Operation & Maintenance Manual

SEAM043102P

PC40MR-X1

HYDRAULIC EXCAVATOR

SERIAL NUMBERS PC40MRx-5501 and up

⚠ 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.

FOREWORD

This manual provides rules and guidelines which will help you use this machine safely and effectively. The precautions in this manual must be followed at all times when performing operation and maintenance. Most accidents are caused by the failure to follow fundamental safety rules for the operation and maintenance of machines. Accidents can be prevented by knowing beforehand conditions that may cause hazard when performing operation and maintenance.

⚠ WARNING

Before beginning operation or maintenance, operators and maintenance personnel must always observe the following points.

- **Read this manual thoroughly and understand its contents fully.**
- **Read the safety messages and safety labels given in this manual carefully so that they should be understood fully.**

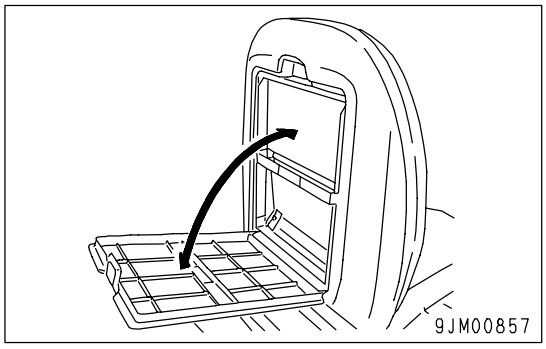
Keep this manual at the storage location for the Operation and Maintenance Manual given below so that all personnel involved in working on the machine can consult it periodically.

In case this manual should be lost or damaged, immediately contact Komatsu or your Komatsu distributor to obtain a new copy.

When you sell the machine, make sure that this manual should be provided to the new owner together with the machine.

In this manual, measurements are expressed in international standard units (SI). For the reference purpose, weight units used in the past are also displayed in { }.

Storage location for the Operation and Maintenance Manual:
Pocket at rear of operator's seat



EMISSION CONTROL WARRANTY

EMISSION CONTROL WARRANTY STATEMENT (APPLIES TO CANADA ONLY)

1. **Products Warranted**

   [illegible]

2. **Coverage**

   [illegible]

3. **Limitations**

   [illegible]

KOMATSU IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This warranty together with the express commercial warranties are the sole warranties of Komatsu. **THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

GARANTIE SUR LE CONTRÔLE DES ÉMISSIONS

ÉNONCÉ DE GARANTIE SUR LE CONTRÔLE DES ÉMISSIONS (APPLICABLE AU CANADA SEULEMENT):

1. **Produits garantis.**

   [illegible]

2. **Couverture.**

   [illegible]

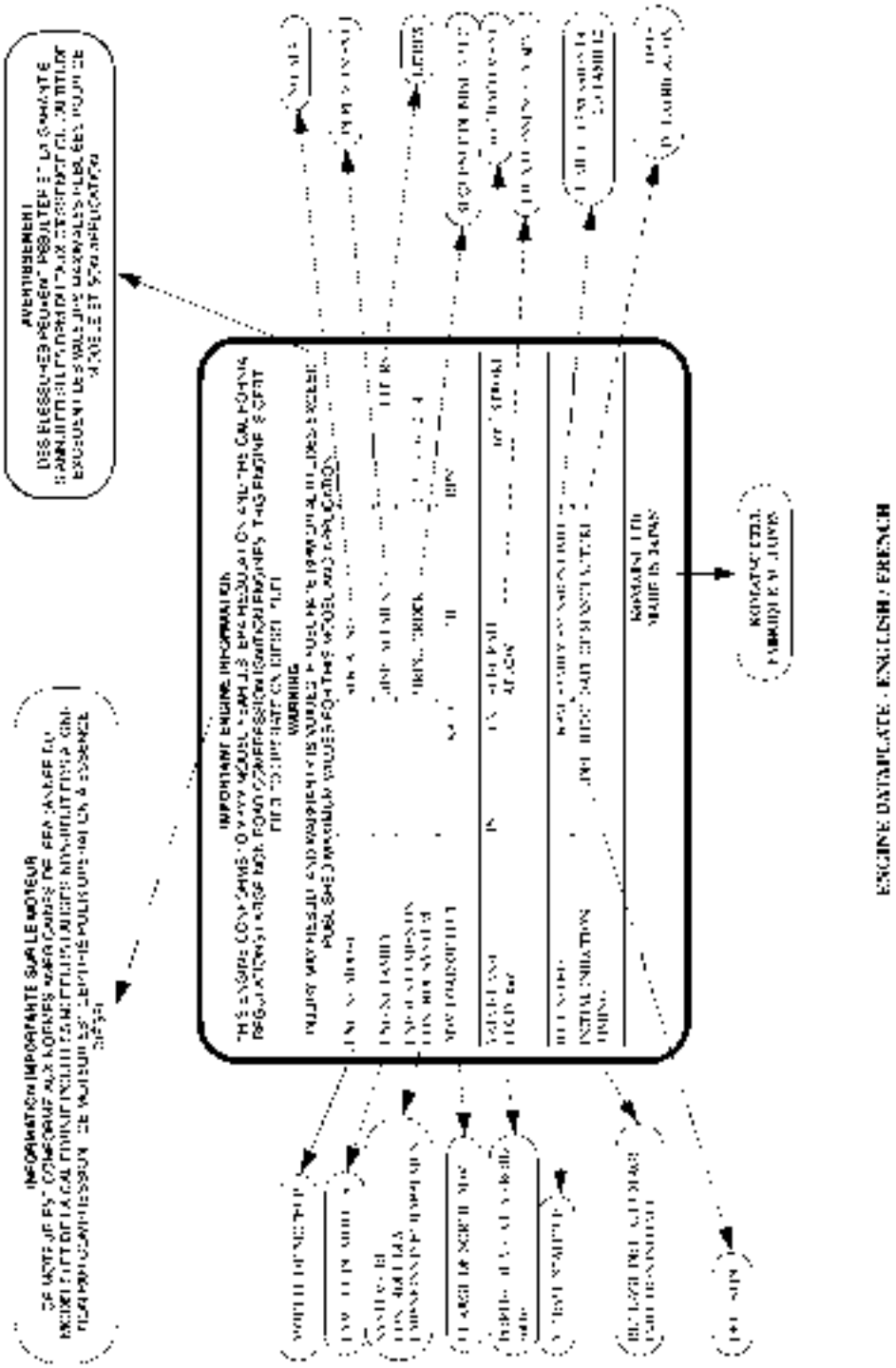
3. **Limitations:**

   [illegible]

KOMATSU N'EST PAS RESPONSABLE DES INCIDENTS OU DOMMAGES CONSÉQUENTS.

Cette garantie, ainsi que les garanties expresses commerciales, sont les seules garanties de Komatsu. **IL N'Y A AUCUNE AUTRE GARANTIE, EXPRESSE OU SOUS-ENTENDUE, MARCHANDABLE OU PROPICE À UNE UTILISATION PARTICULIÈRE.**

[illegible] - Komatsu America International Company [illegible]



ENGINE DATA PLATE - ENGLISH / FRENCH

SAFETY INFORMATION

To enable you to use this machine safely, safety precautions and labels are given in this manual and affixed to the machine to give explanations of situations involving potential hazards and of the methods of avoiding such situations.

Signal words

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

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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

⚠ CAUTION Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. This word is used also to alert against unsafe practices that may cause property damage.

Example of safety message using signal word

⚠ WARNING

When standing up from the operator's seat, always place the safety lock lever in the LOCK position.
If you accidentally touch the control levers when they are not locked, this may cause a serious injury or death.

Other signal words

In addition to the above, the following signal words are used to indicate precautions that should be followed to protect the machine or to give information that is useful to know.

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

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

- **Safety labels**

Safety labels are affixed to the machine to inform the operator or maintenance worker on the spot when carrying out operation or maintenance of the machine that may involve hazard.
This machine uses "Safety labels using words" and "Safety labels using pictograms" to indicate safety procedures.

Example of safety label using words

Safety labels using pictogram

Safety pictograms use a picture to express a level of hazardous condition equivalent to the signal word. These safety pictograms use pictures in order to let the operator or maintenance worker understand the level and type of hazardous condition at all times. Safety pictograms show the type of hazardous condition at the top or left side, and the method of avoiding the hazardous condition at the bottom or right side. In addition, the type of hazardous condition is displayed inside a triangle and the method of avoiding the hazardous condition is shown inside a circle.

Komatsu cannot predict every circumstance that might involve a potential hazard in operation and maintenance. Therefore, the safety messages in this manual and on the machine may not include all possible safety precautions. If any procedures or actions not specifically recommended or allowed in this manual are used, it is your responsibility to take the necessary steps to ensure safety.
In no event should you engage in prohibited uses or actions described in this manual.

The explanations, values, and illustrations in this manual were prepared based on the latest information available at that time. Continuing improvements in the design of this machine can lead to changes in detail which may not be reflected in this manual. Consult Komatsu or your Komatsu distributor for the latest available information of your machine or for questions regarding information in this manual.

The numbers in circles in the illustrations correspond to the numbers in ( ) in the text. (For example: ① -> (1))

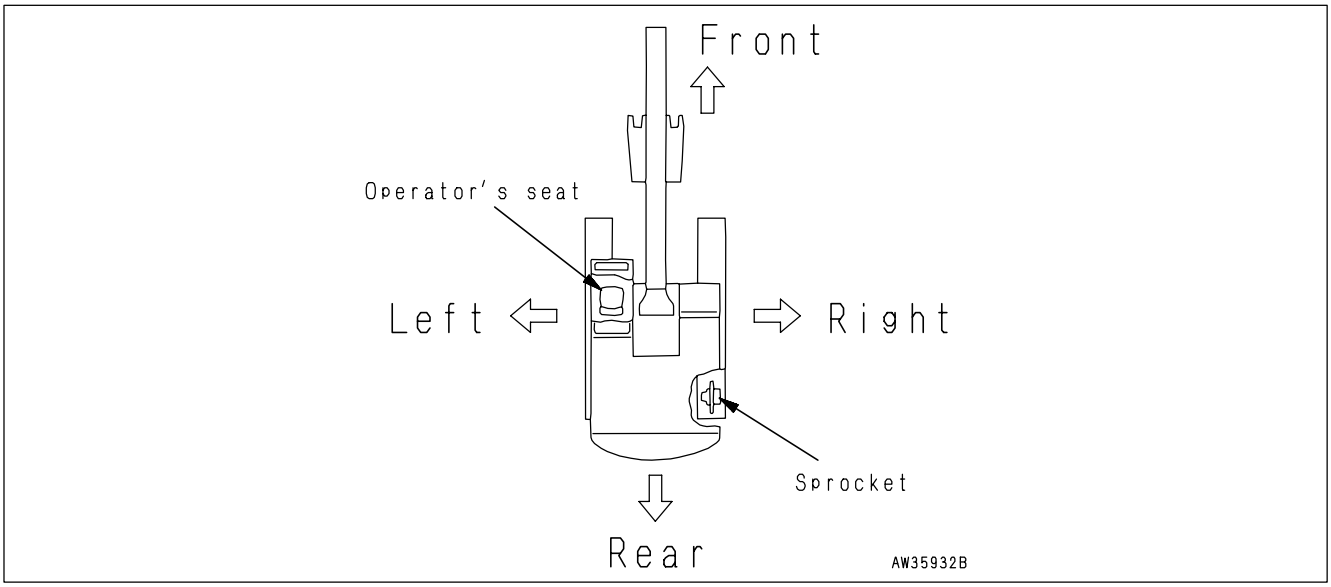
INTRODUCTION

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

- Digging work
- Leveling work
- Ditching work
- Loading work
- Demolition work

See the section "RECOMMENDED APPLICATIONS (PAGE 3-68)" for further details.

DIRECTIONS OF MACHINE



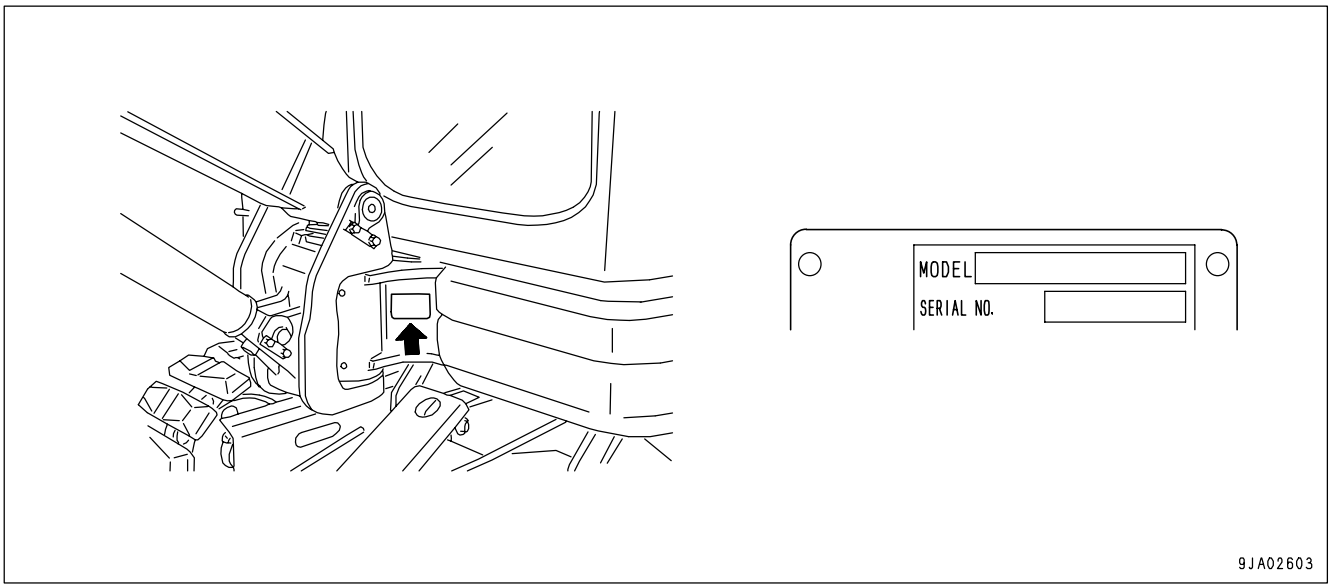
In this manual, the terms front, rear, left, and right refer to the travel direction as seen from the operator's cab when the operator's cab is facing the front and the sprocket is at the rear of the machine.

PRODUCT INFORMATION

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

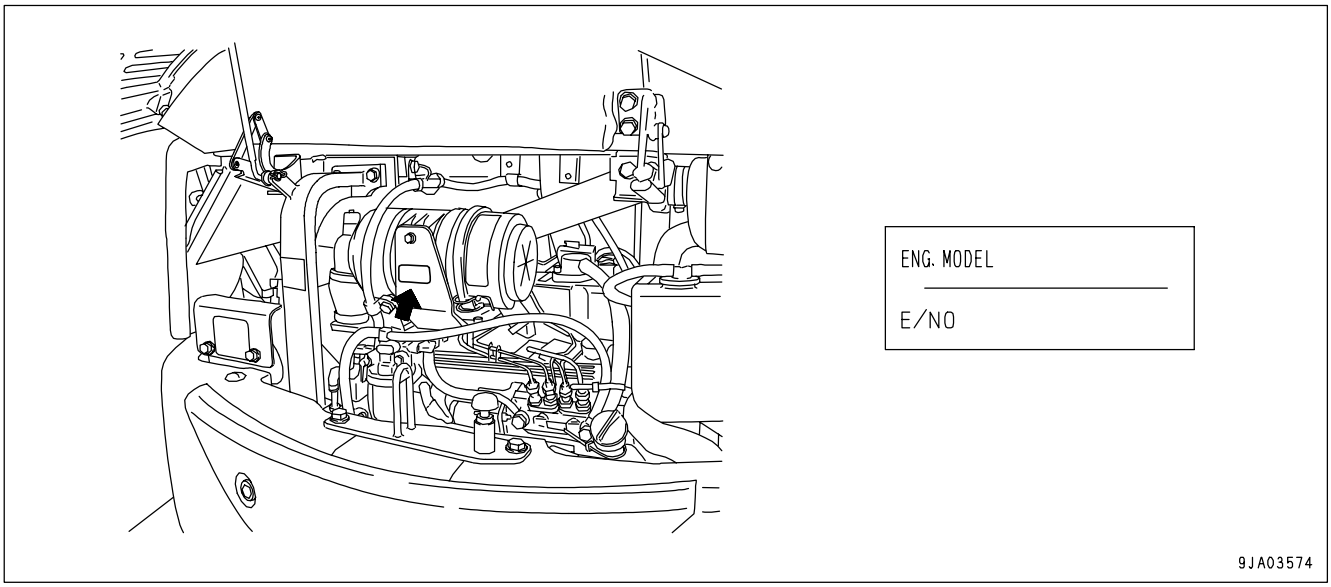
MACHINE SERIAL NUMBER PLATE AND ITS LOCATION

On the left front of the frame.



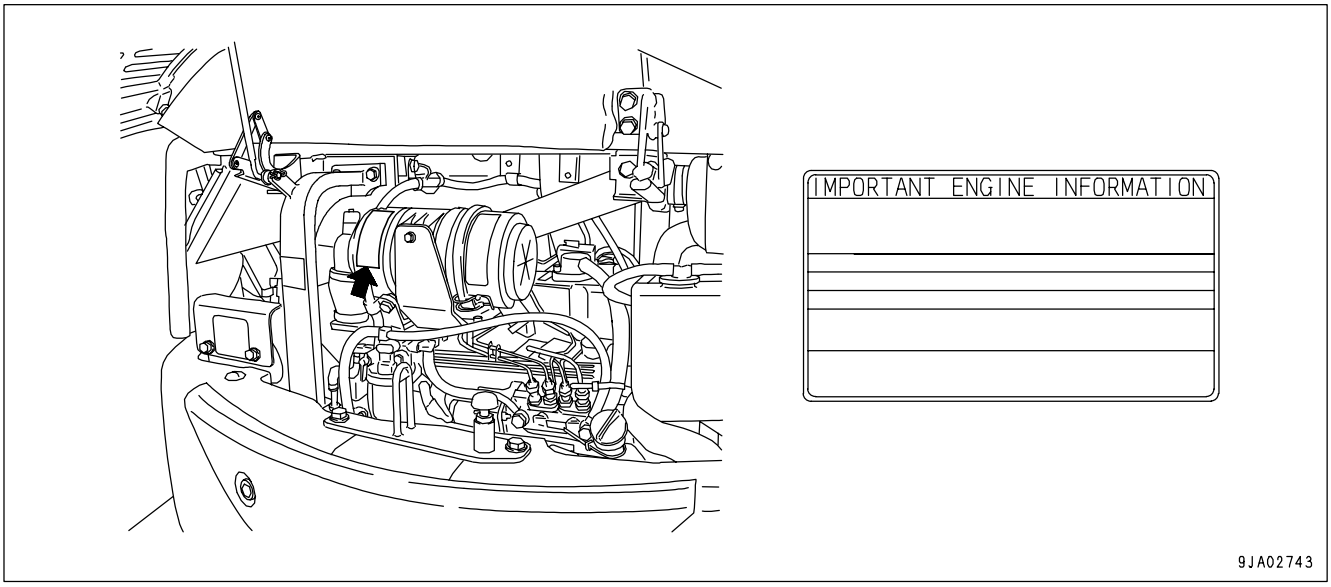
ENGINE SERIAL NUMBER PLATE AND ITS LOCATION

This is stuck to the air cleaner bracket.



EMISSION CONTROL INFORMATION LABEL AND ITS LOCATION

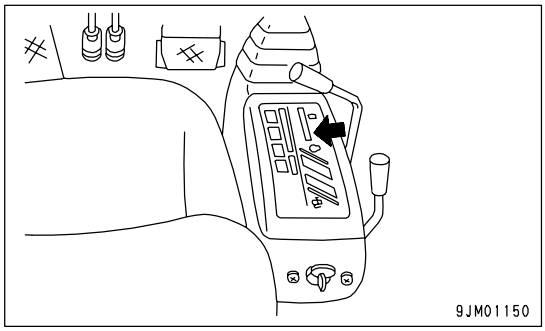
This is stuck to the air cleaner.



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

SERVICE METER LOCATION

On top of the machine monitor



YOUR MACHINE SERIAL NUMBERS AND DISTRIBUTOR

Machine serial No.	
Engine serial No.	
Distributor name Address Service Personnel Phone/Fax	

CONTENTS

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.

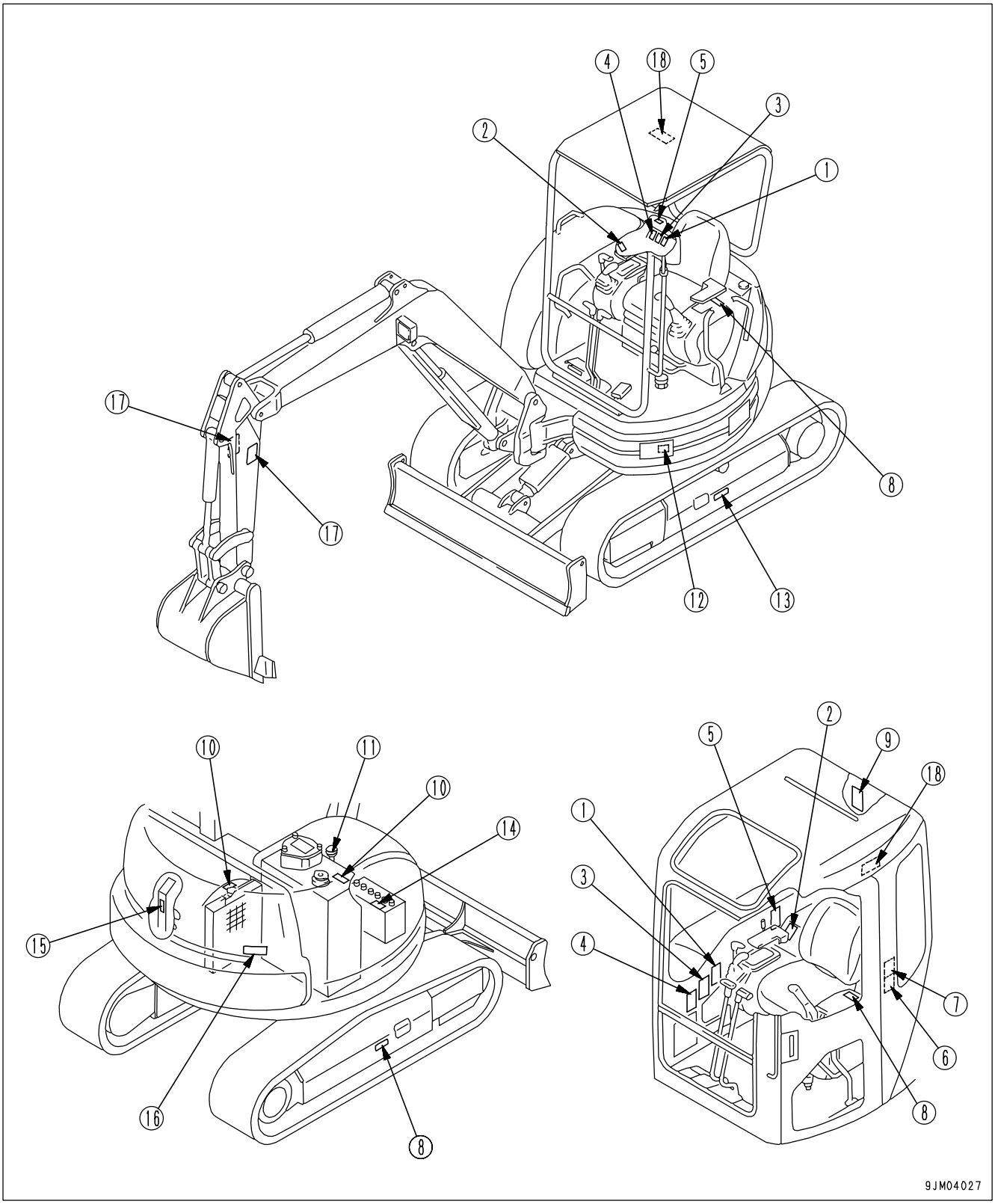
SAFETY INFORMATION

WARNING LABELS AND PICTOGRAMS

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

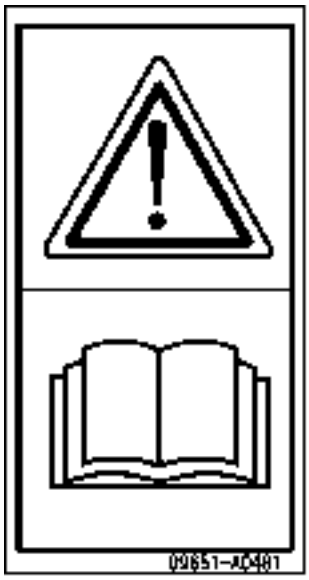
- Be sure that you fully understand the correct position and content of labels.
- To ensure that the content of labels can be read properly, be sure that they are in the correct place and always keep them clean. When cleaning them, do not use organic solvents or gasoline. These may cause the labels to peel off.
- There are also other labels in addition to the warning signes 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.

WARNING LABELS AND PICTOGRAMS - LOCATION



WARNING LABELS AND PICTOGRAMS - ACTUAL

(1) Precautions for operation, inspection and maintenance (09651-A0481)



Warning !

Read manual before operation, maintenance, disassembly, assembly and transportation.

(2) Precautions for operation (22M-98-12110)

Sign indicates a crush hazard by rotation of upper structure of the machine

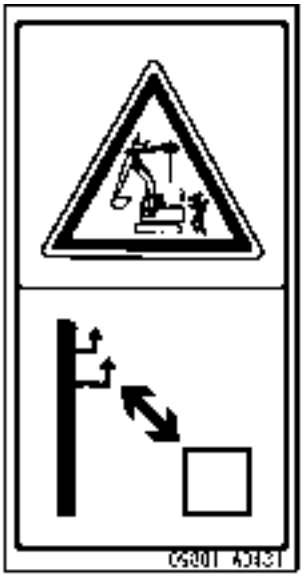
Keep away from swinging area of machine

(3) Precautions for leaving operator's seat (09654-A0481)

There is the hazard that machine may move suddenly and catch or run over someone near the machine causing injury.

When leaving the machine, always lower the work equipment completely to the ground, place the control levers in LOCK position, stop the engine and remove the key and take it with you.

(4) Precautions for going close to electric cables (09801-A0481)

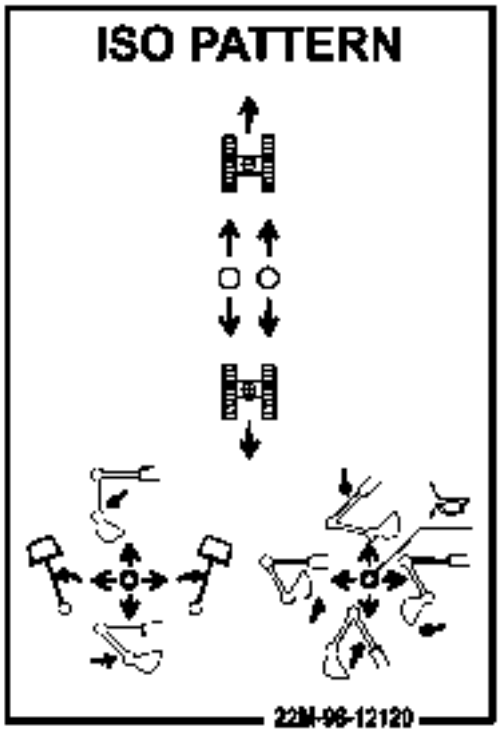


If machine goes close to high-voltage cables, it will result in electric shock to the operator.

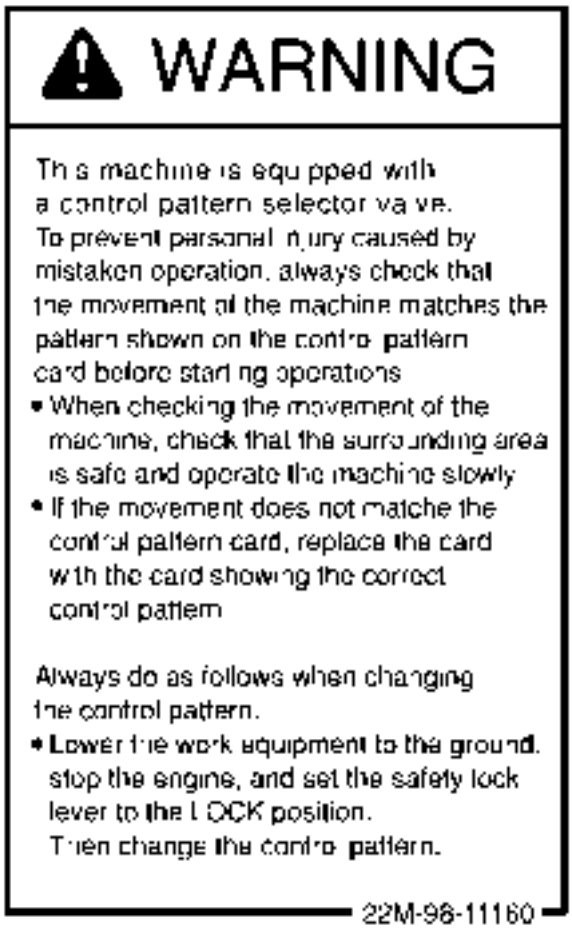
Maintain a safe distance between the machine and the electric cables.

(5) Precautions for operating pattern

Standard machine (22M-98-12120)



Machine equipped with operating pattern selector valve (22M-98-11160)



(6) Precautions when swinging work equipment (22M-98-11520)

(7) Precautions for leaving the operator's seat (09839-03000)

(8) The safety lock is operated with the lock lever (22L-98-18240)

(9) Precautions for stowage (09803-A0481)

When the front window is stowed, there is the hazard that it will fall.

Always lock the front window securely at the stowed position.

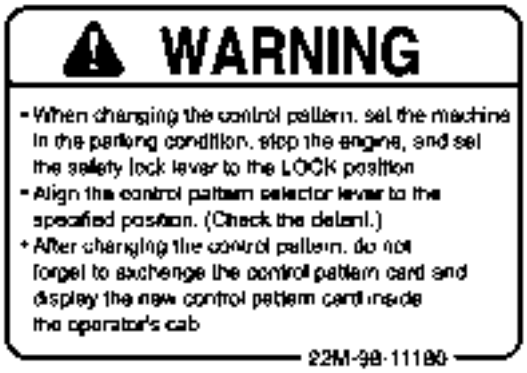
(10) Precautions for high-temperature cooling water and hydraulic oil (09653-A0361)

Never remove the cap when the engine is at operating (high) tempratures. Stream or high temperature oil blowing up from the radiator or hydraulic tank will cause personal injury and/or burns.

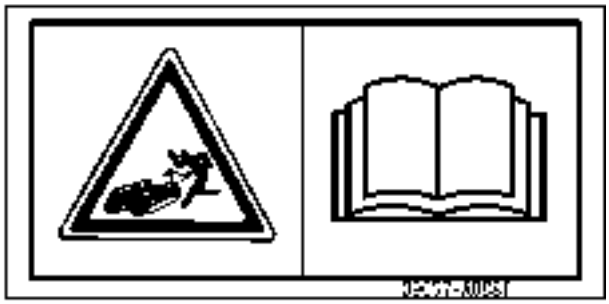
Never remove the radiator cap or hydraulic tank oil filler when cooling water or hydraulic oil is at high temperatures.

(11) Warnings for handling accumulator (14X-98-11390)

(12) Precautions when switching operating pattern (22M-98-11180)
(machines equipped with operating pattern selector valve)



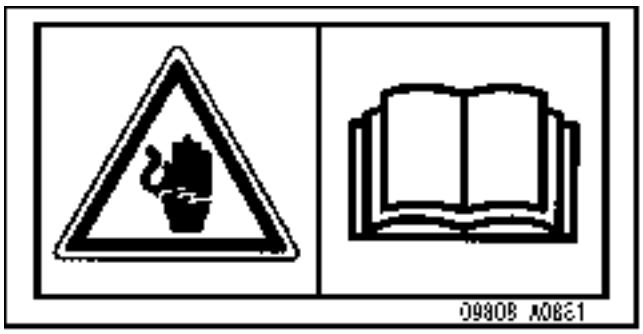
(13) Precautions for check and adjust track tension (09657-A0881)



Plug coming from track shoe tension adjustment device causing injury.

Read the operation and maintenance manual and carrying out the correct method when loosening track tension.

(14) Precautions for handling electric wires (09808-A0881)



There is the hazard to electric shock when handling electric wires.

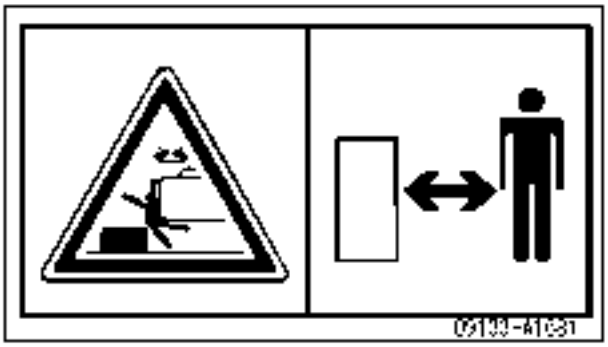
Read the operation and maintenance manual and carrying out the correct method when handling

(15) Precautions for opening engine hood (09667-A0481)

Sign indicates a hazard of rotating parts, such as belt

Turn off before inspection and maintenance.

(16) Prohibited to enter range of swing (09133-A1681)



Sign indicates a crush hazard by rotation of upper structure of the machine.

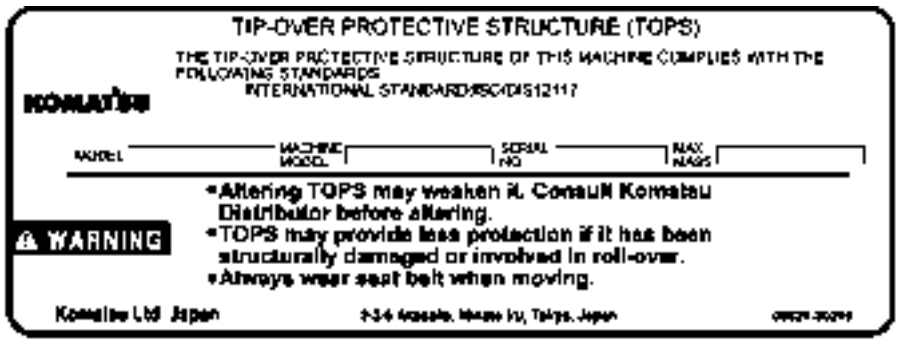
Keep away from swinging area of the machine.

(17) Beware of work equipment (09134-A0881)

Sign indicates a hazard of being hit by the working device of the machine.

Keep away from machine during operation.

(18)Precautions when handling TOPS(09620-30205)



SAFETY INFORMATION

Safety Rules

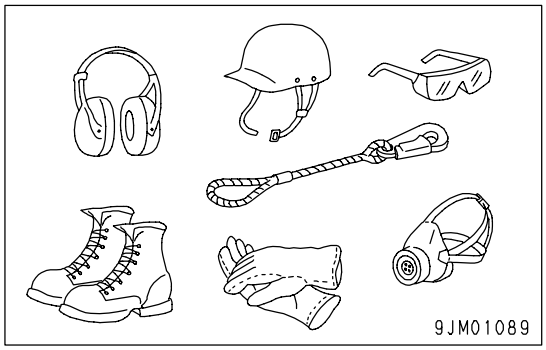
- Only trained and authorized personnel can operate and maintain the machine.
- Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
- If you are under the influence of alcohol or medication, your ability to safely operate or repair your machine may be severly impaired putting yourself and everyone else on your jobsite in danger.
- When working with another operator or with a person on worksite traffic duty, be sure that all personnel understand all hand signals that are to be used.

If Abnormalities are Found

If you find any abnormality 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 abnormality has been corrected.

Working Wear and Personal Protective Items

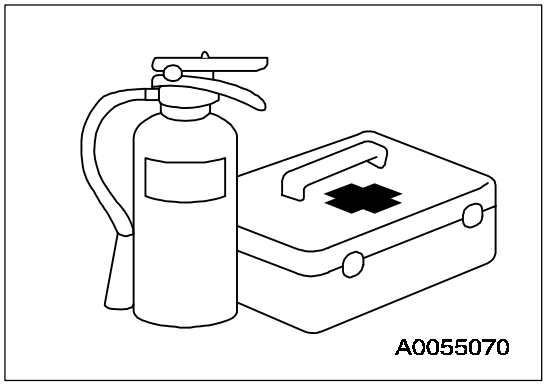
- Do not wear loose clothing and accessories. There is a hazard that they may catch on control levers or other protruding parts.
- If you have long hair and it hangs out from your hard hat, there is a hazard that it may get caught up in the machine, so tie your hair up and be careful not to let it get caught.
- 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.
- Check that all protective equipment functions properly before using it.



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 at the storage point. Carry out periodic checks and add to the contents if necessary.

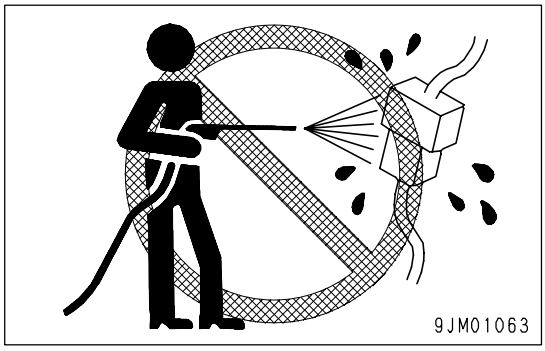


Safety Equipment

- Be sure that all guards and covers 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.

Keep Machine Clean

- If water gets into the electrical system, there is a hazard that it will cause malfunctions or misoperation. Do not use water or steam to wash the electrical system (sensors, connectors).
- If inspection and maintenance is carried out when the machine is still dirty with mud or oil, there is a hazard that you will slip and fall, or that dirt or mud will get into your eyes. Always keep the machine clean.

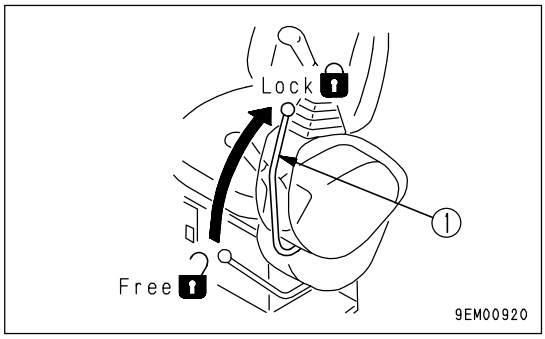


Keep Operator's Compartment Clean

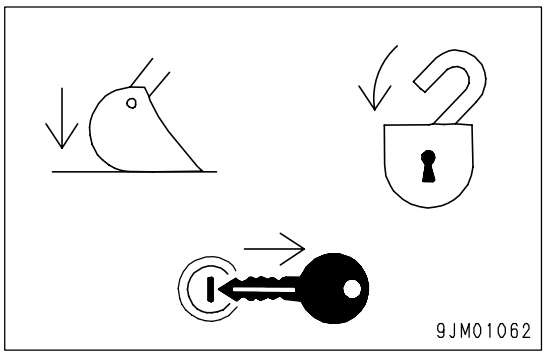
- When entering the operator's compartment, always remove all mud and oil from the soles of your shoes. If you operate the pedal with mud or oil affixed to your shoes, your foot may slip and this may cause a serious accident.
- Do not leave parts or tools lying around the operator's compartment.
- Do not stick suction pads to the window glass. Suction pads act as a lens and may cause fire.
- Do not use cellular telephones inside the operator's compartment when driving or operating the machine.
- Never bring any dangerous objects such as flammable or explosive items into the operator's compartment.

Leaving Operator's Seat with Lock

- Before standing up from the operator's seat (such as when opening or closing the front window, installing or removing the bottom window, or adjusting the operator's seat), always lower the work equipment completely to the ground, set safety lock lever (1) securely to the LOCK position, then stop the engine. If you accidentally touch the levers when they are not locked, there is a hazard that the machine may suddenly move and cause serious injury or property damage.



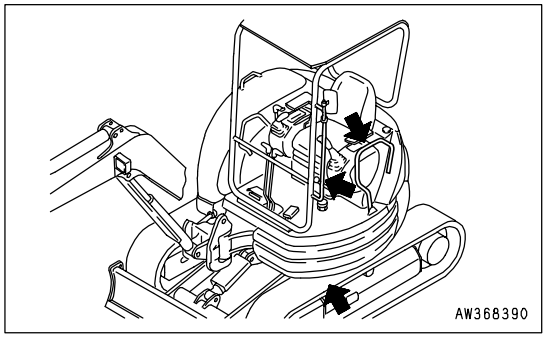
- When leaving the machine, always lower the work equipment completely to the ground, set safety lock lever (1) securely to the LOCK position, then stop the engine. Use the key to lock all the equipment. Always remove the key, take it with you, and keep it in the specified place.

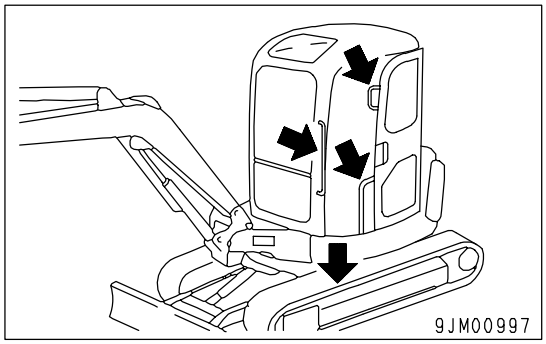


Handrails and Steps

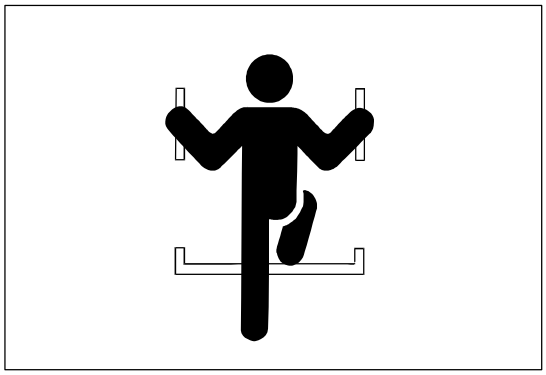
To prevent personal injury caused by slipping or falling off the machine, always do as follows.

- Use the handrails and steps marked by arrows in the diagram on the right when getting on or off the machine.





- To ensure safety, always face the machine and maintain three-point contact (both feet and one hand, or both hands and one foot) with the handrails and steps (including the track shoe) to ensure that you support yourself.
- Do not grip the control levers when getting on or off the machine.
- Never climb on the engine hood or covers where there are no non-slip pads.
- Before getting on or off the machine, check the handrails and steps (including the track shoe). If there is any oil, grease, or mud on the handrails or steps (including the track shoe), wipe it off immediately. Always keep these parts clean. Repair any damage and tighten any loose bolts.
- Do not get on or off the machine while holding tools in your hand.



