weight of the transporter and the machine being transported.
- The machine can be divided into parts for transportation, so when transporting the machine, please contact your Komatsu distributor to have the work carried out.

LOADING AND UNLOADING

When loading or unloading the machine, mistaken operation may bring the hazard of the machine tipping over or falling, so particular care is necessary. Always do as follows.

- Perform loading and unloading on firm, level ground only. Maintain a safe distance from the edge of the road or cliff.
 - Always use ramps of adequate strength. Be sure that the ramps are wide, long, and thick enough to provide a safe loading slope. Take suitable steps to prevent the ramps from moving out of position or coming off.
 - Be sure the ramp surface is clean and free of grease, oil, ice and loose materials. Remove dirt from machine-tracks. On a rainy day, in particular, be extremely careful since the ramp surface is slippery.
 - Run the engine at low idling and drive the machine slowly at low speed.
 - When on the ramps, do not operate any lever except for the travel lever.
 - Never correct your steering on the ramps. If necessary, drive off the ramps, correct the direction, then enter the ramps again.
 - The center of gravity of the machine will change suddenly at the joint between the ramps and the track or trailer, and there is danger of the machine losing its balance. Travel slowly over this point.
 - When loading or unloading to an embankment or platform, make sure that it has suitable width, strength, and grade.
 - For machines equipped with a cab, always lock the door after boarding the machine. If this is not done, the door may suddenly open during transportation.
- Refer to "TRANSPORTATION (PAGE 3-114)".



(1) Blocks
 (2) Ramp
 (3) Centerline of trailer
 (4) Angle of ramps: Max. 15°

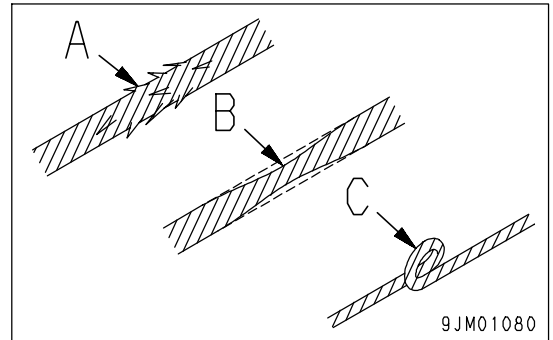
TOWING

PRECAUTIONS WHEN TOWING

Always use the correct towing equipment and towing method. Any mistake in the selection of the wire rope or towing bar or in the method of towing a disabled machine may lead to serious personal injury or death.

For details of the procedure for towing, see the "METHOD OF TOWING MACHINE (PAGE 3-123)"

- Always confirm that the wire rope or drawbar used for towing has ample strength for the weight of the machine being towed.
- 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.

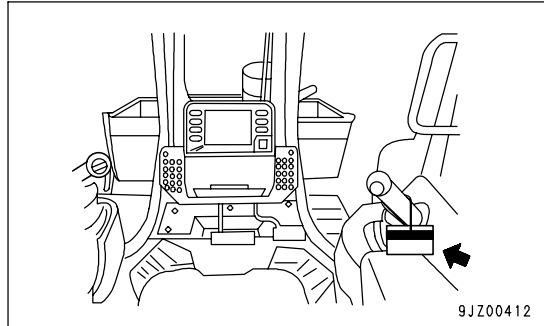


PRECAUTIONS FOR MAINTENANCE

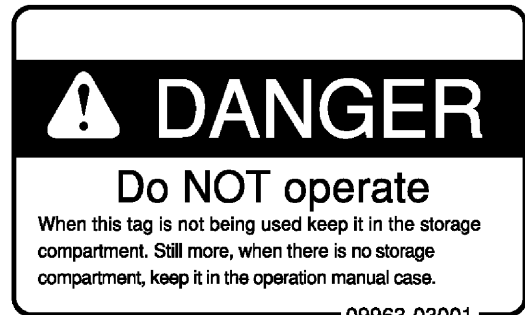
PRECAUTIONS BEFORE STARTING INSPECTION AND MAINTENANCE

DISPLAY WARNING TAG DURING INSPECTION AND MAINTENANCE

Always display the "DANGER! Do NOT operate" warning tag during the inspection and maintenance. If there is any "DANGER! Do NOT operate!" warning tag displayed, it means that someone is carrying out inspection and maintenance of the machine. If the warning sign is ignored and the machine is operated, there is danger that the person carrying out inspection or maintenance may be caught in the rotating parts or moving parts and suffer serious personal injury or death. Do not start the engine or touch the levers.



- If necessary, put up signs around the machine also.
Warning tag part number: 09963-03001
When not using this warning tag, keep it in the toolbox.
If there is no toolbox, keep it in the pocket for the Operation and Maintenance Manual



KEEP WORKPLACE CLEAN AND TIDY

Do not leave hammers or other tools lying around in the work place. Wipe up all grease, oil, or other substances that will cause you to slip. Always keep the work place clean the tidy to enable you to carry out operations safely. If the work place is not kept clean and tidy, there is the danger that you will trip, slip, or fall over and injure yourself.

SELECT SUITABLE PLACE FOR INSPECTION AND MAINTENANCE

- Stop the machine on firm, level ground.
- Select a place where there is no hazard of landslides, falling rocks, or flooding.

ONLY AUTHORIZED PERSONNEL

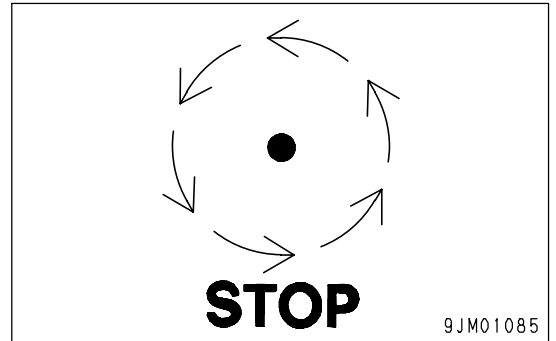
Do not allow any unauthorized personnel into the area when servicing the machine. If necessary, employ a guard.

APPOINT LEADER WHEN WORKING WITH OTHERS

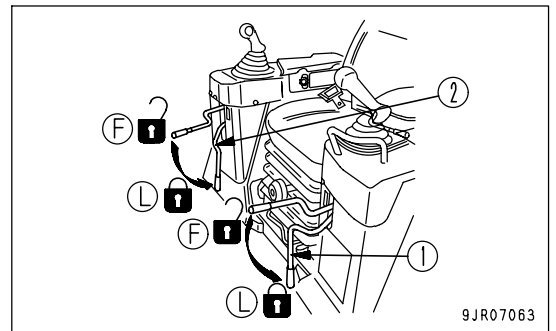
When repairing the machine or when removing and installing the work equipment, appoint a leader and follow his instructions during the operation.

STOP ENGINE BEFORE CARRYING OUT INSPECTION AND MAINTENANCE

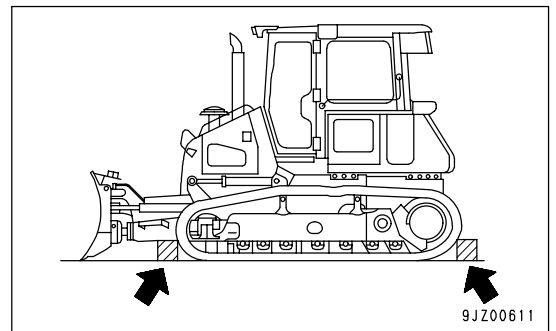
- Lower the work equipment completely to the ground and stop the engine before performing any inspection and maintenance.



- Turn the starting switch to the ON position, operate the work equipment control lever to the RAISE and LOWER position 2 or 3 times repeatedly to release the remaining pressure in the hydraulic circuit, then set parking brake lever (1) and work equipment lock lever (2) to the LOCK position (L).



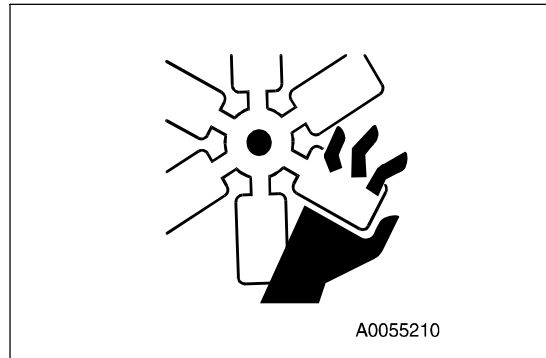
- Put blocks under the track to prevent the machine from moving.



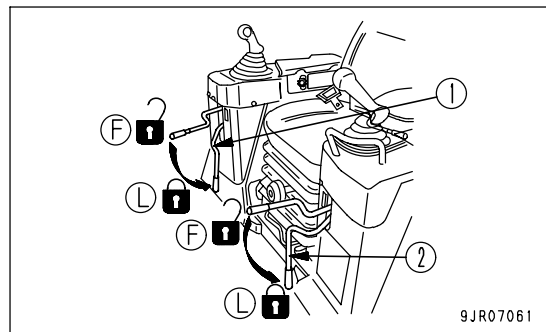
TWO WORKERS FOR MAINTENANCE WHEN ENGINE IS RUNNING

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 do as follows.

- One worker must always sit in the operator’s seat and be ready to stop the engine at any time. All workers must maintain contact with the other workers.
- When carrying out operations near the fan, fan belt, or other rotating parts, there is a hazard of being caught in the parts, so be careful not to come close.
- Never drop or insert tools or other objects into the fan, fan belt, or other rotating parts. There is danger that they may contact the rotating parts and break or be sent flying.



- Set work equipment lock lever (1) and parking brake lever (2) to the LOCK position (L) to prevent the work equipment from moving.
- Do not touch any control levers. If any control lever must be operated, give a signal to the other workers to warn them to move to a safe place.



INSTALLING, REMOVING, OR STORING ATTACHMENTS

- Appoint a leader before starting removal or installation operations for attachments.
- Place attachments that have been removed from the machine in a stable condition so that they do not fall. And take steps to prevent unauthorized persons from entering the storage area.

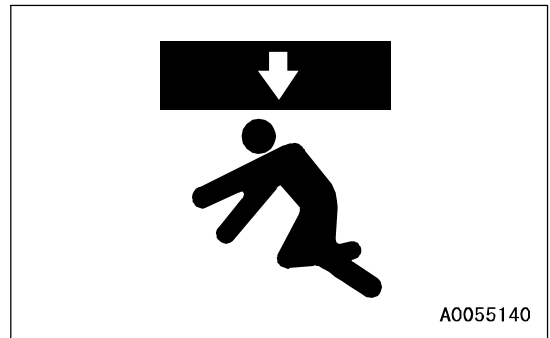


PRECAUTIONS WHEN WORKING AT HIGH PLACES

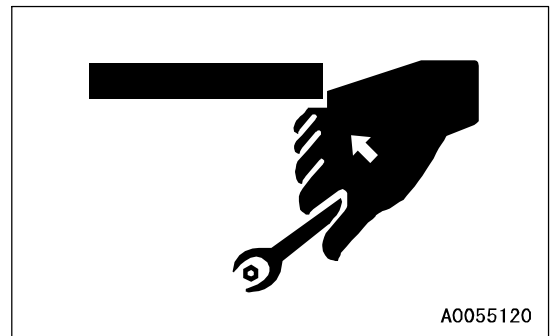
When working at high places, use a step ladder or other stand to ensure that the work can be carried out safely.

PRECAUTIONS WHEN WORKING UNDER MACHINE OR WORK EQUIPMENT

- Make sure the hoists or jacks you use are in good repair and strong enough to handle the weight of the component. Never use jacks at places where the machine is damaged, bent, or twisted. Never use frayed, twisted or pinched wire rope. Never use bent or distorted hooks.
- It is extremely dangerous to work under the machine if the track shoes are lifted off the ground and the machine is supported only with the work equipment. If any of the control levers is touched by accident, or there is damage occurring to the hydraulic piping, the work equipment or the machine will suddenly drop. This is extremely dangerous. Never work under the work equipment or the machine.
- If it is necessary to raise the work equipment or the machine and then go under it to carry out inspection or maintenance, support the work equipment and machine securely with blocks and stands strong enough to support the weight of the work equipment and machine.
If the work equipment and machine are not supported, there is a hazard that they may come down and that this may lead to serious personal injury or death.
- Never use concrete blocks for supports. They can collapse under even light loads.

**PROPER TOOLS**

Use only tools suited to the task and be sure to use the tools correctly. Using damaged, deformed, or low quality tools, or making improper use of the tools may cause serious personal injury.



PRECAUTIONS FOR INSPECTION AND MAINTENANCE

PRECAUTIONS WHEN WELDING

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, so never allow any unqualified personnel to carry out welding.

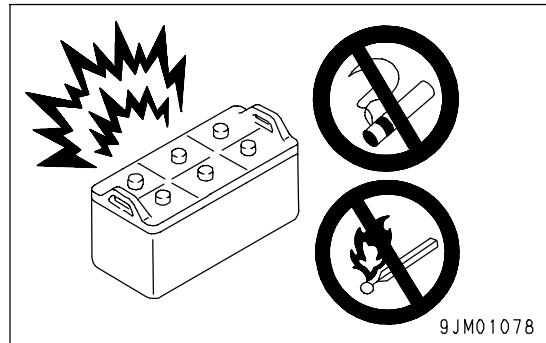
HANDLING BATTERY

Before inspecting or handling the battery, turn the key in the starting switch to the OFF position.

- **Danger of battery exploding**

When the battery is being charged, flammable hydrogen gas is generated and may explode. In addition, the battery electrolyte includes dilute sulphuric acid. Any mistake in handling may cause serious personal injury, explosion, or fire, so always observe the following.

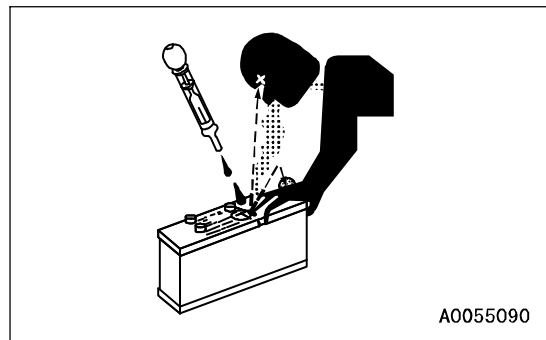
- Do not use or charge the battery if the battery electrolyte is below the LOWER LEVEL mark. This will cause explosion. Always carry out periodic inspection of the battery electrolyte level, and add distilled water (or commercially available battery filler solution) to the UPPER LEVEL mark.
- Do not smoke or bring any flame close to the battery.
- Hydrogen gas is generated when the battery is being charged, so remove the battery from the machine, take it to a well-ventilated place, remove the battery caps, then carry out the charging.
- After charging, tighten the battery caps securely.



- **Danger from dilute sulphuric acid**

When the battery is being charged, flammable hydrogen gas is generated and may explode. In addition, the battery electrolyte includes dilute sulphuric acid. Any mistake in handling may cause serious personal injury, explosion, or fire, so always observe the following.

- When handling the battery, always wear protective goggles and rubber gloves.
- If battery electrolyte gets into your eyes, immediately wash your eyes with large amounts of fresh water. After that, get medical attention immediately.
- If battery electrolyte gets on your clothes or skin, wash it off immediately with large amounts of water.



- **Removing battery cables**

Before repairing the electrical system or carrying out electric welding, turn the starting switch OFF. Wait for approx. 1 minute, then remove the negative (-) battery cable to stop the flow of electricity.

- **Danger of sparks**

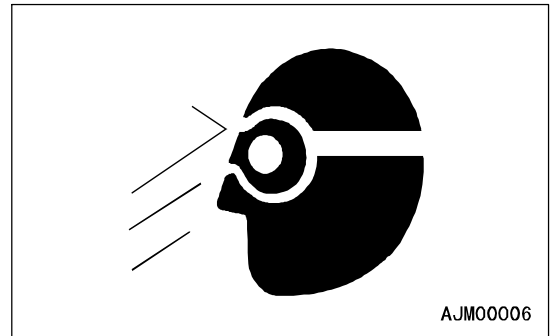
There is hazard that sparks will be generated, so always observe the following.

- Do not let tools or other metal objects make any contact between the battery cables. Do not leave tools lying around near the battery.
- When removing the battery cables, remove the ground cable (negative (-) cable) first. When installing, connect the positive (+) cable first, then connect the ground. Tighten the battery cable terminals securely.
- Secure the battery firmly in the specified position.

PRECAUTIONS WHEN USING HAMMER

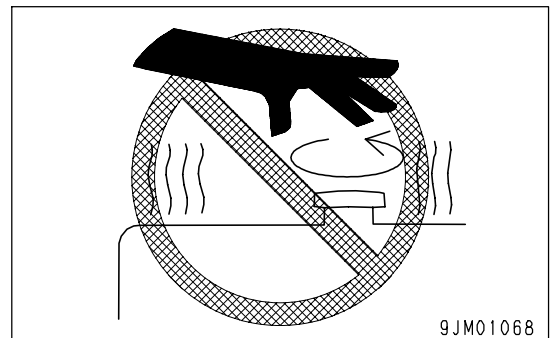
When using a hammer, pins may fly out or metal particles may be scattered. This may lead to serious personal injury or death. Always do as follows.

- 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 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 surrounding area.



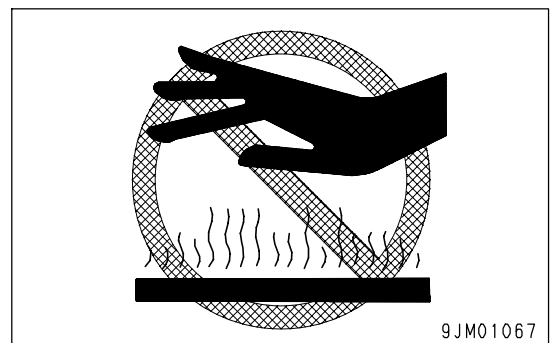
PRECAUTIONS WITH HIGH-TEMPERATURE COOLANT

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. Then loosen the cap slowly to release the pressure inside the radiator, and remove the cap.



PRECAUTIONS WITH 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. Then loosen the cap or plug slowly to release the internal pressure and remove the cap or plug.



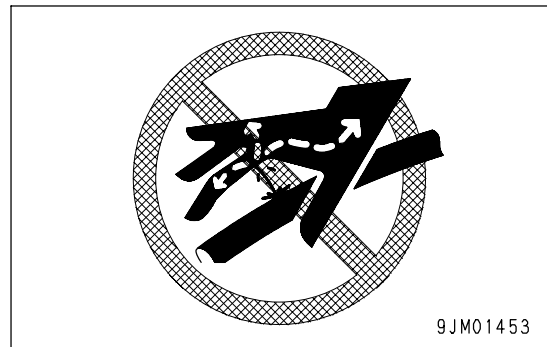
PRECAUTIONS WITH HIGH-PRESSURE OIL

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 as follows.

- Do not carry out inspection or replacement operations when the system is still under pressure.
For details of the procedure for releasing the pressure, see "PROCEDURE FOR BLEEDING AIR IN HYDRAULIC SYSTEM (PAGE 4-46)".
- If there is any leakage from the piping or hoses, the surrounding area will be wet, so check for cracks in the piping and hoses and for swelling in the hoses.

When carry 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.

**PRECAUTIONS WITH HIGH-PRESSURE FUEL**

When the engine is running, high-pressure is generated in the engine fuel piping. When carrying out inspection or maintenance of the fuel piping system, stop the engine and wait for at least 30 seconds to allow the internal pressure to go down before starting the operation.

HANDLING HIGH-PRESSURE HOSES AND PIPING

- If oil or fuel leaks from high-pressure hoses or piping, it may cause fire or misoperation, and lead to serious personal injury, or death. If the hose or piping mounts are loose or oil or fuel is found to be leaking from the mount, stop operations and tighten to the specified torque.

If any damaged or deformed hoses or piping are found, please consult your Komatsu distributor.

Replace the hose if any of the following problems are found.

- Damaged hose or deformed 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.

NOISE

When carrying out maintenance of the engine and you are exposed to noise for long periods of time, wear ear covers or ear plugs while working.

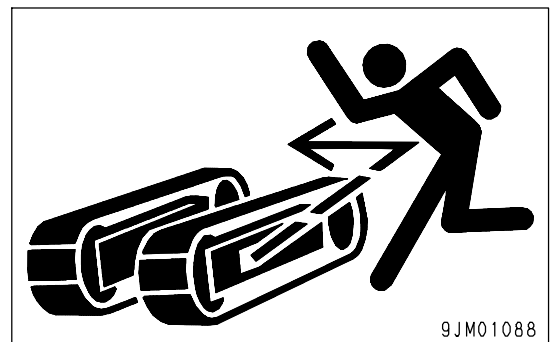
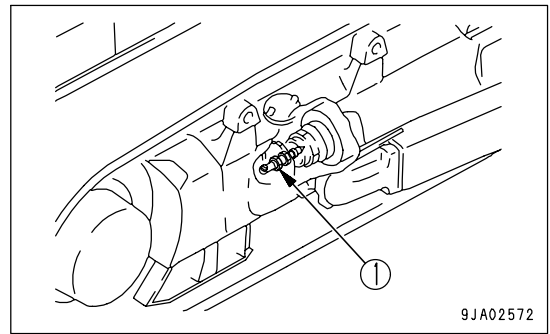
If the noise from the machine is too loud, it may cause temporary or permanent hearing problems.

PRECAUTIONS WITH HIGH-PRESSURE GREASE WHEN ADJUSTING TRACK TENSION

- Grease is pumped into the track tension adjustment system under high pressure.

If the specified procedure for maintenance is not followed when making adjustment, grease drain plug (1) may fly out and cause serious injury or property damage.

- When loosening grease drain plug (1) to loosen the track tension, never loosen it more than one turn. Loosen the grease drain plug slowly.
- Never put your face, hands, feet, or any other part of your body close to grease drain plug (1).

**DO NOT DISASSEMBLE RECOIL SPRING**

Never disassemble the recoil spring assembly. The recoil spring assembly has a powerful spring that acts to reduce the impact on the idler. If it is disassembled by mistake, the spring may shoot out and cause serious personal injury or death.

It is necessary to disassemble the recoil spring assembly, always ask your Komatsu distributor to carry out the operation.

HANDLING ACCUMULATOR AND GAS SPRING

This machine is equipped with an accumulator. Even after the engine stops, if the work equipment control lever is operated soon after stop of the engine in the direction to lower the work equipment, the work equipment goes down under its own weight.

After stopping the engine, set the parking brake lever and the work equipment lock lever to the LOCK position. 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 bring it near flame or dispose of it in fire.
- Do not make holes in it, weld it, or use a cutting torch.
- Do not hit or roll the accumulator, or subject it to any impact.
- When disposing of the accumulator, the gas must be released. Please contact your Komatsu distributor to have this work performed.



PRECAUTIONS WITH 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 the filter element or radiator, wear safety glasses, anti-dust mask, gloves, and other protective equipment.

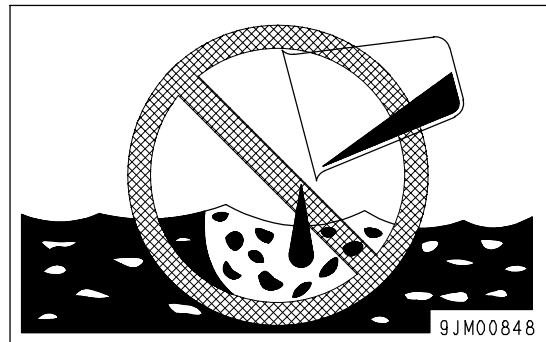
MAINTENANCE OF AIR CONDITIONER

- If air conditioner refrigerant gets into your eyes, it may cause loss of sight; if it contacts your skin, it may cause frostbite. Never loosen any parts of the cooling circuit.

DISPOSING OF WASTE MATERIALS

To prevent pollution, pay careful attention to the method of disposing of waste materials.

- Always put oil drained from your machine in containers. Never drain oil directly onto the ground or dump into the sewage system, rivers, the sea, or lakes.
- Obey appropriate laws and regulations when disposing of harmful objects such as oil, fuel, coolant, solvent, filters, and batteries.

**METHOD OF SELECTING WINDOW WASHER FLUID**

Use an ethyl alcohol base washer liquid.

Methyl alcohol base washer liquid may irritate your eyes, so do not use it.

PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS

- To enable this machine to be used safely for a long period, always carry out periodic replacement of safety critical parts that have a particularly close relation to safety, such as hoses and the seatbelt.
For details of the replacement of safety critical parts, see "PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS (PAGE 4-17)".
- The material of these components naturally changes over time, and repeated use causes deterioration, wear, and fatigue. As a result, there is a hazard that these components may fail and cause serious personal injury or death. It is difficult to judge the remaining life of these components from external inspection or the feeling when operating, so always replace them at the specified interval.
- Replace or repair safety-critical parts if any defect is found, even when they have not reached the specified replacement time.

OPERATION

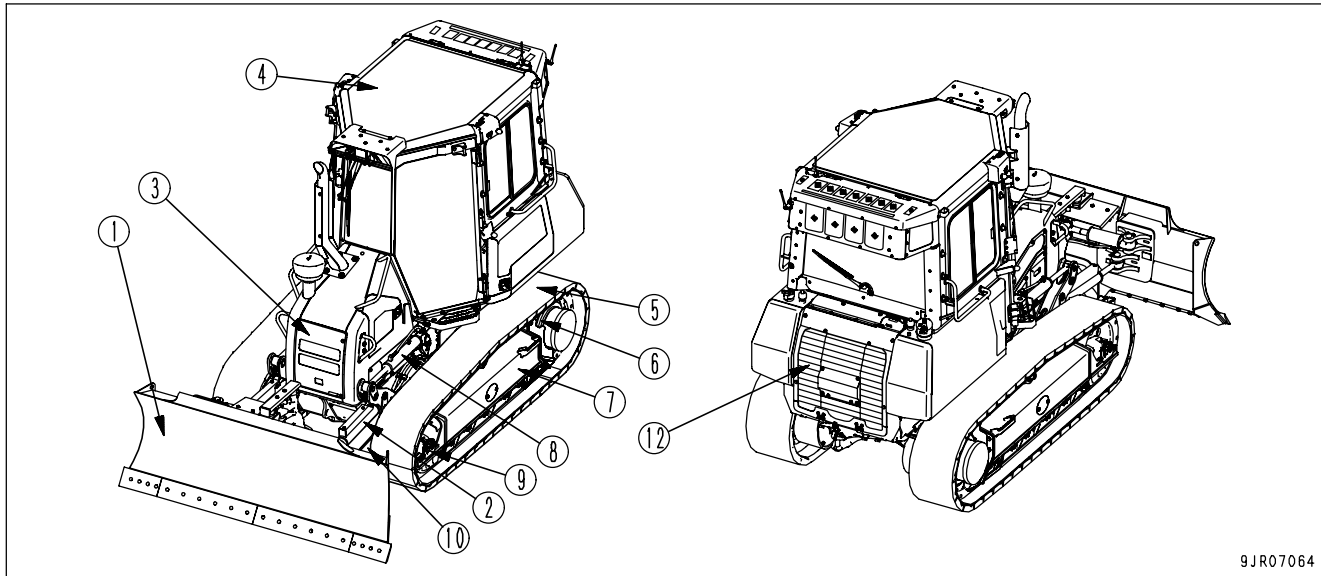
WARNING

Please read and make sure that you understand the SAFETY section before reading this section.

GENERAL VIEW

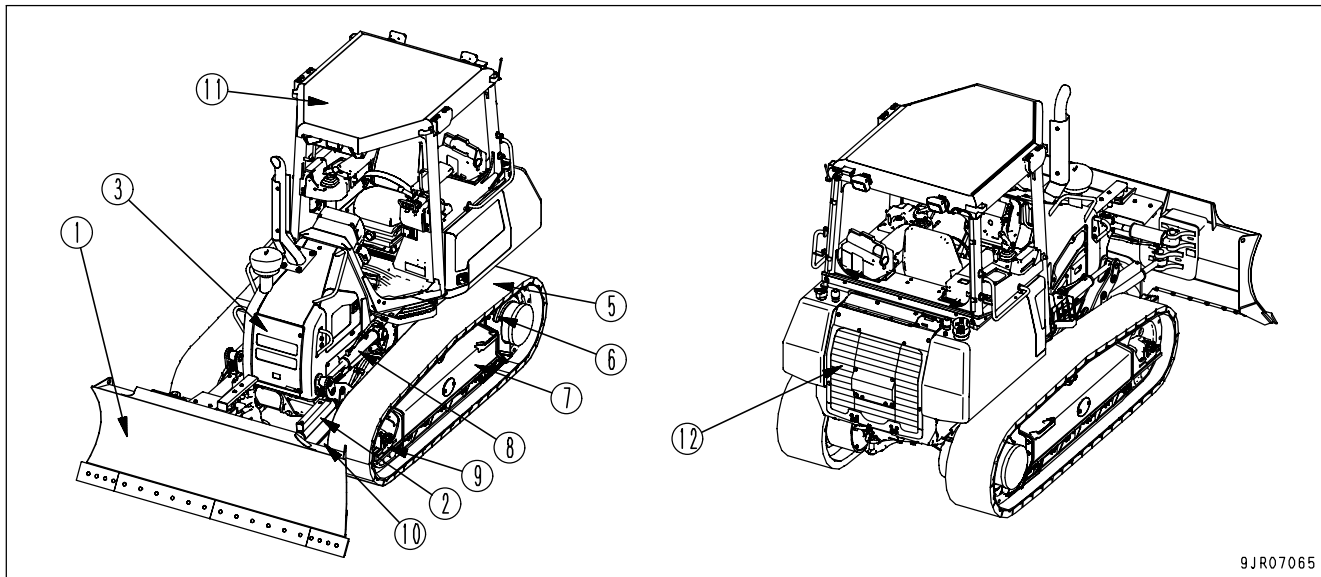
GENERAL VIEW OF MACHINE

Machine equipped with ROPS cab



9JR07064

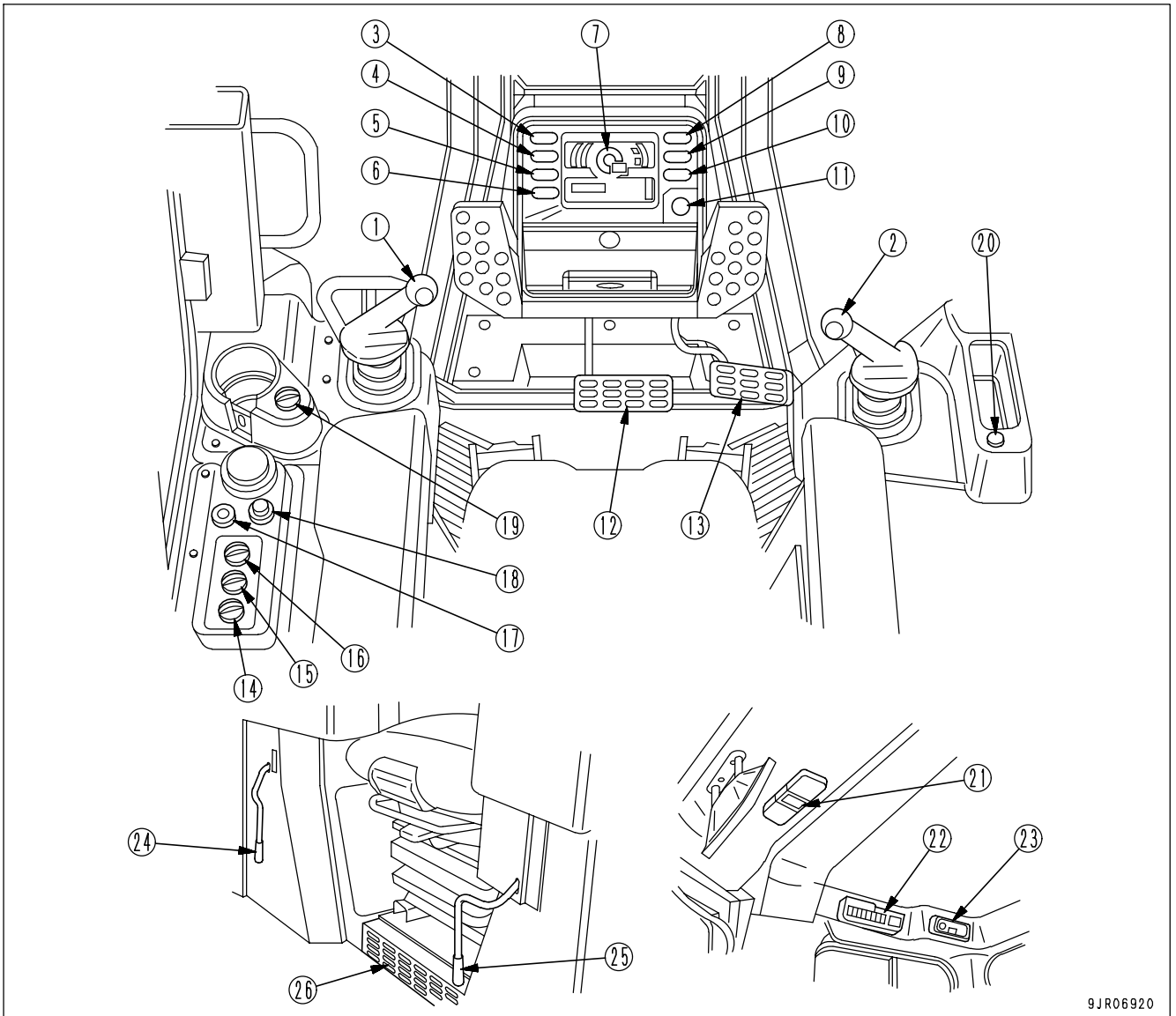
Machine equipped with ROPS canopy



9JR07065

- | | |
|---------------------|---------------------------|
| (1) Blade | (7) Track frame |
| (2) Angle cylinder | (8) Lift cylinder |
| (3) Front cover | (9) Idler |
| (4) Cab (with ROPS) | (10) Work equipment frame |
| (5) Track shoe | (11) ROPS canopy |
| (6) Sprocket | (12) Rear mask |

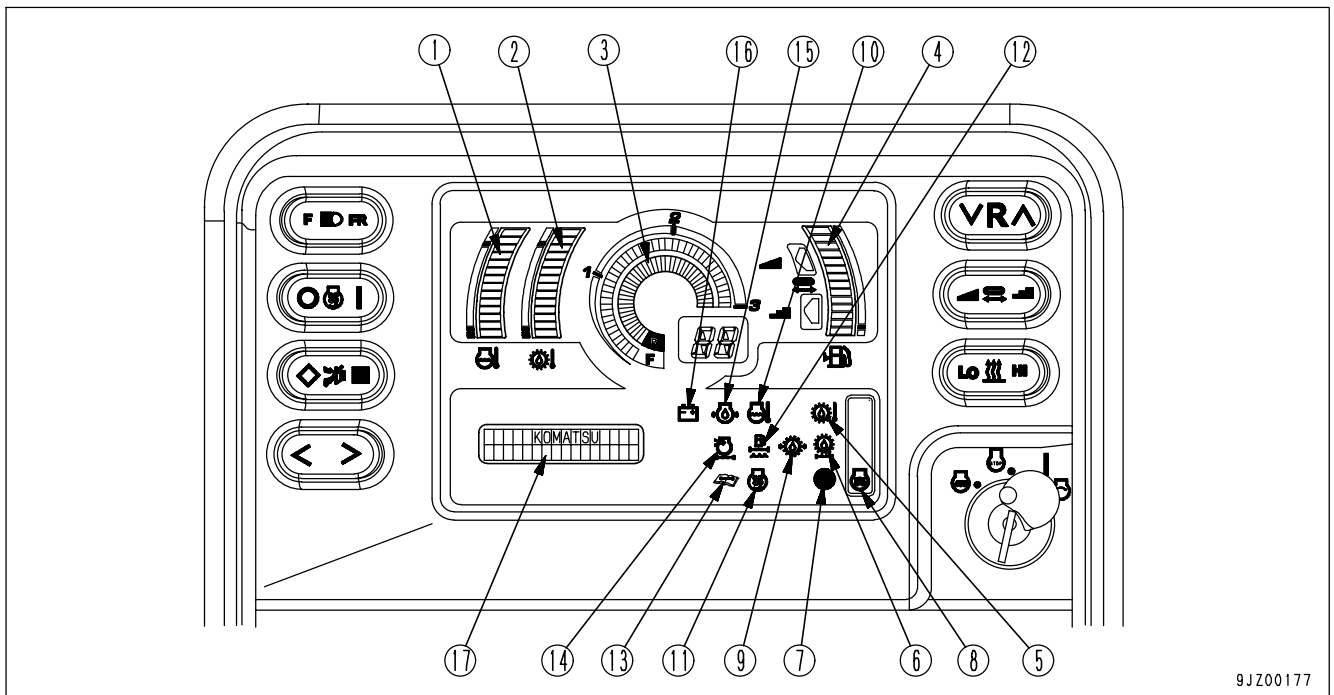
GENERAL VIEW OF CONTROLS AND GAUGES



9JR06920

-
- | | |
|--|---|
| (1) Steering, forward-reverse, gear shift lever | (15) Blower selector switch
(machines equipped with cab) |
| (2) Blade control lever | (16) Temperature control switch
(machines equipped with cab) |
| (3) Lamp switch | (17) Accessory socket (machines equipped with cab)
(if equipped) |
| (4) Fan operation confirmation switch | (18) Cigarette lighter (machines equipped with cab) |
| (5) Buzzer cancel switch | (19) Fuel control dial |
| (6) Information switch | (20) Horn switch |
| (7) Monitor panel | (21) Room lamp switch (machines equipped with cab) |
| (8) Reverse travel speed setting switch | (22) Wiper switch (machines equipped with cab) |
| (9) Shift mode switch | (23) Car radio (machines equipped with cab)
(if equipped) |
| (10) Foot heater switch
(Standard for machines equipped with cab)
(Optional for machines equipped with canopy) | (24) Work equipment lock lever |
| (11) Starting switch | (25) Parking brake lever |
| (12) Brake pedal | (26) Foot heater
(Standard for machines equipped with cab)
(Optional for machines equipped with canopy) |
| (13) Decelerator pedal | |
| (14) Air conditioner mode selector switch
(machines equipped with cab) | |

MONITOR PANEL



9JZ00177

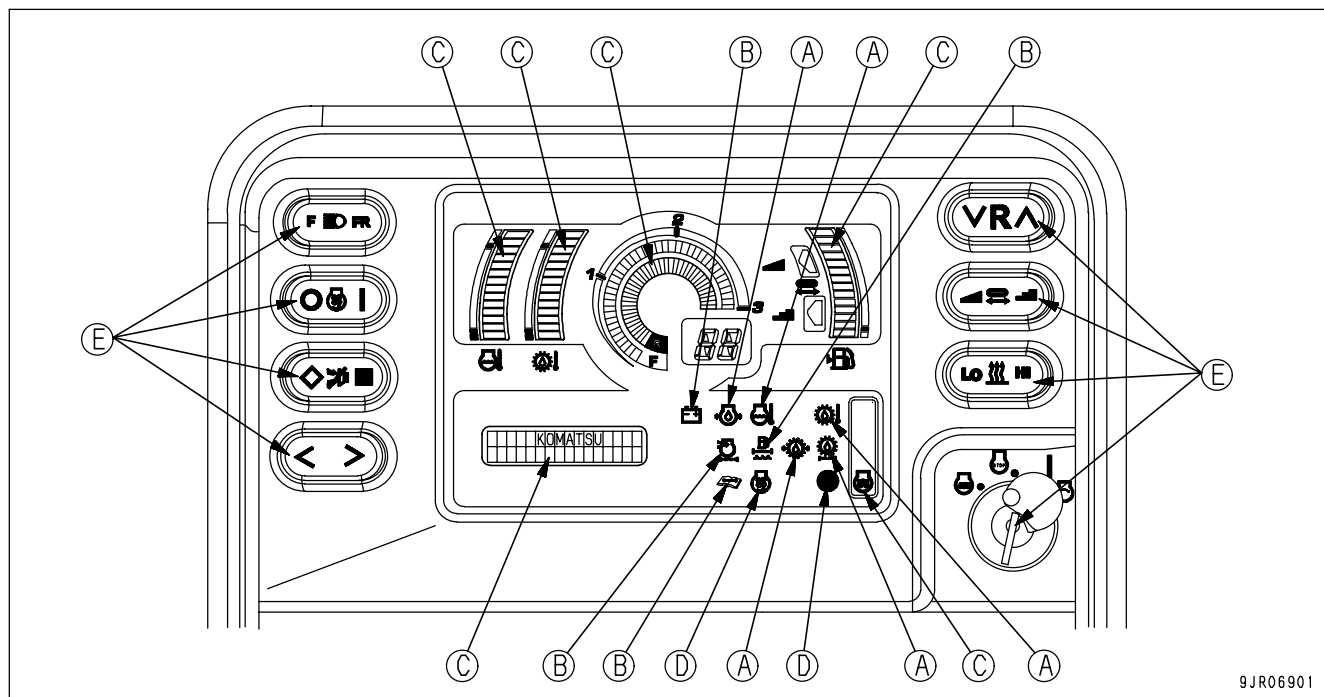
- | | |
|---|--|
| (1) Engine coolant temperature gauge | (9) HST charge pressure caution lamp |
| (2) Hydraulic oil temperature gauge | (10) Engine coolant temperature caution lamp |
| (3) Display panel A (speed range, shift mode indicator) | (11) Fan operating confirmation lamp |
| (4) Fuel level gauge | (12) Water separator caution lamp |
| (5) Hydraulic oil temperature caution lamp | (13) Maintenance caution lamp |
| (6) Charge filter clogging caution lamp | (14) Air cleaner clogging caution lamp |
| (7) Warning lamp | (15) Engine oil pressure caution lamp |
| (8) Engine pre-heating pilot lamp | (16) Battery charge circuit caution lamp |
| | (17) Display panel B (multi-information) |

EXPLANATION OF COMPONENTS

The following is an explanation of 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 meanings of the displays.

FRONT PANEL



9JR06901

- (A) Emergency caution items
- (B) Caution items
- (C) Meter group

- (D) Lamps
- (E) Switches

CHECK MONITOR SYSTEM

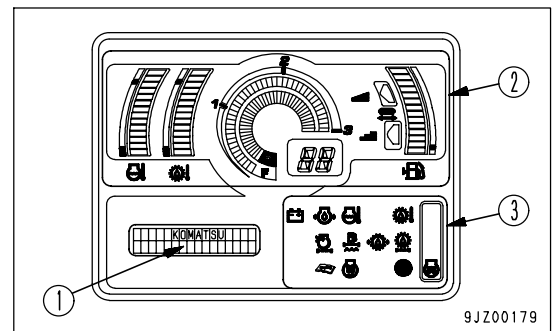
MONITOR SYSTEM

NOTICE

- Stop the machine on level ground and carry out the monitor check.
- Stop the engine, then turn the starting switch to the ON position and check that the lamps light up for approx. 2 seconds. If they do not light up, please ask your Komatsu distributor to carry out inspection.

When carrying out the checks before starting, use the monitor system check.

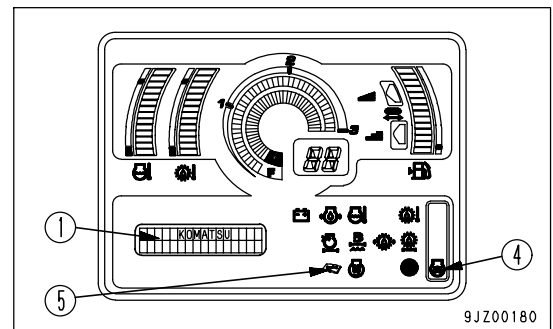
1. Turn the starting switch to the ON position.
2. Check that the monitor liquid crystal display and lamps all light up for 2 seconds, the alarm buzzer sounds for 2 seconds, and "KOMATSU" appears for 3 seconds on the display of display panel B (multi-information) (1).
3.
 - After 2 seconds, the current status of the machine is displayed on liquid-crystal display (2).
 - After 2 seconds, the lamp portion (3) goes out.
 - After 3 seconds, the operating mode is displayed on display panel B (multi-information) (1).



REMARK

The following cases do not indicate any problem.

- In cold weather when the preheater is being operated, preheating pilot lamp (4) does not go out until preheating is completed.
- When the time has come to change the oil or replace the filters, maintenance caution lamp (5) lights up or flashes for 30 seconds, and the maintenance item is displayed on display panel B (multi-information) (1).

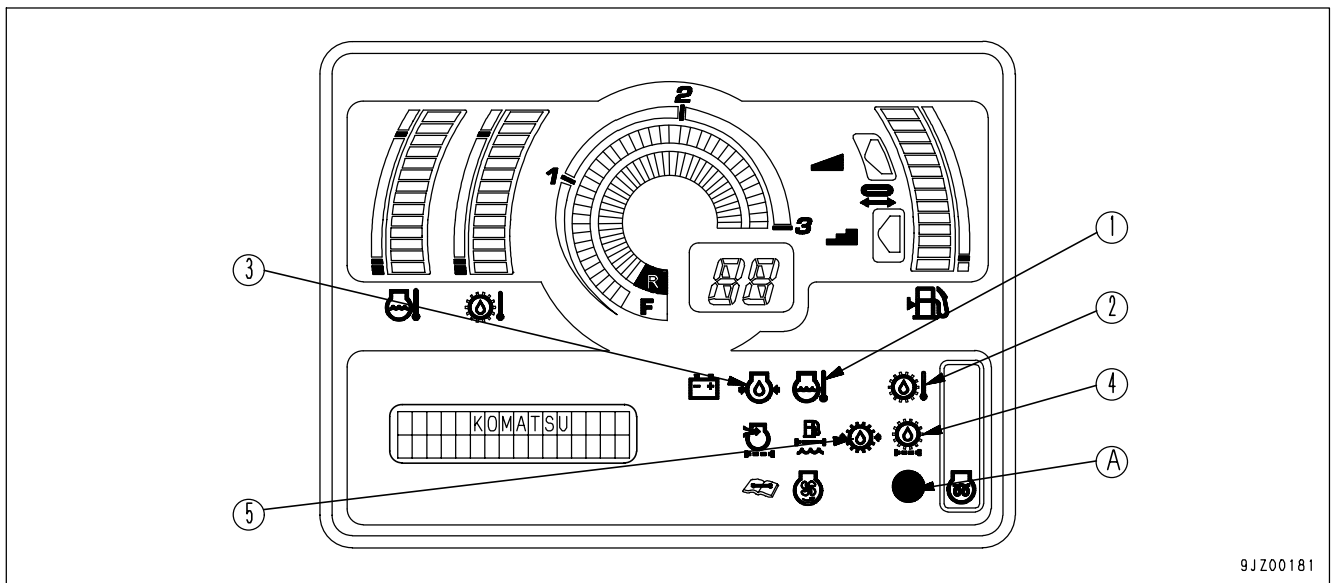


EMERGENCY CAUTION ITEMS

CAUTION

If any of the caution lamps begins to flash, stop the engine or reduce the engine speed to low idle immediately and check the trouble spot for necessary actions.

These items must be monitored when the engine is running. If there is any problem, the caution lamp for the location of the problem and warning lamp (A) flash, and the alarm buzzer sounds intermittently. Take the necessary action immediately.



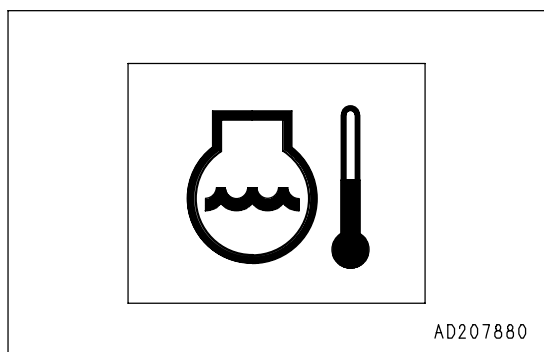
9JZ00181

- (1) Engine coolant temperature caution lamp
- (2) Hydraulic oil temperature caution lamp
- (3) Engine oil pressure caution lamp
- (4) Charge filter clogging caution lamp
- (5) HST charge pressure caution lamp

ENGINE COOLANT TEMPERATURE CAUTION LAMP

This lamp (1) warns the operator that the engine coolant temperature has risen.

If it flashes, run the engine at low idling until the engine coolant gauge displays the green range.

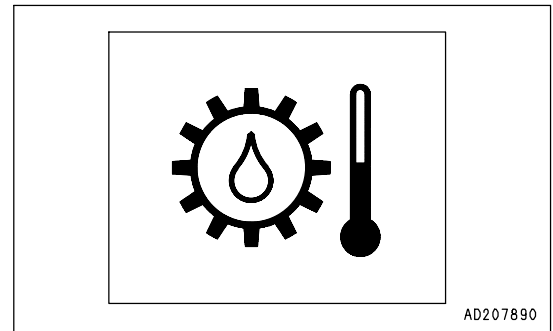


AD207880

HYDRAULIC OIL TEMPERATURE CAUTION LAMP

This lamp (2) warns the operator that the hydraulic oil temperature has risen.

If it flashes, run the engine at low idling until the hydraulic oil temperature gauge displays the green range.

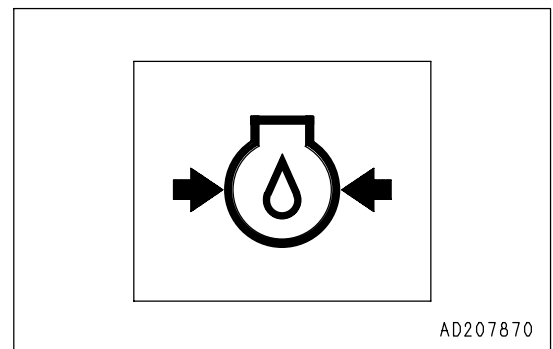
**ENGINE OIL PRESSURE CAUTION LAMP**

This lamp (3) warns the operator that the engine lubricating oil pressure has dropped.

If it flashes, stop the engine and carry out inspection.

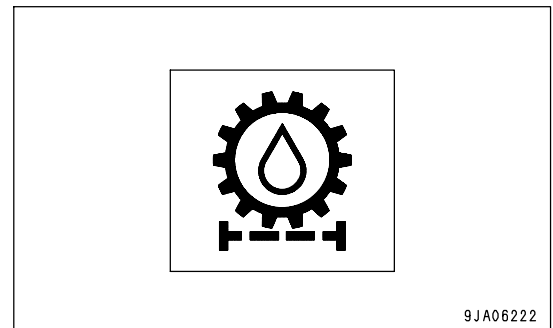
REMARK

The alarm buzzer sounds, when the starting switch is turned to ON immediately after the engine oil has been changed. It does not indicate a problem.

**CHARGE FILTER CLOGGING CAUTION LAMP**

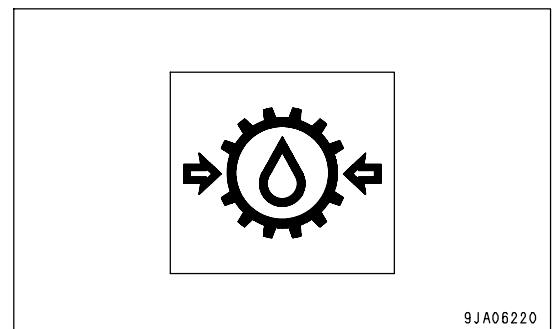
This lamp (4) warns the operator that the HST charge filter is clogged.

If it flashes, stop the machine, check for the cause of clogging, and replace the filter element with a new part.

**HST CHARGE PRESSURE CAUTION LAMP**

This lamp (5) warns the operator that the HST charge pressure has dropped.

If it flashes, stop the machine and check for the cause of the drop in the charge pressure.

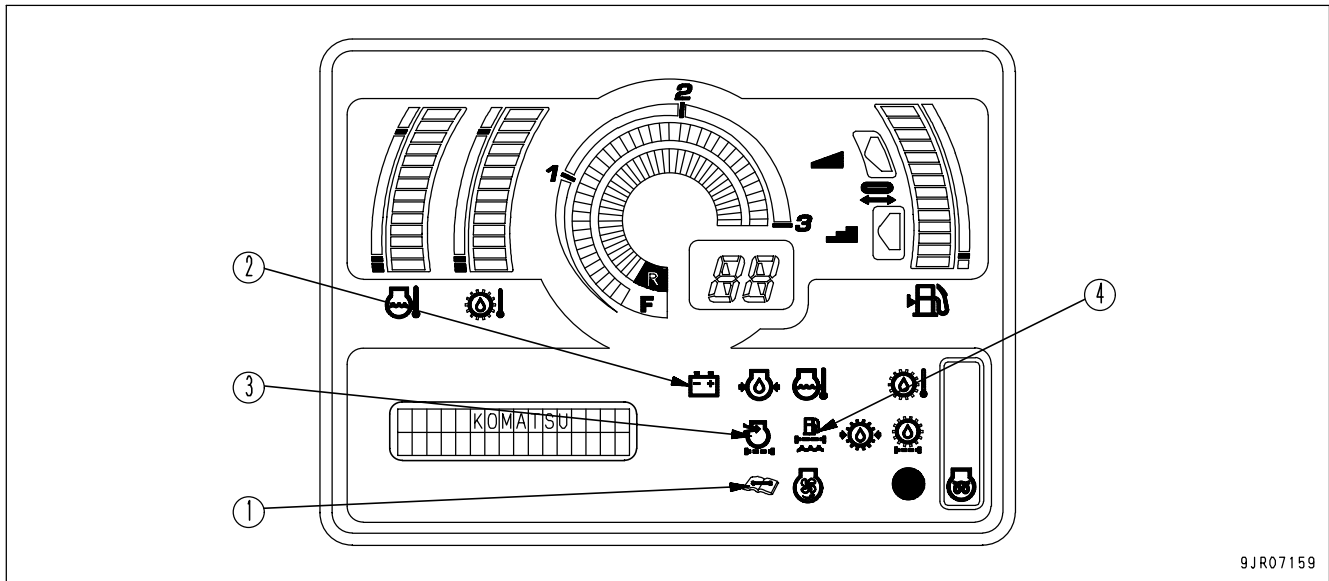


CAUTION ITEMS



If these caution lamps flash, check and repair the appropriate location as soon as possible.

These are items which need to be observed when the engine is running. If any problem occurs, the item needing immediate repair is displayed. If there is any problem, the problem location on the caution lamp will flash.



- (1) Maintenance caution lamp
- (2) Battery charge circuit caution lamp
- (3) Air cleaner clogging caution lamp
- (4) Water separator caution lamp

MAINTENANCE CAUTION LAMP

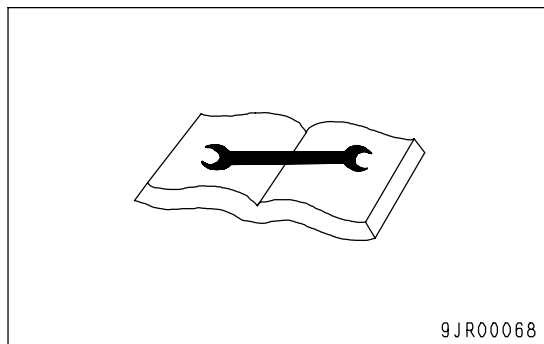
When the time comes to change the oil or replace the filters, this lamp (1) flashes or lights up for approx. 30 seconds after the starting switch is turned ON.

Flashing: Less than 30 hours remaining to replacement time

Lighted up: Replacement time already passed

After replacing the filters and changing the oil displayed on display panel B (multi-information), reset the replacement time. For details, see "METHOD OF USING OIL AND FILTER MAINTENANCE MODE (PAGE 3-29)".

The lamp will go out.



9JR00068

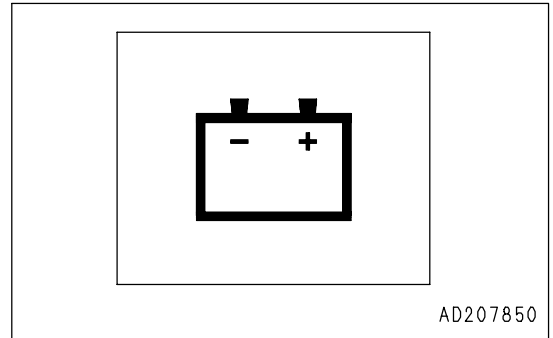
BATTERY CHARGE CIRCUIT CAUTION LAMP

This lamp (2) flashes while the engine is running to warn the operator that charging is not being carried out properly.

If it flashes, stop the engine, and check for any loose alternator V-belt. If any problem is found, see "OTHER TROUBLE (PAGE 3-129)".

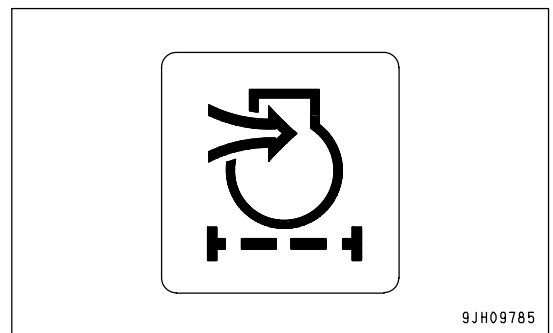
REMARK

This monitor lamp lights when the starting switch is turned to ON immediately after the engine is started or immediately before the engine is stopped. It does not indicate a problem.

**AIR CLEANER CLOGGING CAUTION LAMP**

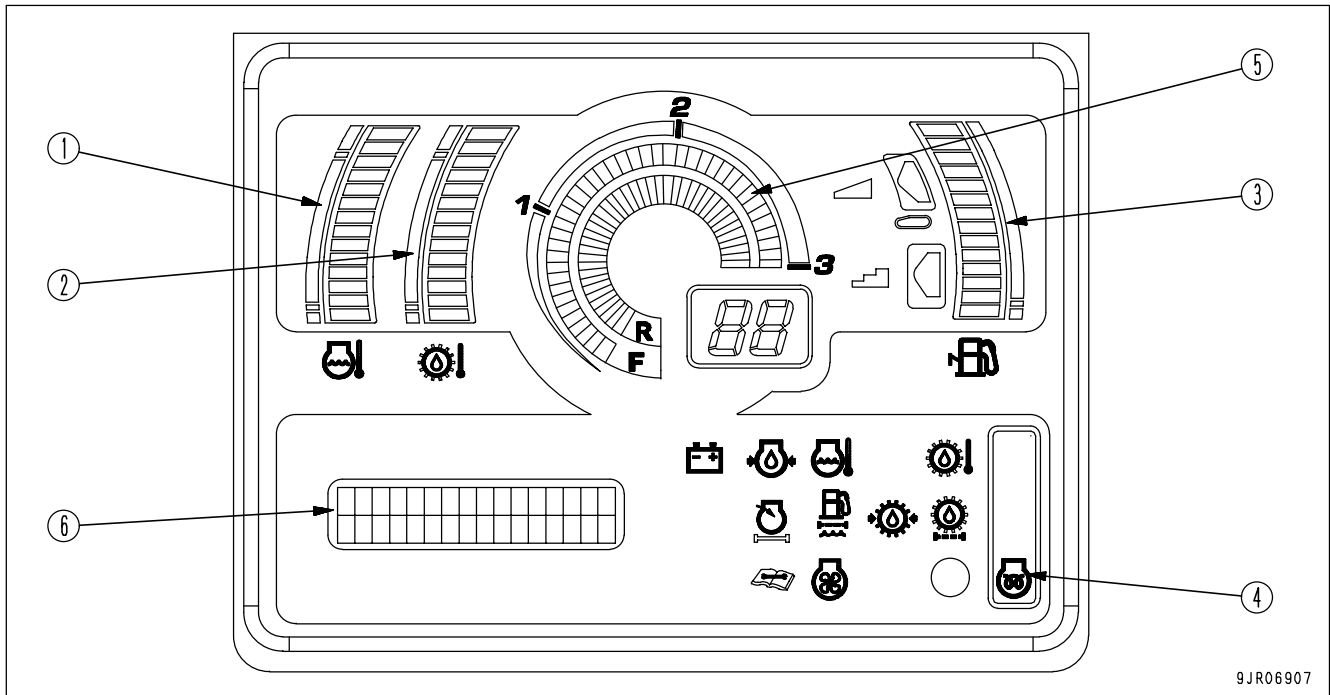
This lamp (3) warns the operator that the air cleaner is clogged.

If it flashes, stop the engine, and check and clean the air cleaner. For details of the method of checking and cleaning the air cleaner, see "CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT (PAGE 4-22)".

**WATER SEPARATOR CAUTION LAMP**

This lamp (4) is not used on this machine.

METER GROUP



- (1) Engine coolant temperature gauge
- (2) Hydraulic oil temperature gauge
- (3) Fuel level gauge
- (4) Engine pre-heating pilot lamp
- (5) Display panel A (speed range, shift mode indicator)
- (6) Display panel B (multi-information)

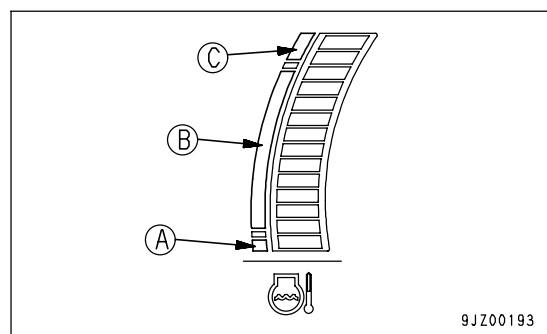
ENGINE COOLANT TEMPERATURE GAUGE

NOTICE

If the coolant temperature gauge often enters red range (C), check the radiator for clogging.

Gauge (1) indicates temperature of the engine coolant.
 If the temperature is normal during operation, green range (B) will light.
 If red range (C) lights during operation, move the fuel control dial to lower engine speed to approx. 3/4 of the full speed, and run until the coolant temperature enters green range (B).
 If red range (C) lights up during operation, and the engine coolant temperature caution lamp flashes and the alarm buzzer sounds, stop the machine, run the engine at low idle, and wait for the coolant temperature to return to green range (B).

- (A): White range
- (B): Green range
- (C): Red range



HYDRAULIC OIL TEMPERATURE GAUGE

NOTICE

If the hydraulic oil temperature gauge tends to enter red range (C), check for clogging of the oil cooler.

This meter (2) displays the oil temperature in the pump suction piping.

Green range (B) should be lighted up during normal operations.

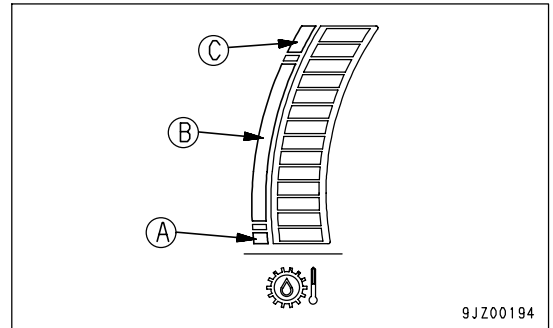
If red range (C) lights up during operation, move the fuel control dial to lower engine speed to approx. 3/4 of the full speed, reduce the load and run until the oil temperature enters green range (B).

If red range (C) lights up while the engine is running or the hydraulic oil temperature caution lamp flashes and the alarm buzzer sounds, stop the machine, run the engine at low idling, and wait for the oil temperature to go down to green range (B).

(A): White range

(B): Green range

(C): Red range



FUEL LEVEL GAUGE

This meter (3) shows the amount of fuel remaining in the fuel tank.

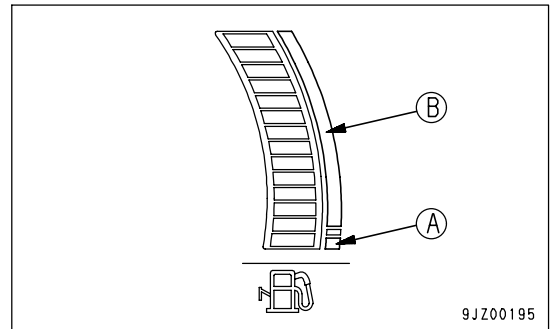
Green range (B) should be lighted up during normal operations.

If red range (A) lights up during operations, add fuel immediately.

If the fuel level remains low, the rotation of the engine will become unstable and error displays will be given on the monitor.

(A): Red range

(B): Green range



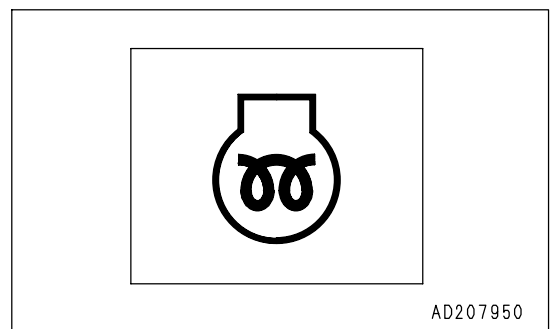
REMARK

- The display is not proportional to the amount of fuel remaining.
- If only the red range (A) lights up, there is less than 40 liters (10.57 US gal) of fuel remaining.

ENGINE PRE-HEATING PILOT LAMP

This lamp (4) shows that the electric heater is being used in cold weather to carry out preheating of the engine.

When the starting switch is turned to the ON position, the engine controller detects the temperature of the water and automatically carries out preheating if the water temperature is low.



DISPLAY PANEL A (SPEED RANGE, SHIFT MODE INDICATOR)

This meter (5) displays the speed range and shift mode.

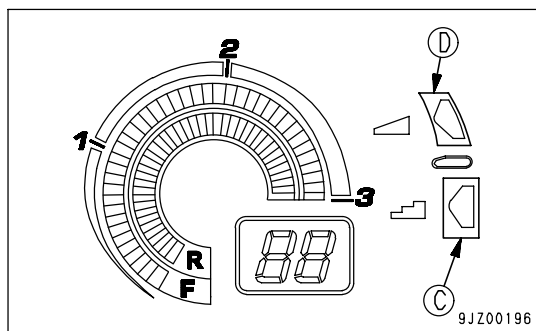
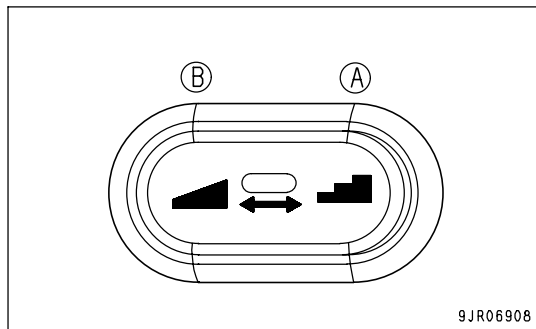
Use the shift mode switch to switch the shift mode.

Position (A): Quick shift mode

Pilot lamp (C) on display panel A lights up.

Position (B): Variable shift mode

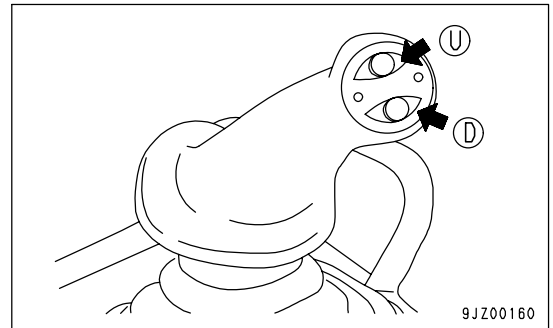
Pilot lamp (D) on display panel A lights up.



QUICK SHIFT MODE

The travel speed is set to the travel speed that matches the general operating load. Operation is easy: each time the shift switch on the steering, forward-reverse, gear shift lever is pressed, the speed switches 1st ↔ 2nd ↔ 3rd.

- Each time UP switch (U) on the steering, forward-reverse, gear shift lever is pressed, the speed range shifts 1st → 2nd or 2nd → 3rd.
- Each time DOWN switch (D) on the steering, forward-reverse, gear shift lever is pressed, the speed range shifts 3rd → 2nd or 2nd → 1st.



- The speed range display at the bottom right displays the direction of travel (E) and the speed range (F).

(E) F: FORWARD

R: REVERSE

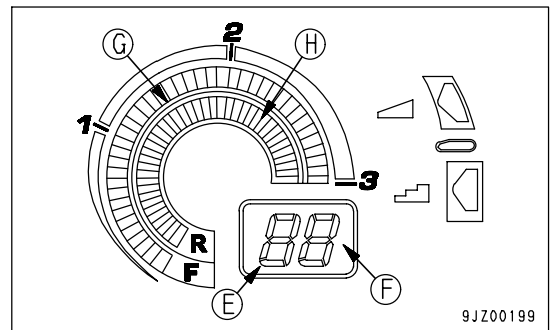
N: NEUTRAL

P: Parking brake lever at LOCK position

(F) 1: 1st

2: 2nd

3: 3rd



Example: F1 is displayed for FORWARD 1st

- Outside bar graph (G) lights up according to the forward set travel speed.
- Inside bar graph (H) lights up according to the reverse set travel speed.
- When the starting switch is turned from the OFF position to the ON position, the speed range is set by default to 1st.

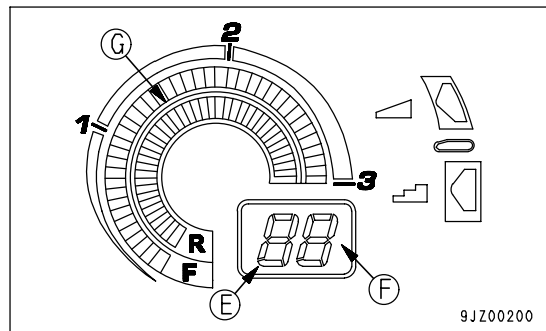
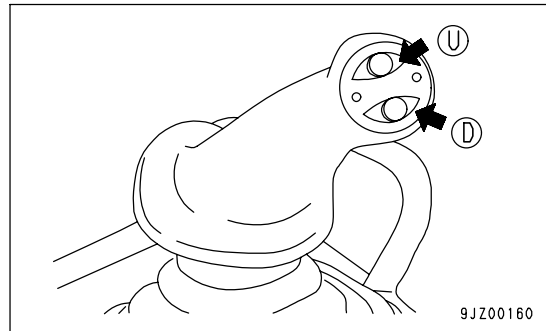
VARIABLE SHIFT MODE (CONTINUOUSLY VARIABLE SHIFT MODE)

The travel speed can be set in 20 stages from 0.8 km/h (0.5 MPH) to 8.5 km/h (5.3 MPH).

In particular, the minimum travel speed is set low so that work such as loading the machine onto a trailer or traveling over rough places on the road surface can be carried out more safely.

Furthermore, it is possible to select the optimum travel speed over a wider range for work such as plowing or winch operations.