Mounting and Dismounting

- 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 Persons on Attachments

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

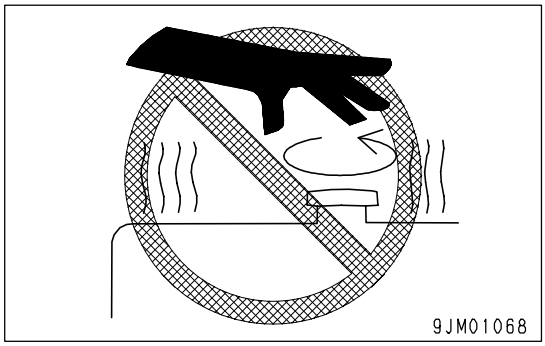
Do Not Get Caught In Articulated Portion

The clearance around the work equipment will change according to the movement of the link. If you get caught, this may lead to serious personal injury. Do not allow anyone to approach any rotating or telescoping part.

Burn Prevention

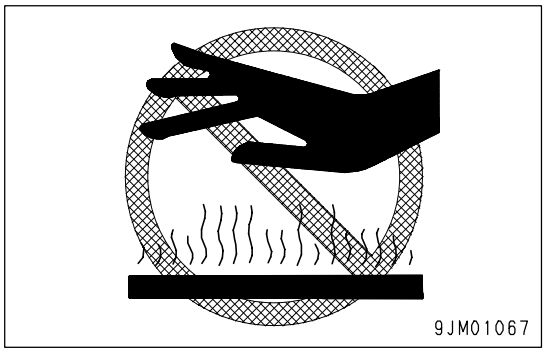
Hot coolant

- To prevent burns from hot water or steam spurting out when checking or draining the coolant, wait for the water to cool to a temperature where it is possible to touch the radiator cap by hand before starting the operation. Even when the coolant has cooled down, loosen the cap slowly to relieve the pressure inside the radiator before removing the cap.



Hot oil

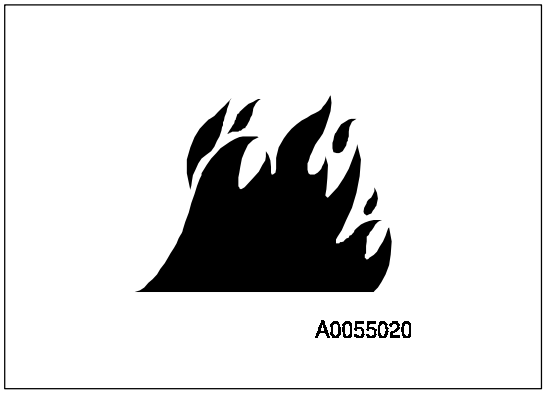
- To prevent burns from hot oil spurting out when checking or draining the oil, wait for the oil to cool to at temperature where it is possible to touch the cap or plug by hand before starting the operation. Even when the oil has cooled down, loosen the cap or plug slowly to relieve the internal pressure before removing the cap or plug.



Fire Prevention and Explosion Prevention

- **Fire caused by fuel or oil**

  Fuel, oil, antifreeze, and window washer liquid are particularly flammable and can be hazardous. To prevent fire, always observe the following:
  - Do not smoke or use any flame near fuel or oil.
  - Stop the engine before refueling.
  - Do not leave the machine while adding fuel or oil.
  - Tighten all fuel and oil caps securely.
  - Do not spill fuel on overheated surfaces or on parts of the electrical system.
  - Use well-ventilated areas for adding or storing oil and fuel.
  - Keep oil and fuel in the determined place and do not allow unauthorized persons to enter.
  - After adding fuel or oil, wipe up any spilled fuel or oil.
  - When carrying out grinding or welding work on the chassis, move any flammable materials to a safe place before starting.
  - When washing parts with oil, use a non-flammable oil. Diesel oil and gasoline may catch fire, so do not use them.
  - Put greasy rags and other flammable materials into a safe container to maintain safety at the work place.
  - Do not weld or use a cutting torch to cut any pipes or tubes that contain flammable liquids.



- **Fire caused by accumulation of flammable material.**

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

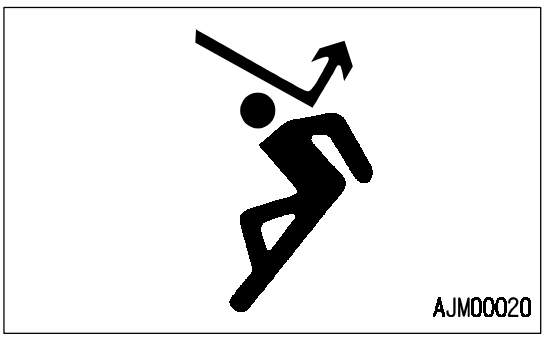
- **Fire coming from electric wiring**
  Short circuits in the electrical system can cause fire.
  - Always keep electric wiring connections clean and securely tightened.
  - Check the wiring every day for looseness or damage. Tighten any loose connectors or wiring clamps. Repair or replace any damaged wiring.
- **Fire coming from hydraulic line**
  Check that all the hose and tube clamps, guards, and cushions are securely fixed in position.
  If they are loose, they may vibrate during operation and rub against other parts. This may lead to damage to the hoses, and cause high-pressure oil to spurt out, leading to fire damage or serious injury.

- **Explosion caused by lighting equipment**
  - When checking fuel, oil, battery electrolyte, window washer fluid, or coolant, always use lighting with anti-explosion specifications. If such lighting equipment is not used, there is danger of explosion that may cause serious injury.
  - When taking the electrical power for the lighting from the machine itself, follow the instructions in this manual.

Action If Fire Occurs
If a fire occurs, escape from the machine as follows.
- Turn the start switch OFF to stop the engine.
- Use the handrails and steps to get off the machine.

Windshield Washer Fluid
Use an ethyl alcohol base washer liquid. Methyl alcohol base washer liquid may irritate your eyes, so do not use it.

Falling Objects, Flying Objects and Intruding Objects Prevention
On jobsites where there is a hazard that falling objects, flying objects, or intruding objects may hit or enter the operator's cab, consider the operating conditions and install the necessary guards to protect the operator.
- When carrying out demolition or breaker operations, install a front guard and use a laminated coating sheet on the front glass.
- When working in mines or quarries where there is a hazard of falling rock, install FOPS (Falling Objects Protective Structure) and a front guard, and use a laminated coating sheet on the front glass.
- When carrying out the above operations, always close the front window. In addition, always ensure that by standers are a safe distance away and are not in hazard from falling or flying objects.
- The above recommendations assume that the conditions are for standard operations, but it may be necessary to add additional guards according to the operating conditions on the jobsite. Always contact your Komatsu distributor for advice.



Attachment Installation

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

Attachment Combinations

Depending on the type or combination of work equipment, there is a hazard that the work equipment may hit the cab or other parts of the machine. Before using unfamiliar work equipment, check if there is any hazard of interference, and operate with caution.

Cab Window Glasses

If the cab glass on the work equipment side is broken, there is a hazard that the work equipment may contact the operator's body directly. Stop operation immediately and replace the glass.

Unauthorized Modifications

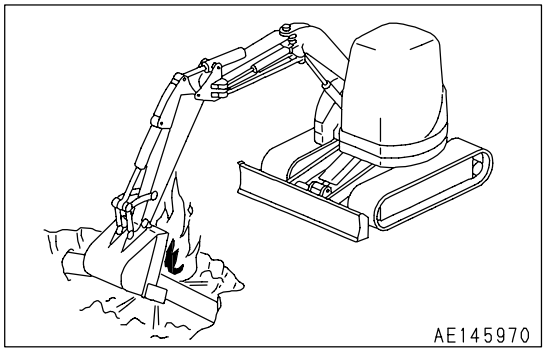
Any modification made without authorization from Komatsu can create hazards. Before making a modification, consult your Komatsu distributor.

- Komatsu will not be responsible for any injuries, accidents, product failures or other property damages resulting from modifications made without authorization from Komatsu.

Safety at Jobsite

Before starting operations, thoroughly check the area for any unusual conditions that could be dangerous.

- 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 carry out operations at places 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 action to prevent unauthorized people from approaching the jobsite.
  When working on public roads, position flagmen and erect barriers to ensure the safety of passing traffic and pedestrians.
- When traveling or operating in shallow water or on soft ground, check the shape and condition of the bedrock, and the depth and speed of flow of the water before starting operations.



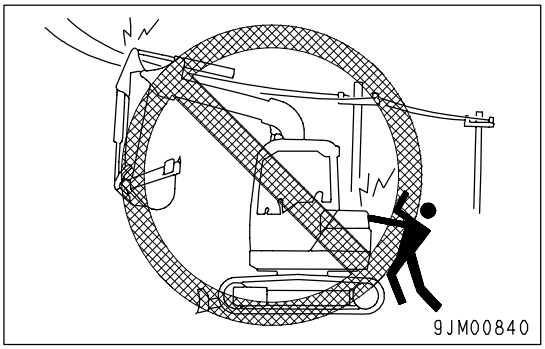
Working on Loose Ground

- 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.

Distance 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 injury or property damage. 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 come close to 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 come close to the machine.

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

Ensure Good Visibility

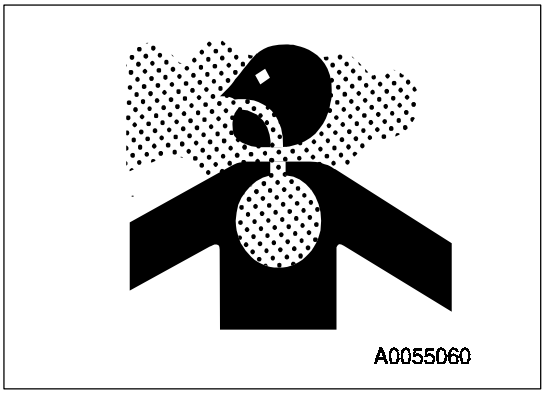
Check for any persons or obstacles in the area around the machine and check the conditions of the jobsite to ensure that operations and travel can be carried out safely. Always do as follows.

- 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.

Ventilation for Enclosed Area

Exhaust fumes from the engine can kill.

- If it is necessary to start the engine within an enclosed area, or when handling fuel, flushing oil, or paint, open the doors and windows to ensure that adequate ventilation is provided to prevent gas poisoning.



Signalman's Signal and Signs

- 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.

Emergency Exit from Operator's Cab

If for any reason, it becomes impossible to open the cab door, use the hammer supplied to break the window and use it as an emergency escape.

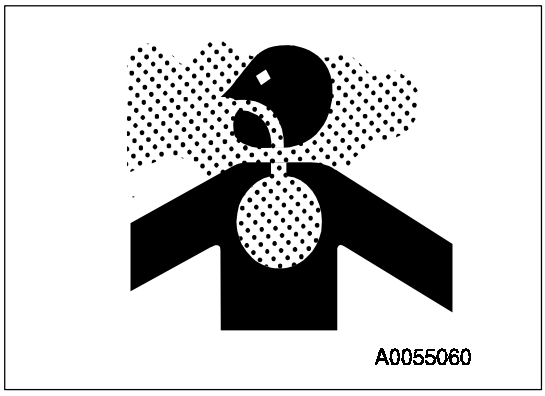
For details, see "EMERGENCY ESCAPE HAMMER (PAGE 3-23)" in this manual.

- When escaping, remove all the pieces of glass from the window frame first and be careful not to cut yourself on the glass. Be careful also not to slip on the broken pieces of glass on the ground.

Asbestos Dust Hazard Prevention

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

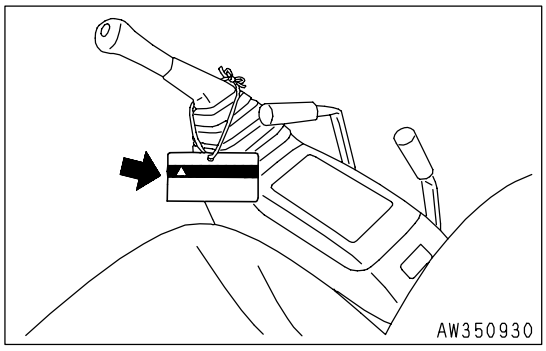


This machine does not use asbestos, but there is a danger that imitation parts may contain asbestos, so always use genuine Komatsu parts.

SAFETY MACHINE OPERATION

STARTING ENGINE

If there is a warning tag hanging from the work equipment control lever, 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.

- Remove all dirt from the surface of the window glass to ensure a good view.
- Remove all dirt from the surface of the lens of the 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.
- 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 lights and working lamps, and check that the control levers are all at the neutral position.
- Before starting the engine, make sure that the safety lock lever is in the LOCK position.
- Adjust the mirror to a position which gives a good view to the rear from the operator's seat.
  When adjusting, see "Rearview Mirrors (PAGE 3-41)".
- Check that there are no persons or obstacles above, below, or in the area around the machine.

Safety Rules for Starting Engine

- When starting the engine, sound the horn as a warning.
- Start and operate the machine only while seated.
- Do not allow anyone apart from the operator to ride on the machine.
- Do not short circuit the starting motor circuit to start the engine. Short circuit can cause fire.

Starting Engine in Cold Weather

- 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.

OPERATION

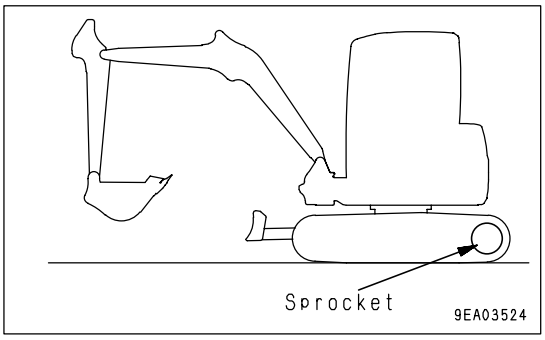
Checks Before Operation

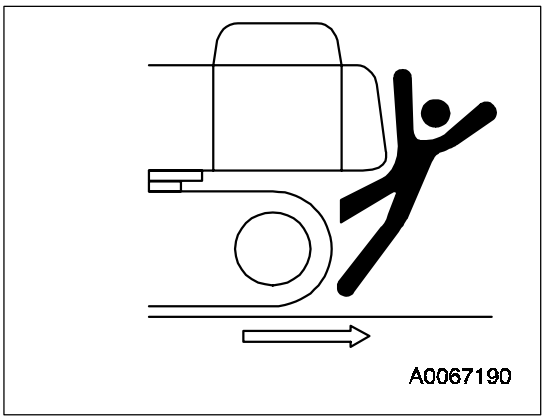
When carrying out the checks, move the machine to a wide area where there are no obstructions, and operate slowly. Do not allow anyone near the machine.

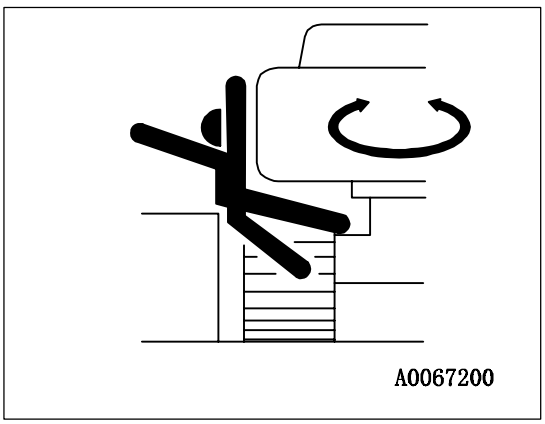
- Always fasten your seat belt.
- Check that the movement of the machine matches the display on the control pattern card. If it does not match, replace it immediately with the correct control pattern card.
- Check the operation of the work equipment, traval system and swing system.
- Check for any abnormality in the sound of the machine, vibration, heat, smell, or gauges; check also that there is no leakage of oil or fuel.
- If any abnormality is found, carry out repairs immediately.

Safety Rules for Changing Machine Directions

- Before traveling, position the upper structure so that the sprocket is at the rear of the operator's cab. If the sprocket is at the front of the operator's cab, the machine makes a movement reverse to the control lever movement (for example, forward becomes reverse, and left becomes right). Be careful to avoid such a reverse movement of the machine.
- Before travelling, check again that there is no one in the surrounding area, and that there are no obstacles.
- Before travelling, sound the horn to warn people in the area.
- Always operate the machine only when seated.
- Do not allow anyone apart from the operator to ride on the machine.
- Always lock the door and windows of the operator's compartment in position (open or closed).
  On jobsites where there is a hazard of flying objects or of objects entering the operator's compartment, check that the door and windows are securely closed.

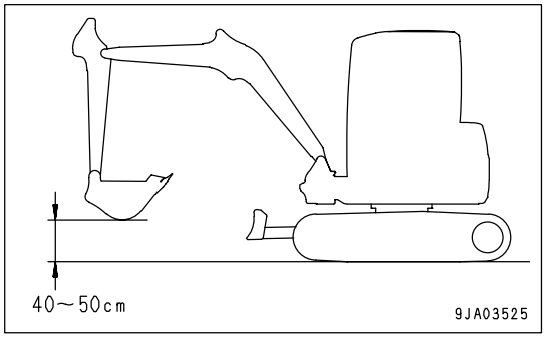




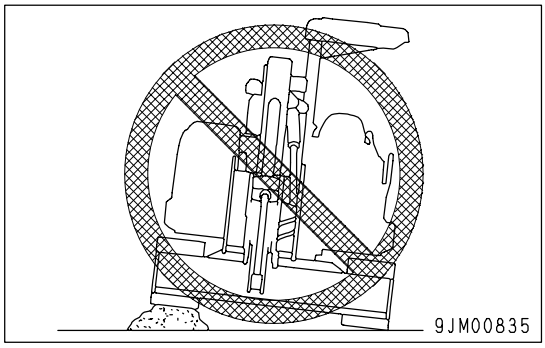


Safety Rules for Traveling

- It is dangerous to drive too fast, or to start suddenly, stop suddenly, or to turn sharply.
- When traveling on level ground, keep the work equipment at a height of 40 to 50 cm (1.6 to 2.0 in) from the ground.
- 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.



- 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. Never travel over obstacles which make the machine tilt strongly to one side.
- 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 passing over bridges or structures, check first that the structure is strong enough to support the weight of the machine. When traveling on public roads, check first with the relevant authorities and follow their instructions.
- 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 work equipment hit anything.

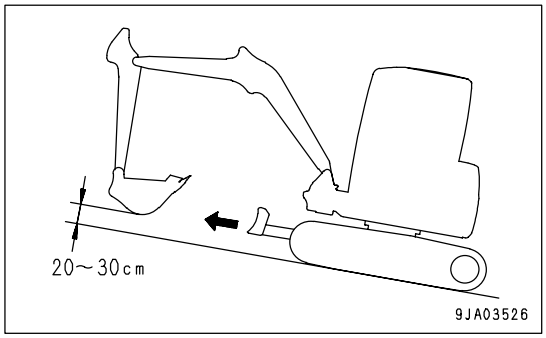


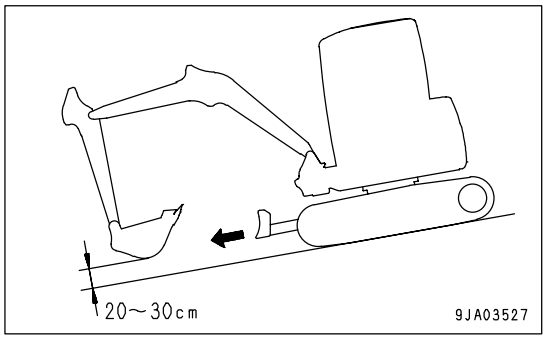
- For machines with the canopy specification, when the work equipment is operated to the maximum left boom swing with the work equipment in the minimum swing posture, soil may spill from the bucket and fall on to the floor. Be extremely careful when operating in this posture.

Traveling on Slopes

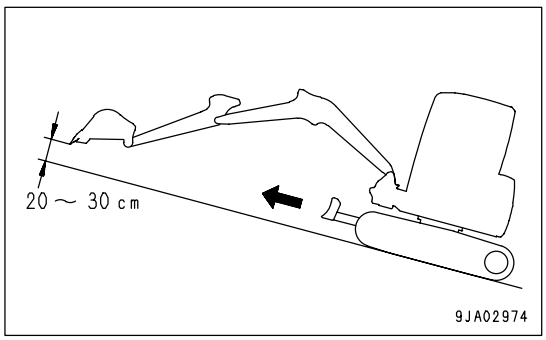
To prevent the machine from tipping over or slipping to the side, always do as follows.

- 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.
- When travel up slopes, set the operator's cab facing uphill, when travel down slopes, set the operator's cab facing downhill. Always check the firmness of the ground under the front of the machine when traveling.

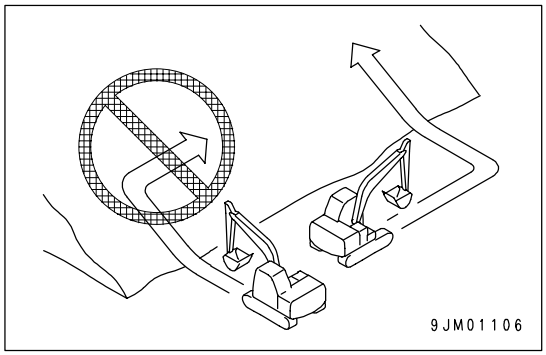




- When traveling up a steep slope, extend the work equipment to the front to improve the balance, keep the work equipment approximately 20 to 30cm (8 to 12 in) above the ground, and travel at low speed.

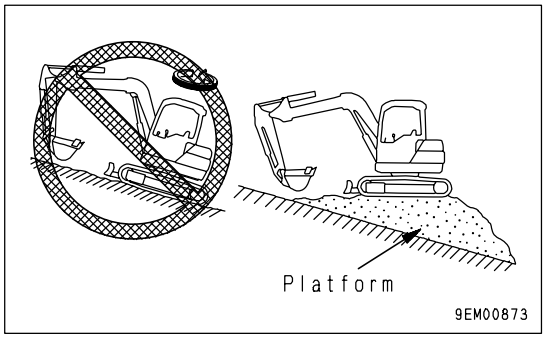


- When traveling downhill, lower the engine speed, keep the travel lever close to the neutral position, and travel at low speed.
- Always travel straight up or down a slope. Traveling at an angle or across the slope is extremely dangerous.
- Do not turn on slopes or travel across slopes. Always go down 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.
- If the engine stops when the machine is traveling on a slope, move the control levers immediately to the neutral position and start the engine again.



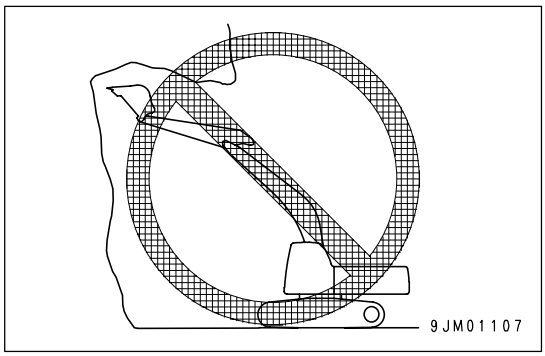
Operations on Slopes

- When working on slopes, there is a hazard that the machine may lose its balance and turn over when the swing or work equipment are operated. This may lead to serious injury or property damage, so always provide a stable place when carrying out these operations, and operate carefully.
- Do not swing the work equipment from the uphill side to the downhill side when the bucket is loaded. This operation is dangerous, and may cause the machine to tip over.
- If the machine has to be used on a slope, pile the soil to make a platform that will keep the machine as horizontal as possible.

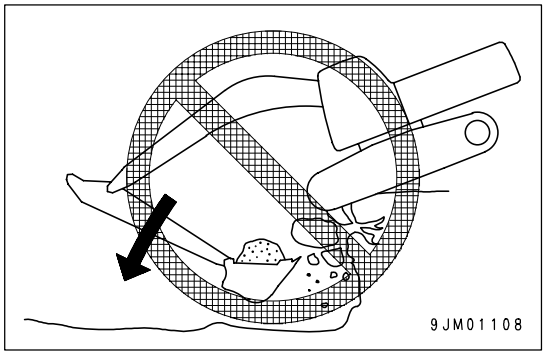


Prohibited Operations

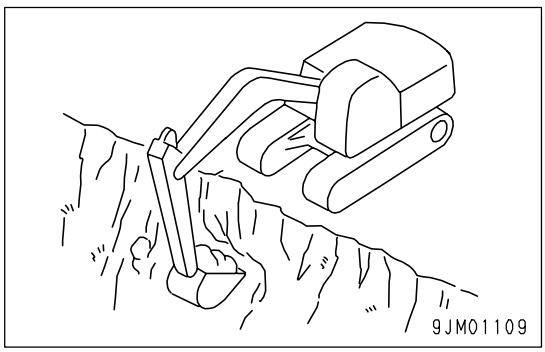
- Never dig the work face under an overhang. There is a hazard that rocks may fall or that the overhang may collapse and fall on top of the machine.



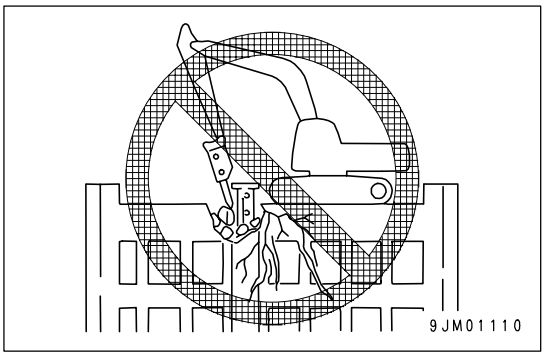
- Do not excavate too deeply under the front of the machine. The ground under the machine may collapse and cause the machine to fall.



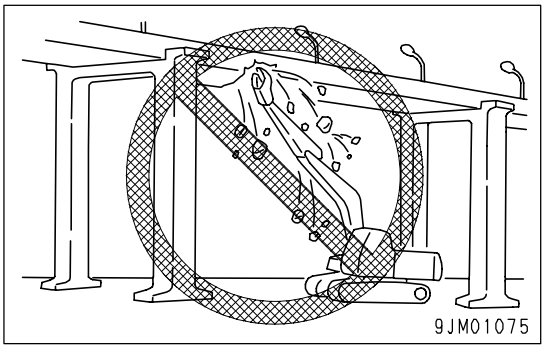
- To make it easier to escape if there is any problem, set the tracks at right angles to the road shoulder or cliff with the sprocket at the rear when carrying out operations.



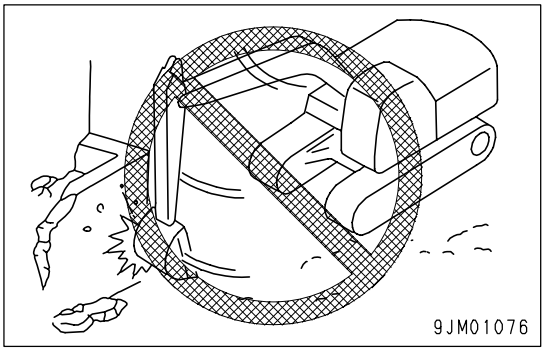
- Do not carry out demolition work under the machine. There is a hazard that the machine may become unstable and tip over.
- When working on or from the top of buildings or other structures, check the strength and the structure before starting operations. There is a hazard of the building collapsing and causing serious injury or damage.



- When carrying out demolition work, do not carry out demolition above your head. There is a hazard of broken parts falling or of the building collapsing and causing serious injury or property damage.



- Do not use the impact force of the work equipment for breaking work. There is a hazard of damage to the work equipment or a hazard of serious personal injury being caused by flying pieces of broken materials or the machine tipped over due to reaction from the impact.
- Generally speaking, the machine is more liable to overturn when the work equipment is at the side than when it is at the front or rear.



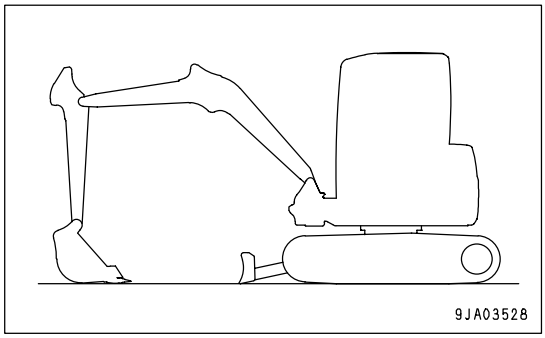
- When using a breaker or other heavy work equipment, there is a hazard of the machine losing its balance and tipping over. When operating on flat ground as well as on slopes.
  - Do not suddenly lower, swing, or stop the work equipment.
  - Do not suddenly extend or retract the boom cylinder. There is a hazard that impact will cause the machine to tip over.
- Do not pass the bucket over any worker's head or over the operator's cab of the truck or hauling machine. The load may fall or the bucket may come into contact and cause serious personal injury or property damage.

Operations on Snow

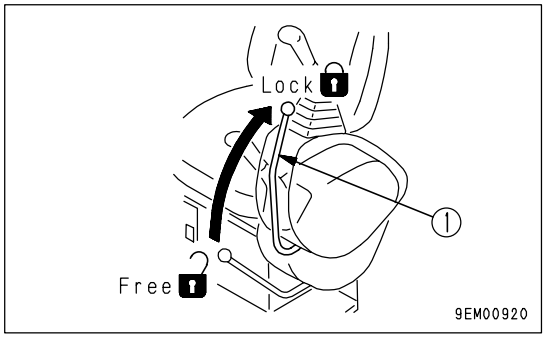
- Snow-covered or frozen surfaces are slippery, so be extremely careful when traveling or operating the machine, and do not operate the levers suddenly. Even a slight slope may cause the machine to slip, so be particularly careful when working on slopes.
- With frozen ground surfaces, the ground becomes soft when the temperature rises, and this may cause the machine to tip over.
- 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.

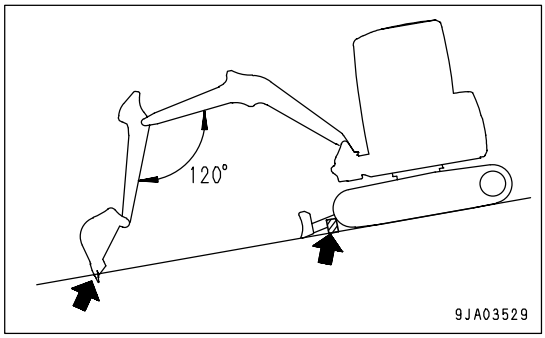
Parking Machine

- Park the machine on firm, level ground.
- Select a place where there is no hazard of falling rocks or landslides, or of flooding if the land is low.
- Lower the work equipment completely to the ground.



- When leaving the machine, set safety lock lever (1) to the LOCK position, then 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 bucket on the downhill side, then dig it into the ground.
  - Put blocks under the tracks to prevent the machine from moving.

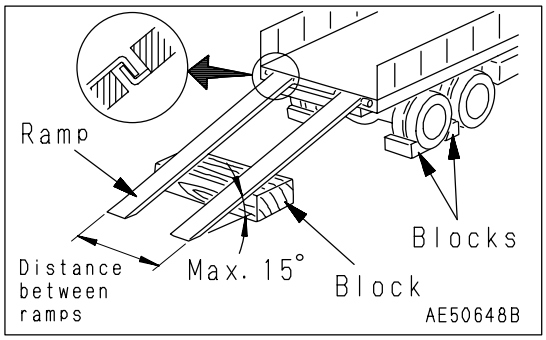




TRANSPORTATION

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.
- Never use the work equipment to load or unload the machine. There is danger that the machine may fall or tip over.
- 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 speed and travel slowly.
- When on the ramps, do not touch any other parts.
- 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 chenge 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.
- When swinging the upper structure on the trailer, the trailer is unstable, so pull in the work equipment and swing slowly. And turn swing lock switch ON to apply swing lock after loading machine.
- 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 3-78)".

Shipping the Machine

When shipping the machine on a trailer, do as follows.

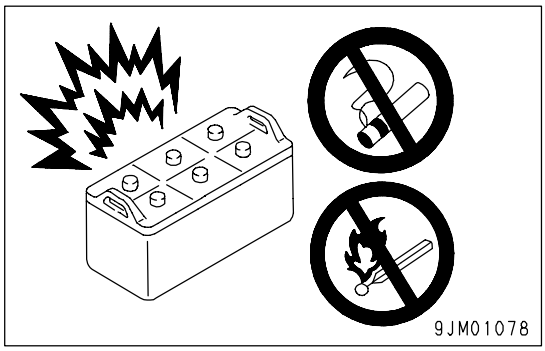
- The weight, transportation height, and overall length of the machine differ according to the work equipment, so be sure to confirm the dimensions.
- When passing over bridges or structures on private land, check first that the structure is strong enough to support the weight of the machine. When traveling on public roads, check first with the relevant authorities and follow their instructions.
- For details of the shipping procedure, see "TRANSPORTATION (PAGE 3-78)" in the OPERATION section.

BATTERY

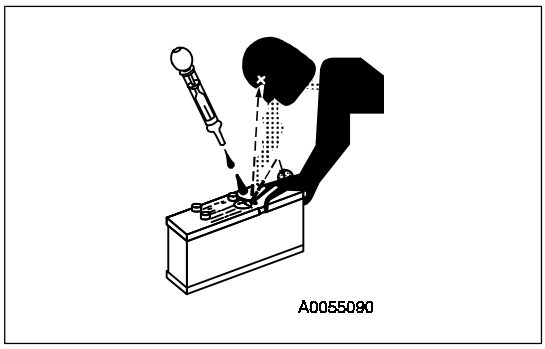
Battery Hazard Prevention

Battery electrolyte contains sulphuric acid, and batteries generate flammable hydrogen gas, which may explode. Mistaken handling can lead to serious injury or fire. For this reason, always observe the following precautions.

- Do not use or charge the battery if the battery electrolyte level is below the LOWER LEVEL line. This may cause an explosion. Always check the battery electrolyte level periodically and add distilled water to bring the electrolyte level to the UPPER LEVEL line.
- When working with batteries, always wear safety glasses and rubber gloves.
- Never smoke or use any flame near the battery.



- If you spill acid on your clothes or skin, immediately flush the area with large amount of water.
- If acid gets into your eyes, flush them immediately with large amount of water and seek medical attention.



- Before working with batteries, turn the starting switch to the OFF position.

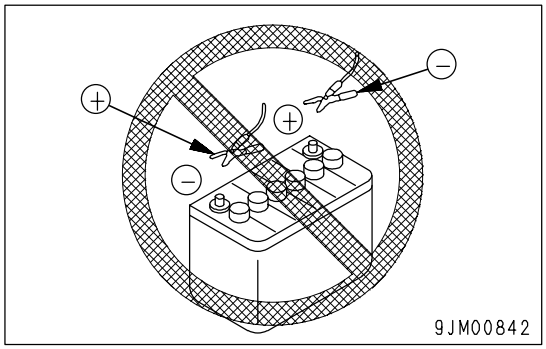
As there is a hazard that sparks will be generated, always do as follows.

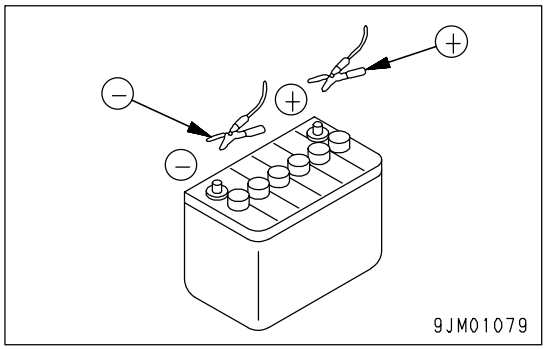
- Do not let tools or other metal objects make any contact between the battery terminals. Do not leave tools or other metal objects lying around near the battery.
- Always disconnect the negative (-) terminal (ground side) first when removing the battery; when installing the battery, connect the positive (+) terminal first, and connect the ground last. Tighten the battery terminals securely.
- Flammable hydrogen gas is generated when the battery is charged, so remove the battery from the chassis, take it to a well-ventilated place, and remove the battery caps before charging it.
- Tighten the battery caps securely.
- Install the battery securely to the determined place.

Starting Engine 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.

- 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 OFF 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.
- Always wear safety goggles and rubber gloves when starting the engine with booster cables.
- 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.
- For details of the starting procedure when using booster cables, see "Starting Engine With Booster Cables (PAGE 3-91)" in the OPERATION section.





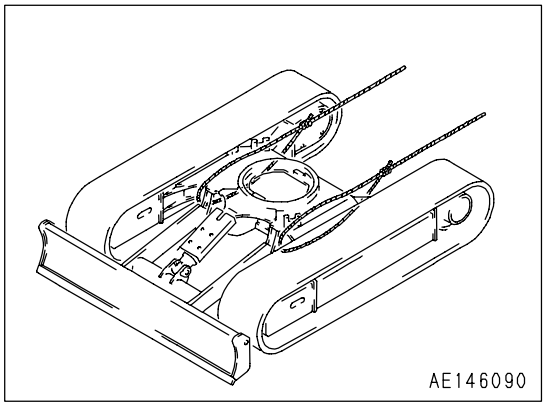
TOWING

Safety Rules for Towing

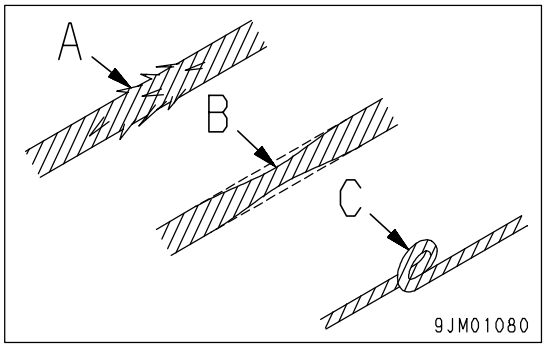
Serious injury or death could result if a disabled machine is towed incorrectly or if there is a mistake in the selection or inspection of the wire rope.

For towing, see "TOWING THE MACHINE (PAGE 3-88)".

- Always wear leather gloves when handling wire rope.
- Fix the wire rope to the track frame.
- During the towing operation, never stand between the towing machine and the machine being towed.
- Never tow a machine on a slope.



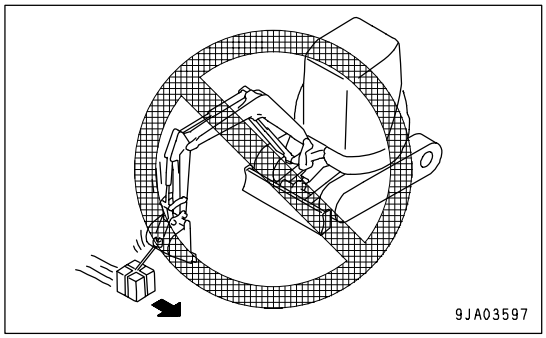
- Never use a wire rope which has cut strands (A), reduced diameter (B), or kinks (C). There is danger that the rope may break during the towing operation.

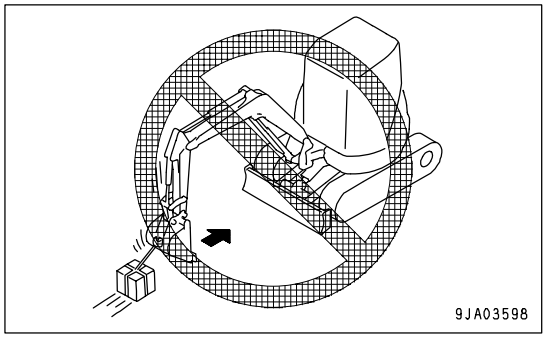


LIFTING OBJECTS WITH BUCKET

Safety Rules for Lifting Objects

- Do not carry out lifting work on slopes, soft ground, or other places where the machine is not stable.
- Use wire rope that conforms to the specified standard.
- Do not exceed the specified lifting load.
  For details of the maximum lifting load permitted for this machine, see "BUCKET WITH HOOK (PAGE 6-4)".
- It is dangerous if the load hits any worker or structure. Always check carefully that the surrounding area is safe before swinging or turning the machine.
- Do not start, swing, or stop the machine suddenly. There is a hazard that the lifted load will swing.
- Do not pull the load to the side or in towards the machine.
- Do not leave the operator's seat when there is a raised load.

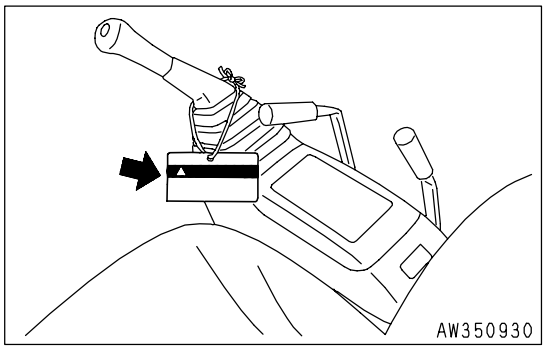




SAFETY MAINTENANCE INFORMATION

Warning Tag

- Always attach the "DO NOT OPERATE" warning tag to the work equipment control lever in the operator's cab to alert others that you are performing service or maintenance on the machine. Attach additional warning tags around the machine if necessary.
  Warning tag Part No. 09963-03001
  Keep this warning tag in the tool box while it is not used. If there is not the tool box, keep the tag in the operation manual pocket.
- If others start the engine, or touch or operate the work equipment control lever while you are performing service or maintenance, you could suffer serious injury or property damage.



Keep Work Place Clean and Tidy

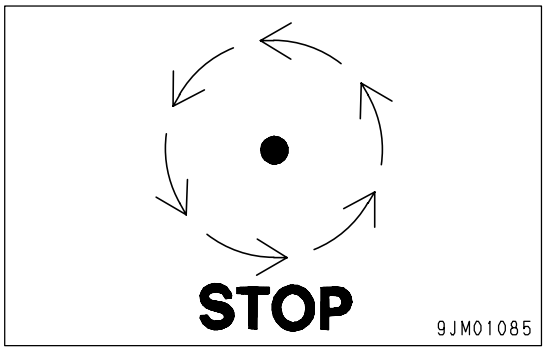
Do not leave hammers or other tools lying around in the work place. Wipe up all grease, oil, or other substances that will cause you to slip. Always keep the work place clean the tidy to enable you to carry out operations safely. If the work place is not kept claen and tidy, there is the danger that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

Appoint Leader when Working with Others

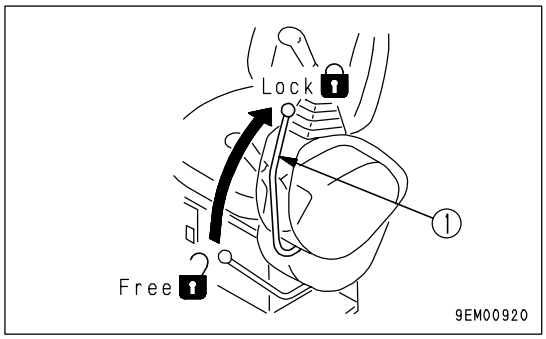
When repairing the machine or when removing and installing the work equipment, appoint a leader and follow his instructions during the operation.
When working with others, misunderstandings between workers can lead to serious accidents.