- Each time UP switch (U) on the steering, forward-reverse, gear shift lever is pressed, two segments on the outside bar graph light up and the travel speed increases by approx. 0.4 km/h (0.2MPH).
- If UP switch (U) on the steering, forward-reverse, gear shift lever is kept pressed, the outside bar lights up continuously and the speed range is set at the point where the switch is released.
- When reducing the set travel speed, carry out the same operation with DOWN switch (D) on the steering, forward-reverse, gear shift lever.
- The direction of travel (E) is displayed in the speed range display at the bottom right. Nothing is displayed in (F).
 (E) F: FORWARD
 R: REVERSE
 N: Neutral
 P: Parking brake lever is at LOCK position
- When the starting switch is turned from the OFF position to the ON position, the speed range is set by default to 1st.



- If the mode is shifted from variable shift mode to quick shift mode, the speed range is set to the nearest speed range (1st, 2nd, or 3rd).
- See the chart below for details of the lighting up of bar graph (G) around the outside circumference and the set travel speed.

Gauge No.	Speed range	Set travel speed km/h (MPH)	Gauge No.	Speed range	Set travel speed km/h (MPH)	Gauge No.	Speed range	Set travel speed km/h (MPH)
1	-	0.8 (0.5)	15	-	3.8 (2.4)	27	-	6.0 (3.7)
2	-	0.8 (0.5)	16	-	3.8 (2.4)	28	-	6.0 (3.7)
3	-	1.0 (0.6)	17	-	4.1 (2.5)	29	-	6.4 (4.0)
4	-	1.0 (0.6)	18	-	4.1 (2.5)	30	-	6.4 (4.0)
5	-	1.5 (0.9)	19	-	4.5 (2.8)	31	-	6.8 (4.2)
6	-	1.5 (0.9)	20	-	4.5 (2.8)	32	-	6.8 (4.2)
7	-	2.0 (1.2)	21	-	4.9 (3.0)	33	-	7.3 (4.5)
8	-	2.0 (1.2)	22	-	4.9 (3.0)	34	-	7.3 (4.5)
9	-	2.4 (1.5)	23	-	5.2 (3.2)	35	-	7.7 (4.8)
10	-	2.4 (1.5)	24	-	5.2 (3.2)	36	-	7.7 (4.8)
11	-	2.9 (1.8)	25	2nd	5.6 (3.5)	37	-	8.1 (5.0)
12	-	2.9 (1.8)	26	2nd	5.6 (3.5)	38	-	8.1 (5.0)
13	1st	3.4 (2.1)				39	3rd	8.5 (5.3)
14	1st	3.4 (2.1)				40	3rd	8.5 (5.3)

REVERSE TRAVEL SPEED INDICATOR

It is possible to set the reverse travel speed by selecting one of the following 5 speed ranges. The speed ranges have the following ratio to the forward travel speed.

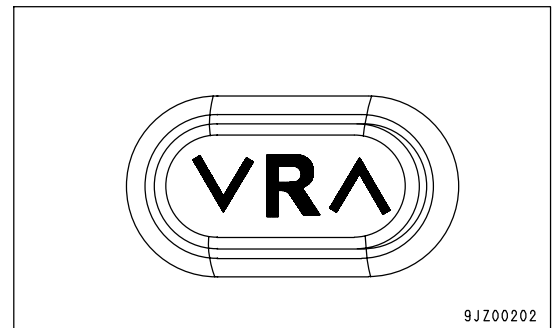
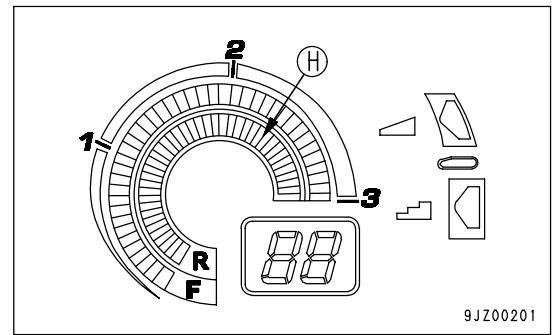
- (1) Approx. 20% slower than forward travel speed
- (2) Same as forward travel speed
- (3) Approx. 20% faster than forward travel speed
- (4) Approx. 40% faster than forward travel speed
- (5) Approx. 60% faster than forward travel speed

If the travel speed is set to match the nature of the operation before starting, it becomes unnecessary to carry out any gearshifting operation when operating the steering, forward-reverse, gear shift lever.

If it is desired to raise the efficiency in dozing operations, set the reverse travel speed to a higher speed.

When traveling on rough ground or when carrying out pushing-up operations, set the reverse travel speed to a lower speed.

- To set the reverse travel speed, press the left or right side of the reverse travel speed setting switch.
- Each time the right side of the switch is pressed, the set travel speed becomes faster.
- Each time the left side of the switch is pressed, the set travel speed becomes slower.
- Inside bar graph (H) shows the reverse travel speed.
- When the starting switch is turned to the ON position, the reverse travel speed is set to approx. 20% faster than the forward travel speed.
- If the left side of the switch is pressed once, the reverse travel speed will become the same as the forward travel speed.
- 3rd speed is the top limit, so it cannot be set to a higher travel speed.



DISPLAY PANEL B (multi-information)

The top and bottom lines in display panel B (multi-information) display information related to the condition of the machine.

The content of the display is divided into "OPERATING MODE" and "MAINTENANCE MODE". Use the buzzer cancel switch to switch between the operating mode and maintenance mode.

When switching the mode, see "BUZZER CANCEL SWITCH (PAGE 3-24)".

OPERATING MODE (default screen)

Use this mode when operating the machine.

REMARK

When the starting switch is turned from the OFF position to the ON position, display panel B (multi-information) always displays the operating mode.

The following information is displayed by the operating mode.

Top line (A): Service meter

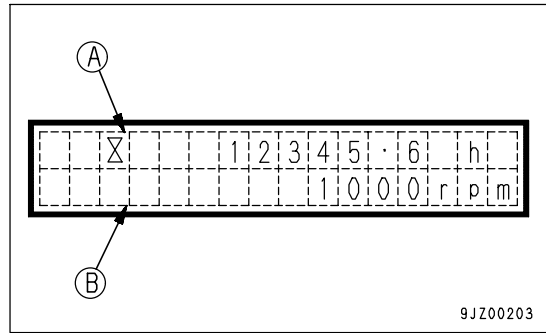
This displays the total number of hours that the machine has been operating. Use this display to manage the maintenance intervals.

When the engine is running, the service meter advances, even if the machine is not being operated. The engine is running, the hourglass mark at the side of the meter lights up to indicate that the meter is advancing.

The meter advances by 0.1h for 1/10 hours of operation, regardless of the engine speed.

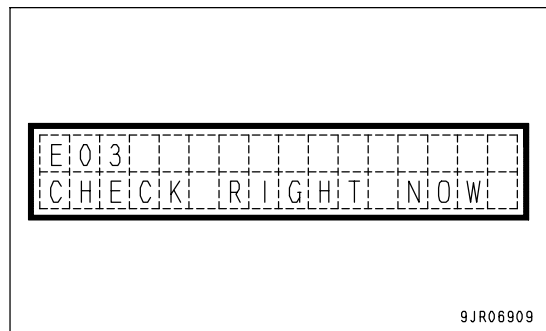
Bottom line (B): No display, or engine speed

The engine speed can be displayed by operating the information switch.



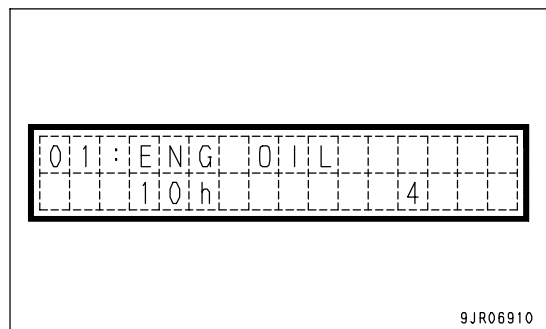
Action code

If any problem occurs on the machine, an action code is displayed. For details of the action to take, see "OTHER TROUBLE (PAGE 3-129)".



Maintenance item

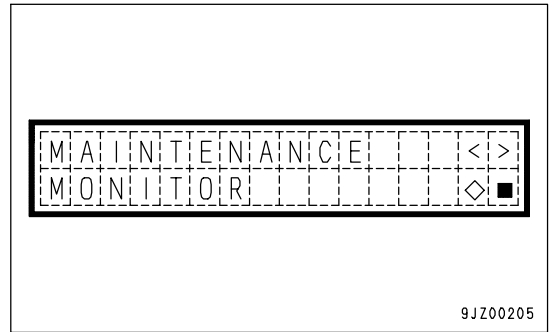
This displays filter or oil items that are close to the replacement interval.



Maintenance mode

This displays various types of information related to maintenance of the machine.

For details, see "METHOD OF USING MAINTENANCE MODE (PAGE 3-27)".

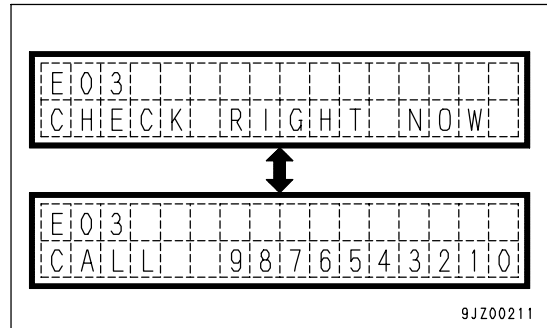


METHOD OF USING FAILURE CODE DISPLAY

If an action code indicating a problem is displayed on display panel B (multi-information), as follows to display the failure code. (For details of the abnormality display, see "MONITOR PANEL (PAGE 3-130)".)

The following is an example of an abnormality display on display panel B (multi-information).

The display switches every approx. 3 seconds.



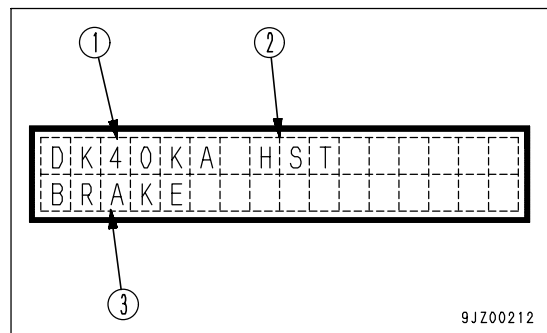
To display the failure code, press the > portion of the information switch.

The content of the display is as follows.

Position (1): Failure code is displayed.

Position (2): Controller that detected failure code is given.

Code	Controller detecting failure code
MON	Monitor panel
HST	HST controller
ENG	Engine controller



Position (3): Message is displayed.

If there is more than one failure code

To display the following failure codes, press the > portion of the information switch. If no operation is carried out for 30 seconds, the screen will return to the abnormality display screen.

REMARK

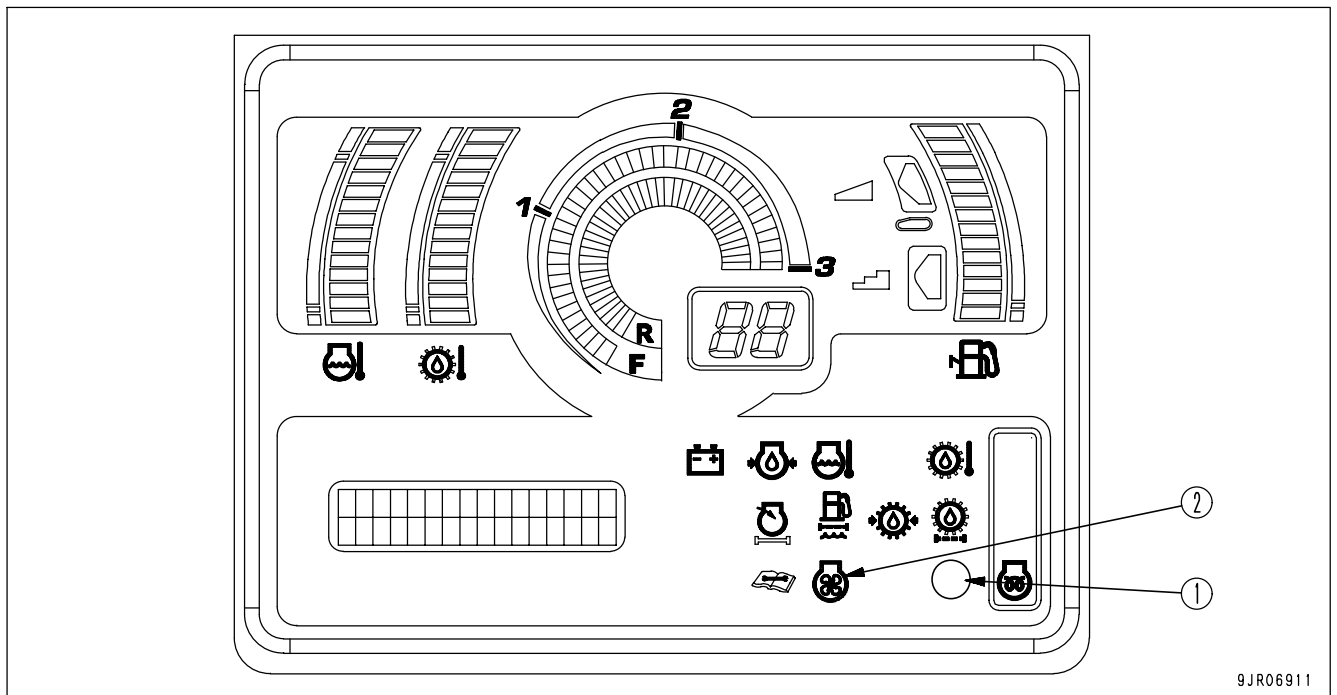
If action codes E02 or E03 are displayed to show an abnormality, check the failure code. If failure codes CA559 or CA2249 are displayed, replace the fuel filter.

If the display does not go out even when the filter is replaced, there is probably a different cause of the failure, so have inspection carried out. Please ask your Komatsu distributor to carry out the inspection.

When the filter is replaced or when the fuel tank runs out of fuel, and operation of the priming pump sends air to the fuel line, failure codes CA559 or CA2249 may be displayed, but this does not indicate an abnormality.

Start the engine again and check that the display has gone out.

LAMPS



(1) Warning lamp

(2) Fan operation confirmation lamp

WARNING LAMP

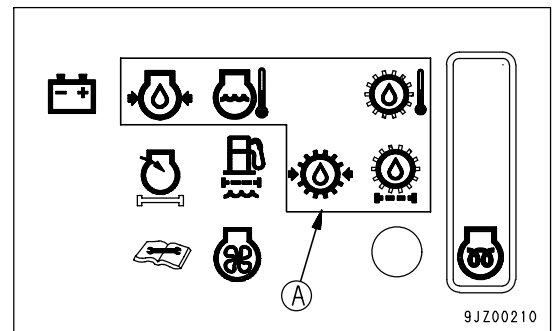
(Red)

NOTICE

If alarm buzzer sounds, stop work immediately and perform inspection and maintenance of the appropriate point.

This lamp (1) flashes when caution lamp (A) flashes and an action code is displayed on the top line of display panel B (multi-information).

When the caution lamp (A) of an emergency warning item flashes, or when the part of an action code is displayed, the alarm buzzer sounds continuously at the same time.

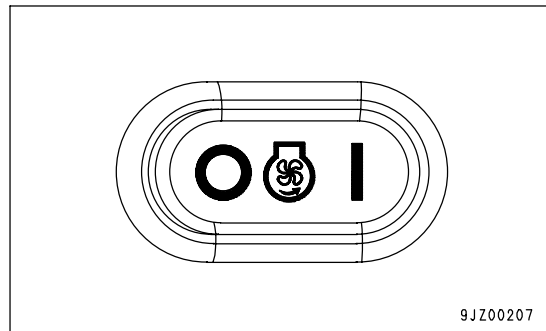
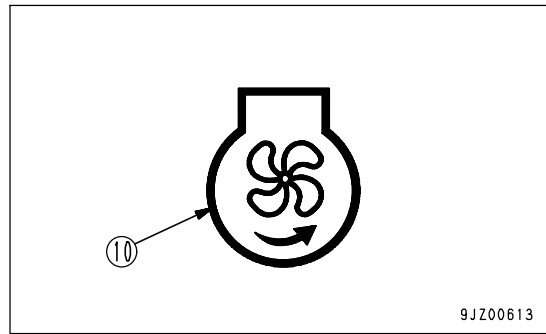


FAN OPERATION CONFIRMATION LAMP

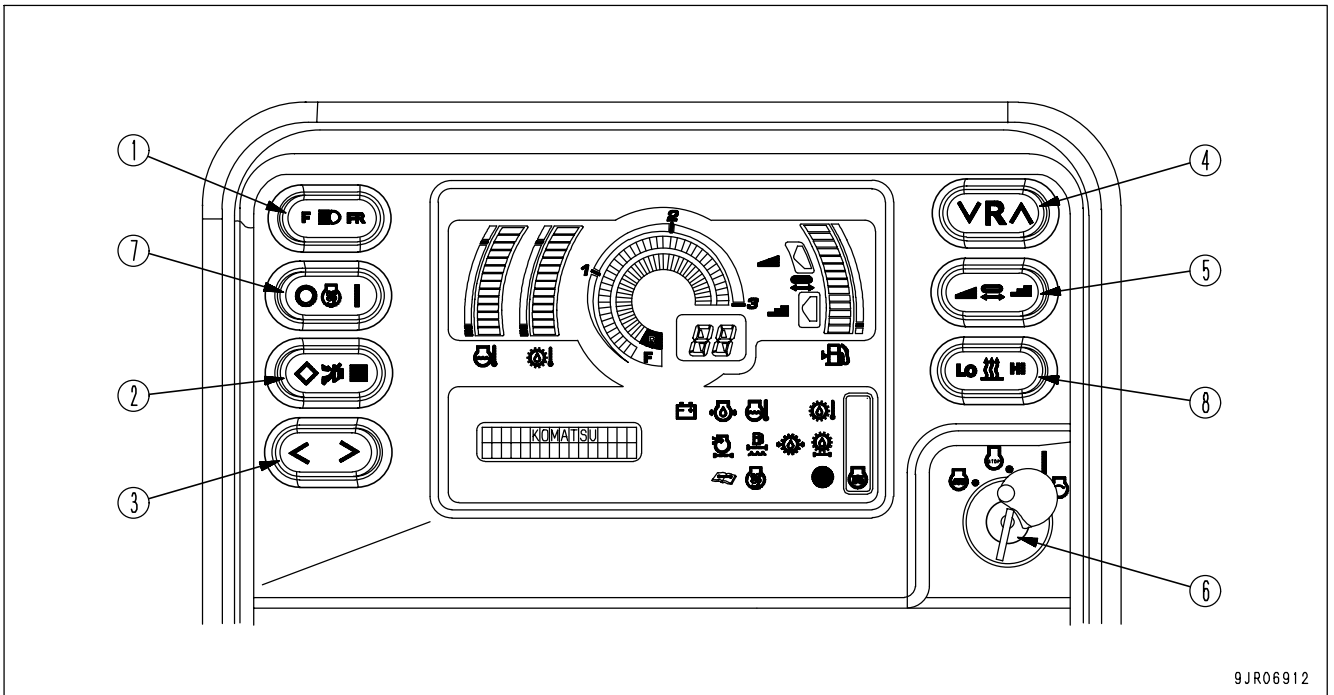
This lamp (2) lights up or flashes according to the following operations.

- After the starting switch is turned ON, if this lamp (2) is out and the engine is started, the fan will rotate in the normal direction.
- After the starting switch is turned ON, if the I side of the fan rotation selector switch is pressed, this lamp (2) lights up. If the engine is started when this lamp (2) is lighted up, the fan will rotate in the reverse direction.
- When this lamp is lighted up (when the fan is rotating in reverse), the machine cannot travel.
- If the I side of the fan rotation selector switch is pressed when the engine is running, this lamp (2) will flash several times to show that the direction of rotation of the fan cannot be changed.

For an explanation of the fan rotation selector switch, see "FAN ROTATION SELECTOR SWITCH (PAGE 3-26)".



SWITCHES



- | | |
|---|--|
| (1) Lamp switch | (6) Starting switch |
| (2) Buzzer cancel switch | (7) Fan rotation selector switch |
| (3) Information switch | (8) Foot heater switch |
| (4) Reverse travel speed setting switch | (Standard for machines equipped with cab) |
| (5) Shift mode switch | (Optional for machines equipped with canopy) |

LAMP SWITCH

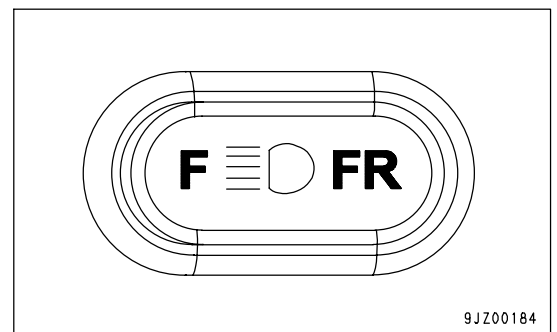
Use this switch (1) to light up the front and rear lamps.

Center position: OFF

F position: Front lamps light up

FR position: Front lamps and rear lamps light up

When the switch is operated, the lamp inside the switch also lights up.

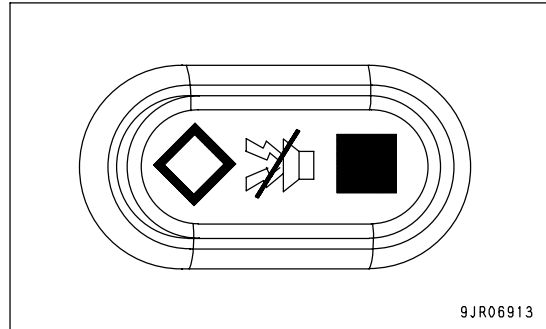


9JZ00184

BUZZER CANCEL SWITCH

This switch (2) is used to operate control panel B (multi-information) or to stop the alarm buzzer. When the switch is released, it returns automatically to the center position.

- **When display panel B (multi-information) is in the operating mode**
 - If the warning buzzer is sounding, press the ■ side of this switch to stop the buzzer.
 - If the ◇ side of the switch is pressed, the display will switch to the maintenance mode.



- **When display panel B (multi-information) is in the maintenance mode**

Position ■: Cancel or restore to operating mode

Position ◇: Confirm selection or selected item

For details, see "METHOD OF USING MAINTENANCE MODE (PAGE 3-27)".

REMARK

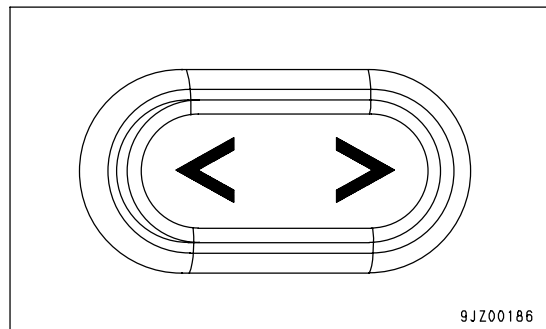
When the starting switch is OFF, if the ◇ side of the switch is pressed, the service meter is displayed on display panel B (multi-information).

INFORMATION SWITCH

This switch (3) is used to operate display panel B (multi-information). When the switch is released, it returns automatically to the center position.

- **When display panel B (multi-information) is in the operating mode**

By pressing the < or > side of the switch it is possible to switch to display or non-display of the service meter or engine speed.
- **When display panel B (multi-information) is in the maintenance mode**



It is used to move between sub modes, between items, to move the cursor, or to change values.

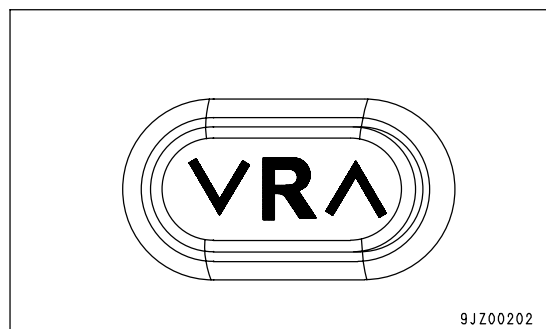
For details, see "METHOD OF USING MAINTENANCE MODE (PAGE 3-27)".

REVERSE TRAVEL SPEED SETTING SWITCH

With this switch (4) it is possible to set the reverse travel speed to a different speed from the forward reverse speed.

For details, see "REVERSE TRAVEL SPEED INDICATOR (PAGE 3-17)".

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

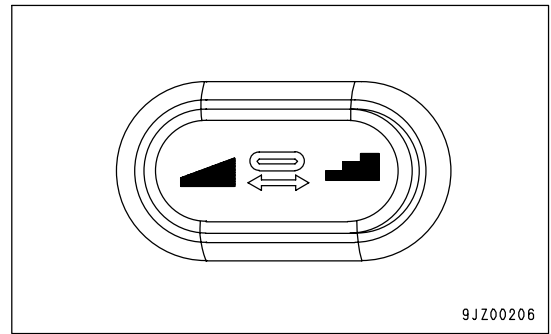


SHIFT MODE SWITCH

Use switch (5) to change the shift mode.

For details, see "DISPLAY PANEL A (SPEED RANGE, SHIFT MODE INDICATOR) (PAGE 3-14)".

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

**STARTING SWITCH**

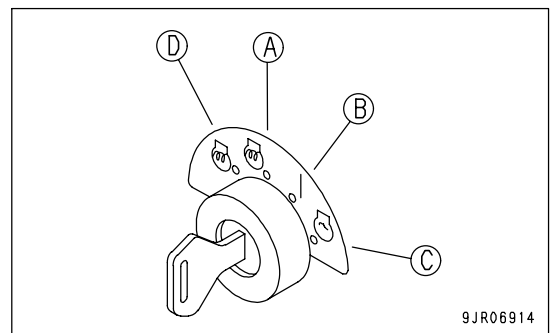
The switch (6) is used to start and stop the engine.

(A): OFF position

The starting switch key can be removed, all the electrical circuit switches are turned off, and the engine stops.

(B): ON position

Electricity flows through the charging circuit and lamp circuits. Leave the key at this position when the engine is running. If the key is set to this position when starting in cold weather, preheating will start automatically.

**(C): START position**

This is the position for starting the engine. Keep it at this position when the starting motor is cranking, and when the engine starts, release the key immediately. The key will return to ON position (B).

(D): PREHEAT position

This machine is equipped with an automatic preheating function, but if the key is held in this position, preheating can be carried out manually.

For details of the method of operation, see "STARTING IN COLD WEATHER (PAGE 3-86)".

FAN ROTATION SELECTOR SWITCH

Use this switch (7) to change the direction of rotation of the cooling fan.

When the switch (7) is released, it automatically returns to the center position.

Position ○: Normal rotation

Normally, use the switch at this position. Fan operation confirmation lamp (A) is OFF at this position.

The cooling air is sucked in from the front grille and discharged to the rear.

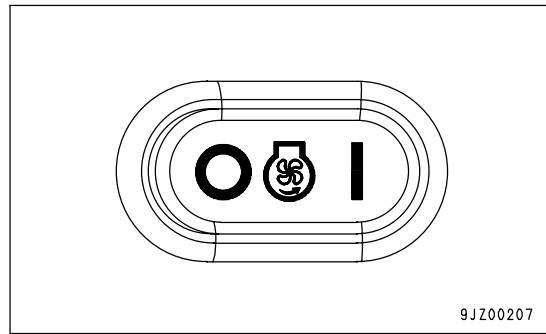
The fan rotates at a speed that matches the temperature of the coolant, and carries out efficient cooling.

Position I: Cleaning (Reverse rotation)

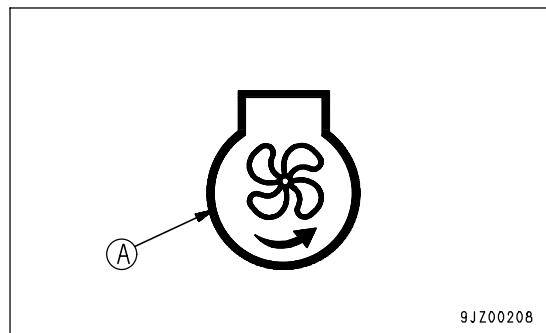
Fan operation confirmation lamp (A) lights up and the fan rotates in the reverse direction to normal. The fan rotates at high speed, regardless of the coolant temperature.

Use this position when cleaning the radiator fins.

For details of the method of cleaning, see "CLEANING BY ROTATING COOLING FAN IN REVERSE DIRECTION (PAGE 4-34)".



9JZ00207



9JZ00208

FOOT HEATER SWITCH

(Standard for machines equipped with cab, Optional for machines equipped with canopy)

Use this switch (8) to operate the foot heater.

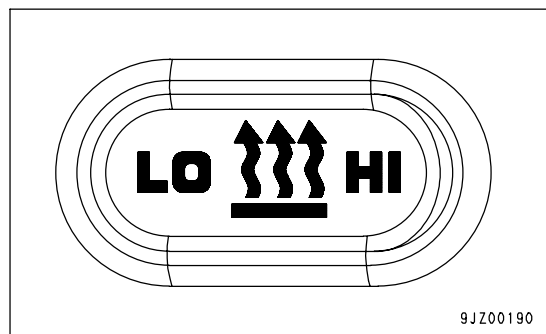
The foot heater is at position (A).

Center position: OFF

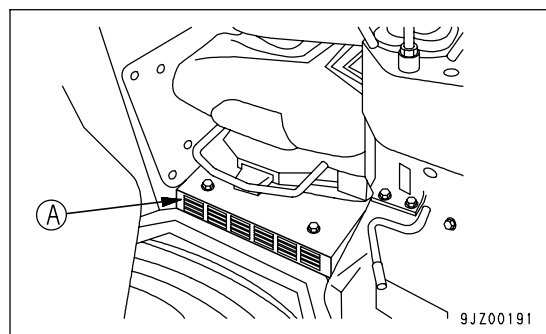
Lo position: Weak air flow

Hi position: Strong air flow

When the switch is operated, the lamp inside the switch lights up.




9JZ00190



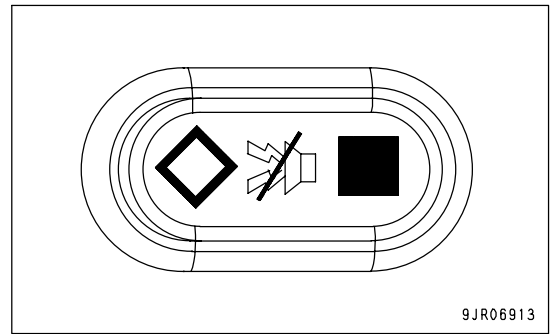
9JZ00191

METHOD OF USING MAINTENANCE MODE

To switch from the operation mode to the maintenance mode, press the  portion of the buzzer cancel switch.

The mode will switch to the maintenance mode.

At first, the oil and filter maintenance mode is displayed.



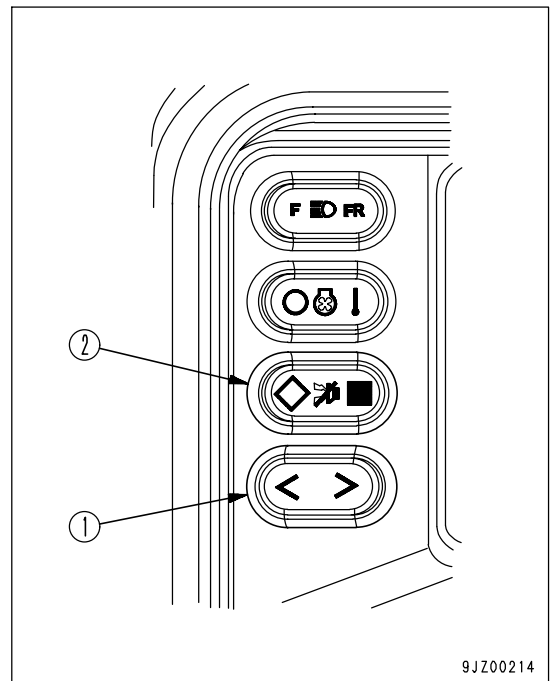
9JR06913

EXPLANATION OF MODES AND OPERATION

There are 2 types of sub mode in the maintenance mode.

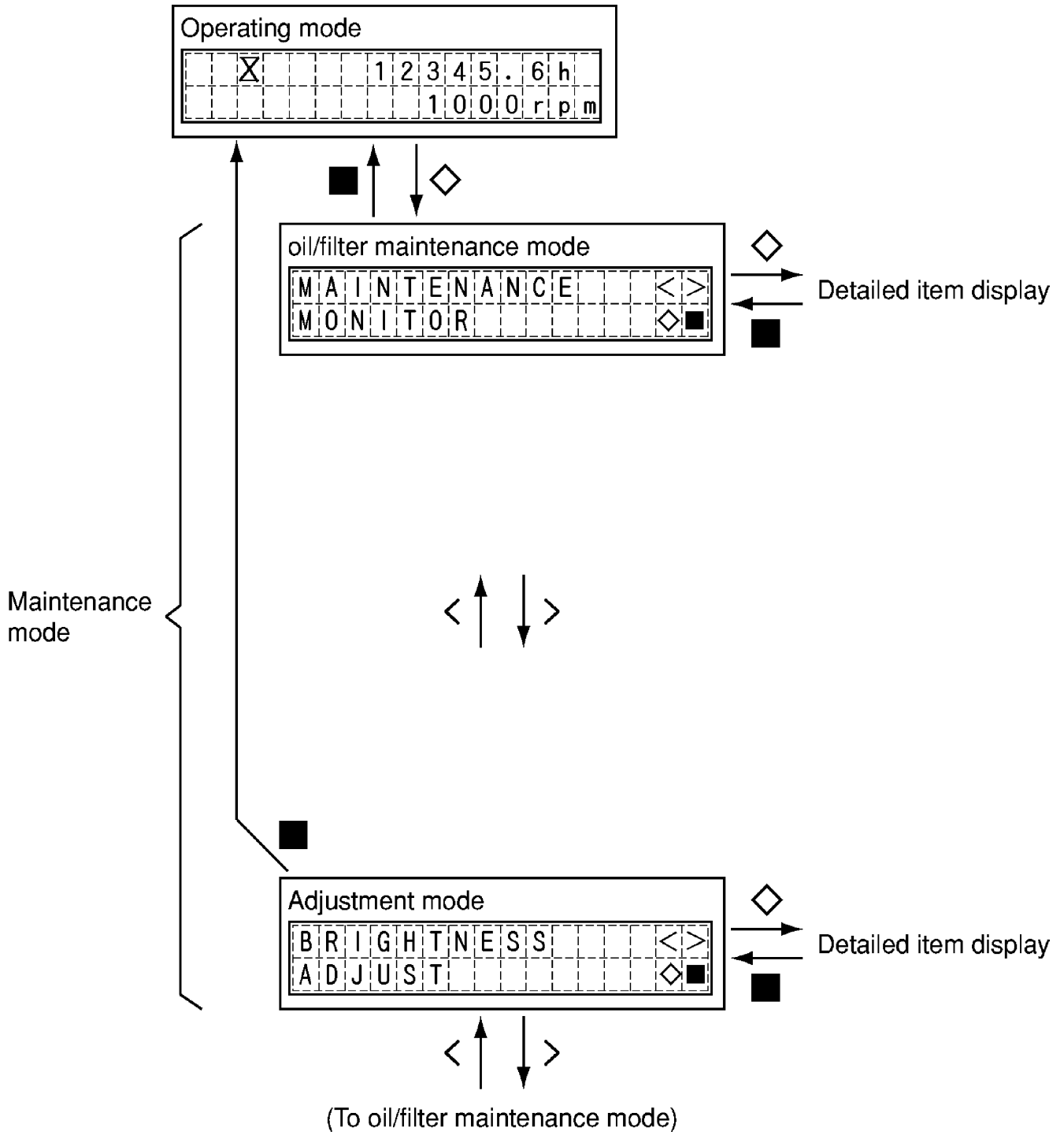
Sub mode	Function	Reference items
Oil/filter maintenance mode	Oil or filter replacement time is displayed	METHOD OF USING OIL AND FILTER MAINTENANCE MODE(3-29 PAGE)
Adjustment mode	Adjusts monitor brightness, etc.	METHOD OF USING USER ADJUST MODE(3-30 PAGE)

Use information switch (1) and buzzer cancel switch (2) to operate each mode.



9JZ00214

METHOD OF SELECTING EACH MODE



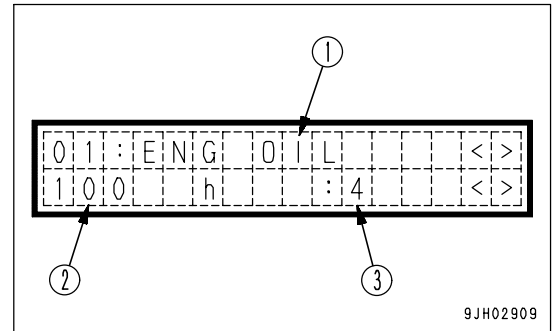
METHOD OF USING OIL AND FILTER MAINTENANCE MODE

NOTICE

This function is only a guideline. If dirty oil or filters are found during daily maintenance, replace them immediately. If the controllers or monitor panel are replaced, the timer for this function will not work properly. Contact your Komatsu distributor for replacement.

In the oil and filter maintenance mode, the replacement intervals for oil and filters are displayed on display panel B (multi-information).

- (1) The item is displayed.
- (2) The time remaining until replacement is displayed.
- (3) The quantity of replacements until now is displayed.



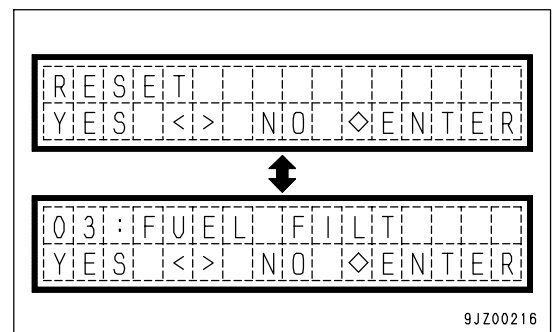
The display items can be displayed in order by operating the information switch to the left or right (<, >).

Code	Display	item	Replacement interval
01	ENG OIL	Engine oil	500h
02	ENG FILT	Engine oil filter	500h
03	FUEL FILT	Fuel filter	1000h
41	P FUEL FILT	Fuel pre-filter	500h
04	HYD FILT	Hydraulic oil filter	2000h
08	FNL OIL	Final drive oil	1000h
10	HYD OIL	Hydraulic oil	2000h
21	HST FILT	HST charge filter	2000h

When changing the oil or replacing the filter, select the appropriate item, then depress the \diamond position of the buzzer cancel switch. A question asking if the replacement history is to be updated is displayed.

Select YES with the information switch (<, >), and press the \diamond position on the buzzer cancel switch. The number of times of replacement increases by 1, the replacement interval is also reset, and the oil and filter replacement interval lamp goes out.

If the maintenance caution lamp does not go out when this is done, it means that the replacement interval is close for some other item, so check.



REMARK

To return to the maintenance item without resetting, use the information switch (<,>) to select NO, then press the \diamond portion of the buzzer cancel switch.

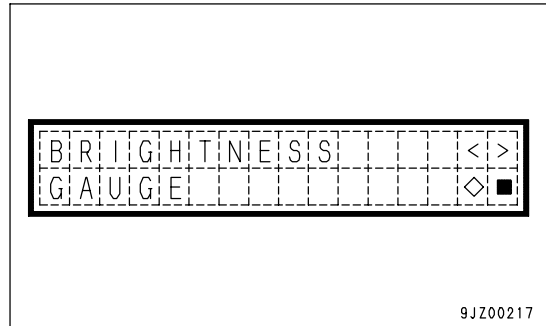
METHOD OF USING USER ADJUST MODE

With the user adjust mode, the brightness of the panel screen backlighting and the contrast of the liquid crystal panel can be changed.

1. Adjusting backlighting of liquid crystal display

- 1) The figure on the right shows the mode for adjusting the backlighting of the liquid-crystal gauge.

On this screen, press the \diamond position of the buzzer cancel switch to switch to the screen for adjusting the brightness.

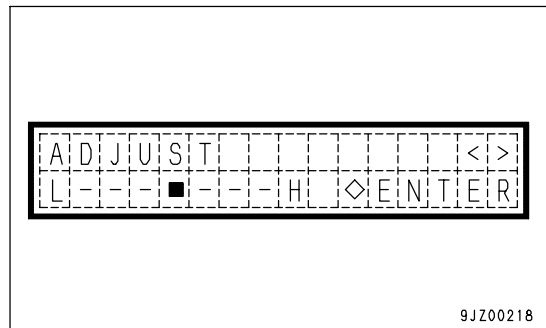


- 2) Operate the information switch to adjust the brightness.

When the \blacksquare square moves closer to H, the screen becomes brighter; when it moves closer to L, the screen becomes darker.

> position: \blacksquare square moves closer to H

< position: \blacksquare square moves closer to L



- 3) Press the \diamond position of the buzzer cancel switch to confirm the brightness of the backlighting of the liquid-crystal gauge portion. The screen then returns to the previous screen.

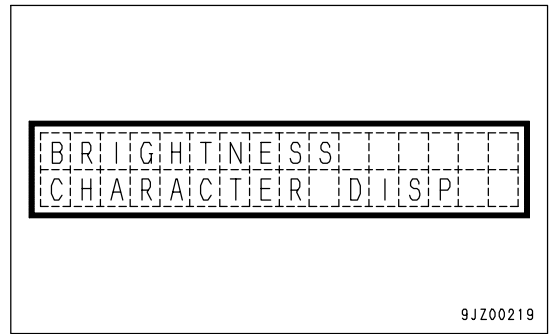
REMARK

The brightness of the backlighting of the monitor panel differs according to whether the front lamp is lit or not. Entering this mode when the front lamps are lit makes it possible to adjust the brightness when the front lamps are lit. In the same way, entering this mode when the front lamps are not lit makes it possible to adjust the brightness when the front lamps are not lit.

2. Adjusting backlighting of display panel B (multi-information)

1) The figure on the right shows the mode for adjusting the backlighting of display panel B (multi-information).

On this screen, press the ◊ position of the buzzer cancel switch to switch to the screen for adjusting the brightness.

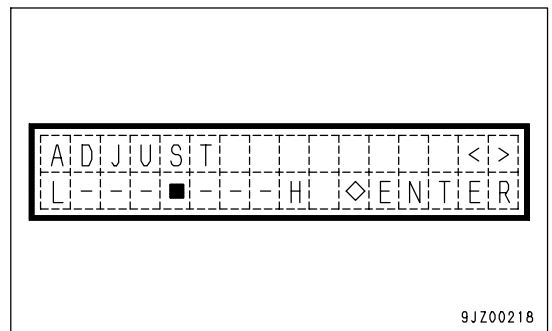


2) Operate the information switch to adjust the brightness.

When the ■ square moves closer to H, the screen becomes brighter; when it moves closer to L, the screen becomes darker.

> position: ■ square moves closer to H

< position: ■ square moves closer to L

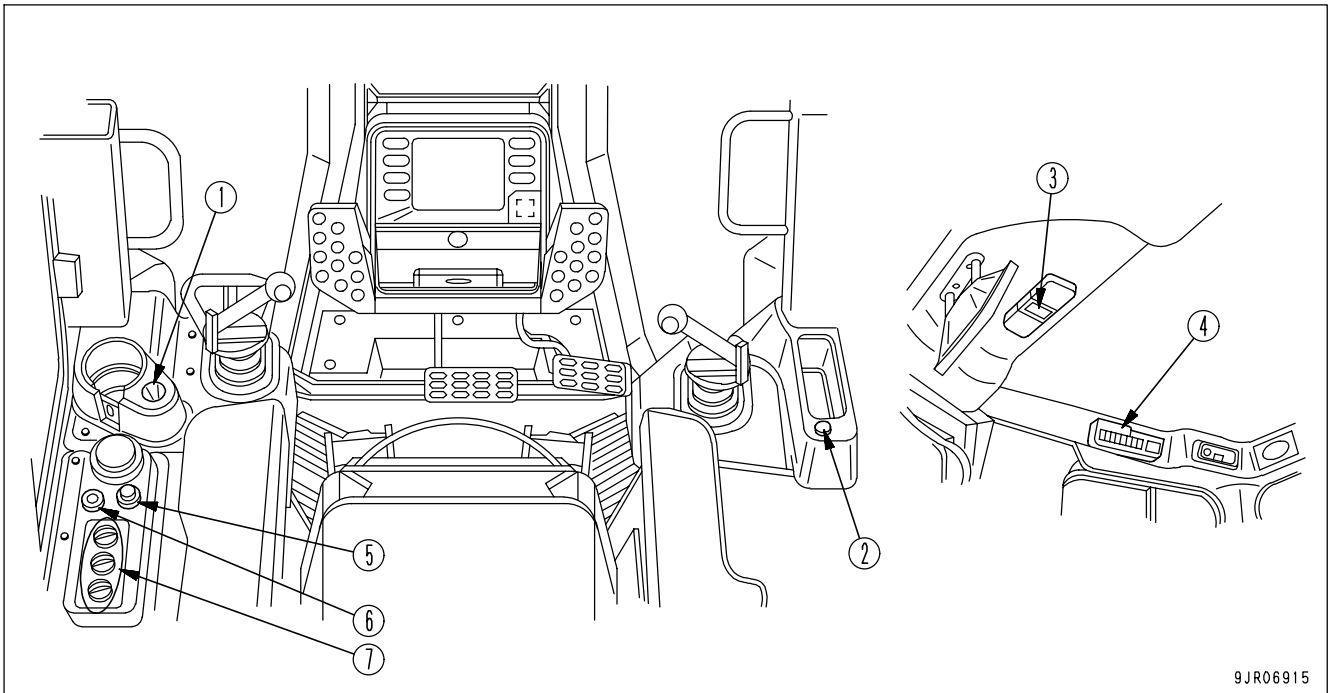


3) Press the ◊ position of the buzzer cancel switch to confirm the brightness of the backlighting of display panel B (multi-information). The screen then returns to the previous screen.

REMARK

The brightness of the backlighting of the monitor panel differs according to whether the front lamp is lit or not. Entering this mode when the front lamps are lit makes it possible to adjust the brightness when the front lamps are lit. In the same way, entering this mode when the front lamps are not lit makes it possible to adjust the brightness when the front lamps are not lit.

SWITCHES



- | | |
|--|--|
| (1) Fuel control dial | (6) Accessory socket (machines equipped with cab)
(if equipped) |
| (2) Horn switch | (7) Air conditioner switch
(machines equipped with cab) |
| (3) Room lamp switch (machines equipped with cab) | |
| (4) Wiper switch (machines equipped with cab) | |
| (5) Cigarette lighter (machines equipped with cab) | |

FUEL CONTROL DIAL

**WARNING**

- When the machine is stopped, check that the steering, directional, and gear shift lever is at the Neutral position before turning the fuel control dial to the FULL position. If the steering, directional, and gear shift lever is at a forward or reverse travel position and the fuel control dial is turned to the FULL position, there is danger that the machine may suddenly move and cause serious personal injury.
- If the steering, directional, and gear shift lever is at a forward or reverse travel position, check that the surrounding area is safe, and then turn fuel control dial slowly to the FULL position.

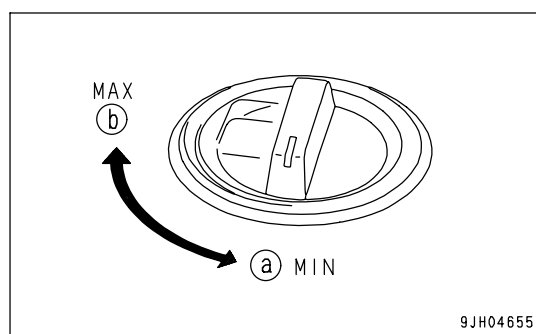
Dial (1) is used to control the engine speed and output.

(a) Low idling position: Turn fully to the left

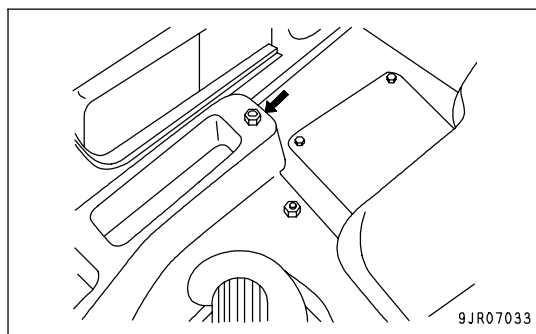
(b) High idling position: Turn fully to the right

REMARK

- If it is unnecessary to travel at high speed and the operation has a comparatively light load, turn the fuel control dial from the FULL position slightly towards the low idling position. This will improve the fuel consumption efficiency and reduce the noise.
- For leveling and finishing operations or spreading gravel, turn the fuel control dial also from the FULL position slightly towards the low idling position. This will reduce shoe slip and improve the service life of the machine.

**HORN SWITCH**

The horn sounds when the button (2) at the rear of the blade control lever at the right side of the operator's seat is pressed.

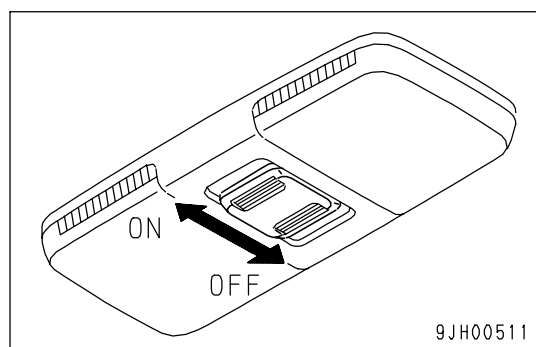
**ROOM LAMP SWITCH**

(Machine equipped with cab)

This (3) illuminates the room lamp.

OFF position: Lamps are out

ON position: Lamps light up



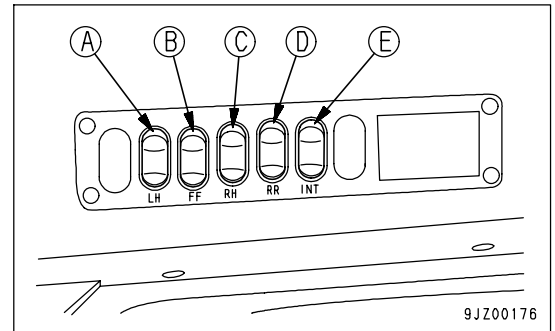
WIPER SWITCH

(Machine equipped with cab)

This (4) activates the wipers.

The wiper switches are as follows:

- (A): Left door window
- (B): Front window
- (C): Right door window
- (D): Rear window
- (E): Intermittent switch (for left and right door windows)



The wiper will automatically stop if the blade is stuck for some reason. After a fixed time of stopping, it will automatically start again, but always remove the cause of the wiper stopping.

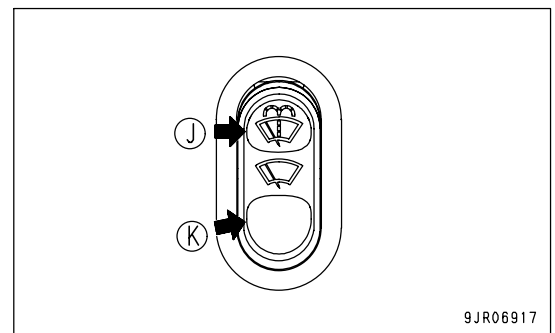
Example of cause of wiper stopping

- The glass is half dry and the wiper has been operated for a long time
- Something is caught in the arm or blade
- Snow or ice are stuck to the arm or blade

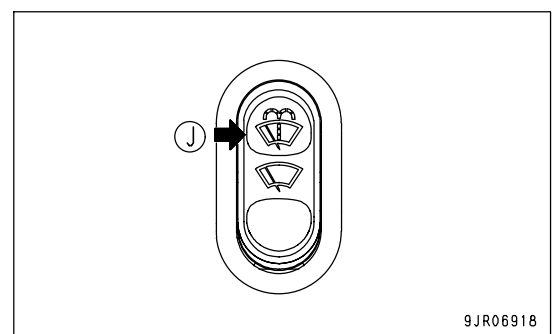
This is also used as the window washer switch.

The switch is operated as follows.

- Wiper only
 - (J) ON position: Wiper is operated
 - (K) OFF position: Wiper stops



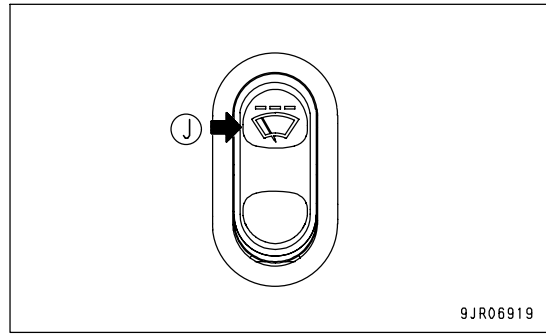
- Wiper and window washer
 - If this is kept pressed to the ON position (J) while the wiper is working, water will be sprayed out.



- Wiper intermittent switch (for left and right door windows)
If the switch is set to ON position (J) to operate the wiper, the wiper will perform 1 cycle every 4 seconds.

REMARK

When the intermittent switch is at ON position (J), if the wiper switch for the left and right door windows is turned ON, the wiper will move intermittently.



9JR06919

CIGARETTE LIGHTER

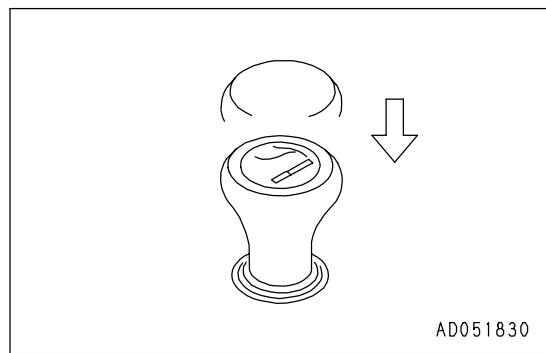
(Machine equipped with cab)

This (5) is used to light cigarettes.

When the cigarette lighter is pushed in, it will return to its original position after a few seconds, so take it out to light your cigarette. If the cigarette lighter is removed, the socket can be used as a power source.

NOTICE

This cigarette lighter is 24V. Do not use it as the power supply for 12V equipment. This will cause failure of the equipment. The capacity of the cigarette lighter is 120W (24V x 5A).



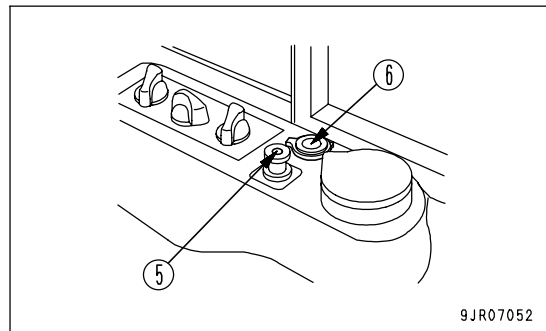
AD051830

ACCESSORY SOCKET

(Machine equipped with cab) (If equipped)

This (6) is used as the power source for a wireless or other 12V equipment.

The capacity of this accessory socket is 144W (12V x 12A).



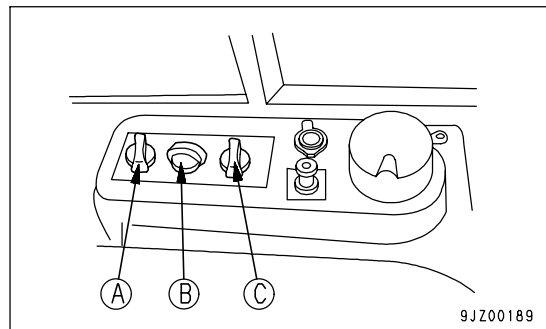
9JR07052

AIR CONDITIONER SWITCH

(Machine equipped with cab)

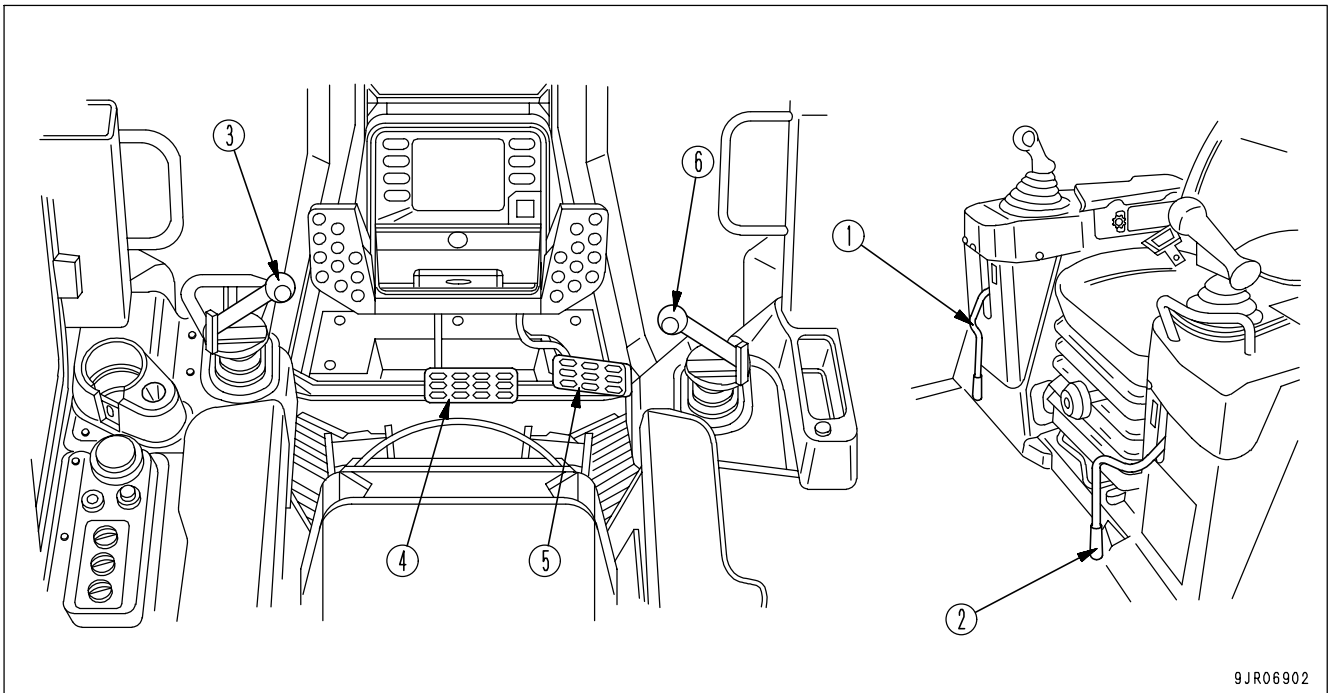
- (A): Air conditioner mode selector switch
- (B): Blower selector switch
- (C): Temperature control switch

For details, see "AIR CONDITIONER, HANDLING (PAGE 3-61)".



9JZ00189

CONTROL LEVERS AND PEDALS



9JR06902

- (1) Work equipment lock lever
- (2) Parking brake lever
- (3) Steering, forward-reverse, gear shift lever

- (4) Brake pedal
- (5) Decelerator pedal
- (6) Blade control lever

WORK EQUIPMENT LOCK LEVER

**WARNING**

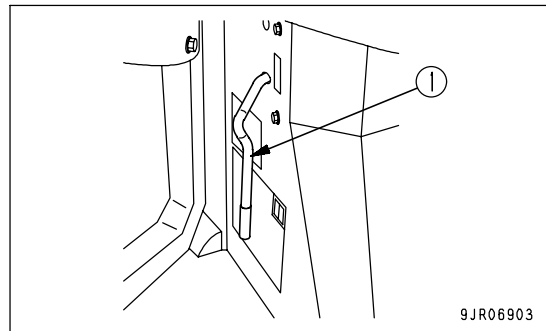
- When leaving the operator's compartment, set the work equipment lock lever securely to the LOCK position. If the work equipment lock lever is not at the LOCK position and the control levers are touched by mistake, it may lead to serious personal injury.
- If the work equipment lock lever is not set securely to the LOCK position, the work equipment may move and cause serious injury. Check that it is in the position shown in the diagram.
- When parking the machine or when carrying out maintenance, always lower the work equipment to the ground, then set the work equipment lock lever to the LOCK position.

This lever (1) is the lock device for the work equipment control lever.

When it is operated to the LOCK position (1 position shown in the diagram on the right), operation of the work equipment is locked.

- Even when the lever is operated to the LOCK position, the blade control lever will still move. Or other, the control hydraulic pressure for the blade control is locked, so the blade does not move.

If the blade control lever is at the FLOAT position and the safety lever is set to the LOCK position, the blade control lever is automatically returned to the HOLD position.



9JR06903

REMARK

When starting the engine, to ensure safety, always set the work equipment lock lever to the LOCK position.

PARKING BRAKE LEVER

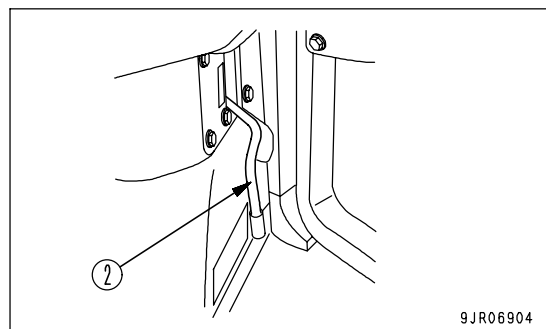
**WARNING**

- When parking the machine, always set the parking brake lever in the LOCK position.
- If the parking brake lever is operated, the brake is applied, even when the machine is traveling.
The machine will suddenly stop, so this is dangerous. For this reason, do not operate the parking brake lever when the machine is moving, except in emergencies.

This lever (2) is the lever for applying the parking brake. When it is operated to the LOCK position (the position shown in diagram on the right), the parking brake is applied.

REMARK

If the parking brake lever is not at the LOCK position when the engine is started, the limit switch is actuated and the engine will not start.



9JR06904

STEERING, FORWARD-REVERSE, GEAR SHIFT LEVER

This control lever (3) serves to change forward or reverse direction of machine travel, steer the machine to the right or left, change the traveling speed and make a counter-rotation.

- **Forward-reverse shifting**

Position (A): FORWARD

Position (B): REVERSE

Position (N): Neutral

When the lever is operated to the front, the machine travels forward; when it is operated to the rear, the machine travels in reverse.

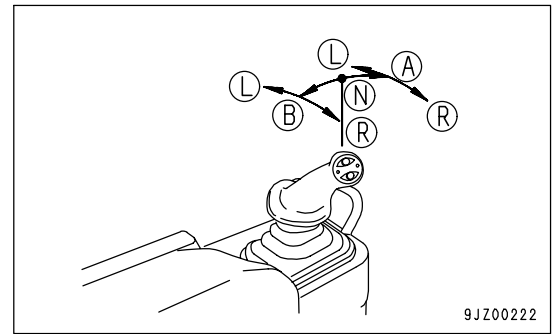
- **Steering**

Position (L): Left turn

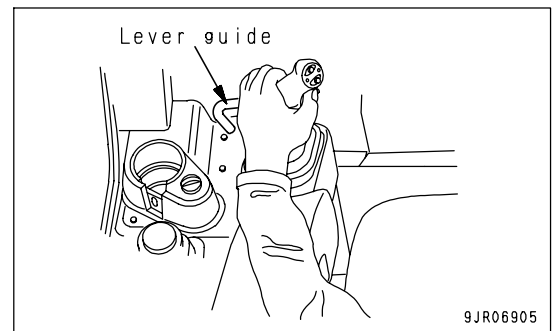
Position (R): Right turn

If the lever is at the FORWARD or REVERSE position and it is operated to the left or right, the machine will turn in the direction that the lever is operated.

If the lever is operated to the left or right to a position where it becomes heavy, the turning radius will become smaller.



9JZ00222



9JR06905

REMARK

- When you are steering, if you release the lever, it will return to the center position and the machine will travel in a straight line.
- When you are steering, support your hand with the lever guide to make it easier to carry out the turning operation.

- **Counterrotation turn**

When steering the machine, if the lever is operated further from the position where it becomes heavy, the left and right tracks will rotate in opposite directions and the machine will carry out a counterrotation turn.

- **Gear shifting**

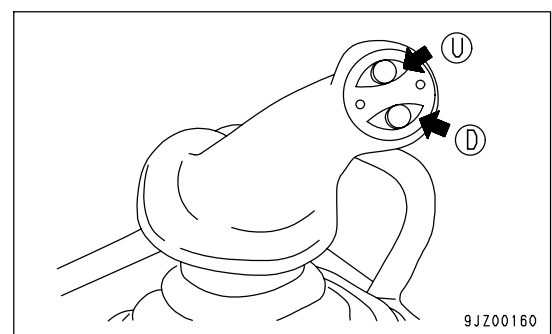
Press the shift switch of the knob of the steering, forward-reverse, gear shift lever to carry out the gearshifting operation.

Press the UP switch (U) once to shift up.

Press the DOWN switch (D) once to switch down.

When the starting switch is turned to the ON position, the transmission is automatically set to 1st.

For details of the method of switching the shift mode, displaying the monitor, and setting the travel speed, see "DISPLAY PANEL A (SPEED RANGE, SHIFT MODE INDICATOR) (PAGE 3-14)".



9JZ00160

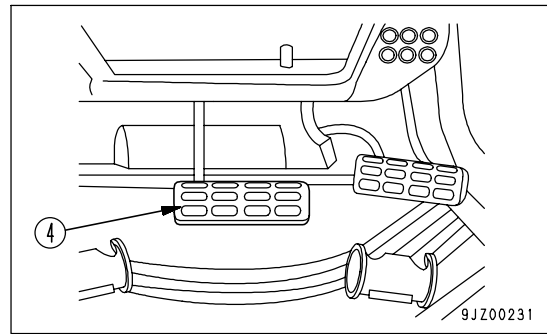
If the operating load increases, the travel speed will slowly decrease and the transmission will shift down. When the load becomes lighter again, the transmission will shift up to the set travel speed.

When the transmission automatically shifts down, the speed range display does not change.

BRAKE PEDAL

When this pedal (4) is depressed, the travel speed is reduced according to the amount the pedal is depressed. When the operating effort becomes stronger, the machine stops.

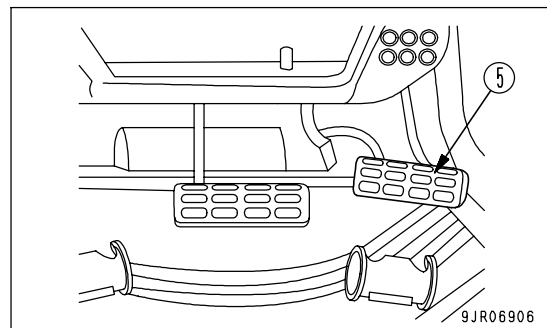
If the brake pedal is depressed further, the mechanical brake is applied.

**DECELERATOR PEDAL****WARNING**

- When passing over the top of a hill or when dumping a load from the edge of a cliff, the load is suddenly reduced and there is danger that the travel speed will rise. To prevent there is danger, depress the decelerator pedal to reduce the travel speed.
- On flat ground, the decelerator pedal can be used to stop the machine, but this does not mean that the brake has been applied. On downhill slopes, even if the decelerator pedal is depressed to reduce the engine speed, the machine may still move. On downhill slopes, be particularly careful when using the decelerator pedal.
- When going down a slope, select a gear range that will use the braking force of the engine, and depress the brake pedal if necessary.

This pedal (5) is used to reduce the engine speed or to reduce the travel speed.

When switching between forward and reverse travel, or when stopping the machine, depress this pedal to reduce the travel speed first.



BLADE CONTROL LEVER

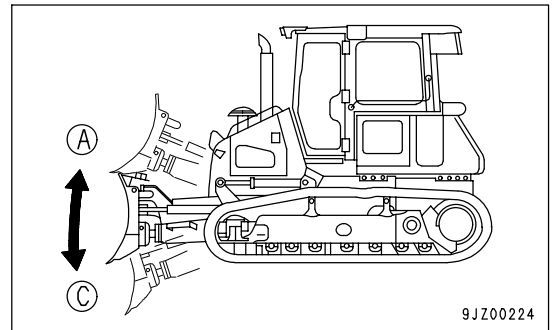
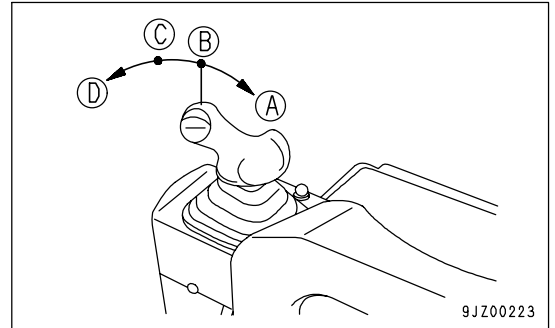
This lever (6) is used to lift, tilt or angle the blade.

LIFTING CONTROL

- (A) RAISE: Blade goes up
- (B) HOLD: Blade stops and is held in position
- (C) LOWER: Blade goes down
- (D) FLOAT: Blade moves freely under external force

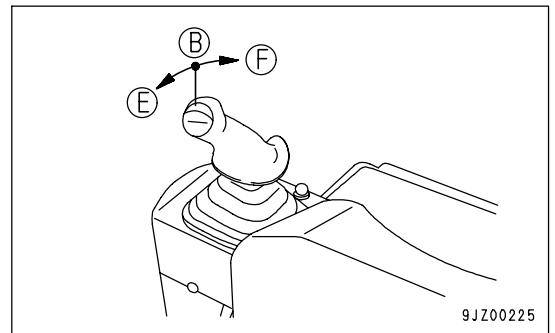
REMARK

- When released from FLOAT position, this lever will not return to HOLD position, so it must be moved back by hand.
- Before starting the engine, check that the blade control lever is at the HOLD position.
- In cold weather, it will take time for the lever to be held at the HOLD position, so hold the lever by hand at the HOLD position for at least 1 second.

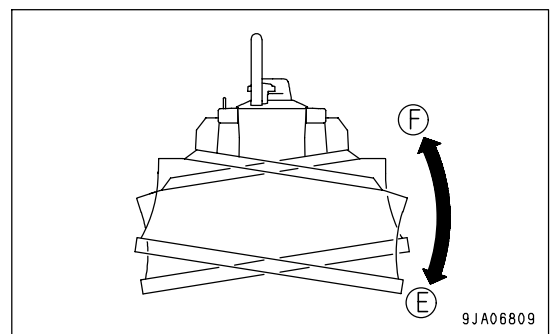


TILTING CONTROL

- (B) HOLD: Blade is stopped and held in this position.
- (E) LEFT TILT
- (F) RIGHT TILT



Model	Tilt amount (mm (in))	
	Narrow blade	Wide blade
D31EX	-	380 (15.0)
D31PX	390 (15.4)	445 (17.5)
D37EX	-	370 (14.6)
D37PX	390 (15.4)	445 (17.5)



ANGLING CONTROL

Rotate the knob to the left or right to change the angle of the blade.

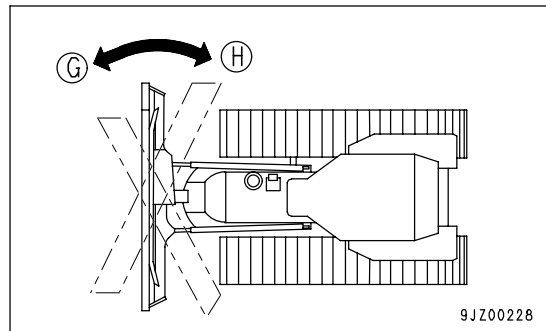
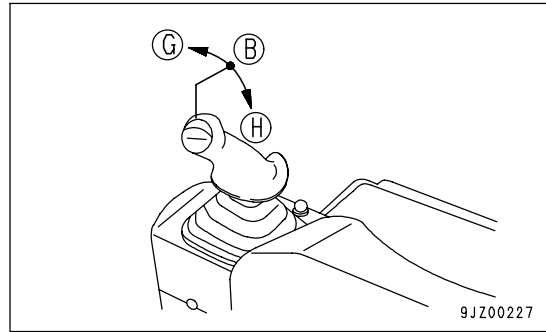
(G) Angle to left

(B) HOLD: Blade stops and is held in position

(H) Angle to right

REMARK

- When performing only angling operation, be sure to set the lever in the neutral (HOLD) position and turn the knob to the right or left.
- If the angling operation is performed while the lever is not in the neutral (HOLD) position (while either or both of lifting and tilting operations are performed), all of those operations can be continued, but the moving speed of the blade is lowered. Select the operations according to the type of the work.
- If the lifting or tilting operation is performed while angling operation is performed, the machine moves similarly to the above.



FUSE

NOTICE

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

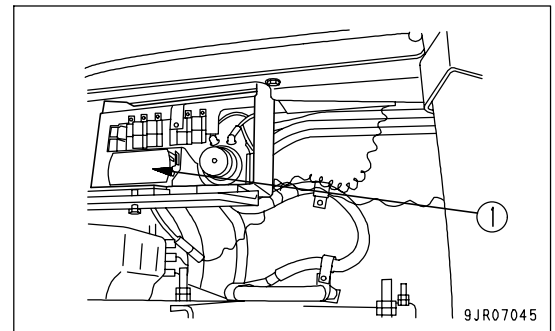
Fuses protect the wiring and electrical components from burning out.

If a fuse is corroded or covered in white powder, or if there is any looseness between the fuse holder and the fuse, replace the fuse.

Replace the fuse with another of the same capacity.

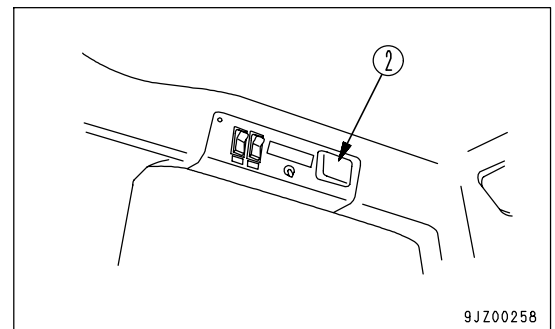
- Chassis

Open the hydraulic tank inspection cover on the left side. Fuse box (1) is installed inside.



- Cab (machines equipped with cab)

Fuse box (2) is installed in the ceiling at the rear right.

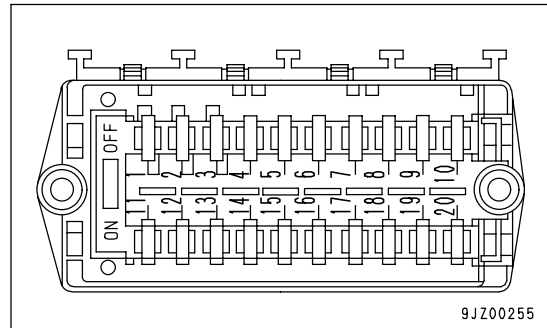


FUSE CAPACITY AND CIRCUIT NAME

• Chassis

Fuse box (1)

No.	Fuse capacity	Name of circuit
1	20A	Lamp
2	10A	Horn
3	10A	PPC lock
4	30A	Air conditioner power source
5	10A	Machine controller 1
6	10A	Center brake
7	30A	Cab power source 1
8	30A	Cab power source 2
9	15A	Starting switch
10	30A	Engine controller 1
11	20A	Power takeoff port
12	15A	Preheater relay
13	10A	Foot heater
14	15A	Air suspension seat (if equipped)
15	10A	Machine controller 2
16	10A	Monitor panel
17	5A	Spare
18	10A	Service connector
19	10A	Cab permanent power source
20	5A	Engine controller 2

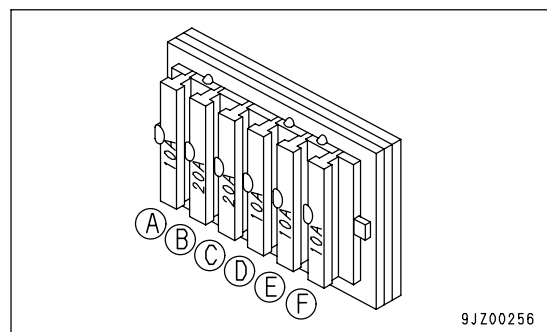


9JZ00255

• Cab

Fuse box (2)

No.	Fuse capacity	Name of circuit
(A)	10A	Radio memory
(B)	20A	Additional working lamp
(C)	20A	Cigarette lighter, 12V socket
(D)	10A	Radio, room lamp
(E)	10A	Front wiper, rear wiper
(F)	10A	Left, right door wipers



9JZ00256

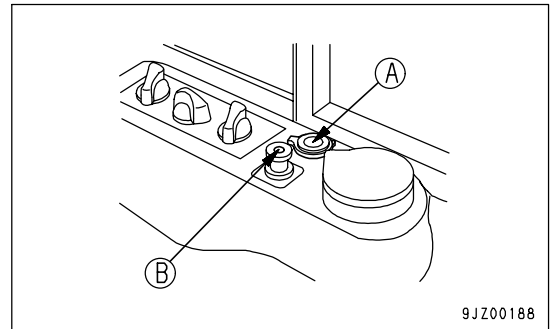
ELECTRIC POWER TAKE-OUT ADAPTER

NOTICE

- Do not use the cigarette lighter as a power supply for 12V equipment. This may cause the equipment to break down.
- When using the cigarette lighter socket as a power takeoff port, to install equipment that exceeds 120W (24V x 5A).

(Machine equipped with cab) (If equipped)

- Accessory socket (A) can be used for 12V low-voltage equipment.
- The capacity of the accessory kit (A) is 144W (12V x 12A).
- If cigarette lighter (B) is removed, the socket can be used as a 24V power supply.
- The capacity of cigarette lighter (B) is 120W (24V x 5A).



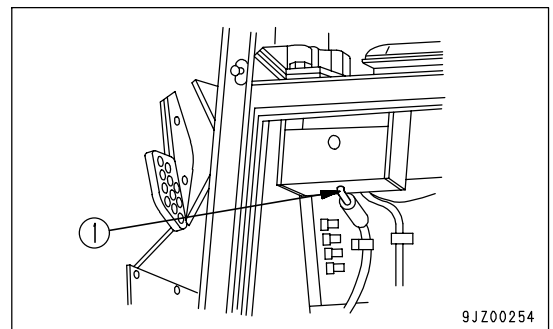
(Machines equipped with canopy)

1. Open the hydraulic tank inspection cover on the left side of the machine.
2. Power take-off connector (1) is inside.
The connector is held by a clamp.

Capacity of connector

(1) CN 17: 120W (24V x 5A)

(this can be used when the starting switch is ON)



REMARK

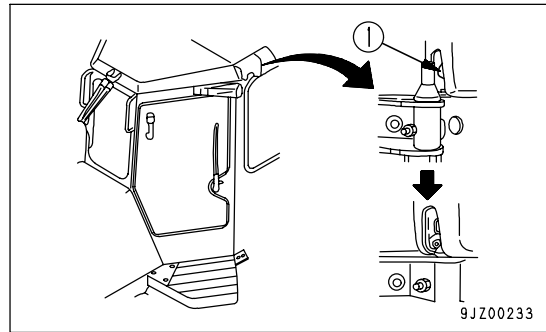
- Ground the negative (-) wiring to the bodywork or main frame. Grounding the wiring to the engine, valves, or other parts mounted with rubber will cause failure.
- If the wiring is grounded to a place where the paint is remaining, the electricity will not flow, so remove the paint.

DOOR - OPEN LOCK

(Machine equipped with cab)

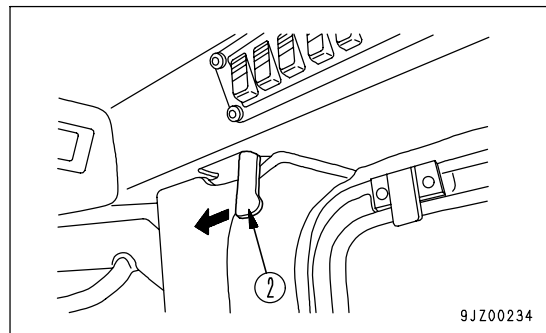
Use this when your want to keep the door held open.

- 1. Push the door against the door catch (1). The door will be held by the door catch.



9JZ00233

- 2. To release the door, move lever (2) inside the cab to the front of the cab. This will release the catch.



9JZ00234

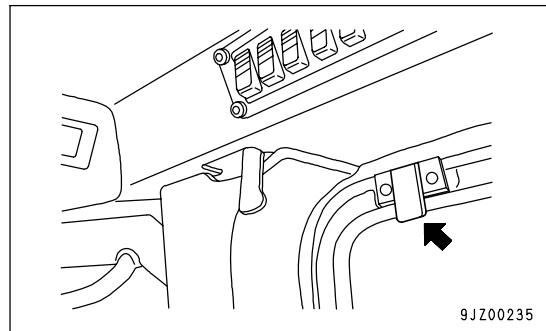
NOTICE

- When keeping the door open, fix it securely to the catch.
- Always close the door when traveling or carrying out operations. Leaving the door open will cause the door to break.
- Keep the door locked open securely. The door may swing closed because of the vibration.

SASH GLASS INTERMEDIATE LOCK

(Machine equipped with cab)

When working with the cab sash glass open, use this lock to prevent the glass from chattering.

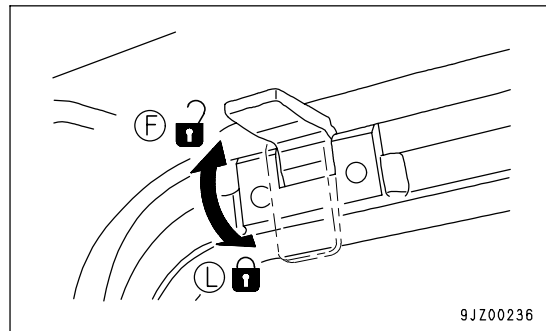


9JZ00235

- When the lever is in the FREE position (F), the glass can be opened or closed.
- When the lever is in the LOCK position (L), the glass is held in position.

NOTICE

Keep the glass locked when traveling and during operations. If operations are carried out when the glass is not locked, it may cause breakage of the glass.



9JZ00236

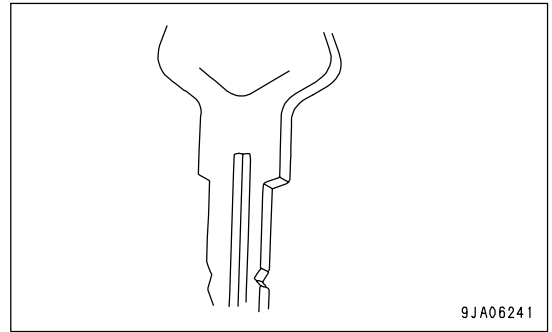
COVER, CAP WITH LOCK

Use the starting key to lock or unlock the covers and caps with locks.

(A separate key is used for locking the fuel tank cap.)

For details of the locations of the covers and caps with locks, see "LOCKING (PAGE 3-109)".

Insert the key as far as it will go, then turn it. If the key is turned before it is inserted fully, it may break.



METHOD OF OPENING OR CLOSING HYDRAULIC TANK CAP

The method of opening or closing hydraulic cap is as follows.

OPENING THE CAP

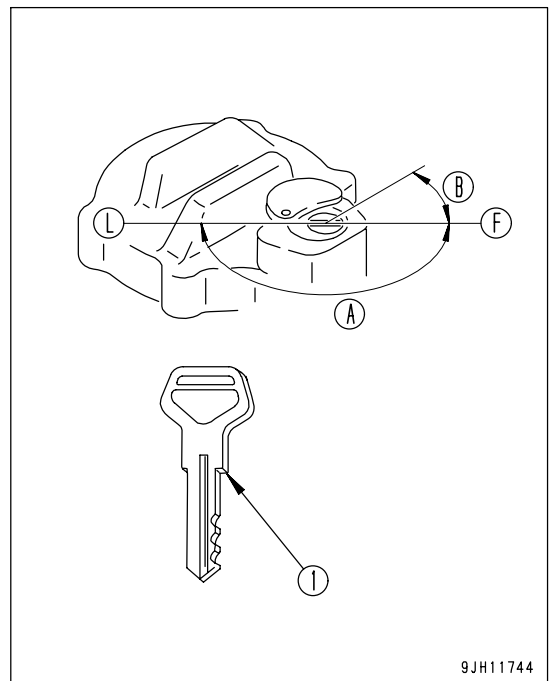
1. Insert the key. Make sure that you have inserted the key fully (1) before turning it. If the key is turned when only partially inserted, it may break.

(L) : Lock position

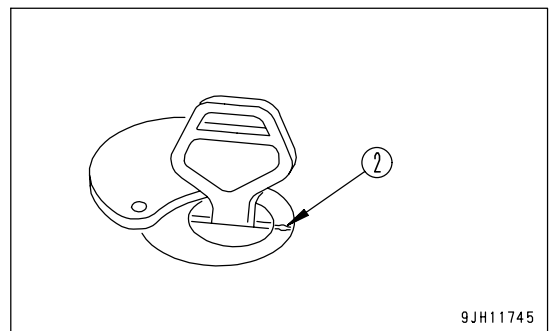
(F) : Open position

(A) : working angle of key 180°

(B) : 45°



2. Turn the key counterclockwise to align the match mark (2) on the cap with the rotor groove, then turn the cap slowly. When a click is heard, the lock is released, enabling the cap to be opened.



LOCKING THE CAP

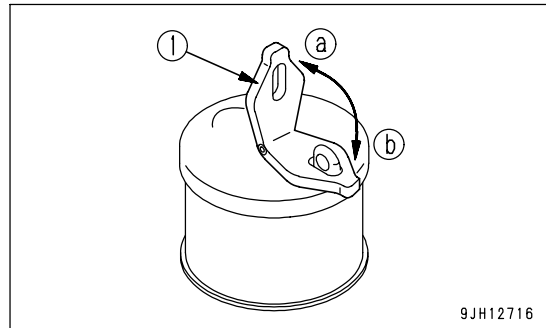
1. Turn the cap into place.
2. Turn the key clockwise and take the key out.

METHOD OF OPENING OR CLOSING THE FUEL TANK CAP

The method of opening or closing the fuel tank cap is as follows.

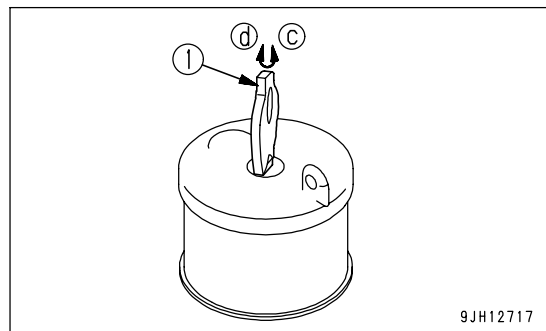
OPENING THE CAP

1. Raise lever (1) in the (a) direction.
2. When lever (1) is turned in the (c) direction (counterclockwise) by approx 35°, it stops at the stopper, and the cap can be opened.



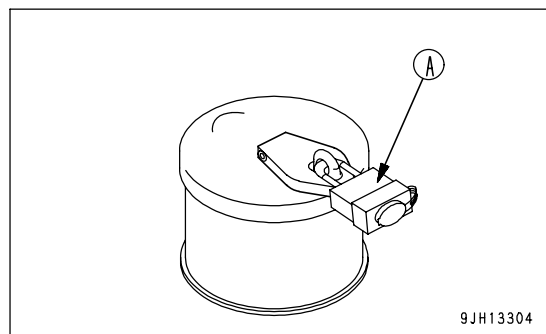
CLOSING THE CAP

1. After turning lever (1) in the (c) direction (counterclockwise), keep it in that position and fit the cap.
2. Turn lever (1) in the (d) direction (clockwise) until it stops at the stopper, and then tilt it in the (b) direction.



REMARK

If the padlock (A) is to be used, it is recommended to use the type that has the cover to protect the key hole.



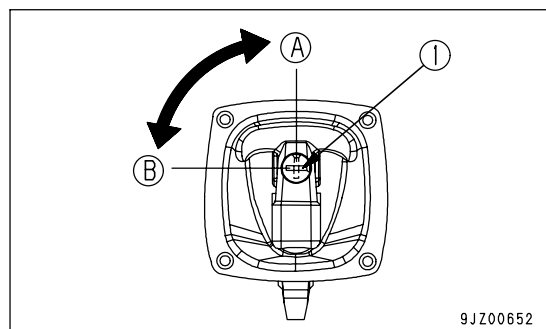
METHOD OF OPENING OR CLOSING INSPECTION COVER

(There are inspection covers in three places.)

Insert the key in slot (1).

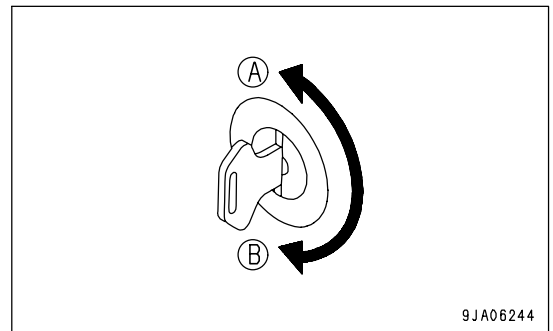
When it is turned to position (A), the lock is opened.

When it is turned to position (B), the cover is locked.

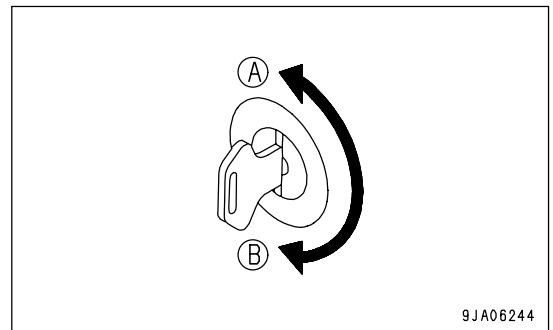


METHOD OF OPENING OR CLOSING COVER WITH LOCK**WHEN OPENING (IF IT IS LOCKED)**

1. Insert the key in the slot.
2. Turn the key counterclockwise in direction (A), then pull the cover knob to open the cover.

**WHEN LOCKING**

1. Close the cover and insert the key in the slot.
2. Turn the key clockwise in direction (B), then remove the key.



OPENING OR CLOSING REAR MASK

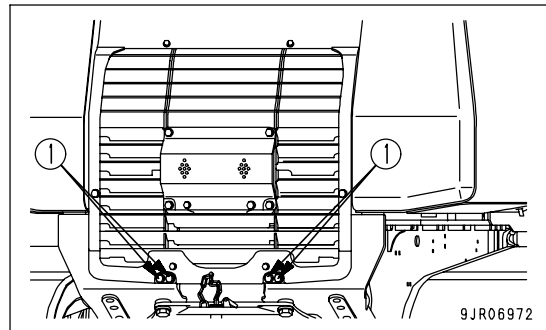


WARNING

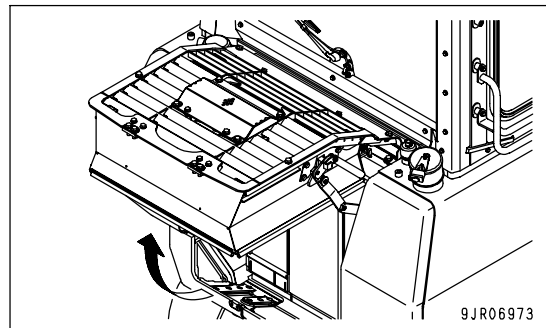
- Stop the engine and fan before opening or closing the rear mask. If you touch the fan when it is rotating, it may cause serious personal injury.
- When opening or closing the rear mask, be careful not to get your fingers caught by the tank.
- After opening the rear mask, check that the lock is applied securely. Check also that there is no abnormality with the lock or link portion.
- After opening the rear mask, be careful not to hit your head on the rear mask.
- Check that there are no cracks or other damage in the hoses or piping that move together with the rear mask.

WHEN OPENING

1. When opening the rear mask, remove 4 bolts (1) at the bottom of the mask.
2. Pull the rear mask towards you and push it up.



3. Check that the rear mask has opened to the maximum opening position and that the lock is applied, then release it.

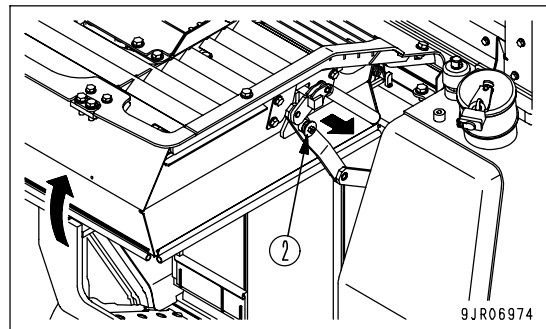


WHEN CLOSING

NOTICE

The rear mask cannot be closed if the lock is not released. If you attempt to close the rear mask without releasing the lock, the rear mask will be damaged.

When closing the rear mask, lift it up, screw lock release knob (2) in the direction of the arrow to release the lock, then close the rear mask.



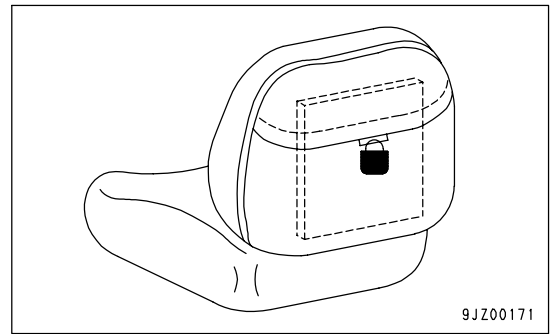
DOOR POCKET

There is a pocket on the back of the operator's seat. (fitted with a lock)

Keep the Operation & Maintenance manual in this pocket so that the operator can read it whenever necessary.

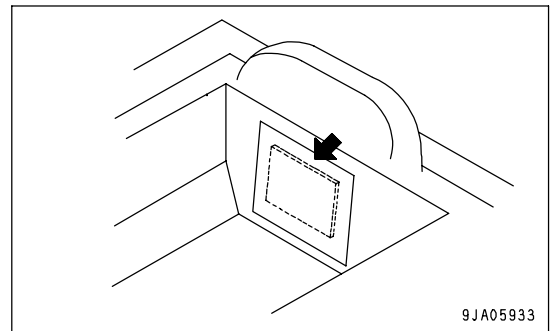
REMARK

When locking the machine with the canopy specification, use the hole at the entrance of the pocket.



REMARK

If the machine is equipped with an air suspension seat, keep the Operation and Maintenance Manual in the steel pocket behind the seat.

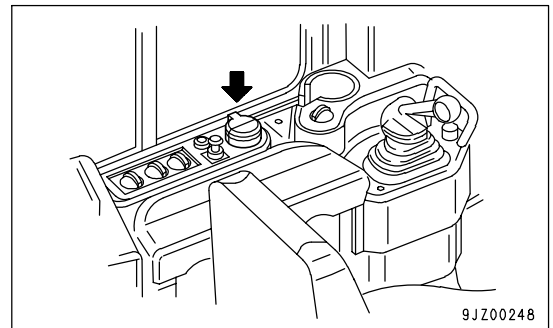


ASHTRAY

(Machine equipped with cab)

This is on the left side of the operator's seat.

Always make sure that you extinguish the cigarette before closing the lid.



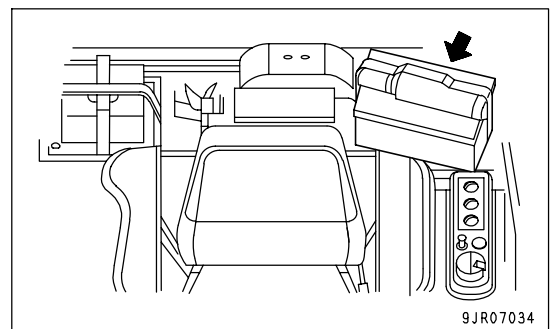
LUNCHBOX HOLDER BELT

(Machine equipped with cab)

This is the place to put your lunchbox.

Hold it in position with the belt.

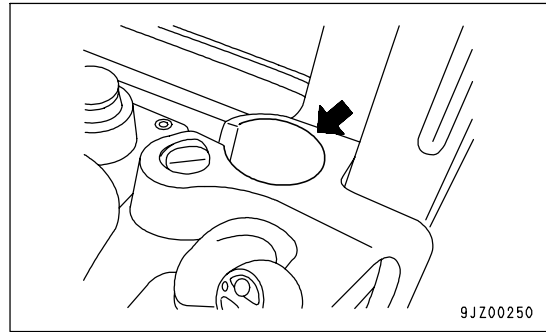
It can also be used for things other than lunchboxes.



CUP HOLDER

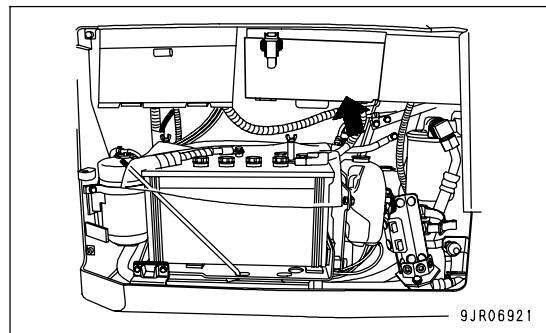
This is the place to put cans and cups.

If cans or cups are put in any other place when they still have drink remaining in them, there is danger that they will fall over and that the drink will get over the surrounding area or equipment.



TOOL BOX

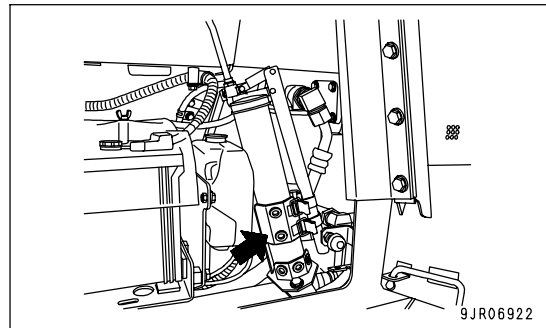
This is inside the hydraulic tank inspection cover at the rear left. Put the tools in it.



GREASE PUMP HOLDER

Fit the grease pump into the grease pump holder at the rear inside the hydraulic tank inspection cover at the rear left of the machine, then fit the rubber band to hold it securely in position.

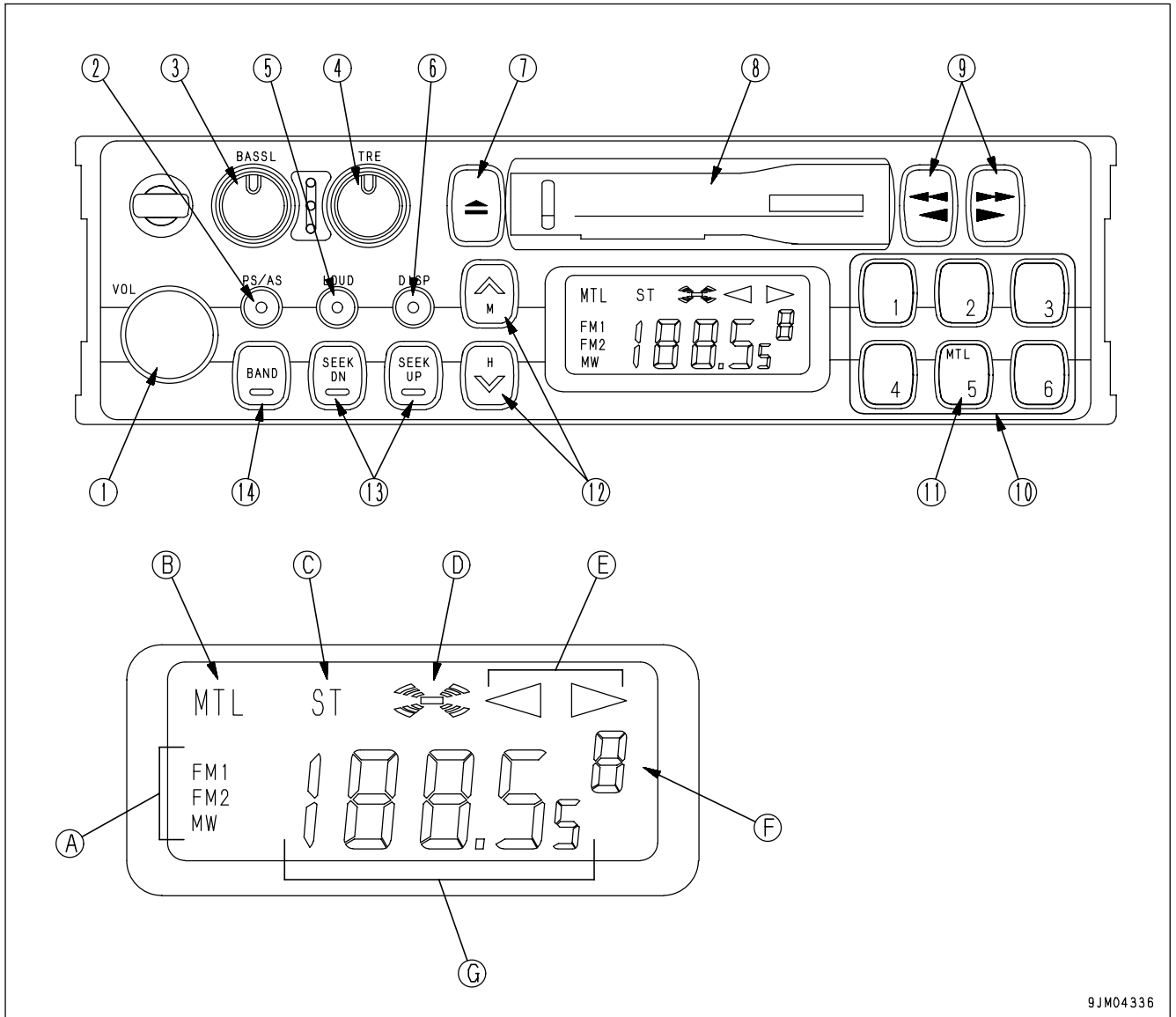
After using, wipe off all the grease from the outside of the pump.



CAR RADIO, HANDLING

(Machine equipped with cab) (If equipped)

EXPLANATION OF COMPONENTS

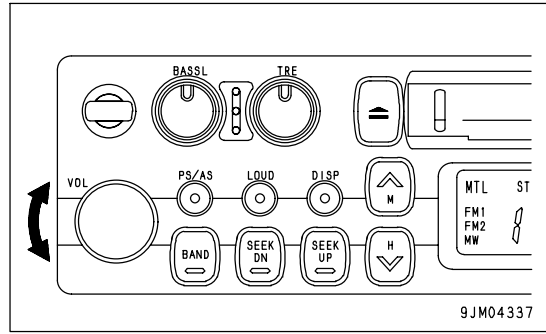


9JM04336

- | | |
|--|----------------------------------|
| (1) Power switch/volume | (8) Cassette door |
| (2) Auto-store/preset scan button | (9) Fast forward, rewind buttons |
| (3) Bass control knob | (10) Preset buttons |
| (4) Treble control knob | (11) Metal tape button |
| (5) Loudness button | (12) Manual tuning buttons |
| (6) Time/radio display selector button | (13) Seek tuning buttons |
| (7) Tape eject button | (14) Band selector button |
| (A) Band display | (E) Tape direction display |
| (B) Metal tape display | (F) Preset channel display |
| (C) FM stereo reception display | (G) Time/frequency display |
| (D) Loudness display | |

POWER SWITCH/VOLUME

Turn this knob (1) to the right until it clicks to turn the power on.
Turn it further to increase the volume.

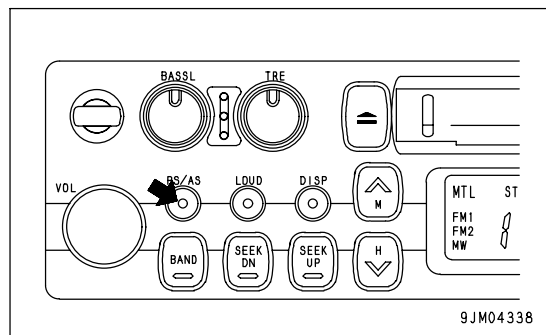


AUTO-STORE/PRESET SCAN BUTTON

Use this button (2) to actuate the preset scan and auto-store functions.

• Auto-store

Each time this button is pressed for more than 2 seconds while in radio reception, this auto-store function automatically starts to search for the desired station within a receivable band, and memorize the frequency in the preset memory. During this scanning process, the frequency shown in the right side of display continues to change. This indicates that each frequency is memorized in the auto-store.



REMARK

If the channel display is flashing, it is impossible to use the auto store function. The flashing display indicates that preset scanning is being carried out.

• Preset scan

If this button is pressed for less than 0.5 seconds while in radio reception, the preset stations in the band now being received are broadcast from No. 1 to No. 6 for 5 seconds each.

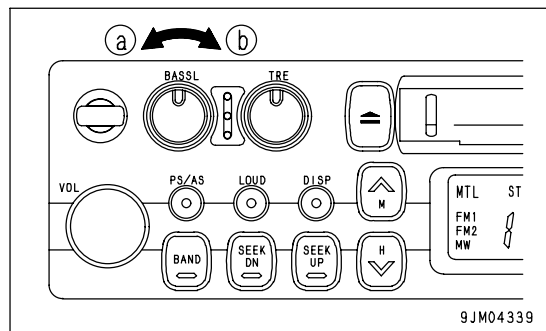
When the desired station is received, press the button again. The preset scan operation stops and the system switches to normal broadcasting. This continues repeatedly until the button is pressed again.

BASS CONTROL KNOB

Turn this button (3) to the left to reduce the low tones; turn it to the right to emphasize the low tones.

Direction (a): Low tone reduced

Direction (b): Low tone emphasized

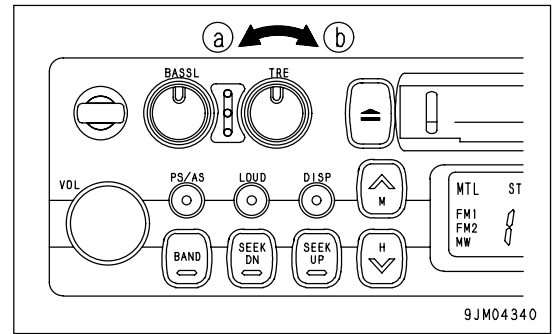


TREBLE CONTROL KNOB

Turn this button (4) to the left to reduce the low tones; turn it to the right to emphasize the high tones.

Direction (a): High tone reduced

Direction (b): High tone emphasized

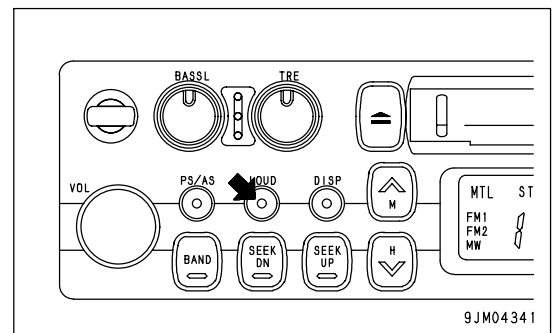


LOUDNESS BUTTON

This button (5) is used when playing at low volume. It makes it possible to hear more easily by emphasizing the low tone when the low tones are weak.

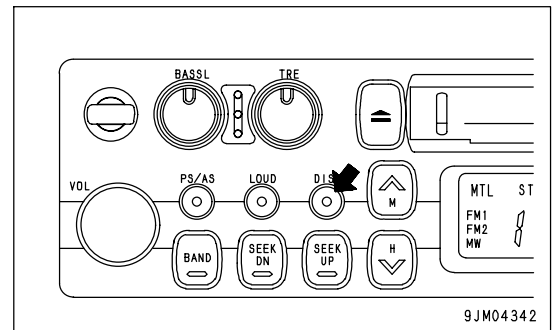
Push button: Actuated (ON)

Push button again: Canceled (OFF)



TIME/RADIO DISPLAY SELECTOR BUTTON

This button (6) is used to switch between the "Radio/tape display" and the "Time display".



• Correcting the time

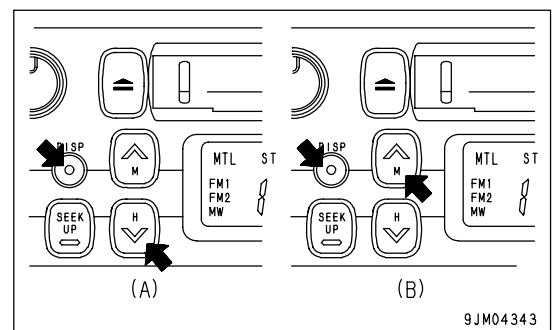
Press the button to set the time display.

(A) Correcting hour:

Keep the DISP button pressed and press the bottom (H) of the TUNING button to correct the hour.

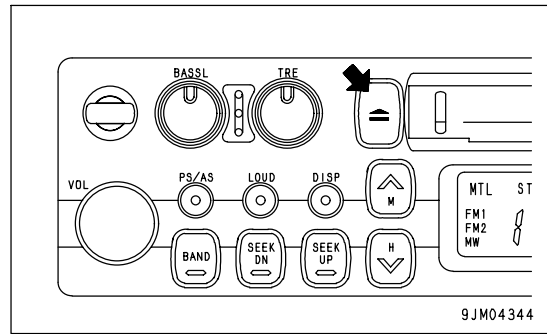
(B) Correcting minute:

Keep the DISP button pressed and press the top (M) of the TUNING button to correct the minute.



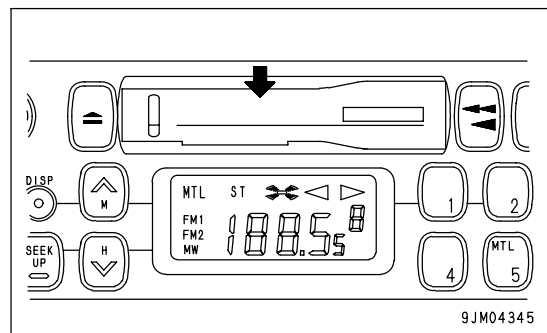
TAPE EJECT BUTTON

This button (7) is used to stop the tape and to eject the cassette. When this button is pressed, the tape is ejected and the radio plays.



CASSETTE DOOR

Set the cassette with the exposed portion of the tape on the right side and insert it through the cassette door (8).



FAST FORWARD, REWIND BUTTONS

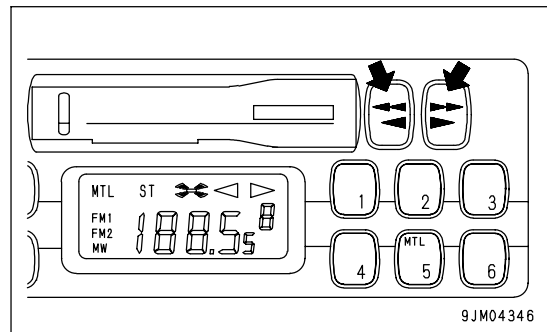
These buttons (9) are used to fast-forward or rewind the tape.

- Fast-forward/rewind

If you press the button pointing in the same direction as the lighted arrow indicating the direction of play, the tape will be fast-forwarded; 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.

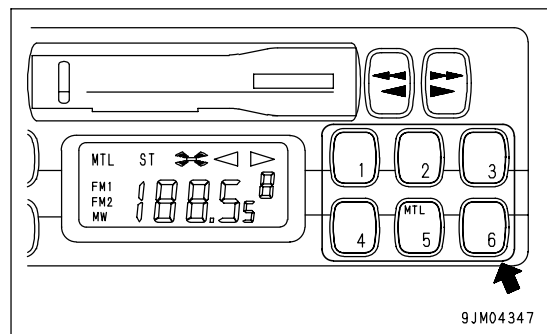
If the fast-forward and rewind buttons are pressed at the same time, the tape will change sides.



PRESET BUTTONS

Use one of these buttons (10) to select the desired frequency saved in memory for the desired station from No. 1 to No. 6 .

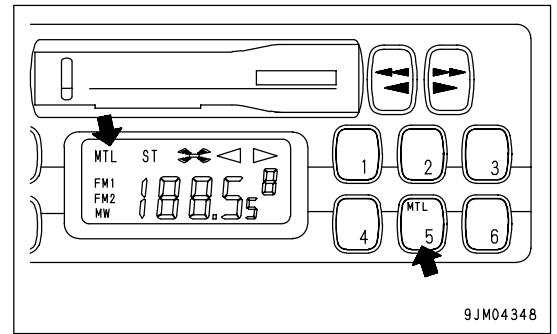
With these buttons, it is possible to preset 6 AM stations and 12 FM stations (FM1: 6 stations, FM2: 6 stations).



METAL TAPE BUTTON

(used also for preset button No. 5)

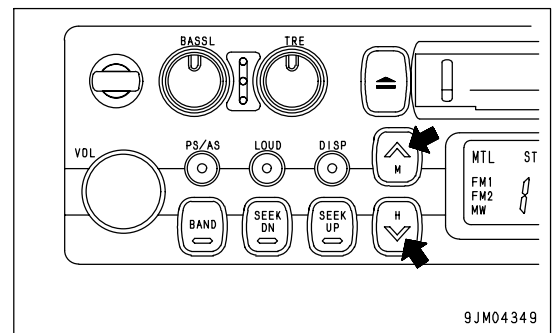
This button (11) is used when playing a metal or chrome tape. This button is also used for preset button No. 5. When it is pressed, "MTL" appears on the display.



MANUAL TUNING BUTTONS

These buttons (12) are used for manual tuning.

When "∧" button is pressed, the frequency goes up; when "∨" button is pressed, the frequency goes down. If the button is pressed down and held, the frequency will change continuously.

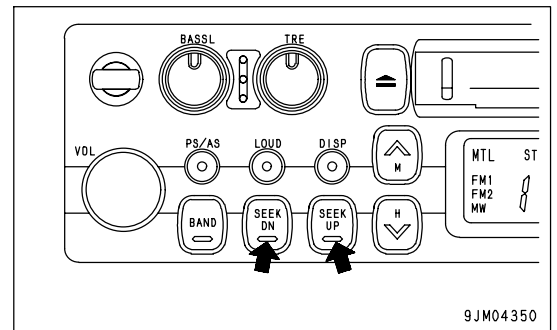


SEEK TUNING BUTTONS

These buttons (13) are used to seek tuning.

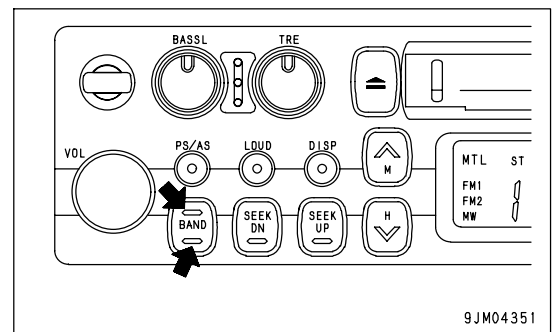
When the "SEEK UP" button is pressed, the search automatically goes up; when the "SEEK DN" button is pressed, the search automatically goes down.

When the next station that can be received is found, it automatically stops.



BAND SELECTOR BUTTON

When this button (14) is pressed, the band is switched between FM1, FM2, and MW (AM). The band is shown on the display.



METHOD OF OPERATION

WHEN PRESETTING STATIONS

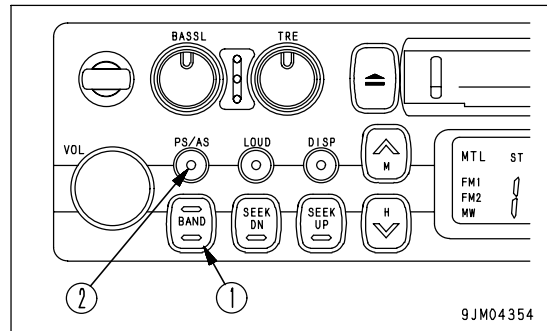
It is possible to preset 6 MW (AM) stations and 12 FM stations (FM1: 6 stations, FM2: 6 stations).

REMARK

If you are playing the cassette, press the tape eject button to stop the tape.

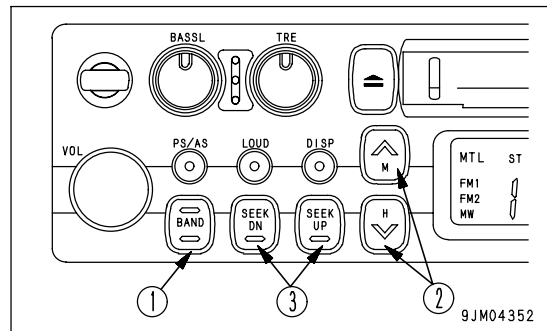
PROCEDURE FOR SUTOMATIC PRESETTING

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 6 stations in the preset memory.



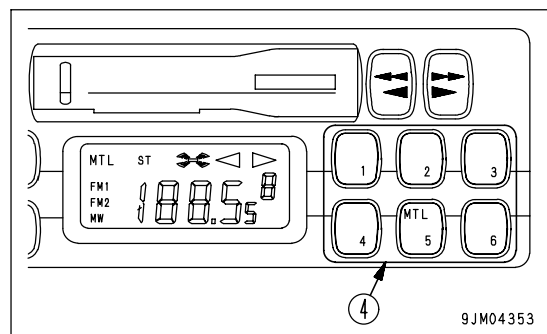
PROCEDURE FOR MANUAL PRESETTING

1. Use band selector button (1) to select MW (AM), FM1 or FM2.
2. Press manual tuning buttons (2) or seek tuning buttons (3).
3. Press preset button (4) of the number to be preset for 2 seconds while the frequency display is being shown on the display. (The preset channel and frequency are displayed and the presetting is completed).
4. Repeat the steps explained in Item 2 and 3 above to preset other stations to the subsequent numbers.
5. If you want to preset a station in the other bands, follow the steps explained in Item 1 through 4 above.



REMARK

- Also, 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, so preset the stations again.



LISTENING TO RADIO

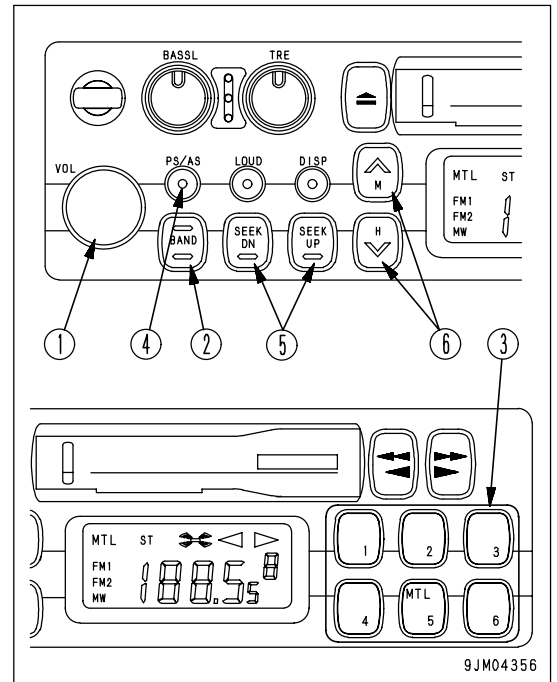
1. Turn the starting switch ON, then turn power switch (1) ON.
2. Use band selector button (2) to select MW (AM), FM1 or FM2.
3. Select the station with the preset buttons (3).

REMARK

If you do not know what station has been recorded for any preset button, press auto store/preset scan button (4) for less than 0.5 seconds. The preset stations are broadcast from No. 1 to No. 6 for 5 seconds each.

When the desired station is received, press auto store/preset scan button (4) again to select the station.

4. If you want to tune in to a station that is not preset, use either seek tuning button (5) or manual tuning button (6).
5. Adjust the volume, balance, and tone as desired.
6. When turning the radio OFF, turn power switch (1) to the left until it clicks.



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.

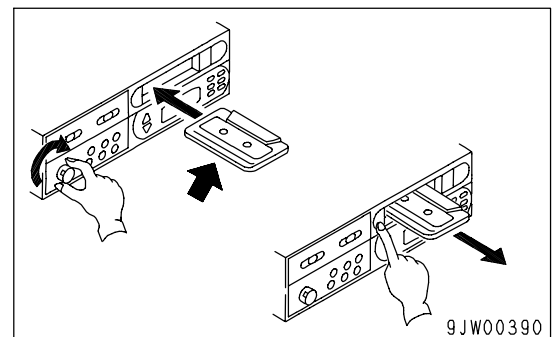
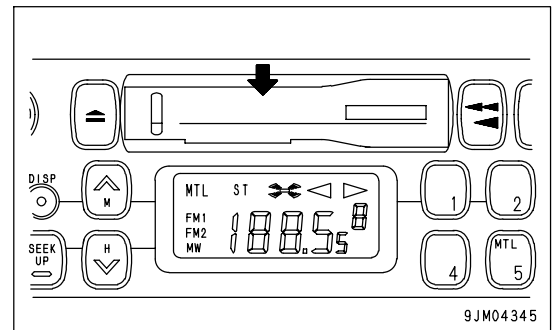
LISTENING TO CASSETTE TAPE

1. Turn the starting switch ON, then turn power switch (1) ON.
2. Set the cassette with the exposed portion of the tape on the right side and push it past the cassette door. The tape will automatically start playing.

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 is automatically reversed and the other side starts to play.

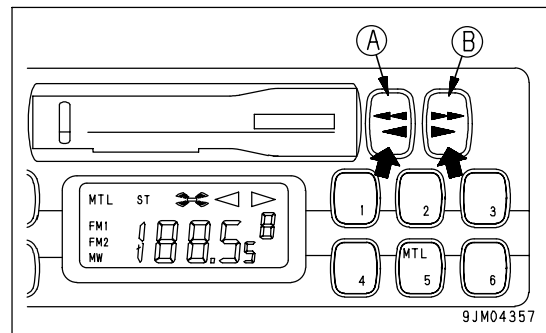
3. When finished with the tape, press the cassette eject button to eject the tape and automatically switch to the radio.



SWITCHING DIRECTION OF TAPE

When listening to the tape, 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 the sound cannot be heard, 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 during operations, keep the volume at a level where it is possible to hear other machines.
- If water gets inside the speaker case or radio (auto tuning), it may cause a serious problem, take care not to let water get in these items.
- Do not wipe the scales or buttons with solvent such as benzene or thinner. Wipe with a dry soft cloth. If the dirt cannot be removed easily, soak the cloth with alcohol.

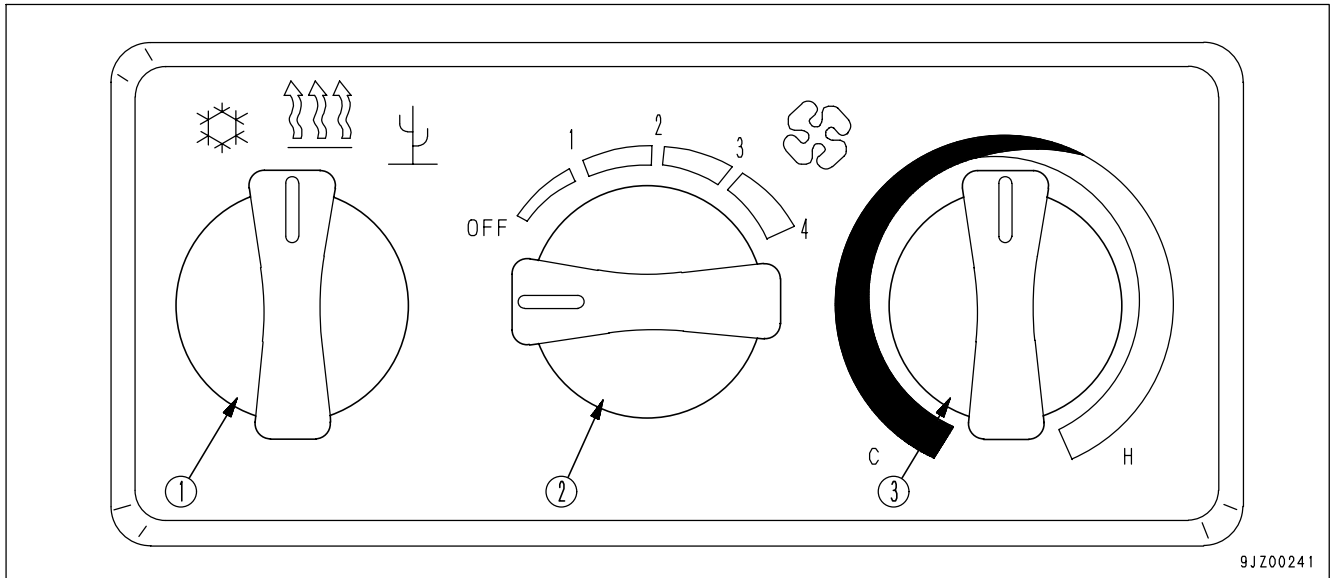
NOTICE**Handling cassette tape**

- Clean the tape head approx. once a month with a commercially available head cleaning tape.
- Do not leave the tape any place where it is exposed to direct sunlight, any place that is excessively dusty, or any place where there is a magnetic field.
- Do not use 120-minute tapes. The tape is thin and it easily gets caught up inside the machine.
- If the tape is slack, it easily gets caught up inside the machine. Use a pencil to wind in the tape to remove any slack.
- Do not use any 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.

AIR CONDITIONER, HANDLING

(Machine equipped with cab)

EXPLANATION OF PARTS



- (1) Air conditioner mode selector switch
- (2) Blower selector switch

- (3) Temperature control switch

AIR CONDITIONER MODE SELECTOR SWITCH

Use this switch (1) to switch the air conditioner mode.

Position (A): Cooler/air conditioner system

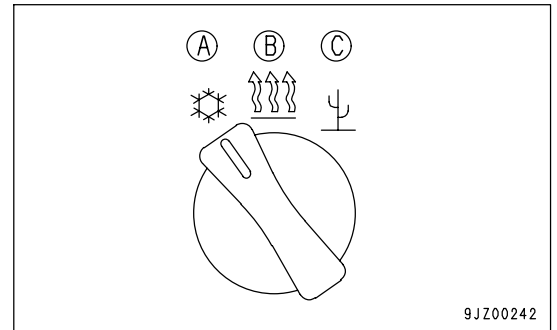
Cooling can be carried out. (Heating cannot be carried out.)

Position (B): Heating

Heating can be carried out. (Cooling cannot be carried out.)

Position (C): Dehumidifying/demisting

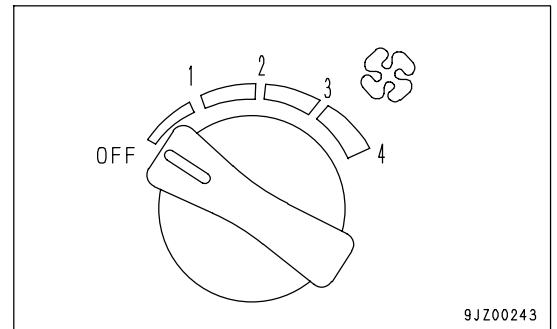
Cooling or heating can be carried out.



BLOWER SELECTOR SWITCH

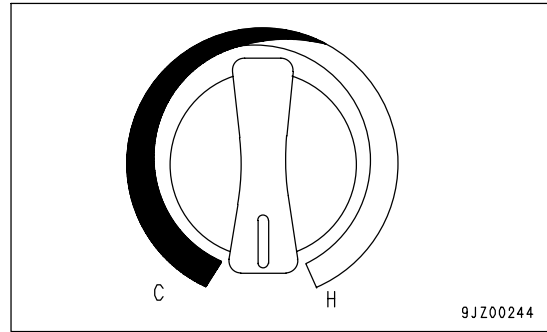
This switch (2) is used as both the main switch and air flow control switch during cooling.

- The air flow can be set to 4 stages: 1 (low) -> 2 -> 3 -> 4 (high).
- When the switch is turned to the OFF position, the power is cut and the air conditioner is stopped.



TEMPERATURE CONTROL SWITCH

Use this switch (3) to adjust the cooling or heating temperature. If the dial is turned to the left (counterclockwise in direction C), the temperature of the air coming from the vents becomes lower. If the dial is turned to the right (clockwise in direction H), the temperature of the air coming from the vents becomes higher.

**PREVENTION METHOD OF ENTRY OF DUST**

Dust may be prevented from entering the cab room by pressurizing the inside air to be slightly higher than the outside air.

When working in a dusty job site or when preventing dust from entering the cab, use this function.

- Close the windows and doors.
- Set blower selector switch (2) to one of positions 1 to 4.
- Set air conditioner mode selector switch (1) and temperature control switch (3) to the desired position.

PRECAUTION WHEN USING AIR CONDITIONER

CARRY OUT VENTILATION FROM TIME TO TIME WHEN USING THE COOLER

- If you smoke when the cooler is on, the smoke may start to hurt your eyes, so turn the lever to FRESH to remove the smoke while continuing the cooling.
- When the air conditioner is used for long periods, carry out ventilation once every hour.

BE CAREFUL NOT TO MAKE THE TEMPERATURE IN THE CAB TOO LOW

- When the cooler is on, set the temperature so that it feels slightly cool when entering the cab (5 to 6°C (9 to 10.8 °F) lower than the outside temperature). This temperature difference is considered to be the most suitable for your health, so always be careful to adjust the temperature properly.

DIRECTION OF VENTS WHEN COOLING

- If the temperature and humidity of the outside air is high, and the air conditioner is used for a long time with the grill of the vents for the front window defroster open, moisture may condense on the outside of the glass and reduce the visibility. If this happens, close the grill or change the direction of the louvers.

INSPECTION DURING OFF-SEASON

Even during the off-season, run the compressor at low speed for several minutes once a week to prevent the loss of the oil film on the lubricated parts of the compressor. (Run the engine at low speed and set the temperature control lever to the central position.)

REMARK

If the external temperature is low and the compressor is suddenly run at high speed, it will cause failure of the compressor. The system is set so that the compressor will not rotate when the external temperature is -0.5 - 4.2 °C (31 - 39.5 °F).

PROCEDURE FOR REPLACING RECEIVER

Replace the receiver once every two years.

After replacing the receiver, add compressor oil. To judge how much oil to add, set the receiver at an angle and measure the remaining amount of oil inside the receiver. Then add the same brand of fresh oil (SANDEN SP-20 PAG oil) to the receiver to bring the oil to the correct level.

REMARK

- The replacement interval may become shorter depending on the conditions during use.
- If the receiver is used when the moisture absorption limit of the desiccant has been exceeded, the refrigerant circuit may become blocked and cause the compressor to break down.

PRECAUTIONS WHEN REPLACING RECEIVER

- If the receiver is left with the cap off for more than 15 minutes, the moisture in the air will be absorbed, and this will reduce the service life of the desiccant. If the cap has been removed, quickly connect the piping, evacuate the system, and fill with refrigerant.
- When removing the refrigerant from the refrigerant circuit, release it gradually from the low pressure side to prevent oil from flowing out.

CLEANING AIR FILTER

If the air filter for the FRESH or RECIRC air intake becomes clogged, the cooling or heating capacity will drop. In places where there is a lot of dust, clean the air with compressed air once a week. For details of the cleaning method, see "CLEAN AIR CONDITIONER AIR FILTER (FRESH/RECIRC FILTER) (PAGE 4-59)".

OPERATION

CHECK BEFORE STARTING ENGINE, ADJUST

WALK-AROUND CHECK

Before starting the engine, check around and under the machine for the loose bolts nuts, and leakage of oil, fuel, or coolant. Check also the condition of the work equipment and hydraulic line.

Check that there is no looseness or play in the electric wiring, or any dust accumulated at high-temperature parts.



WARNING

- Accumulation of flammable materials around the battery, high-temperature parts of the engine, such as the engine muffler and turbocharger, and leakage of fuel and hydraulic oil will cause fire on the machine. Check carefully, and if any problem is found, always carry out repairs or contact your Komatsu distributor.
- Not to get up or down at the rear of the machine. It is dangerous because it is easy to slip, and also this area cannot be seen from the operator's seat. Always use the handrails and steps and get on or off the machine at the front.

If the machine is at an angle, reposition it level before checking.

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

1. Check for damage, wear, play in 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 any problem is found, repair it.
2. Remove dirt and debris from around the engine, battery, and radiator
Check for dirt accumulated around the engine or radiator. Also check for flammable material (dry leaves, twigs, grass, etc.) accumulated around the battery, engine muffler, turbocharger, or other high temperature engine parts. If any dirt or flammable materials are found, remove them.
3. Check for coolant and oil leakage around the engine
Check for oil leakage from the engine and coolant leaks from the cooling system. If any problem is found, repair it.
4. Check for leakage from fuel line.
Check that there is no leakage of fuel or damage to the hoses and tubes. If any problem is found, carry out repairs.
5. Check for leakage of oil from the hydraulic equipment, final drive, hydraulic tank, hoses, and joints
Check that there is no leakage of oil. If any problem is found, repair the location of the oil leakage.
Check for oil leakage from the undercover and for any signs of oil leakage on the ground surface.
6. Check for abnormalities in the undercarriage (track assembly, sprocket, idler, guard), wear, loose bolts, or oil leakage from the rollers. Repair any problems.
7. Check for abnormalities in the handrails and steps, check for loose bolts
Repair any problems and tighten any loose bolts.
8. Check for broken gauges and lamps, and for loose bolts
Check that there is no damage to the panel, gauges, or lamps. If any problem is found, replace the damaged part. Clean any dirt from the surface.

9. Seat belt and mounting clamps
Check for damage or wear to the seat belt and mounting clamps. If there is any damage, replace with new parts.
10. Check rearview mirror
Check that the rearview mirror is not broken. If any problem is found, replace it with a new part.
In addition, clean the surface and adjust the angle so that the rear of the machine can be seen from the operator's seat.
11. Check drawbar and hook
If any problem is found, ask your Komatsu distributor to carry out repairs.
12. Remove mud from under work equipment hoses
Check that there is no mud or soil accumulated under the hoses from the mainframe to the work equipment frame. Remove any mud or soil.

CHECK BEFORE STARTING

Always check the items in this section before starting the engine each day.

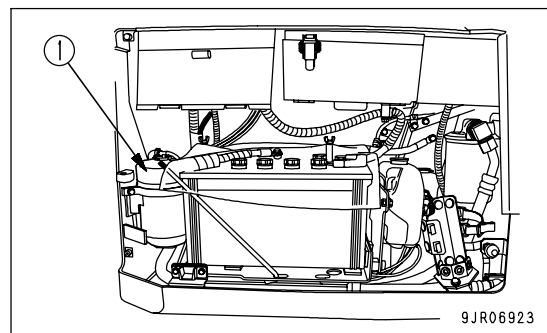
CHECK COOLANT LEVEL, ADD COOLANT



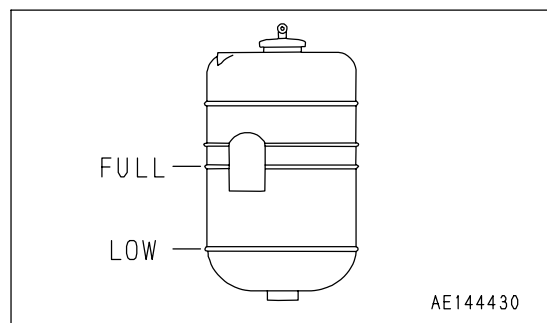
WARNING

- Do not open the radiator cap unless necessary. When checking the coolant, always wait for the engine to cool down and check the sub-tank.
- Immediately after the engine is stopped, the coolant is at a high temperature and the radiator is under high internal pressure. 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, then turn the cap slowly to release the pressure and remove it carefully.

1. Open the inspection cover of the hydraulic tank of the left side of the machine and check the amount of coolant in sub tank (1).



2. The coolant level must be between the FULL and LOW marks. If the coolant level is low, add water through the water filler port of sub tank (1) until the coolant reaches the FULL level. If the sub tank is empty, it means that there is leakage of coolant. Check for the location and repair it immediately. If there is no problem, check the level of the coolant inside the radiator tank.



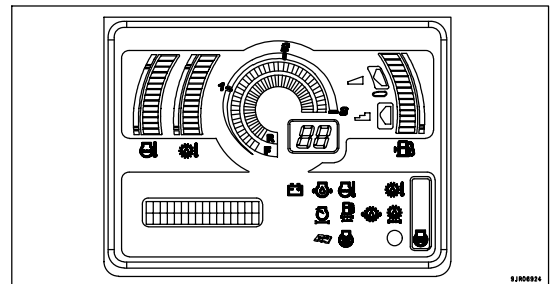
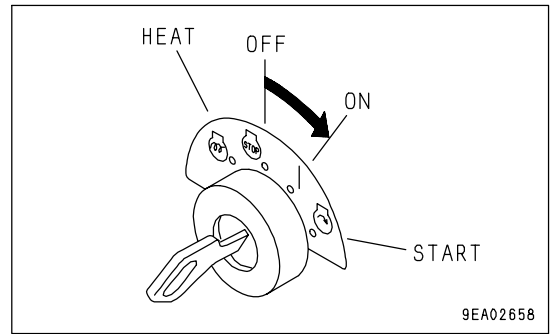
3. After adding coolant, tighten the cap securely.

CHECKING WITH MONITOR

1. Turn the starting switch to the ON position.
2. Check that all the monitors and gauges light up for approx. 2 seconds and the alarm buzzer sounds for approx. 2 seconds.
For details, see "CHECK MONITOR SYSTEM (PAGE 3-7)".

REMARK

If the lamps do not light up, there may be a failure or disconnection in the monitor, please contact your Komatsu distributor.

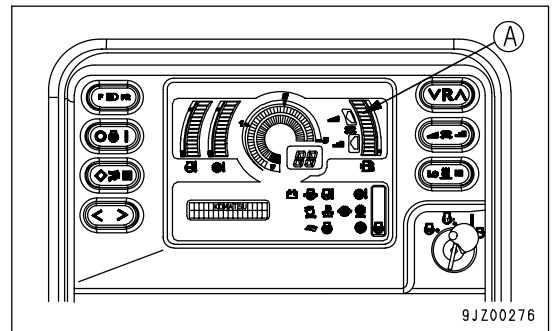


CHECK FUEL LEVEL, ADD FUEL

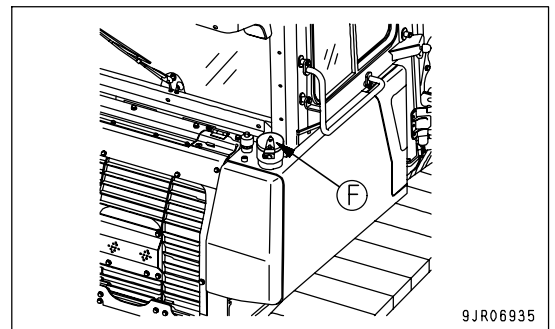
! WARNING

When adding fuel, never spill the fuel or let it overflow. It will cause fire.
If any fuel has spilled, wipe it up completely. If fuel has spilled over soil or sand, remove that soil or sand.
Fuel is highly flammable and dangerous. Never bring flames near fuel.

1. Turn the engine-starting switch to the ON position and check the remaining amount of fuel on fuel gauge (A) on the monitor panel.
After checking, turn the starting switch back to the OFF position.



2. After completing work, fill the fuel tank through oil filler port (F).
Fuel capacity: 195 liters (51.52 US gal)
3. After adding oil, be sure to screw on the oil filler cap and lock it with the key.



CHECK OIL LEVEL IN ENGINE OIL PAN, ADD OIL

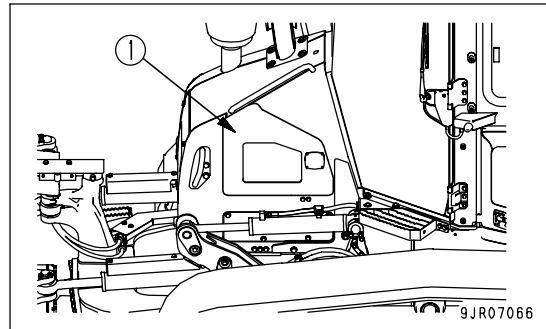
**WARNING**

Parts and oil are at high temperature immediately after the engine is stopped and may cause serious burns. Wait for the oil temperature to go down before performing this operation.

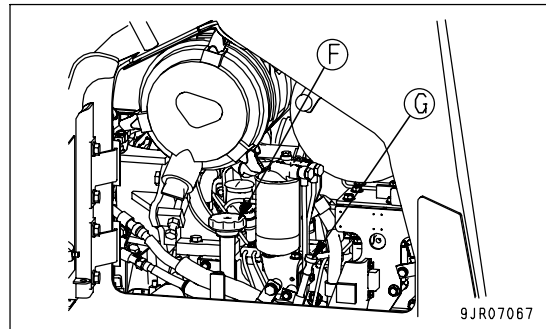
NOTICE

Do not move the blade when the front cover and engine side cover on the left side of the machine are open. The blade will hit the covers and there is danger that the covers may be broken.

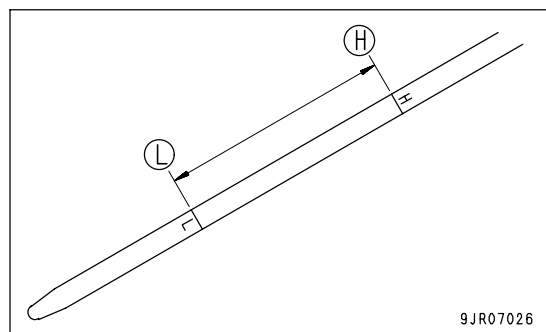
1. Open engine side cover (1) on the left side of the machine.