Stop Engine Before Carrying Out Maintenance

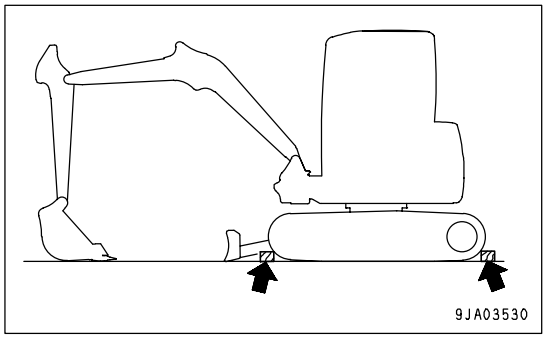
- Stop the machine on firm, level ground.
- Select a place where there is no hazard of falling rocks or landslides, or of flooding if the land is low.
- Lower the work equipment completely to the ground and stop the engine.



- Set safety lock lever (1) to the LOCK position.



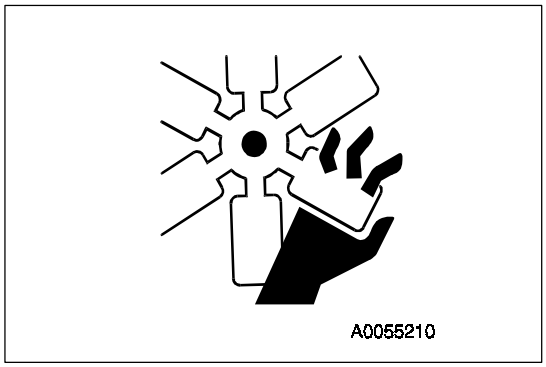
- Put blocks under the track to prevent the machine from moving.



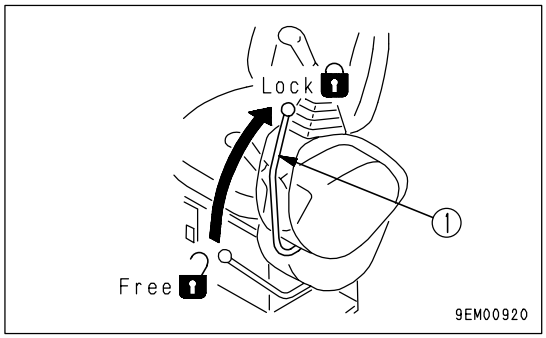
Two Workers for Maintenance when Engine is Running

To prevent 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.

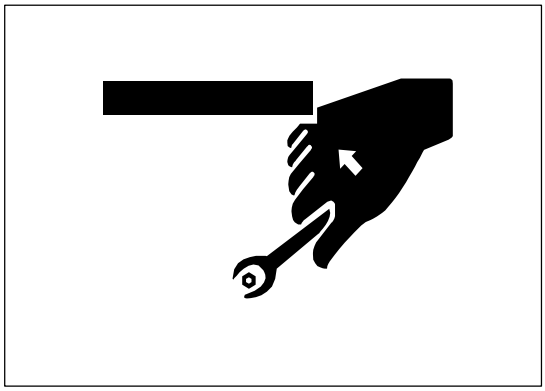


- Set safety lock lever (1) to the LOCK position.
- When carrying out operations near the fan, fan belt, or other rotating parts, there is a hazard of being caught in the parts, so be careful not to come close.
- Do not touch any control levers. If any control lever must be operated, give a signal to the other workers to warn them to move to a safe place.
- Never drop or insert tools or other objects into the fan or fan belt. Parts may break or be sent flying.



Proper Tools

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

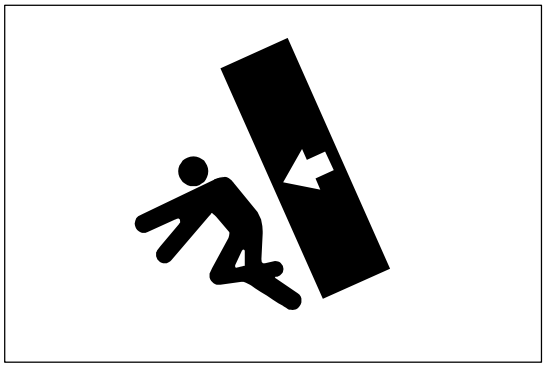


Personnel

Only authorized personnel can service and repair the machine. Do not allow unauthorized personnel into the area. If necessary, employ an observer.

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.



Work Under the Machine

- If it is necessary to go under the work equipment or the machine to carry out service and maintenance, support the work equipment and machine securely with blocks and stands strong enough to support the weight of the work equipment and machine.
- 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.

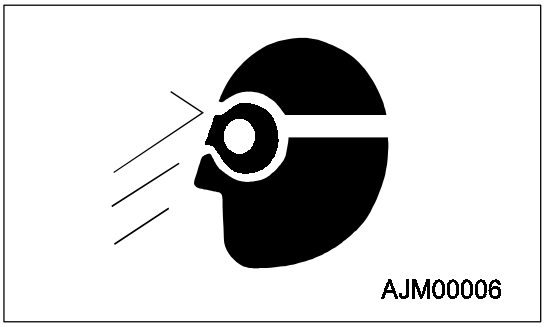
Noise

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.

When Using Hammer

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

- 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 injury. Always wear safety goggles and gloves.
- 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.
- There is a hazard that the pin hit with strong force may fly out and injure people in the surrounding area.



Welding Works

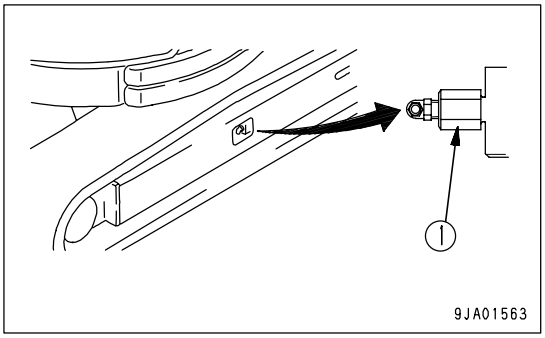
Welding operations must always be carried out by a qualified welder and in a place equipped with proper equipment. There is a hazard of gas, fire, or electrocution when carrying out welding, so never allow any unqualified personnel to carry out welding.

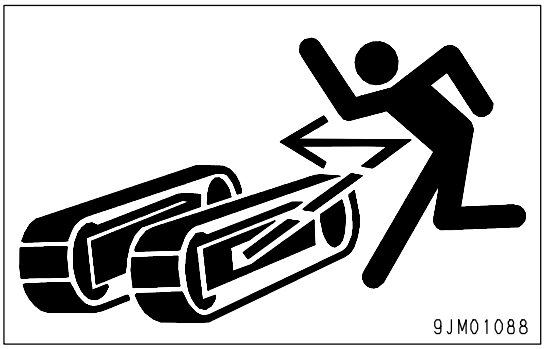
Removing Battery Terminals

When repairing the electrical system or when carrying out electrical welding, remove the negative (-) terminal of the battery to prevent the flow of current.

Safety First when Using High-pressure Grease to Adjust 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).





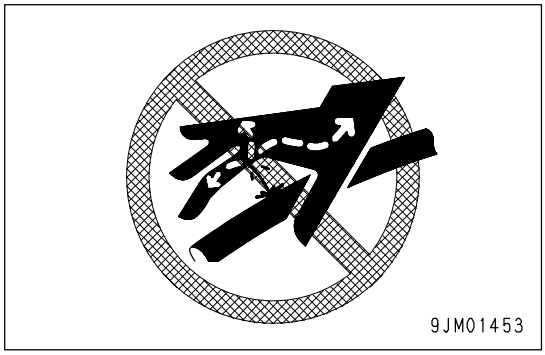
Do Not Disassemble Recoil Springs

Never attempt to disassemble the recoils spring assembly. It contains a spring under high pressure which serves as a shock absorber for the idler. If it is disassembled by mistake, the spring will fly out and cause serious injury. When it becomes necessary to disassemble it, ask your Komatsu distributor to do the work.

Safety Rules for High-pressure Oil

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

- Always release the pressure before starting any inspection or replacement operation.
- 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 blindness if it contacts your eyes directly. If you are hit by a jet of high-pressure oil and suffer injury to your skin or eyes, wash the place with clean water, and consult a doctor immediately for medical attention.



Safety Handling High-pressure Hoses

- If oil or fuel leaks from high-pressure hoses, it may cause fire or defective operation, which may lead to serious injury. If any loose bolts are found, stop work and tighten to the specified torque. If any damaged hoses are found, stop operations immediately and contact your Komatsu distributor.

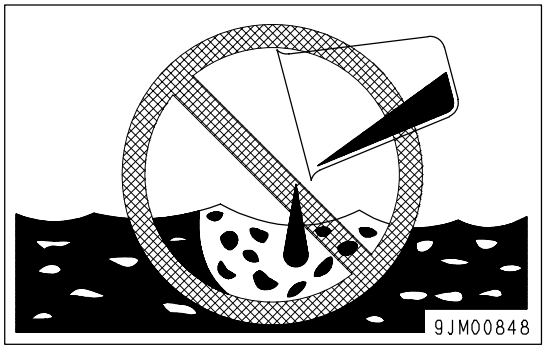
Replace the hose if any of the following problems are found.

- Damaged or leaking hydraulic fitting.
- Frayed or cut covering or exposed reinforcement wire layer.
- Covering swollen in places.
- Twisted or crushed movable portion.
- Foreign material embedded in covering.

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.



Air Conditioner Maintenance

If air conditioner refrigerant gets into your eyes, it may cause blindness; if it touches your skin, it may cause frostbite. Never touch refrigerant.

Compressed Air

- When carrying out cleaning with compressed air, there is a hazard of serious injury caused by flying particles.
- When using compressed air to clean elements or the radiator, always wear safety goggles, dust mask, gloves, and other protective equipment.

Periodic Replacement of Safety Critical Parts

- For using the machine safely for an extended period of time, replace safety-critical parts like hoses and seat belts periodically.
  Replacement of safety-critical parts: See "SAFETY CRITICAL PARTS (PAGE 4-13)".
- 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 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 time specified interval.

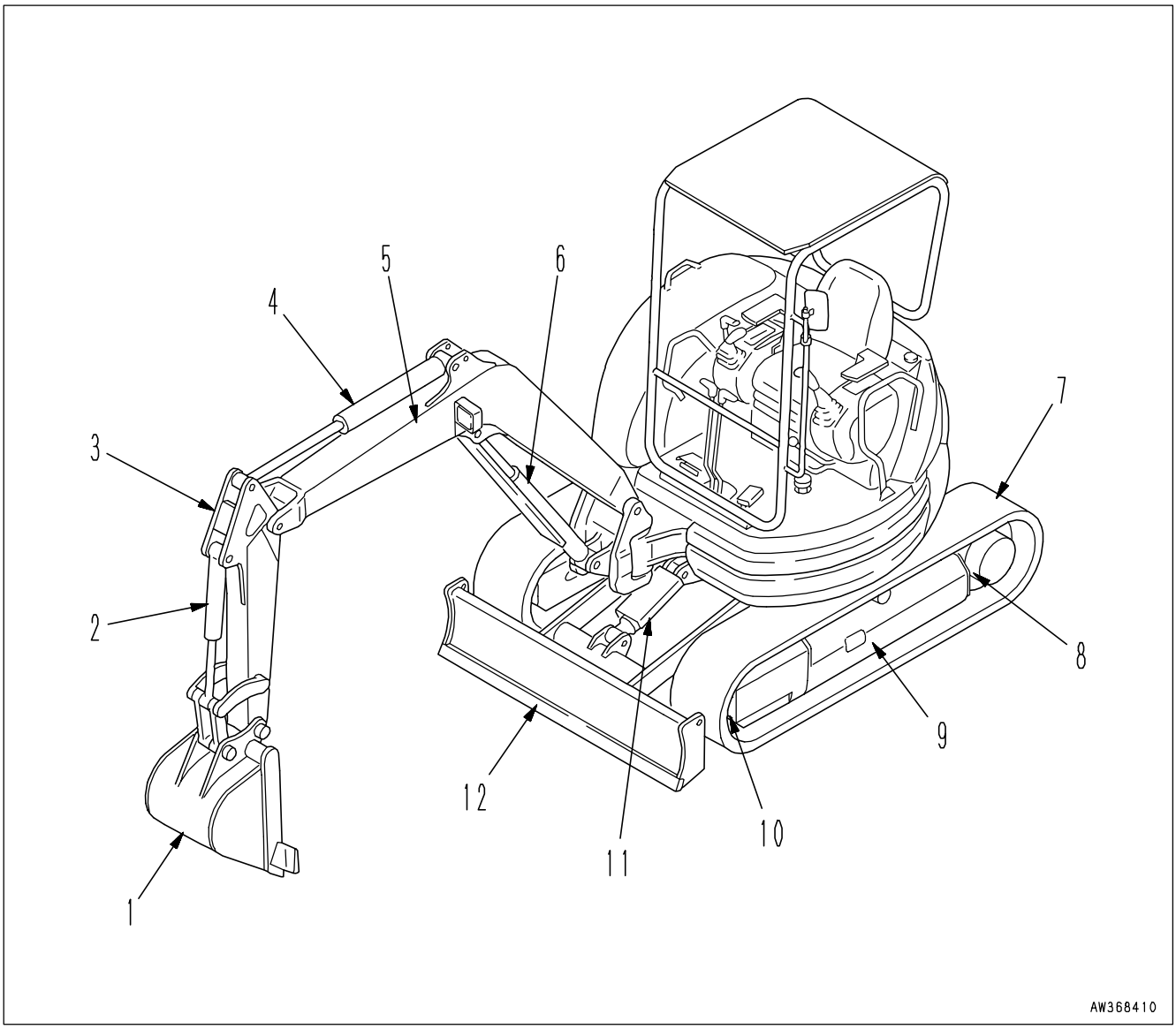
OPERATION

⚠ WARNING

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

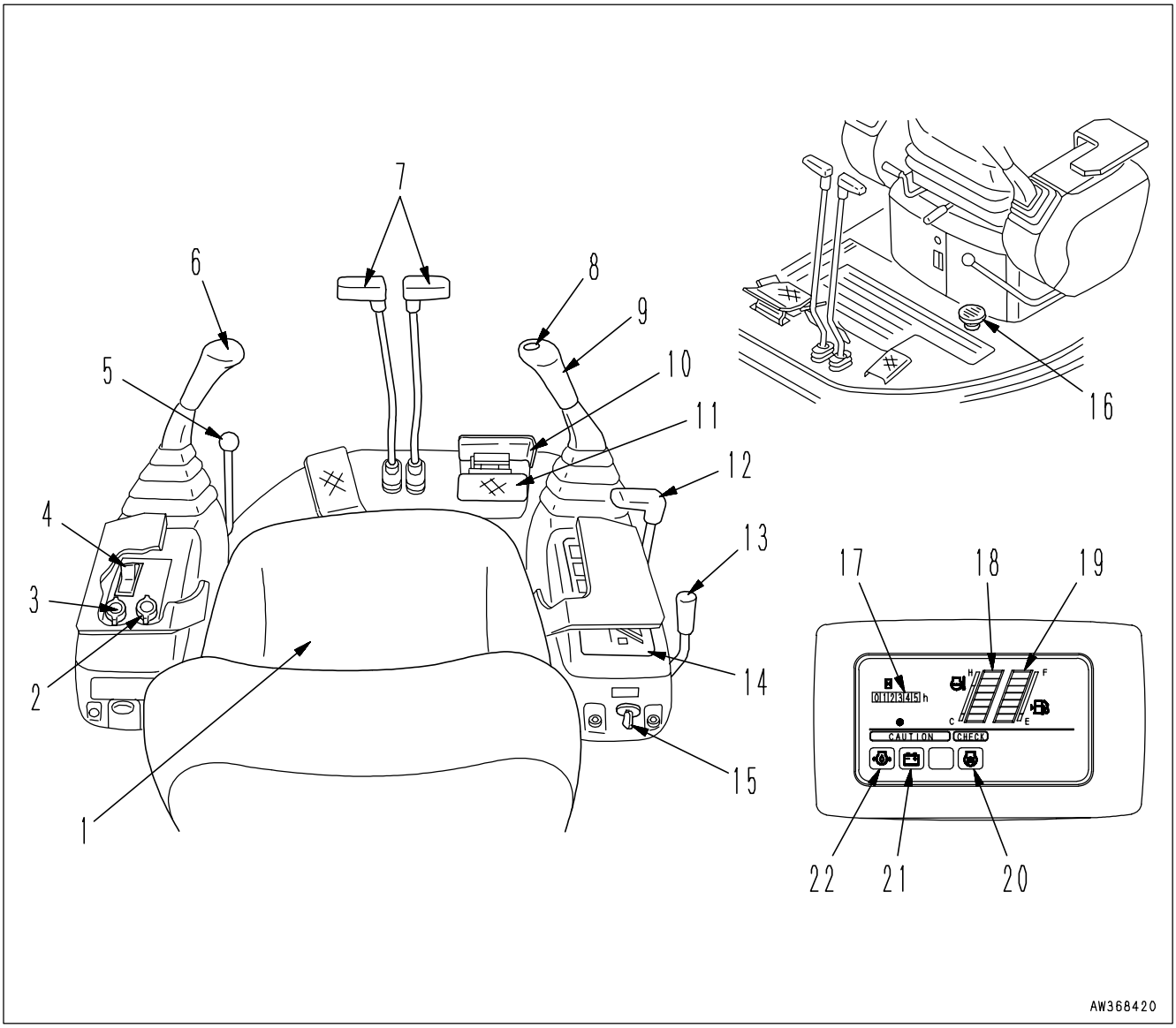
MACHINE VIEW ILLUSTRATIONS

OVERALL MACHINE VIEW



(1) Bucket
(2) Bucket cylinder
(3) Arm
(4) Arm cylinder
(5) Boom
(6) Boom cylinder
(7) Track shoe
(8) Sprocket
(9) Track frame
(10) Idler
(11) Blade cylinder
(12) Blade

CONTROLS AND GAUGES

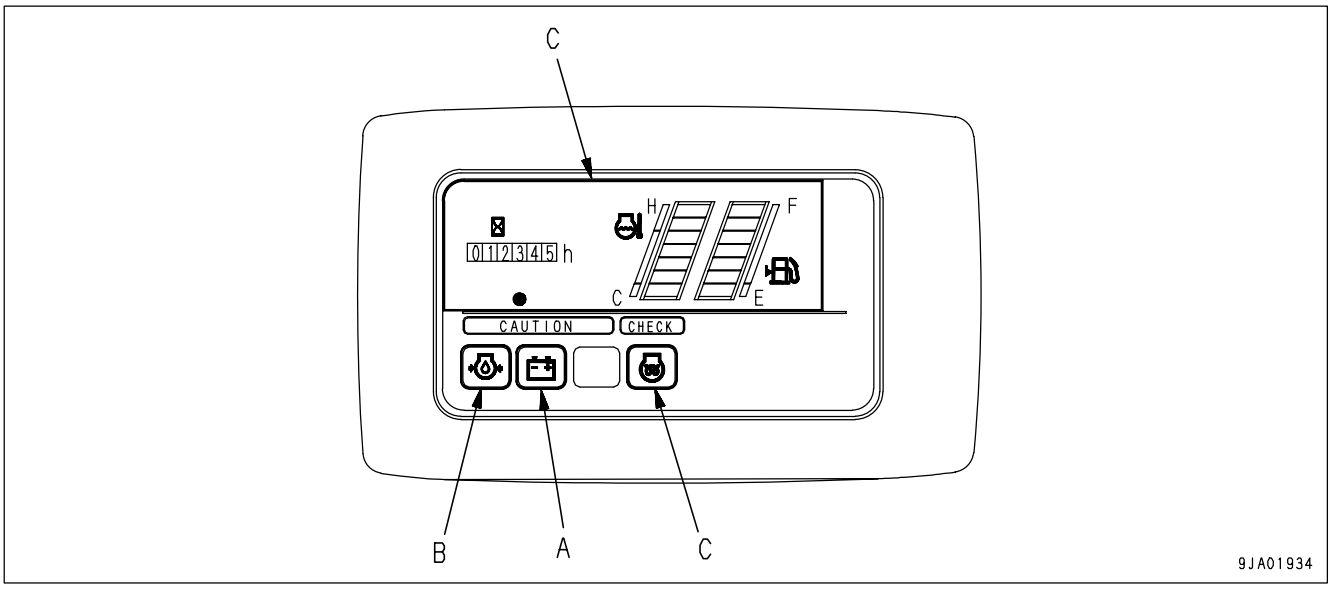


(1)Operator's seat
(2)Heater switch
(3)Lamp switch
(4)Wiper switch
(5)Safety lock lever
(6)Left work equipment control lever
(7)Travel lever
(8)Horn switch
(9)Right work equipment control lever
(10)Pedal lock
(11)Boom swing control pedal
(12)Blade control lever
(13)Fuel control lever
(14)Monitor panel
(15)Starting switch
(16)Accelerator pedal
(17)Service meter
(18)Engine coolant temperature gauge
(19)Fuel gauge
(20)Pre-heating monitor
(21)Charge monitor
(22)Engine oil pressure monitor

DETAILED CONTROLS AND GAUGES

The following is an explanation of the devices needed for operating the machine.
To carry out suitable operations correctly and safely, it is important to understand fully the methods of operating the equipment and the meanings of the displays.

MONITORING SYSTEM



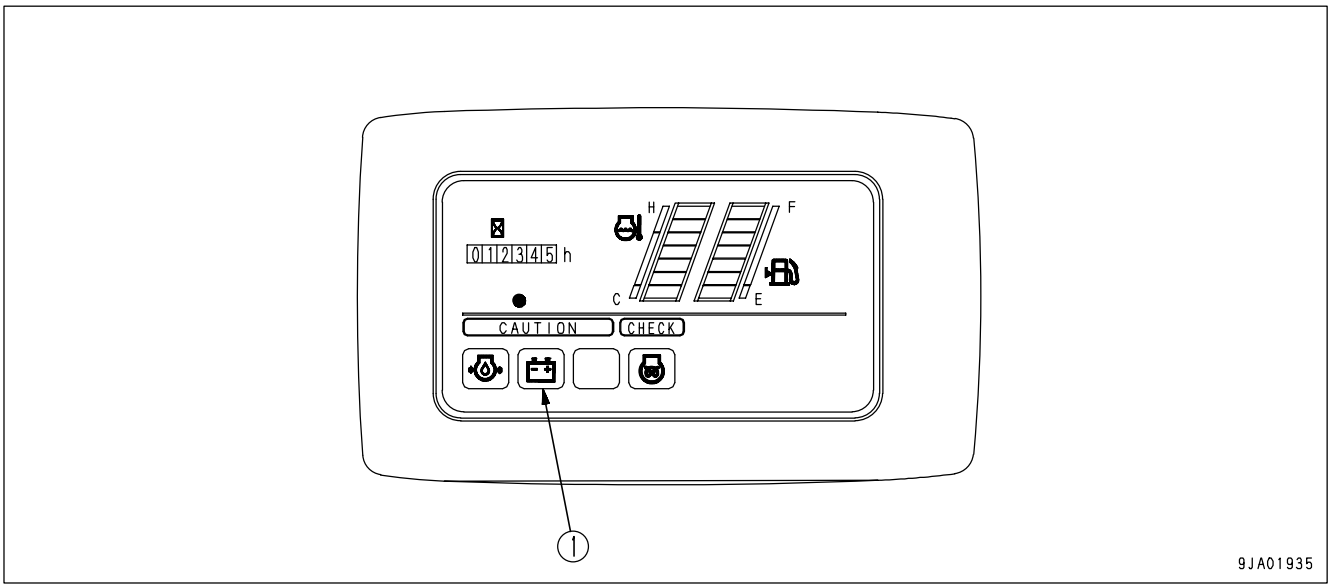
A:Caution Items
B:Emergency Stop Items
C:Meter Display Portion

Caution Monitors

CAUTION

If the caution monitor lamp lights up, repair the problem as soon as possible.

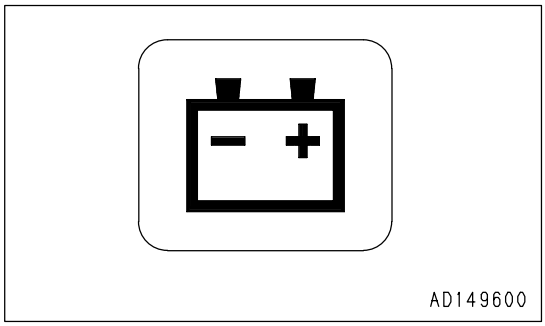
These are items that must be watched carefully when the engine is running. If any abnormality occurs, the monitor displays the item that should be corrected as soon as possible.
If there is any abnormality, the monitor for the location of the abnormality flashes.



(1) Charge level monitor

Charge Level Monitor

This monitor (1) indicates an abnormality in the charging system while the engine is running.
If the charging is not being carried out properly when the engine is running, the lamp lights up and the buzzer sounds.



REMARK

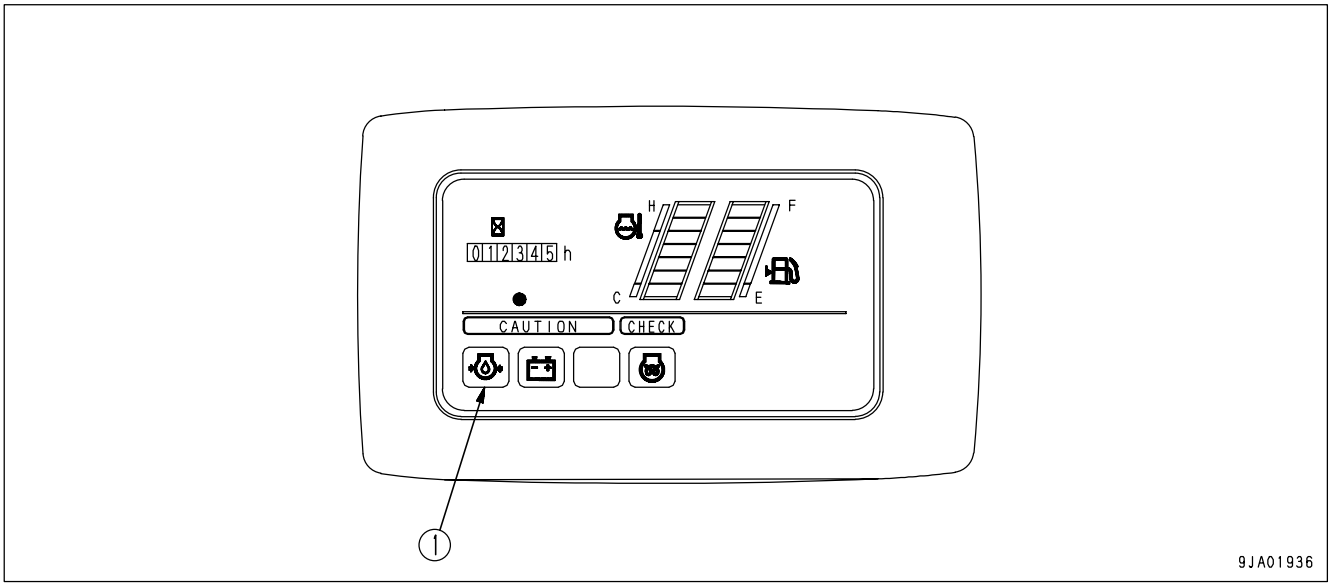
- This lamp will light up if the starting switch is turned ON when the engine is stopped, but this does not indicate any abnormality.
- When the engine is started or stopped with the starting switch at the ON position, the lamp may light up and the buzzer may sound momentarily, but this does not indicate any abnormality.

Emergency Monitors

CAUTION

If any monitor lamp lights up, stop the engine immediately and check the problem point.

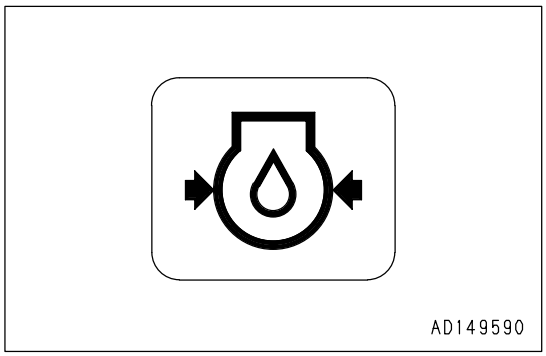
These are items that should be watched when the engine is running. If any abnormality occurs, the monitor for the problem point lights up and the buzzer sounds. Take action immediately.



(1)Engine Oil Pressure Monitor

Engine Oil Pressure Monitor

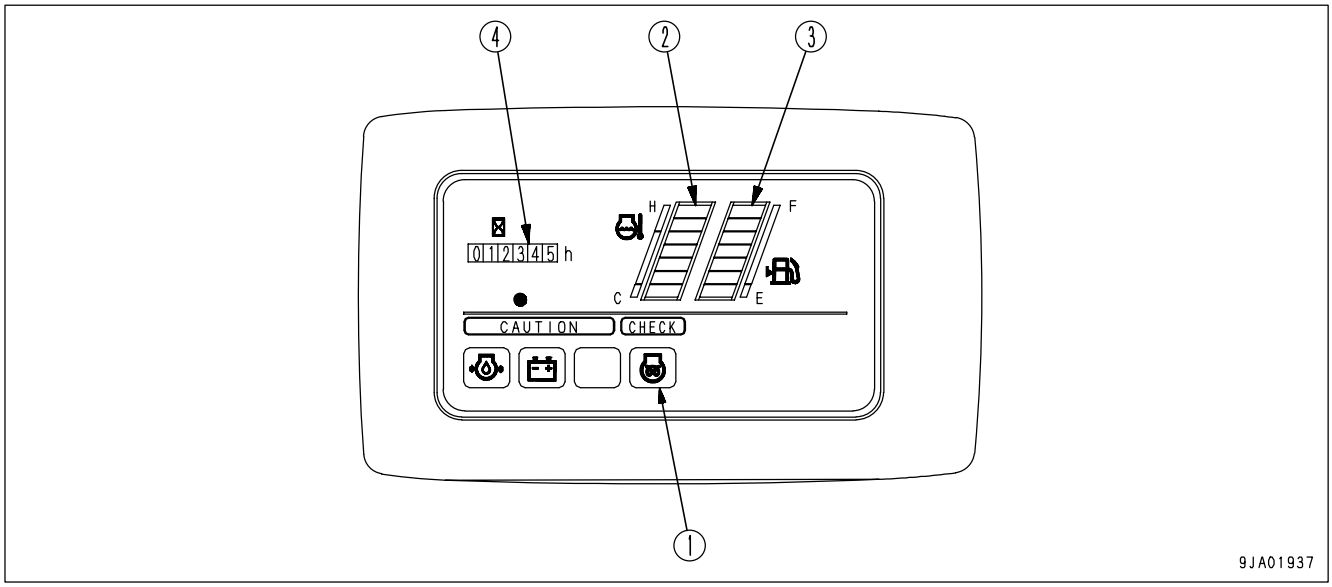
If the engine lubricating oil pressure goes below the normal value, this monitor lights up and the buzzer sounds. If the lamp lights up, stop the engine, and check the lubricating system and oil level in the oil pan.



REMARK

- This lamp will light up if the starting switch is turned ON when the engine is stopped, but this does not indicate any abnormality.
- When the engine is started or stopped with the starting switch at the ON position, the lamp may light up and the buzzer may sound momentarily, but this does not indicate any abnormality.

Meter Display Portion



Pilot Display
(1)Engine Pre-heating Monitor

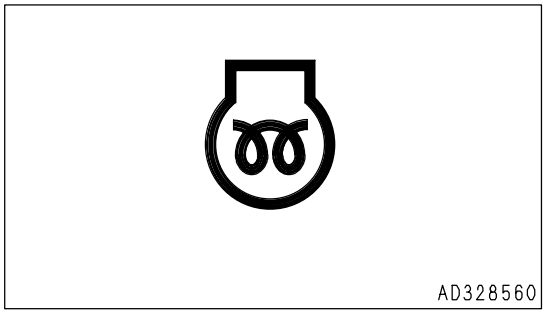
Meter
(2)Engine Coolant Temperature Gauge
(3)Fuel Gauge
(4)Service Meter

Pilot Display

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

Engine Pre-heating Monitor

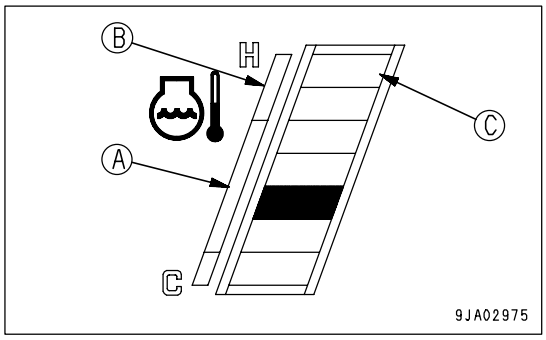
This monitor lamp (1) indicates the pre-heating time requred when starting the engine at an ambient temperature below 0°C (32°F). The monitor lamp lights when the starting switch is turned to HEAT position and goes off after about 18 seconds to show that the pre-heating is completed.



Gauges and Meter

Engine Coolant Temperature Gauge

This meter (2) shows the engine cooling water temperature.
During normal operation, the lamp should light up in the green range (A).
If the lamp in the red range (B) lights up during operation, run the engine at low idling and wait for the temperature to go down to the green range (A).
After starting the engine, warm up it until the green range lights up.

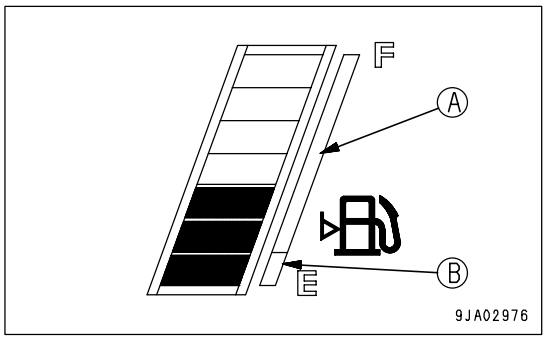


REMARK
Only segment (C) flashes, and the alarm buzzer sounds at the same time.

Fuel Gauge

This meter (3) shows the fuel level in the fuel tank.
During normal operation, the lamp should light up in the green range (A).
If the lamp is red range (B) flashes during operation, there is less than 6 liters (1.59 US gal) of fuel remaining, so check and add fuel.

The correct level may not be displayed for a short time after the starting switch is turned to the ON position,but this is not an abnormality.

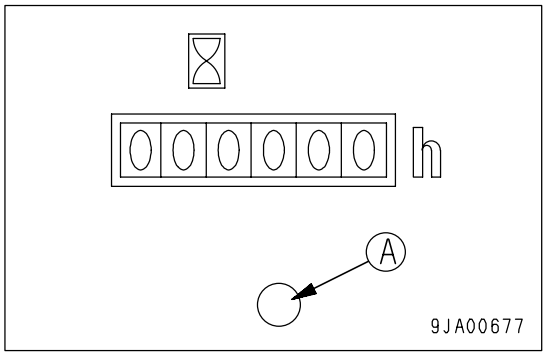


Service Meter

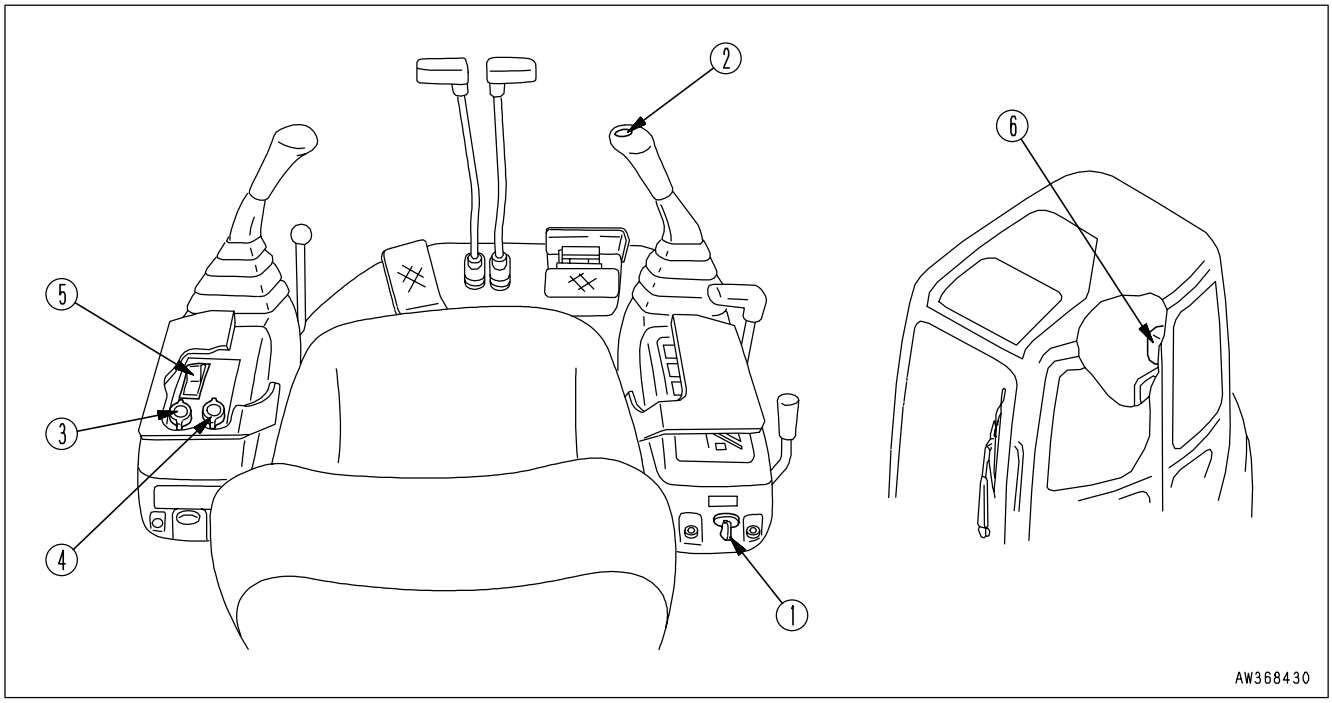
This meter (4) shows the total operation hours of the machine.
Set the periodic maintenance intervals using this display.
The service meter advances while the engine is running - even if the machine is not traveling.

While the engine is running,operation display (A) at the top inside of the meter will light to show that the meter is advancing.

The meter will advance by 1 for each 1/10 hour of operation regardless of the engine speed.



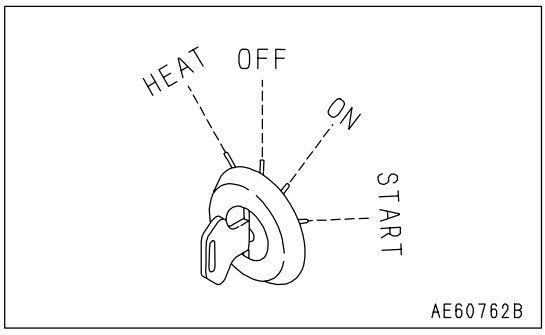
SWITCHES



(1) Starting switch
(2) Horn switch
(3) Lamp switch
(4) Cab heater switch (machine equipped with cab)
(5) Windshield wiper switch (machine equipped with cab)
(6) Room lamp switch (machine equipped with cab)

Starting Switch

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



OFF position
The key can be inserted or withdrawn. The switches for the electric system except the cab lamp, are all turned off and the engine is stopped.

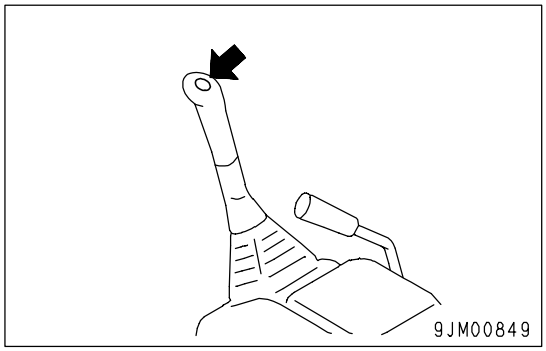
ON position
Electric current flows in the charging and lamp circuits. Keep the starting switch key at the ON position while the engine is running.

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

HEAT (preheat) position
When starting the engine in cold weather, turn the key to this position. When the key is set to the HEAT position, the preheating monitor lights up. Keep the key at this position until the preheating monitor goes out.
When the preheating monitor goes out, release the key.
When the key is released, it will return to the OFF position, so turn it immediately to START and start the engine.

Horn Switch

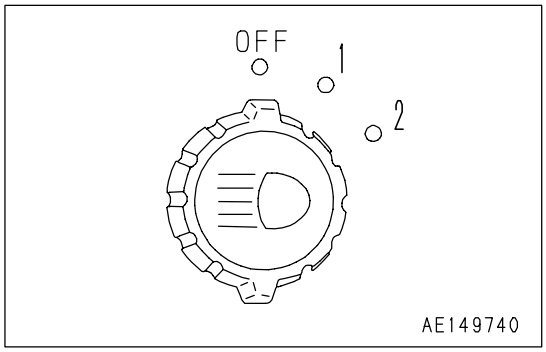
Press switch (2) at the center of the knob of the right work equipment lever to sound the horn.



Lamp Switch

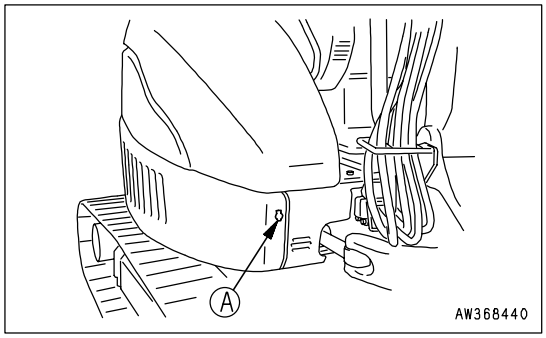
This switch (3) lights up the head lamps and panel lamp.

Position 1: Panel lamp lights up
Position 2: Panel lamp and head lamp lights up.
OFF position: Lamps goes off.



REMARK

- When the lamp switch is at position 2, electric current will flow to the equipment taking its power from socket (A).
- A maximum of 5A can be taken from socket (A).

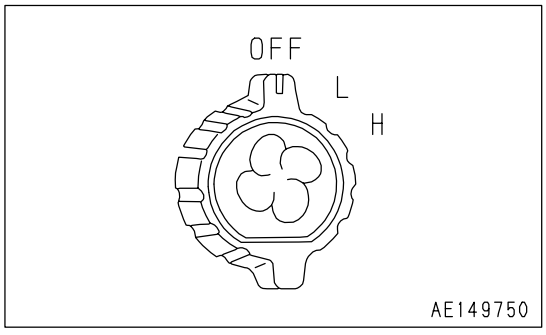


Cab Heater Switch

(Machine equipped with cab)
This switch (4) is used to heat the operator's compartment. The flow rate of the hot air can be set to two levels.