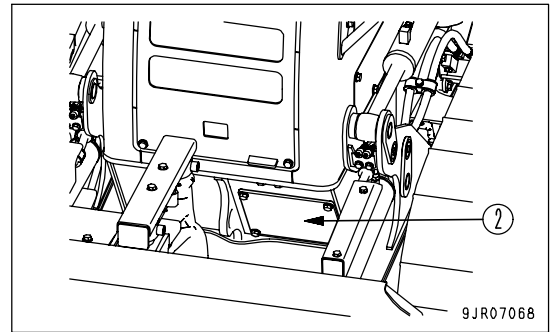
2. Remove dipstick (G) and wipe off all the oil with a cloth.
3. Fully insert dipstick (G) into filler pipe, then remove it.



4. 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).

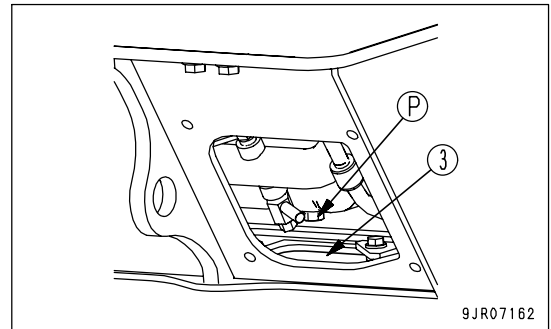


5. If the oil is above the H mark, remove covers (2) and (3) under the front cover and prepare a container to catch the drained oil.
6. Loosen drain plug (P), drain the excess oil, then tighten drain plug (P).
Check the oil level again.
7. If the oil level is correct, Install covers (2) and (3).
8. Tighten the oil filler cap securely, then close the engine side cover.



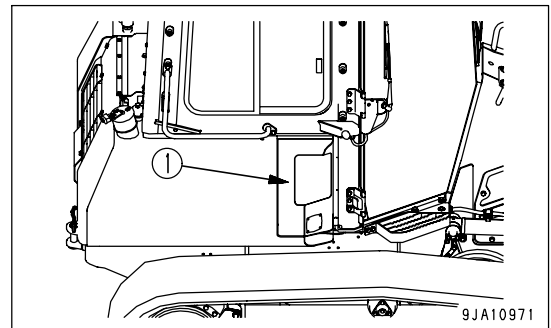
REMARK

- If the machine is at an angle, reposition it to level before checking.
- When checking the oil level after the engine has been operated, allow the engine to cool for 15 minutes before checking.

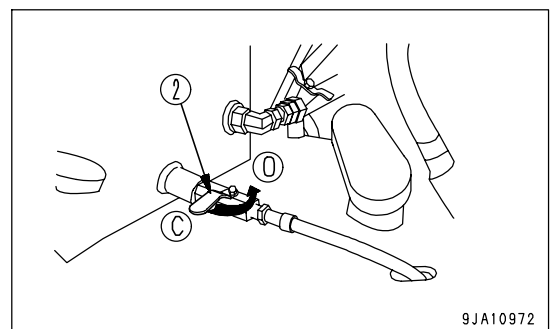


DRAIN WATER, SEDIMENT FROM FUEL TANK (ONLY POOR FUEL ARRANGEMENT SPECIFICATION)

- Prepare a container to catch the fuel that is drained.
1. Open the fuel tank inspection cover (1) on the right side of the machine.



2. Set drain valve (2) to the OPEN position (O), then drain the sediment and water accumulated at the bottom together with the fuel.
When doing this, be careful not to get fuel over yourself.
3. When clean fuel comes out, turn drain valve (2) to the CLOSED position (C).



REMARK

Before draining the water and sediment, pass a hose through the hole in the bottom plate of the tank.

CHECK ADDITIONAL WATER SEPARATOR, DRAIN WATER (ONLY POOR FUEL ARRANGEMENT SPECIFICATION)

**WARNING**

- The engine fuel piping system is under high internal pressure when the engine is running. Always reduce the internal pressure before draining water or replacing the element cup.
- Do not bring fire close.
- This engine consists of higher precision parts than on the conventional fuel injection pump and nozzle, so if dirt gets in, it will cause problems. If there is any dirt stuck to the fuel line, use fuel to wash it off completely.

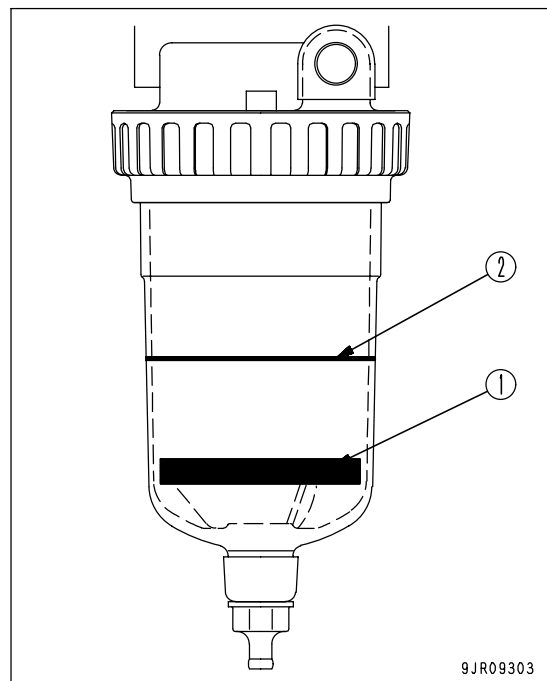
The water separator serves to separate moisture mixed in the fuel.

NOTICE

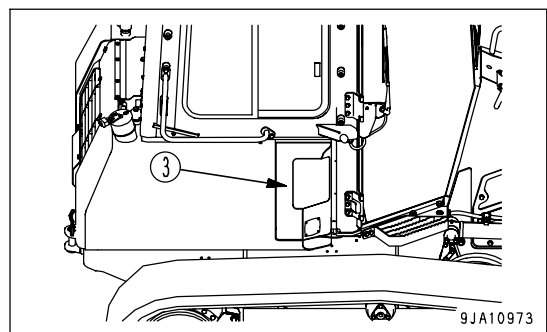
If float (1) goes above level line (2), there is danger that the separated water may be sucked into the engine.

Always drain the water before float (1) reaches level line (2).

Prepare a container to catch the water.



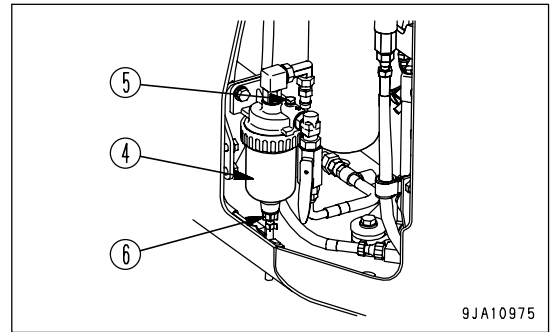
1. Open the fuel tank inspection cover (3) on the right side of the machine.



2. Check if there is any water accumulated in water separator (4).
3. If there is any water accumulated, loosen air bleeding plug (5) (width across flats: 13 mm (0.5 in)), then loosen drain valve (6) of the water separator and drain the water.
4. Tighten air bleeding plug (5) and drain valve (6).

Tightening torque

- Air bleeding plug: 8.0 to 12.0 Nm {0.8 to 1.2 kgm}
- Drain valve: 2.0 to 3.0 Nm {0.2 to 0.3 kgm}



9JA10975

NOTICE

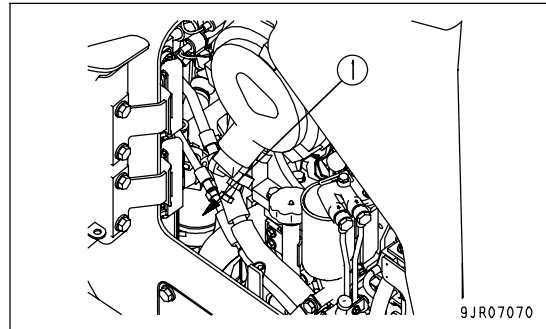
When the engine is started after adding fuel, the water separator and fuel pre-filter cup may become filled with water. If they become full of water, drain the water.

CHECK WATER SEPARATOR, DRAIN WATER AND SEDIMENT

NOTICE

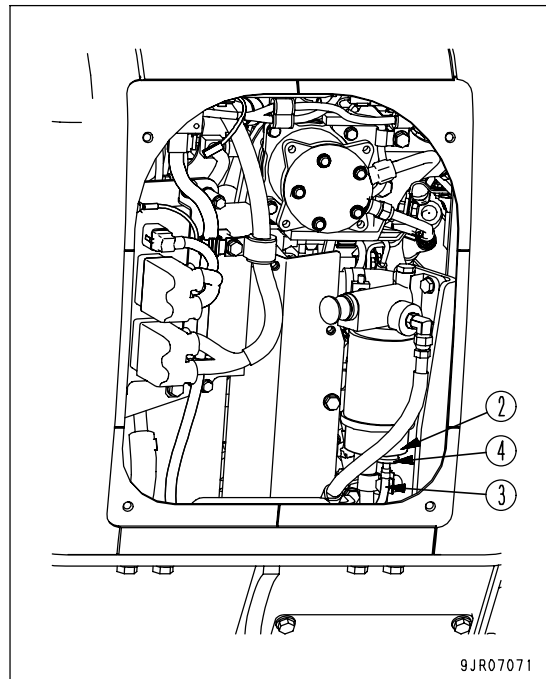
Do not move the blade when the front cover and engine side cover on the left side of the machine are open. The blade will hit the covers and there is danger that the covers may be broken.

1. Open up the engine side cover on the left side of the machine.
 - The water separator forms one unit with fuel pre-filter (1).



2. It is possible to check for water and sediment through transparent cap (2). If water or sediment are accumulated, drain the water as follows.

- 1) Remove the mounting bolts of the front cover at the front of the machine, then remove the front cover.
- 2) Pull out drain hose (3) to the front of the machine and set a container under the hose to catch the drained water.
- 3) Loosen drain valve (4) and drain the water and sediment accumulated in transparent cap (2).
- 4) Check that the fuel comes out from drain hose (3), then tighten drain valve (4) securely.
- 5) Return the drain hose (3) to its original position.
- 6) Use the mounting bolts to install the front cover.



NOTICE

If the water inside transparent cap (2) freezes, check that the frozen water has melted completely, then use the procedure above to drain the water.

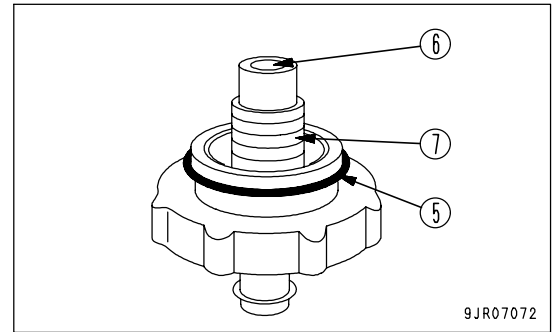
REMARK

- If transparent cap (2) is dirty and it is difficult to check the condition, clean transparent cap (2) or replace it when replacing the fuel prefilter cartridge (1).
- When cleaning, if drain valve (4) has been removed, coat the O-ring with grease, then tighten until it contacts the bottom.

If the movement of drain valve (4) has becomes stiff, coat O-ring portion (5) of the drain valve with grease to make the valve move more smoothly.

REMARK

When closing the valve, be careful not to get grease on discharge port (6) and thread (7) of the valve.



CHECK OIL LEVEL IN HYDRAULIC TANK, ADD OIL

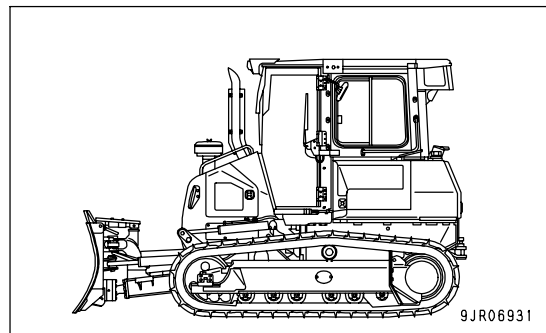
**WARNING**

- Immediately after the engine is stopped, the parts and the oil are at a high temperature. Wait for the temperature to go down before starting the operation.
- When the cap of the oil filler port is removed, oil may spurt out, so turn the cap slowly to release the internal pressure, then remove it carefully.

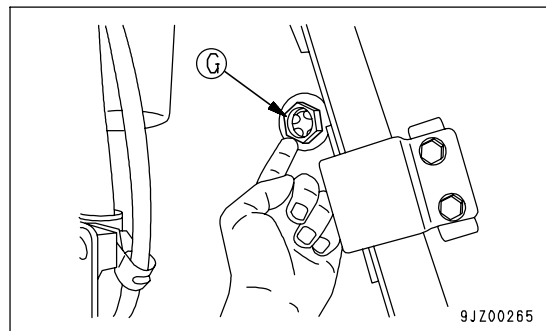
NOTICE

- Do not fill above the H line. This will damage the hydraulic circuit and may cause oil to spurt out.

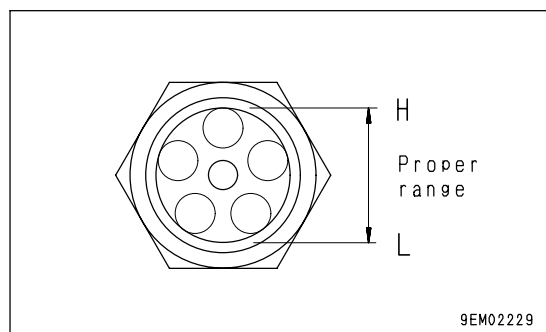
1. When checking the hydraulic oil level or adding oil, set the work equipment in the posture shown in the diagram on the right before starting.
2. If the work equipment is not in the posture shown in the diagram on the right, start the engine, run at low idling, then lower the work equipment and attachment.



3. Open the hydraulic tank inspection cover at the rear left of the machine and check the position of sight gauge (G) on the tank.



4. Check the oil level with sight gauge (G). The oil level should be between the H and L marks.



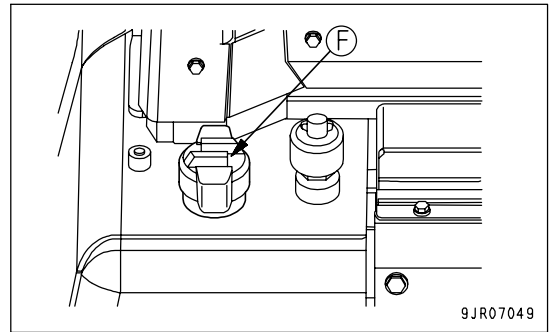
5. If the oil level is below the L mark, add oil through oil filler (F) at the top of the hydraulic tank.

REMARK

The oil level changes according to the oil temperature. Use the following as a guideline.

Before starting operations: Between H and L marks (oil temperature 10 °C - 30 °C (50 °F - 86 °F))

During normal operations: Near H (oil temperature of 50 °C - 80 °C (122 °F - 176 °F))



6. After adding oil, be sure to screw on the oil filler cap and lock it with the key.

CHECK ELECTRIC WIRING**CAUTION**

- If the fuse blows frequently or there are traces of short circuits on the electric wiring, investigate the cause immediately and ask your Komatsu distributor to carry out repairs.
- Keep the top surface of the battery clean and inspect the breather holes in the battery caps. If they are clogged with mud or dirt, rinse the battery cap to remove the material clogging it.

Check that the fuse is not damaged and that a fuse of the specified capacity is being used. Check also for traces of disconnections or short circuits in the electric wiring, and for loose bolts. If any loose bolts are found, tighten them. Be particularly careful when inspecting the wiring of the battery.

Always check that there is no flammable material accumulated around the battery. Remove any such flammable material.

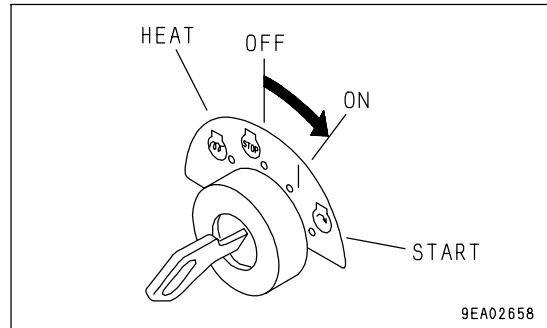
Please consult your Komatsu distributor when carrying out investigation and repair of the cause.

CHECK THAT LAMPS LIGHT UP

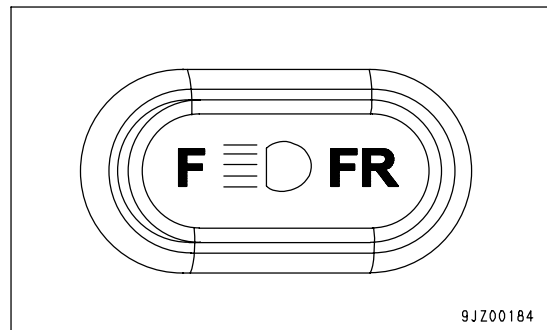
Check that the head lamp, rear lamp, and instrument lamp light up normally and they are free from stain and damage.

If the lamps do not light, check for a broken bulb or disconnected wire, contact your Komatsu distributor for repairs.

1. Turn the starting switch to the ON position.

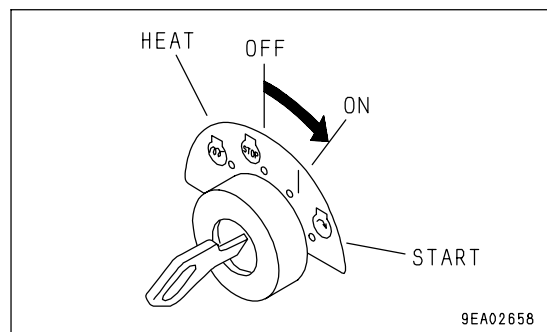


2. Turn the lamp switch to the F or FR position and check that the rear lamps light up.

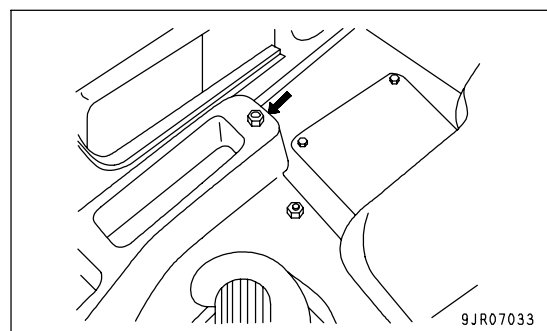
**CHECK HORN SOUND**

Check that the horn sounds. If it does not sound at all or the sound is extremely feeble, a defect or broken wire is suspected, ask your Komatsu distributor for possible repairs.

1. Turn the starting switch to the ON position.



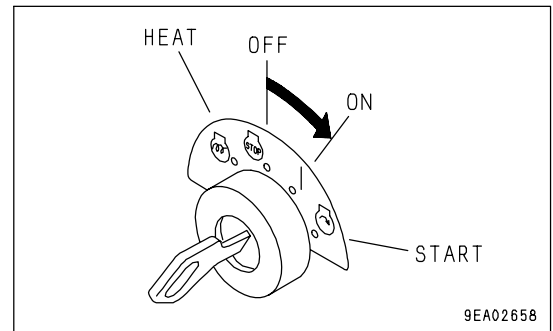
2. Push the horn switch and check that the horn sounds.



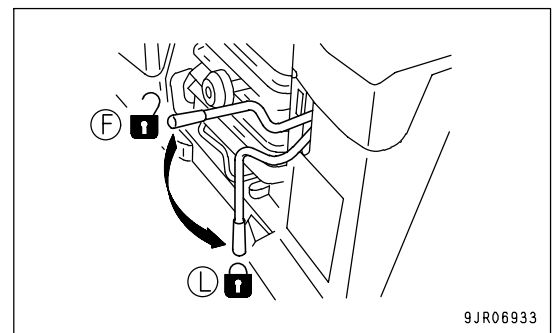
CHECK OF OPERATION OF BACKUP ALARM

Check that the backup alarm sounds normally. If it does not, a defect or broken wire is suspected, ask your Komatsu distributor for possible repairs.

1. Turn the starting switch to the ON position.

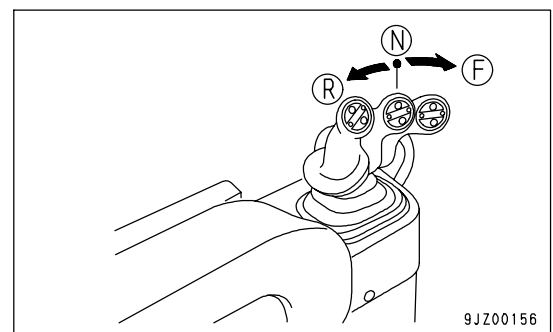


2. Check that parking brake lever is in the LOCK position (L).



3. Set the steering, forward-reverse, gear shift lever in the REVERSE position (R).

The alarm must sound immediately at this time. The alarm keeps sounding until the steering, forward-reverse, gear shift lever is set to the NEUTRAL position (N) or FORWARD position (F).



ADJUSTMENT

ADJUST OPERATOR'S SEAT



WARNING

When adjusting the position of the operator's seat, always set the work equipment lock lever to the LOCK position to prevent any accidental contact with the control levers.

- Always adjust the operator's seat before starting each operation or when the operators change shift.
- When adjusting the seat, put your back against the backrest and adjust to a position where the brake pedal can be fully depressed.

(A) Fore-and-aft adjustment

Pull lever (1), set the seat to a position where it is easy to operate, then release the lever.

Fore-aft adjustment: 160 mm (6.3 in) (8 stages)

(B) Weight adjustment of seat

Turn knob (2) under the seat to match the weight adjustment scale with your own weight.

The weight can be adjusted to 50 to 120 kg (110 to 265 lb).

REMARK

When setting the seat to a softer setting, adjust the weight adjustment to a lighter setting. When setting the seat to a harder setting, adjust the weight adjustment to a heavier setting.

Before traveling on rough roads, set the weight adjustment to a harder setting than the standard.

(C) Adjust reclining angle

Pull up lever (3) and set the seat back to a position which is comfortable for operation, then release the lever.

Sit with your back against the seat back when adjusting. If your back is not touching the seat back, the seat back may suddenly move forward.

REMARK

The seat can be reclined more when the seat is pushed to the front. The amount of reclining decreases as the seat is pushed back, so when moving the seat back, return the seatback to the upright position.

(D) Seat angle adjustment

- Front angle adjustment of seat (5 stages)

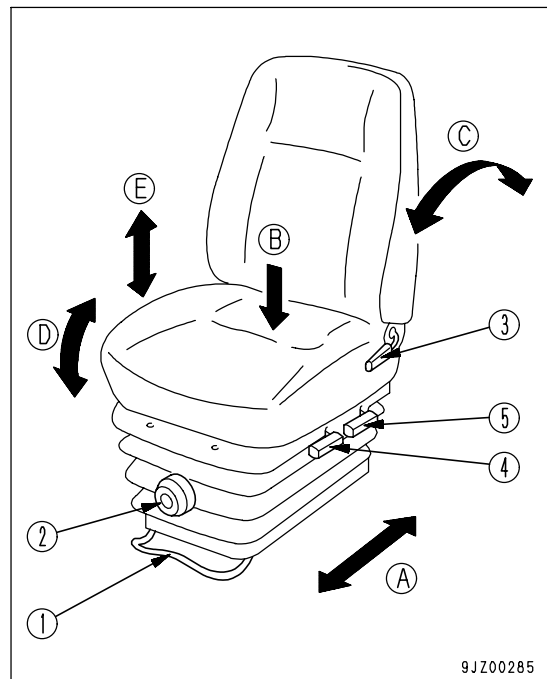
To raise the front of the seat, apply your weight to the seatback, while pulling up lever (4).

To lower the front of the seat, apply your weight to the front of the seat, while pulling up lever (4).

- Rear angle adjustment of seat (5 stages)

To raise the rear of the seat, stand up on your feet a little, while pulling up lever (5).

To lower the rear of the seat, apply your weight to the rear of the seat, while pulling up lever (5).



9JZ00285

(E) Seat height adjustment

Pull up levers (4) and (5) alternately to adjust the angle of the seat.

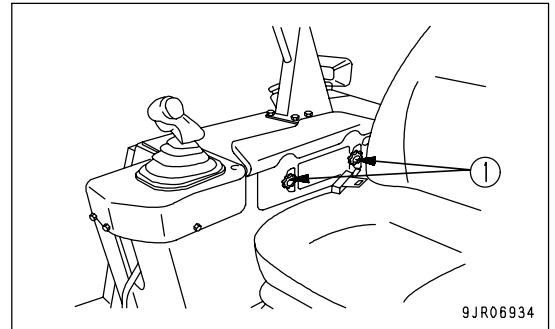
Then, release the levers to lock the seat.

(Height adjustment distance: 5 stages, 60 mm (2.4 in))

ADJUST ARMREST

The height of the armrests on both sides of the operator's seat can be adjusted to three levels. After adjusting the operator's seat, adjust the height of the armrests properly.

1. Loosen bolts (1) on the left and right sides of the operator's seat.
2. Adjust the armrests on both sides of the operator's seat to a suitable height.
3. Tighten bolts (1) securely.



FASTENING AND REMOVING SEAT BELT

Always install a seat belt on machines equipped with ROPS.

**WARNING**

- Before fitting the seat belt, check that there is no problem in the belt mount bracket or mounting belt. If it is worn or damaged, replace the seat belt.
- Even if there are no signs of damage, replace belts in accordance with the following schedule:
5 years after the date of seat belt manufacture, or every 3 years after the start of actual usage, whichever date comes first.
- Always wear the seat belt during operations.
- Fit the seat belt so that it is not twisted.

REMARK

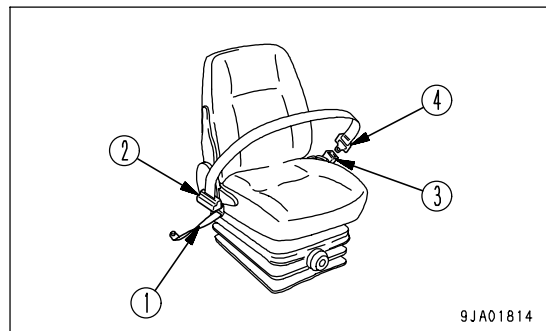
The date of seat belt manufacture attached to the seat belt is the start of the 5-year period. It is not the start of the 3-year period of actual usage.

Check that the bolts of the mount installing the seat belt to the machine are not loose. If they are loose, tighten them. The tightening torque for the mounting bolt is 24.5 ± 4.9 Nm (2.5 ± 0.5 kgm, 18.1 ± 3.6 lbft).

If the belt surface is scratched or frayed or if the fittings are broken or deformed, replace the seat belt unit.

FASTENING AND REMOVING SEAT BELT

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 and hold tongue (4) connected to wind-in mechanism (2) and pull out the belt slowly so that the belt will cover your abdomen sufficiently.
4. Insert tongue (4) in buckle (3) until it clicks. The belt is pulled back into wind-in mechanism (2) until it is fitted to your abdomen. The belt is locked under this condition and cannot be extended anymore. Fit the belt to your abdomen without twisting it.



9JA01814

REMARK

If the belt is locked before the tongue is inserted in the buckle, let it return to the wind-in mechanism, then repeat the above procedure from the start.

5. Pull the belt to check that it is securely locked in position.
6. When removing the belt, press the red button on buckle (3).
The belt will automatically retract.

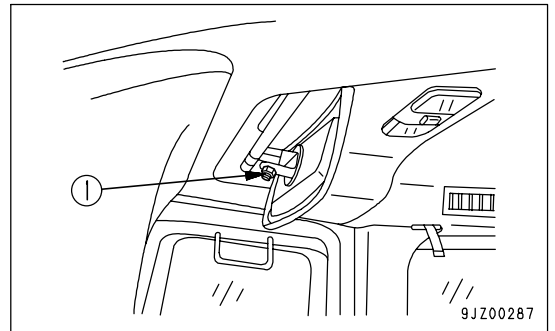
ADJUST MIRROR

**WARNING**

Be sure to adjust the mirrors before starting work. If they are not adjusted properly, you cannot secure the visibility and may be injured or may injure someone seriously.

Loosen nut (1) installing the mirror, then adjust the position so that it gives the best view from the operator's seat.

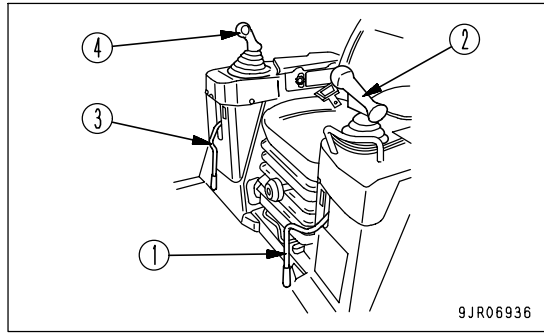
Be particularly sure to adjust the mirror so that it is possible to see anyone in the area to the left and right at the rear of the machine.



OPERATION AND CHECK BEFORE STARTING ENGINE

! WARNING

When starting the engine, check that the work equipment lock lever are placed securely at the LOCK position. If the work equipment control lever is touched by accident when the engine is started, the work equipment may move unexpectedly and cause serious injury or damage.

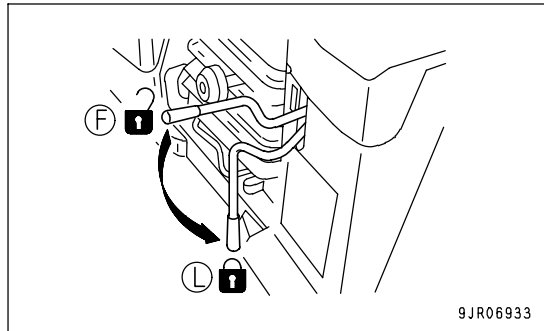


9JR06936

1. Check that parking brake lever (1) is in the LOCK position (L).

REMARK

If this parking brake lever is not in the LOCK position, the engine will not start.

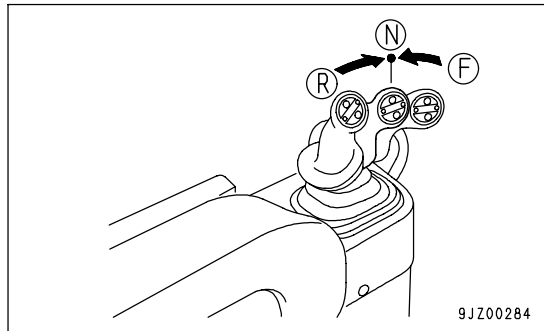


9JR06933

2. Check that steering, forward-reverse, gear shift lever (2) is in the NEUTRAL position (N).

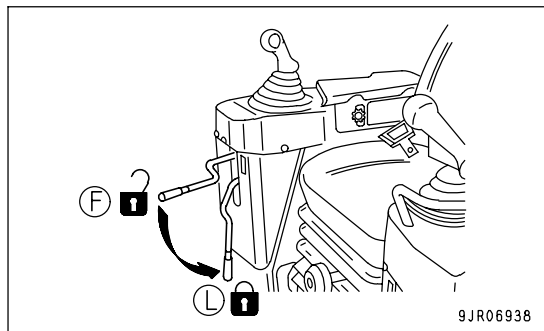
REMARK

- The engine will not start if the steering, forward-reverse, gear shift lever is not at the Neutral position.
- If the steering, forward-reverse, gear shift lever is at the F or R positions, the letter P in the middle of display panel A is displayed and flashes.



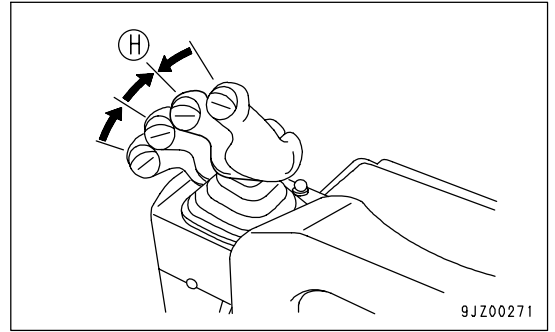
9JZ00284

3. Check that work equipment lock lever (3) is at the LOCK position (L).



9JR06938

4. Check that the blade control lever (4) is HOLD position (H).



STARTING ENGINE

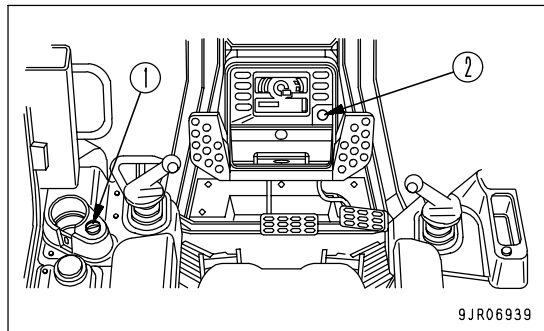
NORMAL STARTING

WARNING

- Sit down in the operator's seat before starting the engine.
- Do not attempt to start the engine by short-circuiting 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 particularly careful to ensure good ventilation.

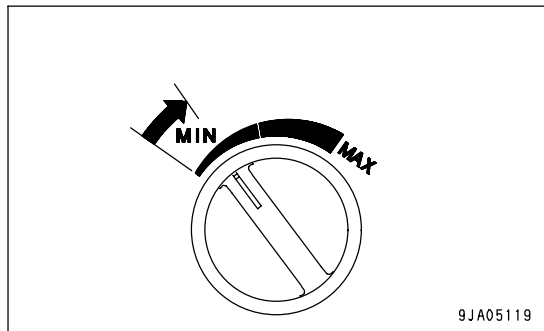
NOTICE

- Do not crank the starting motor continuously for more than 20 seconds. If the engine does not start, wait for at least 2 minutes, then repeat the procedure in Step 3.
- Before starting, check that the fuel control dial is at the low idling (MIN) position.
- This machine is equipped with an automatic warming-up function and turbo protect function. In cold weather, even if the fuel control dial is operated immediately after the engine is started, there may be no change in the engine speed.
- If the fuel control dial is at the FULL position, the engine may suddenly and cause damage to the engine components.
Set the fuel control dial to a midpoint position or low speed position.



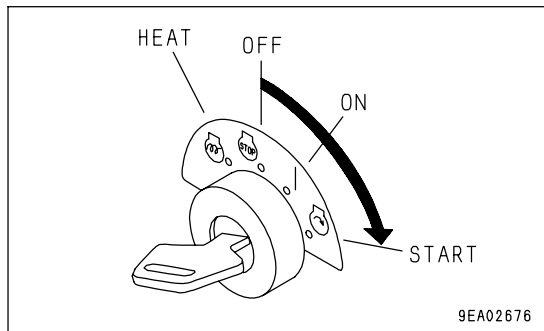
9JR06939

1. Before starting, check that fuel control dial (1) is at the low idling position.
2. Set fuel control dial (1) to a speed slightly higher than low idling (MIN).



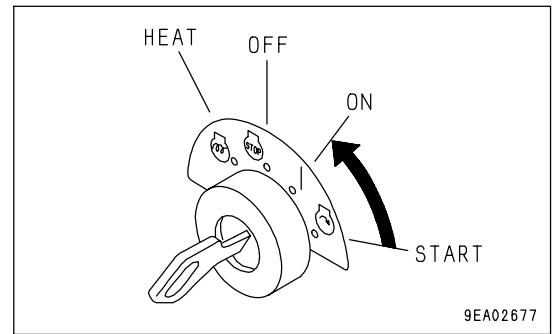
9JA05119

3. Insert the key in starting switch (2) and turn it to the START position. The engine will start.



9EA02676

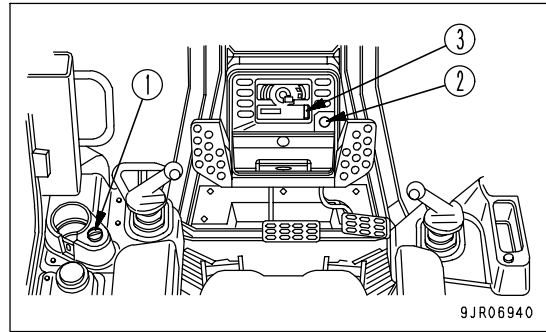
4. After the engine starts, release the key in the starting switch. The key will automatically return to the ON position.
5. Keep the engine idle for the initial 15 seconds right after it has been started, and do not operate any control lever or the fuel adjustment dial during that time.
6. After starting the engine, run at the engine at mid-range speed and travel slowly in forward and reverse to equalize the temperature in all the equipment.



STARTING IN COLD WEATHER

WARNING

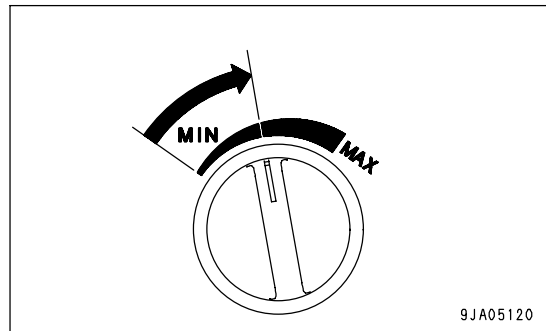
- Start the engine only after sitting down in the operator's seat.
- Do not attempt to start the engine by short-circuiting the engine starting circuit. Such an act may cause a serious bodily injury or fire.
- Check that there are no persons or obstacles in the surrounding area, then sound the horn and start the engine.
- Never use starting aid fluids as they may cause explosions.
- Exhaust gas is toxic. When starting the engine in confined spaces, be particularly careful to ensure good ventilation.



NOTICE

- If snow or melted water gets into the fan or alternator belt, there is danger that it will freeze and cause breakage. Before starting the engine, check carefully around the engine and fan.
- Do not crank the starting motor continuously for more than 60 seconds for any reason. If the engine does not start, wait for at least 2 minutes, then repeat the procedure from Step 3.
- Before starting, check that the fuel control dial is at the low idling (MIN) position.
- This machine is equipped with an automatic warming-up function and turbo protect function. In cold weather, even if the fuel control dial is operated immediately after the engine is started, there may be no change in the engine speed.
- If the fuel control dial is at the FULL position, the engine may suddenly accelerate and cause damage to the engine components.
Set the fuel control dial to a midpoint position or low speed position.
- Set the fan rotation selector switch to the normal rotation position, then start the engine, and carry out the warming-up operation if the weather is cold.

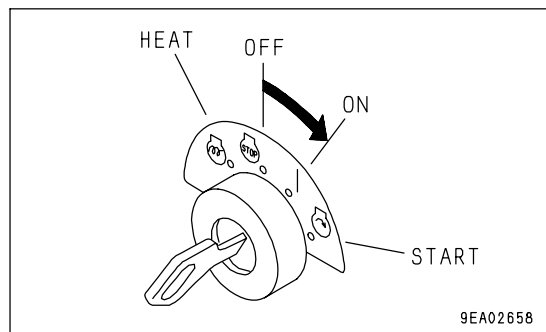
1. Before starting, check that fuel control dial (1) is at the low idling position.
2. Set fuel control dial (1) to a point midway between low idling position (MIN) and full speed position (MAX).



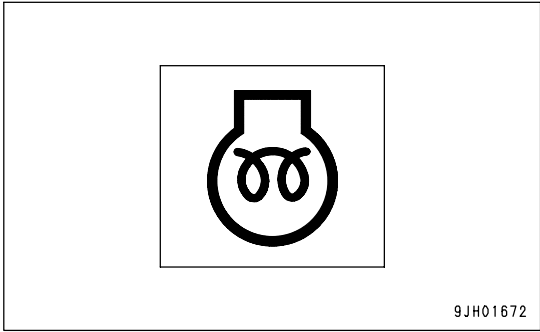
3. Turn the key in starting switch (2) to the ON position.

REMARK

This machine is equipped with an automatic preheating function. When the key is set to the ON position when starting in cold weather, preheating will start automatically.



4. Check that engine pre-heating pilot lamp (3) on the monitor panel lights up.
5. Maintain the key in the on position until the pre-heating pilot lamp (3) goes off.



9JH01672

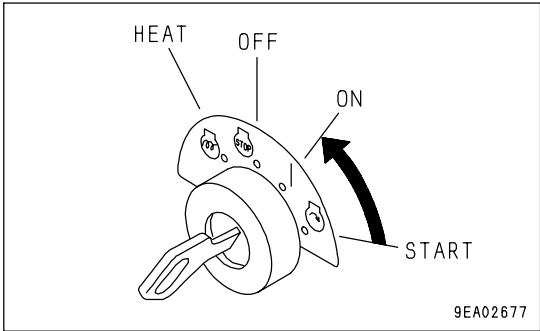
6. When preheating pilot lamp (3) goes out, turn the key in starting switch (2) to the START position and start the engine. The length of time that preheating pilot lamp (3) stays lighted up differs according to the coolant temperature.

Coolant temperature (°C (°F))	Lighting-up time (sec)
-5 - -15 (23 - 5)	5 - 30
below -15 (5)	30

7. After the engine starts, release the key in the starting switch. The key will automatically return to the ON position.

REMARK

Immediately after an engine startup, keep the engine idling, and while the engine is idling, keep the foot off the deceleration pedal and do not operate the work equipment.



9EA02677

8. When the engine rotation stabilizes, return to the low idle (MIN) position of fuel control dial (1) and then carry out the warming-up operation.

REMARK

- Regardless of the coolant temperature, if the key in the starting switch is turned from the OFF position to the left, the preheating pilot lamp will light up and preheating will be carried out. (Preheating continues while the key in the starting switch is kept turned to the left.)
For details of the preheating time, see the chart for Step 6.
- If the engine does not start when the above operation is carried out, wait for at least 2 minutes, then repeat the procedure in Steps 3 and 4.

Turbo protect function

The turbo protect function is a function to protect the turbocharger by keeping the engine speed at less than 1000 rpm immediately after the engine is started.

- When the turbo protect function is actuated, the engine speed is held at less than 1000 rpm, even if the fuel control dial is operated.
- When the turbo protect function is canceled, the engine speed is set to the speed for the position of the fuel control dial.
- The relationship between the length of time of actuating the turbo protect function and the temperature of the engine coolant is as shown in the table.
- During operation of the turbo protect function, the machine does not accept any operation to move the machine off.

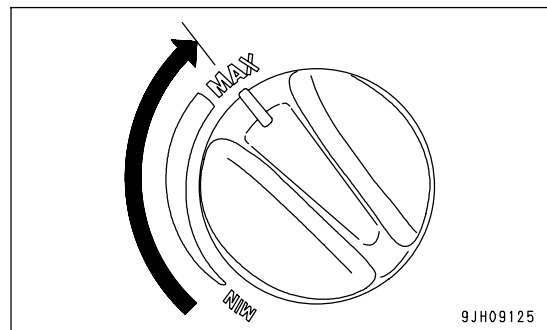
Coolant temperature	Turbo protect time (sec.)
Above 10°C (50°F)	0
10 to -30°C (50 to -22°F)	Change 0 to 20

Engine Cooling Water Auto Warming-up Function

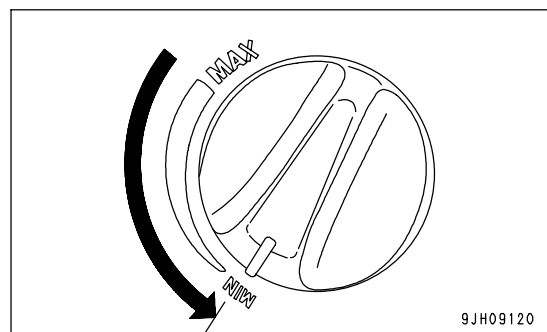
This is a function to automatically warm up engine cooling water more quickly by raising an engine idling speed. When the turbocharger protection function and engine cooling water auto warming-up function are activated at the same time, the former takes priority over the latter.

- During the warming-up operation, even if the fuel control dial is set to a position below 1200 rpm, the engine speed is held at 1200 rpm.
 - This function continues to work for a maximum of 10 minutes, or until the engine cooling water temperature reaches 30°C (86°F).
 - If the decelerator pedal is depressed during the automatic warming-up operation, the automatic warming-up function is cancelled and the engine speed drops to below 1200 revolutions per minute.
- In addition, the automatic warming-up function is also cancelled by the following procedure.

- 1) Turn the fuel control dial to the full speed position (MAX) and hold it there for 3 seconds.



- 2) If the fuel control dial is turned to the low idling position (MIN), the engine speed will go down.



OPERATIONS AND CHECKS AFTER STARTING ENGINE



WARNING

- If the engine suddenly stops or operates abnormally, turn the key in the starting switch to the OFF position.
 - If the work equipment is operated without carrying out the warming-up operation thoroughly, the reaction of the work equipment and track assembly may be slow when the control lever is operated or the movement may not be what the operator intended. Always carry out the warming-up operation. In particular, in cold areas, always carry out the warming-up operation thoroughly.
-

BREAKING IN THE NEW MACHINE



CAUTION

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 machine life.

Be sure to break-in the machine for the initial 100 hours (as indicated by the service meter).

During break-in operations, follow the precautions described in this manual.

- Idle the engine for 5 minutes after starting it up.
- Avoid operation 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.

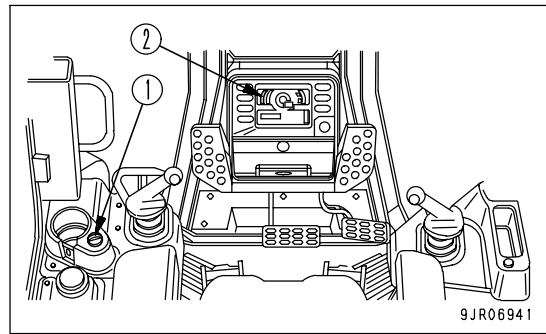
WARMING UP OPERATIONS

NOTICE

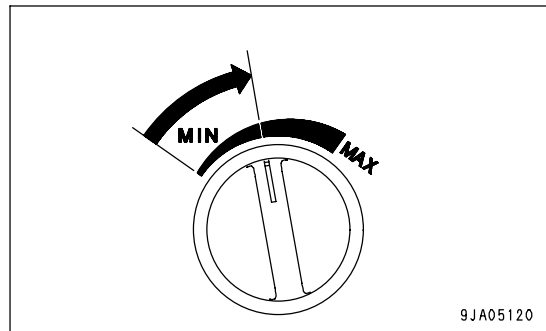
Do not accelerate the engine suddenly until the warming-up operation has been completed.

Do not run the engine at low idle or high idle continuously for more than 20 minutes.

If it is necessary to continue to run the engine at idle, apply a load from time to time or run the engine at a mid-range speed.

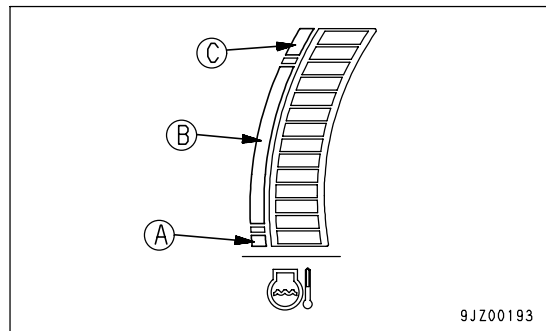


1. Set fuel control dial (1) to a point midway between low idling position (MIN) and full speed position (MAX), and run the engine at a mid-range speed under no load for approx. 5 minutes (warming-up operation).



2. After completing the warming-up operation, check that all the gauges and caution lamps are working properly. If there is any problem, carry out maintenance or repair. Run the engine under a light load until engine water temperature gauge (2) is in green range (B).

- (A): White range
- (B): Green range
- (C): Red range



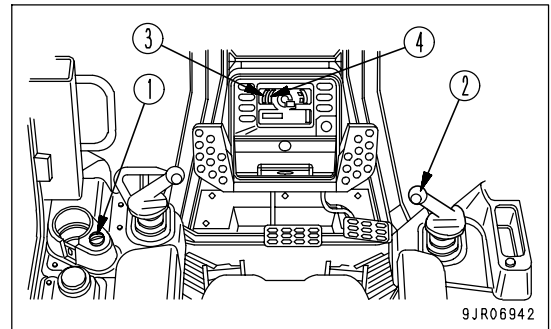
3. Check for abnormal exhaust gas color, noise, or vibration. If any problem is found, contact your Komatsu distributor.

STARTING IN COLD WEATHER

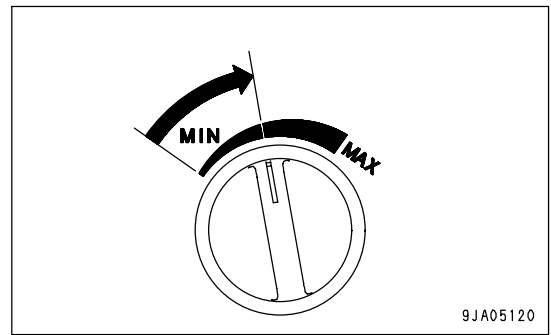
(Ambient temperature below 10°C (50°F))

NOTICE

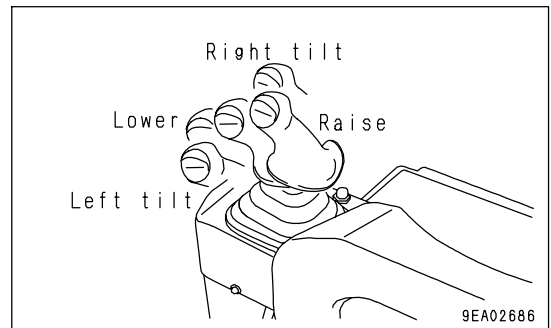
- Do not carry out operations or operate the levers suddenly when the hydraulic oil is at low temperature. Always carry out the warming-up operation. This will also extend the service life of the machine. Do not suddenly accelerate the engine before the warming-up operation is completed.
- Do not run the engine under no load at low idling or high idling for more than 20 minutes. This will have an adverse effect on the environment, and it will also have an adverse effect on the turbocharger and internal components of the engine. If it is necessary to run at idling, apply a load from time to time, or run the engine at a mid-speed.



1. Set fuel control dial (1) to a point midway between low idling position (MIN) and full speed position (MAX), and run the engine at a mid-range speed under no load for approx. 10 minutes (warming-up operation).



2. Operate blade control lever (2) to the RAISE position to raise the blade to the maximum height, then operate the lever slowly in turn to the left tilt relief and right tilt relief positions for 5 minutes in turn.
3. In addition, operate blade control lever (2) fully to the RAISE position, hold it there and operate it intermittently to the left and right tilt relief positions, then operate the lever to the LOWER position to lower the blade to the ground. After this, operate the lever fully to the FLOAT position, hold it there and operate it intermittently to the left and right tilt positions in turn repeatedly for 5 minutes.



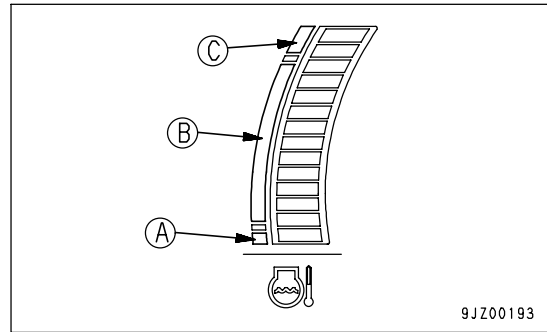
4. After completing the warming-up operation, check that all the gauges and caution lamps are working properly. If there is any problem, carry out maintenance or repair.

- Check that engine water temperature gauge (3) and hydraulic oil temperature gauge (4) are in green range (B).

(A): White range

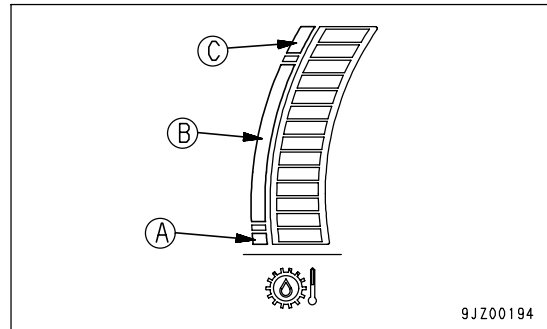
(B): Green range

(C): Red range



NOTICE

When the hydraulic oil temperature is low, the machine may deviate to one side when starting off or stopping. Be extremely careful if it is necessary to operate the machine while the hydraulic oil temperature gauge is in white range (A).



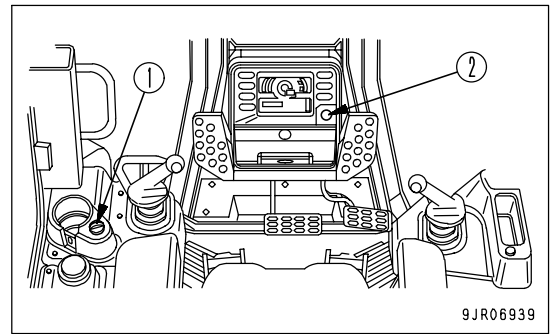
5. Check for abnormal exhaust gas color, noise, or vibration. If any problem is found, contact your Komatsu distributor.
6. After carrying out the warming-up operation, to make the temperature of all equipment the same, run the engine at a mid-range speed and travel slowly forward and in reverse.

STOPPING ENGINE

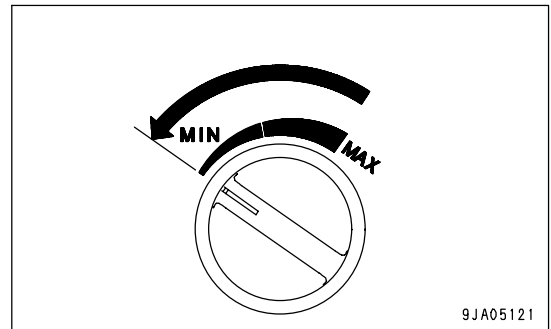
NOTICE

If the engine is stopped without allowing it to cool down, there is danger that the service life of various parts of the engine will be reduced. Except in emergencies, never stop the engine suddenly.

If the engine overheats, do not stop it suddenly. Run it at low speed to allow it to cool down gradually, then stop it.



1. Lower the work equipment to the ground.
2. Turn the fuel control dial (1) to the low idling position (MIN), then run the engine at low idling for approx. 5 minutes to gradually cool the engine down.

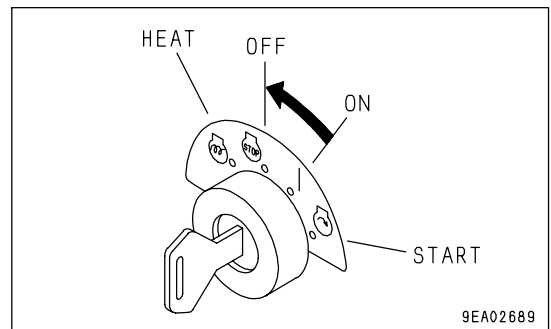


3. Turn the key in starting switch (2) to the OFF position. The engine will stop.

REMARK

When the key in starting switch (2) is turned to the OFF position, the engine will stop, but the power supply for the machine is not cut off immediately.

The power supply is maintained for several seconds to allow the controller to save the operating condition data and then to shut down the system. The time that the power supply is maintained differs according to the operating condition.



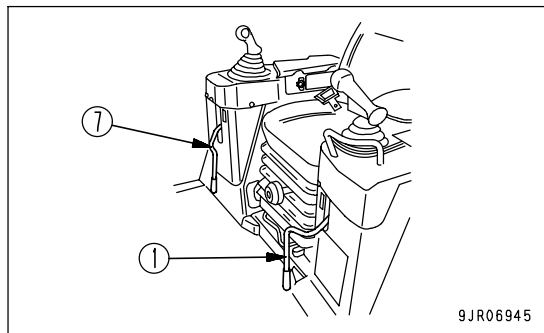
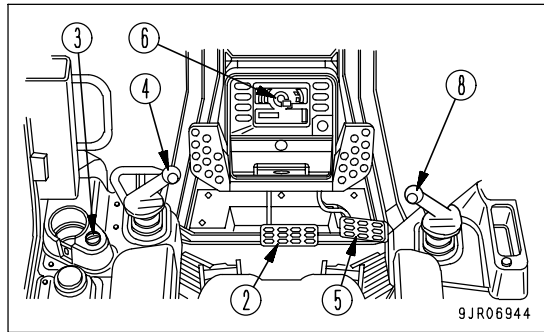
4. Remove the key from starting switch (2).

MACHINE OPERATION

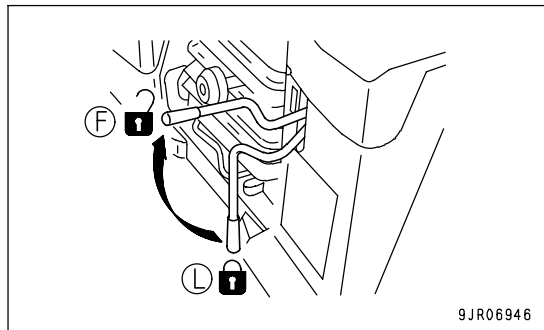
MOVING MACHINE

WARNING

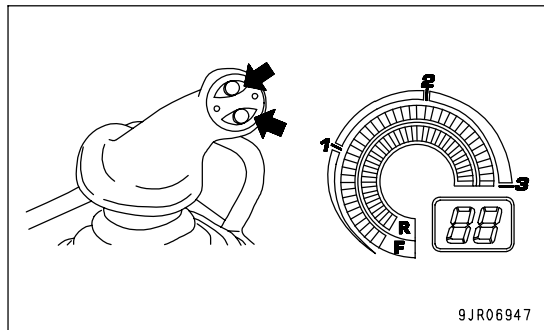
- When starting the machine off, check that the area around the machine is safe and sound the horn before moving.
Do not allow anybody to enter the area around the machine.
The area behind the machine is a blind spot, so be particularly careful when driving in reverse.
- When starting the machine off on a slope, always keep brake pedal (2) depressed even after setting parking lever (1) to the FREE position.
- When starting the machine off up a steep slope, turn fuel control dial (3) fully and run the engine at full throttle. Keep brake pedal (2) depressed, set steering, forward-reverse, gear shift lever (4) in 1st, then operate steering, forward-reverse, gear shift lever (4) in the direction of travel. Let brake pedal (2) back slowly, and when the machine starts to move slowly (or the shoes start to slip), release brake pedal (2) fully.
- When decelerator pedal (5) is depressed on flat ground or fuel control dial (3) is at the low idling position, the machine is stopped, but the brake is not applied. On slopes, the machine may move even if the engine is running at low idling, so be particularly careful.



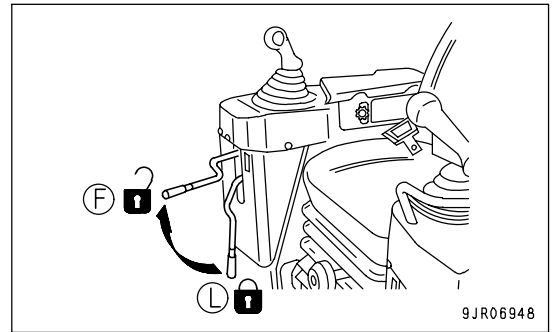
1. Operate parking brake lever (1) to the FREE (F) position.



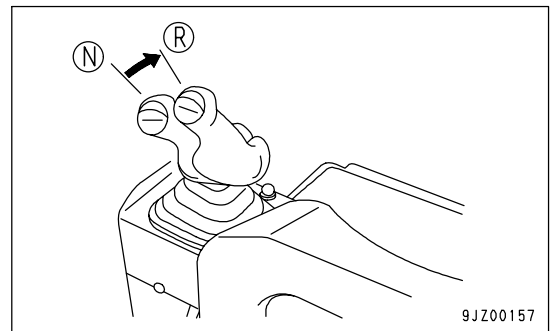
2. Operate steering, forward-reverse, gear shift lever (4) to the desired speed range and check speed range indicator (6) to see that it indicates the correct range.



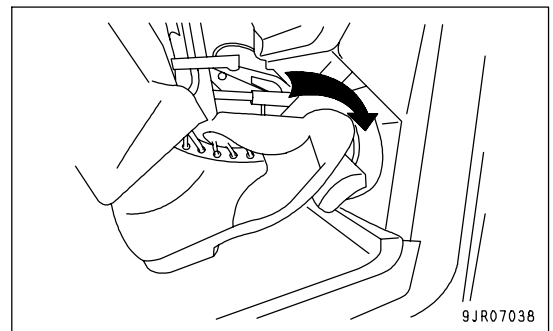
3. Set the work equipment lock lever (7) to the FREE position (F).



4. Operate blade control lever (8) to the RAISE position (R) and raise the blade 40 - 50 cm (15.8 - 19.7 in) above the ground.



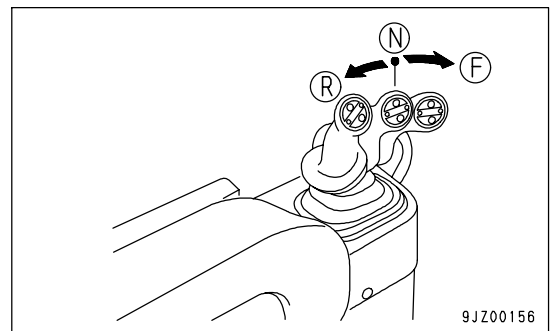
5. Depress decelerator pedal (5).



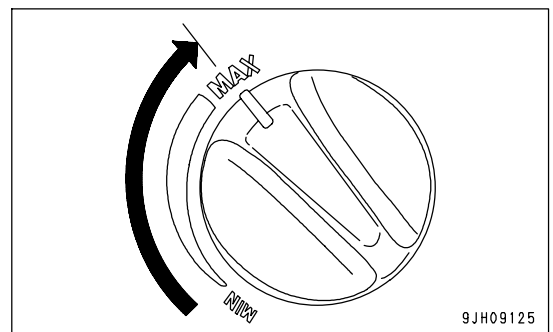
6. Operate steering, forward-reverse, gear shift lever (4) to the FORWARD position (F) or REVERSE position (R).

REMARK

Check that the alarm sounds when the steering, forward-reverse, gear shift lever is operated to the REVERSE position. If the alarm does not sound, ask your Komatsu distributor to carry out repairs.



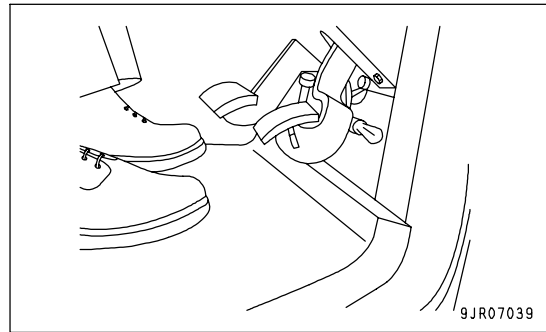
7. Turn fuel control dial (3) in the full speed (MAX) direction.



8. Release decelerator pedal (5) slowly and move the machine off.

REMARK

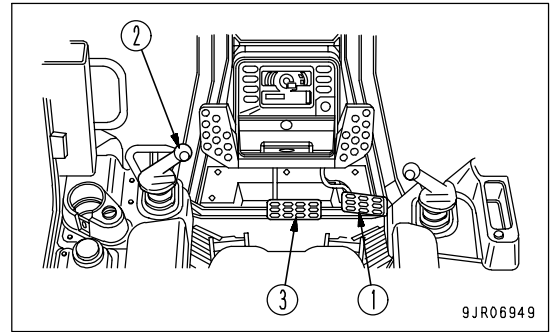
When the machine starts off, it may deviate slightly, but this is caused by the actuation of the straight-line compensation system. It does not indicate any abnormality.



STOPPING MACHINE

**WARNING**

Avoid stopping suddenly. Give yourself ample room when stopping.

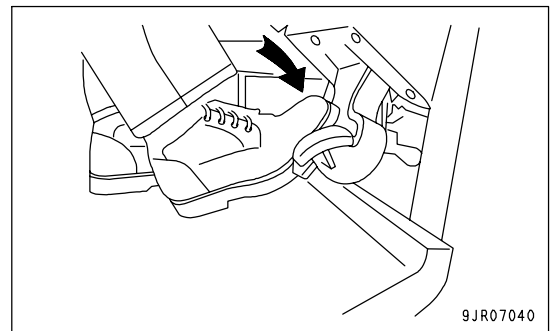
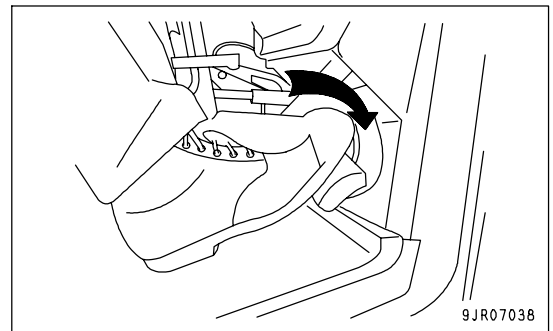


1. Depress decelerator pedal (1), return steering, forward-reverse, gear shift lever (2) to the N position, and stop the machine.

If the machine is to be kept in a stopped condition, depress brake pedal (3).

REMARK

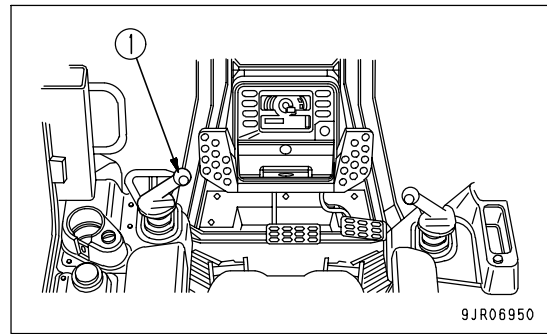
- If it is difficult to stop the machine on a downhill slope using only the decelerator pedal, use brake pedal (3) in addition to the decelerator pedal.
- If it is necessary to stop the machine suddenly, depress the brake pedal.



SHIFTING GEARS

The machine does not have to be stopped to shift gears.

Press the shift switch on the knob of steering, forward-reverse, gear shift lever (1) and select the desired speed range.



• Gear shifting

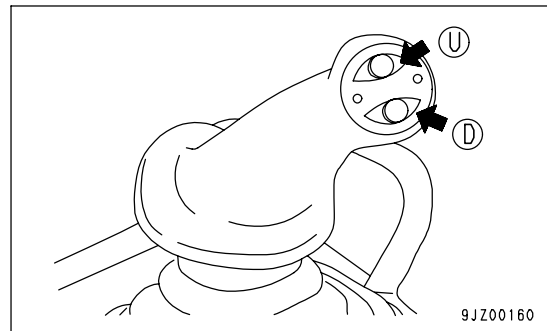
Press the shift switch of the knob of the steering, forward-reverse, gear shift lever to carry out the gearshifting operation.

Press UP switch (U) or DOWN switch (D) to shift gear.

UP switch (U): Each time UP switch (U) is pressed, the speed range shifts up one speed.

DOWN switch (D): Each time DOWN switch (D) is pressed, the speed range shifts down one speed.

When the key in the starting switch is turned to the ON position, the transmission is automatically set to 1st.



For details of the method of switching the shift mode, monitor display, and set travel speed, see "DISPLAY PANEL A (SPEED RANGE, SHIFT MODE INDICATOR) (PAGE 3-14)".

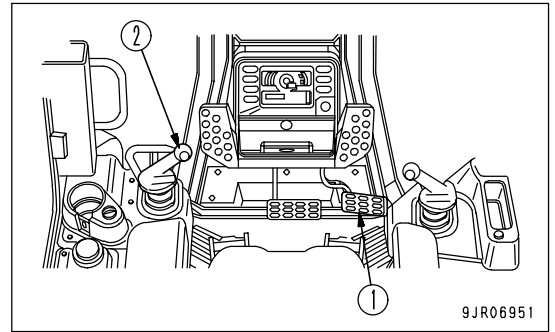
If the operating load increases, the travel speed will slowly decrease and the transmission will shift down. When the load becomes lighter again, the transmission will shift up to the set travel speed.

When the transmission automatically shifts down, the speed range display does not change.

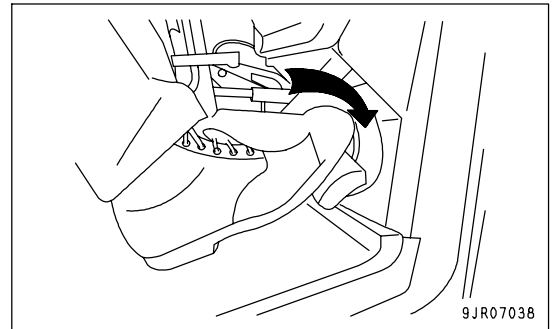
SHIFTING BETWEEN FORWARD AND REVERSE

 **CAUTION**

It is possible to shift between forward and reverse without stopping the machine, but to ensure safety and operator comfort, and to extend the service life of the power transmission system, do not shift when the engine is rotating at full speed. Depress decelerator pedal (1) to reduce the engine speed before shifting.



1. Depress decelerator pedal (1) to reduce the engine speed.

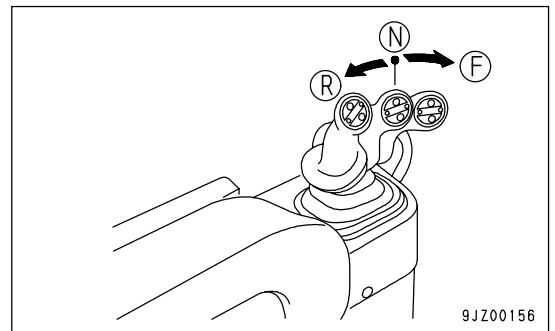


2. Shift steering, forward-reverse, gear shift lever (2) to the desired position.

Position (F): Forward

Position (N): Neutral

Position (R): Reverse

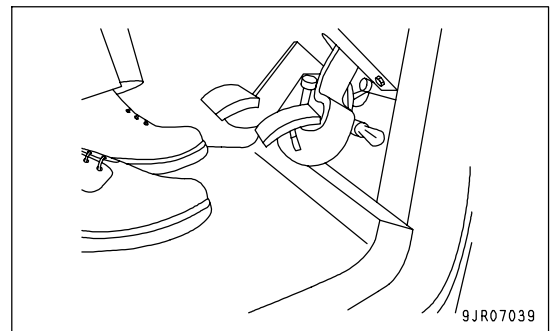
**REMARK**

Check that the alarm sounds when the steering, forward-reverse, gear shift lever is operated to the REVERSE position. If the alarm does not sound, ask your Komatsu distributor to carry out repairs.

3. Release decelerator pedal (1) and raise the engine speed.

REMARK

When the machine starts off, it may deviate slightly, but this is caused by the actuation of the straight-line compensation system. It does not indicate any abnormality.



STEERING MACHINE

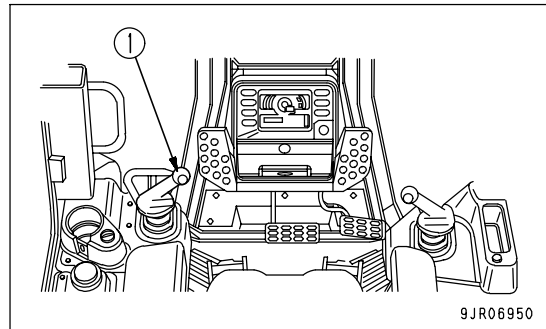


WARNING

- Avoid as much as possible turning the machine on a slope.
The machine will tend to slip sideways. Particular care should be taken on soft or clay soil.
- Never make a pivot turn at high speed.