H position: High
L position: Low

Hot water from the engine is used to carry out heating, so heating is possible when the engine cooling water is hot.



Windshield Wiper Switch

(Machine equipped with cab)

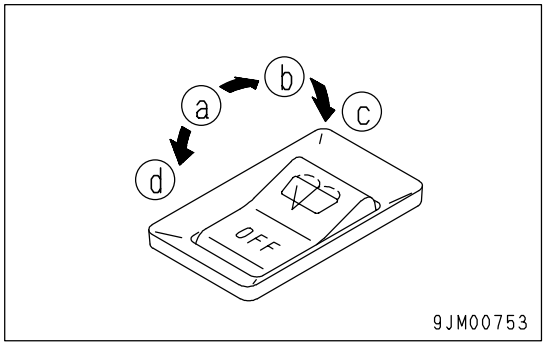
This switch (5) actuates the front window wiper.

(a) OFF: The wiper stops.

(b) ON: The wiper moves continuously.

(c) The wiper moves continuously and window washer fluid is sprayed out. When the switch is released, it return to (b).

(d) Window washer fluid is sprayed out. When the switch is released, it return to (a).



REMARK

- Do not keep the switch pressed at the washer spray position for more than 10 seconds continuously.
- Do not press the switch to the washer spray position if the washer fluid container is empty.

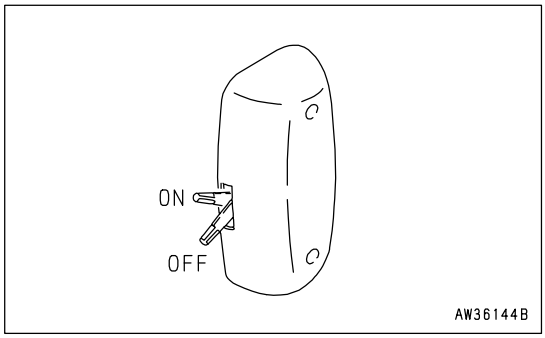
Room Lamp Switch

(Machine equipped with cab)

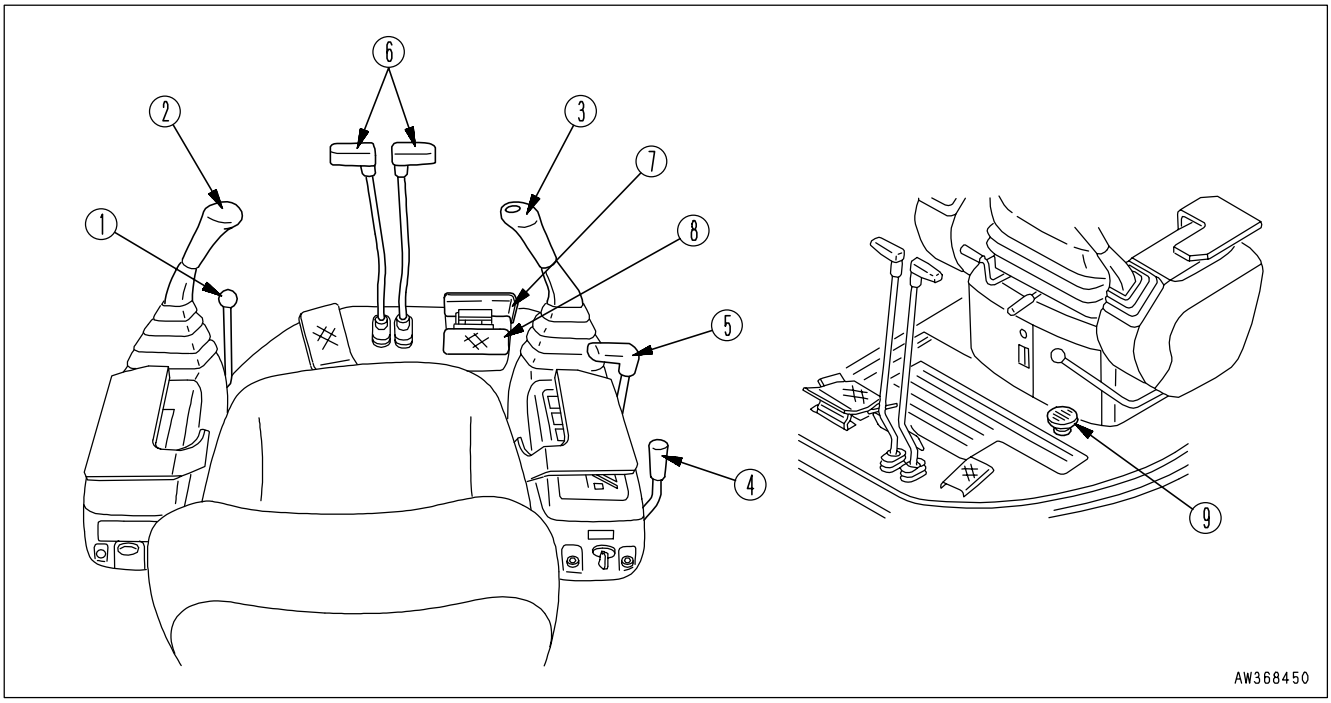
This switch (6) is used to turn on the room lamp.

ON position : Lights up

OFF position : Lights off



CONTROL LEVERS AND PEDALS



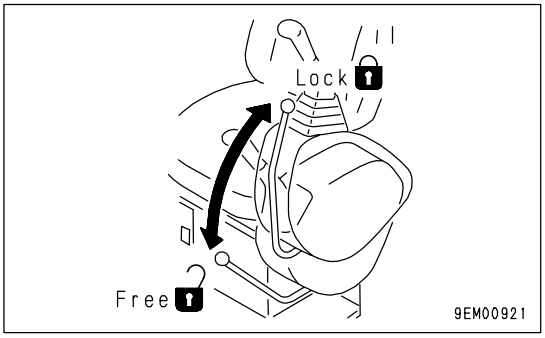
(1) Safety lock lever (for left and right work equipment control levers)
(2) Left work equipment control levers
(3) Right Work equipment control levers
(4) Fuel control lever
(5) Blade control lever
(6) Travel levers
(7) Pedal lock (for boom swing control pedal)
(8) Boom swing control pedal
(9) Traveling acceletor pedal

Safety Lock Lever

WARNING

- **When leaving the operator's compartment, set the safety lock lever securely to the LOCK position. If the safety 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 safety lock lever is not placed securely at the LOCK position, the control lever may move and cause a serious accident or injury. Check that the condition of the lever is as shown in the diagram.**
- **Even if the safety lock lever is set to the LOCK position, the travel, blade, and boom swing controls are not locked.**
- **When pulling the safety lever up, be careful not to touch the work equipment control lever.**
- **When pushing the safety lever down, be careful not to touch the work equipment control lever.**

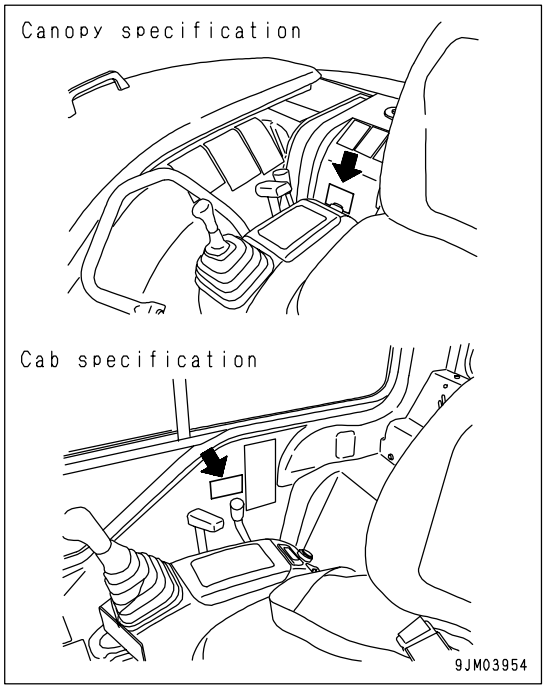
This lever (1) is a device with which to lock the operations of the work equipment, swing, travel and attachment.
When pulled up, it locks them.
This safety lock lever is of a hydraulically actuated type. When it is in the LOCK position, the work equipment control lever and travel control lever are still movable, but none of the work equipment, swing and travel motors works.



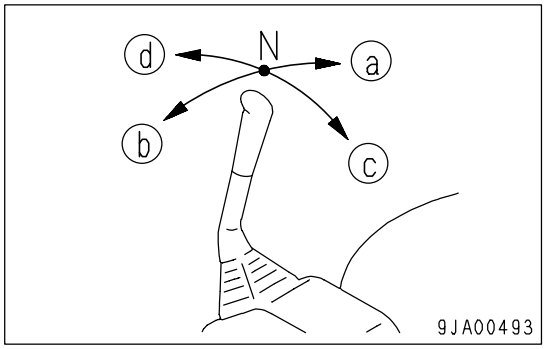
Work Equipment Control Lever

WARNING

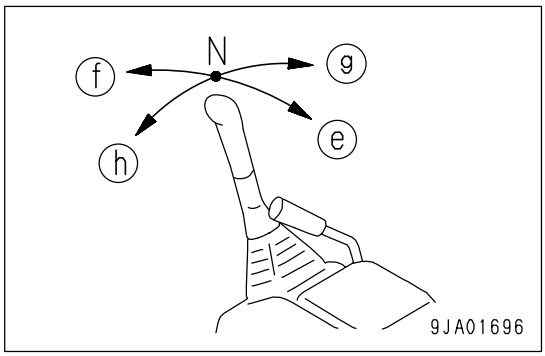
- **The operating pattern is set to the standard operating pattern (ISO pattern).**
- **When changing the operating pattern, please contact your Komatsu distributor.**
- **The method of using operating patterns other than the ISO pattern is given in the ATTACHMENT AND OPTIONS section. Always read and understand the contents before operating the machine.**
- **When changing the operating pattern, change the operating plate at the same time to the operating plate that matches the movement of the machine.**
  The place to attach the operating plate is on the right side of the operator's cab.



This left work equipment control lever (2) is used to operate the arm and upper structure.
Swing operation
(a) Swing to right
(b) Swing to left
Arm operation
(c) Arm IN
(d) Arm OUT
N (Neutral): The upper structure and arm are held in that position when they come to a stop and do not move.

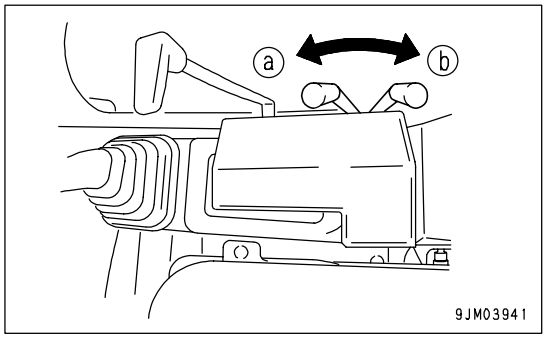


This right work equipment control lever(3) is used to operate the arm and upper structure.
Boom operation
(e) RAISE
(f) LOWER
Bucket operation
(g) DUMP
(h) CURL
N (Neutral): The boom and bucket are held in that position when they come to a stop and do not move.



Fuel Control Lever

This lever (4) is used to control the engine speed and output.
(a) Low idling: Push the lever fully.
(b) High idling: Pull the lever fully.

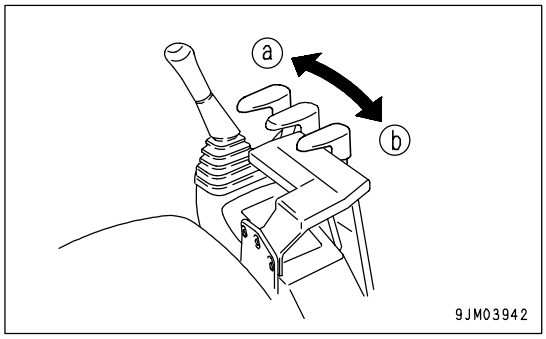


Blade Control Lever

NOTICE

- **This lever is not locked even when the safety lock lever is at the LOCK position, so when not operating the blade, be careful not to touch this lever.**
- **When continuing with the work using the blade for more than an hour, keep a close watch on the possible rise of the cooling water temperature.**

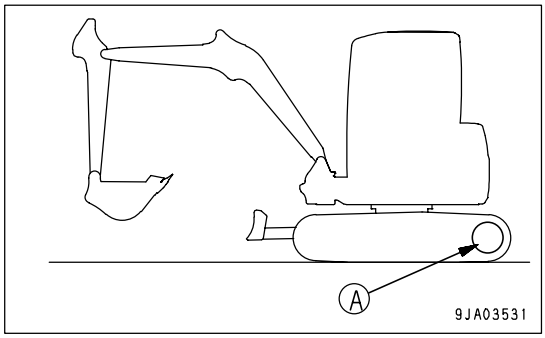
This lever (5) is used to control the blade.
(a) Lower
(b) Raise



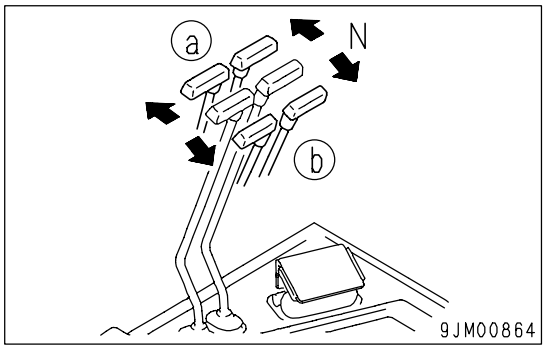
Travel Levers

WARNING

- **If the track frame is facing the rear, the direction of travel operations will be reversed.**
  When operating the travel levers, check if the track frame is facing the front or the rear.
  (If sprocket (A) is at the rear, the track frame is facing the front.)



Use this lever (6) to driver the machine.
(a) FORWARD: The lever is pushed forward
(b) REVERSE: The lever is pulled back
N (Neutral): The machine stops



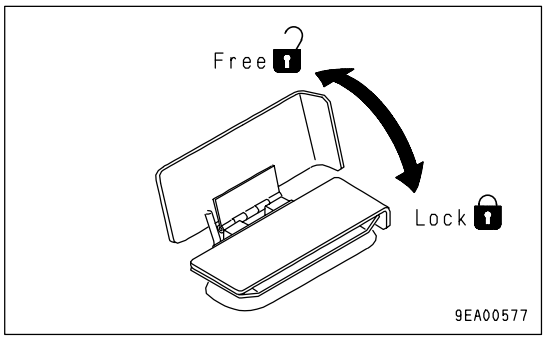
Pedal Lock

(For boom swing contol pedal)

WARNING

When boom swing operation is not required, lock the boom with the pedal lock. If the operation pedal is accidentally pressed while it is not lock, a serious accident or injury.

This pedal (7) is used to lock the boom swing pedal.
The pedal is locked by fitting the plate over the pedal.

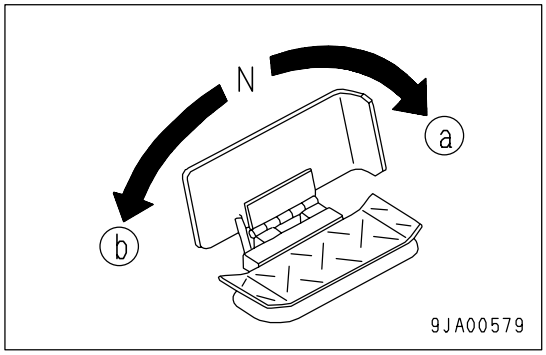


Boom Swing Control Pedal

WARNING

If the bucket is wider than the standard bucket, there is danger that the bucket will contact the operator's cab when swinging the boom to the left with the work equipment pulled in. Check the distance between the bucket and the cab during the operation and operate the work equipment slowly.

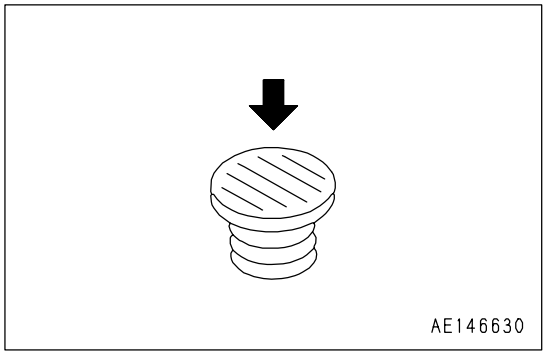
This pedal (8) swings the boom to the left and right.
(a): Right swing
(b): Left swing
N(Neutral): Boom is stopped and held in this position.



Traveling Accelerator Pedal

If the pedal (9) is depressed, the machine speed will increase.

For details of the travel speed values, see "SPECIFICATIONS (PAGE 5-2)".

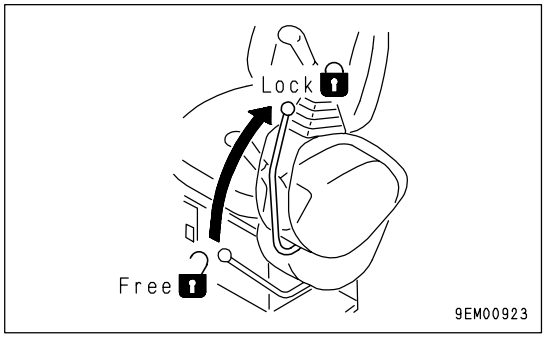


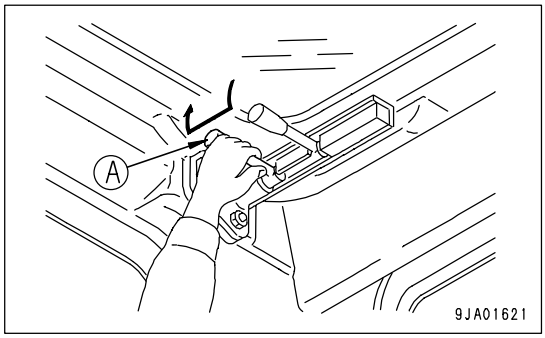
WINDSHIELD

(Machine equipped with cab)

WARNING

- **When opening or closing the front window, bottom window, or the door, be sure to first set the safety lock lever to the LOCK position.**
  If the control levers are not locked and touched by accident, a serious personal injury may be caused.
- **When opening or closing the front window, park the machine on the flat ground, lower the work equipment to the ground, then stop the engine.**
- **When opening the front window, hold the grips securely with both hands, pull it up and do not release it until it clicks into the automatic lock catch.**
- **The pulled-up front window may drop under its own weight, so be sure to lock it with the right and left pins (A).**
- **When closing the front window, hold the grips securely with both hands, and pull it down slowly.**

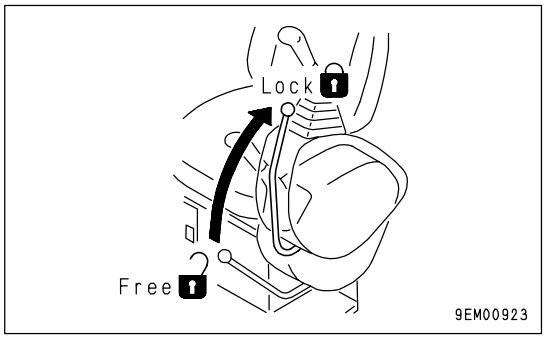




It is possible to stow (pull up) the front window in the roof of the operator's compartment.

Opening

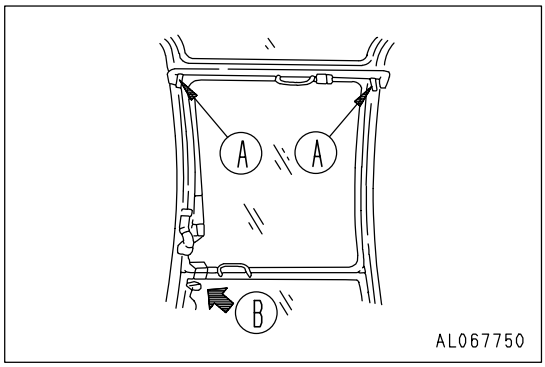
1. Stop the machine on level ground, lower the work equipment completely to the ground, then stop the engine.
2. Set the safety lock lever securely to the LOCK position.



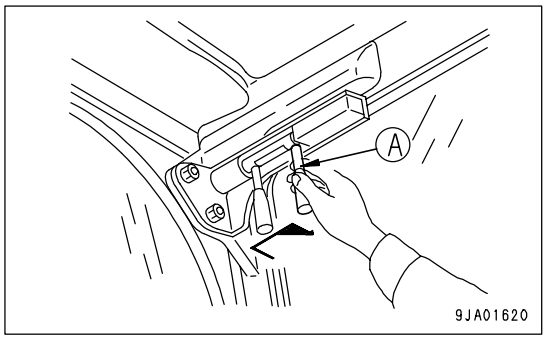
NOTICE

If it is attempted to open the upper windshield without disconnecting the wiring, the wiring will be torn off.

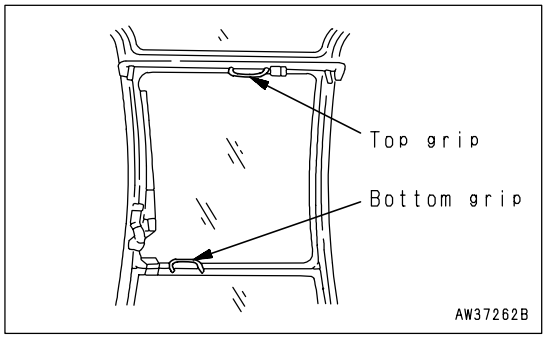
3. Disconnect the wiring for the wiper motor from socket (B).



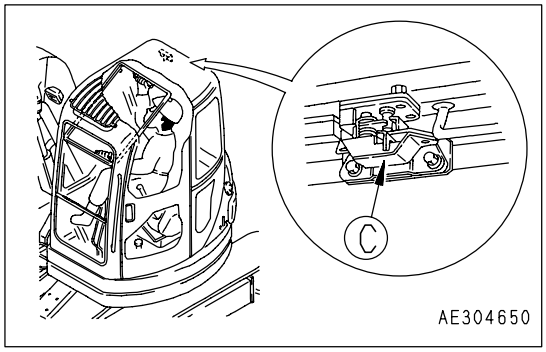
4. Pull lock pins (A) at the top left and right sides of the front window to the inside to release the lock.



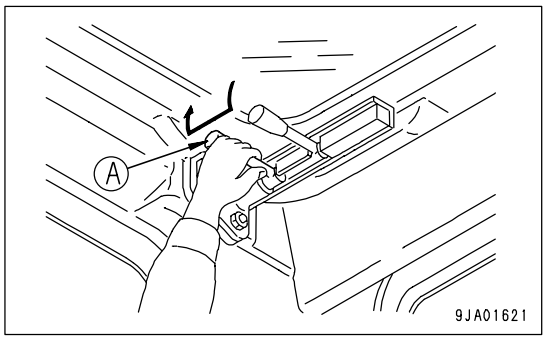
5. Hold the top grip with your right hand, pull it to the front to remove the top of the front window from the frame, then set it on the rail of the top roller.



6. From the inside of the operator's cab, hold the bottom grip with the left hand and the top grip with right hand, pull up the upper windshield, and push it in fully until it is locked by catch (C).

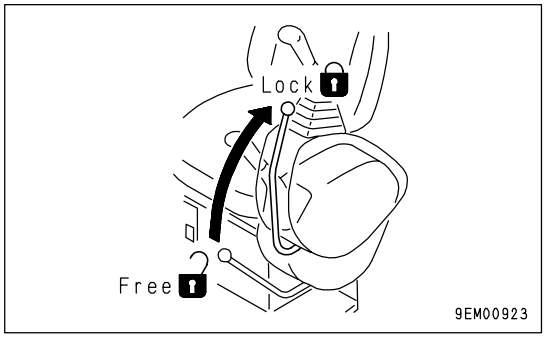


7. Be sure to push the right and left pins (A) in the holes to apply the lock.

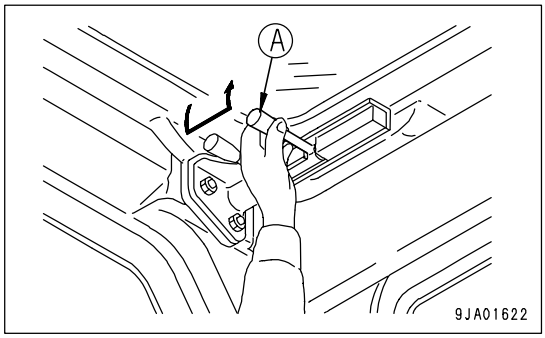


Closing

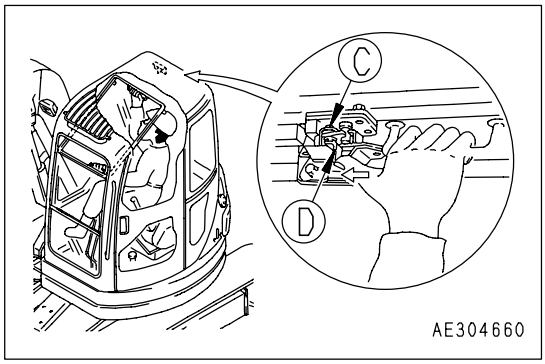
1. Stop the machine on level ground, lower the work equipment completely to the ground, then stop the engine.
2. Set the safety lock lever securely to the LOCK position.



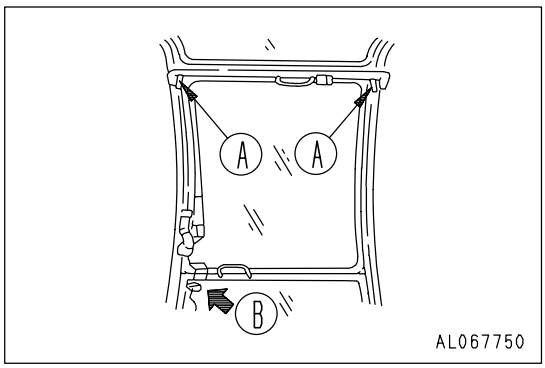
3. Release the lock pin (A).



4. Hold the grip at the bottom of the front window with your left hand and the grip at the top with your right hand, release the lock of catch (C) with your right thumb, then pull the top grip to the front and lower the front window slowly. When releasing the lock of catch (C), move release lever (D) in the direction of the arrow to release the lock.

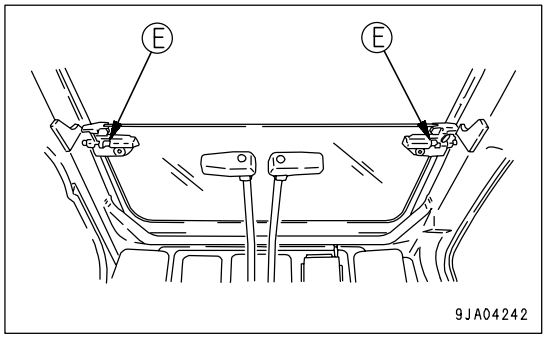


5. When the bottom of the window reaches the top of the bottom window, push the top of the window to the front, and insert left and right lock pins (A) securely in the holes to apply the lock.
6. Connect the wiper motor wiring to socket (B).

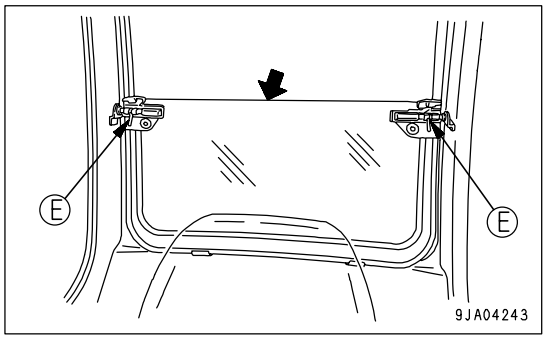


Removing Lower Windshield

1. With the front window open, remove lock pins (E), and the bottom part of the front window can be removed.



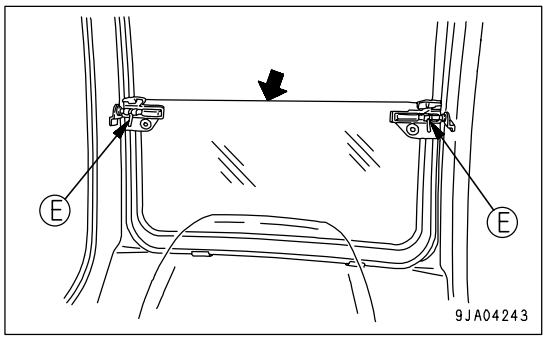
2. Store the removed bottom part of the front window at the rear of the opertor's cab and lock with lock pins (E).



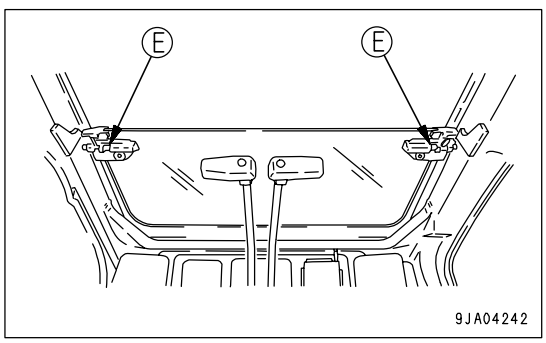
Installing Lower Windshield

With the front window open, install the bottom part of the front window.

1. Remove lock pins (E) and detach the bottom part of the front window from its storing position.



2. Install the bottom part of the front window and lock securely with lock pins (E).

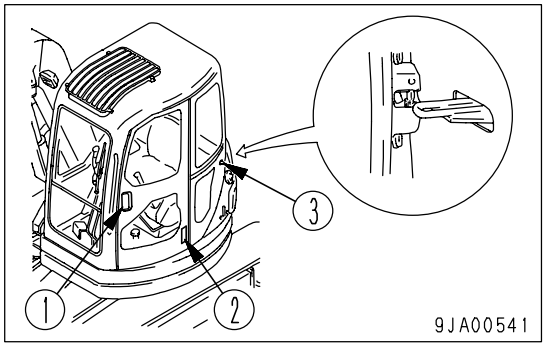


SLIDING DOOR

(Machine equipped with cab)

CAUTION

- **Be sure to check that the sliding door is locked in position both when it is open and when it is closed.**
- **Always stop the machine on level ground when opening or closing the door.**
  If the door is opened or closed on a slope, there is danger that the operating effort will suddenly change. Do not open or close the door on slopes.
- **When opening or closing the door, always use door handle (1) and knob (2).**
- **Be careful not to get your hands caught between the front pillar or center pillar.**
- **If there is anyone inside the cab, call out to that person before opening or closing the door.**



NOTICE

Always clean the step at the entrance to the cab and take action to prevent snow or mud from accumulating.
If snow accumulates, it may freeze and make it impossible to open the door.

Door Lock

When closing the door, pull the handle back to remove lock (3), then pull the door to the front.

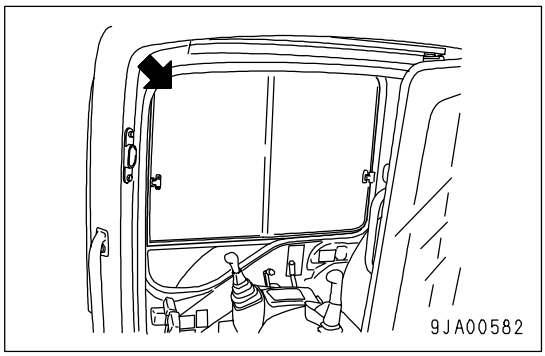
SLIDING WINDOW

(Machine equipped with cab)

CAUTION

Do not put your head or hands out of the window when traveling or during operations.

The window on the right side of the cab can be opened.



REAR WINDOW

(Machine equipped with cab)

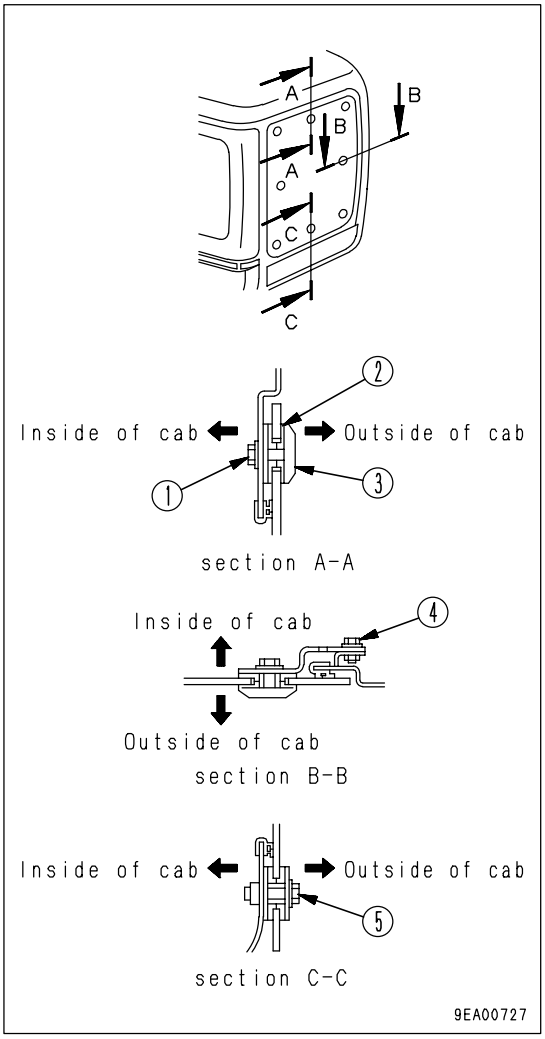
WARNING

When the rear window is removed, the glass will drop, so carry out the operation with two workers: one worker removes the bolts and the other worker supports the glass.

It is possible to remove the rear window.
Remove the rear window as follows.

1. Remove 3 bolts (1) at the top from inside the cab. When the bolts are removed, spacer (2) and button (3) will drop, so one worker should stand outside the cab to catch the spacer and button before they fall.
2. Remove 4 bolts (4) at two places in the center from the inside of the cab.
3. Remove three bolts (5) at the bottom from outside the cab. When bolts (5) are removed, the glass will drop, so one worker should support the glass securely.
4. Rotate the glass approx. 30° when removing it.

5. After removing the parts, put them in a bag and store them in a safe place to prevent them from becoming lost.



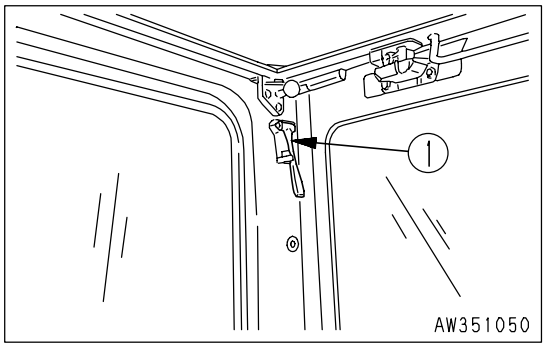
EMERGENCY ESCAPE HAMMER

(Machine equipped with cab)

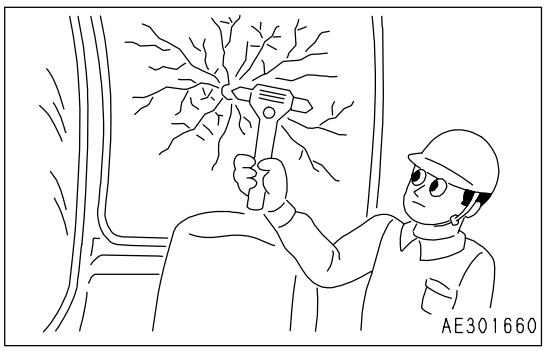
⚠ CAUTION

- **When you are obliged to break the window glass pane with a hammer, take good care not to get hurt with flying glass shards. Before getting out of the operator's cab, remove glass fragments remained in the windowsills not to get hurt with them. Moreover watch your step not to slip over the broken glasses scattered on the ground.**
- **To prevent injury from pieces of glass, remove all the broken glass from the window frame. Be careful also not to slip on the broken glass that has fallen to the ground.**

In case it becomes impossible to open the door, a hammer (1) to be used for escape from the cab is installed.

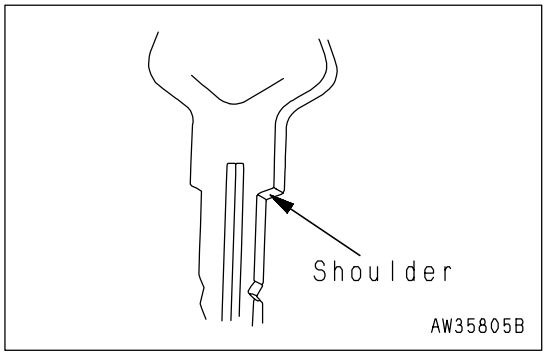


When escaping, break the window glass with hammer (1).



CAP WITH LOCK

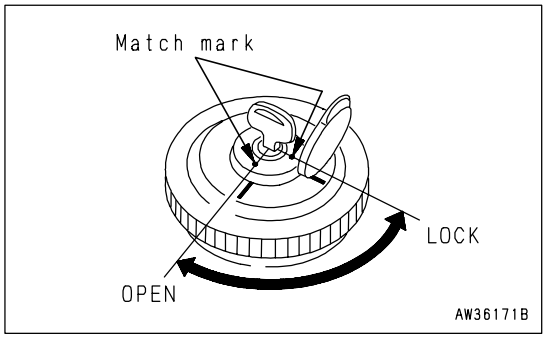
Use the starting key to open and close the locks on the caps and covers.
For details of the locations of the caps and covers with locks, see "LOCKING (PAGE 3-72)".
Insert the key as far as it will go to the shoulder. If the key is turned before it is inserted all the way, it may break.



Opening and Closing Caps with Lock

Opening the Cap

1. Insert the key into the key slot.
2. Turn the key clockwise, align the key slot with the match mark on the cap, then open the cap.



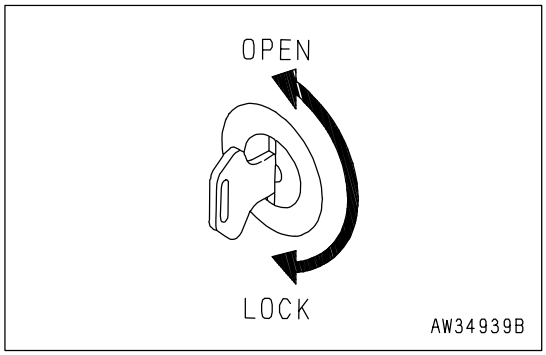
Locking the Cap

1. Turn the cap until tight, then insert the key into the key slot.
2. Turn the key counterclockwise and take the key out.

Opening and Closing Covers with Lock

Opening the Cover

1. Insert the key into the key slot.
2. Turn the key counterclockwise and open the cover by pulling the cover grip.



Locking the Cover

1. Close the cover and insert the key into the key slot.
2. Turn the key clockwise and take the key out.

ENGINE HOOD

CAUTION

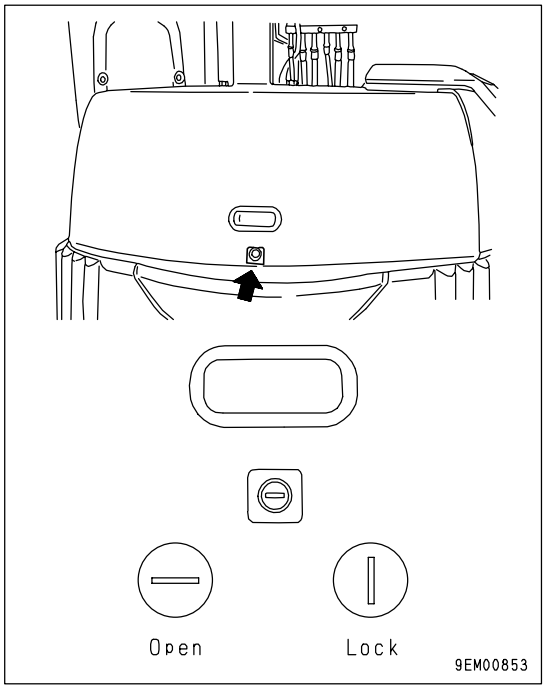
When carrying out inspection and maintenance inside the engine hood, always use the hood support lever to hold the engine hood open.

NOTICE

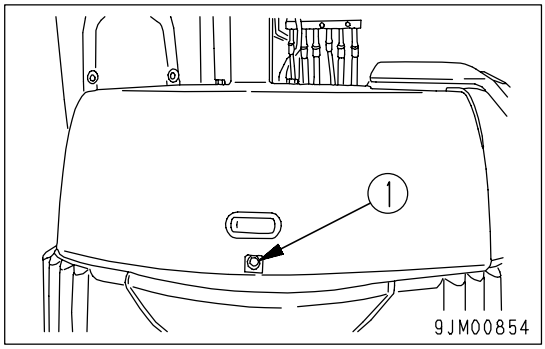
Always keep the hood locked except when opening it.

Check the direction of the key slot in the opening knob to check that it is locked.

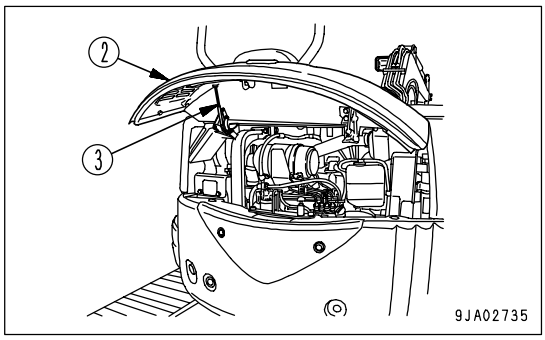
1. Release lock (1) of the engine hood.
   (For details see "Opening and Closing Covers with Lock (PAGE 3-24)".)



2. Push engine hood opening knob (1) and open hood (2).



3. After opening the hood, use hood support lever (3) to secure the hood in position.
4. When closing hood (2), remove hood support lever (3), fit it securely in the lever lock, then lower the hood slowly and push it down to lock it.



MUD COVER

WARNING

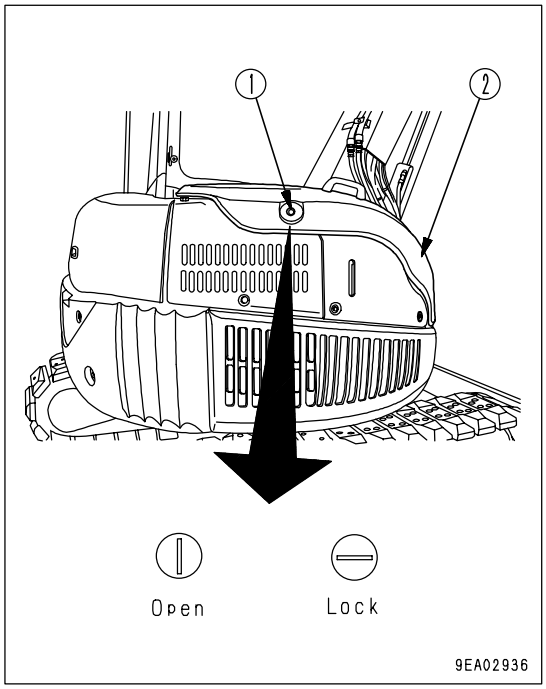
When carrying out inspection or maintenance inside the cover, open the cover and be sure to fix it securely in position with the stopper.

NOTICE

Always keep the hood locked except when opening it.

Check the direction of the key slot in the opening knob to check that it is locked.

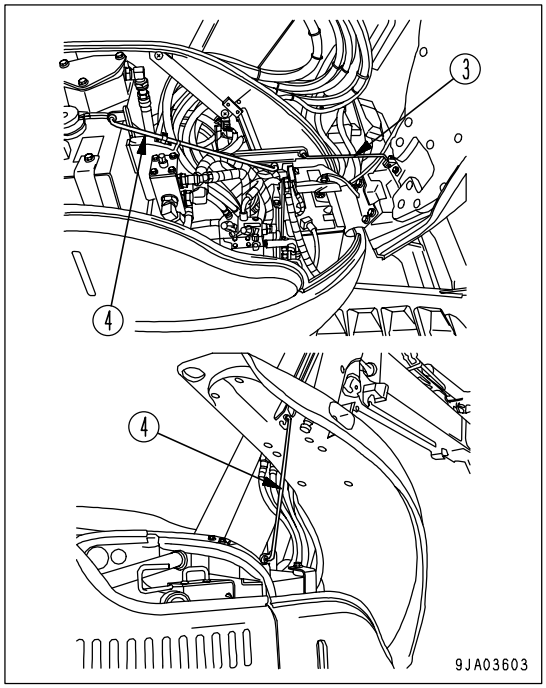
1. Release lock (1) of the mud cover.
   (For details see "Opening and Closing Covers with Lock (PAGE 3-24)".)
2. Push mud cover opening knob (1) and open cover (2).



3. It can be secured in 2 positions by using cover support lever (3) or (4).
   After opening cover (2), set cover support lever (3) or (4) to the LOCK position to hold the cover in position.
4. When closing cover (2), remove cover support lever (3) or (4) from the LOCK position, lower the cover slowly and push the cover down to lock it.

REMARK

When carrying out normal maintenance, use support lever (4) to hold the cover in position.

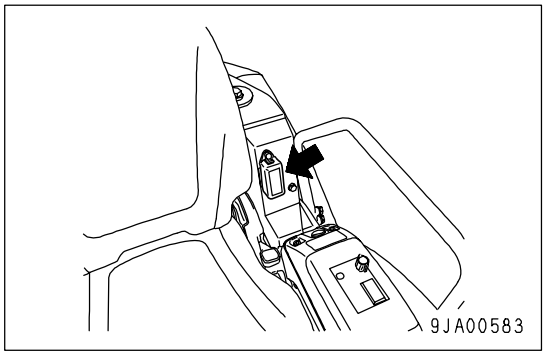


FUSE

NOTICE

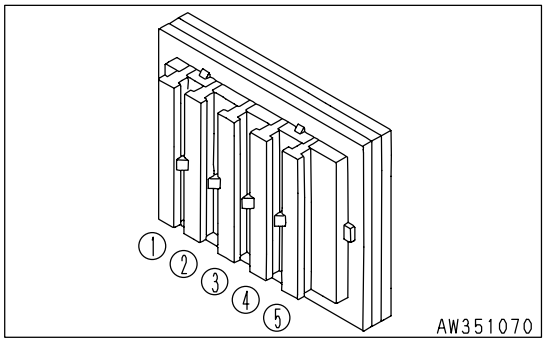
Before replacing a fuse, be sure to turn off the starting switch.

The fuses protect the electrical equipment and wiring from burning out.
If the fuse becomes corroded, or white powder can be seen, or the fuse is loose in the fuse holder, replace the fuse.
Replace the fuse with another of the same capacity.



Fuse Capacities and Circuit Names

No.	Fuse capacity	Name of circuit
(1)	10A	Spare
(2)	10A	Engine control, work equipment lever, lock valve
(3)	20A	Monitor, *wiper, *heater, *room lamp, *car radio (if equipped)
(4)	20A	Working lamp, travel selector valve
(5)	30A	Engine control



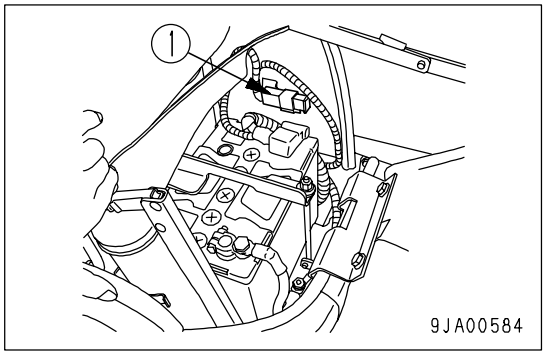
The item marks with * are special parts for the machine equipped with cab.

BLOCK FUSE

If the starting motor does not rotate even when the starting switch is turned to the ON position, block fuse (1) is probably blown, so open the cover on the right side of the machine and check or replace.

REMARK

A block fuse is a large fuse wire installed to the circuit where a large-capacity current is flowing. It acts in the same way as a normal fuse to protect the electrical equipment and wiring from burning out under abnormal current.

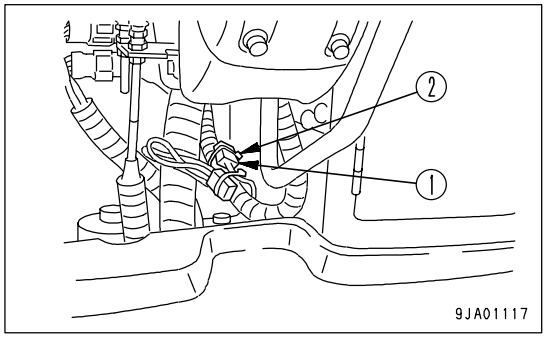


AUXILIARY ELECTRIC POWER

NOTICE

When installing electrical not supplied by Komatsu, use 12V specification with a maximum of 120W (equivalent to 10A). If equipment is to be installed with a capacity greater than this, please contact your Komatsu distributor.

There is a connector for taking off the power supply for optional equipment at the bottom of the box the right work equipment control lever (connector No. M30).



REMARK

As connector(1) is fixed by using band(2), use it after removing the band.

Fix the connector by using band(2) after using the connector.

Regarding as Canopy specification, cover the connector(1) by using nylon

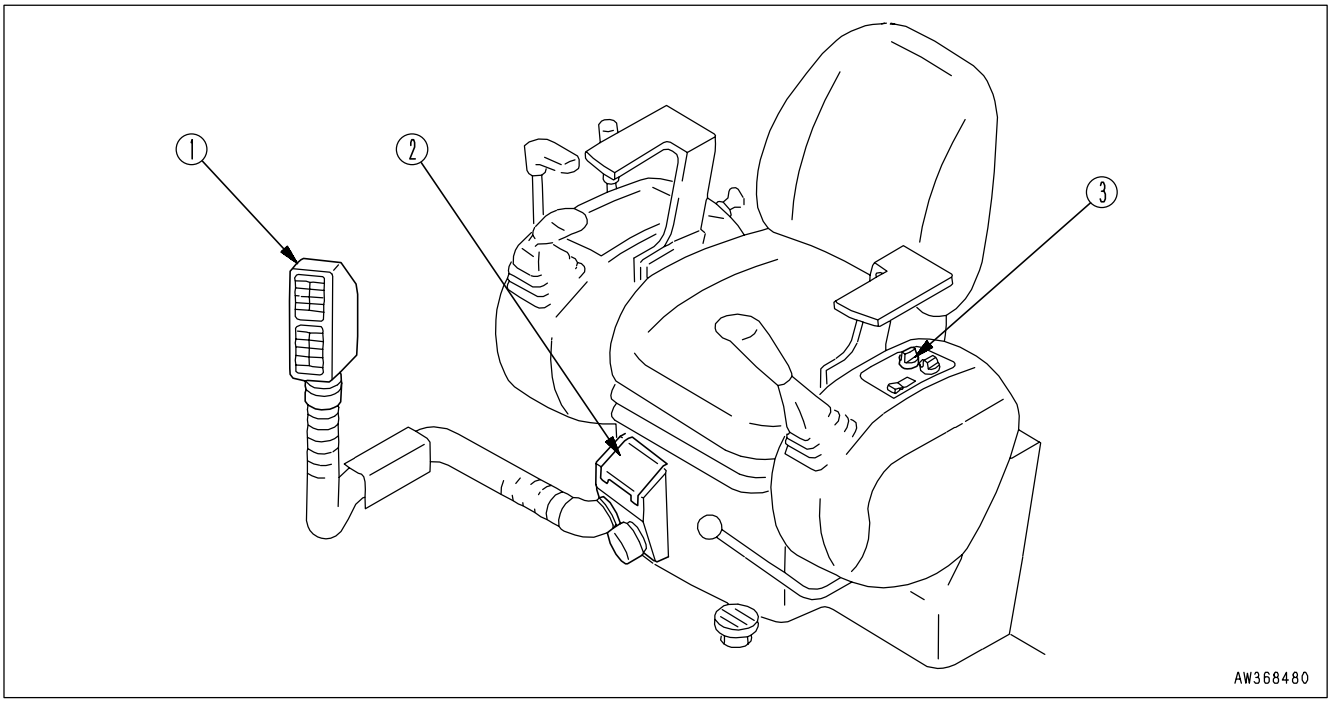
not so as to be exposed to water.

The connector types are shown in the table below.

	M type housing (2 poles)		Terminal		
	Body	Rear holder	AVS 0.5	M. AVS0.85 - 2	M. AVS3
Komatsu part No.	08056-00211	08056-00230	08056-00050	08056-00051	08056-00052

CAR HEATER CONTROLS

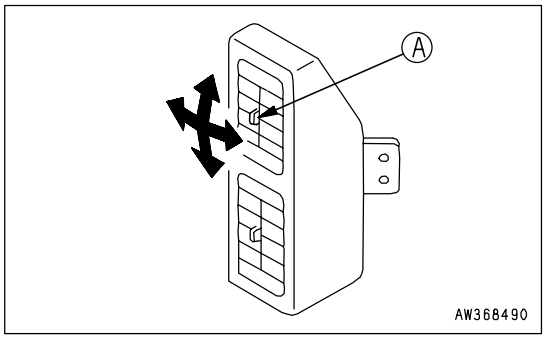
Control panel



(1) Hot air vent (window side)
(2) Hot air vent (foot)
(3) Wind volume selector switch

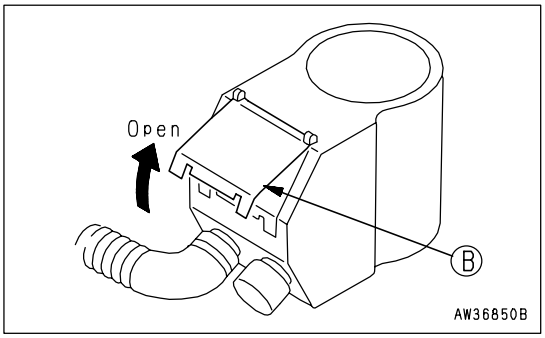
Hot Air Vent

This equipment (1) is used to remove the mist from the window.
It is possible to change the direction of the vent by adjusting with knob (A).



Foot Vent

When cover (B) of this equipment (2) is opened, hot air will flow to the operator's feet.

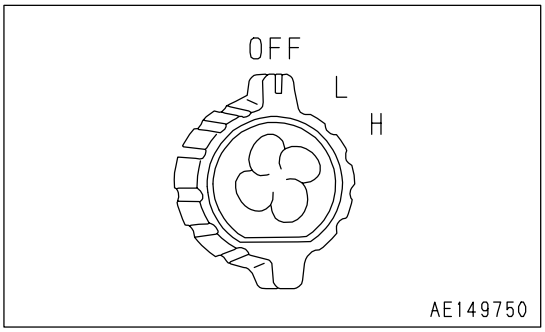


Wind Volume Selevtor Switch

This switch (3) can be used to adjust the flow of hot air to 2 levels.

H position: High
L position: Low

The air is heated by the hot water from the engine, so it can be used when the engine cooling water is warmed up.



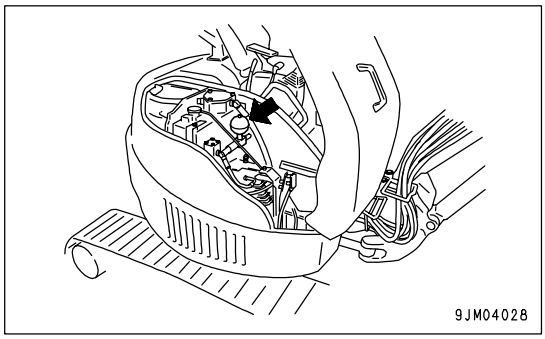
ACCUMULATOR

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.

- **Do not disassemble the accumulator.**
- **Do not bring it near flame or dispose of it in a fire.**
- **Do not make holes in it, weld it, or use a gas cutter.**
- **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.**

This machine is equipped with the accumulator in the control circuit.
The accumulator is a device to store the pressure in the control circuit, and when it is installed, the control circuit can be operated for a short time even after the engine is stopped. Therefore, if the control lever is moved in the direction to lower the work equipment, it is possible for the work equipment to move under its own weight.
The accumulator is installed to the position shown in the diagram on the right.

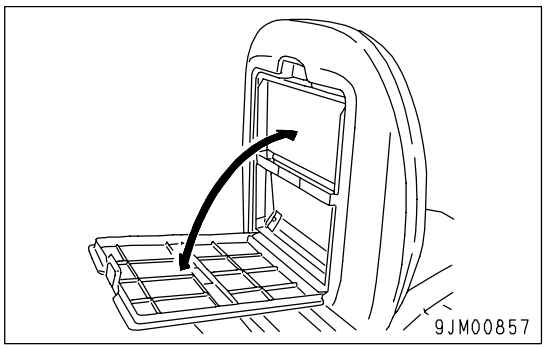


Releasing Hydraulic Pressure With Accumulator

1. Place the work equipment on the ground. Close the crusher attachment jaws, etc.
2. Stop the engine.
   Turn the key to the ON position to let electricity flow in the circuit.
3. Move the safety lock lever to the free position. Move the work equipment control lever and the attachment control pedal to full stroke back and forth, right and left so as to release the pressure in the control circuit.
4. Move the safety lock lever to the lock position. Lock the control lever and attachment control pedal.

OPERATION MANUAL STORAGE

There is a box provided in the rear of the operator's seat to keep the Operation and Maintenance Manual.
Keep the operation manual in this box so that you can read it when you need it.

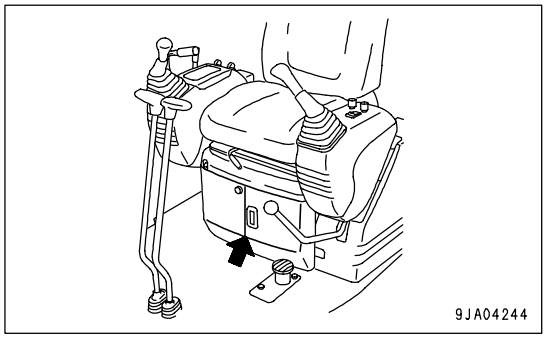


TOOL BOX

NOTICE

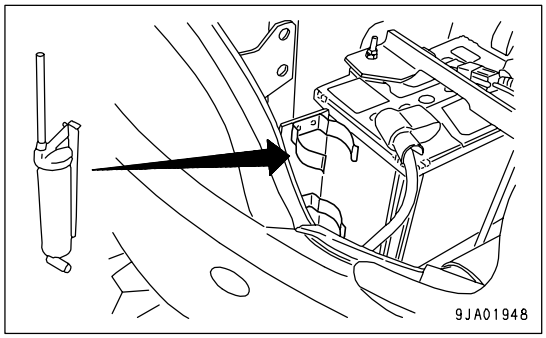
Except when opening the cover for some reason, always keep the cover locked.

Store the tools in this box.



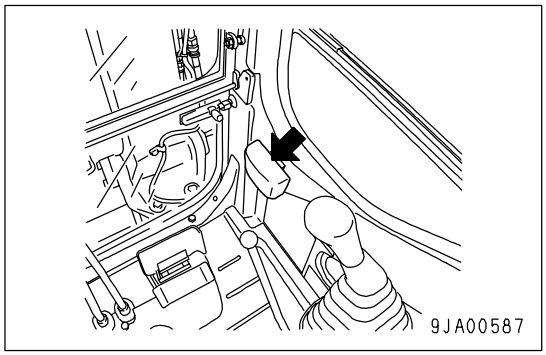
GREASE PUMP HOLDER

This is at the side of battery.
When not using the grease gun, fit it in the holder.



ASHTRAY

(Machine equipped with cab)
This is on the right side of the operator's seat.
Always make sure that you extinguish the cigarette before closing the lid.



MACHINE OPERATIONS AND CONTROLS

BEFORE STARTING ENGINE

Walk-Around Checks

Before starting the engine, look around the machine and under the machine to check for loose nuts or bolts, or leakage of oil, fuel, or coolant, and check the condition of the work equipment and hydraulic system. Check also for loose wiring, play, and accumulation of dust at places which reach high temperatures.

⚠ WARNING

Remove any flammable materials from around the battery or engine muffler or other high temperature engine parts. Leakage of fuel or oil will cause the machine to catch fire. Check carefully, and be sure to repair any abnormalities, or please contact your Komatsu distributor.

If the machine is at an angle, make it horizontal before checking.
Carry out the following inspections and cleaning every day before starting the engine for the day's work.

1. Check for damage, wear, play in work equipment, cylinders, linkage, hoses
   Check that there are no cracks, excessive wear, or play in the work equipment, cylinders, linkage, or hoses. If any abnormality is found, repair it.

2. Remove dirt and dust from around engine, battery, and radiator
   Check that there is no dirt or dust accumulated around the engine or radiator. Check also that there is no flammable material (dry leaves, twigs, etc.) accumulated around the engine muffler or high temperature parts of the engine, or around the battery. Remove all dirt, dust, and flammable materials.

3. Check for leakage of water or oil around engine
   Check that there is no leakage of oil from the engine or leakage of water from the cooling system. If any abnormality is found, repair it.

4. Check for oil leakage from hydraulic equipment, hydraulic tank, hoses, joints
   Check that there is no oil leakage. If any abnormality is found, repair the place where the oil is leaking.

5. Check the undercarriage (track, sprocket, idler, guard) for damage, wear, loose bolts, or leakage of oil from rollers.
   If any abnormality is found, repair it.

6. Check for abnormality in handrails, steps, loose bolts.
   If any abnormality is found, repair it. Tighten any loose bolts.

7. Check for abnormality in gauges and monitor
   Check that there is no abnormality in the gauges and monitor in the operator's cab. If any abnormality is found, replace the parts. Clean off any dirt on the surface.

8. Checking window for damage and displacement
   Check the window for any damage or displacement. If it is found broken or displaced, repair it. In particular, repairs must be made immediately, once stopping the machine, if the window is broken or displaced during operation. Do not attempt to continue to operate the machine without repair.

9. Clean, check rear view mirror
   Check that there is no damage to the rear view mirror. If it is damaged, replace it with a new mirror. Clean the surface of the mirror and adjust the angle so that the area at the rear can be seen from the operator's seat.

10. Seat belt and mounting clamps
    Check that there is no abnormality in the seat belt or mounting clamps. If there is any damage, replace with new parts.

11. Check bucket with hook (if equipped) for damage.
    Check that there is no damage to the hook, guide, or hook mount. If any abnormality is found, please contact your Komatsu distributor for repair.

Checks Before Starting

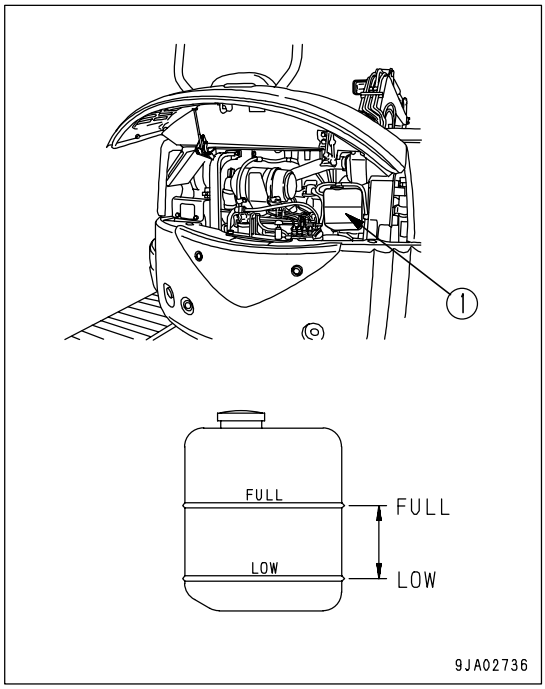
Always carry out the items of the checks in this section before starting the engine each day.

Cooling System Coolant Level - Check/Add

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 before removing it.**

1. Open the engine hood and check that the cooling water level is between the FULL and LOW marks on radiator reserve tank (1) (Shown in the diagram on the right). If the water level is low, add clean and soft water through the water filler of reserve tank (1) to the FULL level.
2. After adding water, tighten the cap securely.
3. If the sub tank is empty, there is probably leakage of water. After inspecting, repair any abnormality immediately. If there is no abnormality, check the water level in the radiator. If the water level is low, add water to the radiator, then fill the reserve tank(1).

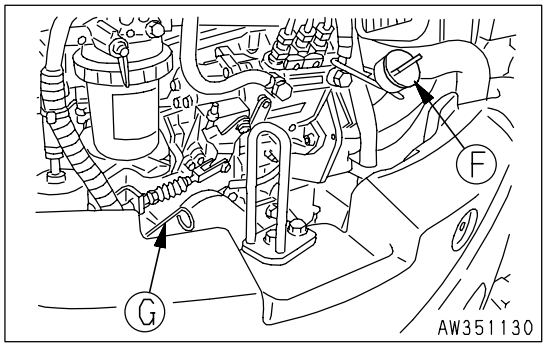


Engine Crankcase Oil Level - Check/Add

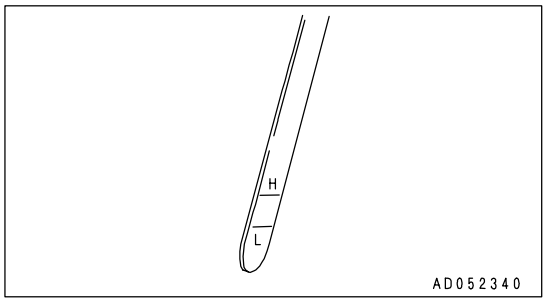
WARNING

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

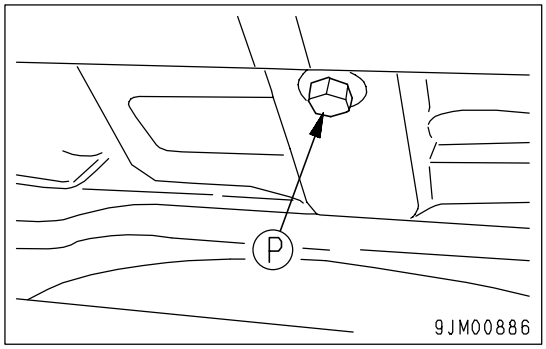
1. Open engine hood.
2. Remove dipstick (G) and wipe the oil off with a cloth.
3. Insert dipstick (G) fully in the oil filler pipe, then take it out again.



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 engine oil through oil filler (F).



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



REMARK

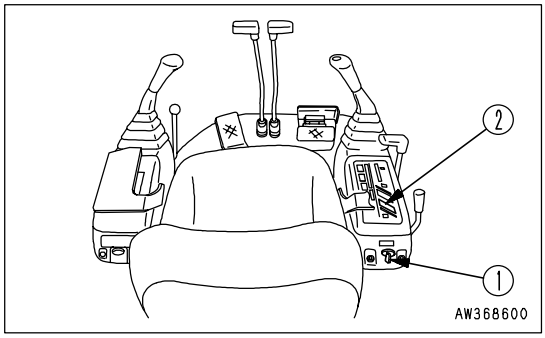
- If the machine is at an angle, make it horizontal before checking.
- When checking the oil level after the engine has been operated, wait for at least 15 minutes after stopping the engine before checking.

Fuel Level - Check/Refill

WARNING

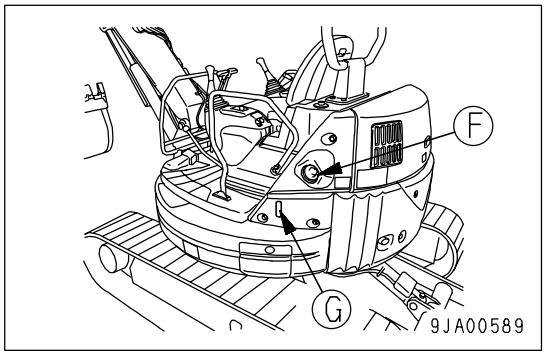
When adding fuel, never spill the fuel or let it overflow. It will cause fire.
If any fuel has spilled, wipe it up completely. If fuel has spilled over soil or sand, remove that soil or sand.
Fuel is highly flammable and dangerous. Never bring flames near fuel.

1. Insert the key in starting switch (1), and turn in to the ON position to light up the monitor.
2. Check the remaining fuel level with fuel gauge (2). If the fuel level is low, watch sight gauge (G), and add fuel through fuel filler port (F).
   Fuel capacity: 60 liters (15.85 US gal)

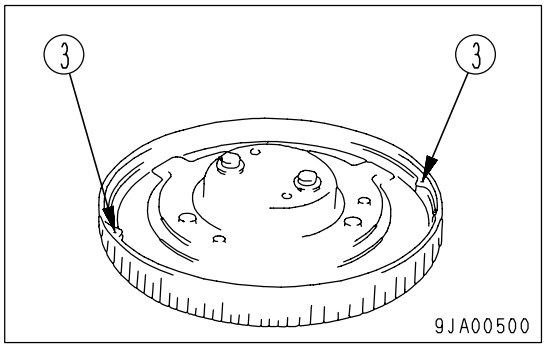


REMARK
When adding fuel to cab specification machines, keep the sliding door closed during the filling operation. If the sliding door is left open, fuel filler port (F) and sight gauge (G) are hidden by the sliding door.

3. After adding fuel, tighten the cap securely.



NOTICE
If breather hole (3) in the cab is clogged, the pressure in the tank will drop and fuel may not flow. Clean the hole from time to time and check that breather hole (3) is not clogged.

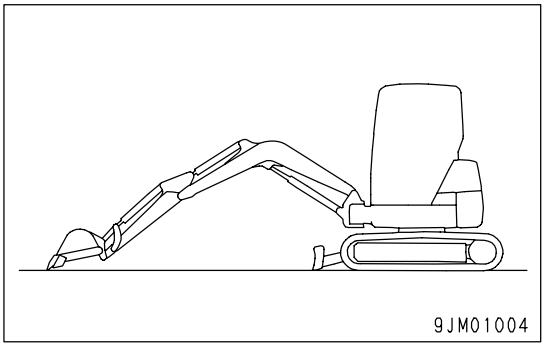


Hydraulic Oil Level - Check/Add

WARNING

- **The parts and oil are at high temperature after the engine is stopped, and may cause burns. Wait for the temperature to go down before starting the work.**
- **When removing the oil filler cap, turn it slowly to release the internal pressure, then remove it.**

1. If the work equipment is not in the condition shown in the diagram on the right, start the engine, run the engine at low speed, retract the arm and bucket cylinder rods fully, then lower the boom, set the bucket teeth in contact with the ground, and stop the engine.



2. Confirm that the oil level is between the H and L marks of sight gauge (G).

NOTICE

Do not add oil above the H line. This will damage the hydraulic circuit or cause the oil to spurt out.

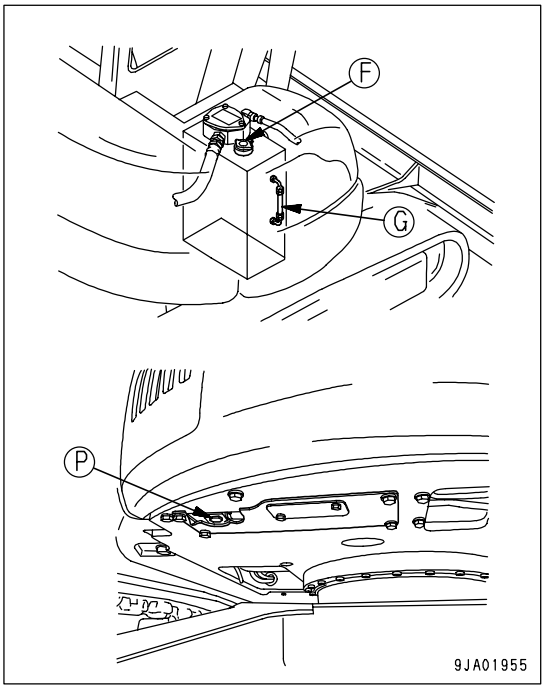
If oil has been added above the H level, stop the upper structure so that the drain plug (P) under the hydraulic tank will be between both tracks, and stop the engine and wait for the hydraulic oil to cool down, then drain the excess oil from drain plug (P).

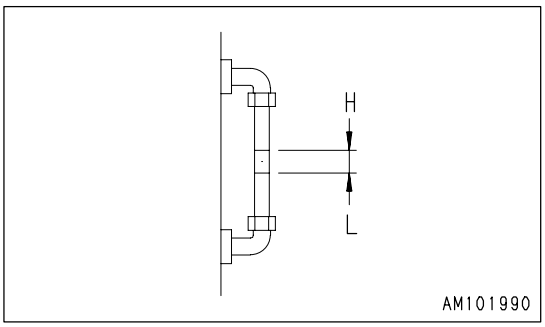
3. If it is below the L level, open the mud cover and add through filler port (F).

REMARK

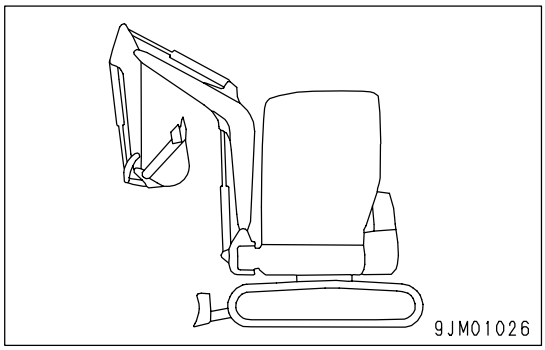
The oil level will vary depending upon the oil temperature.
Accordingly, use the following as the guide:

- Before operation: around L level
  (Oil temperature 10 to 30°C (50 to 86°F))
- Normal operation: around H level
  (Oil temperature 50 to 80°C (122 to 176°F))





4. Extend the boom, arm, and bucket cylinder fully as shown in the diagram on the right, remove the oil filler cap, then install the cap and pressurize the inside of the tank.

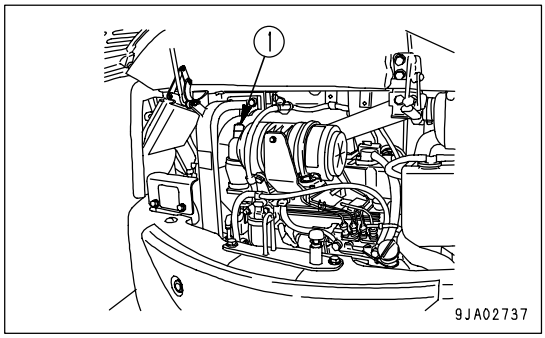


NOTICE

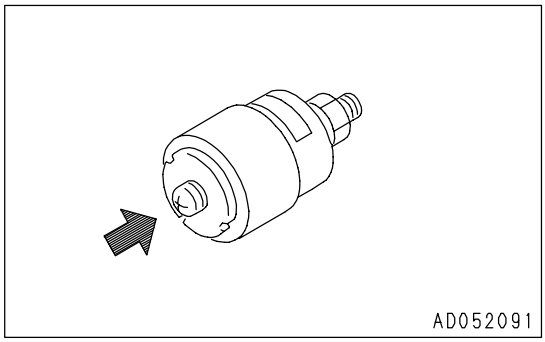
Be sure to pressurize the hydraulic tank. If it is not pressurized, the pump will suck in air, and this will adversely affect the equipment.

Air Cleaner Dust Indicator - Check

1. Open the engine hood and check that the red piston is not showing in dust indicator (1).
2. If the red piston has appeared, clean or replace the element immediately.
   For details of the method of cleaning the element, see "Air Cleaner Element - Check/Clean/Replace (PAGE 4-17)".

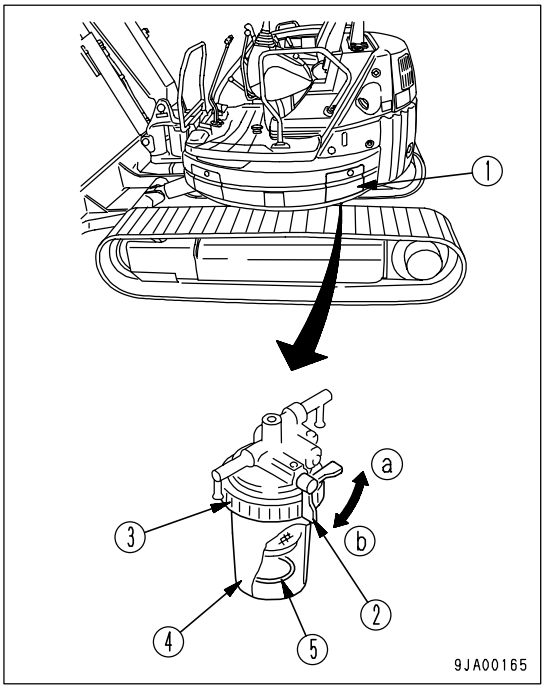


3. After checking, cleaning, and replacing, press the knob of dust indicator (1) to return the red piston to its original position.



Water Separator - Check

If red ring (5) of water separator is at the bottom of element cup (4), there is no water.
If red ring (5) is floating, there is water up to the bottom of the ring, so drain the water as follows.



- Prepare the filter wrench for fuel filter.

1. Open inspection cover (1) on the left side of the machine and set handle (2) of the filter inside to the CLOSED position (a).
2. Using the filter wrench, loosen ring (3), then remove element cup (4) and throw out the water inside it.
3. Fill element cup (4) with fuel, install it to the filter holder, then tighten ring (3).
4. Set handle (2) to the OPEN position (b).
5. Drain any water or sediment from the fuel tank. For details, see "Fuel Tank - Drain (PAGE 4-22)".

Electric Wiring - Inspect

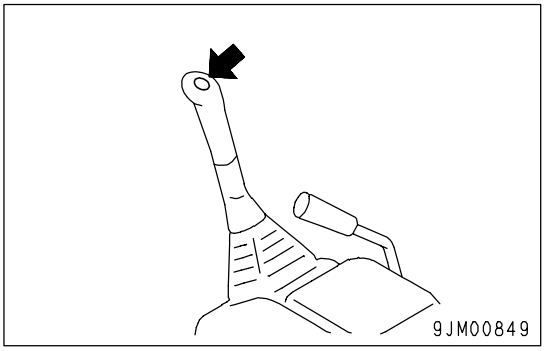
WARNING

- **If the fuses frequently blow or if there are traces of short circuits on the electrical wiring, locate the cause immediately and carry out repairs, or contact your Komatsu distributor for repairs.**
- **Keep the top surface of the battery clean and check the breather hole in the battery cap. If it is clogged with dirt or dust, wash the battery cap to clean the breather hole.**

Check that there is no damage to the fuses; that fuses of the specified capacity are used; that there is no disconnection or trace of short-circuiting on the electric wiring and no damage to the covering. Check also that there is no loosened terminal. If any, tighten it again.
Moreover, pay particular attention to the electric wiring when checking the battery, engine starting motor and alternator.
Be sure to check that there is no inflammable material accumulated around the battery. If present, remove it without fail.

Horn Function - Check

1. Turn the starting switch to the ON position.
2. Confirm that the horn sounds immediately when the horn button is pressed.
   If the horn does not sound, please contact your Komatsu distributor for repair.



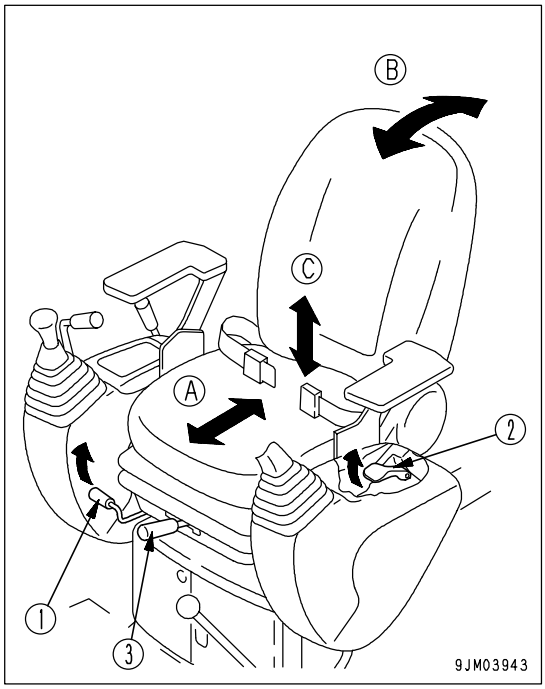
Adjustment

WARNING

- **Adjust the seat position before starting operations or after changing the operator.**
- **Adjust the seat so that the control levers and switchis can be operated freely and easily with the operator back against the backrest.**

Seat Adjustment

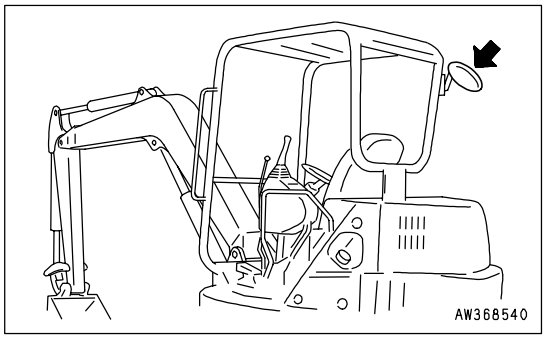
(A) Fore-and-aft adjustment
The seat can move forward and backward.
Move lever (1) to the upper, set the operator's seat at the desired position, then release the lever.
Fore-and-aft adjustment: 100mm (3.9 in)
Adjust the position of the operator's seat to match the operation. For example, when carrying out deep digging operations, slide the seat to the front to improve the view below the front of the machine.



(B) Adjusting reclining
Pull up lever (2) 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.
(C) Adjusting suspension
Pull lever (2) up, then move it to the left to make the suspension harder or move it to the right to make the suspention softer. Adjust the lever position to match the weight of the operator and provide the optimum suspention.
Suspension adjustment: 5 stages 50kg to 120kg (110 lb to 265 lb)

Rearview Mirrors

Adjust the angle so that the area behind the operator's compartment can be seen clearly.



Seat Belt

(Machine equipped with cab)

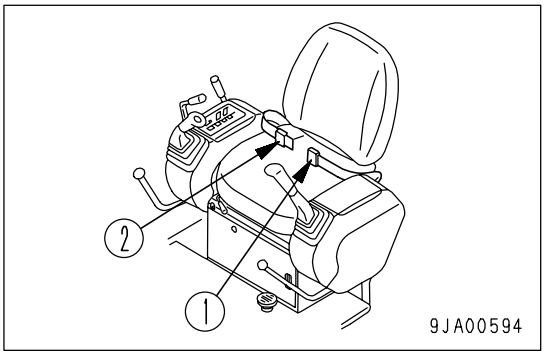
⚠ WARNING

- **Before fastening the seat belt, check that there is no abnormality in the securing brackets or belt. If there is any wear or damage, replace.**
- **Even if there appears to be no abnormality in the seat belt, replace the seat belt once every 3 years. The date of manufacture is woven on the reverse side of the belt.**
- **Adjust and fasten the seat belt before operating the machine.**
- **Always use the seat belt when operating the machine.**
- **Do not use the seat belt with either half of the belt twisted.**

Check that the bolts of the clamp securing the belt to the chassis are not loose. Tighten them if they are loose.
The tightening torque for the mounting bolt is 24.5 ± 4.9 N·m (2.5 ± 0.5 kgf·m, 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

1. Adjust the seat so that the operator still feels that there is sufficient knee room when fully depressing the pedal while seated, with the operator's back against the backrest.
2. After adjusting the seat poaition, sit in the seat. Grip buckle (1) and tongue (2) in each hand and insert tongue (2) into buckle (1). Confirm by pulling the belt that the tongue is securely locked to the buckle.
3. When removing the belt, raise the tip of buckle (1) lever to release it.

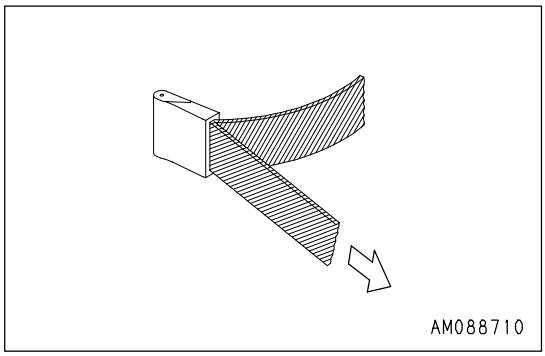


Fasten belt along your body without kinking it. Adjust the lengths of the belt on the tongue sides.

Seat Belt Adjustment

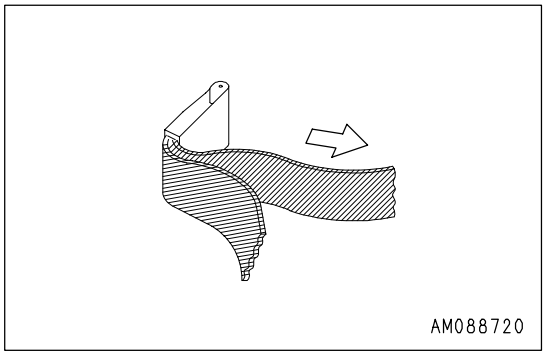
Shortening

Pull the free end of the belt on either the buckle body or tongue side.



Lengthening

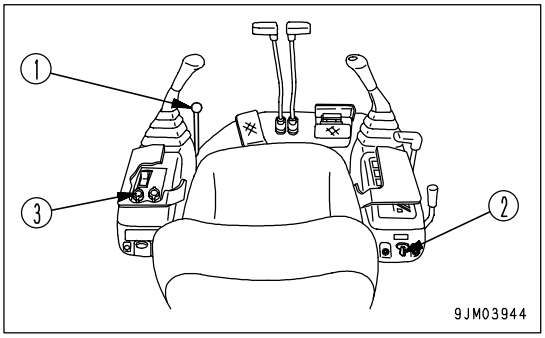
Pull the belt while holding it at a right angle to the buckle or tongue.