NORMAL TURNING

To turn the machine while traveling, incline steering, forward-reverse, gear shift lever (1) in the direction of the turn.



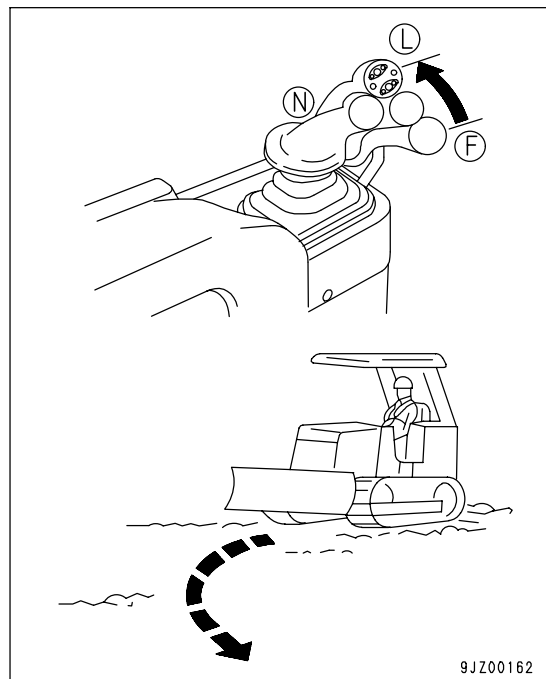
TURNING LEFT WHILE TRAVELING FORWARD

If the steering, forward-reverse, gear shift lever (1) is operated to the FORWARD position and moved partially to the left (L), the machine will start to turn gradually. After that, the lever can be moved further towards the position where it becomes heavy to give the desired turning radius.

REMARK

To turn gradually to the right while traveling FORWARD, if the steering, forward-reverse, gear shift lever (1) is operated to the FORWARD position and moved slowly to the right, the machine will start to turn gradually. After that, the lever can be moved further towards the position where it becomes heavy to give the desired turning radius.

Do the same when traveling in reverse.

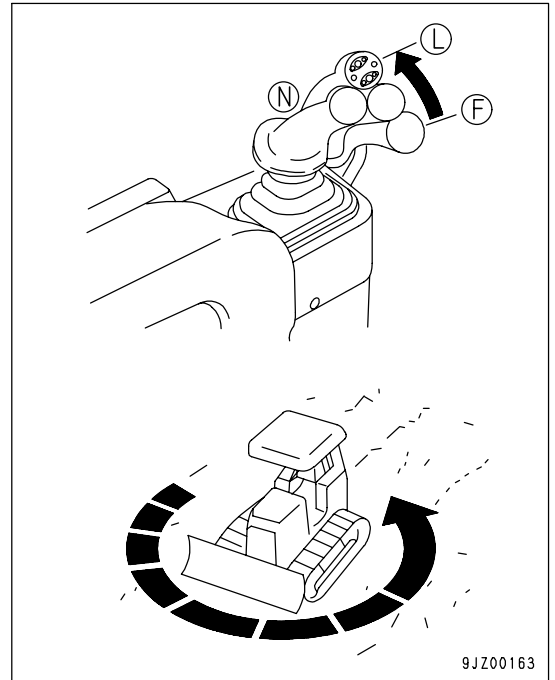


WHEN MAKING PIVOT TURN TO LEFT WHILE TRAVELING

When steering the machine, if the lever is operated further from the position where it becomes heavy, the left and right tracks will rotate in opposite directions and the machine will carry out a counterrotation turn.

REMARK

When carrying out a counterrotation turn to the right, move the steering, forward-reverse, gear shift lever (1) to the right in the same way.



9JZ00163

TURNING WHILE DESCENDING A SLOPE

This machine does not cross-steer even when it descends a steep slope where it is driven down by its own weight or when it is pushed down by a towed machine on a slope.

REMARK

Cross steering means the phenomenon that the machine turns in the opposite direction to the actual steering direction.

WHEN TURNING TO THE LEFT GRADUALLY WHILE TRAVELING FORWARD

If the steering, forward-reverse, gear shift lever (1) is operated to the FORWARD position and moved partially to the left (L), the machine will start to turn gradually. After that, the lever can be moved further towards the position where it becomes heavy to give the desired turning radius.

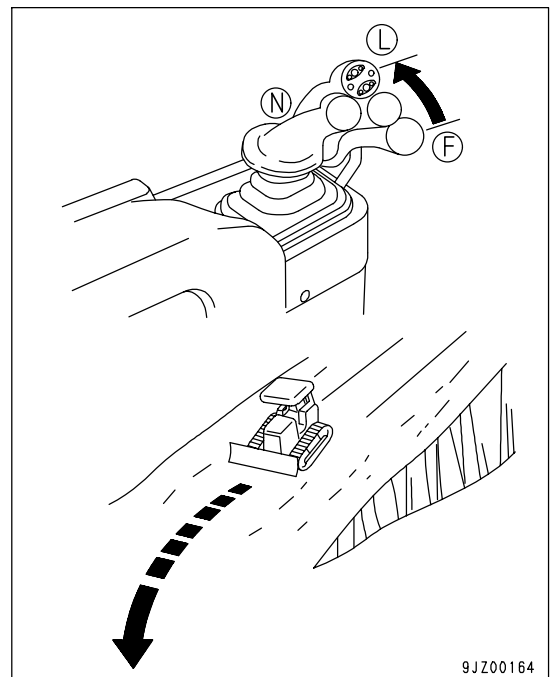
(The machine does not carry out cross-steering)

REMARK

To turn gradually to the right while traveling FORWARD, if the steering, forward-reverse, gear shift lever (1) is operated to the FORWARD position and moved slowly to the right, the machine will start to turn gradually. After that, the lever can be moved further towards the position where it becomes heavy to give the desired turning radius.

Do the same when traveling in reverse.

(The machine does not carry out cross-steering)



9JZ00164

PRECAUTIONS FOR OPERATION

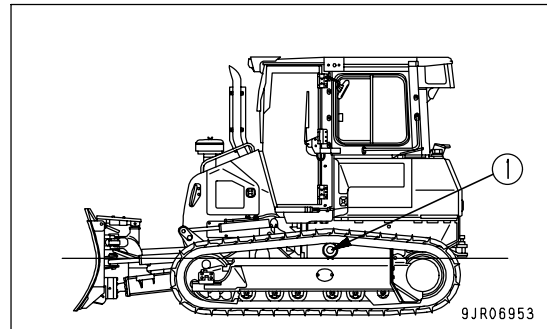
PAY ATTENTION TO GAUGES

If the hydraulic oil temperature gauge reaches the red range during operations, reduce the operating load and wait for the temperature to go down.

PERMISSIBLE WATER DEPTH

When operating in water, always keep the bottom of carrier rollers (1) above the surface of the water. Also, be careful that the engine cooling fan will not come in contact with water. The fan can be damaged.

After operating the machine for a long time in water, carry out greasing of the greasing points.



PRECAUTIONS WHEN TRAVELING DOWNHILL

USING ENGINE AS A BRAKE

Before traveling downhill, place the steering, forward-reverse, gear shift lever in a low speed range and run the engine at low speed to use the braking force of the engine when traveling downhill.

Always use 1st when traveling down slopes of 15° or more.

REMARK

When the machine travels in a straight line down a slope, the machine may deviate slightly to the left or right, but this is caused by the actuation of the straight-travel compensation mechanism and does not indicate any problem.

PRECAUTIONS ON SLOPES

BE CAREFUL OF FUEL LEVEL

If the fuel level in the fuel tank becomes low when working on slopes, the engine may suck in air because of the angle of the machine or the swaying of the machine. This makes the engine stop, so be careful not to let the fuel level in the fuel tank become too low.

IT IS PROHIBITED TO KEEP THE DOOR OPEN DURING OPERATIONS

(Machine equipped with cab)

Always keep the door closed when traveling or carrying out operations.

If the door is open, there is danger of damage from obstacles or strong vibration.

IT IS PROHIBITED TO MODIFY THE CAB GLASS IN ANY WAY THAT WILL OBSTRUCT THE VIEW

(Machine equipped with cab)

- For safety reasons, do not install anything on the cab glass that will obstruct the view.
- Always keep the glass clean to ensure safety during operations.

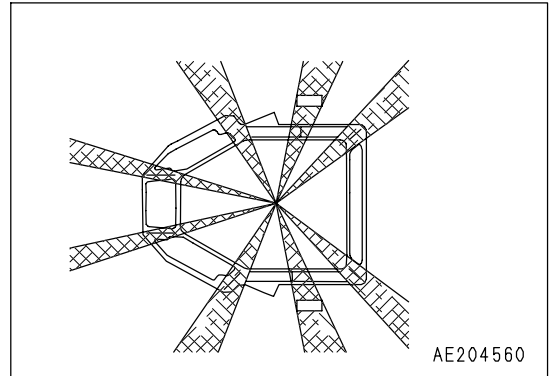
PRECAUTIONS FOR BLIND SPOTS CAUSED BY CAB STAY

(Machine equipped with cab)

**WARNING**

The cab stays create blind spots.

When operating, check carefully that there is no person or obstacle in the surrounding area.

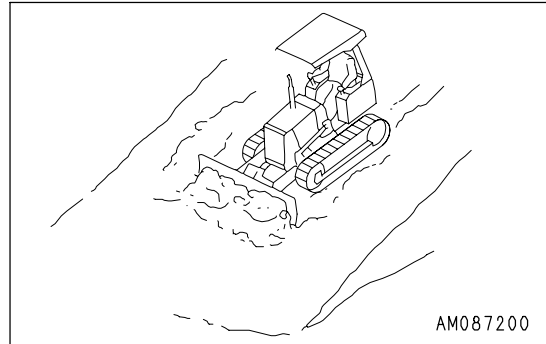


WORK POSSIBLE USING BULLDOZER

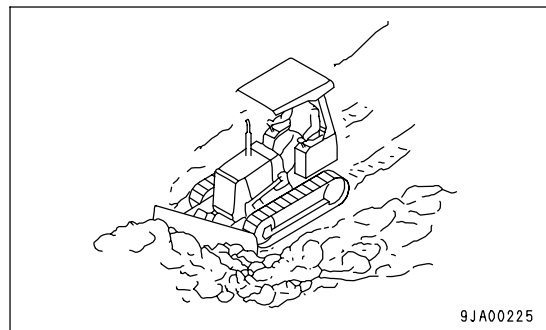
In addition to the following, it is possible to further increase the range of applications by using various attachments.

DOZING

A bulldozer digs and transports dirt in a forward direction. Slope excavation can always be most effectively carried out by proceeding from the top downward.



When dozing toward one side only, operate with angled blade.

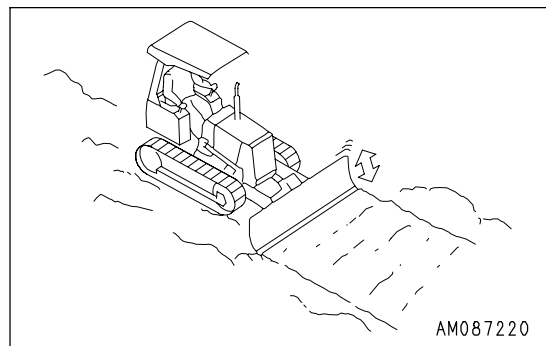


SMOOTHING

NOTICE

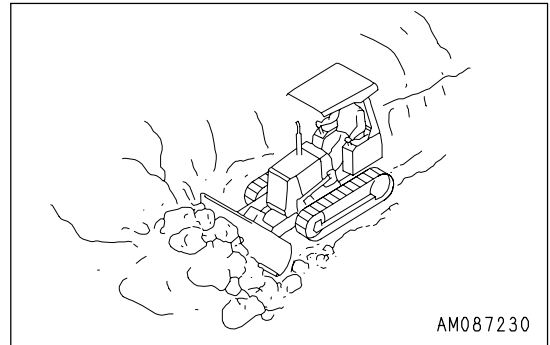
Avoid smoothing on rocky or stony ground. It can damage the blade.

To finish the ground to a flat surface after digging or leveling, put a full load of soil in front of the blade and operate the blade up and down in small movements while traveling forward. Finally, place the blade at FLOAT and travel at low speed in reverse while pulling the blade over the ground surface. Before doing this, hold the lever by hand at the FLOAT position for at least 1 second to make sure that it stays in position. To prevent damage to the blade, be careful not to travel over any stones or rocks.



CUTTING INTO HARD OR FROZEN GROUND OR DITCHING

For digging and ditch excavation of hard or frozen ground, tilt the blade. Even hard ground can be dug effectively by a tilted or angled blade.



FELLING TREES, REMOVING STUMPS

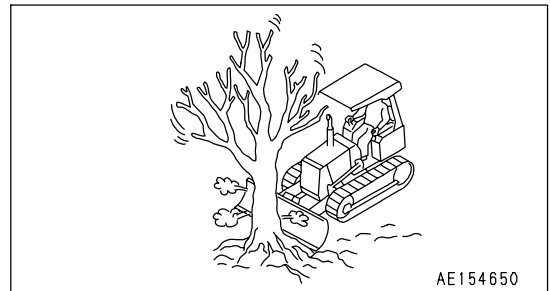
NOTICE

Do not uproot trees or stumps or fell trees by angling or tilting the blade.

For trees with a diameter of 10 to 30 cm (3.9 to 11.8 in), raise the blade high and push 2 or 3 times to fell the tree.

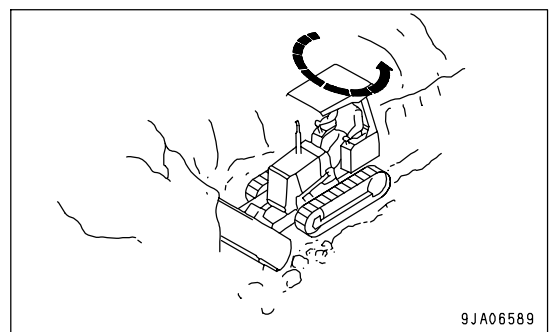
Next, travel in reverse, and dig the corner of the blade into the ground to cut and dig up the roots.

When doing this, never hit the tree at high speed or apply shock to fell the tree.



SIDE-CUTTING OPERATIONS

When carrying out side-cutting operations with the load on one side of the blade, the work can be carried out efficiently by using counter-rotation to correct the direction.



ADJUSTING POSTURE OF WORK EQUIPMENT

For details of the procedure for adjusting play in the center ball, see the "ADJUST PLAY IN CENTER BALL (PAGE 4-45)" in the MAINTENANCE Section and WHEN REQUIRED Section.

ADJUST ANGLE OF BLADE EDGE



WARNING

It is dangerous if the work equipment moves by accident when then angle of the blade edge is being adjusted. Set the work equipment in a stable position, lower the blade completely to the ground, stop the engine, then set then work equipment lock lever securely to the LOCK position.

It is possible to change the cutting angle of the blade (a) to match the soil condition and the nature of the operation. To increase cutting angle (a), rotate rod (1) to increase distance (L) between the joints. To reduce cutting angle (a), rotate rod (1) to reduce distance (L) between the joints.

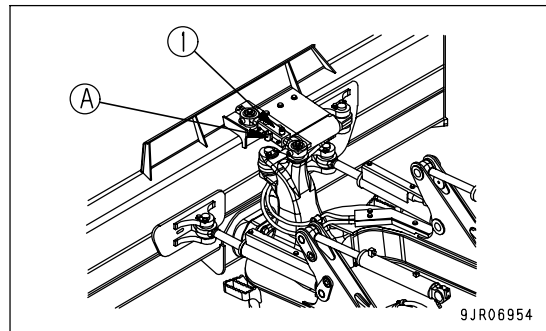
The standard cutting angle (a) is 57° and the standard distance between the joints is 368.5 mm (14.5 in). This is suitable for general operations.

The maximum cutting angle (a) is 59.5° and the distance between the joints is 408.5 mm (16.1 in). This is suitable for digging operations on clay soil or hard soil. In addition, this will improve the removal of the soil from the blade and reduce spillage of soil over the back of the blade. This is suitable also for dozing operations on slopes.

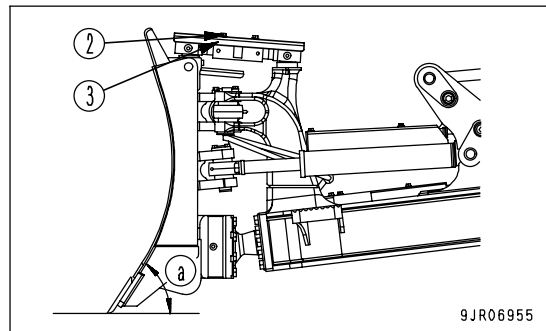
The minimum cutting angle (a) is 54.5° and the distance between the joints is 327.5 mm (12.9 in). This allows the blade to gather a larger amount of soil and is suitable for hauling operations on soft soil. In addition, it makes it easier for the cutting edge of the blade to dig into the soil, so it is suitable for operations digging into hard soil.

Method of adjusting

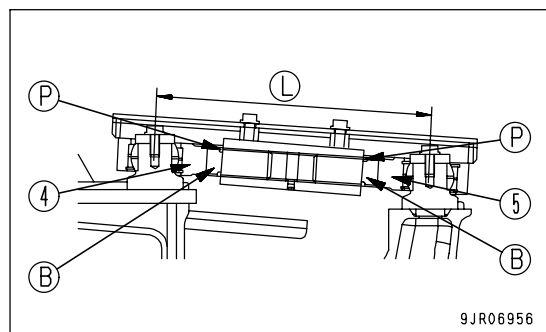
1. Remove 2 bolts (2), then remove cover (3).
2. Insert a bar in hole (A) of rod (1) and turn rod (1).
3. When increasing distance (L) between the joints, increase until cover (3) is at its original mounting distance. Do not make distance (L) any longer than this.
4. When reducing distance (L) between the joints, reduce until the thread of rods (4) and (5) contacts rod (1). Do not make distance (L) any shorter than this.
5. When setting distance (L) between the joints to the standard length, as a guideline, set to a position where small hole (P) of rods (4) and (5) can be seen slightly from rod (1).
6. After completing adjustment, use 2 bolts (2) to install cover (3) to its original position.



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REMARK

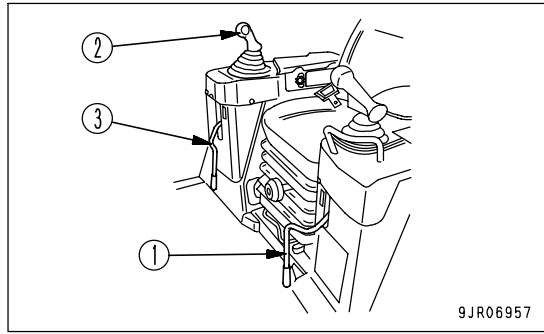
When the maximum cutting angle (blade tilted fully forward) is changed to the minimum cutting angle (blade tilted back), there is resistance from the pressure stored in the angle cylinder, so the operating effort may gradually become heavier.

In this case, turn the starting switch ON (there is no need to start the engine), then release the work equipment lock lever and operate the blade control lever to the Angle position to release the pressure in the angle cylinder.

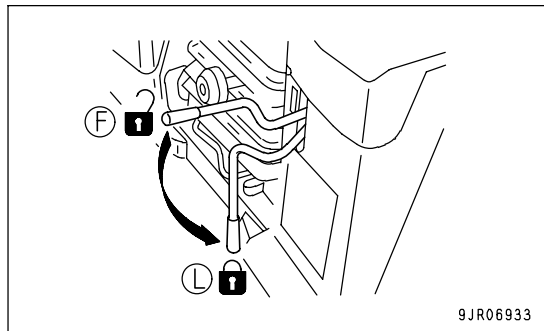
PARKING MACHINE

WARNING

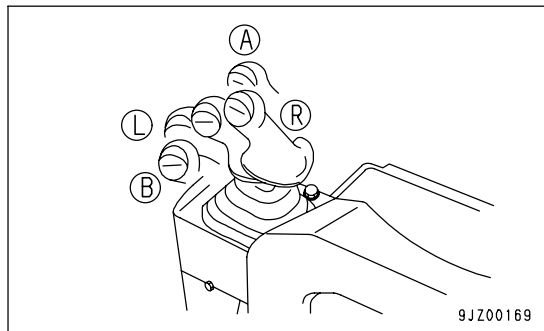
- When parking the machine, select flat hard ground.
- Avoid parking the machine on a slope.
- On slopes, even if steering, forward-reverse, gear shift lever is set to the N position, the machine may move slowly down the slope.
If it is unavoidably necessary to park the machine on a slope, place the parking brake lever at the LOCK position and insert blocks under the track shoes. As an additional safety measure, lower the work equipment and thrust the blade into the ground.
- If the work equipment control lever is touched by accident, the work equipment may move suddenly, and this may lead to a serious accident. Before standing up from the operator's seat, always place the work equipment lock lever and parking brake lever securely at the LOCK position.



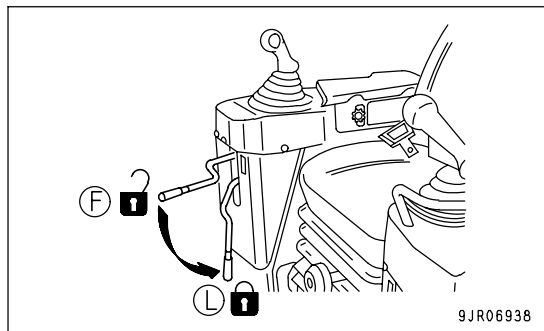
1. Stop the machine. For details, see "STOPPING MACHINE (PAGE 3-97)".
2. Set parking brake lever (1) to the LOCK position (L) and apply the parking brake.



3. Set blade control lever (2) to the LOWER (L) position and lower the blade to the ground.



4. Set work equipment lock lever (3) in the LOCK position (L).



CHECK AFTER FINISHING WORK

BEFORE STOPPING ENGINE

Use the meters and caution lamps to check the engine water temperature, engine oil pressure, fuel level, and hydraulic oil temperature.

AFTER STOPPING ENGINE

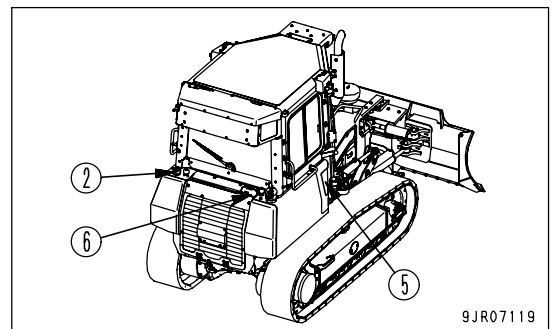
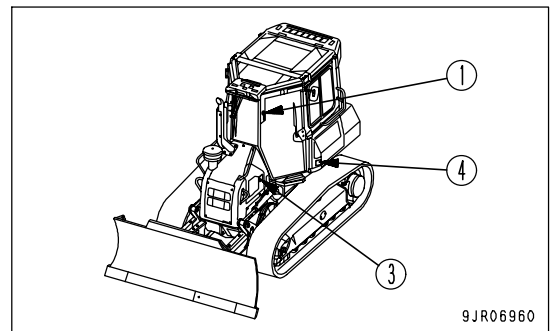
1. Walk around the machine and check the work equipment, machine exterior, and undercarriage, also check for any leakage of oil or coolant. If any problems are found, repair them.
2. Fill the fuel tank.
3. Check the engine compartment for paper and debris. Clean out any paper and debris to avoid a fire hazard.
4. Remove any mud affixed to the undercarriage.
5. To prevent freezing of the track shoe assembly, always park the machine on a dry ground surface.

LOCKING

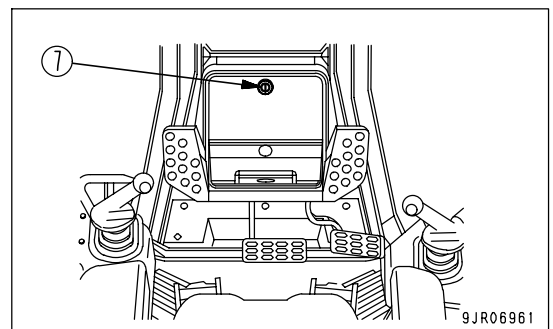
Places that can be locked with the starting switch key.

To prevent vandalism, there are locks in the following places.

- Cab door opener (1) (machines equipped with cab, both sides)
- Hydraulic tank filler cap (2)
- Left engine side cover (3)
- Hydraulic tank inspection cover (4)
- Fuel tank inspection cover (5)
- Radiator filler port inspection cover (6)

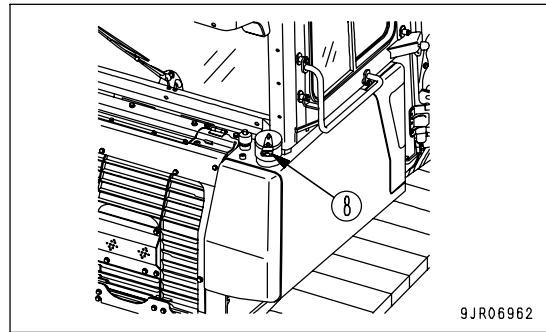


- Monitor panel cover (7) (machines equipped with canopy) (if equipped)



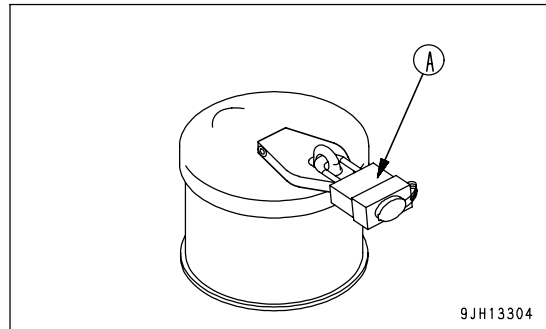
Places locked with special key

- Fuel tank cap (8)



REMARK

If the padlock (A) is to be used, it is recommended to use the type that has the cover to protect the key hole.



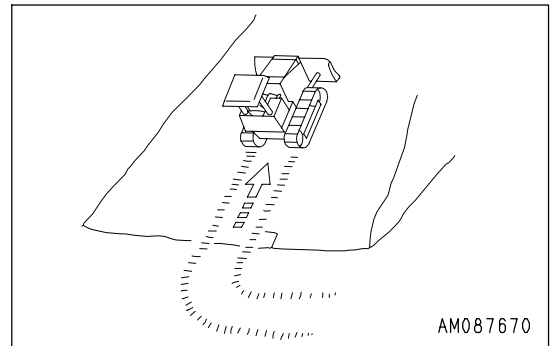
For details of the method of locking, see "COVER, CAP WITH LOCK (PAGE 3-47)".

TIPS FOR LONGER UNDERCARRIAGE LIFE

Undercarriage life greatly varies depending on operation method, inspection and maintenance. For most efficient operation, keep the following points in mind.

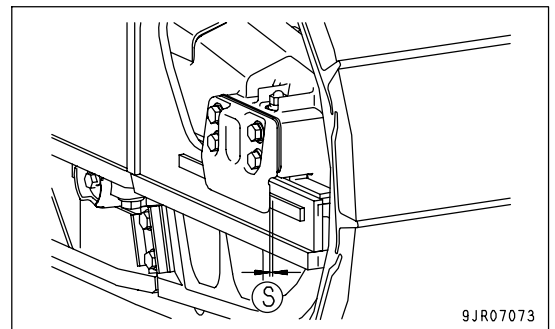
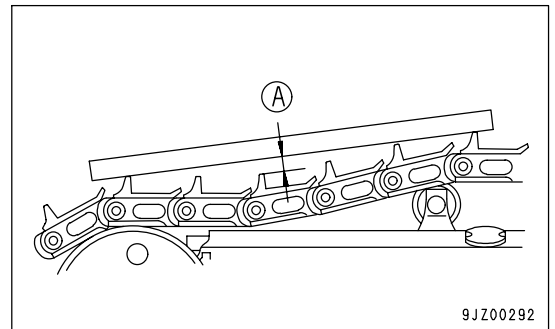
OPERATION METHOD

- Select the track shoe that best suits the type of soil to be encountered in service.
Please consult your Komatsu distributor when selecting track shoes.
- Do not allow shoe slipping to occur during operation.
If shoe slipping occurs, reduce load on the blade until slipping stops.
- Avoid sudden starts, acceleration or stops, unnecessary high speeds and sharp turns.
- Always operate machine in a straight line whenever possible. When making turns, be careful not to allow the machine to stay to one side, so operation in both turning directions can be done properly. Make turns with the largest possible radius.
- Prior to operation, clear boulders and obstacles to prevent machine from riding over them while operating.
- On a slope, operate the machine parallel to the inclination of the slope. Do not operate across the slope. Also when stopping the machine on a slope, the machine should face the top of the slope.
- When ground inclines to the left or right during digging operations, do not continue to dig with the incline. Move the machine back to level ground and start to dig again.
- If you come across obstacles that are difficult to move during dozing operations or ripper operations, and the idler or sprocket come up from the ground, it means that the operation is excessive for the machine, so avoid such operations.



INSPECTION AND ADJUSTMENT

- Adjust the track shoe to the proper tension.
When adjusting the tension, measure clearance A between the idler and carrier roller in the diagram on the right. The normal clearance is 20 - 30 mm (0.8 - 1.2 in), but on bedrock, set the tension slightly higher, and on clay ground, set it slightly looser. If the track is excessively loose, it may cause abnormal vibration during the operation and abnormal wear of the sprocket teeth. (For details of the method of inspection and maintenance for the track tension, see "CHECK TRACK SHOE TENSION, ADJUST (PAGE 4-30)".)
- Check for oil leakage from the idlers and sprockets, and for loose bolts or nuts. If any problem is found, repair it immediately.
- Check clearance S between the idler guide plate and track frame. If clearance S becomes larger, the idler will move to the side and cause the track assembly to come off. For details of the method of inspection and maintenance, see "ADJUST IDLER CLEARANCE (PAGE 4-44)".



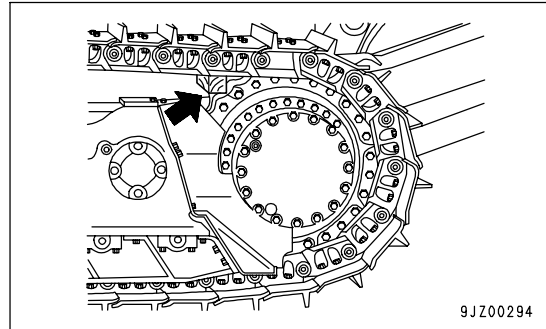
INSPECTION AND REPAIR

Frequent inspection and prompt repair will reduce repair costs.

The following items for inspection will serve as a guide to maintenance service of each undercarriage part. Perform periodical inspection and contact the Komatsu distributor in your area when machine has approached repairable limits and reversing limits.

MEASURING LINK PITCH

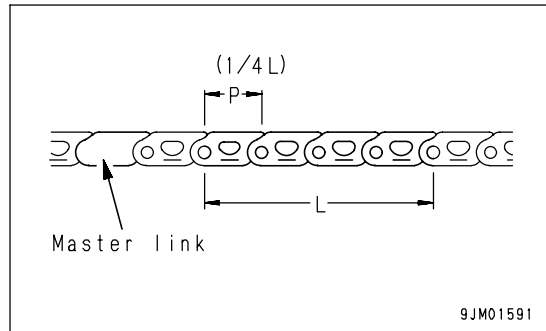
1. Insert a wooden block between track shoe and sprocket to take up the slack in track shoes.



2. Measure pitch length of 4 links in stretched portion at least 2 links away for master pin. Of length obtained, 1/4 is the link pitch.

There is no link window on the master link.

- Basic link pitch (P): 154.3 mm (6.1 in)
- Link pitch limit for turning: 157 mm (6.2 in)



REMARK

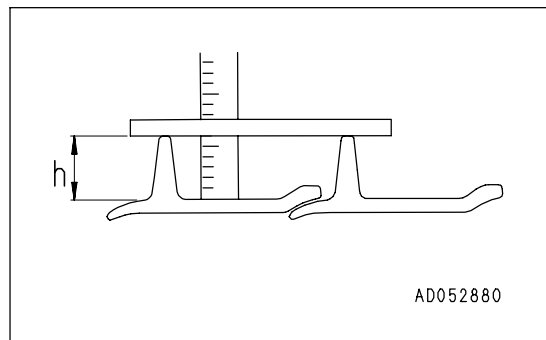
The measured value under decimal of link pitch is different from the basic value depending upon the precision of measure or the tolerance of product even if it isn't worn out.

Don't judge it's worn out too soon, do it with the trend of measured value after that.

MEASURING HEIGHT OF GROUSER

After taking up slack in track shoes, measure height at center of shoe as shown below.

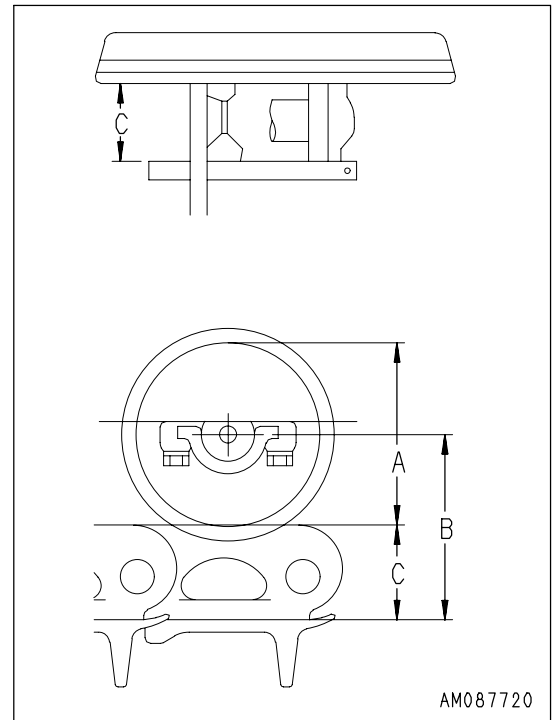
- Standard height (h): 47 mm (1.9 in)
- Repair limits: 25 mm (1.0 in)



MEASURING OUTSIDE DIAMETER OF TRACK ROLLER

1. Measure the height (dimension C) of the link tread as shown in the diagram.
2. Stop machine at position where link tread, whose size C has been measured completely, contacts roller tread. Then measure size B.
3. Calculate outside diameter of tread (size A):
 $A = (B - C) \times 2$

- Standard size (h): 170 mm (6.7 in)
- Repair limits: 156 mm (6.1 in)



TRANSPORTATION

When transporting the machine, observe all related laws and regulations, and be careful to assure safety.

TRANSPORTATION MEANS

When transporting the machine, choose the transportation method in reference to the weight and dimensions shown in "SPECIFICATIONS (PAGE 5-2)".

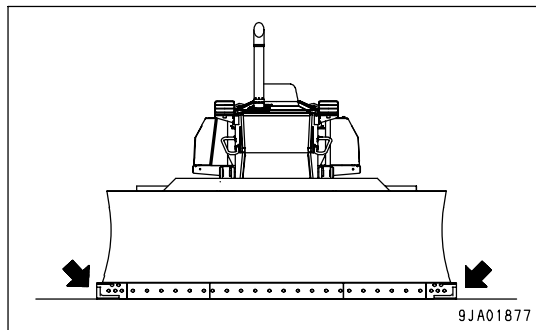
Note that the machine specifications (weight and dimensions) vary depending on the kind of track shoes, blade, or other equipment.

REMOVING CAB

The cab forms one unit with the operator's seat, so it cannot be removed. If there is any problem when transporting, please consult your Komatsu distributor.

PRECAUTIONS WHEN REMOVING WORK EQUIPMENT

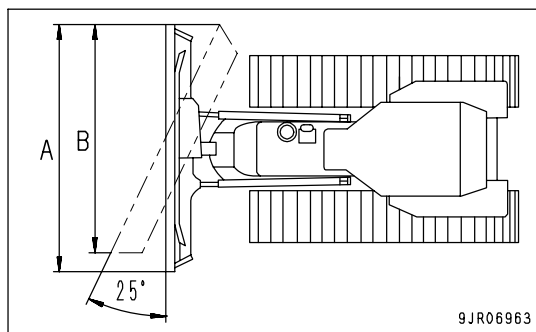
1. Lower the blade to the ground and set it horizontal to the ground surface.
2. Remove the blade assembly.



REMARK

When the blade is angled to the maximum, the overall width is reduced. Use the diagram below for reference and decide if it is necessary to remove the blade.

Model		A(mm (ft in))	B(mm (ft in))
D31EX		2,550 (8' 4")	2,350 (7' 9")
D31PX	Narrow blade	2,875 (9' 5")	2,640 (8' 8")
	Wide blade	3,250 (10' 8")	2,980 (9' 9")
D37EX		2,710 (8' 11")	2,490 (8' 2")
D37PX	Narrow blade	2,875 (9' 5")	2,640 (8' 8")
	Wide blade	3,250 (10' 8")	2,980 (9' 9")



LOADING, UNLOADING WORK

**WARNING**

- Since loading and unloading of the machine is dangerous, be extremely careful.
- When loading or unloading the machine, operate it slowly with the engine speed low and the transmission in the 1st gear.
- Use ramps having sufficient width, length, thickness, and strength. Install them securely and set their angle to 15° or less. If the ramps are deflected appreciably, reinforce them with blocks.
- Perform the loading work of the machine on firm, level ground. Secure sufficient distance between the shoulder of the road and the trailer.
- Remove mud from the undercarriage of the machine so that the machine will not slip sideways on the ramps. In addition, remove water, snow, ice, grease, oil, etc. from the ramps.
- Never steer the machine on the ramps, since steering on the ramps can cause the machine to tip over. If it is necessary to change the travel direction, return to the ground or to the bed of the trailer, then change the travel direction.
- The center of gravity of the machine shifts suddenly at the border between the ramps and trailer, and the machine is unbalanced and becomes dangerous. Accordingly, pass the border slowly.

When loading or unloading, always use ramps or a platform. Proceed as follows.

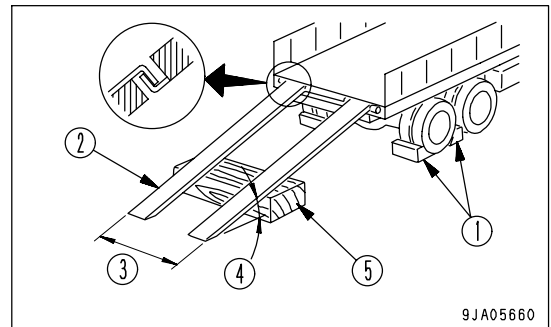
LOADING WORK

1. Load and unload on firm level ground only.

Maintain a safe distance from the edge of a road.

2. Apply the trailer brakes securely and put blocks (1) under the tires to hold the trailer in position. Set gap (3) between ramps (2) to match the distance between the left and right tracks, and keep angle (4) to a maximum of 15°.

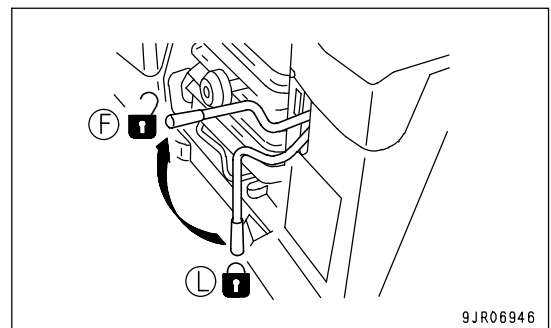
If ramps (2) bend appreciably under the weight of the machine, put wooden block (5) under the ramps to support them.



3. Start the engine.

In a cold weather, carry out an engine warming-up run, referring to the section, "STARTING IN COLD WEATHER (PAGE 3-91)", in this manual.

4. Set parking brake lever to the FREE position (F).
5. Use the variable mode to set the speed range to 1st or less, and travel slowly.
6. Set the travel direction toward the ramps and drive slowly.
7. The center of gravity of the machine shifts suddenly at the border between the ramps and trailer, and the machine is unbalanced and becomes dangerous. Accordingly, pass the border slowly.
8. Stop the machine at the specified position on the trailer.



SECURING MACHINE

**WARNING**

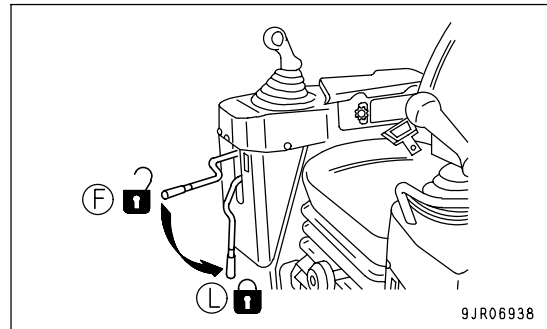
When the edge of the blade protrudes beyond the trailer, angle the blade.

NOTICE

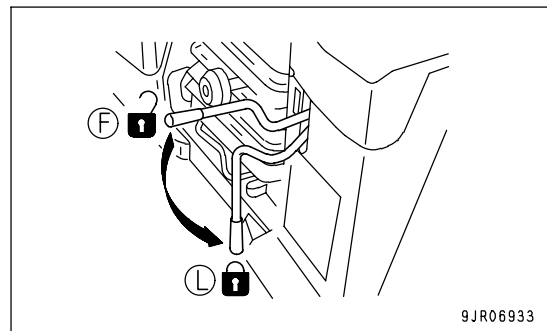
Stow the radio antenna.

Load the machine onto a trailer as follows:

1. Lower the work equipment slowly.
2. Set the work equipment lock lever to the LOCK position (L) securely.



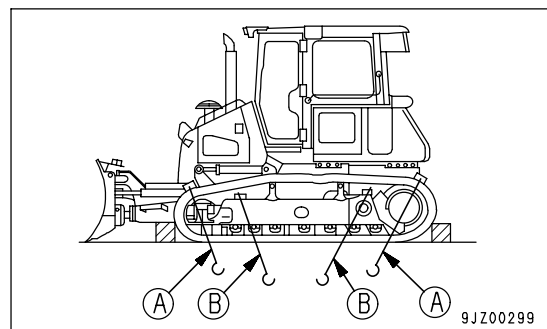
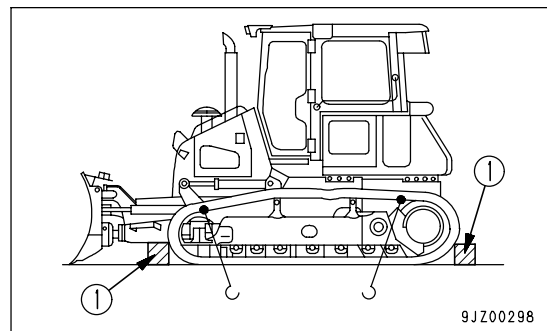
3. Set the parking brake lever to the LOCK position (L).
4. Stop the engine, then remove the key from the starting switch.
5. Lock the glass windows, cab doors, engine side cover, hydraulic tank inspection cover, and fuel tank inspection cover securely.



6. Fix the machine as explained below so that it will not move during transportation.

In particular, fix the machine securely to prevent it from slipping sideways.

- 1) Put blocks (1) in front and behind the track shoes of both sides.
- 2) Set up chain or wire, following (A) or (B).
 - A: Secure chain or wire around the track shoes.
 - B: Secure chain or wire through the holes of track links.
- 3) Protect the wire from contacting directly with angular parts of the machine, by inserting pads.

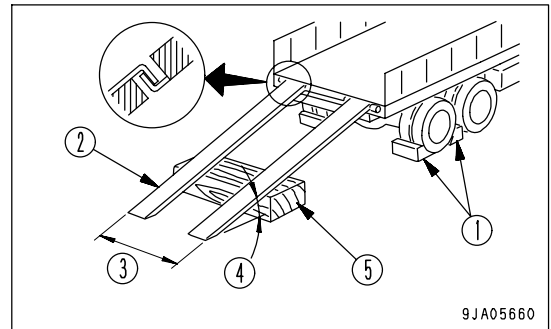


UNLOADING WORK

1. Load and unload on firm level ground only. Maintain a safe distance from the edge of a road.
2. Apply the trailer brakes securely and put blocks (1) under the tires to hold the trailer in position. Set gap (3) between ramps (2) to match the distance between the left and right tracks, and keep angle (4) to a maximum of 15°.

If ramps (2) bend appreciably under the weight of the machine, put wooden block (5) under the ramps to support them.

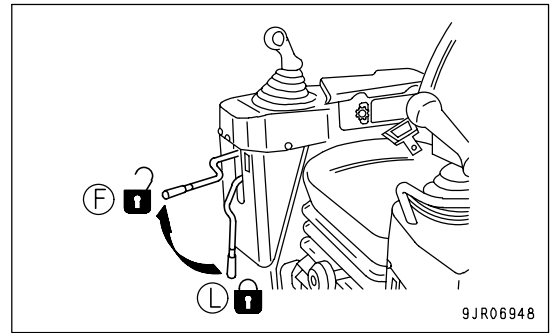
3. Remove the chains and wire ropes fastening the machine.



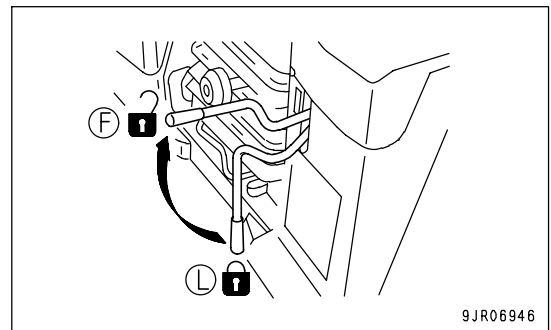
4. Start the engine.

In a cold weather, carry out an engine warming-up run, referring to the section, "STARTING IN COLD WEATHER (PAGE 3-91)", in this manual.

5. Turn the work equipment lock lever to FREE position (F).
6. Raise the blade.



7. Set parking brake lever to the FREE position (F).
8. Use the variable mode to set the speed range to 1st or less, and travel slowly.
9. Set the travel direction toward the ramps and drive slowly.
10. The center of gravity of the machine shifts suddenly at the border between the ramps and trailer, and the machine is unbalanced and becomes dangerous. Accordingly, pass the border slowly.
11. Drive down the ramps slowly and carefully until the machine leaves the ramps perfectly.



METHOD OF LIFTING MACHINE



WARNING

- The operator carrying out the lifting operation using a crane must be a properly qualified crane operator.
- Never raise the machine with any worker on it.
- Always make sure that the wire rope is of ample strength for the weight of this machine.
- When lifting, keep the machine horizontal.
- Before starting the lifting operation, set the parking brake lever and work equipment lock lever securely to the LOCK position to prevent the machine from moving unexpectedly.
- Never go under or near the machine when it is raised.
- There is a hazard that the machine may lose its balance.

Always lift the machine in the posture given in the procedure below using the lifting equipment in the procedure below.

NOTICE

This method of lifting applies to the standard specification machine.

The method of lifting differs according to the attachments and options installed.

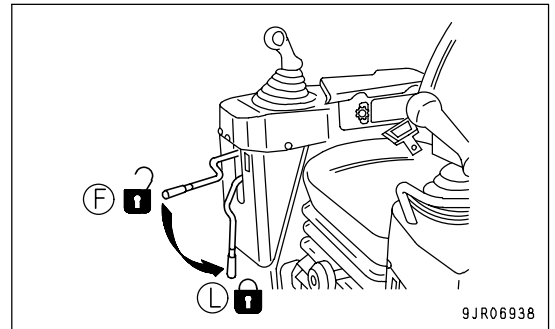
For details of the procedure for machines that are not the standard specification, please consult your Komatsu distributor.

For weight, see "SPECIFICATIONS (PAGE 5-2)".

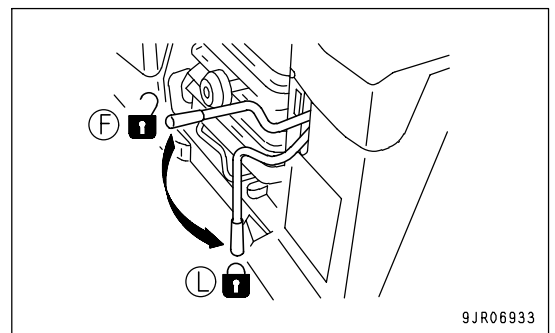
PROCEDURE FOR LIFTING OPERATIONS

When lifting the machine, stop it on a level place, then observe the following procedure.

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



2. Stop the engine and set the parking brake lever to the LOCK position (L).
3. Lock the glass windows, cab doors, engine side cover, hydraulic tank inspection cover, and fuel tank inspection cover securely.

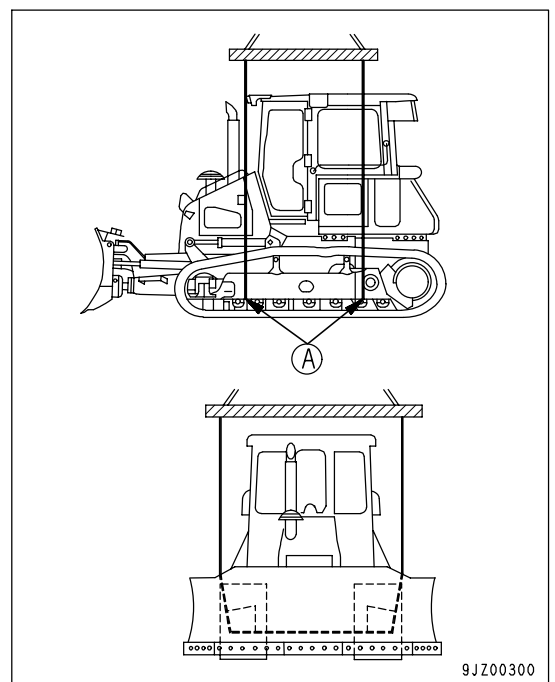


4. Use a wire rope and sling that matches the weight of the machine.
 Pass the wire rope under the track frame at the point where the machine is to be lifted.
 A): Mark showing lifting position

NOTICE

- Use protectors to prevent the wire rope from being cut on sharp corners and to prevent the wire rope from cutting into the machine bodywork.
- When using a spreader bar, select an ample width to prevent contact with the machine.

5. Before lifting the machine, check the settings, raise the machine 100 - 200 mm (3.9 - 7.9 in) from the ground and check that there is no looseness in the wire rope and that the machine is kept horizontal. Then raise the machine slowly.



COLD WEATHER OPERATION

PRECAUTIONS FOR LOW TEMPERATURE

If the temperature becomes low, it becomes difficult to start the engine, and the coolant may freeze, so do as follows.

FUEL AND LUBRICANTS

Change to oil with low viscosity for all components. For details of the specified viscosity, see "RECOMMENDED FUEL, COOLANT, AND LUBRICANT (PAGE 4-13)".

COOLANT



WARNING

- COOLANT 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 large amounts of fresh water and see a doctor at once.
- When changing the coolant or when handling the coolant containing COOLANT that has been drained during repair of radiator, please contact your Komatsu distributor or request a specialist company to carry out the operation. COOLANT is toxic. Do not let it flow into drainage ditches or spray it onto the ground surface.

NOTICE

Please use Komatsu genuine SUPERCOOLANT (AF-NAC) for the COOLANT. As a basic rule, we do not recommend the use of any COOLANT other than SUPERCOOLANT (AF-NAC).

COOLANT is already diluted with distilled water, so it is not flammable.

For details of the density of COOLANT and the interval for changing the coolant, see "CLEAN INSIDE OF COOLING SYSTEM (PAGE 4-27)".

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.
- 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 to the ground surface.

When the ambient temperature drops, the capacity of the battery will also drop. If the battery charge ratio is low, the battery electrolyte may freeze. Maintain the battery charge as close as possible to 100%. Insulate it against cold temperature to ensure the machine can be started easily the next morning.

REMARK

Measure the specific gravity and calculate the charging rate from the following conversion table.

Electrolyte Temperature	20°C (68°F)	0°C (32°F)	-10°C (14°F)	-20°C (-4°F)
Charging Rate (%)				
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 drastically drops in low temperatures, cover or remove the battery from the machine, store the battery 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 to prevent diluted electrolyte in the battery from freezing during the night.

AFTER COMPLETION OF WORK

To prevent mud, water, or the undercarriage from freezing and making it impossible for the machine to move on the following morning, observe the following precautions.

- Remove all the mud and water from the machine body. In particular, wipe the hydraulic cylinder rods clean to prevent damage to the seal caused by mud, dirt, or drops of water on the rod from getting inside the seal.
- Park the machine on hard, dry ground.
If this is impossible, park the machine on boards.
The boards prevent the tracks from freezing to the ground, and allow the machine to be moved the next morning.
- Open the drain valve and drain the water 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.

AFTER COLD WEATHER

When the season changes and the weather becomes warmer, do as follows.

- Replace the fuel and oil for all parts with oil of the viscosity specified.
For details, see "RECOMMENDED FUEL, COOLANT, AND LUBRICANT (PAGE 4-13)".

LONG-TERM STORAGE

BEFORE STORAGE

When keeping in long-term storage (more than one month), store as follows.

- Clean and wash all parts, then store the machine indoors. If the machine has to be stored outdoors, select level ground and cover the machine with a sheet.
- Completely fill the fuel tank. This prevents moisture from collecting.
- Lubricate and change the oil before storage.
- Apply a thin coat of grease to metal surface of the hydraulic piston rods and the idler adjusting rods.
- Disconnect the negative terminals of the battery and cover it or remove it from the machine and store it separately.
- Set all the control levers to the Neutral position or HOLD position, then set the work equipment lock lever and parking brake lock lever to the LOCK position.
- To prevent rust, fill with COOLANT to give a density of at least 30% for the engine coolant.

DURING STORAGE



WARNING

If it is necessary to perform the rust-prevention operation while the machine is indoors, open the doors and windows to improve ventilation and prevent gas poisoning.

- During storage, operate and move the machine for a short distance once a month so that a new film of oil will coat 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, operate the air conditioner for 3 to 5 minutes once a month to lubricate all parts of the air conditioner compressor. Always run the engine at low idle when doing this. In addition, check the refrigerant level twice a year.

AFTER STORAGE

NOTICE

If the machine has been stored without carrying out the monthly rust-prevention operation, consult your Komatsu distributor before using it.

When using the machine after long-term storage, do as follows before using it.

- Wipe off the grease from the hydraulic cylinder rods.
- Add oil and grease at all lubrication points.
- When the machine is stored for a long period, moisture in the air will mix with the oil. Check the oil before and after starting the engine. If there is water in the oil, change all the oil.

TROUBLESHOOTING

AFTER RUNNING OUT OF FUEL

When starting after running out of fuel, fill the fuel tank with fuel and bleed the air from the fuel system before starting the engine.

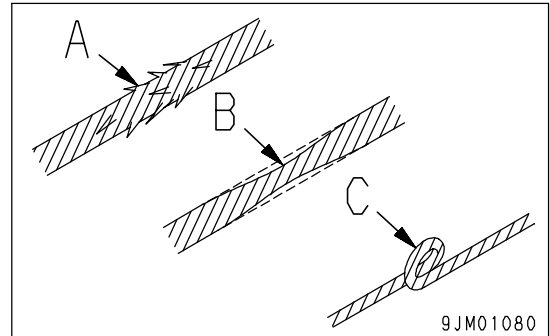
For details of the method of bleeding the air, see "REPLACE FUEL PRE-FILTER CARTRIDGE (PAGE 4-62)" in the inspection and maintenance section.

METHOD OF TOWING MACHINE

WARNING

Serious injury or death could result if a disabled machine is towed incorrectly or if there is a mistake in the selection or inspection of the wire rope.

- If the engine does not start, put blocks under the track to prevent the machine from moving, then release the brake. If blocks are not use, there is danger that the machine may move suddenly.
- Always check that the wire rope used for towing has ample strength for the weight of the machine being towed.
- 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.
- Operate the machine slowly and be careful not to apply any sudden load to the wire rope.



NOTICE

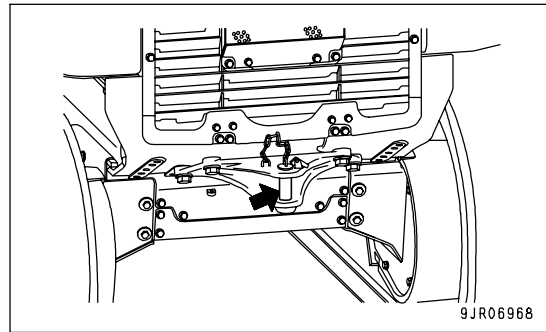
The maximum towing capacity for this machine is 67,500 N (6,885 kg).

Always carry out towing operations within the maximum towing capacity.

For details of the method of towing, please contact your Komatsu distributor.

- If the engine stops or the oil pressure in the brake circuit lowers because of a trouble in the hydraulic system, the brake works and the machine cannot move. To move the machine in this case, the oil pressure in the brake circuit must be heightened to the specified level with a special device. Ask your Komatsu distributor.
- When towing a machine, travel at a speed of less than 1 km/h for a distance of only a few meters to a place that is suitable for carrying out repairs.
This is for use only in emergencies.
- 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 towing line to the minimum. Operate the machine so that the angle does not become greater than 30° from the straight line.

If the machine gets stuck in the mud or a heavy thing needs to be towed, install a towing wire rope to the draw bar pin.

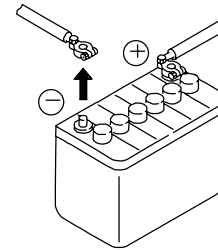


IF BATTERY IS DISCHARGED

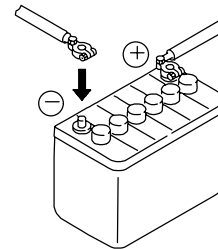
**WARNING**

- It is dangerous to charge the battery when it is mounted on the machine. Always remove it before charging it.
- Always stop the engine and turn the starting switch to the OFF position before inspecting or removing the battery.
- During the charging operation, hydrogen gas is generated inside the battery, so there is danger of explosion. Do not smoke or bring any flame close to the battery, and be careful not to cause sparks.
- Battery electrolyte (dilute sulphuric acid) will attack your clothes and skin. If battery electrolyte gets on your clothes or skin, immediately wash it off with large amounts of fresh water. If battery electrolyte gets into your eyes, immediately wash your eyes with fresh water. After that, get medical attention immediately.
- Always wear protective glasses and rubber gloves when handling the battery.
- When removing the battery terminals, disconnect the ground terminal (normally the negative (-) terminal) first. When installing, install the positive (+) terminal first.
It is extremely dangerous if any tool forms a contact between the positive (+) terminal and the chassis. This will cause sparks.
- If the terminals are loose, improper contact will cause sparks, and there is danger that the flammable gas generated inside the battery will ignite and cause an explosion.
When installing, tighten the battery terminals securely.
- When removing or installing, always check which is the positive (+) terminal and which is the negative (-) terminal.

When removing, disconnect the cable from the ground terminal first.



When installing, connect the cable to the positive (+) terminal first.



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REMOVE AND INSTALL BATTERY

1. Open hydraulic tank inspection cover (1).
2. Remove nuts (A) (2 places) and (B) of the battery mount holder.
3. When removing the battery, disconnect the ground terminal (normally the negative (-) terminal) first.

It is extremely dangerous if any tool forms a contact between the positive (+) terminal and the chassis. This will cause sparks.

Loosen the terminal nut and remove the wiring from the battery.

4. When replacing the battery, fit the battery securely in position with the battery mount holder.

Tightening torque:(A) 3.92 - 5.88Nm {0.4 - 0.6 kgm (2.9 - 4.3 lbft)}

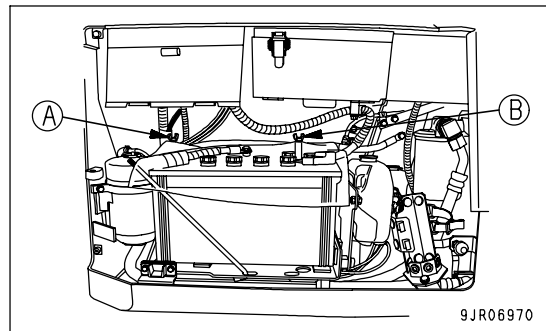
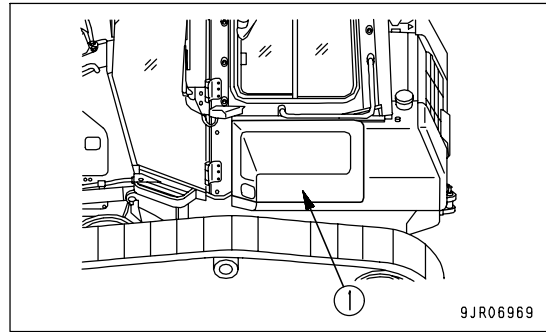
(B)9.8 - 19.6 {1.0 - 2.0 kgm (7.2 - 14.5 lbft)}

5. When installing the battery, connect the ground cable last.

Insert the hole of the terminal on the battery and tighten the nut.

Tightening torque: 5.9 to 9.8 Nm

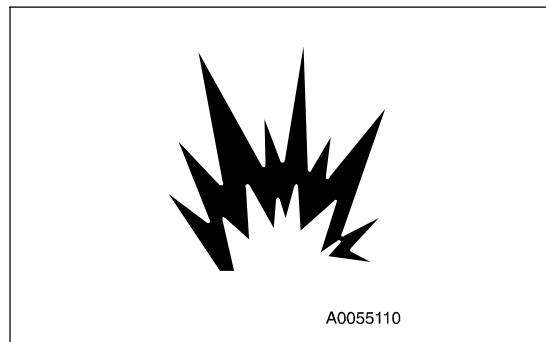
(0.6 to 1.0 kgm, 4.3 to 7.2 lbft)



PRECAUTIONS FOR BATTERY CHARGING

If the battery is charged improperly, it may explode. Accordingly, charge it according to "IF BATTERY IS DISCHARGED (PAGE 3-125)" and the instruction manual attached to the charger, and observe the following items.

- Adjust the voltage of the charger to match the voltage of the battery to be charged. If the voltage setting is mistaken, it will lead to overheating and fire on the charger, and this will cause an explosion.
- Connect the positive (+) charger clip of the charger to the positive (+) terminal of the battery, then connect the negative (-) charger clip of the charger to the negative (-) terminal of the battery. Be sure to attach 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, and 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 a danger that this will ignite the battery electrolyte and cause the battery to explode.
- 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.



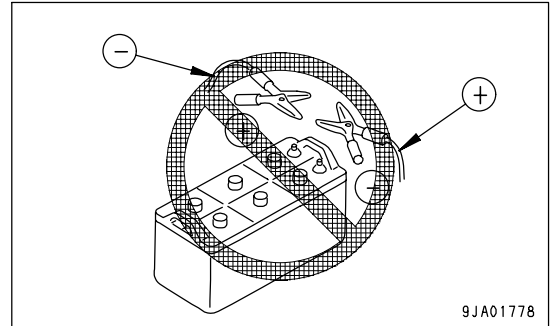
STARTING ENGINE WITH BOOSTER CABLE

When starting the engine with a booster cable, do as follows.

PRECAUTIONS WHEN CONNECTING AND DISCONNECTING BOOSTER CABLE

WARNING

- When connecting the cables, never contact the positive (+) and negative (-) terminals.
- When starting the engine with a booster cable, wear safety glasses and rubber gloves.
- Be careful not to let the normal machine and 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, but sparks will be generated when this is done, so connect to a place as far as possible from the battery.
- When disconnecting the booster cable, take care not to bring the clips in contact with each other or with the machine body.



NOTICE

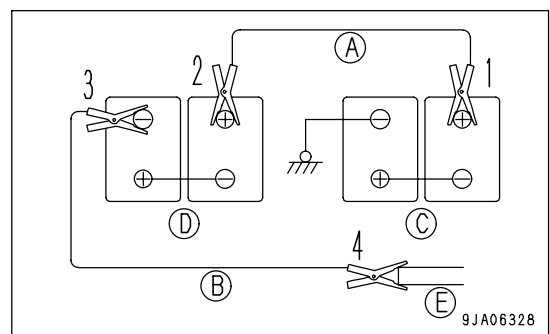
- The starting system on this machine is 24V. Always use a 24V machine for the normal machine also.
- Always use a booster cable or clip of a thickness that is suitable for the capacity of the battery.
- For the battery on the normal machine, use a battery with the same capacity as the problem machine.
- Check that the cable and clips are not damaged or corroded.
- Connect the clips securely.
- Check that the work equipment lock lever and parking brake lever of both machines are at the LOCK position.
- Check that all levers are at the neutral position.

CONNECTING THE BOOSTER CABLE

Keep the starting switch of the normal machine and problem machine in 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**

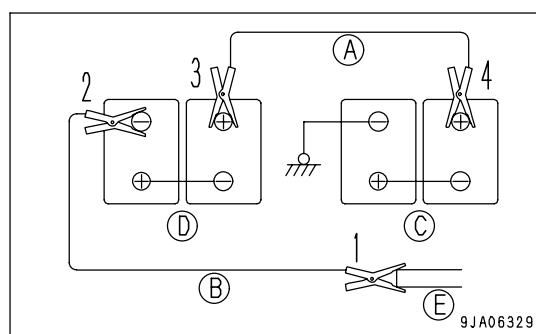
Always check that the work equipment lock lever is set to the LOCK position, regardless of whether the machine is working normally or has failed. Check also that all the control levers are in the HOLD or NEUTRAL position.

1. Make sure the clips are firmly connected to the battery terminals.
2. Start engine of the normal machine and run it at high idle speed.
3. Turn the starting switch of the problem machine to the START position and start the engine.
If the engine doesn't start at first, try again after 2 minutes or so.

DISCONNECTING THE BOOSTER CABLE

After the engine has started, disconnect the booster cables in the reverse of the 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.



OTHER TROUBLE

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 cause	Remedy
Lamp does not glow brightly even when the engine runs at high speed	• Defective wiring	(• Check, repair loose terminals, disconnections)
Lamp flickers while engine is running		
Charging caution lamp flashes when engine is running	• Defective alternator • Defective wiring • Defective belt	(• Replace) (• Check, repair) (• Replace)
Abnormal noise is generated from alternator	• Defective alternator	(• Replace)
Starting motor does not turn when starting switch is turned to ON	• Defective wiring • Insufficient battery charge • Defective safety switch • Parking brake lever is at FREE position • Steering, forward-reverse, gear shift lever is not at Neutral	(• Check, repair) • Charge (• Replace) • Set to LOCK position • Set to Neutral position
Pinion of starting motor keeps going in and out	• Insufficient battery charge	• Charge
Starting motor turns engine sluggishly	• Insufficient battery charge • Defective starting motor	• Charge (• Replace)
Starting motor disengages before engine starts	• Defective wiring, defective ring gear pinion • Insufficient battery charge	(• Check, repair) • Charge
Preheating pilot lamp does not go out or does not flash	• Defective wiring • Defective monitor • Defective heater relay	(• Check, repair) (• Replace) (• Replace)
Outside of electric heater is not warm when touched by hand	• Defective wiring • Disconnected electric heater wiring • Defective operation of heater relay switch	(• Check, repair) (• Replace) (• Check, repair heater switch)
Air conditioner operation is defective	• Blown fuse • Insufficient battery charge • Defective air conditioner switch • Defective flow selector switch • Defective compressor	(• Check, repair) • Charge (• Replace air conditioner switch) (• Replace air flow selector switch) (• Replace)

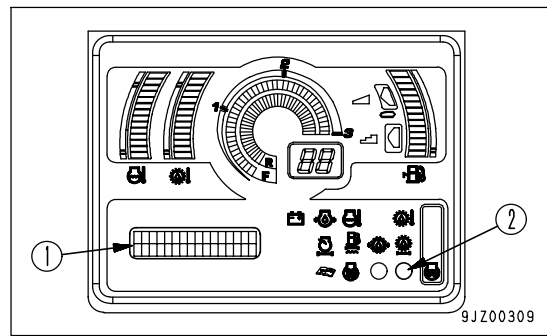
MONITOR PANEL

When an action code appears on the display panel B (multi-information), take appropriate remedies based upon the table below.

- (1): Display panel B
- (2): Warning lamp (red)

REMARK

If different kinds of failures occur at the same time, their action codes are arranged in the order of seriousness in the display. The order of seriousness in this case is E04, E03, E02 and E01, starting from the most serious one.



Action code	Display panel B	Warning lamp	Alarm buzzer	Remedy
E01	Top line: Displays E01	-	-	Failure in part of function, stops. When continuing operations, be extremely careful of location of failure. After completing operations, contact Komatsu distributor for repairs.
E02	Top line: Displays E02	Flashes	Sounds	Serious failure in part of function, stops. When continuing operations, be extremely careful of location of failure. After completing operations, contact Komatsu distributor for repairs
E03	Top line: Displays E03 Bottom line: Displays CALL telephone number and "CHECK RIGHT NOW "	Flashes	Sounds	After moving to safe place, stop machine immediately. Contact Komatsu distributor for repairs
E04	Top line: Displays E04 Bottom line: Displays CALL telephone number and "CHECK RIGHT NOW "	Flashes	Sounds	Stop machine immediately. Contact Komatsu distributor for repairs

Note: If an action code is given in an abnormality display on display panel B, check the failure code. For details, see "METHOD OF USING FAILURE CODE DISPLAY (PAGE 3-20)".

When contacting your Komatsu distributor, please inform the failure code.