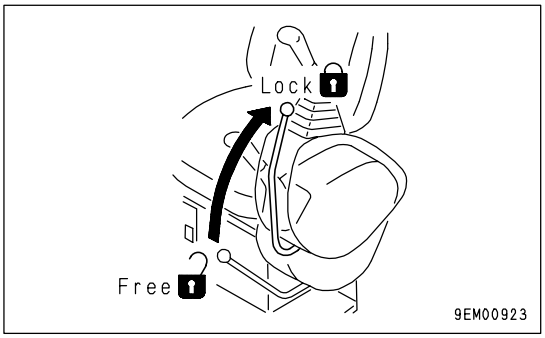
Operations Before Starting Engine

WARNING

- **When starting the engine, check that the safety lock lever is securely at the LOCK position.**
  If the control levers are not locked and they are touched by accident when starting the engine, the work equipment may move unexpectedly, and this may lead to a serious accident.



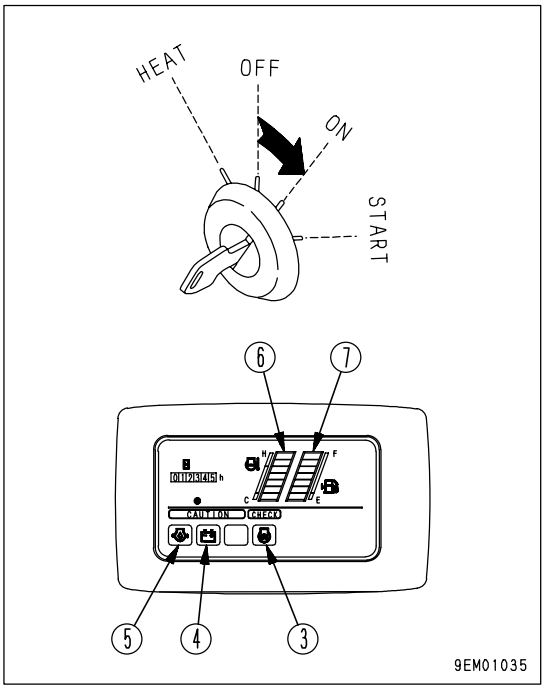
1. Check the safety lock lever (1) is at the LOCK position.
2. Check the position of each levers.



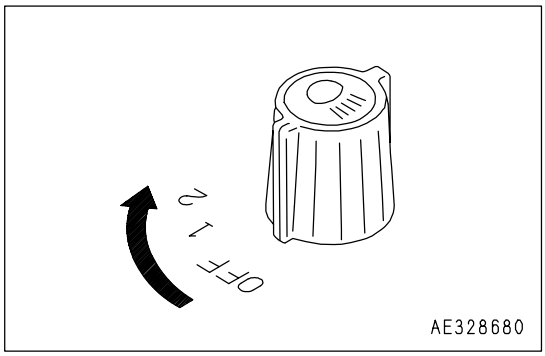
3. Insert the key in starting switch (2), turn the key to the ON position, then carry out the following checks.
   1) The buzzer will sound for approx. 1 second, and the following monitors and gauges will light up for approx. 3 seconds.
      - Engine pre-heating monitor (3)
      - Charge level monitor (4)
      - Engine oil pressure monitor (5)
      - Engine water temperature gauge (6)
      - Fuel gauge (7)

      If the monitors or gauges do not light up or the buzzer does not sound, there is probably a blown bulb or disconnection, so please contact your Komatsu distributor for repair.

      After approx. 3 seconds, the following gauges will remain on and the other monitors will go out.
      - Charge level monitor (4)
      - Engine oil pressure monitor (5)
      - Enigne water temperature gauge (6)
      - Fuel gauge (7)



2) Turn lamp switch (8) to turn on the working lamps.
If the lamps do not light up, there is probably a broken bulb or disconnection in the wiring, so contact your Komatsu distributor for repairs.



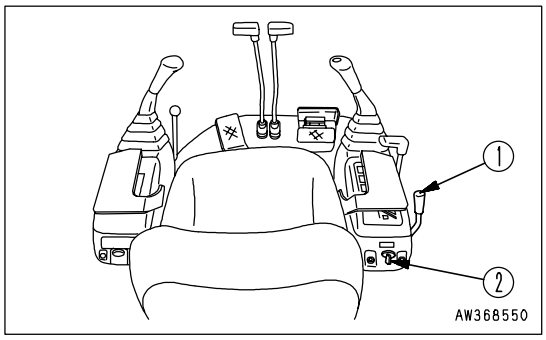
STARTING ENGINE

Normal Starting

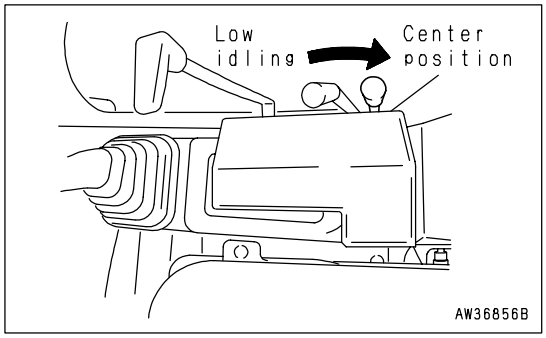
⚠ WARNING

- **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.**

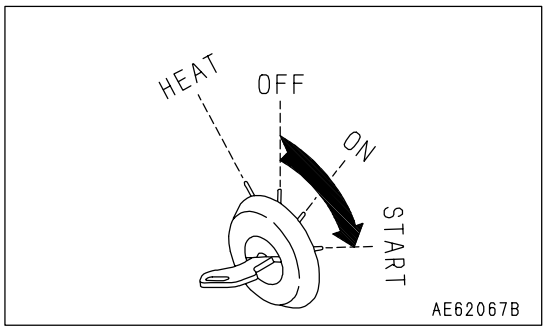
NOTICE
Do not keep the starting motor rotating continuously for more than 20 seconds.
If the engine will not start, wait for at least 30 seconds before trying to start the engine again.



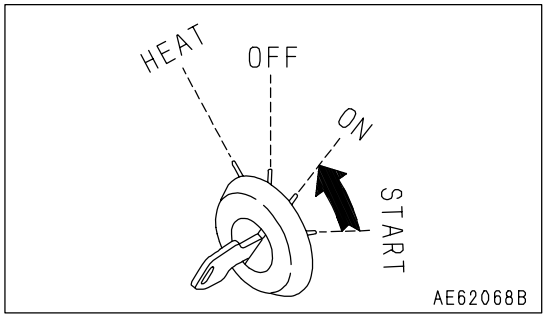
1. Before starting the engine, check that fuel control lever (1) is at the low idling position.
2. Pull fuel control lever (1) to the center position between LOW IDLING and HIGH IDLING.



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



4. When the engine starts, release the key in starting switch (2). The key will return automatically to the ON position.



Starting Engine In Cold Weather

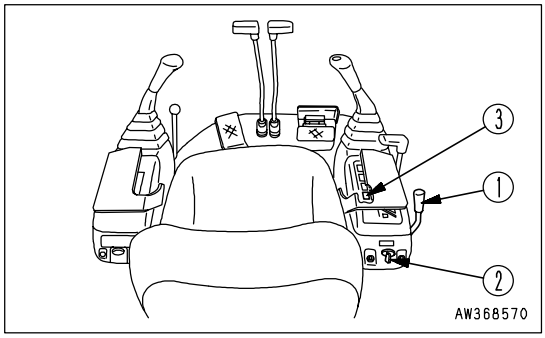
⚠ WARNING

- **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

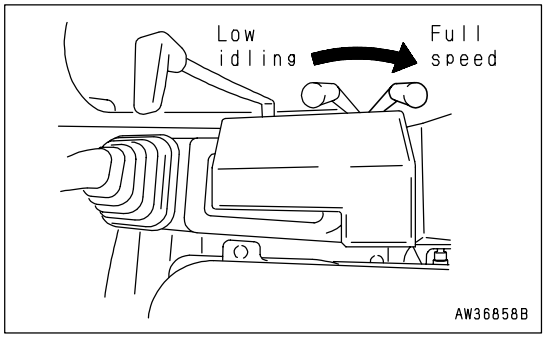
Do not keep the starter motor running for more than 20 seconds continuously.

If the engine does not start, wait for about 30 seconds and begin with the step 3. again.



When starting in low temperatures, do as follows.

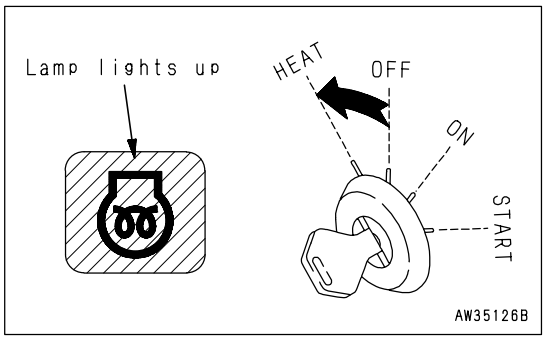
1. Before starting the engine, check that fuel control lever (1) is at the low idling position.
2. Pull fuel control lever (1) to the HIGH IDLING position.



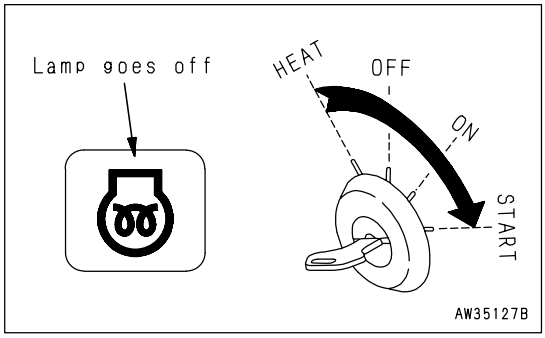
3. Hold the key in starting switch (2) at the HEAT position, and check that preheating monitor (3) lights up.
   After about 18 seconds, preheating monitor lamp (3) will goes off to indicate that preheating is finished.

REMARK

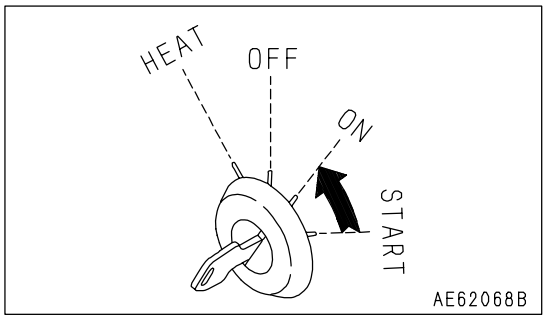
The monitor and gauge also light up when the key is at the HEAT position, but this does not indicate any abnormality.



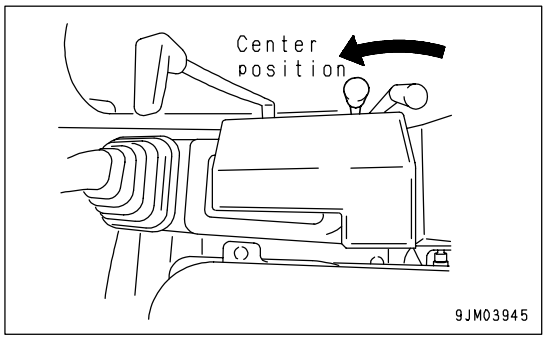
4. When preheating monitor (3) goes off, turn the key in starting switch (2) to the START position to start the engine.



5. When the engine starts, release the key in starting switch (2). The key will return automatically to the ON position.



6. Return fuel control lever (1) to a position midway between the low idling and full speed positions.



AFTER STARTING ENGINE

WARNING

- **Emergency stop**
  If there has been any abnormal actuation or trouble, turn the starting switch key to the OFF position.
- **If the work equipment is operated without warming the machine up sufficiently, the response of the work equipment to the movement of the control lever will be slow, and the work equipment may not move as the operator desires, so always carry out the warming-up operation. Particularly in cold areas, be sure to carry out the warming-up operation fully.**

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 breaking-in the machine for the initial 100 hours (as indicated by the service meter).
During breaking-in operations, follow the precautions described in this manual.

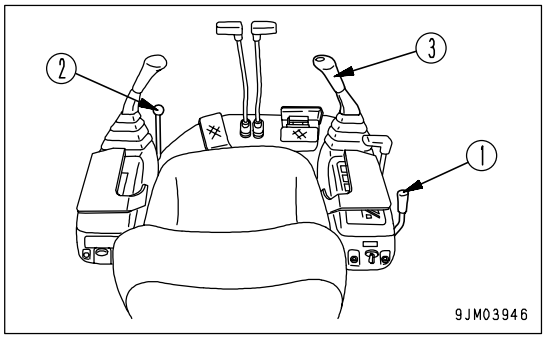
- Idle the engine for 5 minutes after starting it up.
- Avoid operation with heavy loads or at high speeds.
- Immediately after starting the engine, avoid sudden starts, sudden acceleration, unnecessary sudden stops, and sudden changes in direction.

Warming-Up Operation

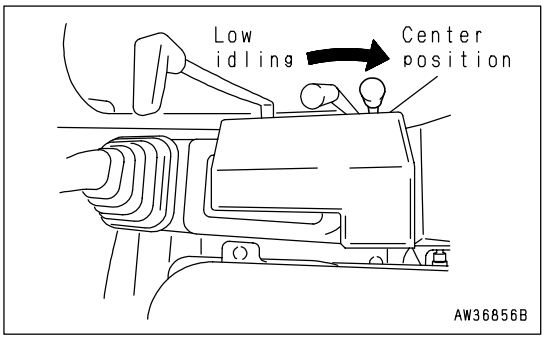
NOTICE

- **When the hydraulic oil is at a low temperature, do not carry out operations or move the lever suddenly. Always carry out the warming-up operation. This will help to extend the machine life.**
- **Do not suddenly accelerate the engine before the warming-up operation is completed.**
  Do not run the engine at low idling or high idling continuously for more than 20 minutes. (Oil down) If it is necessary to run the engine at idling, apply a load from time to time or run the engine at a mid-range speed.

After starting the engine, do not immediately start operations. First, carry out the following operations and checks.

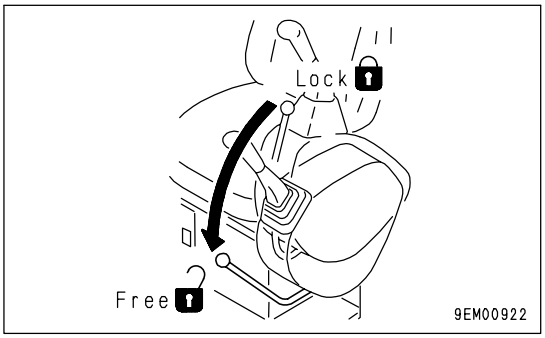


1. Pull fuel control lever (1) to the center position between LOW IDLING and HIGH IDLING and run the engine at medium speed for about 5 minutes with no load.

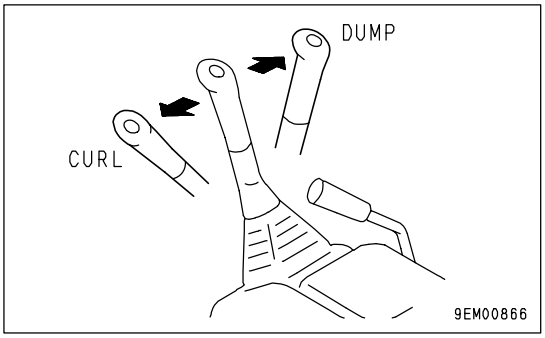


REMARK
When the ambient temperature is below 0°C (32°F), keep the fuel control lever close to the 1/4 position when carrying out the warming-up operation.

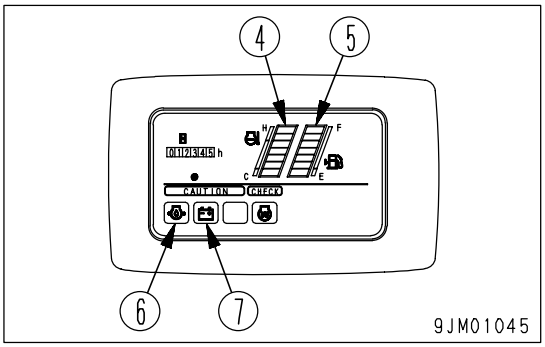
2. Set safety lock lever (2) to the FREE position, and raise the bucket from the ground.

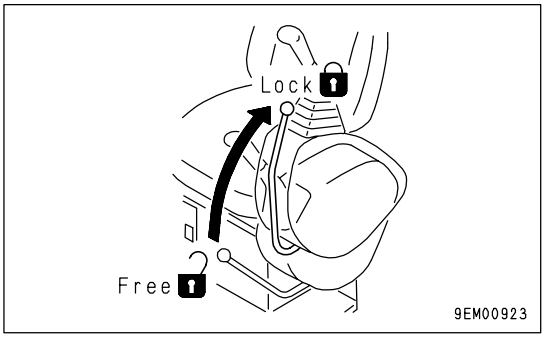


3. Operate right work equipment control lever (3) slowly, pull the bucket into the stop position, and hold it there for 5 minutes.



4. After carrying out the warming-up operation, check that each gauge and monitor lamp is in the following condition.
   If there is any abnormality, carry out maintenance and repair.
   - Engine water temperature gauge (4): Inside green range
   - Fuel gauge (5): Inside green range
   - Engine oil pressure monitor (6): OFF
   - Charging monitor (7): OFF
5. Check that there is no abnormal exhaust gas color, noise, or vibration. If any abnormality is found, contact your Komatsu distributor.
6. Set lock lever (2) to the LOCK position and check that it is impossible to operate the swing and work equipment with the left and right work equipment control levers.



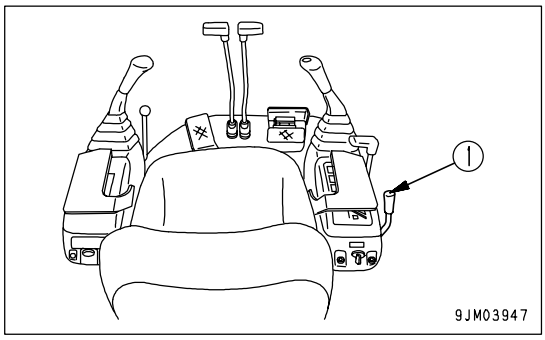


STOPPING THE ENGINE

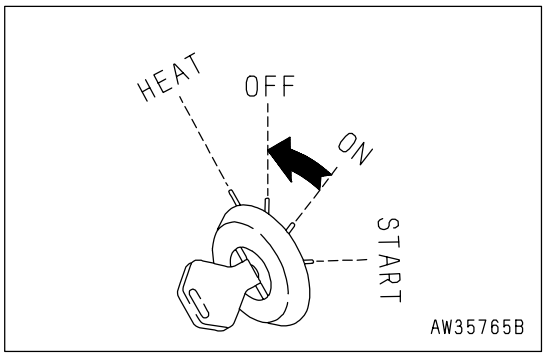
NOTICE

If the engine is stopped abruptly, service life of component parts of the engine may be considerably reduced. Hence do not stop the engine abruptly except in an emergency. If the engine has overheated, do not try to stop it abruptly but run it at medium speed to allow it to cool down gradually, and then stop it.

1. Run the engine at low idling for about 5 minutes to cool down gradually.



2. Turn the key of starting switch (1) to the OFF position to stop the engine.
3. Remove the key from starting switch (1).



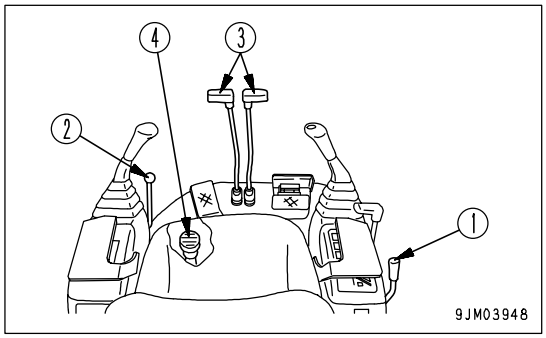
CHECK AFTER SHUT OFF ENGINE

1. Walk around the machine and check the work equipment, machine exterior, and undercarriage, and check also for leakage of oil or water. If any abnormalities are found, repair them.
2. Check the engine compartment for paper and debris. Clean out any paper and debris to avoid a fire hazard.
3. Remove any mud affixed to the undercarriage.

MACHINE OPERATION

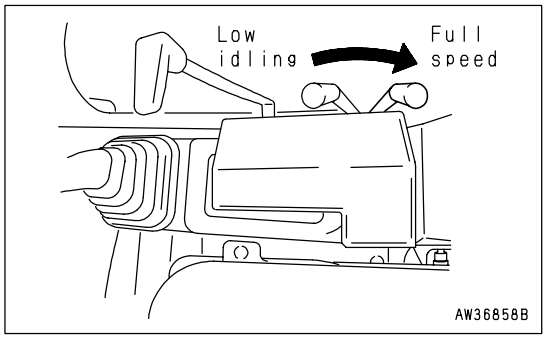
WARNING

- **Before operating the travel levers, check the direction of the track frame. If the sprocket is at the front, the operation of the travel levers is reversed.**
- **When moving off, check that the area around the machine is safe, and sound the horn before moving.**
- **Clear all personnal from the machine and the area.**
- **Clear all obstracles from the path of the machine.**



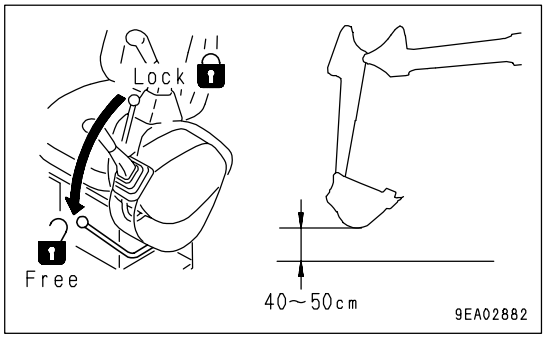
Preparations For Moving The Machine Off

1. Pull fuel control lever (1) towards the high idling position to increase the engine speed.



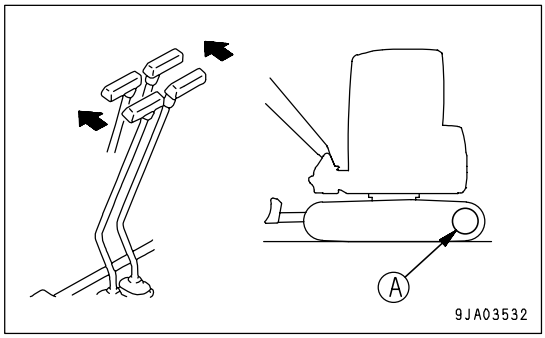
Moving Machine Forward

1. Set safety lock lever (2) to the FREE position, then raise the work equipment 40 to 50 cm (1.6 to 2.0 in) from the ground.

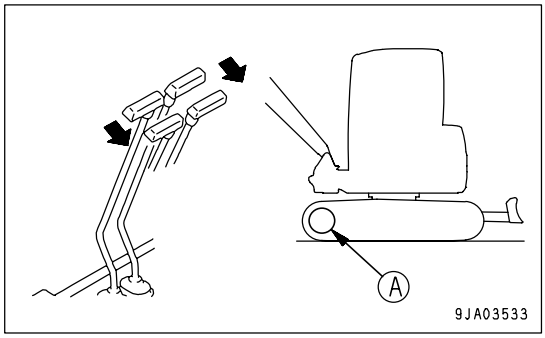


2. Raise the blade.
3. Opearate the both travel levers (3) as explained below.

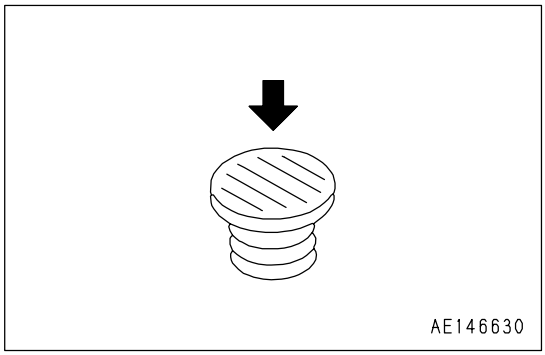
- When the sprocket (A) is at the rear of the machine.
  Push levers (3) forward slowly to move the machine off.



- When the sprocket (A) is at the front of the machine.
  Pull levers (3) backward slowly to move the machine off.

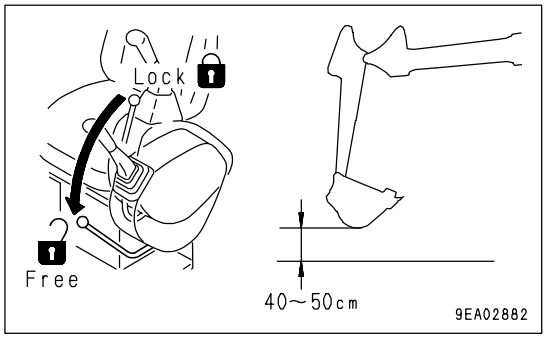


4. When travel accelerator pedal (4) depressed, the speed will increase.
   For details if the speed, see "SPECIFICATIONS (PAGE 5-2)".



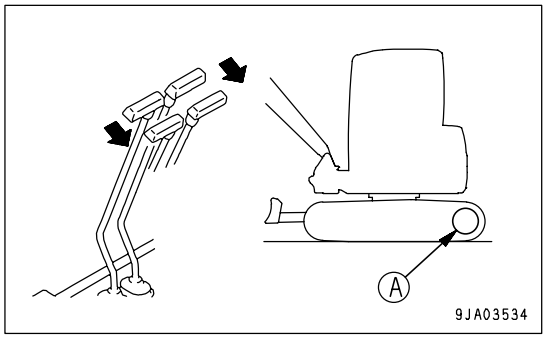
Moving Machine Backward

1. Set safety lock lever (2) to the FREE position, then raise the work equipment 40 to 50 cm (1.6 to 2.0 in) from the ground.

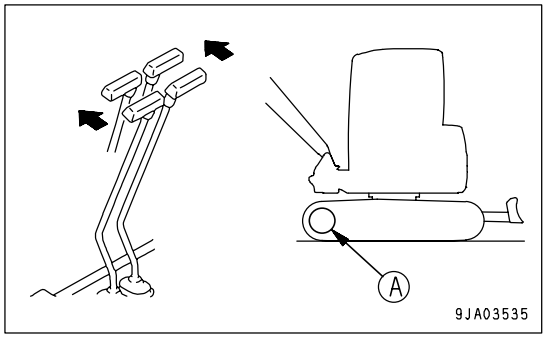


2. Raise the blade.
3. Opearate the both travel levers (3) as explained below.

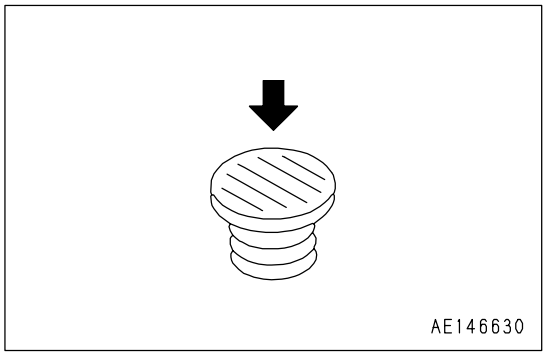
- When the sprocket (A) is at the rear of the machine.
  Pull levers (3) backward slowly to move the machine off.



- When the sprocket (A) is at the front of the machine.
  Push levers (3) forward slowly to move the machine off.



4. When travel accelerator pedal (4) depressed, the speed will increase.
   For details if the speed, see "SPECIFICATIONS (PAGE 5-2)".

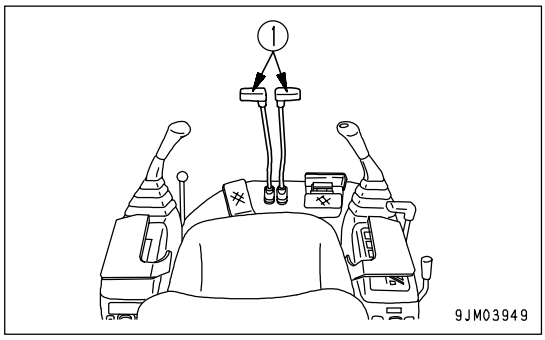


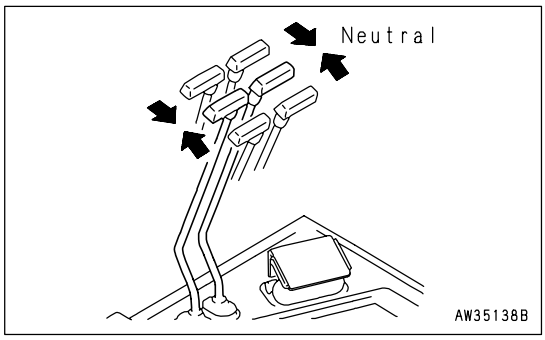
Stopping Machine

WARNING

Avoid stopping suddenly. Give yourself ample room when stopping.

Put the left and right travel levers (1) in the neutral position, then stop the machine.





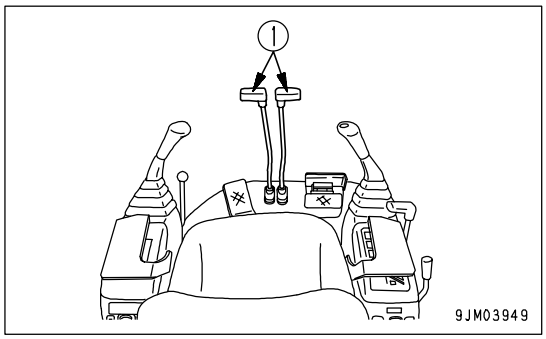
STEERING THE MACHINE

Steering

WARNING

Before operating the travel control levers, check the direction of the track frame (i.e. position of the sprocket) first. If the sprocket is at the front, the machine moves in the reverse direction to the operation of the travel lever.

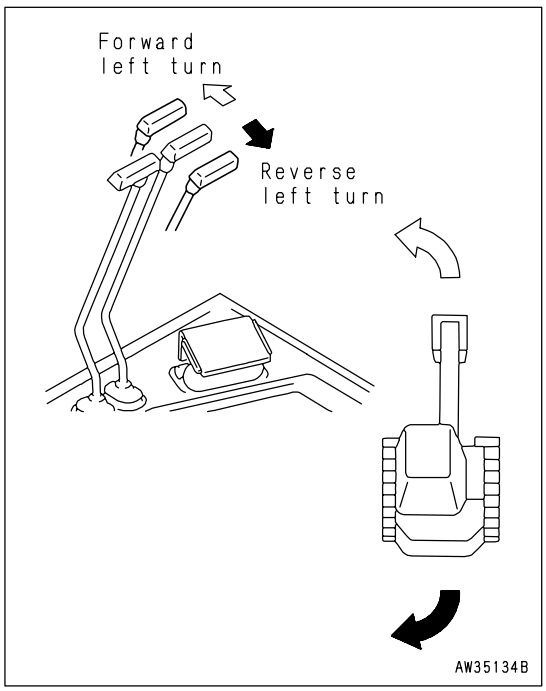
Use the travel levers to change direction.
Avoid sudden changes of direction as far as possible. In particular, when carrying out counter-rotation (spin turn), stop the machine first before turning.
Operate two travel levers (1) as follows.



Steering the Machine when Stopped

When turning to the left:
Push the right travel lever forward to turn to the left when traveling forward; and pull it back to turn left when traveling in reverse.

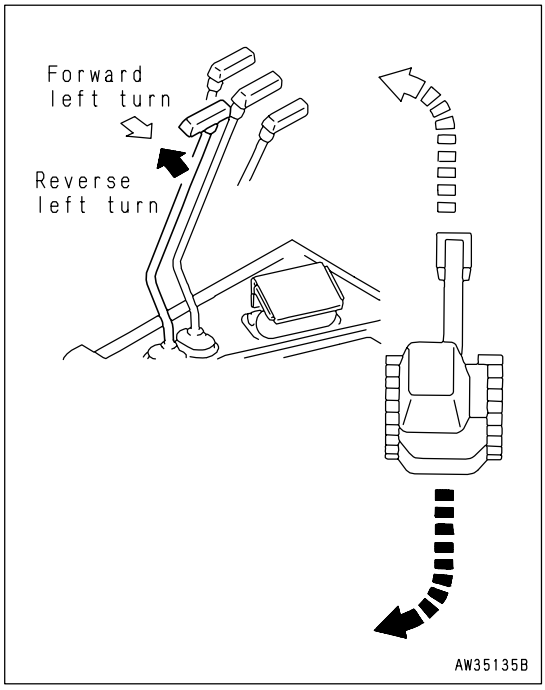
REMARK
When turning to the right, operate the left travel lever in the same way.



Steering when Traveling

When turning to the left:

If the left travel lever is returned to the neutral position, the machine will turn to the left.

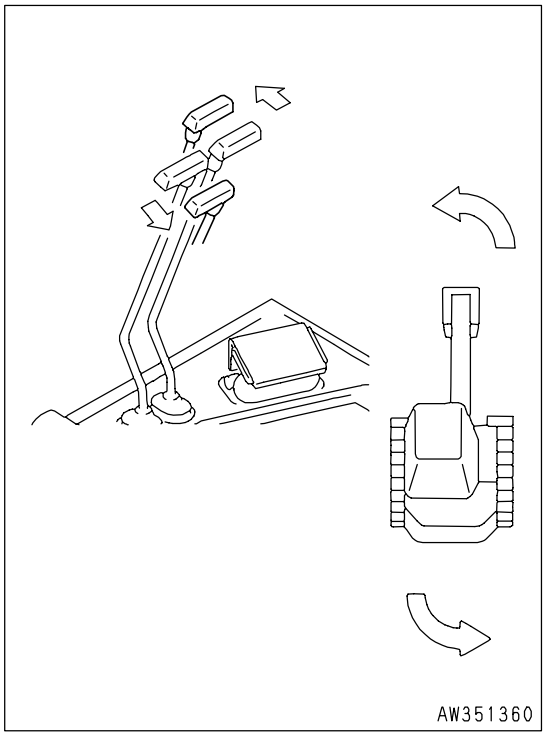


REMARK

When turning to the right, operate the right travel lever in the same way.

Counter-rotation Turn (Spin Turn)

When using counter-rotation (spin turn) to turn left, pull the left travel lever back and push the right travel lever forward.



REMARK

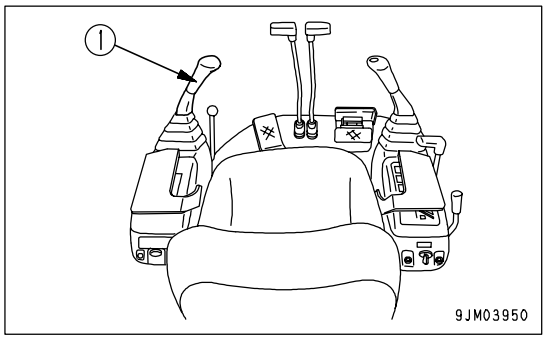
When using counter-rotation to turn right, pull the right travel lever back and push the left travel lever forward.

SWINGING

WARNING

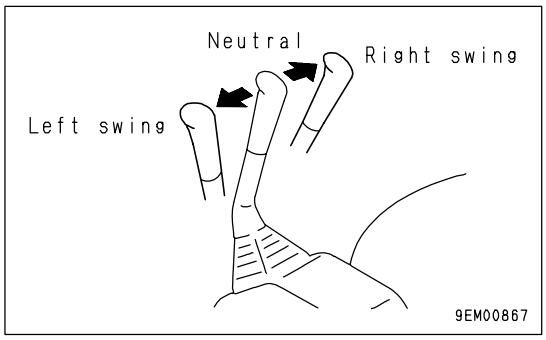
When operating the swing, check that the area around the machine is safe.

1. Operate left work equipment control lever (1) to swing the upper structure.
2. When not using the swing, set left work equipment control lever (1) to the N position.
   The swing holding brake will be applied.



REMARK

- When using the swing on a slope, run the engine at low idling and operate the swing lever extremely slowly.
  Be particularly careful to avoid sudden movement when the bucket is loaded.
- When the bucket is loaded and the left work equipment control lever is operated, the swing holding brake is released, so the upper structure may swing momentarily, but this is not an abnormality.



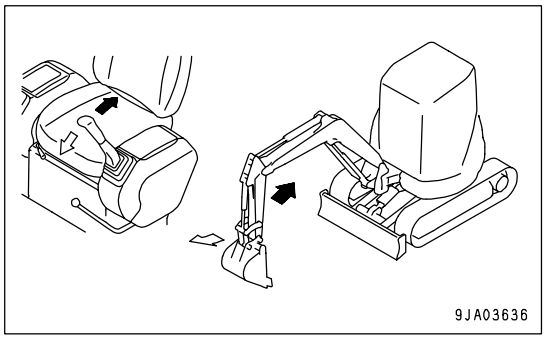
WORK EQUIPMENT CONTROLS AND OPERATIONS

WARNING

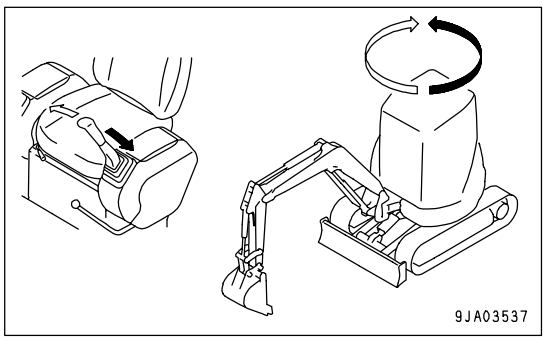
For operation modes other than the standard one (ISO pattern), refer to the chapter of ATTACHMENTS AND OPTIONS in this manual.

Use the control levers to operate the work equipment.
Note that when the levers are released, they return to the HOLD position and the work equipment is held in that position.

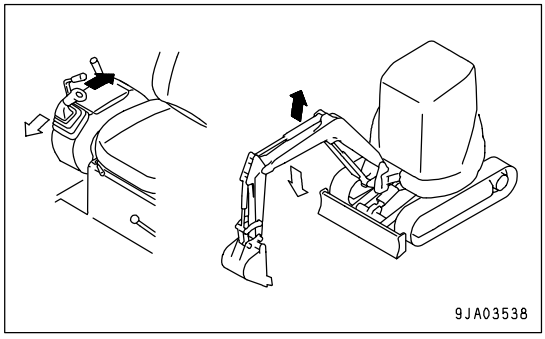
- Arm control
  Move the left work equipment control lever to the front or rear to operate the arm.



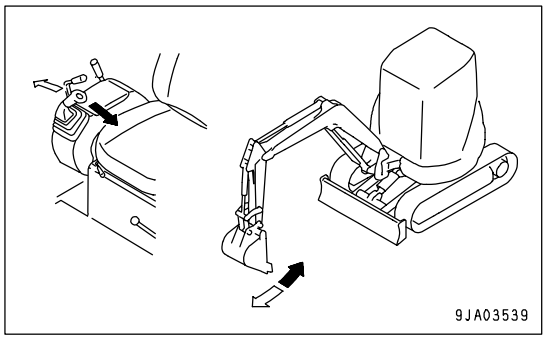
- Swing control
  Move the left work equipment control lever to the left or right to swing the upper structure.



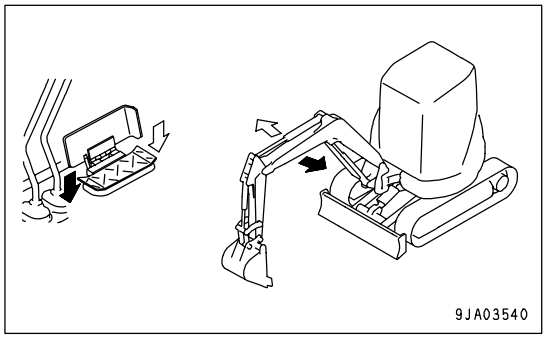
- Boom control
  Move the right work equipment control lever to the front or rear to operate the boom.



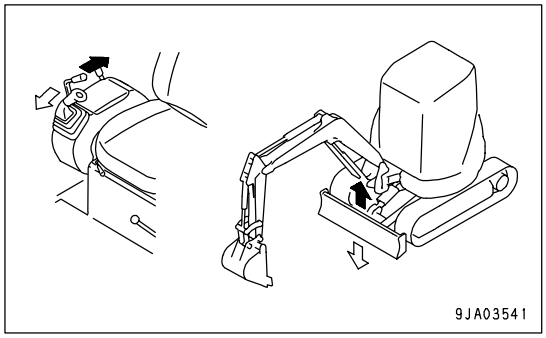
- Bucket control
  Move the right work equipment control lever to the left or right to operate the bucket.



- Boom swing operation
  The boom swing operation can be carried out with the boom swing control pedal.



- Blade control
  Move the lever on the right side of the operator's seat to the front or rear to operate the blade.



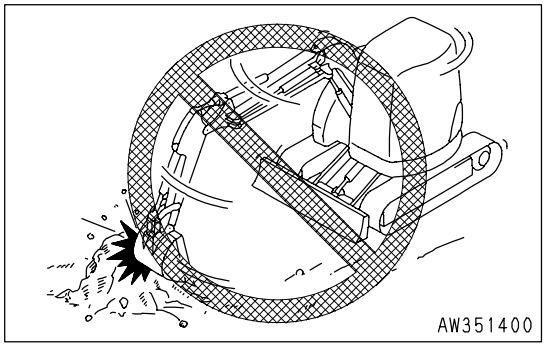
PROHIBITED OPERATIONS

WARNING

Do not attempt to operate the work equipment control lever, while the machine is traveling.

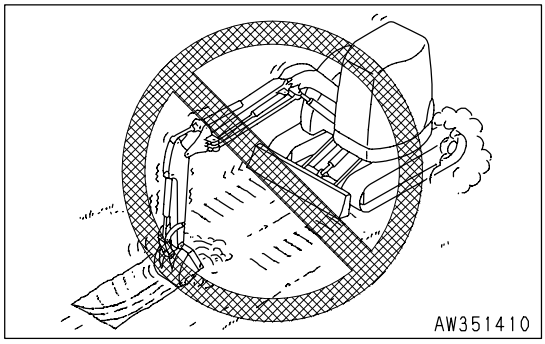
Operations Using Swing Force

Do not use the swing force to compact soil or break objects. This is not only dangerous, but will also markedly reduce the life of the machine.