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
Machine does not stop even when brake pedal is depressed	<ul style="list-style-type: none"> • Defective adjustment of brake pedal sensor, switch 	(• Adjust, check, repair)
Track shoe comes off	<ul style="list-style-type: none"> • Track shoe too loose 	<ul style="list-style-type: none"> • Adjust track tension. See WHEN REQUIRED
Abnormal wear of sprocket	<ul style="list-style-type: none"> • Track shoe too loose or too tight 	
Blade lifting speed too slow or blade does not go up	<ul style="list-style-type: none"> • Lack of hydraulic oil • Work equipment lock lever is in LOCK position • Charge pump worn or scuffing • Defective work equipment PPC valve 	<ul style="list-style-type: none"> • Add oil to specified level. For details, see CHECK BEFORE STARTING • Set to FREE position (• Check, replace) (• Check, replace)
Does not steer even when steering is operated	<ul style="list-style-type: none"> • Defective steering, forward-reverse, gear shift lever 	(• Check, replace)
Idler makes abnormal noise	<ul style="list-style-type: none"> • Lack of oil in idler 	<ul style="list-style-type: none"> • Check. See WHEN REQUIRED (• Add oil to specified level)
Lacks drawbar pull (machine does not pick up speed)	<ul style="list-style-type: none"> • Lack of engine horsepower • Defective HST pump, motor 	<ul style="list-style-type: none"> • See ENGINE related parts (• Check, replace)
Travel speed pick-up is slow	<ul style="list-style-type: none"> • Low hydraulic oil temperature 	<ul style="list-style-type: none"> • Carry out warming-up operation
Even when steering, forward-reverse, gear shift lever is set to travel position, machine does not move off	<ul style="list-style-type: none"> • Parking brake lever is at LOCK position • Charge pump worn or scuffing • Brake cancel solenoid does not function • Defective steering, forward-reverse, gear shift lever • Fan is in reverse rotation mode • Turbo protect function is actuated 	<ul style="list-style-type: none"> • Set to FREE position (• Check, replace) (• Check, repair, replace) (• Check, replace) <ul style="list-style-type: none"> • Run in normal direction • Wait until function stops
Track assembly moves only on one side	<ul style="list-style-type: none"> • Defective HST pump • Defective electrical system 	(• Check, replace) (• Check, repair, replace)
Steering lever not operated but machine deviates	<ul style="list-style-type: none"> • Defective steering, forward-reverse, gear shift lever • Defective HST pump, motor • Defective motor rotation sensor • Low hydraulic oil temperature • Air in hydraulic circuit 	(• Adjust, check, repair) (• Adjust, check, repair, replace) (• Adjust, check, replace) <ul style="list-style-type: none"> • Carry out warming-up operation (• Bleed air)
Hydraulic oil overheats (indicator is in red range)	<ul style="list-style-type: none"> • Excessive operating load • Work equipment being relieved • Continuous high-speed operation • Oil cooler fins clogged, fins damaged 	<ul style="list-style-type: none"> • Reduce load in order to prevent travel relief • Do not operate blade to end of cylinder travel • Reduce travel speed when traveling • Clean or repair. See WHEN REQUIRED

ENGINE

- (): 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
Engine oil pressure caution lamp flashes when engine speed is raised after completion of warm-up	<ul style="list-style-type: none"> • Engine oil pan oil level is low (sucking in air) • Clogged oil filter cartridge • Defective tightening of oil pipe joint, oil leakage from damaged part • Defective monitor panel 	<ul style="list-style-type: none"> • Add oil to specified level, see CHECK BEFORE STARTING • Replace cartridge, see EVERY 500 HOURS SERVICE (• Check, repair) (• Replace)
Steam is emitted from top part of radiator (pressure valve)	<ul style="list-style-type: none"> • Lack of coolant, water leakage • Dirt or scale accumulated in cooling system 	<ul style="list-style-type: none"> • Add coolant, repair, see CHECK BEFORE STARTING • Change coolant, clean inside of cooling system, see WHEN REQUIRED
Engine water temperature caution lamp flashes	<ul style="list-style-type: none"> • Clogged radiator fins or damaged fins • Defective thermostat • Loose radiator filler cap (high altitude operation) • Defective monitor panel 	<ul style="list-style-type: none"> • Clean or repair, see 500 HOURS SERVICE (• Replace thermostat) • Tighten cap or replace packing (• repair)
Engine does not start when starting motor is turned	<ul style="list-style-type: none"> • Lack of fuel • Air in fuel system • Defective fuel pump or nozzle • Speed of starting motor when cranking engine is slow • Defective compression 	<ul style="list-style-type: none"> • Add fuel, see CHECK BEFORE STARTING • Repair place where air is sucked in (• Replace pump or nozzle) • See ELECTRICAL SYSTEM (• Adjust valve clearance)
Exhaust gas is white or blue	<ul style="list-style-type: none"> • Too much oil in oil pan • Defective cooling water temperature sensor • Improper fuel 	<ul style="list-style-type: none"> • Refill with engine oil up to the specified level, referring to CHECK BEFORE STARTING. (• Check, repair) • Change to specified fuel
Exhaust gas occasionally turns black	<ul style="list-style-type: none"> • Clogged air cleaner element • Defective nozzle • Defective compression • Defective turbocharger 	<ul style="list-style-type: none"> • Clean or replace, see WHEN REQUIRED (• Replace nozzle) (• Adjust valve clearance) (• Clean or replace, turbocharger)
Combustion noise occasionally makes breathing sound	<ul style="list-style-type: none"> • Defective nozzle • Lack of fuel (in air) 	<ul style="list-style-type: none"> (• Replace nozzle) • Add fuel(bleed air)
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 • See "Engine water temperature caution lamp flashes" above (• Replace muffler) (• Adjust valve clearance)
Monitor displays action code	Please contact your Komatsu distributor	
Alarm buzzer sounds		
Engine horsepower lowered suddenly (Has entered direct mode)		

MAINTENANCE

 **WARNING**

Please read and make sure that you understand the SAFETY section before reading this section.

GUIDE TO MAINTENANCE

Do not perform any inspection and maintenance operation that is not found in this manual.

CHECK SERVICE METER:

Check the service meter reading every day to see if the time has come 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:

For lubrication of the machine, use the Komatsu genuine lubricants. Moreover use oil of the specified viscosity according to the ambient temperature.

ALWAYS USE CLEAN WASHER FLUID:

Use automobile window washer fluid, and be careful not to let any dirt get into it.

CLEAN OIL AND GREASE:

Use clean oil and grease. Also, keep the containers of the oil and grease clean. Keep foreign materials away from oil and grease.

CHECKING FOREIGN MATERIALS IN DRAINED OIL:

After oil is changed or filters are replaced, check the old oil and filters for metal particles and foreign materials. If large quantity of metal particles or foreign materials are found, always report to the person in charge, and carry out suitable action.

FUEL STRAINER:

Do not remove the strainer from the filler port when adding fuel.

WELDING INSTRUCTIONS:

- Cut off power. Wait for approx. one minute after turning off the engine starting switch key, and then disconnect the negative (-) terminal of the battery.
- Do not apply more than 200 V continuously.
- Connect grounding cable within 1 m (3.3 ft) of the area to be welded. If grounding cable is connected near instruments, connectors, etc., the instruments may malfunction.
- Be careful that there is no seal or bearing between the welding point and the grounding point. Sparks will cause damage to the seals.
- Do not use the area around the work equipment pins or the hydraulic cylinders as the grounding point.

DO NOT DROP THINGS INSIDE MACHINE:

- When opening inspection windows or the oil filler port of the tank to carry out inspection, 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 will 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 WORKSITES:

When working at dusty worksites, do as follows:

- 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 accumulation of dust.
- When inspecting or changing the oil, move the machine to a place that is free of dust to prevent dirt from getting into the oil.

AVOID MIXING OILS:

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. Never mix different brand or grade of oil.

PRECAUTIONS WHEN OPENING OR CLOSING REAR MASK

- Stop the engine and fan before opening or closing the rear mask. If you touch the fan when it is rotating, it may cause serious personal injury.
- When opening or closing the rear mask, be careful not to get your fingers caught by the tank.
- After opening the rear mask, check that the lock is applied securely. Check also that there is no abnormality with the lock or link portion.
- After opening the rear mask, be careful not to hit your head on the rear mask.
- Check that there are no cracks or other damage in the hoses or piping that move together with the rear mask.

PRECAUTIONS WHEN OPENING INSPECTION COVER

Do not move the blade when the front cover and engine side cover on the left side of the machine are open. The blade will hit the covers and there is danger that the covers may be broken.

LOCKING THE INSPECTION COVER:

Lock inspection cover securely into position with the lock bar. If inspection or maintenance is performed with inspection cover not locked in position, there is a danger that it may be suddenly blow shut by the wind and cause injury to the worker.

HYDRAULIC SYSTEM-AIR BLEEDING:

After repairing or replacing hydraulic equipment or after removing the hydraulic piping, it is necessary to bleed the air from the circuit. For details, see "PROCEDURE FOR BLEEDING AIR IN HYDRAULIC SYSTEM (PAGE 4-46)".

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, be careful not to forget to assemble the O-rings and gaskets.
- When installing the hoses, do not twist them or bend them sharply. If they are installed so, their service life will be shortened extremely and they may be damaged.

CHECKS AFTER INSPECTION AND MAINTENANCE WORK:

If you forget to perform the checks after inspection and maintenance, unexpected problems may occur, and this may lead to serious injury or property damage. Always do the following:

- 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 leakage of coolant or oil? Have all nuts and bolts been tightened?
- Checks when engine is running
 - For the checks when the engine is running, see "TWO WORKERS FOR MAINTENANCE WHEN ENGINE IS RUNNING (PAGE 2-32)" in the SAFETY section, and take care of safety sufficiently.
 - Check that the inspected and maintained parts work normally.
 - Raise the engine speed and check for fuel leakage and oil leakage.

FUEL AND LUBRICANTS TO MATCH THE AMBIENT TEMPERATURE:

Select the fuel and lubricants to match the ambient temperature.

For details, see "RECOMMENDED FUEL, COOLANT, AND LUBRICANT (PAGE 4-13)".

OUTLINE OF SERVICE

- Always use Komatsu genuine parts replacement parts, grease or oil.
- When changing the oil 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 table below.

Item	Type
Engine oil pan	Engine oil EO15W40DH-1 (Komatsu genuine parts)
Final drive case	Power train oil TO30 (Komatsu genuine parts)
Hydraulic tank	Engine oil EO10W30DH (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), and deteriorates with use.
Always use oil that matches the grade and maximum and minimum ambient temperatures recommended in the Operation and Maintenance Manual. Even if the oil is not dirty, always change the oil at the specified interval.
- Oil corresponds to blood in the human body, always be careful when handling it to prevent any impurities (water, metal particles, dirt, etc.) from getting in.
The majority of problems with the machine are caused by the entry of such impurities.
Take particular care not to let any impurities get in when storing or adding oil.
- Never mix oils of different grades or brands.
- Always add the specified amount of oil.
Having too much oil or too little oil are both causes of problems.
- If the oil in the work equipment is not clear, there is probably water or air getting into the circuit. In such cases, please contact your Komatsu distributor.
- When changing the oil, always replace the related filters at the same time.
- We recommend you have an analysis made of the oil periodically to check the condition of the machine. For those who wish to use this service, please contact your Komatsu distributor.
- 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 checks 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, and if fuel containing water or dirt is used, it cannot work properly.
- Be extremely careful not to let impurities get in when storing or adding fuel.
- Always use fuel that matches the temperatures given in the Operation and Maintenance Manual.
 - If the fuel is used in temperatures lower than the specified temperature for use (particularly at temperatures of lower than -15°C), the properties of the fuel will make it congeal.
 - If the fuel is used in temperatures higher than the specified temperature for use, the viscosity will go down, and this may result in a drop in output or other problems.
- 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.

NOTICE

Always use diesel oil for the fuel.

To ensure good fuel consumption characteristics and exhaust gas characteristics, the engine mounted on this machine uses an electronically controlled high-pressure fuel injection device. This device requires high precision parts and lubrication, so if low viscosity fuel with low lubricating ability is used, the durability may drop markedly.

COOLANT AND WATER FOR DILUTION

- Komatsu genuine SUPERCOOLANT (AF-NAC) has the important function of preventing corrosion as well as preventing freezing.

Even in the areas where freezing is not an issue, the use of antifreeze COOLANT is essential.

Komatsu machines are supplied with Komatsu SUPERCOOLANT (AF-NAC). SUPERCOOLANT (AF-NAC) has excellent anticorrosion, antifreeze and cooling properties and can be used continuously for two years or 4000 hours.

As a basic rule, we do not recommend the use of any COOLANT other than SUPERCOOLANT (AF-NAC). If you use another COOLANT, it may cause serious problems, such as corrosion of the engine and aluminum parts of the cooling system.

- When using antifreeze, always observe the precautions given in the Operation and Maintenance Manual.
- COOLANT is already diluted with distilled water, so it is not flammable.
- The density used for the COOLANT differs according to the ambient temperature.

For details of the density of the COOLANT, see "CLEAN INSIDE OF COOLING SYSTEM (PAGE 4-27)".

Even in the areas where it is not considered necessary to prevent freezing, always use COOLANT with a density of over 30% in order to prevent corrosion of the cooling system.

COOLANT is diluted with distilled water that does not contain any ions or water-hardening substances. Never dilute the COOLANT with ordinary water.

- If the engine overheats, wait for the engine to cool before adding coolant.
- If the coolant level is low, it will cause overheating, and will also cause problems with corrosion due to air entering the coolant.

GREASE

- Grease is used to prevent seizure and noises at the joints.
- This construction equipment is used under heavy-duty conditions. Always use the recommended grease and follow the change intervals and recommended ambient temperatures given in this Operation and Maintenance Manual.
- Grease fittings not included in the maintenance section are grease fittings for overhaul, so they do not need grease.
If any part becomes stiff after being used for long time, add 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.

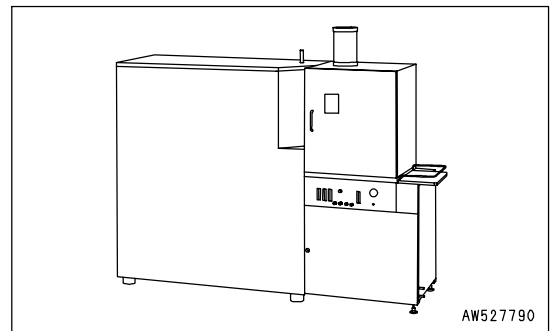
CARRYING OUT KOWA (Komatsu Oil Wear Analysis)

KOWA 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 problems.

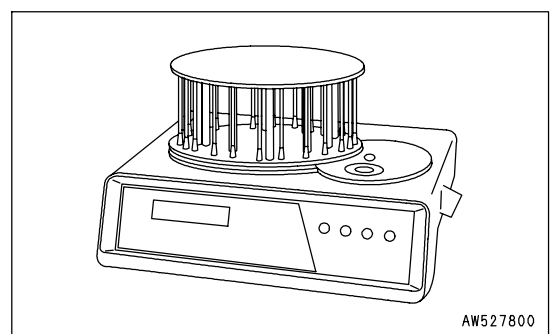
We strongly recommend you to use this service. The oil analysis is carried out at actual cost, so the cost is low, and the results of the analysis are reported together with recommendations which will reduce repair costs and machine downtime.

KOWA ANALYSIS ITEMS

- 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 quantity of particles
This uses a PQI (Particle Quantifier Index) measurer to measure the quantity of iron particles of 5µm or more, enabling early detection of failures.



- Others
Measurements are made of items such as the ratio of water in the oil, density of the COOLANT, ratio of fuel in the oil, and dynamic viscosity, enabling a highly precise diagnosis of the machine's health.

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 of KOWA, please contact your Komatsu distributor.

STORING OIL AND FUEL

- Keep indoors to prevent any water, dirt, or other impurities from getting in.
- When keeping drum cans for a long period, put the drum on its side so that the filler port of the drums is at the side to prevent moisture from being sucked in.
If drums have to be stored outside, cover them with a waterproof sheet or take other measures to protect them.
- To prevent any change in quality during long-term storage, be sure to use in the order of first in - first out (use the oldest oil or fuel first).

FILTERS

- Filters are extremely important safety parts. They prevent impurities in the fuel and air circuits from entering important equipment and causing problems.
Replace all filters periodically. For details, see the Operation and Maintenance Manual.
However, 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 any metal particles are found, contact your Komatsu distributor.
- Do not open packs of spare filters until just before they are to be used.
- Always use Komatsu genuine filters.

RELATING TO ELECTRIC SYSTEM

- It is extremely dangerous if the electrical equipment becomes wet or the covering of the wiring is damaged. This will cause an electrical short circuit and may lead to malfunction of the machine. 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 is checking fan belt tension, checking damage or wear to the fan belt and checking battery fluid level.
- Never install any electric components other than those specified by Komatsu.
- External electro-magnetic interference may cause malfunction of the control system controller, before installing a radio receiver or other wireless equipment, contact your Komatsu distributor.
- Be careful to keep the electric system free of water when washing the machine or when it rains.
- When working at the seashore, carefully clean the electric system to prevent corrosion.
- When installing electrical equipment, connect it to the special power source connector.
Do not connect the optional power source to the fuse, starting switch, or battery relay.

HANDLING HYDRAULIC SYSTEM

- The hydraulic equipment is at high temperature during operations and after operations. In addition, during operations, it is also under high pressure, so when carrying out inspection or maintenance of the hydraulic related equipment, be careful of the following when carrying out the operation.
 - Stop the machine on flat ground, lower the work equipment completely to the ground, and set so there is no pressure on the cylinder circuit.
 - Always stop the engine.
 - Immediately after operations, the hydraulic oil and lubricating oil are at high temperature and high pressure, so wait for the temperature of the oil at all parts to go down before starting maintenance. Even when the temperature goes down, the system may be under internal pressure, so when loosening plugs or screws or when loosening hose joints, do not stand right in front. Loosen the parts slowly to release the internal pressure before removing.
 - When carrying out inspection and maintenance of the hydraulic circuit always release the air from the hydraulic tank to remove the internal pressure.
- Inspection and maintenance include checking the hydraulic system for oil level, replacement of filter elements and replacement of hydraulic oil.
- If high-pressure hoses have been removed, check that there is no damage to the O-rings. If any damage is found, replace the O-ring.
- It is necessary to bleed the air from the circuits when the hydraulic filter element or strainer have been replaced or washed, or when hydraulic equipment has been repaired or replaced, or when the hydraulic piping has been removed.
- The accumulator is charged with high-pressure nitrogen gas, and it is extremely dangerous if it is handled incorrectly. For details of the method of handling, see "CHECK ACCUMULATOR (FOR CONTROL CIRCUIT) (PAGE 4-78)".

WEAR PARTS LIST

Replace wear parts such as the filter element or air cleaner element 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 economic use of the machine. When replacing parts, always use Komatsu genuine parts.

As a result of our continuous efforts to improve product quality, the part number may change, so inform your Komatsu distributor of the machine serial number and check for the latest part number when ordering parts.

WEAR PARTS LIST

The parts in parentheses are to be replaced at the same time.

In case of standard specification

Item	Part No.	Part name	Weight (kg (lb))	Q'ty	Replacement frequency
Engine oil filter	600-211-2110	Cartridge	-	1	Every 500 hours service
Fuel pre-filter	600-319-4110	Cartridge	-	1	
Fuel main filter	600-319-3530	Cartridge	-	1	Every 1000 hours service
Fuel tank breather	421-60-35170	Element	-	1	
Hydraulic tank breather	421-60-35170	Element	-	1	
Hydraulic oil filter	113-60-43321	Cartridge	-	1	Every 2000 hours service
HST charge filter	11Y-60-28710	Cartridge	-	1	
Air cleaner	600-185-2500	Element Ass'y (Inner element, outer element)	-	1	
Air conditioner	Fresh air filter	12Y-979-1171	Filter	-	1
	Recirculated air filter	12Y-979-1181	Filter	-	1
Blade	D31EX	12F-70-31261	Cutting edge	16.4 (36)	2
		11Y-72-31850	End bit (each)	6.4 (14)	2
		(02090-11050)	(Bolt)	-	20
		(02290-11016)	(Nut)	-	20
	D31PX	12F-70-31281	Cutting edge	21.9 (48)	2
		11Y-72-15220	End bit (each)	7.2 (16)	2
		(02090-11050)	(Bolt)	-	24
		(02290-11016)	(Nut)	-	24
	D31PX (Narrow blade)	12F-70-31261	Cutting edge	16.4 (36)	1
		12F-70-31281	Cutting edge	21.9 (48)	1
		112-946-1510	End bit (each)	6.8 (15)	2
		(02090-11050)	(Bolt)	-	22
D37EX	12F-70-31281	Cutting edge	21.9 (48)	1	
	11Y-72-12330	Cutting edge	13.0 (29)	1	
	112-946-1510	End bit (each)	6.8 (15)	2	
	(02090-11050)	(Bolt)	-	21	
D37PX	12F-70-31281	Cutting edge	21.9 (48)	2	
	11Y-72-15220	End bit (each)	7.2 (16)	2	
	(02090-11050)	(Bolt)	-	24	
	(02290-11016)	(Nut)	-	24	
D37PX (Narrow blade)	12F-70-31261	Cutting edge	16.4 (36)	1	
	12F-70-31281	Cutting edge	21.9 (48)	1	
	112-946-1510	End bit (each)	6.8 (15)	2	
	(02090-11050)	(Bolt)	-	22	
	(02290-11016)	(Nut)	-	22	

NOTICE

When handling parts that weigh more than 25 kg (55 lb), remember that they are heavy objects, and take the necessary care.

In case of poor fuel arrangement specification

Item	Part No.	Part name	Weight (kg (lb))	Q'ty	Replacement frequency
Engine oil filter	600-211-2110	Cartridge	-	1	Every 500 hours service
Fuel pre-filter (*)	600-319-4110	Cartridge	-	1	
Fuel main filter (*)	600-319-3530	Cartridge	-	2	Every 1000 hours service
Fuel tank breather	421-60-35170	Element	-	1	
Hydraulic tank breather	421-60-35170	Element	-	1	
Hydraulic oil filter	113-60-43321	Cartridge	-	1	Every 2000 hours service
HST charge filter	11Y-60-28710	Cartridge	-	1	
Air cleaner	600-185-2500	Element Ass'y (Inner element, outer element)	-	1	
Air conditioner	Fresh air filter	12Y-979-1171	Filter	-	1
	Recirculated air filter	12Y-979-1181	Filter	-	1
Blade	D31EX	12F-70-31261	Cutting edge	16.4 (36)	2
		11Y-72-31850 (02090-11050)	End bit (each) (Bolt)	6.4 (14) -	2 20
		(02290-11016)	(Nut)	-	20
	D31PX	12F-70-31281	Cutting edge	21.9 (48)	2
		11Y-72-15220 (02090-11050)	End bit (each) (Bolt)	7.2 (16) -	2 24
		(02290-11016)	(Nut)	-	24
	D31PX (Narrow blade)	12F-70-31261	Cutting edge	16.4 (36)	1
		12F-70-31281	Cutting edge	21.9 (48)	1
		112-946-1510 (02090-11050)	End bit (each) (Bolt)	6.8 (15) -	2 22
		(02290-11016)	(Nut)	-	22
	D37EX	12F-70-31281	Cutting edge	21.9 (48)	1
		11Y-72-12330	Cutting edge	13.0 (29)	1
112-946-1510 (02090-11050)		End bit (each) (Bolt)	6.8 (15) -	2 21	
(02290-11016)		(Nut)	-	21	
D37PX	12F-70-31281	Cutting edge	21.9 (48)	2	
	11Y-72-15220 (02090-11050)	End bit (each) (Bolt)	7.2 (16) -	2 24	
	(02290-11016)	(Nut)	-	24	
D37PX (Narrow blade)	12F-70-31261	Cutting edge	16.4 (36)	1	
	12F-70-31281	Cutting edge	21.9 (48)	1	
	112-946-1510 (02090-11050)	End bit (each) (Bolt)	6.8 (15) -	2 22	
	(02290-11016)	(Nut)	-	22	

*: If the fuel filter gets clogged before its periodic replacement time is arrived at, replace both the fuel pre-filter and fuel main filter together.

NOTICE

When handling parts that weigh more than 25 kg (55 lb), remember that they are heavy objects, and take the necessary care.

RECOMMENDED FUEL, COOLANT, AND LUBRICANT

- Komatsu genuine oils are adjusted to maintain the reliability and durability of Komatsu construction equipment and components.

In order to keep your machine in the best conditioner for long periods of time, it is essential to follow the instructions in this Operation and Maintenance Manual.

- Failure to follow these recommendations may result in shortened life or excess wear of the engine, power train, cooling system, and/or other components.
- Commercially available lubricant additives may be good for the machine, but they may also cause harm. Komatsu does not recommend any commercially available lubricant additive.
- Use the oil recommended according to the ambient temperature in the chart below.
- Specified capacity means the total amount of oil including the oil in the tank and the piping. Refill capacity means the amount of oil needed 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 course of the day.
- If the machine is operated at a temperature below -20°C (-4°F), a separate device is needed, so consult your Komatsu distributor.
- When the fuel sulfur content is less than 0.5%, change the engine oil according to the period inspection table given in this Operation and Maintenance Manual.

If the fuel sulfur content is more than 0.5%, change the oil according to the following table.

Sulfur content (%)	Oil change interval
Less than 0.5	500 hours
0.5 - 1.0	250 hours
1.0 and up	Not recommendable (*)

* If these fuels are used, there is danger that serious trouble 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.

- 1) Be sure to check Total Basic Number (TBN) of oil frequently by TBN handy checker etc., and change oil based on the result.
- 2) Always be aware that oil change interval is extremely shorter than standard.
- 3) Be sure to carry out periodic engine inspection by distributor's expert since change interval of periodic replacement parts and overhaul interval are also shorter.

USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE

Reservoir	Fluid Type	Ambient Temperature, degrees Celsius										Recommended Komatsu Fluids
		-22	-4	14	32	50	68	86	104	122 °F		
		-30	-20	-10	0	10	20	30	40	50 °C		
Engine oil pan	Engine oil	(Note.1)										Komatsu EOS0W30
		(Note.1)										Komatsu EOS5W40
		(Note.1)										Komatsu EO10W30DH
		(Note.1)										Komatsu EO15W40DH
		(Note.1)										Komatsu EO30DH
Final drive case	Power train oil (Note.2)	(Note.1)										TO30
Idler	Power train oil	(Note.1)										TO30
Hydraulic system	Power train oil	(Note.1)										TO10
	Engine oil	(Note.1)										Komatsu EO10W30DH
		(Note.1)										Komatsu EO15W40DH
Grease fitting	Hyper grease (Note.3)	(Note.1)										G2-T, G2-TE
	Lithium EP grease	(Note.1)										G2-LI
Cooling system	SUPERCOOLANT (AF-NAC) (Note.4)	(Note.1)										AF-NAC
Fuel tank	Diesel fuel	(Note.1)										ASTM Grade No.1-D S15 ASTM Grade No.1-D S500
		(Note.1)										ASTM Grade No.2-D S15 ASTM Grade No.2-D S500

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		Engine oil pan	Final drive case (each)	Hydraulic system	Idler (each)	Fuel tank	Cooling system (incl. reserve tank)
Specified capacity	liter	12	3.5	110	0.16	195	18
	US gal	3.17	0.92	29.06	0.04	51.52	4.76
Refil capacity	liter	11	3.5	60	0.16	-	-
	US gal	2.91	0.92	15.85	0.04		

NOTICE

Always use diesel oil for the fuel.

To ensure good fuel consumption characteristics and exhaust gas characteristics, the engine mounted on this machine uses an electronically controlled high-pressure fuel injection device. This device requires high precision parts and lubrication, so if low viscosity fuel with low lubricating ability is used, the durability may drop markedly.

Note 1: HTHS (High-Temperature High-Shear Viscosity 150°C), specified by ASTM D4741 must be equal to or higher than 3.5 mPa·S. Komatsu EOS0W30 and EOS5W40 are the most suitable oils.

Note 2: Powertrain oil has different properties from engine oil. Be sure to use the recommended oils.

Note 3: Hyper grease (G2-T, G2-TE) has a high performance.

When it is necessary to improve the lubricating ability of the grease in order to prevent squeaking of pins and bushings, the use of G2-T or G2-TE is recommended.

Note 4: COOLANT

1) Komatsu genuine SUPERCOOLANT (AF-NAC) has the important function of preventing corrosion as well as preventing freezing.

Even in the areas where freezing is not an issue, the use of antifreeze COOLANT is essential.

Komatsu machines are supplied with SUPERCOOLANT (AF-NAC). SUPERCOOLANT (AF-NAC) has excellent anticorrosion, antifreeze and cooling properties and can be used continuously for two years or 4000 hours. SUPERCOOLANT (AF-NAC) is strongly recommended wherever available.

2) For details of the density of the COOLANT, see "CLEAN INSIDE OF COOLING SYSTEM (PAGE 4-27)".

COOLANT is supplied already diluted. In this case, add the pre-diluted fluid to keep the tank full. (Never dilute the COOLANT with ordinary water.)

3) To maintain the anticorrosion properties of COOLANT, always keep the density of COOLANT between 30% and 68%.

RECOMMENDED BRANDS, RECOMMENDED QUALITY FOR PRODUCTS OTHER THAN KOMATSU GENUINE OIL

When using commercially available oils other than Komatsu genuine oil, consult your Komatsu distributor.

STANDARD TIGHTENING TORQUES FOR BOLTS AND NUTS

TORQUE LIST

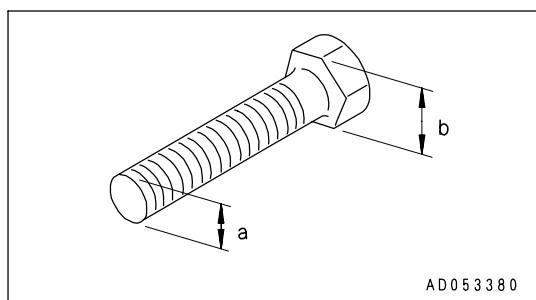


If nuts, bolts, or other parts are not tightened to the specified torque, it will cause looseness or damage to the tightened parts, and this will cause failure of the machine or problems with operation.

Always pay careful attention when tightening parts.

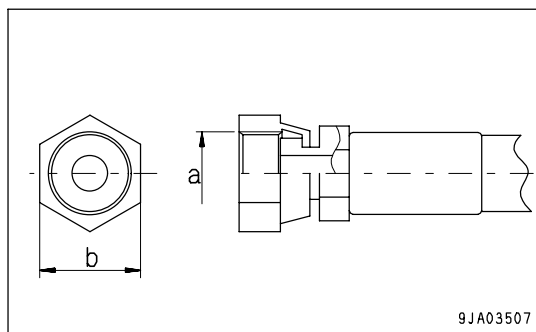
Unless otherwise specified, tighten the metric nuts and bolts to the torque shown in the table below. If it is necessary to replace any nut or bolt, always use a Komatsu genuine part of the same size as the part that was replaced.

Thread diameter of bolt (a)(mm)	Width across flats (b)(mm)	Tightening torque					
		Target value			Service limit		
		Nm	kgm	lbft	Nm	kgm	lbft
6	10	13.2	1.35	9.8	11.8-14.7	1.2-1.5	8.7-10.8
8	13	31	3.2	23.1	27-34	2.8-3.5	20.3-25.3
10	17	66	6.7	48.5	59-74	6.0-7.5	43.4-54.2
12	19	113	11.5	83.2	98-123	10.0-12.5	72.3-90.4
14	22	172	17.5	126.6	153-190	15.5-19.5	112.1-141
16	24	260	26.5	191.7	235-285	23.5-29.5	170.0-213.4
18	27	360	37	267.6	320-400	33.0-41.0	238.7-296.6
20	30	510	52.3	378.3	455-565	46.5-58.0	336.3-419.5
22	32	688	70.3	508.5	610-765	62.5-78.0	452.1-564.2
24	36	883	90	651	785-980	80.0-100.0	578.6-723.3
27	41	1295	132.5	958.4	1150-1440	118.0-147.0	853.5-1063.3
30	46	1720	175.0	1265.8	1520-1910	155.0-195.0	1121.1-1410.4
33	50	2210	225.0	1627.4	1960-2450	200.0-250.0	1446.6-1808.3
36	55	2750	280.0	2025.2	2450-3040	250.0-310.0	1808.3-2242.2
39	60	3280	335.0	2423.1	2890-3630	295.0-370.0	2133.7-2676.2



Apply the following table for Hydraulic Hose.

Nominal - No. of threads (a)	Width across flats (b) (mm)	Tightening torque					
		Target value			Permissible range		
		Nm	kgm	lbft	Nm	kgm	lbft
9/16 -18UNF	19	44	4.5	32.5	35 - 63	3.5 - 6.5	25.3 - 47.0
11/16 -16UN	22	74	7.5	54.2	54 - 93	5.5 - 9.5	39.8 - 68.7
13/16 -16UN	27	103	10.5	75.9	84 - 132	8.5 - 13.5	61.5 - 97.6
1 -14UNS	32	157	16.0	115.7	128 - 186	13.0 - 19.0	94.0 - 137.4
13/16 -12UN	36	216	22.0	159.1	177 - 245	18.0 - 25.0	130.2 - 180.8



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 carry out periodic maintenance. In addition, to further improve safety, the parts in the safety-critical parts list on the next page must also be replaced at the specified interval. These parts are particularly closely connected to safety and fire prevention, so please contact your Komatsu distributor to have them replaced.

Material quality of these parts can change as time passes and they are likely to wear out or deteriorate. However, it is difficult to determine the extent of wear or deterioration at the time of periodic maintenance. Hence, it is required to replace them with new ones regardless of their condition after a certain period of usage. This is important to ensure that these parts maintain their full performance at all times.

Furthermore, 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 like deformation or cracking, replace the clamps at the same time as the hoses.

Also perform the following checks with 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.

SAFETY CRITICAL PARTS

In case of standard specification

No.	Periodic replacement parts	Q'ty	Replacement interval
1	Fuel hose (Fuel tank - fuel pre-filter)	1	Every 2 years or every 4000 hours of service meter reading whichever comes earlier
2	Fuel hose (Fuel pre-filter - fuel main filter)	1	
3	Fuel return hose (Engine outlet port - fuel tank)	1	
4	Turbocharger lubrication hose	1	
5	Suction hose (Hydraulic tank - hydraulic pump)	2	
6	Suction hose (Hydraulic tank - charge pump)	1	
7	Charge hose (Charge pump - Charge filter)	1	
8	Charge hose (Charge filter - Cooler bypass valve)	1	
9	Charge hose (Cooler bypass valve - HST pump)	1	
10	Charge hose (Charge filter - control valve)	1	
11	Charge hose (Control valve - solenoid valve)	1	
12	Charge hose (Solenoid valve - accumulator)	1	
13	Charge hose (Solenoid valve - Work equipment PPC)	1	
14	Brake hose (Solenoid valve - HST motor (brake))	3	
15	Gearshift hose (Solenoid valve - HST motor (gearshift))	2	
16	PPC hose (Work equipment PPC - control valve)	6	
17	HST hose (HST pump - HST motor)	4	
18	Work equipment hose (Hydraulic pump - control valve)	2	
19	Work equipment hose (Control valve - lift cylinder)	6	
20	Work equipment hose (Control valve - tilt cylinder)	6	
21	Work equipment hose (Control valve - angle cylinder)	6	
22	Work equipment hose (Control valve - fan motor)	2	
23	Drain hose (Fan motor - drain tube)	1	
24	Drain hose (Fan motor - Cooler bypass)	1	
25	Drain hose (Cooler bypass valve - hydraulic tank)	1	
26	Drain hose (Control valve - hydraulic filter)	1	
27	Drain hose (Control valve - drain tube)	1	
28	Drain hose (Work equipment PPC - solenoid valve)	1	
29	Drain hose (Solenoid valve - Central block)	1	
30	Drain hose (HST pump - Central block)	2	
31	Drain hose (Central block - hydraulic tank)	1	
32	Drain hose (HST pump - hydraulic tank)	1	
33	Drain hose (HST motor - drain tube)	2	
34	Accumulator (For control circuit)	1	
35	Seat belt	1	Every 3 years after beginning to use or 5 years after manufacturing of seat belt, whichever comes sooner

In case of poor fuel arrangement specification

No.	Periodic replacement parts	Q'ty	Replacement interval
1	Fuel hose (fuel tank - additional water separator)	1	Every 2 years or every 4000 hours of service meter reading whichever comes earlier
2	Fuel hose (additional water separator - fuel pre-filter)	1	
3	Fuel hose (fuel pre-filter - fuel main filter 1)	1	
4	Fuel hose (fuel main filter 1 - fuel main filter 2)	1	
5	Fuel return hose (Engine outlet port - fuel tank)	1	
6	Turbocharger lubrication hose	1	
7	Suction hose (Hydraulic tank - hydraulic pump)	2	
8	Suction hose (Hydraulic tank - charge pump)	1	
9	Charge hose (Charge pump - Charge filter)	1	
10	Charge hose (Charge filter - Cooler bypass valve)	1	
11	Charge hose (Cooler bypass valve - HST pump)	1	
12	Charge hose (Charge filter - control valve)	1	
13	Charge hose (Control valve - solenoid valve)	1	
14	Charge hose (Solenoid valve - accumulator)	1	
15	Charge hose (Solenoid valve - Work equipment PPC)	1	
16	Brake hose (Solenoid valve - HST motor (brake))	3	
17	Gearshift hose (Solenoid valve - HST motor (gearshift))	2	
18	PPC hose (Work equipment PPC - control valve)	6	
19	HST hose (HST pump - HST motor)	4	
20	Work equipment hose (Hydraulic pump - control valve)	2	
21	Work equipment hose (Control valve - lift cylinder)	6	
22	Work equipment hose (Control valve - tilt cylinder)	6	
23	Work equipment hose (Control valve - angle cylinder)	6	
24	Work equipment hose (Control valve - fan motor)	2	
25	Drain hose (Fan motor - drain tube)	1	
26	Drain hose (Fan motor - Cooler bypass)	1	
27	Drain hose (Cooler bypass valve - hydraulic tank)	1	
28	Drain hose (Control valve - hydraulic filter)	1	
29	Drain hose (Control valve - drain tube)	1	
30	Drain hose (Work equipment PPC - solenoid valve)	1	
31	Drain hose (Solenoid valve - Central block)	1	
32	Drain hose (HST pump - Central block)	2	
33	Drain hose (Central block - hydraulic tank)	1	
34	Drain hose (HST pump - hydraulic tank)	1	
35	Drain hose (HST motor - drain tube)	2	
36	Accumulator (For control circuit)	1	
37	Seat belt	1	Every 3 years after beginning to use or 5 years after manufacturing of seat belt, whichever comes sooner

MAINTENANCE SCHEDULE CHART

MAINTENANCE SCHEDULE CHART

INITIAL 250 HOURS SERVICE (ONLY AFTER THE FIRST 250 HOURS)

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INITIAL 500 HOURS SERVICE (ONLY AFTER THE FIRST 500 HOURS)

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CLEAN AIR CONDITIONER AIR FILTER (FRESH/RECIRC FILTER) ----- 4- 59

EVERY 500 HOURS SERVICE

CHANGE OIL IN ENGINE OIL PAN, REPLACE ENGINE OIL FILTER CARTRIDGE ----- 4- 60
 REPLACE FUEL PRE-FILTER CARTRIDGE ----- 4- 62
 CHECK ELECTRIC WIRING AROUND STARTING MOTOR, ALTERNATOR ----- 4- 64

EVERY 1000 HOURS SERVICE

REPLACE FUEL MAIN FILTER CARTRIDGE (STANDARD SPECIFICATION) ----- 4- 65
 REPLACE FUEL MAIN FILTER CARTRIDGE (POOR FUEL ARRANGEMENT SPECIFICATION) ----- 4- 67
 REPLACE FUEL TANK BREATHER ELEMENT ----- 4- 70
 REPLACE HYDRAULIC TANK BREATHER ELEMENT ----- 4- 71
 CHANGE OIL IN FINAL DRIVE CASE ----- 4- 72
 CHECK CLAMP TIGHTENING PORTIONS FOR MACHINE INTAKE/EXHAUST PIPING ----- 4- 72
 CHECK FOR LOOSE ROPS MOUNT BOLTS ----- 4- 73
 CHECK, CLEAN FAN ----- 4- 74

EVERY 2000 HOURS SERVICE

CHANGE OIL IN HYDRAULIC TANK, REPLACE HYDRAULIC OIL FILTER ELEMENT AND CLEAN
 HYDRAULIC TANK STRAINER ----- 4- 76
 CHECK ACCUMULATOR (FOR CONTROL CIRCUIT) ----- 4- 78
 CHECK ALTERNATOR ----- 4- 80
 CHECK ENGINE VALVE CLEARANCE, ADJUST ----- 4- 80

EVERY 4000 HOURS SERVICE

REPLACE ACCUMULATOR (FOR CONTROL CIRCUIT) ----- 4- 81
 CHECK WATER PUMP ----- 4- 81
 CHECK STARTING MOTOR ----- 4- 81
 CHECKING FOR LOOSENESS OF HIGH-PRESSURE CLAMP, HARDENING OF RUBBER ----- 4- 82
 CHECKING FOR MISSING FUEL SPRAY PREVENTION CAP, HARDENING OF RUBBER ----- 4- 83

EVERY 8000 HOURS SERVICE

REPLACE HIGH-PRESSURE PIPING CLAMPS ----- 4- 84
 REPLACE FUEL SPLAY PREVENTION CAPS ----- 4- 84

SERVICE PROCEDURE

WHEN REQUIRED

CHECK, CLEAN AND 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 danger that dirt may be blown around and cause serious injury. Always use protective glasses, dust mask, and other protective equipment.

NOTICE

Do not move the blade when the front cover and engine side cover on the left side of the machine are open. The blade will hit the covers and there is danger that the covers may be broken.

CHECKING

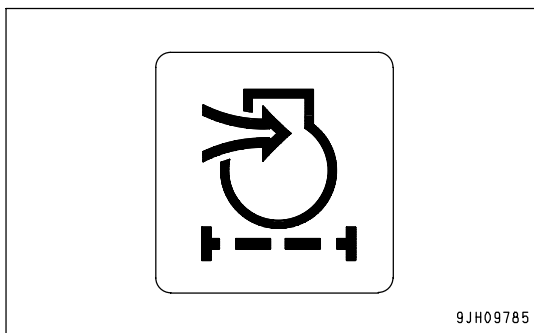
If air cleaner clogging caution lamp of the monitor panel flashes, clean the air cleaner element.

NOTICE

Do not clean the element until the air cleaner clogging caution lamp on the monitor panel flashes.

If the element is cleaned frequently before the air cleaner clogging caution lamp flashes, the air cleaner will not be able to display its proper performance and the cleaning efficiency will go down.

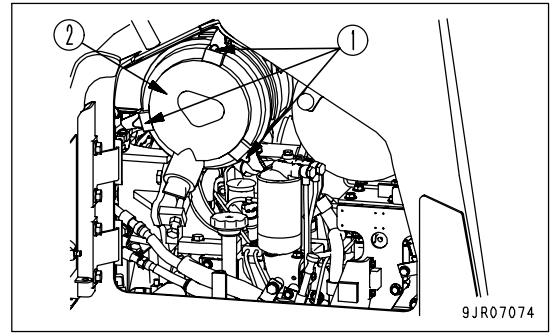
In addition, when cleaning, the frequency of dust stuck to the element falling inside the inner element will increase.



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CLEANING OR REPLACING OUTER ELEMENT

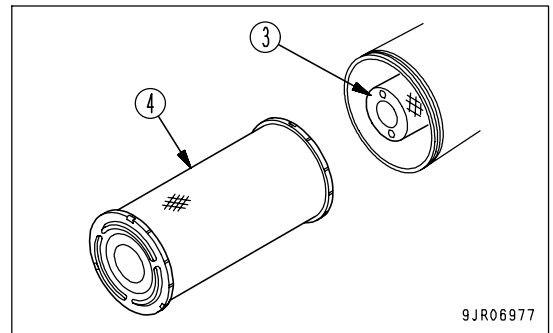
1. Open engine side cover on the left side of machine.
2. Remove 3 clips (1), then remove dust cup (2).



NOTICE

Never remove inner element (3). If it is removed, dust will enter and cause engine trouble.

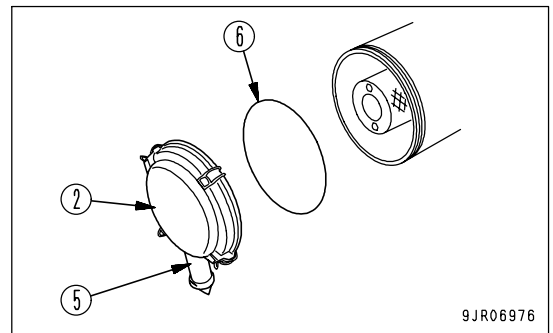
3. Remove outer element (4).



NOTICE

When cleaning the dust cup, do not remove evacuator valve (7).

4. Clean the inside of the air cleaner body and dust cup.

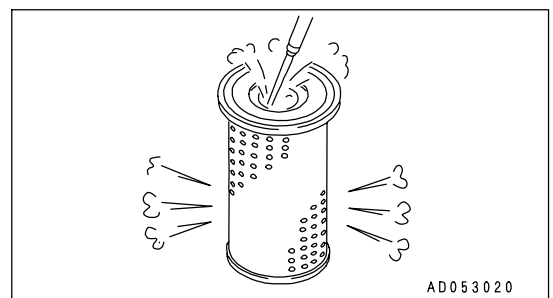


NOTICE

The inner element must not be used again even after cleaning. When replacing the outer element, replace the inner element at the same time.

5. Direct dry compressed air (less than 0.2 MPa (2.1 kg/cm², 30.0 PSI)) to the outer element from inside along its folds, then direct it from outside along its folds and again from inside.

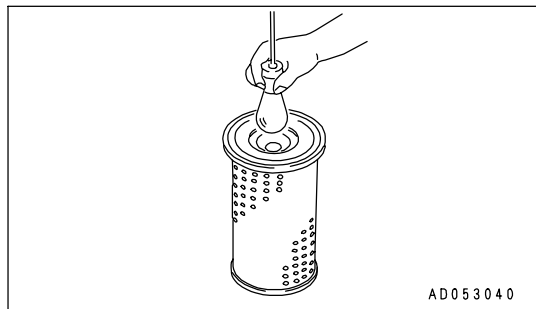
- 1) Replace any outer element which has been cleaned 6 times or used for 1 year. Replace the inner element at the same time.
- 2) After cleaning, if the air cleaner clogging caution lamp flashes immediately, replace the inner and outer elements.



6. If small holes or thinner parts are found on the element when it is checked by shining a light through it after cleaning, replace the element.

NOTICE

When cleaning the element, do not hit or beat it against anything.
Do not use an element whose folds, gasket or seal are damaged.



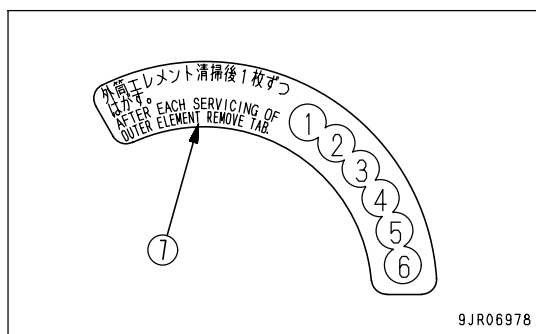
7. Set the cleaned outer element and install dust cup (2), then secure them with clips (1).

CAUTION

- When installing the dust cup, check O-ring (6). If the O-ring has any defect, replace it.
- When installing the dust cup, hold the case down securely and check that all three clips (1) are fitted correctly to the body.

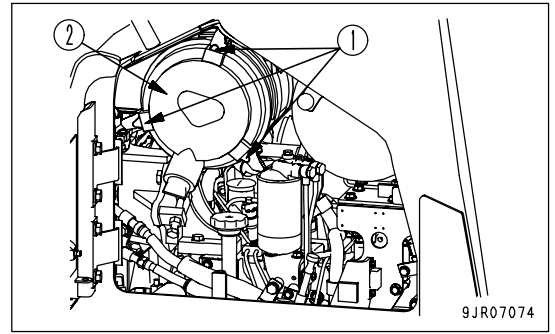
8. Remove one seal from record sheet (7).

9. Close the engine side cover on the left side of the machine.

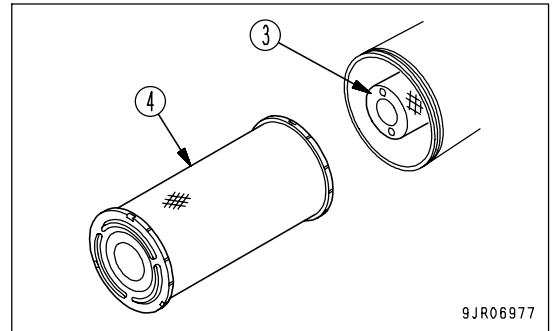


REPLACING ELEMENT

1. Open engine side cover on the left side of machine.
2. Remove 3 clips (1), then remove dust cup (2).



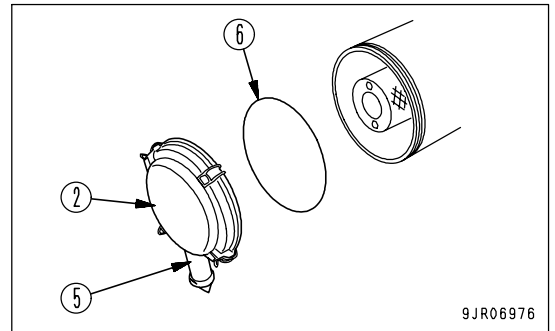
3. Remove outer element (4).
Do not remove inner element (3) at this time, however.



NOTICE

When cleaning the dust cup, do not remove evacuator valve (7).

4. Clean the inside of the air cleaner body and dust cup.

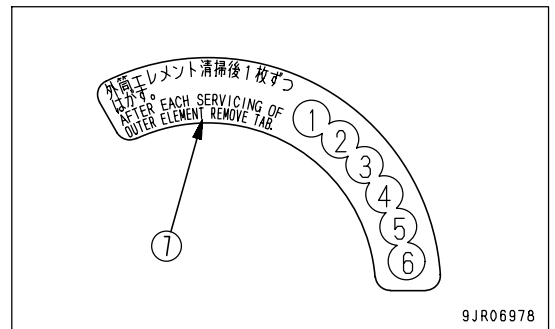


5. Remove inner element (3), then install a new inner element immediately.
6. Set new outer element (4) and install dust cup (2), then secure them with clips (1).

⚠ CAUTION

- When installing the dust cup, check O-ring (6). If the O-ring has any defect, replace it.
- When installing the dust cup, hold the case down securely and check that all three clips (1) are fitted correctly to the body.

7. Replace record sheet (7) with a new part.
8. Close the engine side cover on the left side of the machine.



CHECK ADDITIONAL WATER SEPARATOR, CLEAN INSIDE OF CASE (ONLY POOR FUEL ARRANGEMENT SPECIFICATION)



WARNING

- The engine fuel piping system is under high internal pressure when the engine is running. Always reduce the internal pressure before draining water or replacing the element cup.
- Do not bring fire close.
- This engine consists of higher precision parts than on the conventional fuel injection pump and nozzle, so if dirt gets in, it will cause problems. If there is any dirt stuck to the fuel line, use fuel to wash it off completely.

NOTICE

- When carrying out inspection and maintenance of the fuel system, the particularly careful not to let any dirt or dust get in. If there is any dirt or dust around the fuel system, clean it off thoroughly with fuel before starting the operation.
- To prevent dirt or dust from getting into the fuel circuit, remove all dirt and dust from the surrounding area before starting the operation.
- Prepare a container to catch the fuel.

1. Drain the water and fuel. For details, see "CHECK ADDITIONAL WATER SEPARATOR, DRAIN WATER (ONLY POOR FUEL ARRANGEMENT SPECIFICATION) (PAGE 3-70)".

2. Loosen the ring nut (1), then remove case (2).

3. Pull screen (5) down to remove it from the water separator holder (3).

4. Wash screen (5) in clean fuel.

Check screen (5) and replace it if it is damaged.

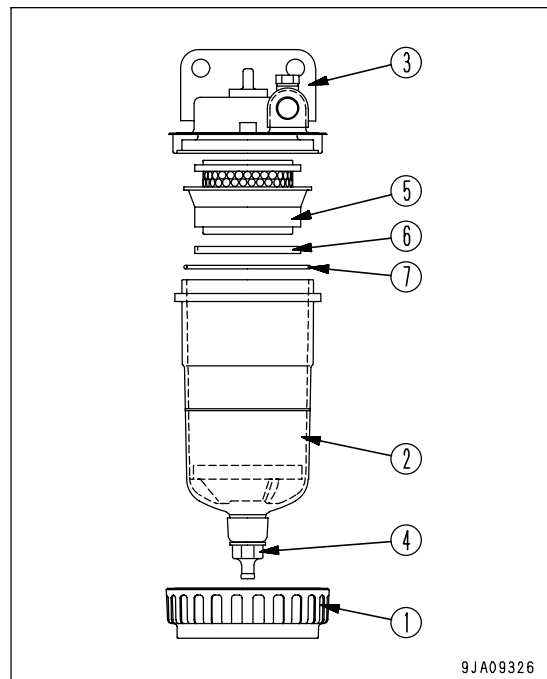
5. Wash the inside of case (2) with clean fuel.

Check case (2). If it is scratched or damaged, or so dirty that the position of float (6) cannot be checked, replace case (2).

6. Wash the inside of water separator holder (3) with clean fuel.

7. Install screen (5) to the water separator holder.

8. Replace O-ring (7) with a new part.



9. Tighten plug (4) and insert in case (2). Be careful not to let float (6) be at an angle.

Tightening torque: 2.0 - 3.0 Nm (0.20 - 0.31 kgm, 1.4 - 2.2 lbft)

10. Install case (2) to the water separator holder (3), then tighten ring nut (1).

Tightening torque: 23 - 27 Nm (2.4 - 2.8 kgm, 17.0 - 19.9 lbft)

11. After completing the inspection and cleaning, bleed the air. Use the same procedure as when replacing the fuel filter cartridge.

For details of the method of bleeding the air, see "REPLACE FUEL PRE-FILTER CARTRIDGE (PAGE 4-62)".

CLEAN INSIDE OF COOLING SYSTEM

 **WARNING**

- Just after the engine is stopped, the coolant is still hot and the internal pressure in the radiator is still high. If the radiator cap is removed under this condition, you may scald yourself. Accordingly, wait until the temperature goes down, then loosen the cap slowly to release the pressure.
- Start the engine to clean the cooling system. When standing up from the operator's seat or leaving the machine, set the work equipment lock lever and parking brake lever to the LOCK positions.
- For the starting method of the engine, see "CHECK BEFORE STARTING ENGINE, ADJUST (PAGE 3-64)" and "STARTING ENGINE (PAGE 3-84)" in the OPERATION section of the manual.
- Never go under the machine body while the engine is running. It is very dangerous since the machine may move suddenly.

Stop the machine on level ground when cleaning or changing the coolant.

Clean the inside of the cooling system, change the coolant according to the table below.

Coolant	Interval for cleaning inside of cooling system and changing antifreeze coolant
Komatsu genuine SUPERCOOLANT (AF-NAC)	Every two years or every 4000 hours whichever comes first

Komatsu genuine SUPERCOOLANT (AF-NAC) has the important function of preventing corrosion as well as preventing freezing. Even in the areas where freezing is not an issue, the use of antifreeze COOLANT is essential. Komatsu machines are supplied with SUPERCOOLANT (AF-NAC). SUPERCOOLANT (AF-NAC) has excellent anticorrosion, antifreeze and cooling properties and can be used continuously for two years or 4000 hours. As a basic rule, we do not recommend the use of any COOLANT other than SUPERCOOLANT (AF-NAC). If you use another COOLANT, it may cause serious problems, such as corrosion of the engine and aluminum parts of the cooling system.

To maintain the anticorrosion properties of COOLANT, always keep the density of COOLANT between 30% and 68%.

When selecting COOLANT, investigate the lowest temperature in the past and decide the density for the COOLANT from the COOLANT density table below. When actually deciding the density for the COOLANT, set it about 10°C (18°F) below lowest temperature. The density must be over 30% at least. If the density of obtained COOLANT is higher than the necessary density for lowest temperature, dilute it with adequate distilled water, and then fill it into the tank.

If there is any unclear point, please contact your Komatsu distributor.

Coolant density table

Minimum Temp	°C	Above -10	-15	-20	-25	-30	-35	-40	-45	-50
	°F	Above 14	5	-4	-13	-22	-31	-40	-49	-58
Concentration (%)		30	36	41	46	50	54	58	61	64

! WARNING

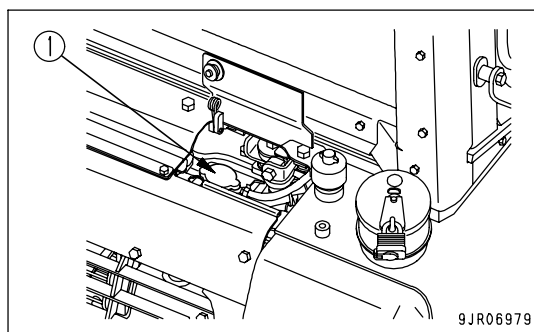
- COOLANT is toxic. When open the drain valve, be careful not to get coolant on you.
If it gets in your eyes, flush your eyes with large amount of fresh water and see a doctor at once.
- When changing the coolant or when handling the coolant containing COOLANT that has been drained during repair of radiator, please contact your Komatsu distributor or request a specialist company to carry out the operation. COOLANT is toxic. Do not let it flow into drainage ditches or spray it onto the ground surface.

NOTICE

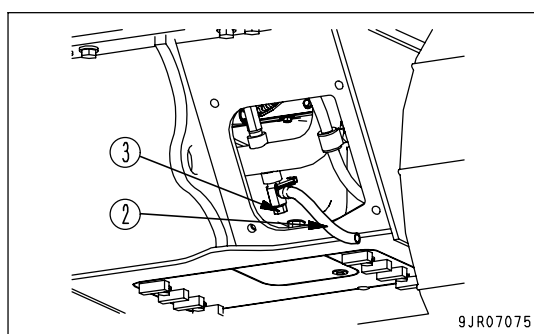
Do not move the blade when the front cover and engine side cover on the left side of the machine are open. The blade will hit the covers and there is danger that the covers may be broken.

COOLANT is already diluted with distilled water, so it is not flammable. (For details of the distilled water, see "COOLANT AND WATER FOR DILUTION (PAGE 4-6)"). Check the density with a COOLANT tester. Prepare a container whose capacity is larger than the specified coolant volume to catch drained coolant.

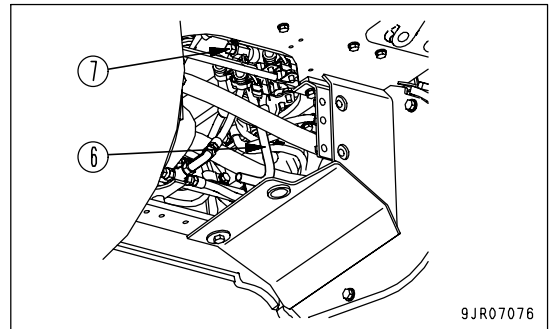
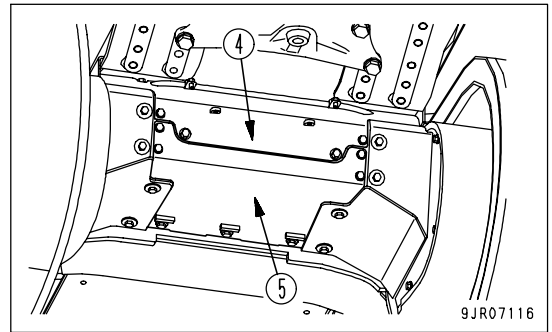
1. Stop the engine.
2. Turn radiator cap (1) slowly until it hits the stopper and by so doing, relieving the internal pressure.
3. Turn radiator cap (1) until it hits the next stopper, while depressing it. Keep turning the radiator cap (1) until it hits the last stopper.



4. Remove the cover under the front cover, then pull out drain hose (2) and insert it in a container to catch the drained water.
5. Open drain valve (3) and drain the water.

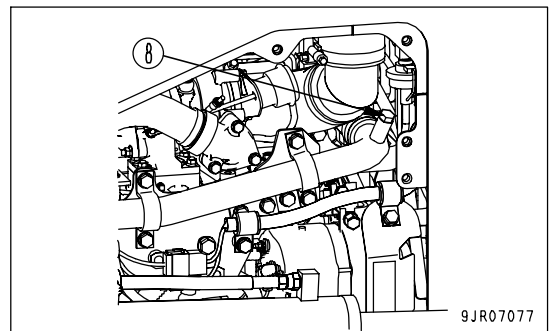


6. Remove covers (4) and (5) at the rear of the machine, pull out drain hose (6), and prepare a container to catch the water.
7. Open drain valve (7) and drain the water.

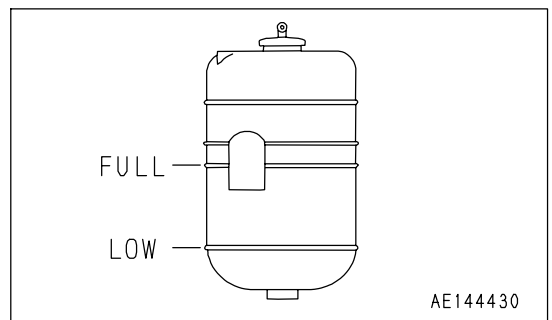


REMARK

When adding water to the cooling system, keep air bleed valve (8) open. This allows the air to escape during the filling operation. When the air is removed and water comes out, close air bleed valve (8).



8. After draining the coolant, close drain valve (3), (7) and fill with city water. When the radiator is full, start the engine and run at low idling to raise the temperature to at least 90°C (194°F), then continue to run for approx. 10 minutes.
9. Stop the engine and open drain valve (3), (7) to drain the water.
10. Close drain valve (3), (7).
11. Add coolant through the water filler port up to the mouth of the port. For details of the COOLANT density, see "COOLANT DENSITY TABLE".
12. To bleed the air from the cooling water, start the engine, run for 5 minutes at low idling, then run for a further 5 minutes at high idling. (When doing this, leave the coolant cap off.)
13. Drain the coolant inside reserve tank, flush the inside of reserve tank, then add coolant to between the FULL and LOW marks.
14. Stop the engine and tighten the cap. Check the coolant level, and add water if the level is low.



CHECK TRACK SHOE TENSION, ADJUST

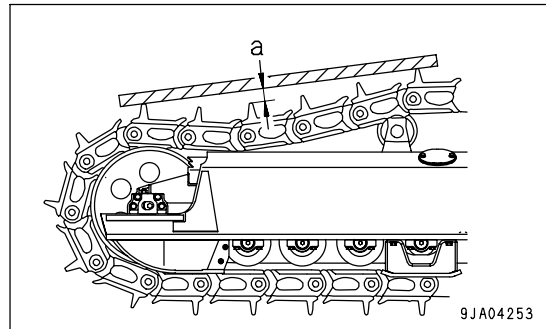
The wear of pins and bushings on the undercarriage will vary with the working conditions and types of soil. It is thus necessary to continually inspect the track tension so as to maintain the standard tension.

Carry out the check and adjustment under the same conditions as when operating (on jobsites where the track becomes clogged with mud, measure with the track clogged with mud).

INSPECTION

Stop the machine on level ground (stop with the transmission in FORWARD without applying the brake). Then place a straight bar on the track shoes between the carrier roller and the idler as shown in the figure, and measure the clearance between the bar and the grouser at the midpoint. If the clearance (a) is 20 to 30 mm (0.79 to 1.18 in), the tension is standard.

If the track tension is not at the standard value, adjust it in the following manner.



ADJUSTMENT

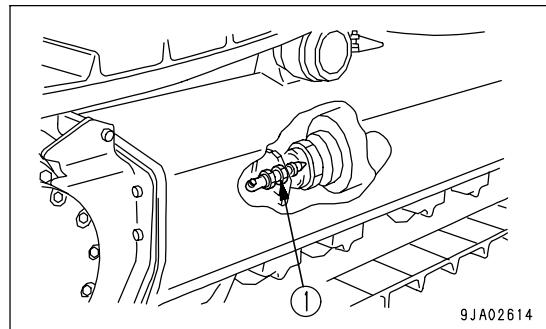


WARNING

There is danger of plug (1) flying out under the high internal pressure of the grease. Never loosen plug (1) more than 1 turn.

Never loosen any part other than plug (1). Never put your face in the mounting direction of plug (1).

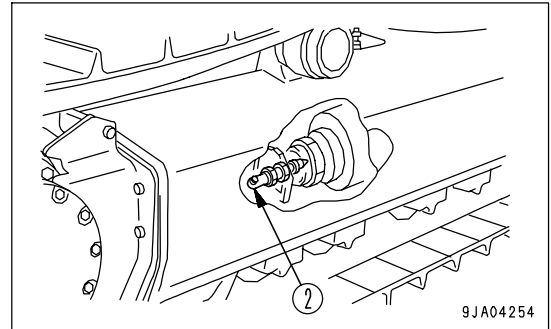
If the track tension cannot be loosened with the procedure given here, please contact your Komatsu distributor.



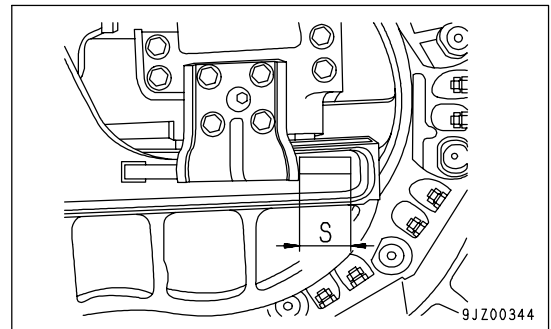
WHEN INCREASING TENSION

Prepare a grease pump.

1. Pump in grease through grease fitting (2) with a grease pump.
2. To check that the correct tension has been achieved, move the machine backwards and forwards.
3. Check the track tension again, and if the tension is not correct, adjust it again.



4. It is possible to pump in grease until dimension S reaches 20 mm (0.8 in), but if the tension is still weak, there is extensive wear of the pin and pushing, so it is necessary to turn or replace the pin and bushing. Please ask your Komatsu distributor to repair.



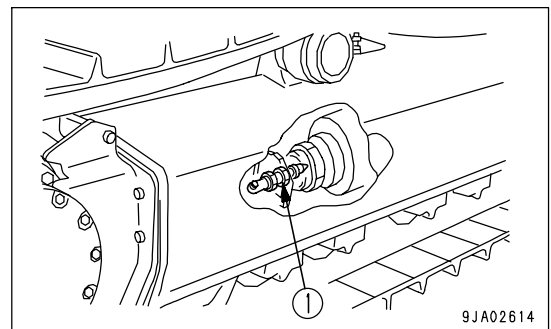
WHEN LOOSENING TENSION



WARNING

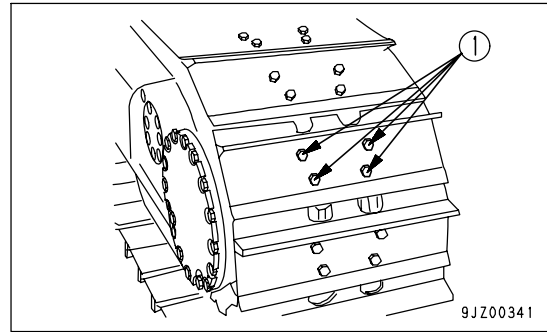
It is extremely dangerous to release the grease by any method except the procedure given below. If the track tension is not relieved by this procedure, please contact your Komatsu distributor.

1. Loosen plug (1) gradually to release the grease.
2. When loosening plug (1), turn it a maximum of one turn.
3. If the grease does not come out smoothly, move the machine forwards and backwards a short distance.
4. Tighten plug (1).
5. To check that the correct tension has been achieved, move the machine backwards and forwards.
6. Check the track tension again, and if the tension is not correct, adjust it again.



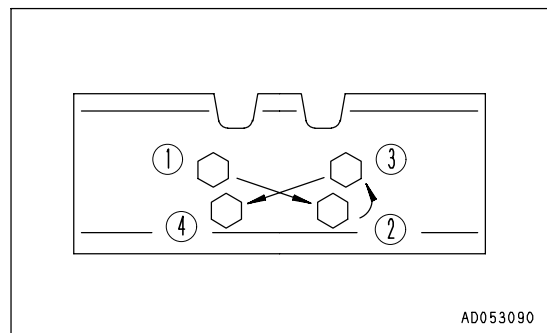
CHECK AND TIGHTEN TRACK SHOE BOLTS

Track shoes may be broken, if they are used with loosened shoe bolts (1). Hence whenever a loosened bolt is found, be sure to retighten it.



ORDER FOR TIGHTENING

Tighten the bolts in the order shown in the diagram on the right.



METHOD OF TIGHTENING (TRACK SHOE BOLTS)

1. First tighten to a tightening torque of 118 ± 19.6 Nm (20 ± 2 kgm, 86.8 ± 14.5 lbft) then check that the nut and shoe are in close contact with the link contact surface.
2. After checking, tighten a further. $90^\circ \pm 10^\circ$.

METHOD OF TIGHTENING (MASTER CONNECTING BOLT)

1. First tighten to a tightening torque of 147 ± 20 Nm (15 ± 2 kgm, 109 ± 14.5 lbft) then check that the nut and shoe are in close contact with the link contact surface.
2. After checking, tighten a further $180^\circ \pm 10^\circ$.

REVERSE AND REPLACE END BITS AND CUTTING EDGES

! WARNING

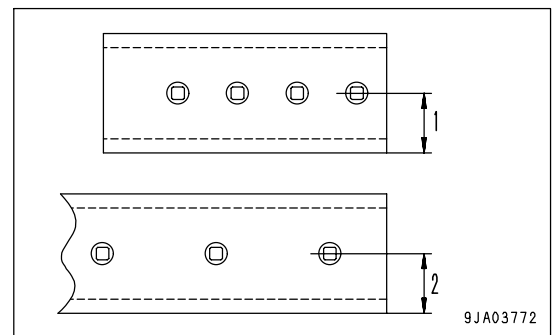
It is dangerous if the work equipment moves during the turning or replacement operation.
 Set the work equipment in a stable condition, set the work equipment lock lever to the LOCK position, then stop the engine.

Reverse or replace the end bits and cutting edges before it is worn out to the blade end.

1. Raise the blade to a proper height, position a block under the frame to prevent the blade from falling.
2. Set the work equipment lock lever to the LOCK position and stop the engine.
3. Measure the wear of the end bit and cutting edge in accordance with the wear standards given below.

Wear standards

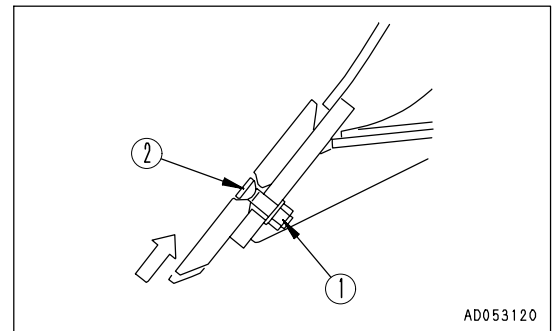
Item		Judgement standard	
No.	Measurement point	Standard dimension (mm (in))	Repair limit (mm (in))
1	Height of end bit	80 (3.2)	55 (2.2)
2	Height of cutting edge	80 (3.2)	55 (2.2)



REMARK

- If the cutting edge and the end bit on both sides are worn out, replace with new ones.
- If it has been worn out up to the fitting surface, repair the fitting surface and then reverse or replace.

4. Remove the cutting edge and the end bit and clean the mounting surface.
5. Reverse or replace the cutting edge and the end bit when worn out.
 - 1) Remove nut (1) and bolt (2), then replace or reverse the cutting edge and the end bit.
 - 2) Install the cutting edge on the blade and tighten the bolt temporarily. Press the blade against the ground to eliminate the play of bolt (2), then tighten the bolt to the specified torque.