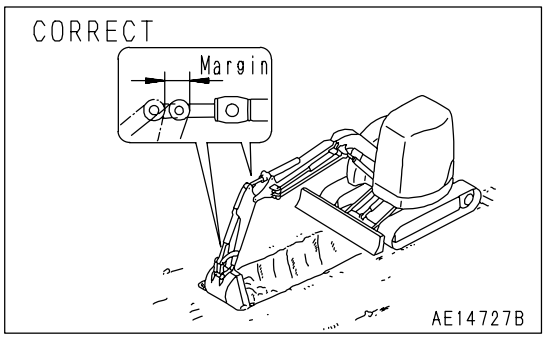
Operations Using Travel Force

Do not dig the bucket into the ground and use the travel force to carry out excavation. This will damage the machine or work equipment.



Prohibition of Operations Using Hydraulic Cylinders to Stroke Ends

If the work equipment is used with the cylinder rod operated to its stroke end, and given impact by some external force, the hydraulic cylinders will be damaged, causing personal injury. Avoid operations with the hydraulic cylinder fully retracted or fully extended.

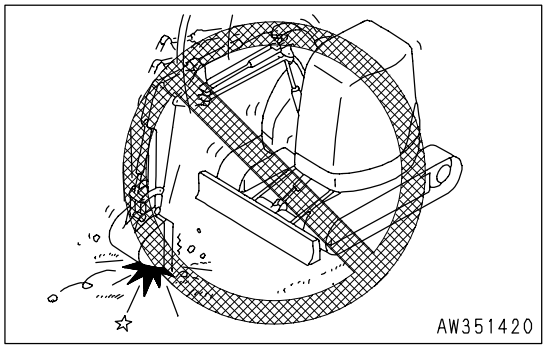


Digging Hard Rocky Ground

Do not attempt to directly excavate hard rocky ground with the work equipment. It is better to excavate it after breaking up by some other means. This will not only save the machine from damage but make for better economy.

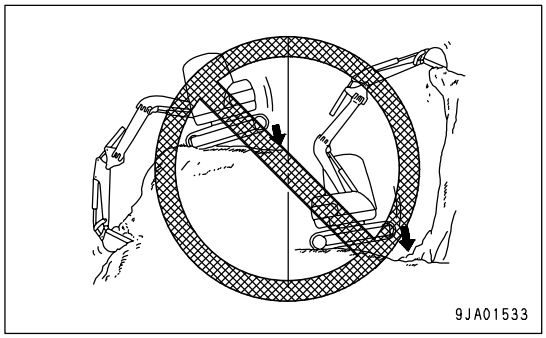
Operations Using Bucket Dropping Force

Do not use the dropping force of the machine for digging, or use the dropping force of the bucket as a pickaxe, breaker, or pile driver. This will markedly reduce the life of the machine.



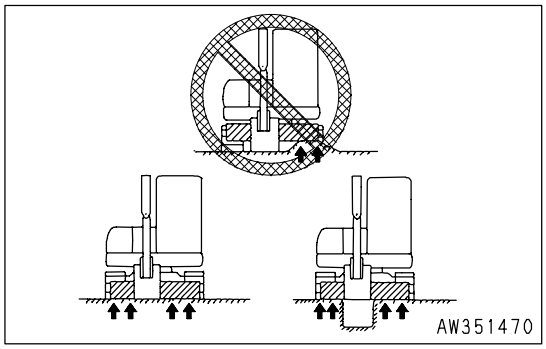
Operations Using Machine Dropping Force

Do not use the dropping force of the machine for digging.



Support Blade on Both Sides

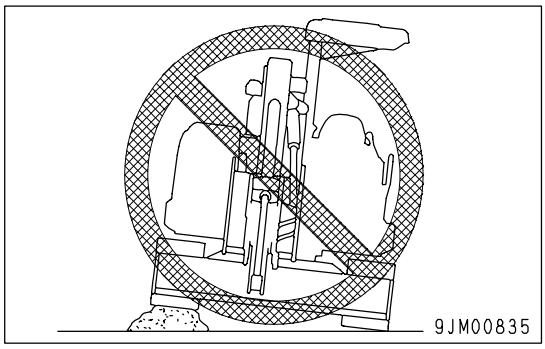
When using the blade as an outrigger, never suport the machine with only one end of the blade.



GENERAL OPERATION INFORMATION

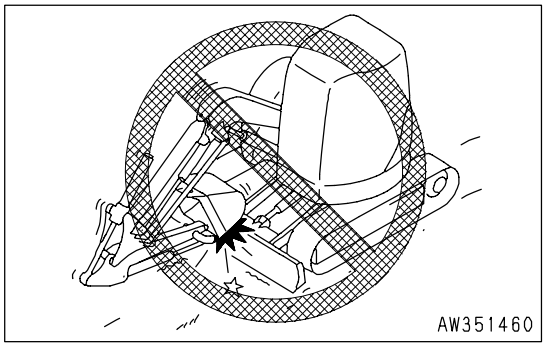
Traveling

Traveling over boulders, tree stumps, or other obstacles will cause a big shock to the chassis (and in particular to the tracks), and this will cause damage to the machine. For this reason, always remove any obstacles or travel around them, or take other steps to avoid traveling over such obstacles as far as possible.
If there is no way to avoid traveling over an obstacle, reduce the travel speed, keep the work equipment close to the ground, and try to travel so that the center of the track passes over the obstacle.



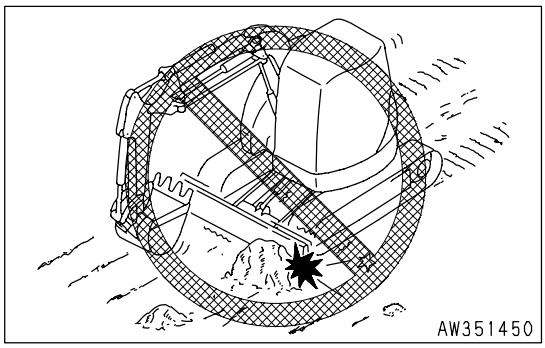
Folding In Work Equipment

When folding in the work equipment to the travel or transportation posture, be careful not to let the bucket hit the blade.



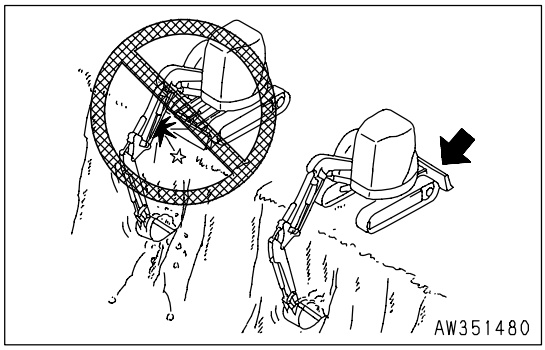
Avoid Hitting Blade

Be careful not to hit the blade against rocks or boulders. This will cause premature damage to the blade or cylinders.



Blade During Backhoe Operations

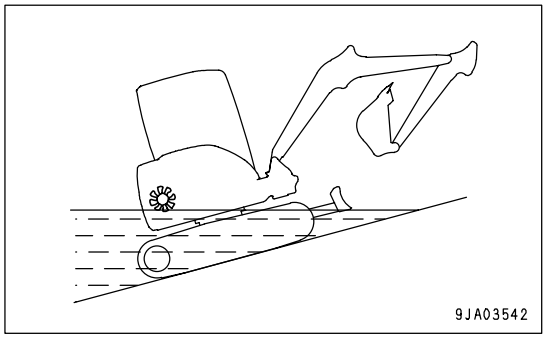
When carrying out deep digging operations with the blade at the front, be careful not to the boom cylinder hit the blade. Always position the blade at the back unless it is needed at the front.



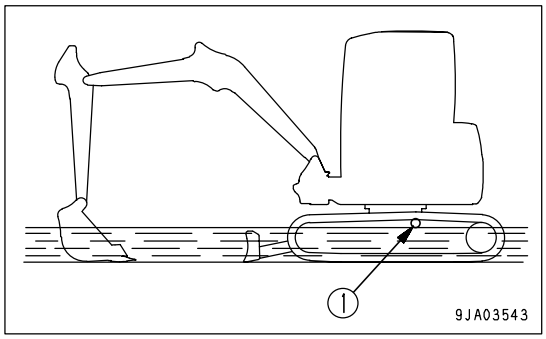
Permissible Water Depth

CAUTION

When driving the machine out of water, if the angle of the machine exceeds 15°, the rear of the upper structure will go under water, and water will be thrown up by the radiator fan. This may cause the fan to break.
Be extremely careful when driving the machine out of water.



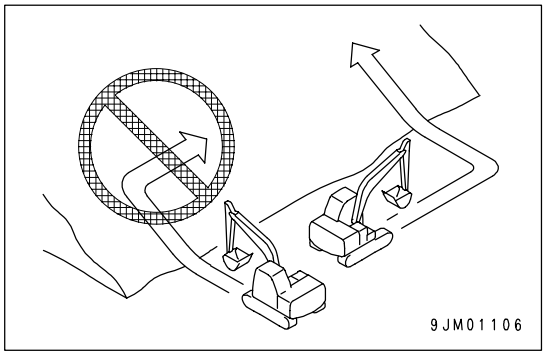
Do not immerse the machine in water by more than the permissible depth (under center of carrier roller (1)).
In addition, for parts that have been immersed in water for a long time, pump in grease until the old grease comes out from the bearings. (Around the bucket pins)

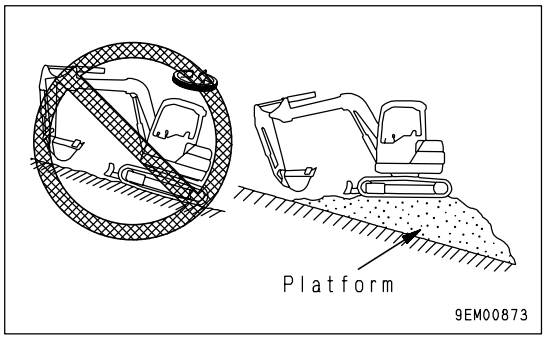


TRAVELING ON SLOPES

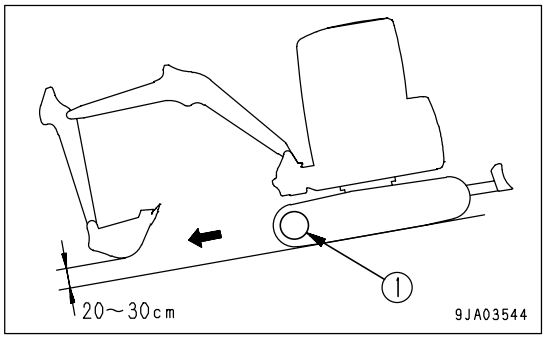
WARNING

- **Turning or operating the work equipment when working on slopes may cause the machine to lose it balance and turn over, so avoid such operations.**
  It is particularly dangerous to swing downhill when the bucket is loaded. If such operations have to be carried out, pile soil to make a platform on the slope so that the machine can be kept horizontal when operating.
- **Do not travel up or down steep slopes. There is danger that the machine may turn over.**
- **When traveling, raise the bucket approx. 20 to 30cm (8 to 12 in) from the ground.**
  Do not travel downhill in reverse.
- **Never turn on slopes or travel across slopes.**
  Always go down to a flat place to perform these operations. It may be longer, but it will ensure safety.
- **Always operate or travel in such a way that it is possible to stop safely at any time if the machine slips or becomes unstable.**
- **When traveling uphill, if the shoes slip or it is impossible to travel uphill using only the force of the tracks, do not use the pulling force of the arm to help the machine travel uphill. There is danger that the machine may turn over.**



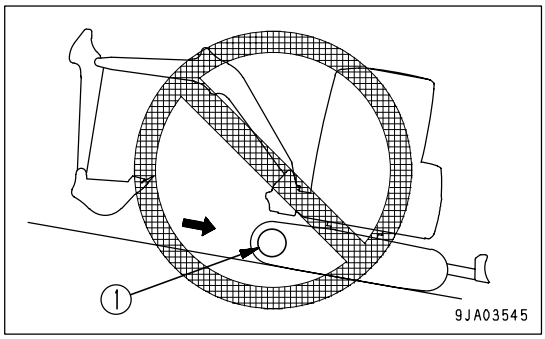


1. When traveling down steep hills, use the travel lever and fuel control lever to keep the travel speed low.
   When traveling down a steep hill of more than 15°, set the work equipment to the posture shown in the diagram on the right, and lower the engine speed.

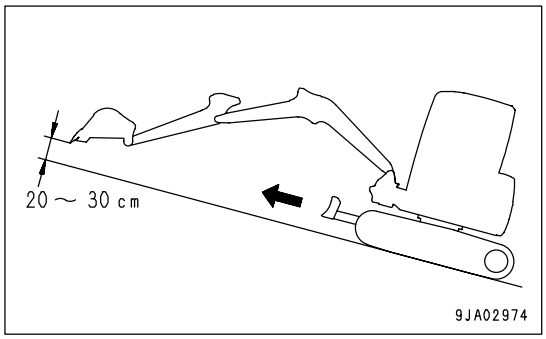


REMARK

Travel down fills with the sprocket (1) side down.
If the machine travels down with the sprocket (1) side up, the track tends to become loose, and that can cause skipping pitches.



2. When traveling up a steep hill of more than 15°, set the work equipment to the posture shown in the diagram on the right.



Traveling Downhill

Put the travel lever in the neutral position. This will cause the brake to be automatically applied.

Engine Stopped on Slope

If the engine stops when traveling uphill, move the travel levers to the neutral position, stop the machine, then start the engine again.

Cab Doors on Slope

- If the engine is stopped when the machine is on a slope and the left work equipment control lever is used to operate the swing, the upper structure may swing under its own weight, so never operate the swing in this condition.
- Do not open or close the sliding door (cab specifications) on slopes when traveling or operating. The operating effort may change suddenly.
  Always keep the sliding door locked.
- Take good care when opening or closing the sliding door (the cab specification). There is the danger that it will likely gain momentum due to its own weight and open or shut suddenly.

ESCAPE FROM MUD

Always operate carefully to avoid getting affixed in mud. If the machine does get affixed in mud, do as follows to get the machine out.

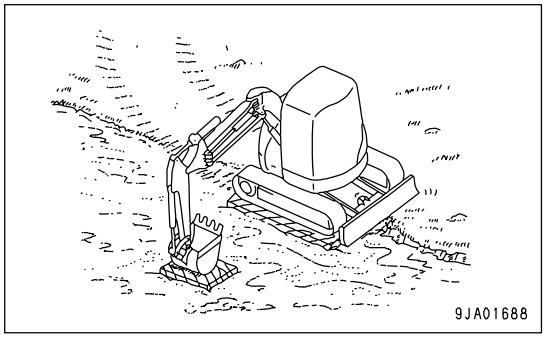
Stuck One Side Of Track

NOTICE

When using the boom or arm to raise the machine, always have the bottom of the bucket in contact with the ground. The angle between the boom and arm should be 90° to 110°.

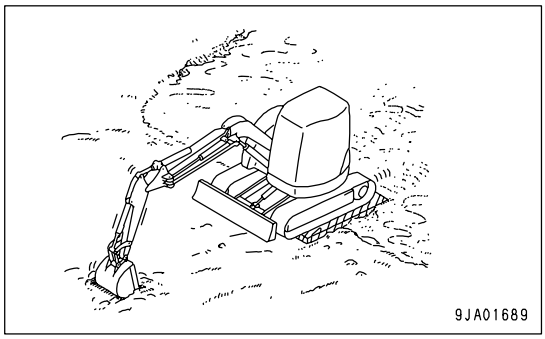
The same applies when using the bucket installed in the reverse direction.

When only one side is affixed in mud, use the bucket to raise the track, then lay boards or logs and drive the machine out.



Stuck Both Sides Of Tracks

If the track on both sides are in mud and the machine slips and cannot move, use the procedure given above to lay logs or timber. dig the bucket into the ground at the front, operate the arm in the same way as when digging, and set the travel lever to FORWARD to pull the machine out.

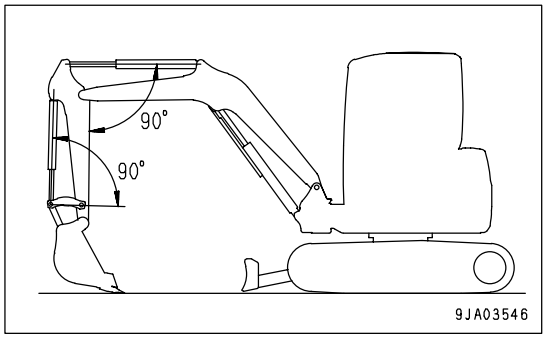


RECOMMENDED APPLICATIONS

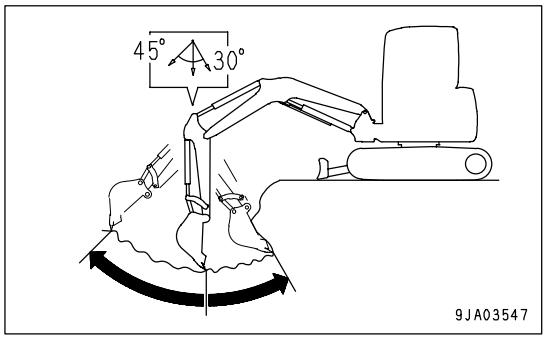
In addition to the following, it is possible to further increase the range of applications by using various attachments.

Backhoe Work

A backhoe is suitable for excavating at a position lower than the machine.
When the condition of the machine is as shown in the diagram at right, each cylinder's maximum pushing excavation force is obtained when the bucket cylinder and link, arm cylinder and arm are at 90°.
When excavating, use this angle effectively to optimize your work efficiency.

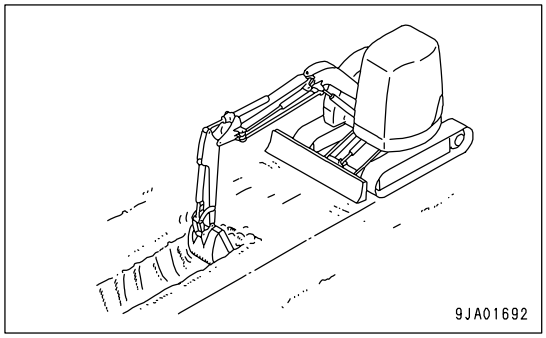


The range for excavating with the arm is from a 45° angle away from the machine to a 30° angle toward the machine.
There may be some differences depending on the digging depth, not try to keep within the above range rather than operating to the end of the cylinder stroke.



Ditching Work

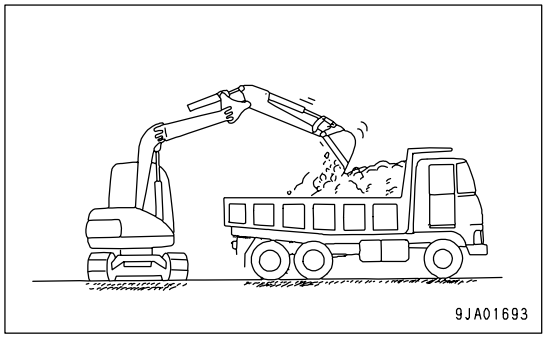
Ditching work can be performed efficiently by attaching a bucket which matches the digging operation and then setting the tracks parallel to the line of the ditch to be excavated.
To excavate a wide ditch, first dig both sides and then finally remove the center portion.



Loading Work

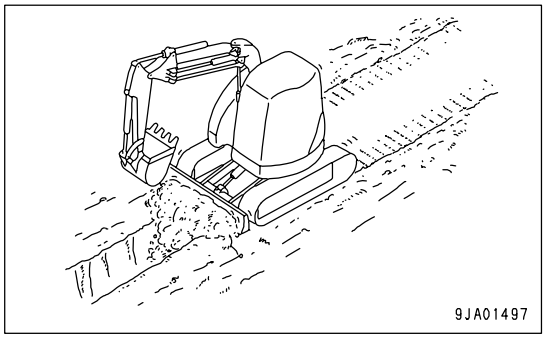
In places where the swing angle is small, work efficiency can be enhanced by locating the dump truck in a place easily visible to the operator.

Loading dump trucks is easier and the loading capacity is greater if the hydraulic excavator loads from the rear of the dump truck rather than from the side.



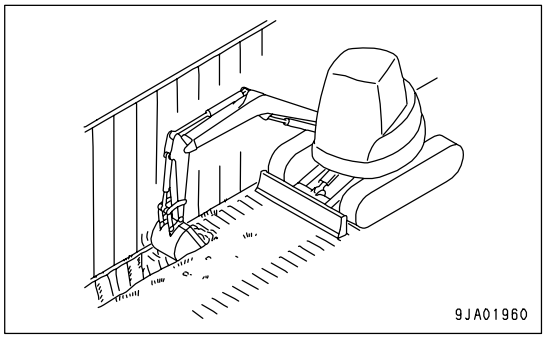
Refill And Finishing Work

When refilling after excavation and when smoothing the ground surface, use the blade.



Side Ditching Work

The machine can be used for side ditching in a confined worksite by combining the swing and boom swing operations.



BUCKET REPLACEMENT

WARNING

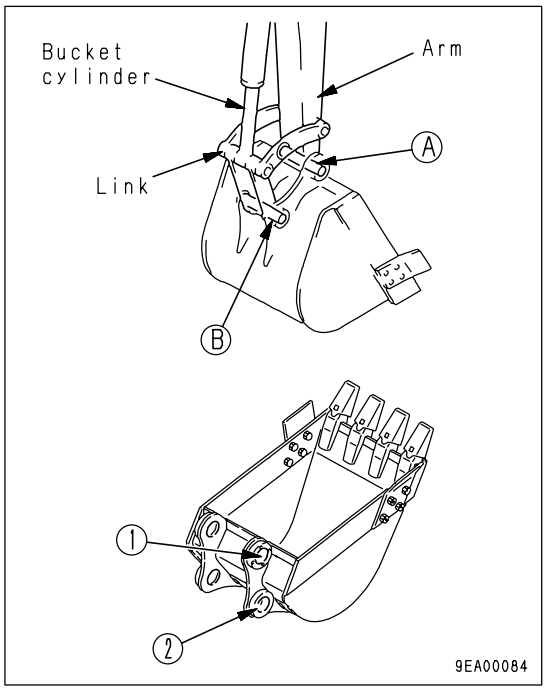
- **When pins are knocked in with a hammer, pieces of metal may fly and cause serious injury. When carrying out this operation, always wear goggles, hard hat, gloves, and other protective equipment.**
- **When the bucket is removed, place it in a stable condition.**
- **If pins are hit with a strong force, there is a hazard that the pin may fly out and injure people in the surrounding area. Make sure that there is no one in the surrounding area before starting the operation.**
- **When removing the pins, do not stand behind the bucket. In addition, be extremely careful not to put your foot under the bucket while standing at the side for the work.**
- **When removing or inserting pins, be extremely careful not to get your fingers caught.**
- **Never insert your fingers into the pin holes when aligning the holes.**

Stop the machine on a firm and flat surface and do the work. When performing joint work, appoint a conductor and follow that person's instructions and signals.

1. Place the bucket in contact with a flat surface.

REMARK

When removing the pins, place the bucket so that it is in light contact with the ground.
If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.



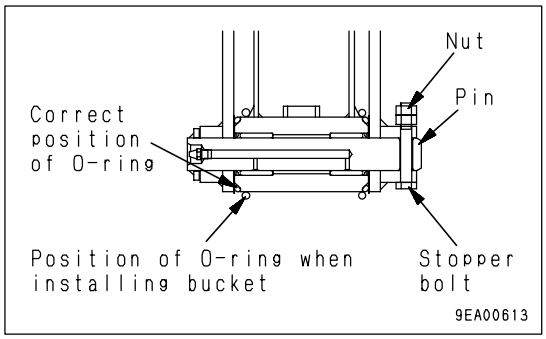
NOTICE

After removing the pins, make sure that mud or sand does not get on them. Dust seals are fitted at both ends of the bushings, so be careful not to damage them.

2. Remove the stopper bolts and nuts, then remove pins (A) and (B), and remove the bucket.
3. Align the arm with holes (1) of the replacement bucket and the link with holes (2), then insert grease-coated pins (A) and (B) into hole (1) and hole (2) respectively.

REMARK

When installing the bucket, the O-rings are easily damaged, so fit the O-rings on the boss of the arm end as shown in the diagram.When knocking the pin, move the O-ting down to the regular groove.

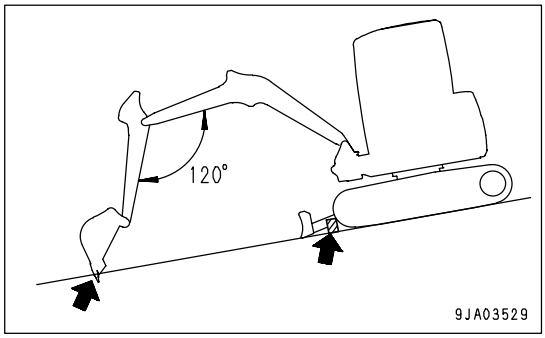


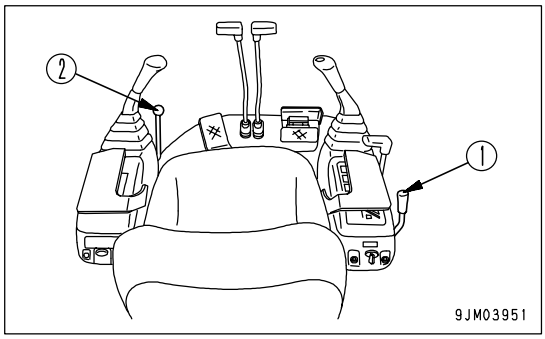
4. Install the stopper bolts and nuts for each pin, then grease the pin.

PARKING MACHINE

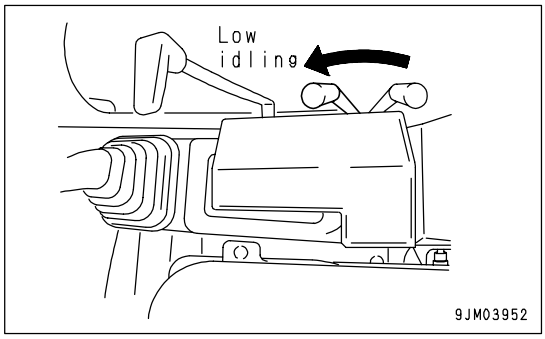
WARNING

- **Park the machine on the firm, level ground.**
  Avoid parking the machine on slopes.
  If it is unavoidably necessary to park the machine on a slope, put blocks under the tracks and dig the work equipment into the ground surface to stop the machine from moving.
- **If the control levers are touched by accident, the work equipment or machine may move suddenly, and this may lead to a serious accident. Before standing up from the operator's seat, always set the safety lock lever securely to the LOCK position.**
- **Set the blade on the downhill side and lower it to the ground.**

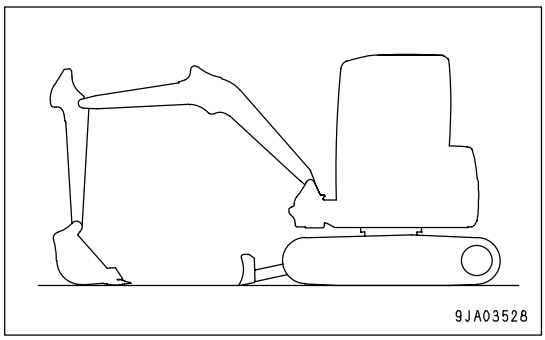




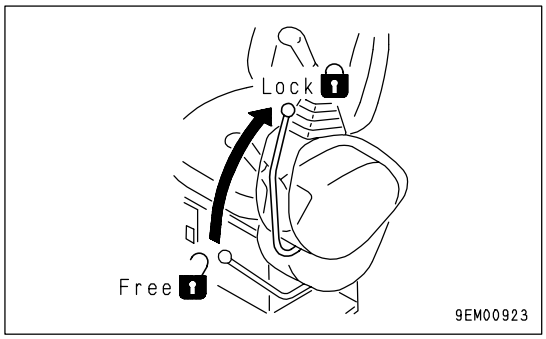
1. Stop the machine. For details, see "Stopping Machine (PAGE 3-55)".
2. Set fuel control lever (1) to the low idling position to lower the engine speed.



3. Lower the bucket horizontally until the bottom touches the ground.
4. Lower the blade to the ground.

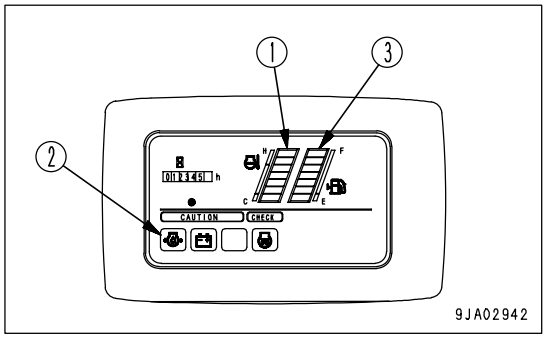


5. Set safety lock lever (2) in the LOCK position.



MACHINE INSPECTION AFTER DAILY WORK

Check the engine water temperature (1), engine oil pressure (2), and fuel level (3) on the machine monitor.



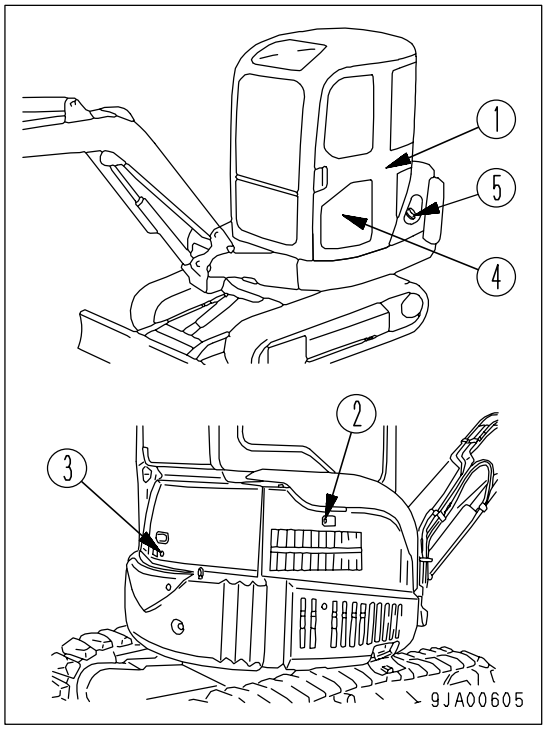
LOCKING

Always lock the following places.

(1) Door of operator's cab (machine equipped with cab)
Always remember to close the window.
(2) Mud cover
(3) Engine hood
(4) Tool box cover (machine equipped with canopy)
(5) Fuel tank filler port

REMARK

Use the starting switch key to open and close all these places.



RUBBER SHOES AND ROAD LINERS

(Machine equipped with rubber shoe or road liner)

Rubber Shoes And Road Liners Information

Rubber shoes and road liner have excellent properties that are not found in steel shoes. However, if they are used in the same way as steel shoes, full use cannot be made of their advantages.

Be sure to operate without straining the rubber shoes in a way that matches the condition of the jobsite and the nature of the work.

Comparison Among Rubber Shoes

	Rubber shoe	Road liner	Steel shoe
Little vibration	Excellent	Excellent	Average
Smooth travel (No creaks)	Excellent	Good	Good
Little noise	Excellent	Excellent	Average
No damage to paved surface	Excellent	Excellent	Average
Easy to handle	Excellent	Average	Average
Easily damage	Average	Good	Excellent
Strong drawber pull	Excellent	Excellent	Excellent

Considering the properities of the material used, rubber shoes and road liners offer various advantages. However, thier weak point is lack of strength. Therefore, it is important to understand the advantages of rubber shoes and road liners, and to follow the precautions regarding handling and prohibited work. This will extend the life of the rubbershoes and road liners and will enable the machine to display the advantages of rubber shoes and road liners to the maximum. Before using rubber shoes and road liner, always read "Using Rubber Shoes And Road Liners (PAGE 3-74)".

Warranty For Rubber Shoes And Road Liners

It is important to inspect and maintain the tracks at the correct tension. Furthermore, these shoes must not be used near objects where they are likely to suffer damage, such as the corners of steel plates, U-shaped ditch liners, blocks, on crushed rock or the sharp edges of rocks, iron beams, or scrap iron.

Any damage resulting from the customer’s mistaken use of the machine shall not be included in the scope of the warranty.

Using Rubber Shoes And Road Liners

Prohibited Works

Do not carry out the following types of work.

- Carrying out operations and steering on crushed rock, extremely rough hard rock, steel beams, scrap iron, or near the edges of steel plates will cause damage to the rubber shoes and road liners.
- In places such as river beds where there are large numbers of large and small boulders, the stones may get caught and damage the rubber shoes and road liners or make the shoes come off. If dozing operations are carried out when the shoes are slipping, this will reduce the life of the rubber shoes and road liner.
- Be careful not to get oil, fuel, or chemical solvent on the rubber shoes and road liners. If such a substance shold get on the shoes, remove it immediately. Furthermore, do not travel on road surfaces where oil has collected.
- When putting the machine into long-term storage (3 months or more), store the machine indoors where it is protected from direct sunlight or rain.
- Do not use the machine in high-temperature areas, such as areas where there is burning wood, steel plates that have been left under the hot sun, or places where asphalt has been laid.
- Do not move the machine with the crawler on one side raised using the work equipment. This will cause damage to the rubber shoes and may cause the rubber shoes to come off.
- When the rubber parts of the road liner are so worn or broken that the head of the mounting bolts are scratched, replace the shoe immediately. If the bolt heads are broken, the bolt cannot be removed.
- When installing road liners, always install them to all links on both sides. If they are installed to only one part of the links, their durability will be greatly reduced.

Long Life Operations

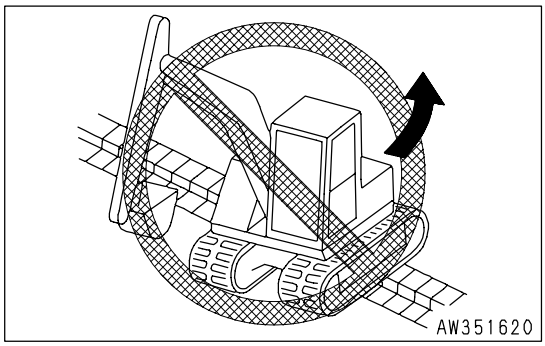
Be careful of the following points when carrying out work.

- Avoid carrying out counterrotation turns on concrete surfaces. There is danger that the concrete surface will scrape off the rubber from the shoe.
- Avoid making sudden changes in direction. This may cause premature wear or damage to the rubber shoes and road liners.
- Avoid operating the steering when traveling over places where there is a big difference in height. When traveling over obstacles or places where there is a difference in height, drive the machine at right angles to the obstacle to prevent the shoes from coming off.
- If the machine has been raised using the bucket, lower it slowly.
- Avoid doing work with materials that produce oil when crushed (soya beans, corn, or remains of vegetables squeezed for oil); or wash the machine after use.
- Avoid handling materials that will attack the adhesion of the steel core, such as salt, ammonium sulphate, potassium chloride, potassium sulphate, or calcium superphosphate; or wash the machine after use.
- The adhesion of the core will be attacked by salt, so avoid using the machine in coastal areas.
- When handling salt, sugar, wheat, or soya beans, if there is any deep cut in the rubber shoes and road liners, these substances may get into the lugs or cut portion of the rubber. Always repair the rubber before use.
- Do not carry out work that involves scraping against walls or concrete embankments.
- Rubber shoes and road liners slip extremely easily on snow or frozen roads. Be careful not to slip when traveling or working on slopes.
- The properties of rubber shoes and road liners change when working in extermely cold places, and this will reduce the life of the rubber shoes and road liners.
- Because of the properties of rubber, use the rubber shoes within a range of -25°C to +55°C (-13°F to +131° F).

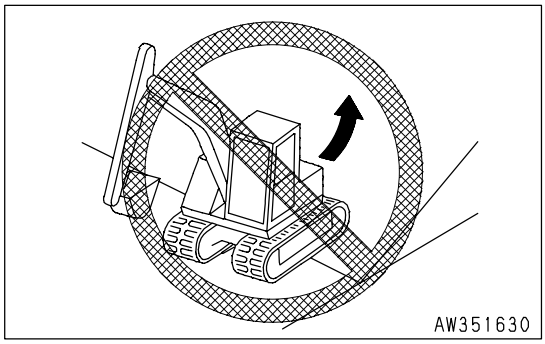
  Because of the properties of rubber, use the road liners within a range of -25°C to +65°C (-13°F to +149°F).
- When carrying out bucket operations, be careful not to damage the rubber shoes and road liners with the bucket.

• Always maintain the rubber shoes at the proper tension to prevent them from coming off.
If the tension is low, the rubber shoes will come off under the following conditions.
Even if the tension is correct, be extremely careful when carrying out operations.

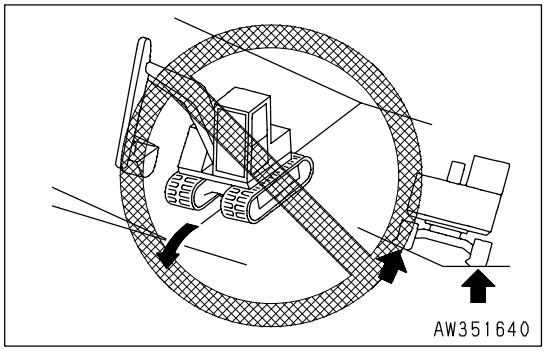
1. Avoid operating the steering when traveling over curbs, rocks, or places where there is a big difference in height (more than approx. 20cm (8 in)). When traveling over such objects, always travel at right angles to the object.



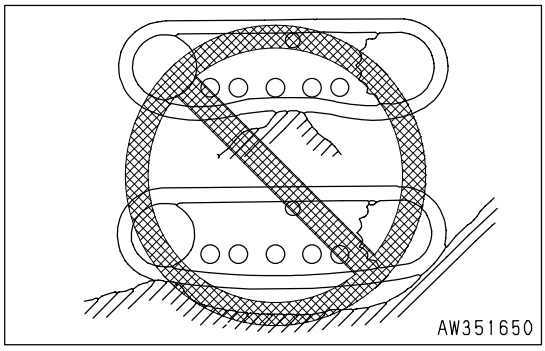
2. When traveling in reverse up a slope, do not turn when moving from flat ground onto the slope.
If it is necessary to turn on slopes, be sure to turn gradually.



3. Avoid traveling along the edge of slopes or on rough groundwith the track on one side raised (with the machine tilting at anangle of more than approx. 10 °) and with the track on the other side on flat ground. To avoid damage to the rubber shoes and road liners, travel with the tracks on both sides on flat ground.

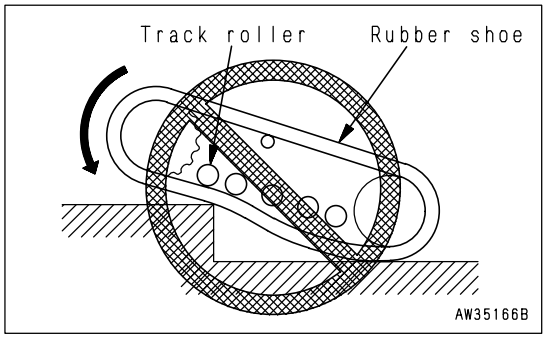


4. If the machine is operated as explained in 1 to 3 above, the rubber shoes is slackened. Do not steer the machine in the positions shown in the figure.

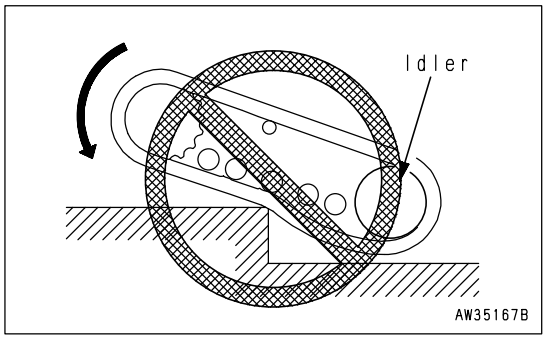


Mechanism of rubber shoe coming off track

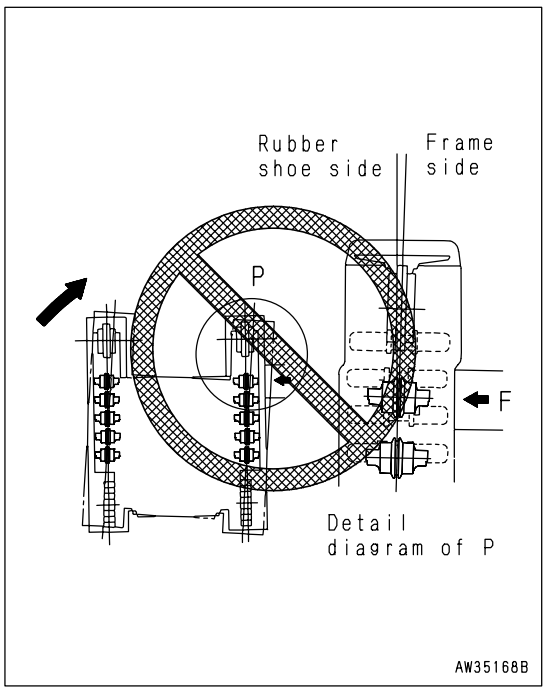
1) When traveling over an obstacle, a gap is formed between the track roller and the rubber shoe. In this condition, the rubber shoe may come off.



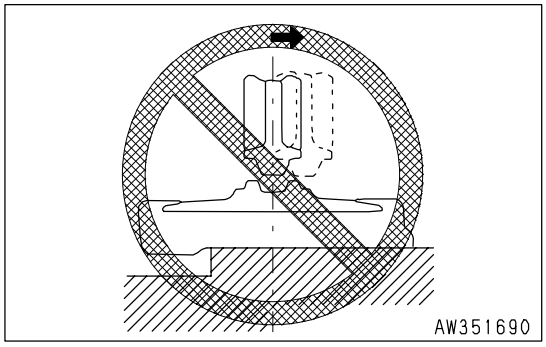
2) Furthermore, if the machine travels in reverse, a gap is formed between the track roller, idler, and rubber shoe.



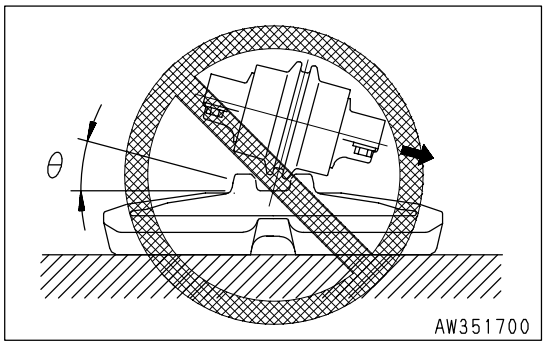
- When turning in a condition where the rubber shoe cannot move to the side because of the object it is passing over, or because of some other object.
- When the rubber shoe has moved out of alignment and the idler or track roller are not aligned with the core.



- If the machine travels in reverse in this condition, the rubber shoe will come off.