Tightening torque of mounting nut: 255 ± 34.3 Nm
 (26 ± 3.5 kgm , 188.1 ± 25.3 lbft)

If bolt (2) and nut (1) are damaged, replace them with new ones at the same time.

6. After several hours of running, retourque the nuts.

CLEAN, CHECK RADIATOR FINS

If the radiator fins are clogged or dirty, clean and inspect them.

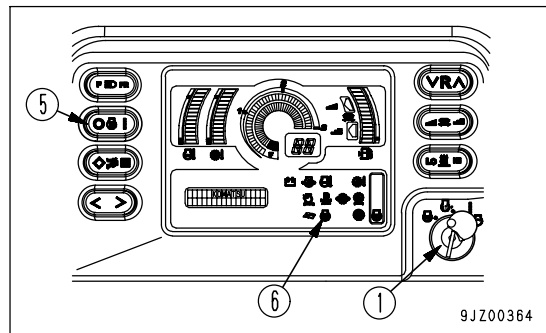
CLEANING BY ROTATING COOLING FAN IN REVERSE DIRECTION

NOTICE

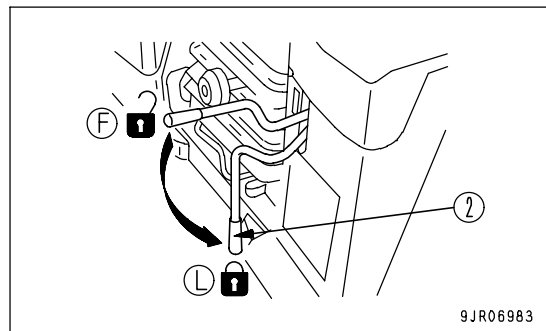
- Dirt and dust will fly when the cooling fan is rotated in reverse, so be extremely careful.
- If it is needed to stop the engine when the cooling fan is rotating in reverse, run the engine at low idling before stopping it.
- After running the fan in reverse, check that there is no dry grass, dirt, or other flammable materials stuck to the engine. In particular, check that there is no dry grass, dirt, or other flammable materials around the exhaust manifold, turbocharger, or on the exhaust pipe where the temperature becomes high during operations. Remove all flammable materials.

The dust and dirt stuck to the radiator and cooler can be blown out by rotating the cooling fan in the reverse direction.

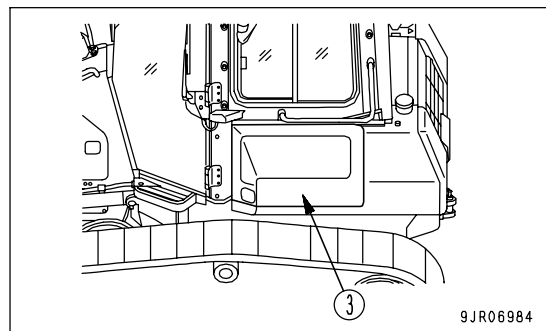
1. Turn starting switch (1) to the "OFF" position and stop the engine.



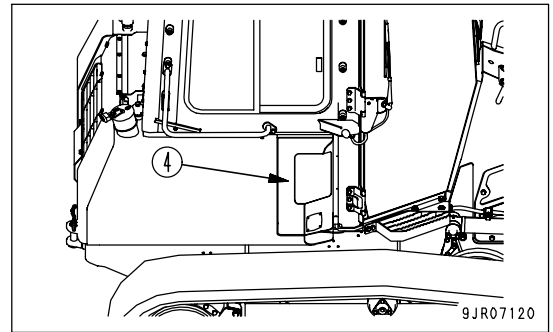
2. Set parking brake lever (2) to the LOCK position to apply the parking brake.



3. Open inspection cover (3) of the hydraulic tank.

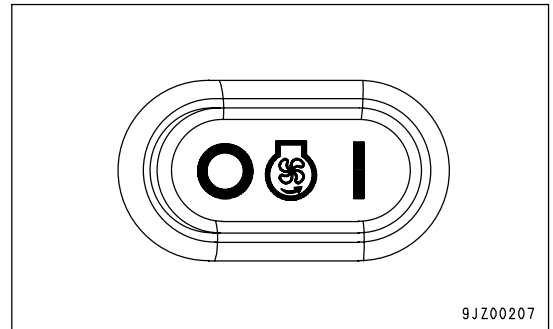


4. Open inspection cover (4) of the fuel tank.



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

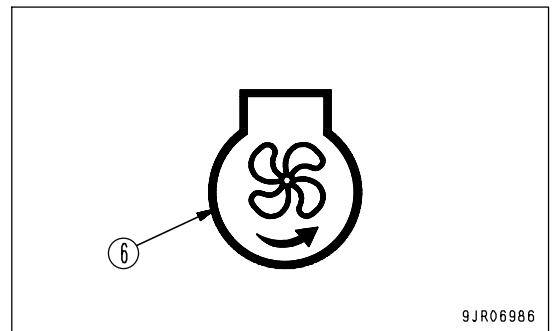
6. Press the cleaning portion (I) of fan rotation selector switch (5).



7. Check that fan operation confirmation lamp (6) lights up.

REMARK

- When the engine is running, even if the fan rotation selector switch is operated, the direction of rotation of the fan will not change. Fan operation confirmation lamp (6) flashes several times to inform the operator that the direction of rotation of the fan has not been switched.
- When the fan operation confirmation lamp (6) is lighted up (when the fan is rotating in reverse), the machine cannot travel.
- When cleaning, leave the parking brake applied.



8. Turn starting switch (1) to the START position and start the engine. The cooling fan will rotate in reverse.

9. Raise the engine to high idling and run it at high idling for 5 minutes.

10. After completing the cleaning, run the engine at low idle for approx. 10 seconds.

11. Turn starting switch (1) to the OFF position and stop the engine.

12. Close the inspection covers of the hydraulic tank and fuel tank.

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

14. Check that fan operation confirmation lamp (6) has gone out, then start the engine. The fan will rotate in the normal direction.

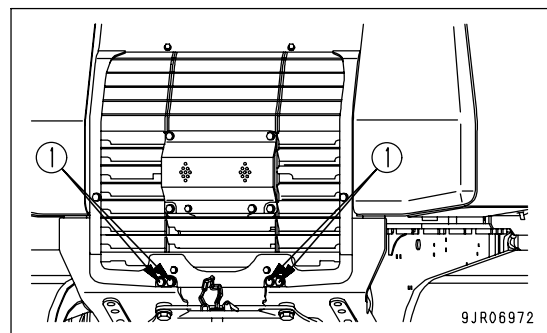
CLEANING WITH COMPRESSED AIR


WARNING

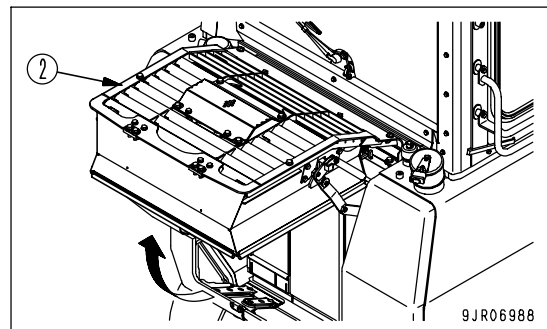
- If compressed air, high-pressure water, or steam hits your body directly or dirt is sent flying by the compressed air, high-pressure water, or steam, there is danger of personal injury. Always wear protective glasses, dust mask, and other protective equipment.
- Before starting the cleaning operation, always stop the engine and stop the rotation of the fan. If you touch the fan when it is rotating, it may cause serious personal injury.
- For details of opening or closing the rear mask, see "OPENING OR CLOSING REAR MASK (PAGE 3-50)".

If there is severe clogging of the radiator fins with dust, use compressed air to clean.

1. Remove 4 bolts (1) at the bottom of the rear mask.

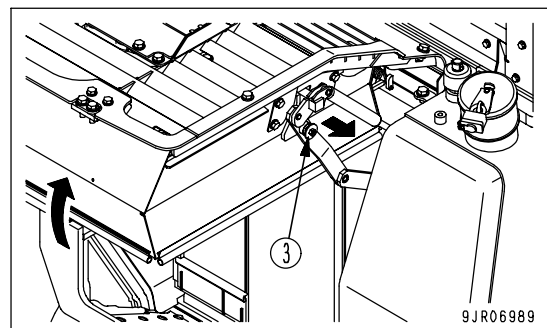


2. Pull rear mask (2) towards you and push it up.
Check that the rear mask has opened to the maximum opening position and that the lock is applied, then release it.
3. Clean the radiator fins clogged with mud, dust and leaves with compressed air. Steam or water may be used instead of compressed air.

**REMARK**

Check the rubber hoses, and if there are any cracks or the hose has become weak, replace it. Check also that there are no loose hose clamps.

4. Close rear mask (2).
When closing the rear mask, lift it up, screw lock release knob (3) in the direction of the arrow to release the lock, then close the rear mask.
5. Tighten 4 bolts (1) at the bottom of the rear mask.



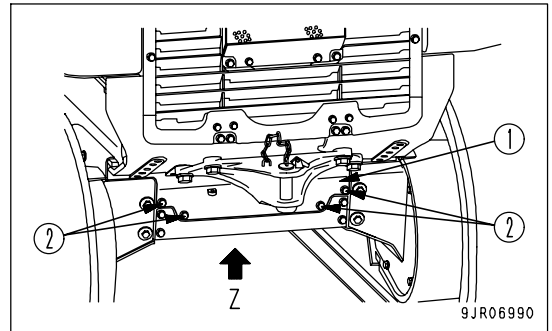
CLEANING INSIDE MACHINE

! WARNING

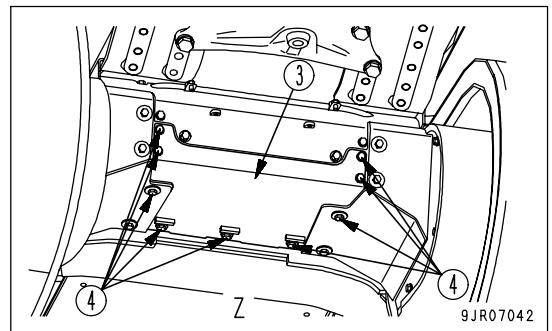
If compressed air, high-pressure water, or steam hits your body directly or dirt is sent flying by the compressed air, high-pressure water, or steam, there is danger of personal injury. Always wear protective glasses, dust mask, and other protective equipment.

Clean inside the machine when mud or dirt has accumulated.

1. Remove 4 mounting bolts (2) of cover (1) at the rear of the machine, then remove cover (1).
2. Remove all accumulated mud and dirt from inside the machine.



3. If the amount of soil and dirt is excessive, remove 9 mounting bolts (4) of cover (3), then remove cover (3) and clean the inside.

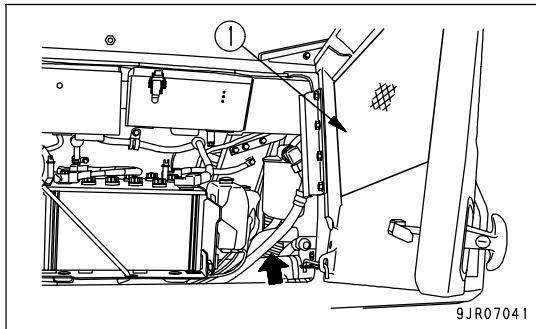


CHECK, CLEAN FRONT FACE OF RADIATOR

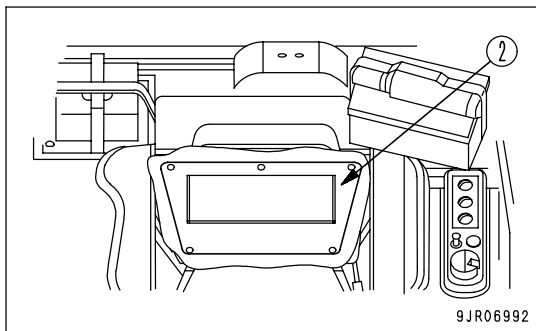
 **WARNING**

If compressed air, high-pressure water, or steam hits your body directly or dirt is sent flying by the compressed air, high-pressure water, or steam, there is danger of personal injury. Always wear protective glasses, dust mask, and other protective equipment.

When inspecting the front face of the radiator, open hydraulic tank inspection cover (1) and check the condition of clogging.



If there is a lot of clogging, remove cover (2) at the rear of the operator's seat, then use compressed air to carry out cleaning from there.



CHECK, ADJUST AIR CONDITIONER

(Machine equipped with cab)

CHECK LEVEL OF REFRIGERANT

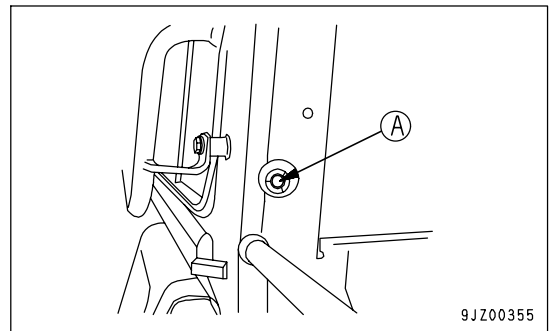
 **WARNING**

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.

There is a sight glass (inspection window) installed to the stay at the rear left of the machine.

When the cooler is operating, check that the color of the refrigerant in the receiver sight glass (A) (inspection window) does not change.

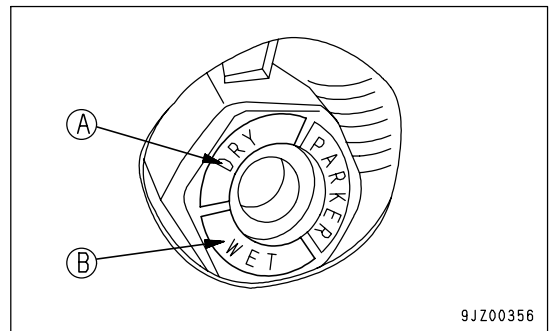


- (A) Blue: Cooler operating normally
- (B) Pink: Necessary to replace receiver dryer

If the sight glass (inspection window) is pink, ask your Komatsu distributor to carry out repairs.

REMARK

There may be bubbles in the sight glass (inspection window) or it may be cloudy, but this does not mean the level of the refrigerant is low. This is normal with R-134a. Do not add refrigerant gas.



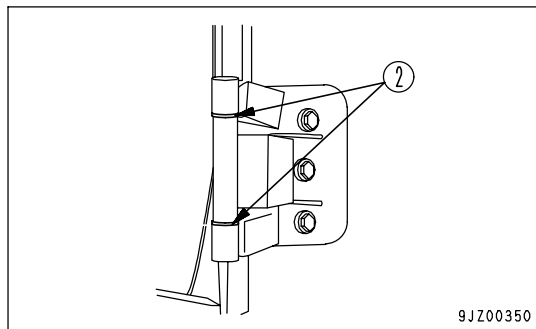
OPERATING AIR CONDITIONER OFF-SEASON

Even during the off-season, operate the air conditioner for 3 to 5 minutes once a month to maintain the oil film at all parts of the compressor.

GREASE DOOR HINGE

(Machine equipped with cab)

If the door makes a squeaking noise when it is open or closed, spray lubricant through the split in the hinge bushing.

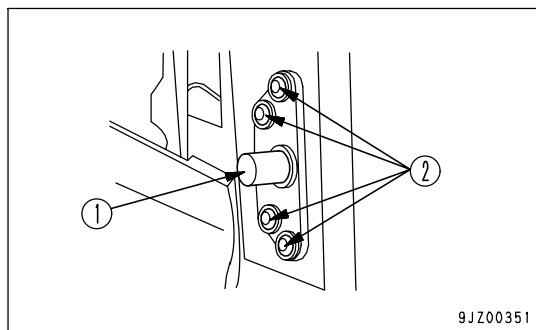


9JZ00350

CHECK DOOR LOCK STRIKER

(Machine equipped with cab)

If the wear of door lock striker (1) is more than 0.5 mm (0.02 in), replace the striker. If it is used as it is, the play will become large and this will lead to damage of the hinge and door lock. Loosen bolt (2) and adjust the striker.



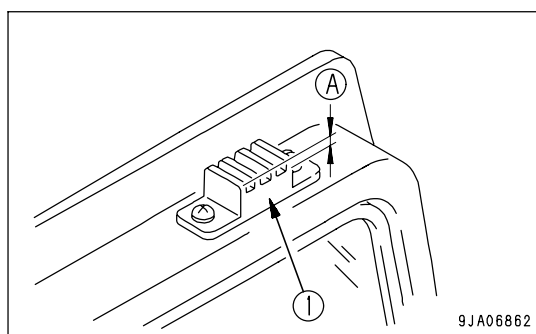
9JZ00351

REPLACE DOOR DAMPER

(Machine equipped with cab)

If depth (A) of the groove of door damper rubber (1) is less than 2 mm (0.08 in), replace the damper.

There are 4 dampers: 1 each at the top and bottom on the left and right doors.



9JA06862

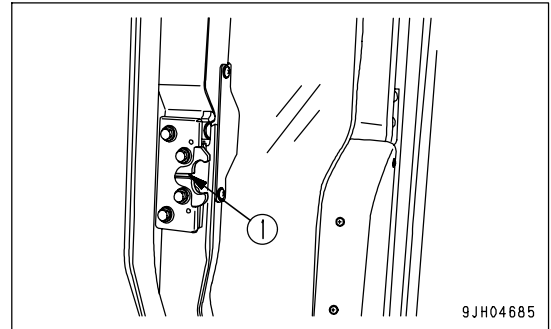
CHECK DOOR LATCH

(Machine equipped with cab)

Hold the door open and check that there is still grease inside the latch. If the amount of grease is low or there is no more grease, coat the inside of the latch with grease from portion (1).

REMARK

If there is no more grease inside the latch, the movement will become poor because of dust inside the latch, and the handle may be stiff when opening the door.



9JH04685

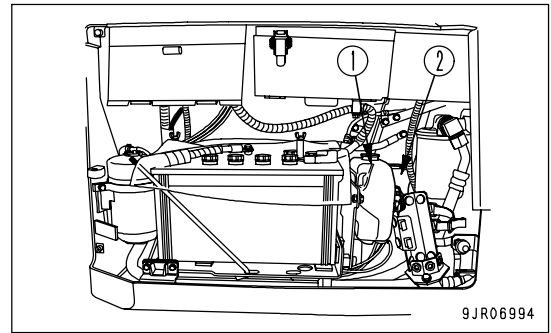
CHECK WINDOW WASHER FLUID LEVEL, ADD FLUID

(Machine equipped with cab)

Check the window washer fluid level if no window washer fluid is sprayed out.

Open the hydraulic tank inspection cover, check the level of the fluid in window washer tanks (1) and (2), and add automobile window washer fluid if the level is low.

When adding fluid, be careful not to let any dust get in.



9JR06994

PROPORTION FOR MIXING FLUID WITH WATER

The proportion differs according to the ambient temperature, so dilute the washer fluid with water to the following proportions before adding.

Area, season	Proportions	Freezing temperature
Normal	Washer fluid 1/3: water 2/3	-10°C (14°F)
Winter in cold area	Washer fluid 1/2 : water 1/2	-20°C (-4°F)
Winter in extremely cold area	Pure washer fluid	-30°C (-22°F)

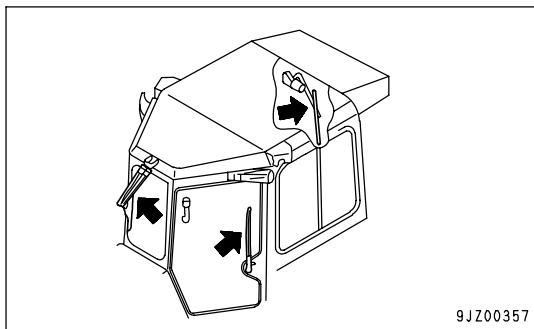
There are two types depending on the freezing temperature:

-10°C (14°F) (general use) and -30°C (-22°F) (cold area use), select according to the area and season.

REPLACE WIPER BLADE

(Machine equipped with cab)

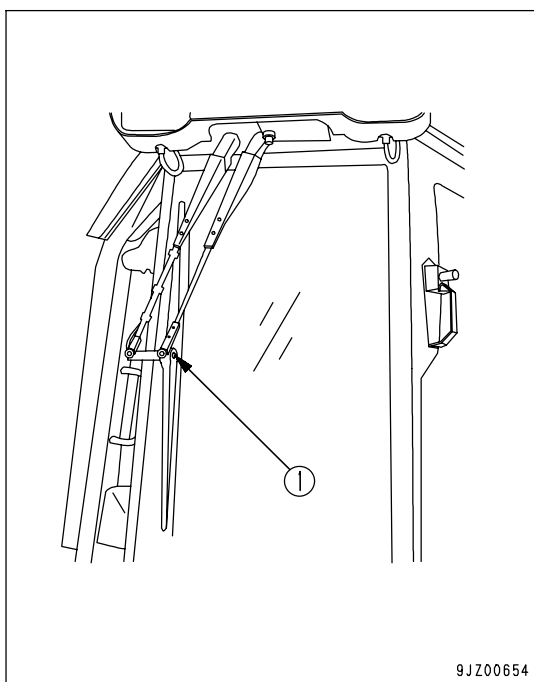
If the blade is damaged, it will not wipe the window clean, so replace the blade.



REPLACEMENT

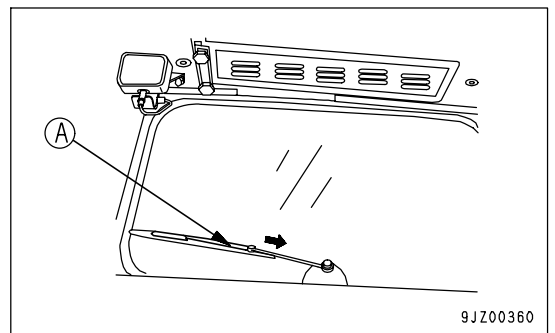
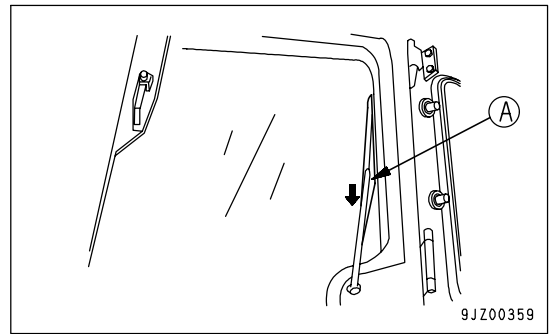
FRONT WIPER

1. Loosen screw (1) and remove the blade.
2. Install a new blade, then tighten screw (1).



DOOR, REAR WIPER

1. It is hooked at portion (A), so move the blade in the direction of the arrow to remove it.
2. Install the new blade and hook it securely.



CHECK IDLER OIL LEVEL



WARNING

If the oil level in the idler is low, new oil must be added, and the machine body must be inclined in this case. Since this work is dangerous, ask your Komatsu distributor.

If the oil level in the idler is low, noise will be generated and there will be seizure, so check the oil level and add oil as follows.

INSPECTION

1. Remove bolt (1), then remove guide plate (2) and shim (3).

REMARK

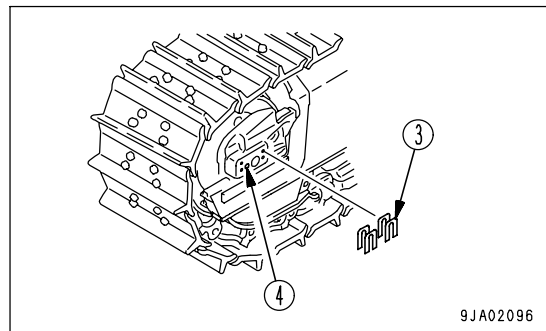
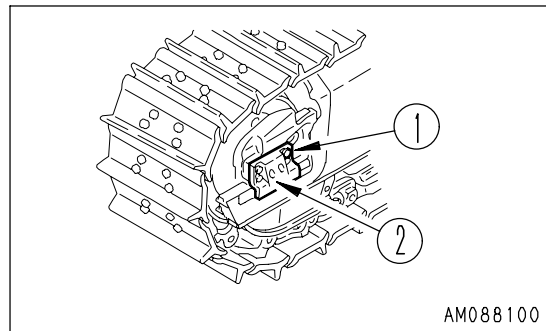
When removing shim (3) keep it in a safe place and be careful not to lose it.

2. Loosen plug (4) slowly. If oil oozes through the threads at this time, the quantity of oil is sufficient. Tighten plug (4).
3. If any oil does not flow out when plug (4) is removed, the quantity of oil is insufficient. In this case, ask your Komatsu distributor for repair.
4. Install guide plate (2) and shim (3) with bolt (1).

REMARK

When installing guide plate (2), install the same number and thickness of shim (3) as removed in Step 1.

The optimum clearance may be obtained, if the adjustment is made at the same time. For details of adjusting the shim thickness, see "ADJUST IDLER CLEARANCE (PAGE 4-44)".



ADJUST IDLER CLEARANCE

Since the idlers are forced to move forward and backward by an external force guide plates will be worn out.

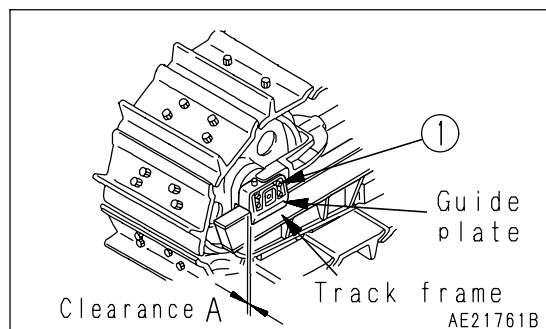
Wear of these plates will cause the vibration of idlers from side to side or inclination of the idlers, and running off of track links from the idlers or unevenly worn idler and links may result.

Therefore, adjust the idlers according to the following procedure.

ADJUSTMENT

1. Move the machine by 1 to 2 m (3.3 to 6.6 ft) on a level place, then measure clearance (A) between the track frame and guide plate (at four places of both sides, inside, and outside).
2. If the clearance (A) exceeds 4.0 mm (0.16 in), loosen bolt (1), and pull out the shim to adjust the clearance at one end to 0.5 to 1.0 mm (0.02 to 0.04 in).

Thickness of one shim is 1.0 mm (0.04 in).



ADJUST PLAY IN CENTER BALL



When adjusting, always set the work equipment lock lever to the LOCK position except when operating the blade.

It is necessary to adjust the shim at the center ball portion in the following cases.

- When there is play in the center ball.
- When the blade is reassembled after having been removed for transportation of the machine.

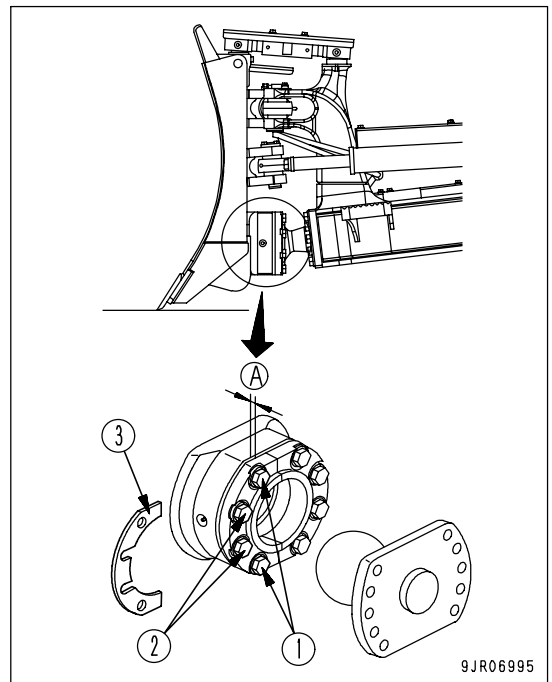
If the adjustment is not made, the play will become larger. Sand and soil will enter the ball portion and this will cause premature wear and damage.

Adjust as follows.

Adjust with shims so that the play at the center ball is 0.2 - 1.2 mm (0.008 - 0.047 in).

1. Remove bolt (1) and loosen bolt (2).
2. Remove all shims (3) and temporarily tighten bolts (1) and (2) so that dimension (A) is uniform around the whole circumference.
3. Measure clearance (A) and decide a shim thickness of a range of (A) + (0.2 - 1.2 mm (0.008 - 0.047 in)).
4. Select a shim thickness that will give the set thickness (remove several shims), then return to the original position and temporarily tighten bolts (1) and (2).
5. Angle and tilt the blade.
 - If the blade moves smoothly without making any squeaking sound, the adjustment is complete.
 - If there is a squeaking sound or the blade does not move smoothly, add shims.
 - If the play at the ball is still excessive, remove more shims.
6. If the work equipment moves smoothly, tighten bolts (1) and (2).

Tightening torque: 456 - 569Nm (46.5 - 58kgm, 336.3-419.5lbft)



Standard shim thickness (A): 8 mm (0.3 in)

Shim thickness: 1.0 mm (0.04 in) (x 2), 2.0 mm (0.08 in) (x 3)

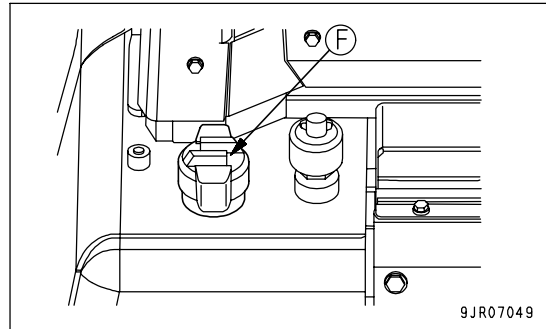
PROCEDURE FOR BLEEDING AIR IN HYDRAULIC SYSTEM

After replacing or cleaning the hydraulic oil, filter element, or strainer, bleed the air from the hydraulic circuit. See "STARTING ENGINE (PAGE 3-84)".

Since the engine must be started and the blade must be operated, see OPERATION.

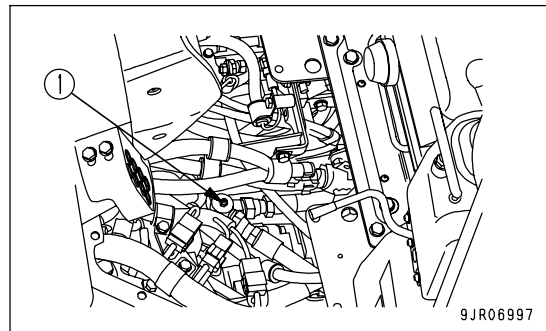
1. Bleeding air from pump

- 1) Remove the cap of oil filler (F) at the top of the hydraulic tank.
- 2) Remove the floor mat and floor plate.
- 3) Loosen air bleeder (1) installed to the drain port and check that oil oozes out.
- 4) After completion of the air bleeding operation, tighten the air bleed plug.
Tightening torque: 11.8 - 14.7 Nm {1.2 - 1.5 kgm (8.7 - 10.8 lbft)}
- 5) Close the hydraulic tank cap.



NOTICE

- If the inside of the pump case is not filled with hydraulic oil and the pump is operated, there is danger that it will generate abnormal heat and this will cause premature damage to the pump.
- Always bleed the air.



2. Starting engine

Start the engine and run for 10 minutes at low idle. For details, see "STARTING ENGINE (PAGE 3-84)". After running for 10 minutes at low idle, move to the next operation.

3. Bleeding air from cylinders

- 1) Run the engine at low idle, and extend and retract each cylinder 4 to 5 times, taking care that a cylinder is not moved to the end of its stroke. (Stop the cylinder approx. 100 mm (3.9 in) short of its stroke end)
- 2) Next, operate each cylinder 3 to 4 times to the end of its stroke.
- 3) Next, run the engine at high idling and operate each cylinder 4 to 5 times to the end of its stroke to bleed the air completely.

NOTICE

If the engine is run at high speed immediately after startup or a cylinder is pushed up to its stroke end, air taken inside the cylinder may cause damage to the piston packing.

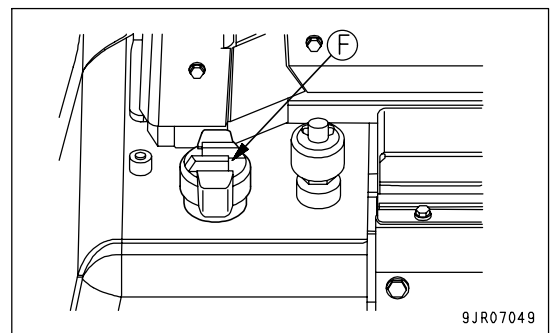
4. Operation

- 1) After completing the bleeding of the air, stop the engine, and wait for at least 5 minutes before starting operations. This will release the bubbles in the oil inside the tank.
- 2) Check that there is no oil leakage, and wipe off any oil that has been spilled.

PROCEDURE FOR RELEASING INTERNAL PRESSURE OF HYDRAULIC SYSTEM**WARNING**

- The hydraulic system is always under internal pressure, so when inspecting or replacing the piping or hoses, release the internal pressure in the circuit. If the pressure is not released, high-pressure oil will spurt out and cause serious personal injury.
- Immediately after the engine is stopped, the parts and the oil are at a high temperature, and will cause burns. Wait for the temperature to go down before starting the operation.
- When the cap of the oil filler port is removed, oil may spurt out, so turn the cap slowly to release the internal pressure, then remove it carefully.

1. Stop the machine on firm level ground.
2. Lower the blade completely to the ground and stop the engine.
3. After stopping the engine, turn the starting switch to the ON position.
4. Set the work equipment lock lever to the FREE position.
5. To release the internal pressure, operate the blade control lever in each direction to the end of its stroke within 15 seconds after stopping the engine.
6. Loosen oil filler cap (F) at the top of the hydraulic tank slowly to release the internal pressure.



CHECK BEFORE STARTING

For details of the following items, see "CHECK BEFORE STARTING (PAGE 3-66)" in the OPERATION section.

- Check coolant level, add coolant
- Checking with monitor
- Check fuel level, add fuel
- Check oil level in engine oil pan, add oil
- Drain water, sediment from fuel tank (Only poor fuel arrangement specification)
- Check additional water separator, drain water (Only poor fuel arrangement specification)
- Check for water and sediment in water separator, drain water
- Check oil level in hydraulic tank, add oil
- Check electric wiring
- Check that lamps light up
- Check horn sound
- Check backup alarm sound

EVERY 50 HOURS SERVICE

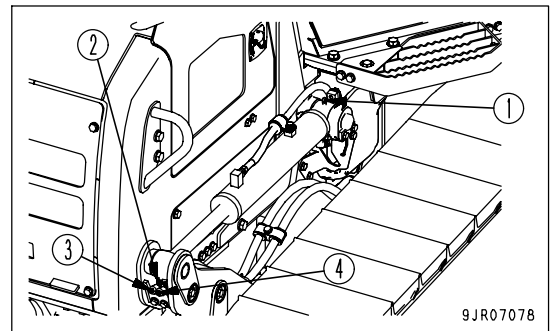
LUBRICATING

NOTICE

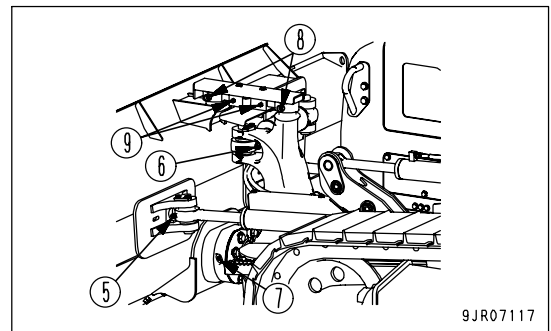
If dirt or sand is found sticking due to work in the soft ground, carry out greasing every 10 hours of operation.

1. Lower the blade to the ground, then stop the engine.
2. Using a grease pump, pump in grease through the grease fittings shown by arrows.
3. After greasing, wipe off any old grease that was pushed out.

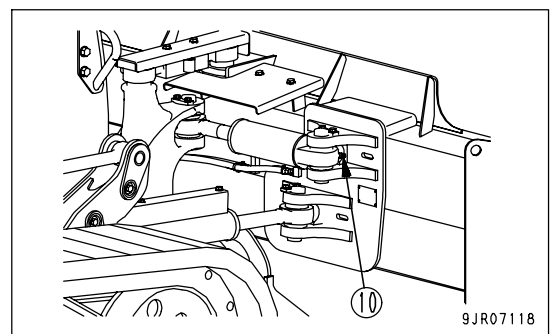
- (1) Lift cylinder bottom pin (left and right: 1 place each)
- (2) Lift cylinder head pin (left and right: 1 place each)
- (3) Angle cylinder bottom pin (left and right: 1 place each)
- (4) U-frame mounting pin (left and right: 1 place each)



- (5) Angle cylinder head pin (left and right: 1 place each)
- (6) Tilt cylinder head pin (1 place)
- (7) Center ball pin (1 place)
- (8) Pitch rod pin (2 places)
- (9) Turnbuckle screw (2 places)



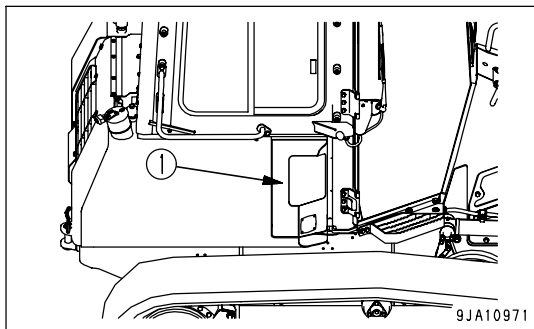
- (10) Tilt cylinder bottom pin (1 place)



DRAIN WATER, SEDIMENT FROM FUEL TANK (ONLY STANDARD SPECIFICATION)

- Prepare a container to catch the fuel that is drained.

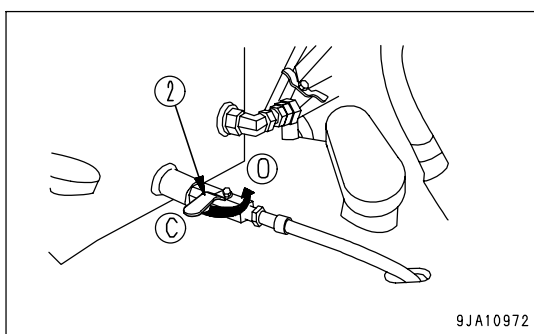
1. Open the fuel tank inspection cover (1) on the right side of the machine.



2. Set drain valve (2) to the OPEN position (O), then drain the sediment and water accumulated at the bottom together with the fuel.

When doing this, be careful not to get fuel over yourself.

3. When clean fuel comes out, turn drain valve (2) to the CLOSED position (C).

**REMARK**

Before draining the water and sediment, pass a hose through the hole in the bottom plate of the tank.

EVERY 250 HOURS SERVICE

Maintenance for every 50 hours service should be carried out at the same time.

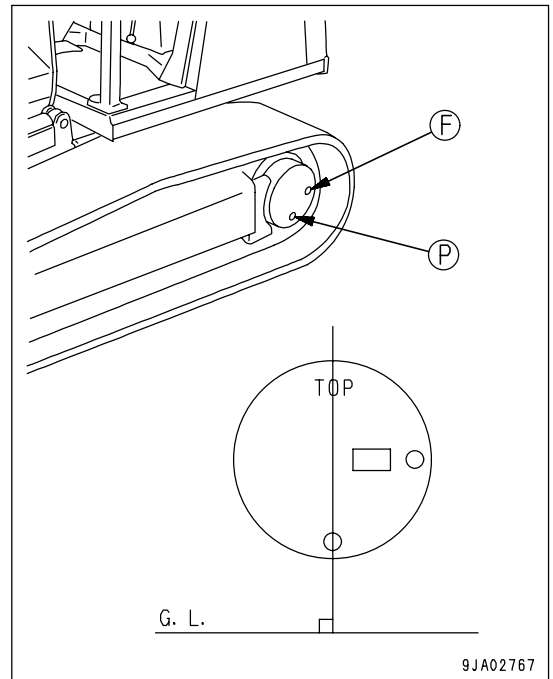
CHECK OIL LEVEL IN FINAL DRIVE CASE, ADD OIL



WARNING

- The oil is at high temperature immediately after the machine has been operated. Wait for the oil to cool down before starting the operation.
- If there is still pressure remaining inside the case, the oil or plug may fly out.
Loosen the plug slowly to release the pressure.

1. Set the TOP mark at the top, with the UP mark and plug (P) perpendicular to the ground surface.
2. Using the handle, remove plug (F). If the oil is up to the bottom of the plug hole, the level is correct.
3. If the oil level is low, add oil through the hole of plug (F). Add oil until oil overflows from the hole of plug (F).
4. After checking, install plug (F).
Tightening torque: $68.6 \pm 9.8 \text{ Nm}$ ($7 \pm 1 \text{ kgm}$, $50.6 \pm 7.2 \text{ lbft}$)



CHECK LEVEL OF BATTERY ELECTROLYTE

Carry out this procedure before operating the machine.



WARNING

- Do not use the battery if the battery electrolyte level is below the LOWER LEVEL line. This 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.
- 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 cause damage to the paint surface or corrode other parts.

NOTICE

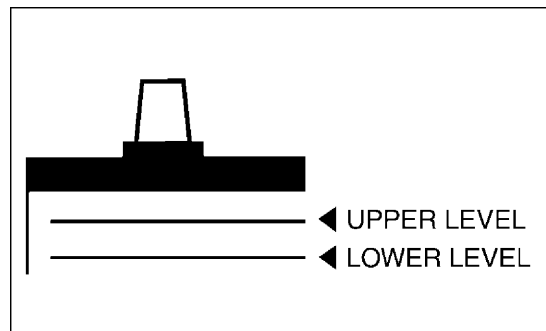
If there is a fear that the battery water may freeze after refilling with purified water (e.g. commercially available replenishment water for a battery), do the replenishment before the day's work on the next day.

Inspect the battery electrolyte level at least once a month and follow the basic safety procedures given below.

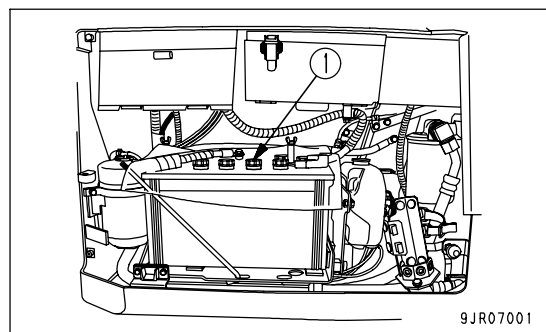
WHEN CHECKING ELECTROLYTE LEVEL FROM SIDE OF BATTERY

If it is possible to check the electrolyte level from the side of the battery, check as follows.

1. Open the hydraulic tank inspection cover on the left side 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 (U.L.) and LOWER LEVEL (L.L.) lines.
If the battery is wiped with a dry cloth, static electricity may cause a fire or explosion.



3. If the electrolyte level is below the midway point between the U.L and L.L lines, remove cap (1) and add distilled water to the U.L line.
4. After adding distilled water, tighten cap (1) securely.



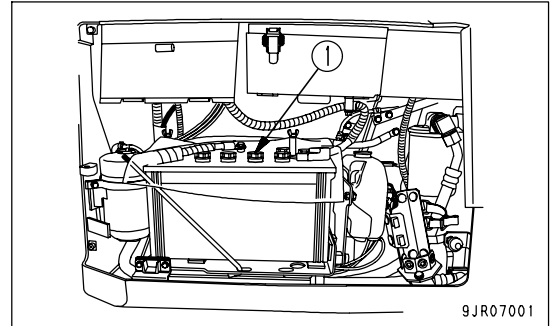
REMARK

If distilled water is added to above the U.L. line, use a syringe to lower the level to the U.L. line. Neutralize the removed fluid with baking soda (sodium bicarbonate), then flush it away with a large amount of water or consult your Komatsu distributor or battery maker.

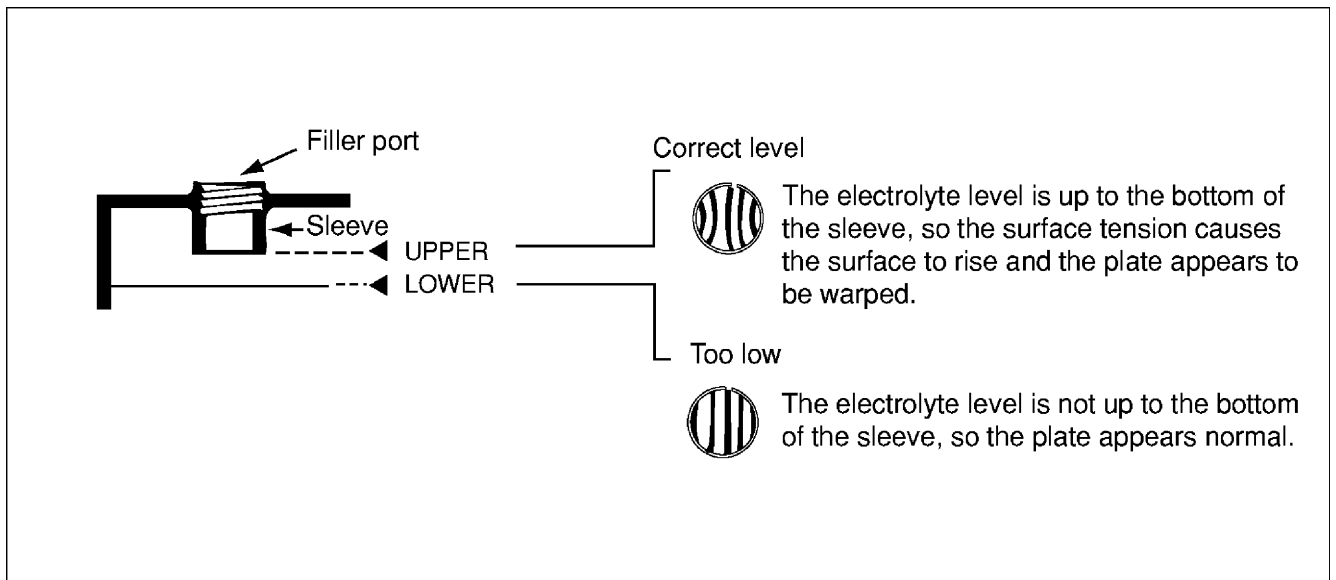
WHEN IT IS IMPOSSIBLE TO CHECK ELECTROLYTE LEVEL FROM SIDE OF BATTERY

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, check as follows.

1. Open the hydraulic tank inspection cover on the left side of the machine.
2. Remove the vinyl cover from the top of the battery.
3. Remove cap (1) at the top of the battery, look through the water filler port, and check the electrolyte surface. If the electrolyte does not reach the sleeve, add distilled water so that the level reaches the bottom of the sleeve (UPPER LEVEL line) without fail.



Use the diagram below for reference, and check if the electrolyte reaches the bottom of the sleeve.



4. After adding distilled water, tighten cap (1) securely.

REMARK

If water is added to above the bottom tip of the sleeve, use a pipette to remove electrolyte. Neutralize the removed electrolyte with sodium bicarbonate, then flush it away with a large amount of water. If necessary, contact your Komatsu distributor or your battery maker.

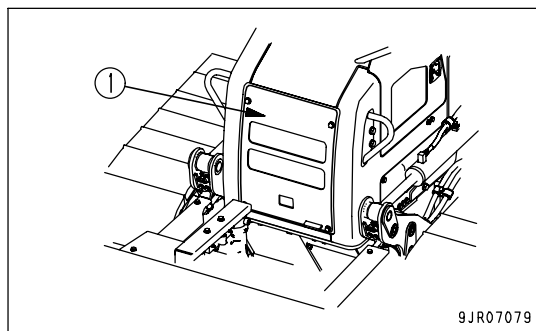
WHEN IT IS POSSIBLE TO USE INDICATOR TO CHECK ELECTROLYTE LEVEL

If it is possible to use an indicator to check the electrolyte level, follow the instructions given.

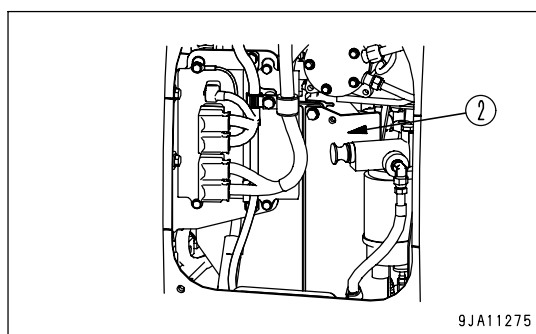
CHECK ALTERNATOR DRIVE BELT TENSION, ADJUST

CHECKING

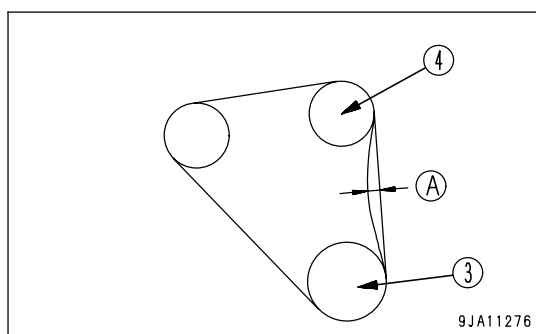
1. Remove front cover (1).



2. Remove cover (2).

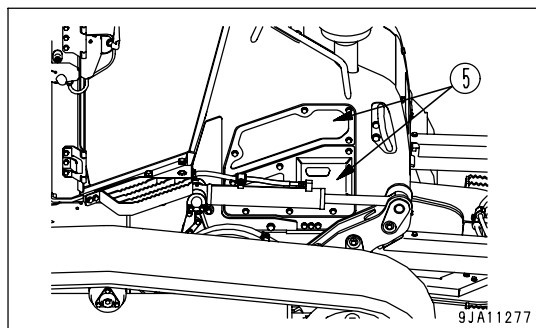


3. Press the belt with a finger force of approx. 58.8 N {6 kg} at a point midway between crankshaft pulley (3) and water pump pulley (4).
Standard deflection (A): 6 - 7 mm (0.2 - 0.3 in)

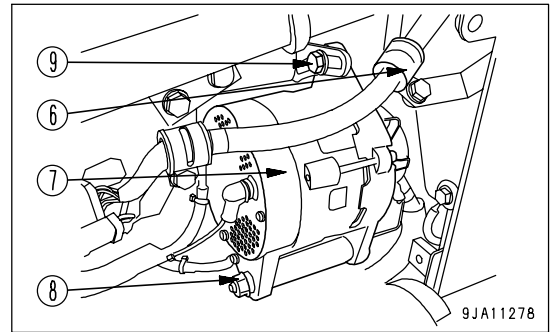


ADJUSTING

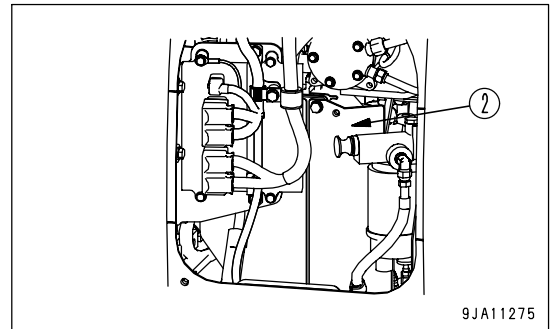
1. Remove 10 mounting bolts from engine side cover (5) on the right side of the machine, then remove the engine side cover.



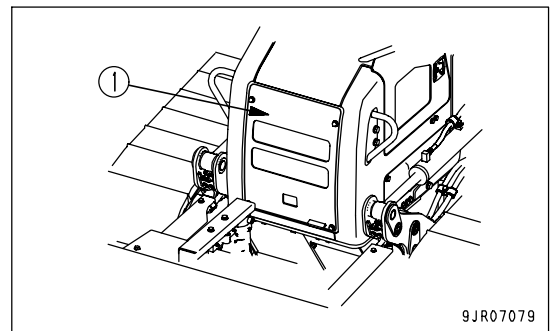
2. Remove clamp (6), insert a bar between alternator (7) and the cylinder block, and use it to hold alternator (7) in position.
To prevent damage to alternator (7) when holding it in position, insert a wooden block between the bar and alternator (7).
3. Loosen bolts (8) and (9).
4. Use the bar to move alternator (7) and adjust the belt tension.
5. Tighten bolts (8) and (9) to hold alternator (7) in position.
6. Install clamp (6) and engine side cover (5).



7. Install cover (2).



8. Install front cover (1).

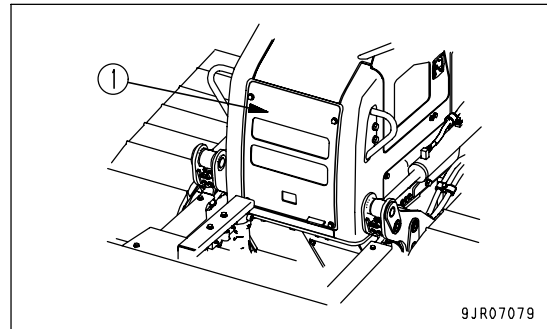


REMARK

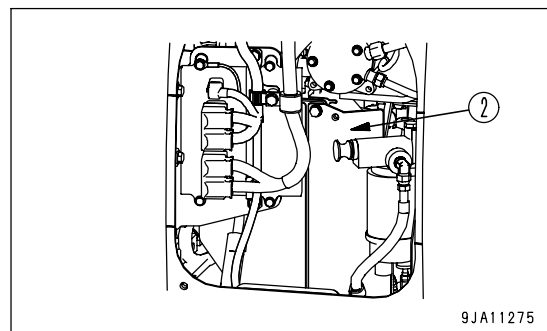
- Check each pulley for breakage and wear of the V-groove. In particular, check that the V-belt does not touch the bottom of the V-groove.
- If any abnormality is found, please contact your Komatsu distributor for replacement of the pulley.
- If the belt is stretched and there is no allowance for adjustment, or if it is cut or cracked, please contact your Komatsu distributor for replacement.
- When adjusting the V-belt, do not press the alternator directly with a bar, but put a wood piece, etc. in-between them.
- If the V-belt has been replaced with a new part, there will be initial elongation, so inspect and adjust it again after one-hour of operation.

CHECK AIR CONDITIONER COMPRESSOR BELT TENSION, ADJUST**CHECKING**

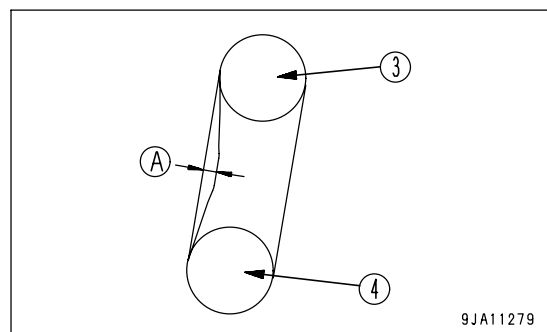
1. Remove front cover (1).



2. Remove cover (2).

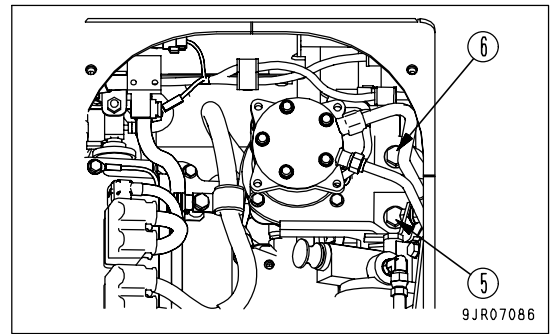


3. Press the belt with a finger force of approx. 98 N {10 kg} at a point midway between compressor pulley (3) and water pump pulley (4).
Standard deflection (A): 13 - 15.5 mm (0.5 - 0.6 in)

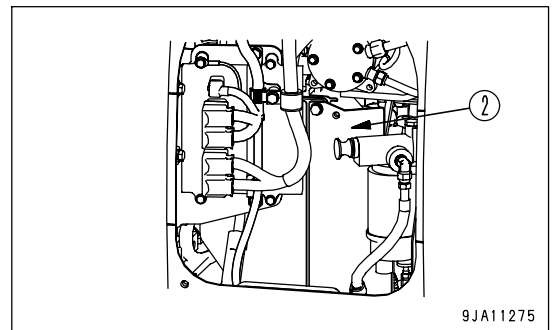
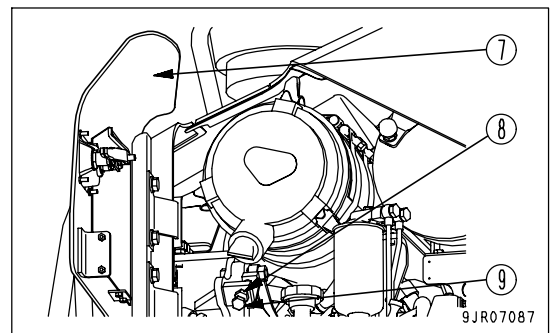


ADJUSTING

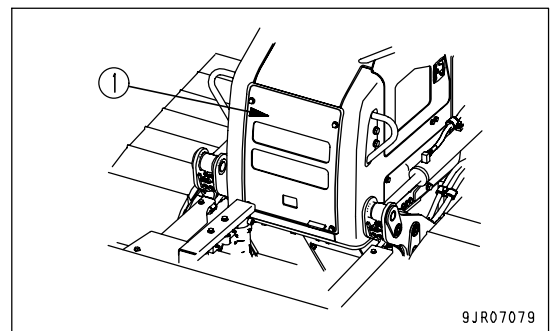
1. Loosen mounting bolts (5) and lock bolt (6).



2. Open engine side cover (7) on the left side of the machine.
3. Loosen locknut (8), then tighten adjustment bolt (9) to adjust the belt tension.
4. After adjusting, tighten locknut (8), mounting bolts (5) and lock bolt (6).
5. Check each pulley for damage, wear of the V-groove, and wear of the V-belt. In particular, be sure to check that the V-belt is not touching the bottom of the V-groove.
6. If the V-belt is so lengthened that it cannot be adjusted any more or if it has any cuts or cracks, replace it.
7. If the V-belt has been replaced with a new part, there will be initial elongation, so adjust the belt again after operating for 2 to 3 days.
8. Close engine side cover (7) on the left side of the machine.
9. Install cover (2).



10. Install front cover (1).



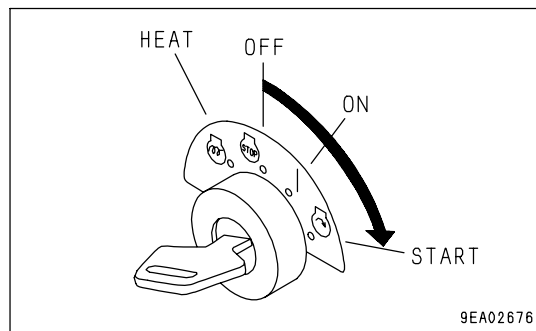
CHECK BRAKE PERFORMANCE

**WARNING**

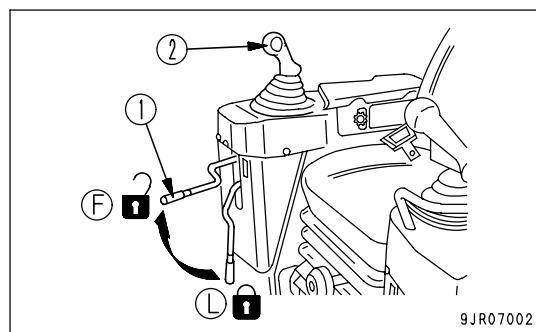
If the machine moves during the following operation, please contact your Komatsu distributor for repairs immediately.

Before starting the engine, check that the area around the machine is safe, then do as follows:

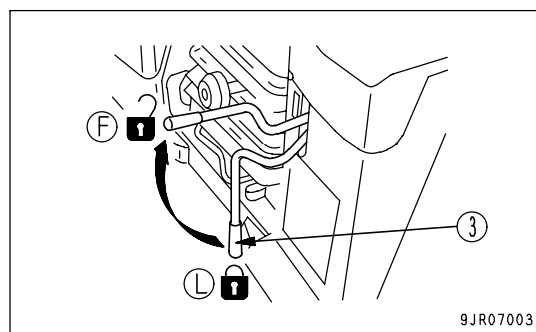
1. Start the engine.



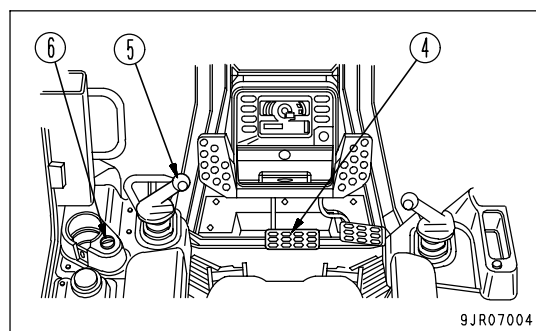
2. Set work equipment lock lever (1) to the FREE position (F) then operate blade control lever (2) to raise the blade. Leave the work equipment lock lever (1) to the FREE position (F).



3. Set parking brake lever (3) to the FREE position (F).



4. Depress brake pedal (4) and move steering, forward-reverse, gear shift lever (5) in 1st.
5. Operate fuel control dial (6) to gradually raise the engine speed to full speed.
6. If the machine does not move with the above operation and no error appears on the monitor panel, the brakes are correct.



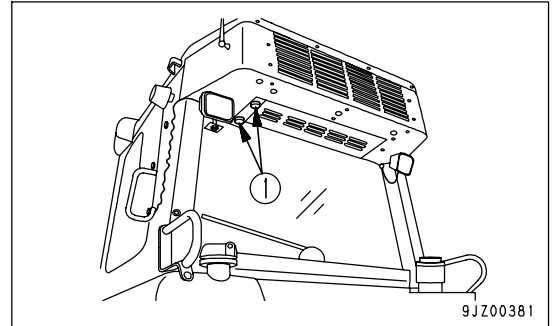
CLEAN AIR CONDITIONER AIR FILTER (FRESH/RECIRC FILTER)

(Machine equipped with cab)

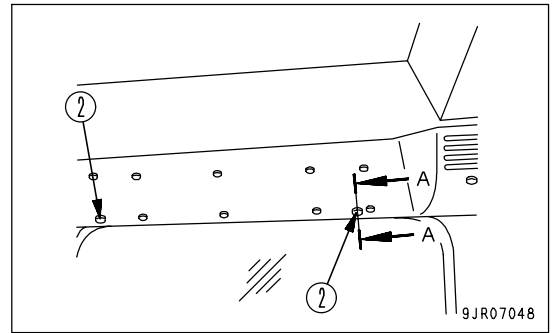
Clean the air conditioner air filter if it becomes clogged or if there is dirt or oil stuck to it.

In places where there is a lot of dust, clean the air filter once a week. In addition, clean the air conditioner air filter at the same time, when cleaning the engine air cleaner.

1. Turn knob (1), open the inspection cover at the rear of the machine, then remove the fresh air filter.



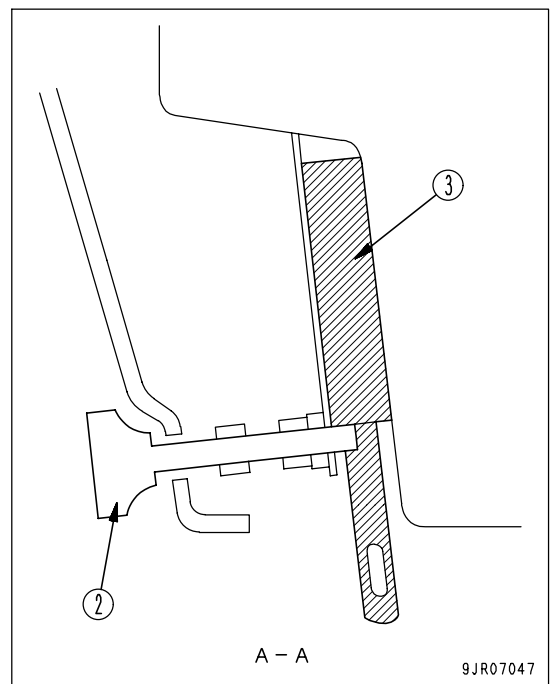
2. Turn knob (2) at the rear of the operator's seat and remove the recirculated air filter (3).
3. Clean the filter with compressed air.
If there is oil on the filter or it is extremely dirty, wash the filter in a neutral agent.
After washing with water, dry thoroughly before using.



REMARK

If the filters cannot be cleaned with air or in water, replace them with new ones.

4. Assemble the recirculated air filter (3), then tighten knob (2).
When securing it in position with the knob, check the position of the filter by hand or visually before tightening.
5. Assemble the fresh air filter, then tighten knob (1).



EVERY 500 HOURS SERVICE

Maintenance for every 50 and 250 hours service should be carried out at the same time.

CHANGE OIL IN ENGINE OIL PAN, REPLACE ENGINE OIL FILTER CARTRIDGE**WARNING**

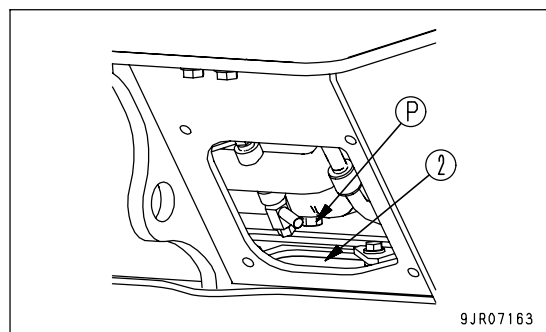
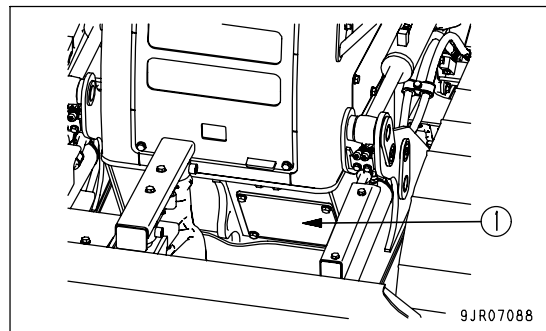
Parts and oil are at high temperature immediately after the engine is stopped and may cause serious burns. Wait for the oil temperature to go down before performing this operation.

NOTICE

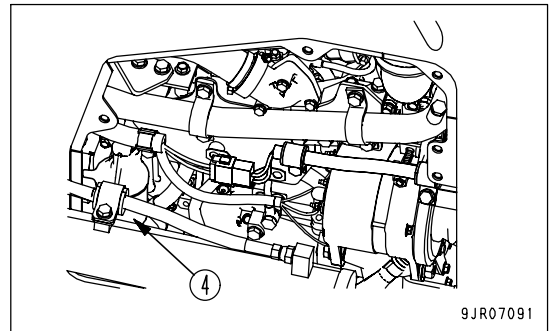
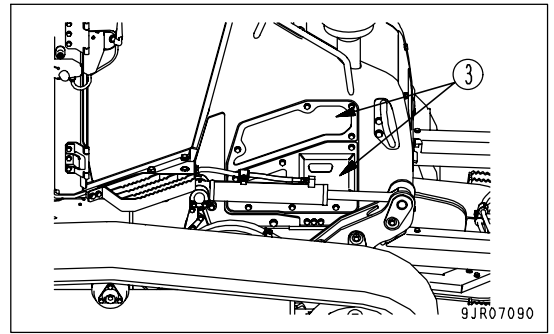
Do not move the blade when the front cover and engine side cover on the left side of the machine are open. The blade will hit the covers and there is danger that the covers may be broken.

- Refill oil amount: 11 liters (2.91 US gal)
- Prepare a container to catch drain oil.
- Prepare a socket wrench and filter wrench.

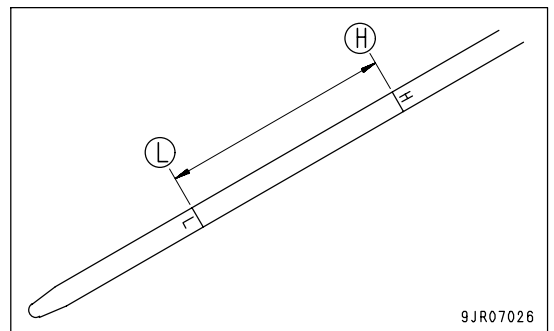
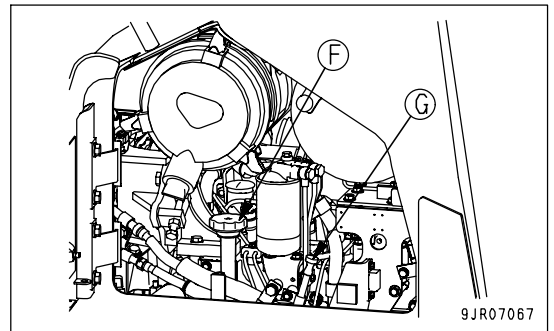
1. Remove covers (1) and (2) under the front cover and prepare a container to catch the drained oil.
2. Taking care not to get oil over yourself, loosen the drain plug (P) slowly and drain the oil. After draining the oil, close the plug.
3. Check the drained oil, and if there are excessive metal particles or foreign material, please contact your Komatsu distributor.
4. Install covers (1) and (2).



5. Remove 10 mounting bolts from engine side cover (3) on the right side of the machine, then remove the engine side cover.
6. Using a filter wrench, turn cartridge (4) to the left to remove it.
7. Clean the filter holder, fill the new filter cartridge with clean oil, coat the thread and packing portion of the new filter cartridge with oil (or coat thinly with grease), then install.
8. When installing the filter cartridge, bring the packing surface into contact with the filter holder, then tighten a further 3/4 to 1 turn.



9. After replacing the filter cartridge, add oil through oil filler (F) until the oil level is between the H and L marks on the dipstick (G).
10. Run the engine at idle for a short time, then stop the engine, and check that the oil level is between the H and L marks on the dipstick. For details, see "CHECK OIL LEVEL IN ENGINE OIL PAN, ADD OIL (PAGE 3-68)".



REPLACE FUEL PRE-FILTER CARTRIDGE



WARNING

- After the engine has been operated, all parts are at high temperature, so do not replace the filter immediately. Wait for all parts 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 stopping the engine to let the internal pressure go down before replacing the filter.
- Do not bring any fire or flame close.

NOTICE

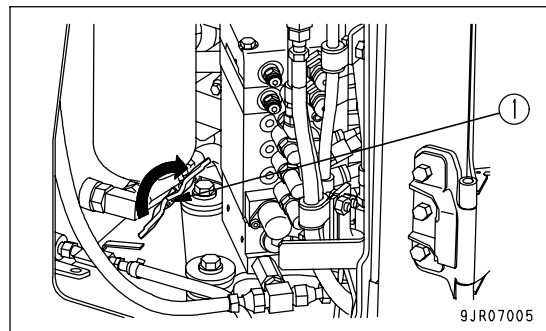
- Genuine Komatsu fuel filter cartridges use a special filter that has highly efficient filtering ability. When replacing the filter cartridge, always use a genuine Komatsu part.
- The common rail fuel injection system used on this machine consists of more precise parts than the conventional injection 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. Always avoid using substitute parts.
- When carrying out 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.

NOTICE

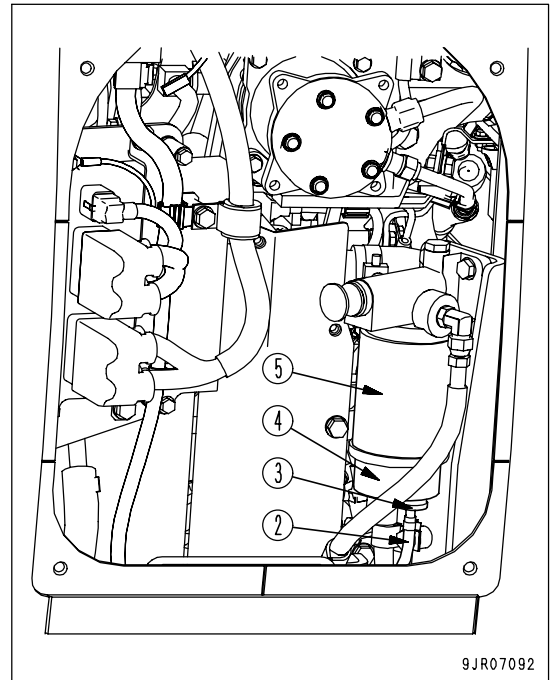
Do not move the blade when the front cover and engine side cover on the left side of the machine are open. The blade will hit the covers and there is danger that the covers may be broken.

- Prepare a container to catch the fuel.
- Prepare a filter wrench

1. Open the fuel tank inspection cover on the right side of the machine.
2. Set fuel supply valve (1) to the CLOSED position (direction of arrow).



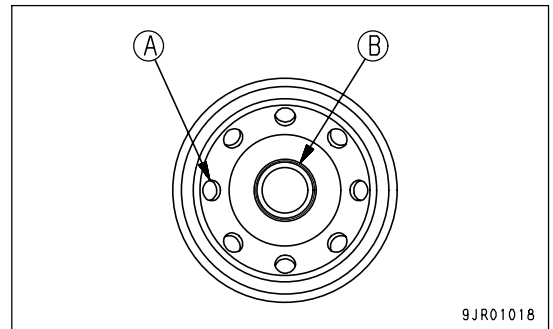
3. Remove the front cover at the front of the machine.
4. Pull out drain hose (2) to the front of the machine and insert it in a container to catch the drained water.
5. Loosen drain valve (3), drain the water and sediment from inside transparent cap (4), then drain all the fuel accumulated in filter cartridge (5).
6. Turn transparent cap (4) to the left with a filter wrench. (This cap is to be used again, so replace it with a new one if there is any damage on it.)
7. Using a filter wrench, turn cartridge (5) to the left to remove it.
8. Install transparent cap (4) to the bottom of the new filter cartridge. (When doing this, always replace O-ring.)



9. When installing, coat the O-ring thinly with clean fuel, bring it into contact with the seal surface of filter cartridge (5), then tighten a further 1/4 -1/2 turns.
If the transparent cap is tightened too much, the O-ring will be damaged and this will cause leakage of fuel. If it is not tightened enough, there will be a gap at the O-ring and this will also cause leakage of fuel. To avoid this problem, always tighten to the proper tightening angle.
10. Clean the filter holder, fill the new filter cartridge with clean fuel, coat the packing surface thinly with oil, then install to the filter holder.

NOTICE

- When adding fuel, do not remove cap (B). Always add fuel from the 8 small holes (A) on the dirty side.
- After adding fuel, remove cap (B) and install the fuel filter.
- Always fill with clean fuel. Be careful not to let any dirt or dust get into the fuel. In particular, center portion is the clean side, so do not remove cap (B) when adding fuel. Be careful not to let dirt or dust get into center portion on the clean side.

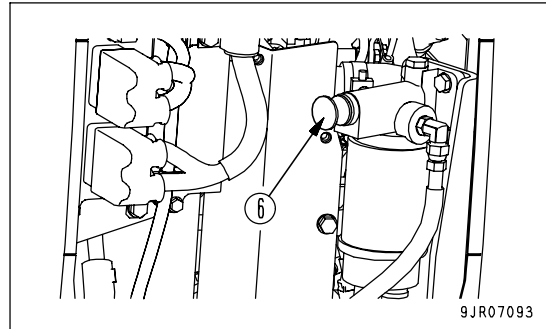


11. When installing, tighten until the packing surface contacts the seal surface of the filter holder, then tighten it 3/4 of a turn.
If the filter cartridge is tightened too far, the packing will be damaged and this will lead to leakage of fuel. If the filter cartridge is too loose, fuel will also leak from the packing, so always tighten the correct amount.
 - When tightening with a filter wrench, be extremely careful not to dent or damage the filter.
12. Check that the drain valve (3) is tightened securely.
13. Open fuel supply valve (1).

14. After replacing filter cartridge (5), bleed the air from the fuel circuit as follows.
15. Fill the fuel tank with fuel (to the position where the float is at the highest position).
16. Loosen the knob of feed pump (6), pull it out, then pump it in and out until it becomes heavy.

REMARK

- It is not necessary to remove the plug at the top of the fuel pre-filter and fuel main filter.
- After the engine runs out of fuel, use the same procedure to operate feed pump (6) and bleed the air.



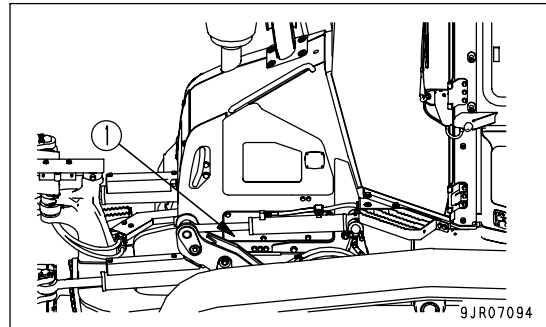
17. After finishing the air bleeding, push in the knob of feed pump (6) and tighten it.
18. After replacing the filter cartridge, start the engine and run it for 10 minutes at low idling. Check that there is no leakage of fuel from the filter seal surface and the transparent cap mounting surface. If any leakage of fuel is found, check that the filter cartridge is tightened properly. If the fuel still leaks, repeat Steps 1 - 7 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 8 - 17 to install the new cartridge.

CHECK ELECTRIC WIRING AROUND STARTING MOTOR, ALTERNATOR

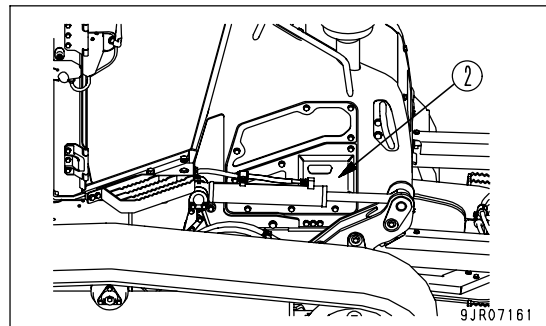
CAUTION

If there are signs of a short circuit in the electrical wiring, ask your Komatsu distributor immediately to investigate the cause and carry out repairs.

1. Remove 4 mounting bolts of cover (1) under the engine side cover on the left side of the machine, then remove cover (1).



2. Remove 6 mounting bolts from engine side cover (2) on the right side of the machine, then remove the engine side cover.



3. Check if there are signs of a short circuit in the electrical wiring and check if there are any loose terminals. Tighten any loose terminals. In particular, check the wiring of the starting motor and alternator.

EVERY 1000 HOURS SERVICE

Maintenance for every 50, 250 and 500 hours should be carried out at the same time.

REPLACE FUEL MAIN FILTER CARTRIDGE (STANDARD SPECIFICATION)

Carry out this operation after carrying out the maintenance in the "REPLACE FUEL PRE-FILTER CARTRIDGE (PAGE 4-62)" for every 500 hours.

! WARNING

- After the engine has been operated, all parts are at high temperature, so do not replace the filter immediately. Wait for all parts 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 stopping the engine to let the internal pressure go down before replacing the filter.
- Do not bring any fire or flame close.

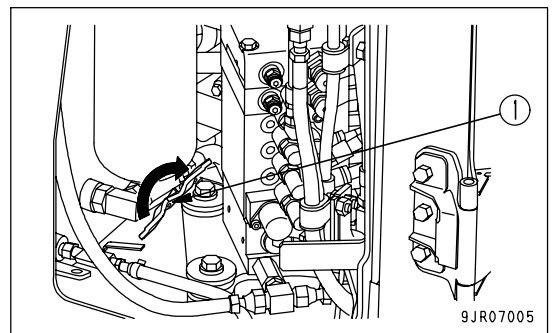
NOTICE

- Genuine Komatsu fuel filter cartridges use a special filter that has 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. Always avoid using substitute parts.
- When carrying out 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.

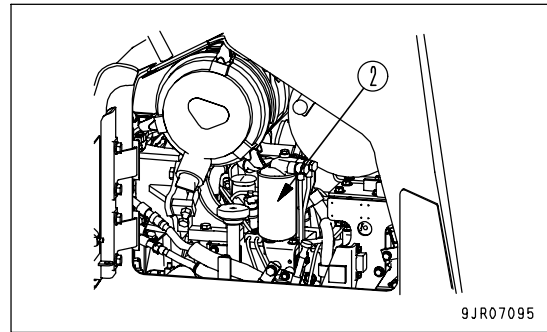
NOTICE

Do not move the blade when the front cover and engine side cover on the left side of the machine are open. The blade will hit the covers and there is danger that the covers may be broken.

- Prepare a container to catch the fuel.
 - Prepare a filter wrench
1. Open the fuel tank inspection cover on the right side of the machine.
 2. Set fuel supply valve (1) to the CLOSED position (direction of arrow).

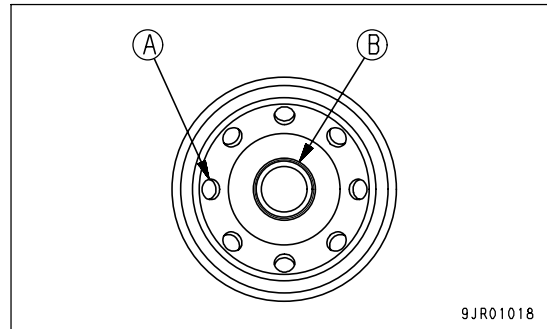


3. Open engine side cover on the left side of machine.
4. Set the container to catch the fuel under the filter cartridge (2).
5. Using a filter wrench, turn filter cartridge (2) counterclockwise on remove it.

**NOTICE**

- Do not fill the new filter cartridge with fuel.
- Remove cap (B) and install the filter cartridge.

6. Clean the filter holder, coat the packing surface of the new filter cartridge thinly with oil, then install the filter cartridge to the filter holder.



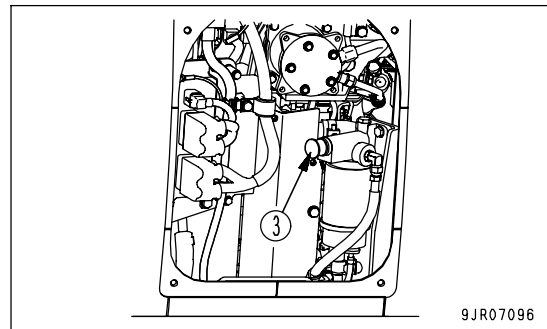
7. When installing, tighten until the packing surface contacts the seal surface of the filter holder, then tighten it 3/4 of a turn.

If the filter cartridge is tightened too far, the packing will be damaged and this will lead to leakage of fuel. If the filter cartridge is too loose, fuel will also leak from the packing, so always tighten the correct amount.

8. Open fuel supply valve (1).
9. After replacing filter cartridge (2), bleed the air from the fuel circuit as follows.
10. Fill the fuel tank with fuel (to the position where the float is at the highest position).
11. Loosen the knob of feed pump (3), pull it out, then pump it in and out until it becomes heavy.

REMARK

- There is no need to remove the plugs from the fuel pre-filter head and fuel main filter head.
- If the engine runs out of fuel, operate feed pump (3) in the same way to bleed the air.



12. After completing the air bleeding operation, push in the knob of feed pump (3) and tighten it.
13. After replacing the filter cartridge, start the engine and run it for 10 minutes at low idling. Check that there is no leakage of fuel from the filter seal surface and the transparent cap mounting surface. If any leakage of fuel is found, check that the filter cartridge is tightened properly. If the fuel still leaks, repeat Steps 1 - 5 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 - 12 to install the new cartridge.

REPLACE FUEL MAIN FILTER CARTRIDGE (POOR FUEL ARRANGEMENT SPECIFICATION)

Carry out this operation after carrying out the maintenance in the "REPLACE FUEL PRE-FILTER CARTRIDGE (PAGE 4-62)" for every 500 hours.



WARNING

- After the engine has been operated, all parts are at high temperature, so do not replace the filter immediately. Wait for all parts 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 stopping the engine to let the internal pressure go down before replacing the filter.
- Do not bring any fire or flame close.

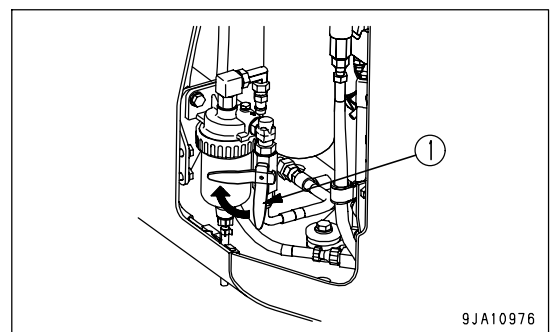
NOTICE

- Genuine Komatsu fuel filter cartridges use a special filter that has 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. Always avoid using substitute parts.
- When carrying out 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.

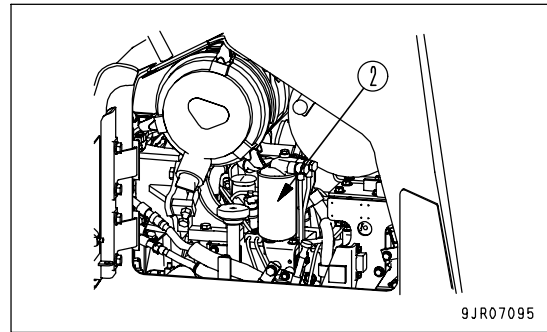
NOTICE

Do not move the blade when the front cover and engine side cover on the left side of the machine are open. The blade will hit the covers and there is danger that the covers may be broken.

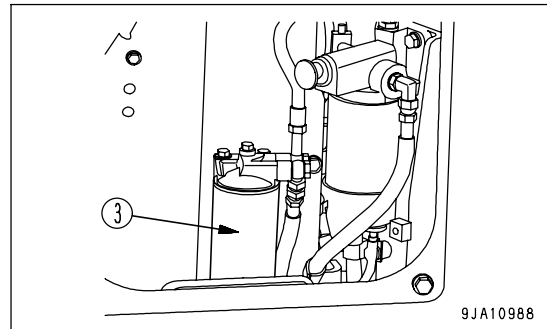
- Prepare a container to catch the fuel.
 - Prepare a filter wrench
1. Open the fuel tank inspection cover on the right side of the machine.
 2. Set fuel supply valve (1) to the CLOSED position (direction of arrow).



3. Open engine side cover on the left side of machine.
4. Set the container to catch the fuel under the filter cartridge (2).
5. Using a filter wrench, turn filter cartridge (2) counterclockwise on remove it.

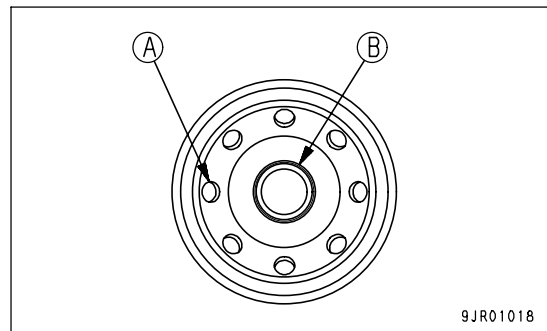


6. Remove the front cover at the front of the machine.
7. Set the container to catch the fuel under the filter cartridge (3).
8. Using a filter wrench, turn filter cartridge (3) counterclockwise to remove it.

**NOTICE**

- Do not fill the new filter cartridge with fuel.
- Remove cap (B) and install the filter cartridge.

9. Clean the filter holder, coat the packing surface of the new filter cartridge thinly with oil, then install the filter cartridge to the filter holder.



10. When installing, tighten until the packing surface contacts the seal surface of the filter holder, then tighten it 3/4 of a turn.

If the filter cartridge is tightened too far, the packing will be damaged and this will lead to leakage of fuel. If the filter cartridge is too loose, fuel will also leak from the packing, so always tighten the correct amount.

REMARK

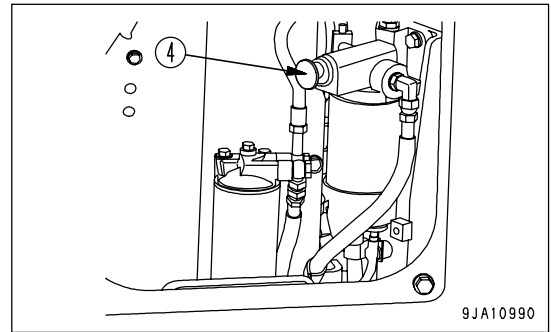
Step 9 and 10 should be carried out for each filter cartridge.

11. Open fuel supply valve (1).
12. After replacing filter cartridges (2) and (3), bleed the air from the fuel circuit as follows.
13. Fill the fuel tank with fuel (to the position where the float is at the highest position).

14. Loosen the knob of feed pump (4), pull it out, then pump it in and out until the movement becomes heavy.

REMARK

- It is not necessary to remove the plug at the top of the fuel pre-filter and fuel main filter.
- After the engine runs out of fuel, use the same procedure to operate feed pump (4) and bleed the air.



15. After completing the air bleeding operation, push in the knob of feed pump (4) and tighten it.
16. After replacing the filter cartridge, start the engine and run it for 10 minutes at low idling. Check that there is no leakage of fuel from the filter seal surface and the transparent cap mounting surface. If any leakage of fuel is found, check that the filter cartridge is tightened properly. If the fuel still leaks, repeat Steps 1 - 8 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 9 - 15 to install the new cartridge.

REPLACE FUEL TANK BREATHER ELEMENT

NOTICE

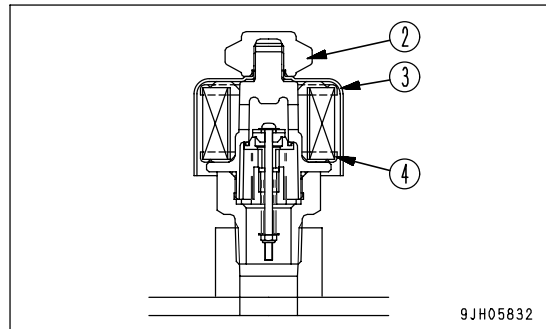
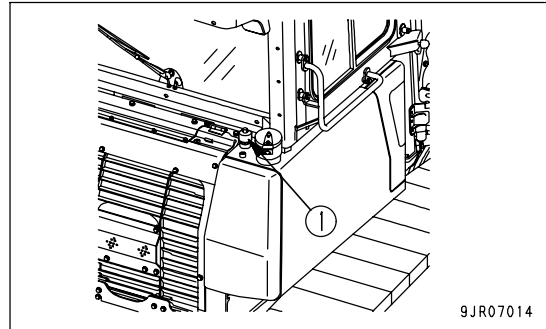
Note that the fuel tank breather and hydraulic tank breather have different part numbers.

(The element is common to both. For details, see "WEAR PARTS LIST (PAGE 4-10)".)

Fuel tank breather part No.: 22U-60-21520

1. Remove nut (2) of breather assembly (1) at the top surface of the fuel tank, then remove cover (3).
2. Replace breather element (4) with a new part.
3. Install cover (3) and nut (2).

Tightening torque: 10 to 14 Nm (1.0 to 1.4 kgm , 7.2 to 10.1 lbft)



REPLACE HYDRAULIC TANK BREATHER ELEMENT

NOTICE

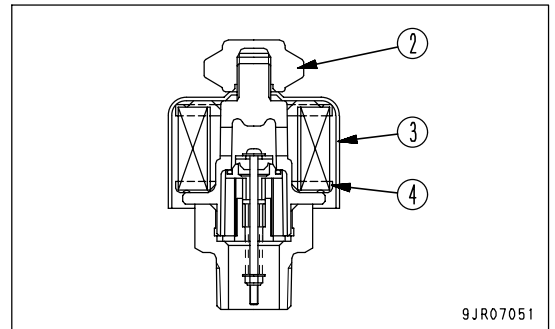
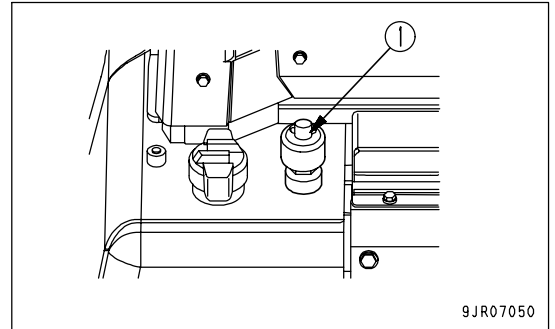
Note that the fuel tank breather and hydraulic tank breather have different part numbers.

(The element is common to both. For details, see "WEAR PARTS LIST (PAGE 4-10)".)

Hydraulic tank breather part No.: 195-60-51550

1. Remove nut (2) of breather assembly (1) at the top of the hydraulic tank, then remove cover (3).
2. Replace breather element (4) with a new part.
3. Install cover (3) and nut (2).

Tightening torque: 10 to 14 Nm (1.0 to 1.4 kgm , 7.2 to 10.1 lbft)



CHANGE OIL IN FINAL DRIVE CASE



WARNING

- The oil is at high temperature immediately after the machine has been operated. Wait for the oil to cool down before starting the operation.
- If there is still pressure remaining inside the case, the oil or plug may fly out.
Loosen the plug slowly to release the pressure.

- Refill capacity: each 3.5 liters (0.92 US gal)
- Prepare a container to catch drain oil.
- Prepare a handle.

1. Set the TOP mark at the top, with the UP mark and plug (P) perpendicular to the ground surface.
2. Set a container under plug (P) to catch the oil.
3. Remove plugs (P) and (F) with the handle and drain the oil.

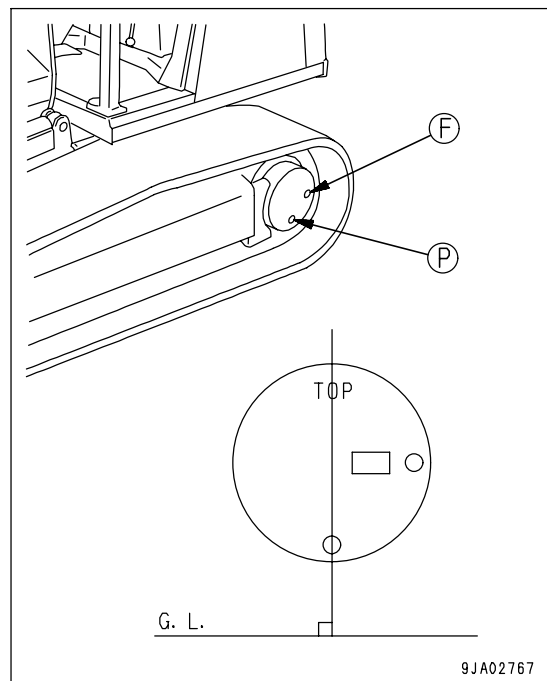
REMARK

Check the O-rings in the plugs for damage. If necessary, replace with new ones.

4. Tighten plug (P).
5. Add oil through the hole of plug (F).
6. When oil begins to overflow from the plug (F) hole, install plug (F).

Tightening torque of plugs (P) and (F):

$68.6 \pm 9.8 \text{ Nm}$ ($7 \pm 1 \text{ kgm}$, $50.6 \pm 7.2 \text{ lbft}$)



CHECK CLAMP TIGHTENING PORTIONS FOR MACHINE INTAKE/EXHAUST PIPING

Please ask your Komatsu distributor to check the tightening of the clamps between the air cleaner - turbocharger - aftercooler - engine.

CHECK FOR LOOSE ROPS MOUNT BOLTS

Check for loose or damaged bolts.

If any bolt is loose, tighten it to the following torque.

If any bolt is damaged, replace the bolt with a Komatsu genuine part.

Rear bolt (1) (x 2): Under tray at rear of operator's seat

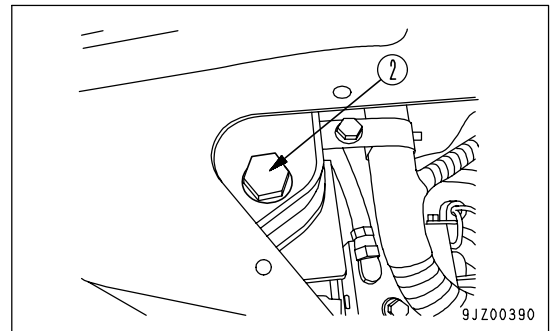
Front bolt (2) (x 2): Under floor plate

Tightening torque

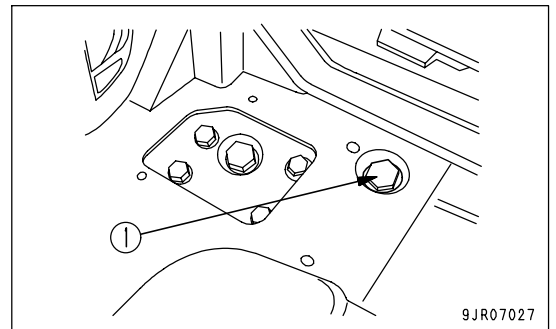
Bolt (1): 785 to 98 Nm (80 to 100 kgm , 785 to 981 lbft)

Bolt (2): 785 to 98 Nm (80 to 100 kgm , 785 to 981 lbft)

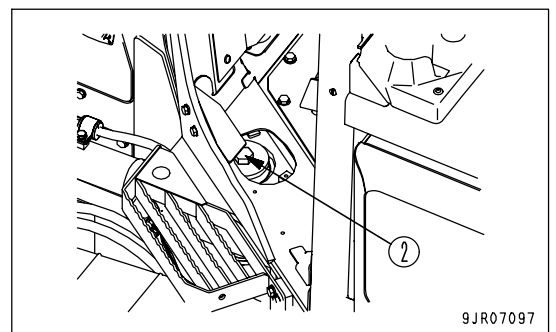
(Machine equipped with cab, front bolt)



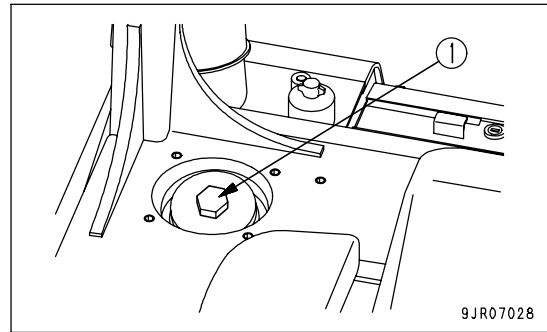
(Machine equipped with cab, rear bolt)



(Machine equipped with canopy, front bolt)



(Machine equipped with canopy, rear bolt)



9JR07028

CHECK, CLEAN FAN



WARNING

- When carrying out cleaning, always stop the engine and stop rotation of the fan. If you touch the fan when it is rotating, you may suffer serious personal injury.
- During the cleaning operation, dust may fly and cause personal injury. Always wear protective glasses, dust mask, and other protective equipment.

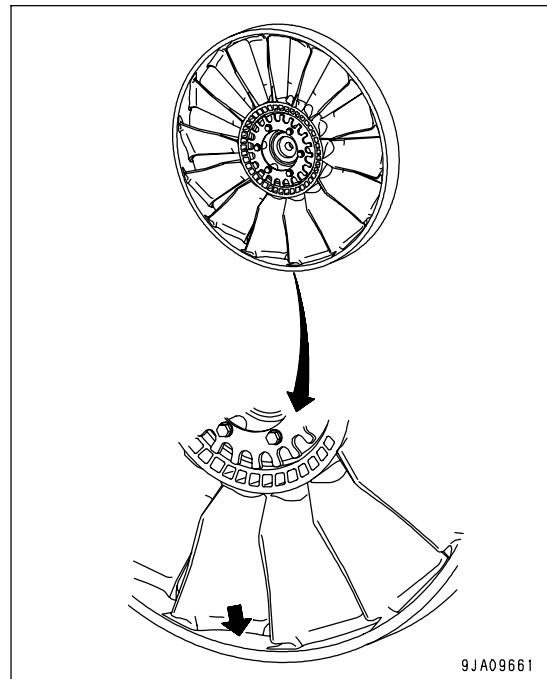
This machine uses a high-performance low-noise ring fan.

If any mud, snow, or ice, or any other material sticks to the fan, use an air blower to remove it.

Even if 1000 hours have not passed, if any mud, snow, ice, or any other material sticks to the area around the ring, wash and remove it immediately.

NOTICE

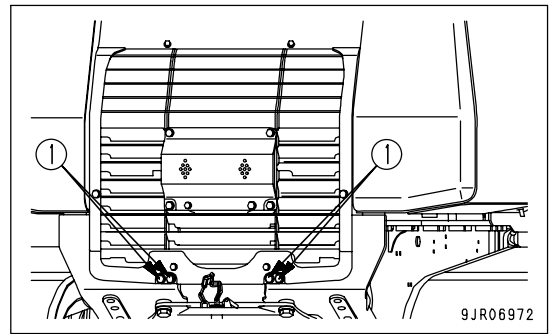
If there is a large amount of mud accumulated around the fan ring, there is danger that the fan may lose its balance and cause vibration.



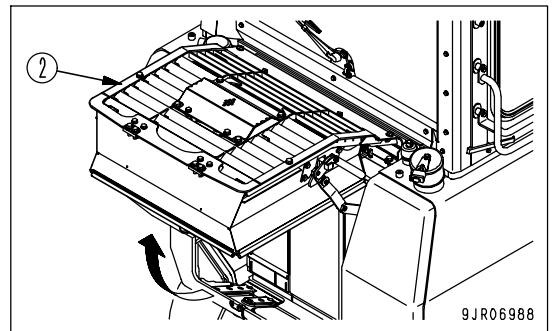
9JA09661

If compressed air cannot be used, use the following procedure when cleaning.

1. Remove 4 bolts (1) at the bottom of the rear mask.



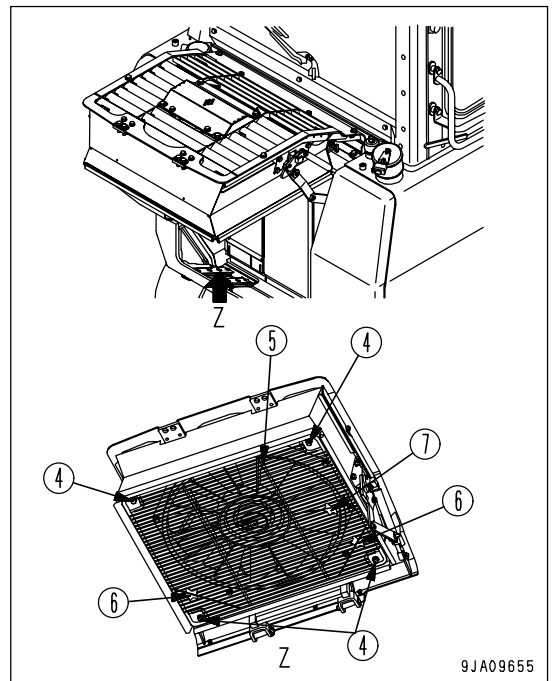
2. Pull rear mask (2) towards you and push it up. Check that the rear mask has opened to the maximum opening position and that the lock is applied, then release it.



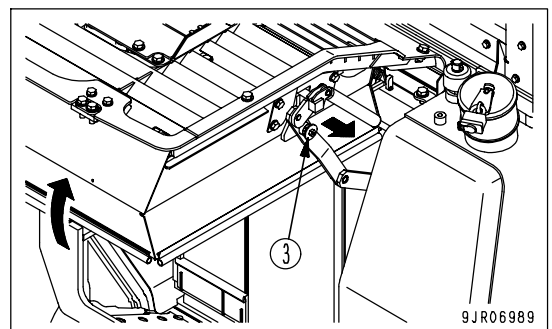
3. Remove 4 bolts (4), then remove net (5) and wipe off all the mud, snow, ice, or other material stuck to fan (7).
4. Install net (5).

NOTICE

Triangular ribs (6) are welded to the corner of net (5) at 2 places. Install net (5) so that ribs (6) are at the position shown in the diagram.



5. Close rear mask (2). When closing the rear mask, lift it up, screw lock release knob (3) in the direction of the arrow to release the lock, then close the rear mask.
6. Tighten 4 bolts (1) at the bottom of the rear mask.



EVERY 2000 HOURS SERVICE

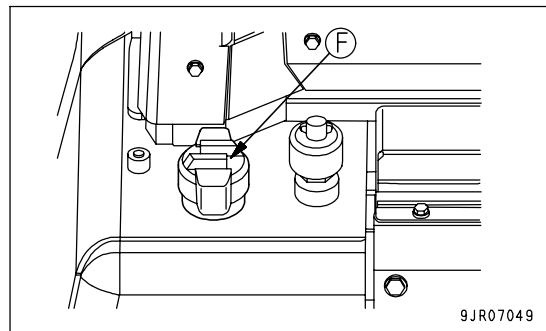
Maintenance for every 50, 250, 500 and 1000 hours service should be carried out at the same time.

CHANGE OIL IN HYDRAULIC TANK, REPLACE HYDRAULIC OIL FILTER ELEMENT AND CLEAN HYDRAULIC TANK STRAINER**WARNING**

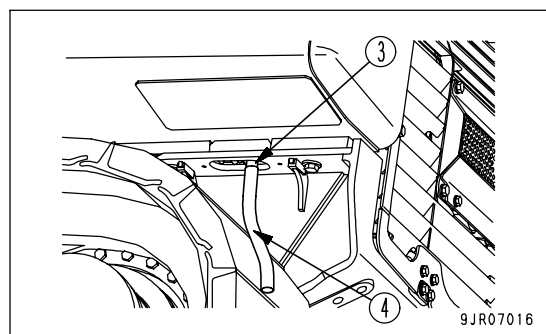
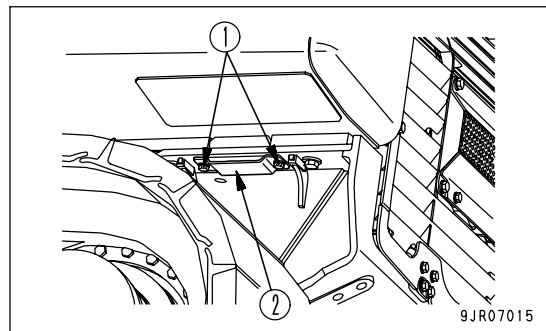
- Immediately after the engine is stopped, the parts and the oil are at a high temperature. Wait for the temperature to go down before starting the operation.
- When the cap of the oil filler port is removed, oil may spurt out, so turn the cap slowly to release the internal pressure, then remove it carefully.

- Refill capacity: 60 liters (15.85 US gal)
- Prepare a container to catch drain oil.
- Prepare a filter wrench
- Prepare a hose.

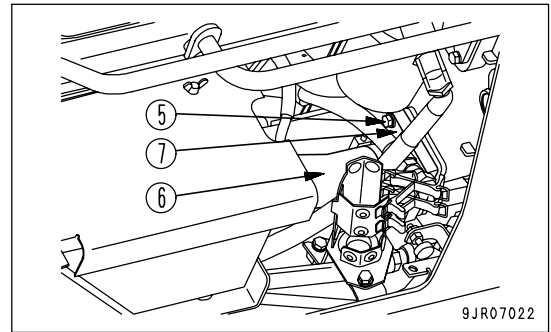
1. Lower the work equipment to the ground, then stop the engine.
2. Turn the cap of oil filler port (F) at the top of the hydraulic tank slowly to release the internal pressure, then remove the cap.



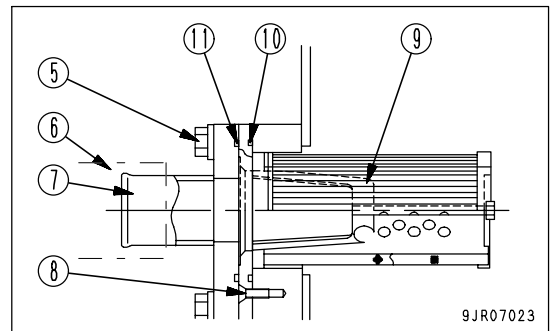
3. Remove 2 bolts (1), then remove cover (2) at the bottom of the hydraulic tank.
4. Install hose (4) to drain port (3). Use a hose that is long enough to reach the container set in position to catch the drained oil.
5. Loosen the drain valve of drain port (3), drain the oil, then tighten the drain valve again after draining the oil. When loosening the drain valve, be careful not to get oil over yourself.



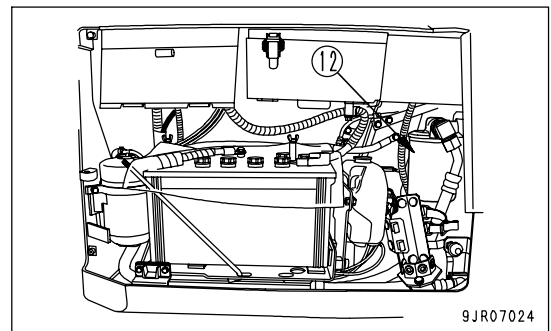
6. Open the hydraulic tank inspection cover on the left side of the machine.
7. Remove 4 bolts (5).
8. Loosen both clamps of hose (6) and move flange (7) towards the front of the machine together with the hose.
9. Bend hose (6) towards you, remove flange (7) from the hose, then remove hose (6) from the piping.
10. Remove 2 bolts (8), then remove strainer (9).
11. Remove all dirt stuck to strainer (9), then wash it in clean diesel oil or flushing oil.



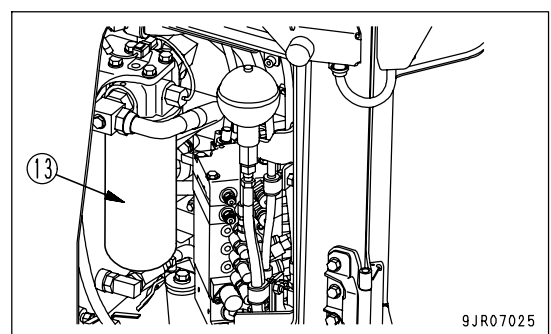
12. Assemble strainer (9) and tighten with bolt (8).
When doing this, replace O-ring (10) (strainer end) with a new part and install.
13. Install hose (6) to the piping, then install flange (7).
14. Tighten flange (7) with bolts (5), then tighten hose (6) with the clamps (both sides).
When doing this, replace O-ring (11) (strainer end) with a new part and install.



15. Set a container under the filter to catch the oil.
16. Using a filter wrench, turn hydraulic filter (return filter) cartridge (12) to the left to remove it.
17. Clean the filter holder, fill the new filter cartridge with oil, then coat the seal and thread of the filter cartridge with oil (or coat thinly with grease) and install.
18. After the packing surface of the cartridge touches the sealing surface of the filter holder, tighten the cartridge further by about 2/3 turns.
Use Komatsu genuine cartridge.



19. Open the fuel tank inspection cover on the right side of the machine.
20. Using a filter wrench, turn charge filter cartridge (13) to the left to remove it.
21. Clean the filter holder, fill the new filter cartridge with oil, then coat the seal and thread of the filter cartridge with oil (or coat thinly with grease) and install.
22. After the packing surface of the cartridge touches the sealing surface of the filter holder, tighten the cartridge further by about 2/3 turns.
Use Komatsu genuine cartridge.



23. Refill the specified quantity of oil through oil filler (F).
24. After adding oil, check that the oil is at the correct level.
For details, see "CHECK OIL LEVEL IN HYDRAULIC TANK, ADD OIL (PAGE 3-74)".
25. After replacing hydraulic oil and cleaning or replacing filter element and strainer, bleed air from the circuit.
For details of the method of bleeding the air from the hydraulic circuit, see "PROCEDURE FOR BLEEDING AIR IN HYDRAULIC SYSTEM (PAGE 4-46)".

CHECK ACCUMULATOR (FOR CONTROL CIRCUIT)

WARNING

The accumulator is charged with high-pressure nitrogen gas, so mistaken operation may cause an explosion, which will lead to serious injury or damage. When handling the accumulator, always do as follows.

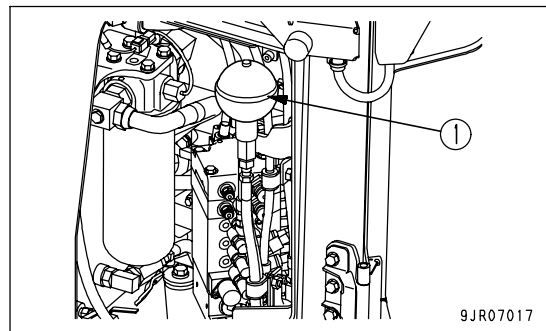
- The pressure in the hydraulic circuit cannot be completely removed. When removing the hydraulic equipment, do not stand in the direction that the oil spurts out when carrying out the operation. In addition, loosen the bolts slowly when carrying out the operation.
- Do not disassemble the accumulator.
- Do not bring it near flame or dispose of it in fire.
- Do not make holes in it or weld it.
- Do not hit it, roll it, or subject it to any impact.
- When disposing of the accumulator, the gas must be released. Please contact your Komatsu distributor to have this work carried out.

ACCUMULATOR FUNCTION

Accumulator (1) stores the pressure in the control circuit. Even after the engine is stopped, the control circuit can be actuated for a short time, so the following actions are possible.

- If the control lever is operated in the direction to lower the work equipment, the work equipment can go down under its own weight.
- The pressure in the hydraulic circuit can be released.

The accumulator is installed to the position shown in the diagram on the right.

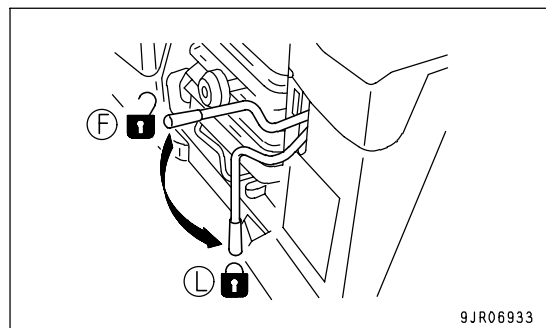


METHOD OF CHECKING ACCUMULATOR FUNCTION

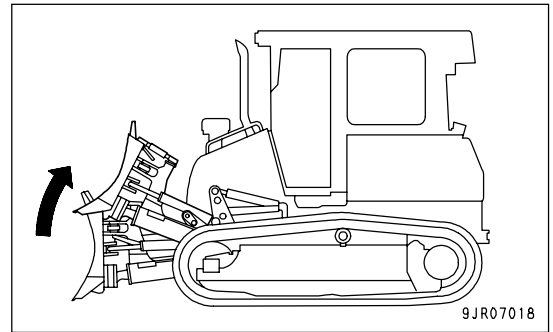
Replace the accumulator every 2 years or every 4000 hours, whichever comes sooner.

Check the accumulator as follows.

1. Stop the machine on firm, level ground.
2. Operate the parking brake lever to LOCK position (L).



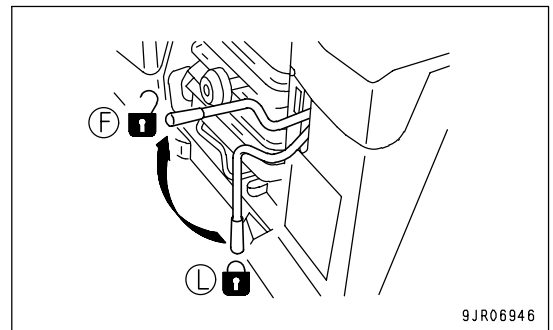
3. Raise the work equipment (blade) to the maximum height.



NOTICE

Carry out the following procedure for lowering the blade to the ground within 15 seconds after stopping the engine. When the engine is stopped, the pressure inside the accumulator gradually goes down, so this inspection can be carried out only immediately after the engine is stopped.

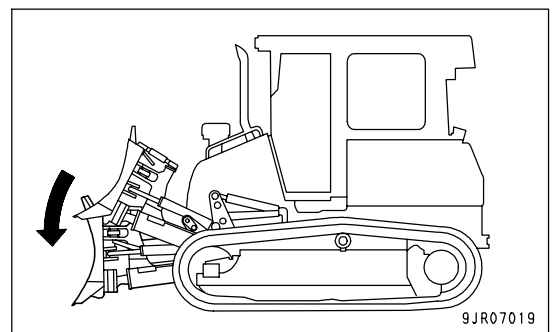
4. Leave the work equipment raised to the maximum height, turn the starting switch to the OFF position and stop the engine.
5. Turn the key in the starting switch to the ON position.
6. Turn the work equipment lock lever to FREE position (F).
7. Operate the blade control lever fully in the direction to lower the blade.



REMARK

Check that the area around the machine is safe, then operate the blade control lever to the LOWER position.

8. Check that the work equipment goes down to the ground under its own weight.
9. This completes the inspection.



NOTICE

If operations are continued when the function of the accumulator has dropped, it becomes impossible to release the remaining pressure in the hydraulic circuit when there is a failure in the machine.

In the following cases, the charge pressure of the accumulator has gone down. Please contact your Komatsu distributor.

- Work equipment does not go down
- Stops while going down

CHECK ALTERNATOR

Contact your Komatsu distributor to have the alternator checked.

If the engine is started frequently, have this inspection carried out every 1000 hours.

CHECK ENGINE VALVE CLEARANCE, ADJUST

Contact your Komatsu distributor for cleaning or inspection.

EVERY 4000 HOURS SERVICE

Maintenance for every 50, 250, 500, 1000 and 2000 hours service should be carried out at the same time.

REPLACE ACCUMULATOR (FOR CONTROL CIRCUIT)

Replace the accumulator every 2 years or every 4000 hours, whichever comes sooner.



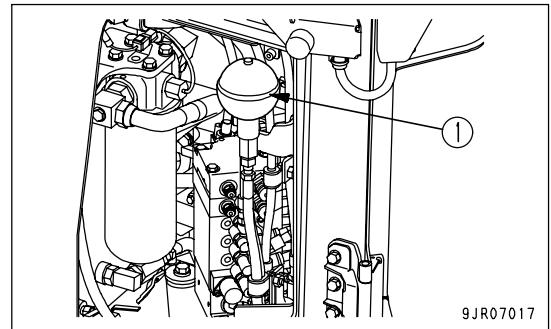
WARNING

The accumulator is charged with high-pressure nitrogen gas, so mistaken operation may cause an explosion, which will lead to serious injury or damage. When handling the accumulator, always do as follows.

- The pressure in the hydraulic circuit cannot be completely removed. When removing the hydraulic equipment, do not stand in the direction that the oil spurts out when carrying out the operation. In addition, loosen the bolts slowly when carrying out the operation.
- Do not disassemble the accumulator.
- Do not bring it near flame or dispose of it in fire.
- Do not make holes in it or weld it.
- Do not hit it, roll it, or subject it to any impact.
- When disposing of the accumulator, the gas must be released. Please contact your Komatsu distributor to have this work carried out.

If operations are continued when the function of accumulator (1) has dropped, it becomes impossible to release the remaining pressure in the hydraulic circuit when there is a failure in the machine.

If this happens, ask your Komatsu distributor to replace the accumulator.



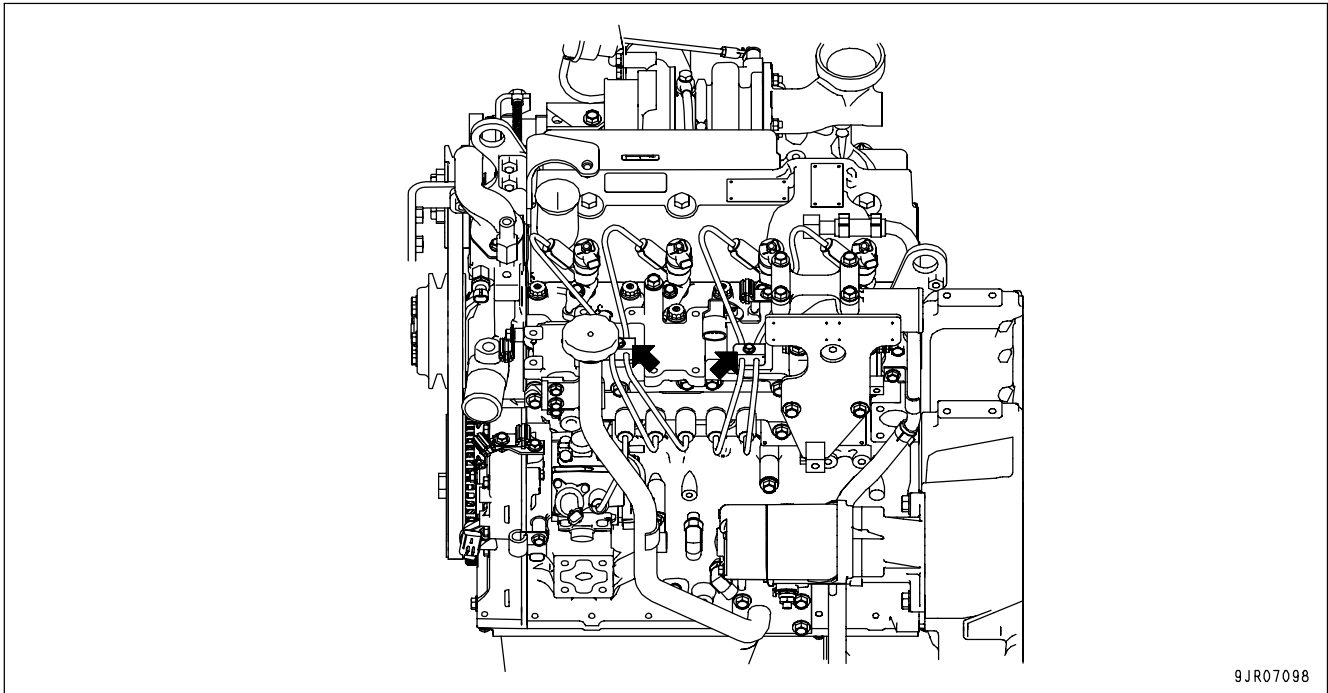
CHECK WATER PUMP

Check that there is no play in the pulley, leakage of oil or water, or clogging of the drain hole. If any problem is found, please contact your Komatsu distributor for repairs or replacement.

CHECK STARTING MOTOR

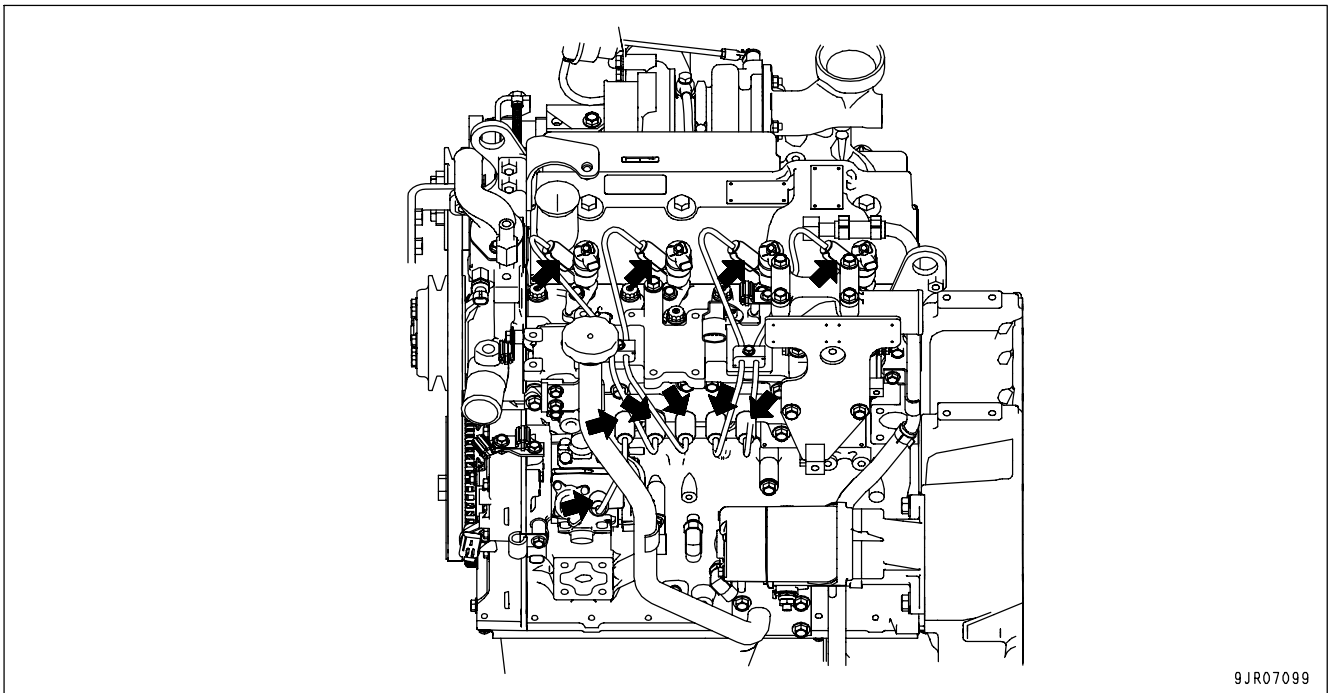
Contact your Komatsu distributor to have the starting motor checked.

If the engine is started frequently, have this inspection carried out every 1000 hours.

CHECKING FOR LOOSENESS OF HIGH-PRESSURE CLAMP, HARDENING OF RUBBER

9JR07098

Check visually and touch by hand to check that there is no hardening of the rubber and no loose bolts of the mounting clamps (2 places) for the high-pressure piping between the supply pump and the common rail. If there are any problems, the parts must be replaced. In this case, please ask your Komatsu distributor to carry out replacement.

CHECKING FOR MISSING FUEL SPRAY PREVENTION CAP, HARDENING OF RUBBER

The fuel spray prevention caps (10 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. Check visually and touch by hand to check that there are no missing caps, loose bolts or hardening of the rubber. If there are any problems, the parts must be replaced. In this case, please ask your Komatsu distributor to carry out replacement.

EVERY 8000 HOURS SERVICE

Maintenance for every 50, 250, 500, 1000, 2000 and 4000 hours service should be carried out at the same time.

REPLACE HIGH-PRESSURE PIPING CLAMPS

Contact your Komatsu distributor to have the engine high-pressure clamps replaced.

REPLACE FUEL SPLAY PREVENTION CAPS

Contact your Komatsu distributor to have the fuel spray prevention cap replaced.

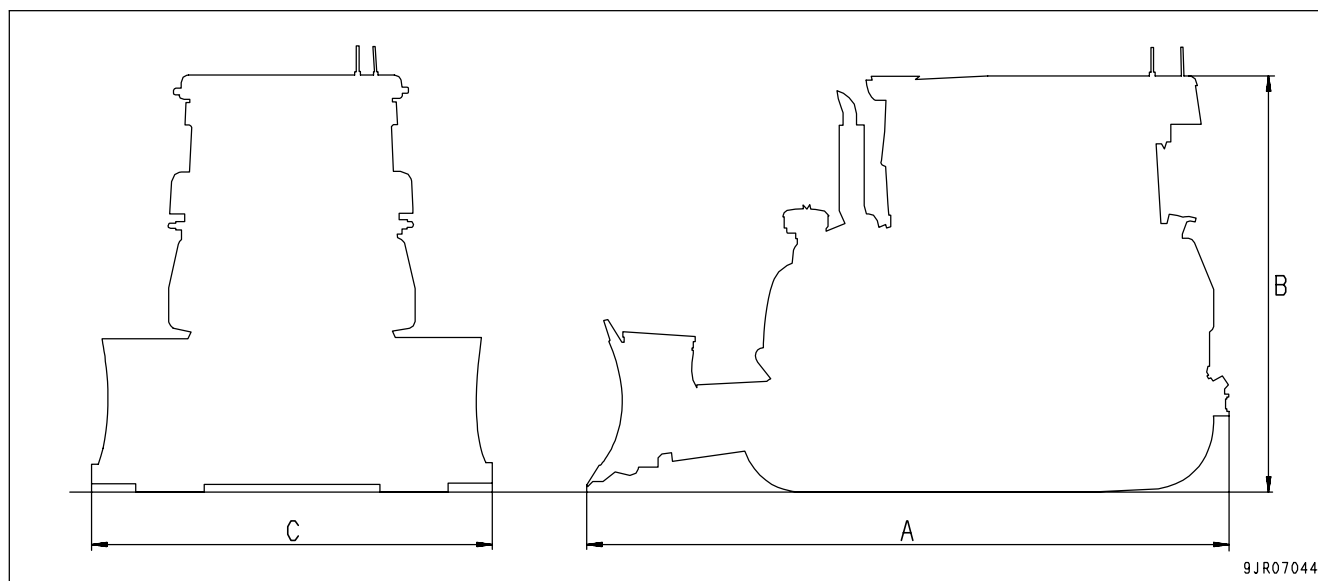
SPECIFICATIONS

SPECIFICATIONS

D31EX-22: Power angle, power tiltdozer, with ROPS cab

D31PX-22: Power angle, power tiltdozer, with ROPS cab

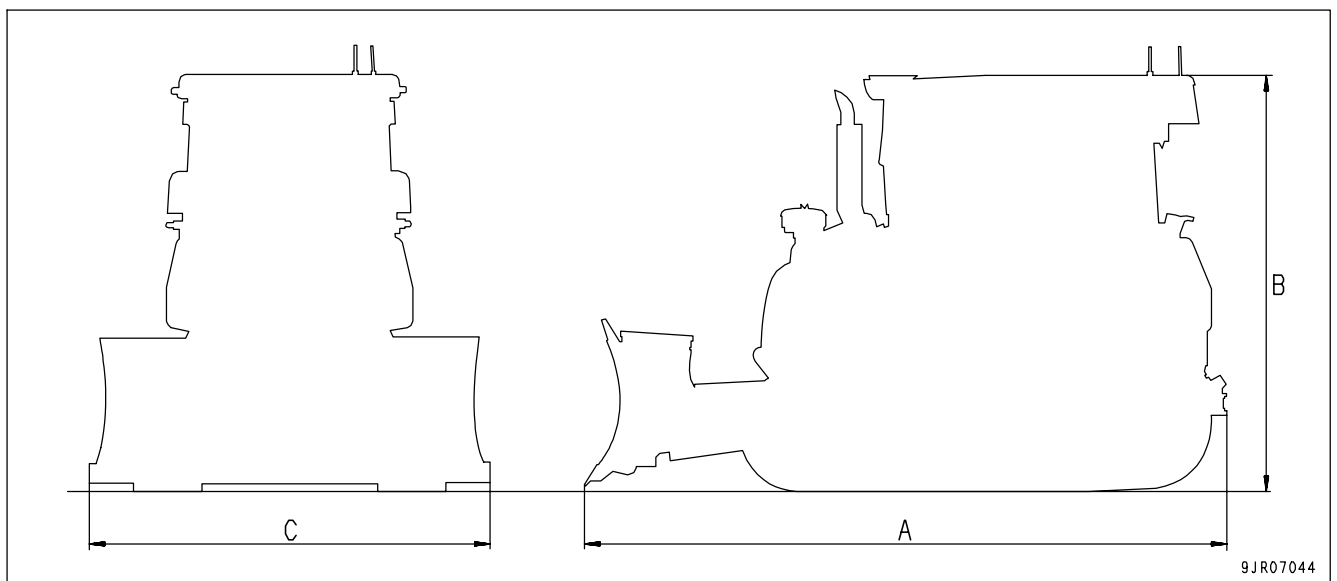
Item		Unit	D31EX-22	D31PX-22
Machine weight		kg (lb)	8,190 (18,059)	8,540 (18,831)
Name of engine		-	Komatsu SAA4D95LE-5 diesel engine	
Engine horsepower		kW{HP}/rpm	58{78}/2,200	
A	Overall length	mm (ft in)	4,175 (13' 8")	4,155 (13' 8")
B	Overall height	Not including antenna	2,755 (9' 0")	
		To tip of KOMTRAX antenna	2,945 (9' 8")	
C	Overall width The figure in [] shows the width when the narrow blade is installed.	mm (ft in)	2,550 (8' 4")	3,250 (10' 8") [2,875 (9' 5")]
	Travel speed (Quick shift mode)	Forward (1st/2nd/3rd)	3.4/5.6/8.5 (2.1/3.5/5.3)	
		Backward (1st/2nd/3rd)	4.1/6.5/8.5 (2.5/4.0/5.3)	
	Travel speed (Variable shift mode)	Forward	0.8 - 8.5 (0.5 - 5.3)	
		Backward	0.8 - 8.5 (0.5 - 5.3)	



D37EX-22: Power angle, power tiltdozer, with ROPS cab

D37PX-22: Power angle, power tiltdozer, with ROPS cab

Item		Unit	D37EX-22	D37PX-22
Machine weight		kg (lb)	8,300 (18,302)	8,650 (19,073)
Name of engine		-	Komatsu SAA4D95LE-5 diesel engine	
Engine horsepower		kW{HP}/rpm	66{89}/2,200	
A	Overall length	mm (ft in)	4,190 (13' 9")	4,175 (13' 7")
B	Overall height	Not including antenna	2,755 (9' 0")	
		To tip of KOMTRAX antenna	2,945 (9' 8")	
C	Overall width The figure in [] shows the width when the narrow blade is installed.	mm (ft in)	2,710 (8' 11")	3,250 (10' 8") [2,875 (9' 5")]
	Travel speed (Quick shift mode)	Forward (1st/2nd/3rd)	3.4/5.6/8.5 (2.1/3.5/5.3)	
		Backward (1st/2nd/3rd)	4.1/6.5/8.5 (2.5/4.0/5.3)	
	Travel speed (Variable shift mode)	Forward	0.8 - 8.5 (0.5 - 5.3)	
		Backward	0.8 - 8.5 (0.5 - 5.3)	



ATTACHMENTS, OPTIONS

 **WARNING**

Please read and make sure that you understand the SAFETY section before reading this section.

GENERAL PRECAUTIONS

PRECAUTIONS RELATED TO SAFETY

If attachments or options other than those authorized by Komatsu are installed, this will not only affect the life of the machine, but will also cause problems with safety.

When installing attachments not listed in this Operation and Maintenance Manual, contact your Komatsu distributor first.

If you do not contact Komatsu, we cannot accept any responsibility for any accidents or failures.



WARNING

General precautions

- Read the instruction manual for the attachment carefully, and do not use the machine before you understand the operation method completely.

If you lose the instruction manual, be sure to order another copy from your Komatsu distributor.

- To prevent serious personal injury caused by misoperation, place your foot on the pedal only when operating the pedal.

Precautions for removal and installation

When removing or installing an attachment, observe the following items and work safely.

- Select a firm, level surface when installing or removing an attachment.
- When working in cooperation with one or more other workers, decide signs and observe them when carrying out the operation.
- When carrying a heavy part (25 kg (55 lb) or more), use a crane.
- When removing a heavy part, always place a support in position before removing it.

When lifting a load with a crane, be particularly careful of the center of gravity.

- It is dangerous to carry out operations when the load has been raised by a crane. Always lower the load onto a stand and check that it is safe.
- When leaving an attachment removed or installing it, place it in a stable position to prevent it from falling over.
- Never go under a load raised by a crane.

Always stand in a place which is safe even if the load should fall.

NOTICE

Qualifications are required to operate a crane. Never allow the crane to be operated by an unqualified person.

For details of removal and installation operations, contact your Komatsu distributor.

AIR SUSPENSION SEAT

ADJUSTMENT



When adjusting the position of the operator's seat, always set the work equipment lock lever to the LOCK position to prevent any accidental contact with the control levers.

- Always adjust the operator's seat before starting each operation or when the operators change shift.
- When adjusting the seat, put your back against the backrest and adjust to a position where the brake pedal can be fully depressed.

NOTICE

There is danger of damage to the air compressor, so do not keep lever (3) operated continuously for more than 1 minute.

Adjustments (C), (D), and (I) use the air compressor built into the seat, so 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.

Fore-aft adjustment: 170 mm (6.7 in) (17 stages)

(B) Adjusting seat angle

Operate lever (2) up to raise or lower the seat cushion and set it in the desired position, then release the lever.

Amount of adjustment Forward tilt: 3 degrees

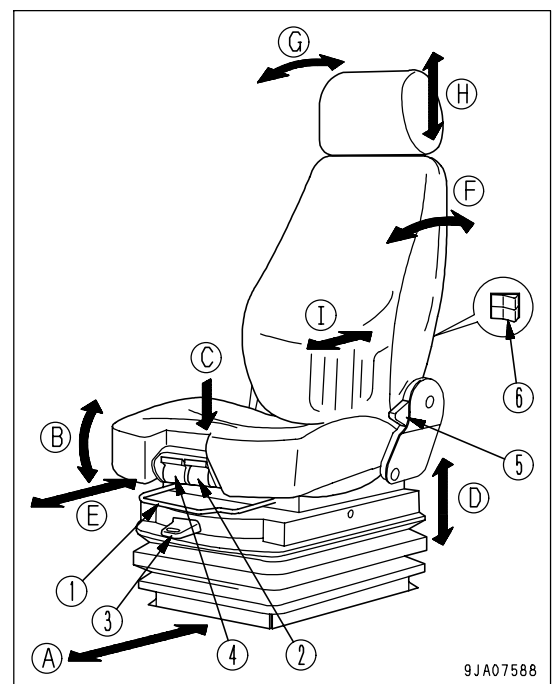
Rear tilt: 11 degrees

(C) Setting seat for operator's weight

To protect the operator, it is necessary to adjust the suspension to match the operator's weight.

Pull lever (3) up fully (pull it until a click can be felt). 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.

If lever (3) is pulled lightly, the weight adjustment starts, but always pull the lever up fully (pull it until a click is felt) before releasing it. When operators change shifts, the new operator should release the air, then repeat the above procedure to adjust the weight setting.



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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.

Amount of adjustment: 80 mm (3.2 in)

After the automatic weight adjustment is carried out, the seat height is at the lowest point in the adjustment range. Adjust the seat to the appropriate height.

(D) Seat height adjustment

The seat height adjustment uses an air system, and it 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 a click is felt).

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.

To prevent the suspension from reaching the bottom, do not set to the seat height below the adjustment range.

(E) Fore-and-aft adjustment of seat cushion

Operate lever (4) up, set the seat cushion in the desired position, then release the lever.

Amount of fore-and-aft adjustment: 60 mm (2.4 in)

(F) Adjusting reclining angle

Move lever (5) 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.

Amount of adjustment

Forward tilt: 20 degrees (over 20 degrees is free)

Rear tilt: 60 degrees

REMARK

The seat can be reclined more when the seat is pushed to the front. The amount of reclining decreases as the seat is pushed back, so when moving the seat back, return the seatback to the upright position.

NOTICE

If the seat back is reclined too far, the seat back may hit the rear glass, so use it in a position where it does not contact the glass.

(G) Adjusting headrest angle

Rotate the headrest to the front or rear to set it to the desired angle.

Amount of adjustment: 38 degrees

(H) Adjusting headrest height

Move the headrest up or down to set it to the desired height.

Amount of adjustment: 100 mm (3.9 in)

(I) Lumbar support

Operate switch (6) to give a suitable tension to the lumbar region.

When + is pressed: Tension becomes stronger

When - is pressed: Tension becomes weaker

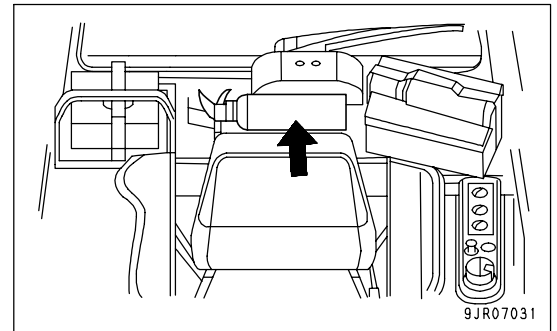
Adjust the backrest to the desired curve.

EQUIPPING FIRE EXTINGUISHER AND FIRST-AID KIT

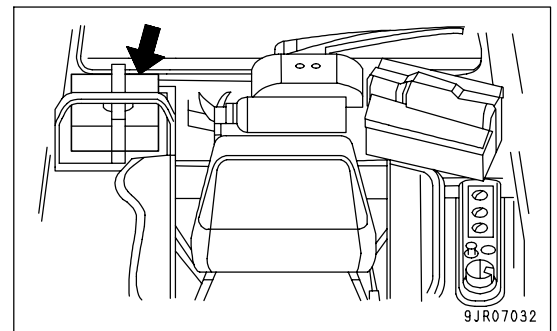
Equipping the fire extinguisher and the first-aid kit at the illustrated position needs brackets (if equipped).
The fire extinguisher and the first-aid kit can be installed to the positions shown in the following illustration.

For parts that are required to install them in your machine, please contact your Komatsu distributor.

When installing a fire extinguisher, install it in the position shown in the diagram.



When installing a first aid box, install it in the position shown in the diagram.



HANDLING MACHINES EQUIPPED WITH KOMTRAX

- 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. Any customers desiring to use the KOMTRAX system should consult their Komatsu distributor.
- The KOMTRAX equipment is a wireless device using radio waves, so 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.
- Near the blasting jobsite, there may be a danger of unexpected explosion due to use of interactive wireless communication device of KOMTRAX and resulting serious personal injury. Make sure to operate the machine away from the blasting jobsite. If you have to operate the machine within 12 m (39 ft 4 in) from the blasting jobsite or the remote blasting device, ask your Komatsu distributor to disconnect power source cable of KOMTRAX in advance.

If there are any restriction or law of the territory or country where the machine equipped with this device is used, such restriction or law has a priority than this warning.

KOMTRAX specifications are as follows.

Rated horsepower: 5 - 10 W

Operating frequency: 148 - 150 MHz

NOTICE

- 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, take the action given in "LONG-TERM STORAGE (PAGE 3-122)".
- Please 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.

REMARK

- The KOMTRAX system uses wireless communications, so it cannot be used inside tunnels, underground, inside buildings, or in mountain 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 communication service area.
- There is absolutely no need to inspect or operate the KOMTRAX communications terminal, but if any abnormality is found, please consult your Komatsu distributor.

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D31EX-22, D31PX-22, D37EX-22, D37PX-22 BULLDOZER

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