- If the machine is turned in this condition, the rubber shoe will come off.



TRANSPORTATION

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

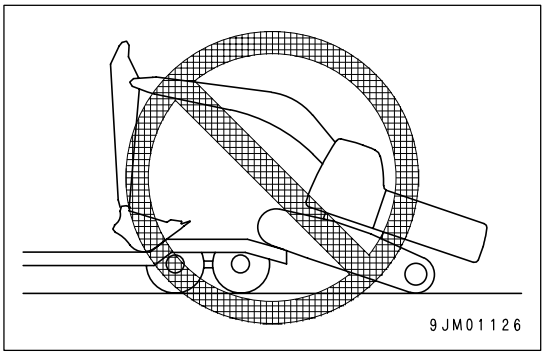
TRANSPORTATION PROCEDURE

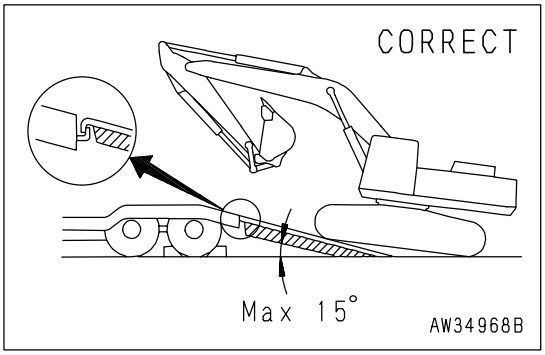
As a basic rule, transport the machine by trailer.
Select the trailer to match the weight and dimensions given in "SPECIFICATIONS (PAGE 5-2)".
Note that the value for the weight and transportation dimensions given in SPECIFICATIONS may differ according to the type of shoe or type of arm or other attachments.

LOADING AND UNLOADING WITH TRAILER

WARNING

- **When loading or unloading, always drive at low speed and do not operate the travel boost pedal.**
- **When loading or unloading, run the engine at low speed and operate slowly.**
- **When loading or unloading the machine, park the trailer on a flat firm roadbed.**
  Keep a fairly long distance between the road shoulder and the machine.
- **Use ramps with ample width, length, thickness, and strength and install them at a maximum slope of 15°.**
  When using paled soil, compact the piled soil fully and prevent the slope face from collapsing.
- **Remove the mud from the undercarriage to prevent the machine from slipping to the side on the ramps.**
  Remove any water, snow, grease, oil, or other substances stuck to the ramps.
- **Never change the direction of travel when on the ramps. There is danger that the machine may tip over.**
  If it is necessary to change direction, drive off the ramps to the ground or back on to the platform, correct the direction, then drive on to the ramps again.
- **It is dangerous to use the work equipment for the loading or unloading operation.**
- **Never operate any lever other than the travel lever on the ramps.**
- **The center of gravity of the machine will change suddenly at the joint between the ramps and the track or trailer, and there is a hazard of the machine losing its balance. Travel slowly over this point.**
- **When swinging the upper structure on the trailer or truck, the machine is unstable, so pull in the work equipment and swing slowly.**
- **On machines with the cab specifications, always check that the sliding door is locked in position, both when it is open and when it is closed. If the door is open or closed on the ramps or on the platform of the trailer, there is danger that the**
  operating effort will suddenly changed. Do not open or close the door on the ramps or on trailer platforms.

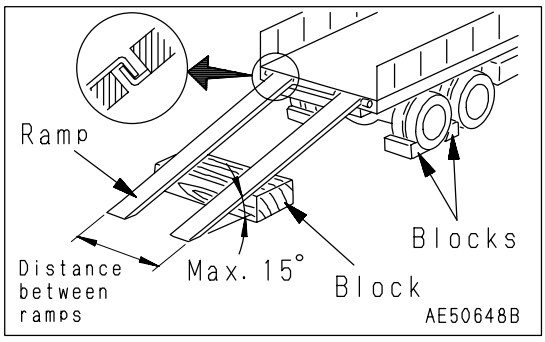




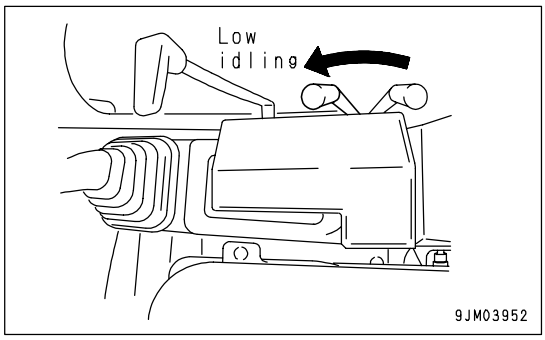
When loading or unloading, always use ramps or a platform and carry out the operation as follows.

Loading

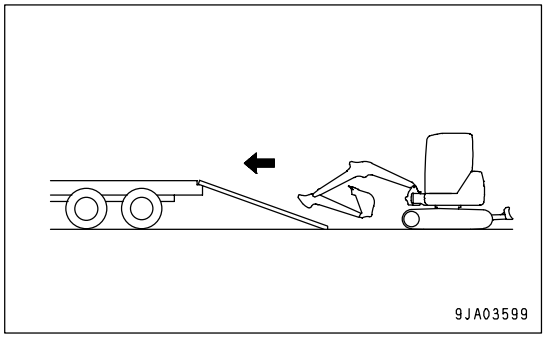
1. Perform loading and unloading on firm, level ground only.
   Maintain a safe distance from the edge of a road.
2. Properly apply the brakes on the trailer and put detents under the tires to ensure that the trailer does not move.
   Then fix the ramps in line with the center of the trailer and the machine.
   Be sure that the two sides are on the same level.
   Make the slope of the ramps a maximum of 15°.
   Set the distance between the ramps to match the center of the tracks.
   Properly apply the brakes on the trailer and put blocks under the tires to ensure that the trailer does not move.
   Make the slope of the ramps a maximum of 15°.



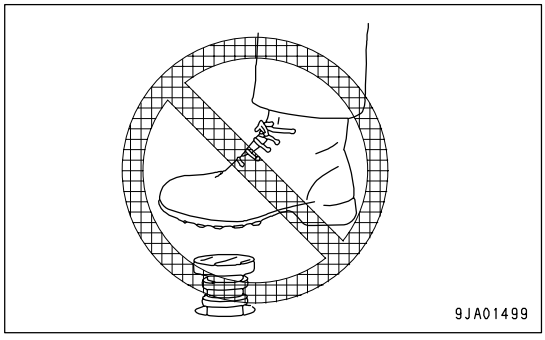
3. Run the engine at low speed.



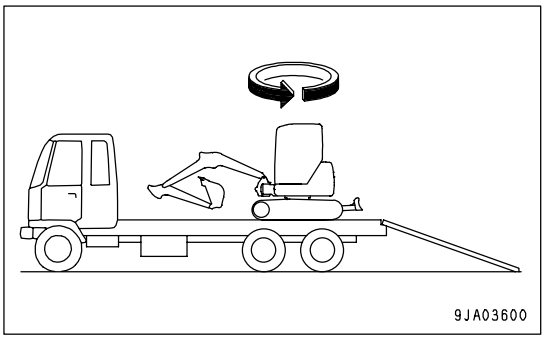
4. When loading, set the work equipment at the front and the blade at the rear, with the undercarriage and upper structure set parallel.
5. Before moving onto the ramps, make sure that the machine is positioned in a straight line with the ramps and that the centerline of the machine matches that of the trailer.
   Align the direction of travel with the ramps and travel slowly.
   Lower the work equipment as far as possible without causing interference.
   When on the ramps, operate only the travel lever. Do not operate any other lever.



6. Do not operate the accelerator pedal.



7. Stop the machine at the specified place, then swing the upper structure slowly 180°.



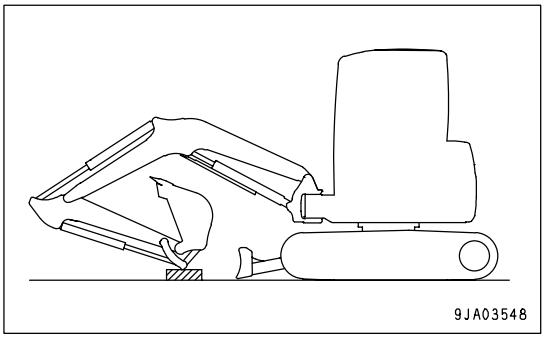
8. Stop the machine at the specified position on the trailer.

Securing Machine

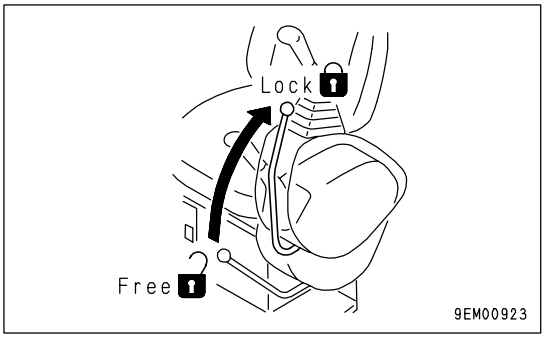
After placing the machine on the specified position of the trailer, secure it according to the following procedure.

NOTICE

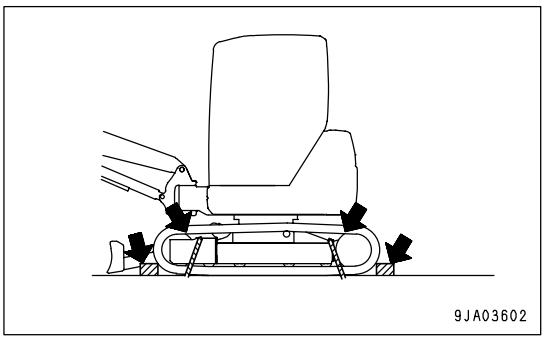
To prevent damage to the bucket cylinder during transportation, fit a wooden block at one end of the bucket cylinder to prevent it from touching the floor.



1. Lower the blade.
2. Extend the bucket and arm cylinders fully, then lower the boom slowly.
3. Stop the engine, then remove the key from the starting switch.
4. Set the safety lock lever to the LOCK position without fail.

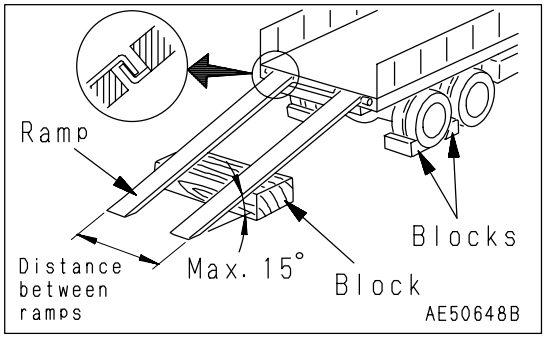


5. Lock the sliding door (cab specification) and covers with locks.
6. Put blocks under both ends of the tracks to prevent the machine from moving during transportation, and tie the machine down securely with chains or wire rope of suitable strength.
   Be particularly careful to fix the machine in position securely so that it does not slip to the side.

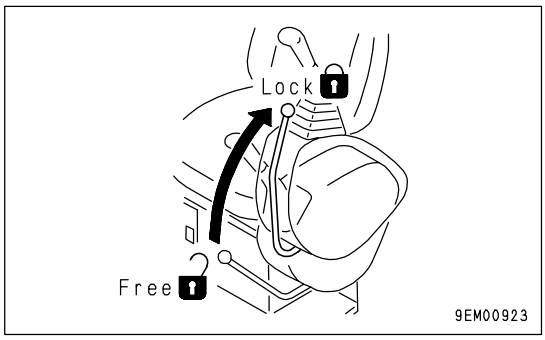


Unloading

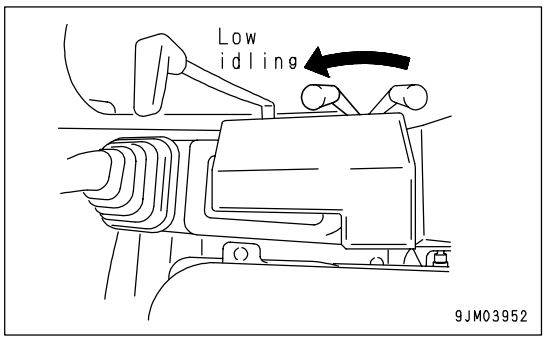
1. Perform loading and unloading on firm, level ground only. Maintain a safe distance from the edge of a road.
2. Properly apply the brakes on the trailer and put detents under the tires to ensure that the trailer does not move.
   Then fix the ramps in line with the center of the trailer and the machine.
   Be sure that the two sides are on the same level.
   Make the slope of the ramps a maximum of 15°.
   Set the distance between the ramps to match the center of the tracks.
   Properly apply the brakes on the trailer and put blocks under the tires to ensure that the trailer does not move.
   Make the slope of the ramps a maximum of 15°.



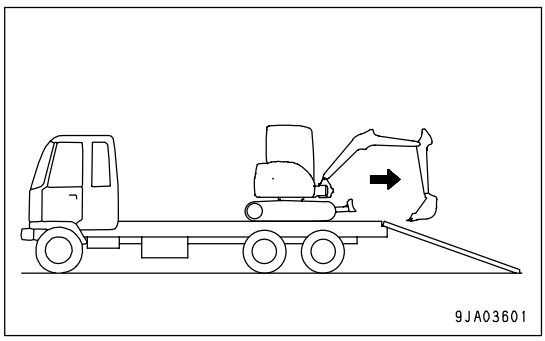
3. Remove the chains and wire ropes fastening the machine.
4. Start the engine.
   Warm the engine up fully.
5. Set the safety lock lever to the FREE position.



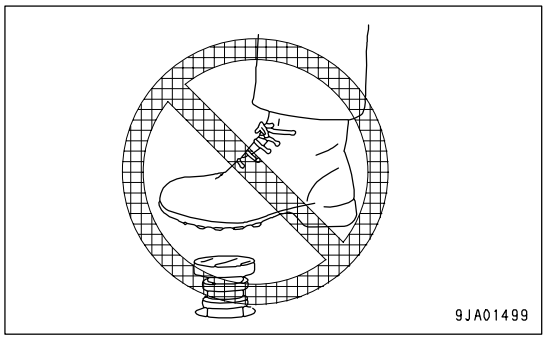
6. Run the engine at low speed.
7. Raise the blade.



8. Raise the work equipment, align the direction of travel with the ramp, and travel slowly.
   Lower the work equipment as far as possible without causing interference.
   When on the ramps, operate only the travel lever. Do not operate any other lever or pedal.



9. Do not operate the accelerator pedal.



LIFTING MACHINE

WARNING

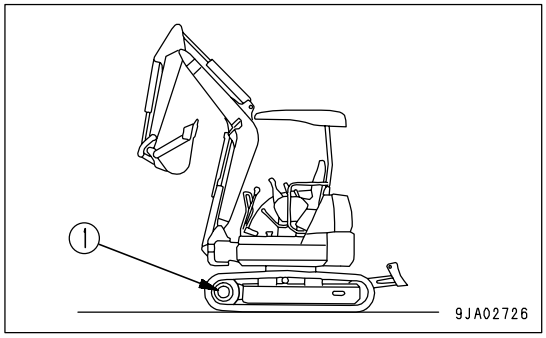
- **Never raise the machine with any worker on it.**
- **Always make sure that the wire rope used for lifting the machine is of ample strength for the weight of the machine.**
- **Never lift the machine with the upper structure swung to the side. Swing the work equipment so that it is at the sprocket end and set the undercarriage and upper structure parallel before lifting.**
- **When lifting, keep the machine horizontal.**
- **Never go under the machine when it is raised.**
- **Never try to lift the machine in any posture other than the posture given in the procedure below. There is a hazard that the machine may lose its balance.**

NOTICE

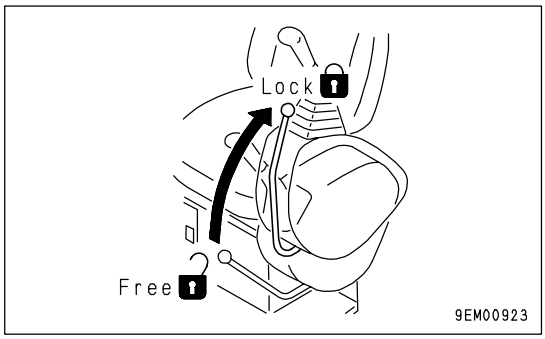
- **For the details on the machine weight, see the section of "SPECIFICATIONS (PAGE 5-2)".**
- **The lifting procedure applies to machines with standard specifications. The method of lifting differs according to the attachments and options actually installed. In such cases, please contact your Komatsu distributor for information.**

When lifting the machine, carry out the operation on flat ground as follows.

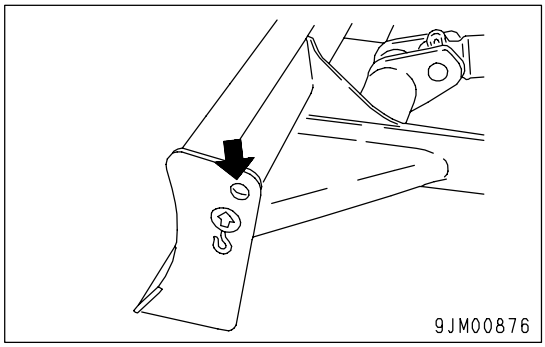
1. Start the engine, then swing the upper structure so that the work equipment is at sprocket (1) end with the track frame and upper structure set parallel.
2. When the boom swing has been operated to the left or right, operate the boom swing pedal to set the boom parallel to the track frame, then set the pedal lock to the LOCK position.
3. Extend the bucket cylinder, arm cylinder, and boom cylinder fully.
4. Raise the blade fully.



5. Operate the safety lock lever to the LOCK position.
6. Stop the engine, check that there is nothing around the operator's compartment, then get off the machine.
   For cab specification machines, close the cab door and front glass securely.



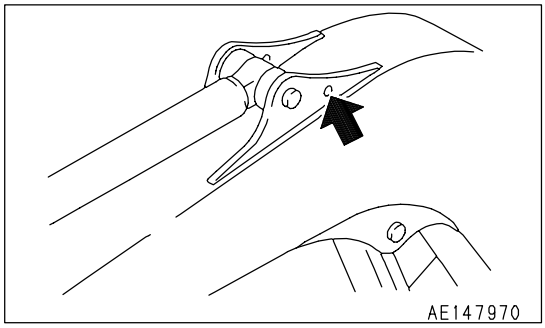
7. Install shackles to the lifting holes (2 places) on both ends of the blade, then install the wire ropes.



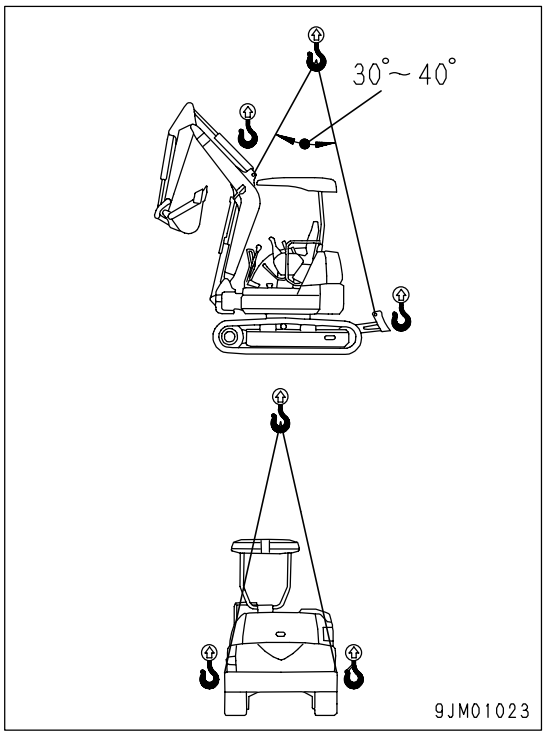
8. Pass the wire rope through the bracket on the boom (see diagram on right).

NOTICE

- **Be sure to use the three brackets.**
  Do not lift the machine with the boom or the upper structure swung.
- **Be careful not to get the hoses caught.**



9. Set the lifting angle of the wire rope to 30° to 40°, then lift the machine slowly.
10. After the machine comes off the ground, check the hook condition and the lifting posture, and then lift slowly.



COLD WEATHER OPERATION

COLD WEATHER OPERATION INFORMATION

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 fuel and oil with low viscosity for all components. For details of the specified visicosity, see "LUBRICANTS, FUEL AND COOLANT SPECIFICATIONS (PAGE 4-8)".

Cooling System Coolant

⚠ WARNING

- **Antifreeze is toxic. Be careful not to get it into your eyes or on your skin. If it should get into your eyes or on your skin, wash it off with large amount of fresh water and see a doctor at once.**
- **When changing the coolant or when handling coolant containing antifreeze that has been drained when repairing the radiator, please contact your Komatsu distributor. Antifreeze is toxic, so do not let it flow into drainage ditches or spray it on to the ground surface.**
- **Antifreeze is flammable, so do not bring any flame close. Do not smoke when handling antifreeze.**

NOTICE

- **Never use methanol, ethanol, or propanol-based antifreeze.**
- **Never use any water-leakage prevention agent or any antifreeze containing such an agent.**
- **Do not mix different types of antifreeze.**

For details of the antifreeze mixture when changing the coolant, see "Cooling System Coolant - Clean/Change (PAGE 4-19)".

Use a Permanent Antifreeze (ethylene glycol mixed with corrosion inhibitor, antifoam agent, etc.) meeting the standard requirements as shown below. With permanent antifreeze, no change of coolant is required for a year. If it is doubtful that an available antifreeze meets the standard requirements, ask the supplier of that antifreeze for information.

Standard requirements for permanent antifreeze

- SAE J1034
- FEDERAL STANDARD O-A-548D

REMARK

In areas where permanent antifreeze is not available, it is possible to use antifreeze whose main component is ethylene glycol and does not contain any corrosion inhibitor. (Such antifreeze can be used for the winter season only.) However, in such a case, the cooling water must be changed twice a year (spring and fall), so use permanent antifreeze as far as possible.

Battery

⚠ WARNING

- **The battery generates flammable gas, so 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 large amount of water, and consult a doctor.**
- **Battery electrolyte dissolves paint. If it gets on to 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, so 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%, and insulate it against cold temperature so that the machine can be started easily the next morning.

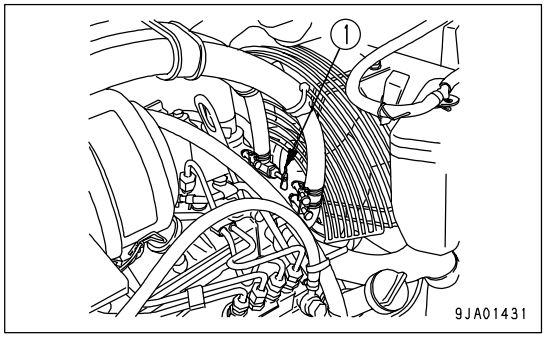
REMARK
Measure the specific gravity and calculate the rate of charge from the following conversion table.

Temperature (°C) / Charging Rate(%)	20	0	-10	-20
100	1.28	1.29	1.30	1.31
90	1.26	1.27	1.28	1.29
80	1.24	1.25	1.26	1.27
75	1.23	1.24	1.25	1.26

- As the battery capacity drops markedly in low temperatures, cover the battery or remove it from the machine, keep it in a warm place, and install it again the next morning.
- If the electrolyte level is low, add distilled water in the morning before beginning work. Do not add the water after the day's work so as to prevent fluid in the battery from freezing in the night.

CAB HEATER IN COLD WEATHER

(Machine equipped with cab)
If the ambient temperature drops, use the operator's cab heater.
When using the heater, turn valve (1) on the water manifold counterclockwise to open it.
When leaving the heater unused for a long time, turn valve (1) clockwise to close it.



AFTER DAILY WORK COMPLETION

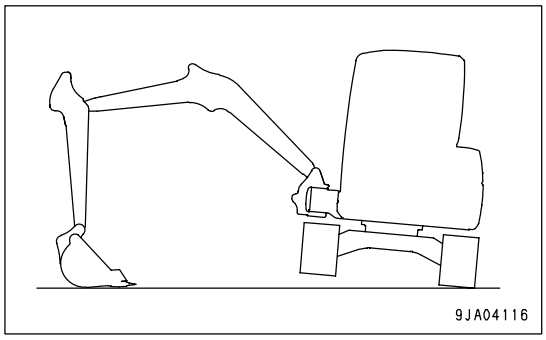
⚠ WARNING

- **Performing idle-running of the tracks is dangerous, so stay well away from the tracks.**

To prevent mud, water, or the undercarriage from freezing and making it impossible for the machine to move on the following morning, always observe the following precautions.

- Remove all the mud and water from the machine body. In particular, wipe the hydraulic cylinder rod clean to prevent damage to the seal caused by mud or dirt on the rod surface getting inside the seal together with drops of water.
- Park the machine on hard, dry ground.
  If this is impossible, park the machine on wooden boards.
  The boards help protect the tracks from being frozen in soil and the machine can start next morning.
- Open the drain valve and drain any water collected in the fuel system to prevent it from freezing.
- After operation in water or mud, remove water from undercarriage as described below to extend undercarriage service life.

1. Swing 90° with engine at low idling and bring the work equipment to the side of the track.
2. Jack up the machine until the track is raised slightly from the ground. Rotate the track under no load. Repeat this procedure on both the left and right sides.



AFTER COLD WEATHER SEASON

When season changes and the weather becomes warmer, do as follows.

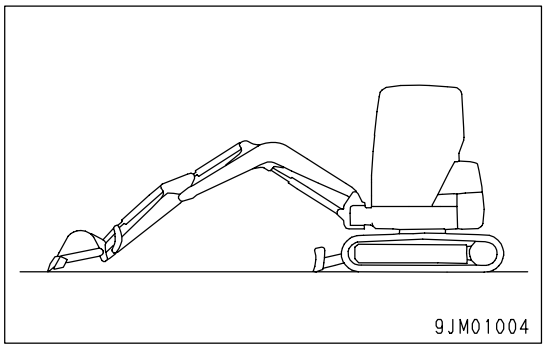
- Replace the fuel and oil for all parts with oil of the viscosity specified.
  For details, see "LUBRICANTS, FUEL AND COOLANT SPECIFICATIONS (PAGE 4-8)".
- If for any reason permanent antifreeze cannot be used, and an ethyl glycol base antifreeze (winter, one season type) is used instead, or if no antifreeze is used, drain the cooling system completely, then clean out the inside of the cooling system thoroughly, and fill with fresh soft water.

LONG TERM STORAGE

BEFORE STORAGE

NOTICE

To protect the hydraulic cylinder piston rod while in storage, keep the work equipment in the posture shown at right.
(This prevents rust from developing on the piston rod)



When putting the machine in storage for a long time, do 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, lubricate and change the oil before storage.
- Apply a thin coat of grease to the metal surface of the hydraulic piston rods.
- Disconnect the negative terminals of the battery and cover it or remove it from the machine and store it separately.
- Lock each control lever and pedal with the safety lock lever and pedal lock.
- Set the stop valve to the "lock" position on machines ready for attachments. Install the blind plugs to the elbows.
- Set the selector valve on the machines which can install attachments to the "Crusher or general attachment" position.

DURING STORAGE

⚠ WARNING

If it is unavoidably necessary to carry out the rust-preventive operation while the machine is indoors, open the doors and windows to improve ventilation and prevent gas poisoning.

Operate the engine and move the machine for a short distance once a month so that a new film of oil will be coated over movable parts and component surfaces. At the same time, also charge the battery.

- For machines equipped with an air conditioner, run the air conditioner.
- Rotate the tracks.

AFTER STORAGE

NOTICE

If the machine is to be used when the monthly rust prevention operation has not been carried out, please contact your Komatsu distributor.

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 to all places.
- When a machine is stored for a long period, moisture in the air will get into the oil. Check the oil before and after starting the engine. If there is water in the oil, change the oil.
- A plastic fuel tank is used, so never use trichloroethylene when washing it. Washing in trichloroethylene will reduce the strength of the fuel tank.

TROUBLES AND ACTIONS

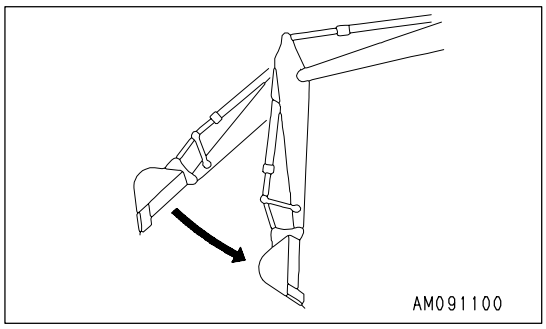
RUNNING OUT OF FUEL

When starting after running out of fuel, fill with fuel and bleed the air from the fuel system before starting.
For details of bleeding the air, see "Air Bleeding (PAGE 4-49)".

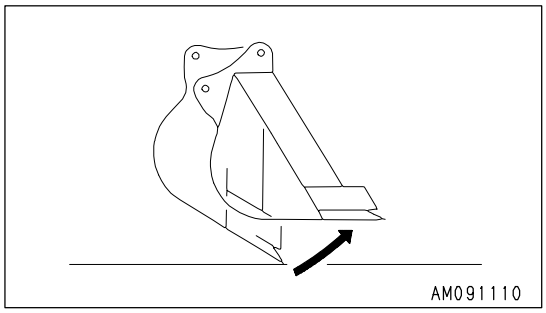
PHENOMENA THAT ARE NOT FAILURES

Note that the following phenomena are not failures:

- When the arm control lever is operated to the IN position and the work equipment is lowered under no load from a high position, the arm speed will drop momentarily when the arm is more or less at the vertical position.



- When the bucket control lever is operated to the CURL position and the work equipment is lowered under no load from a high position, the bucket speed will drop momentarily when the bucket teeth are more or less at the horizontal position.



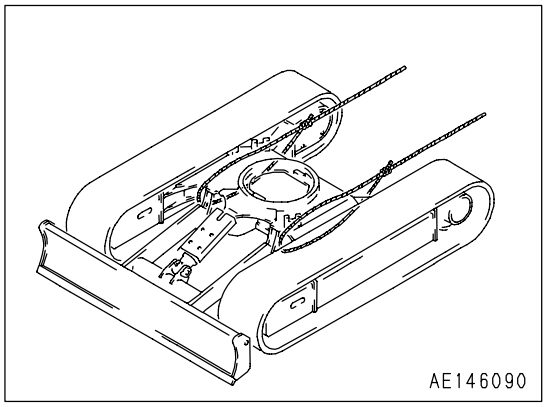
- When starting or stopping the swing, noise will be emitted from the brake valve.
- When going down a steep slope at low speed, a noise will be emitted from the travel motor brake valve.

TOWING THE MACHINE

WARNING

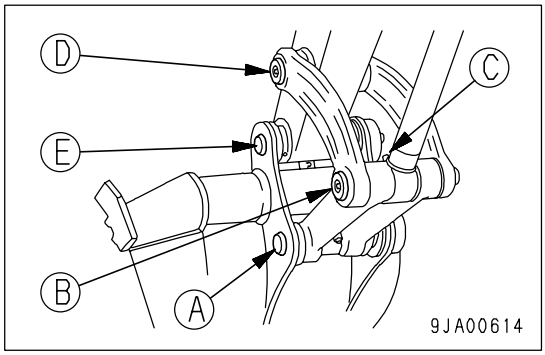
- **When towing the machine, use a wire rope that has ample strength for the weight of the machine that is being towed.**
- **Do not apply a sudden load to the wire rope.**

If the machine sinks in mud and cannot get out under its own power, or if the drawbar pull of the excavator is being used to tow a heavy object, use a wire rope as shown in the diagram on the right.
Places pieces of wood between the wire ropes and the body to prevent the wire ropes from damaging the body.



SEVERE JOB CONDITION

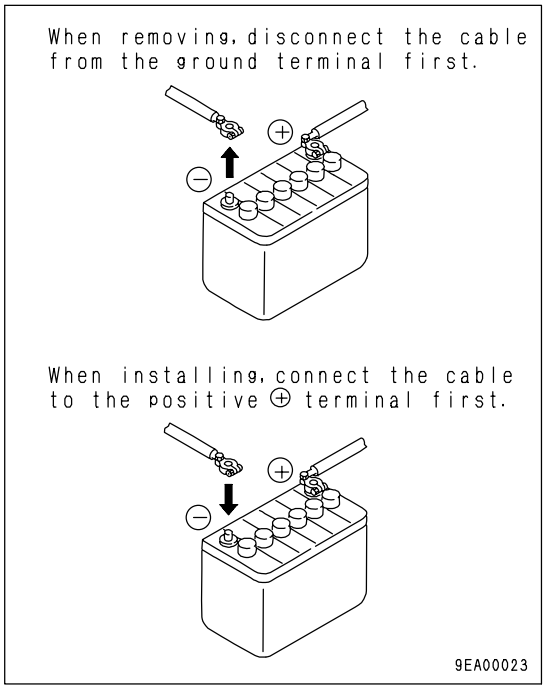
- When digging in water, if the water gets on to the work equipment mounting pins, add grease to bucket links (A), (B), (C), (D) and (E) for each operation.
- When carrying out heavy duty digging and deep digging operations, add grease to bucket links (A), (B), (C), (D) and (E) (total: 5 points) before each operation.
  After greasing, operate the bucket several times, then add grease again.



DISCHARGED BATTERY

WARNING

- **When checking or handling the battery, stop the engine and turn the starting switch key to the OFF position.**
- **The battery generates hydrogen gas, so there is a hazard of explosion. Do not bring lighted cigarettes near the battery, or do anything that will cause sparks.**
- **Battery electrolyte is dilute sulphuric acid, and it will attack your clothes and skin. If it gets on your clothes or on your skin, wash it immediately off with large amount of water. If it gets in your eyes, wash it out with fresh water, and consult a doctor.**
- **When handling batteries, always wear protective goggles and rubber gloves.**
- **When removing the battery, first disconnect the cable from the ground (normally the negative (-) terminal). When installing, install the positive (+) terminal first.**
  If a tool touches the positive terminal and the chassis, there is danger that it will cause a spark, so be extremely careful.
- **If the terminals are loose, there is danger that the defective contact may generate sparks that will cause an explosion.**
- **When removing or installing the terminals, check which is the positive (+) terminal and which is the negative (-) terminal.**

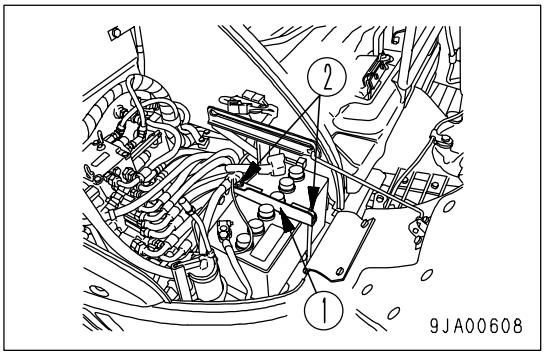


Battery Removal And Installation

NOTICE

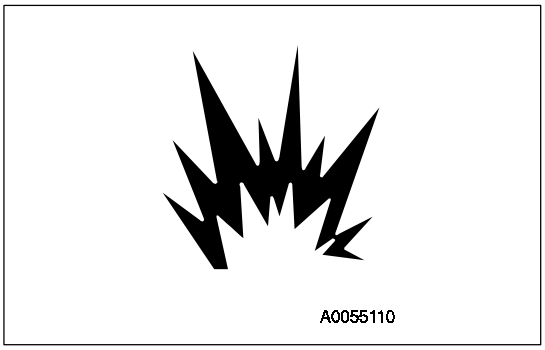
After securing the battery, check that it does not move. If it moves, tighten it again securely.

- Before removing the battery, remove the ground cable (normally connected to the negative (-) terminal). If any tool touches between the positive terminal and the chassis, there is a hazard of sparks being generated.
- When installing the battery, connected the ground cable last.
- When replacing the battery, fix the battery securely with battery clamp (1).
  Tightening torque for mounting nut (2)
  Nut and clamp: 2.0 N·m (0.2 kg·m, 1.5 lbft)
  Double nut: 27 to 34 N·m (2.8 to 3.5 kg·m, 19.9 to 25.1 lbft)



Battery Charges

When charging the battery, if the battery is not handled correctly, there is a hazard that the battery may explode. Always follow the instructions of "DISCHARGED BATTERY (PAGE 3-89)" and the instruction manual accompanying the charger, and do as follows.



- Set the voltage of the charger to match the voltage of the battery to be charged. If the voltage is not selected correctly, the charger may overheat and 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 fix the clips securely.
- Set the charging current to 1/10 of the value of the rated battery capacity; when carrying out rapid charging, set it to less than the rated battery capacity.
  If the charger current is too high, the electrolyte will leak or dry up, 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 hazard 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. Always check the battery electrolyte level periodically and add distilled water to bring the electrolyte level to the UPPER LEVEL line.

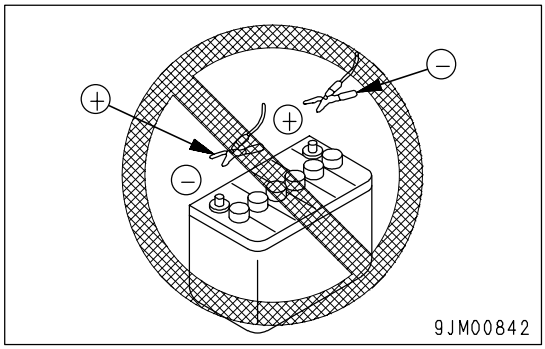
Starting Engine With Booster Cables

When starting the engine with a booster cable, do as follows:

Connecting and Disconnecting Booster Cables

⚠ WARNING

- **When connecting the cables, never contact the positive (+) and negative (-) terminals.**
- **When starting the engine with a booster cable, always wear safety glasses.**
- **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. If hydrogen gas explodes, it could cause serious injury.**
- **Be careful not to make a mistake when connecting a booster cable. In the last connection (to the upper structure frame), a spark will be caused, so connect the cable to a spot as far away from the battery as possible. (Avoid the work equipment, however, because it is not a good conductor)**
- **?When removing the booster cable, exercise good care so that the booster cable clips may not contact each other, or they contact the chassis.**



NOTICE

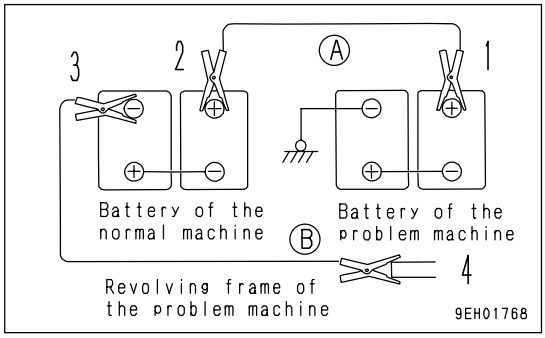
- **The size of the booster cable and clip should be suitable for the battery size.**
- **Use the same capacity battery for both the normal machine and the problem machine.**
  The starting system for this machine uses 12V. For the normal machine, select a machine which also uses 12V.
- **Make sure that the cables and clips are firmly connected.**
- **Connect securely with the clips.**
- **Check that the safety lock levers and parking brake levers of both machines are in the LOCK position.**
- **Check that each lever is in the NEUTRAL position.**

Booster Cable Connection

Keep the starting switch of the normal machine and problem machine are both at the OFF position.

Connect the booster cable as follows, in the order of the numbers marked in the diagram.

1. Connect one clip of booster cable (A) to the positive (+) terminal of the problem machine.
2. Connect the other clip of booster cable (A) to the positive (+) terminal of the normal machine.
3. Connect one clip of booster cable (B) to the negative (-) terminal of the normal machine.
4. Connect the other clip of booster cable (B) to the revolving frame of the problem machine.



Starting the Engine

WARNING

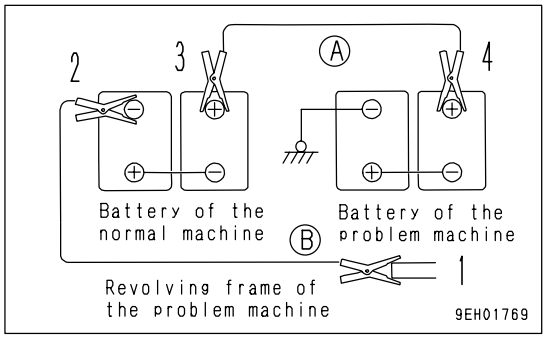
Always check that the safety lock lever is set to the LOCK position, regardless of whether the machine is working normally or has failed. Check also that all the control levers are at the HOLD or neutral position.

1. Make sure the clips are firmly connected to the battery terminals.
2. Start the engine of the normal machine and keep it to run at high idling 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 30 seconds or so.

Booster Cable Disconnection

After the engine has started, disconnect the booster cables in the reverse of the order in which they were connected.

1. Remove one clip of booster cable (B) from the revolving frame of the problem machine.
2. Remove the other clip of booster cable (B) from the negative (-) terminal of the normal machine.
3. Remove one clip of booster cable (A) from the positive (+) terminal of the normal machine.
4. Remove the other clip of booster cable (A) from the positive (+) terminal of the problem machine.



OTHER TROUBLE

Electrical System

- ( ): Always contact your Komatsu distributor when dealing with these items.
- In cases of abnormalities or causes which are not listed below, please contact your Komatsu distributor for repairs.

Problem	Main causes	Remedy
Lamp dose not glow brightly even when the engine runs at high speed	• Defective wiring • Defective adjustment of fan belt tension	(• Check, repair loose terminals, disconnections) • Adjust fan belt tension For details, see EVERY 250 HOURS SERVICE
Lamp flickers while engine is running	• Blown fuse	• Replace
Charge level monitor dose not go out even when engine is running	• Defective alternator • Defective wiring	(• Replace) (• Check, repair)
Abnormal noise is generated from alternator	• Defective alternator	(• Replace)
Starting motor dose not turn when starting switch is turned to ON	• Defective wiring • Insufficient battery charge • Blown fuse	(• Check, repair) • Charge • Replace
Starting motor pinion repeatedly moves in and out (makes rattling sound)	• 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 • Insufficient battery charge	(• Check, repair) • Charge
Pre-heating monitor dose not lights	• Defective wiring • Defective monitor	(• Check, repair) (• Replace)
Oil pressure monitor dose not light up when engine is stopped (starting switch at ON position)	• Defective monitor • Defective oil pressure switch	(• Replace) (• Replace)

Chassis

- ( ): Always contact your Komatsu distributor when dealing with these items.
- In cases of abnormalities or causes which are not listed below, please contact your Komatsu distributor for repairs.

Problem	Main causes	Remedy
Speed of travel, swing, boom, arm, bucket is slow	• Lack of hydraulic oil	• Add oil to specified level, see CHECK BEFORE STARTING
Pump generates abnormal noise	• Clogged element in hydraulic tank strainer	• Clean, see EVERY 2000 HOURS SERVICE
Excessive rise in hydraulic oil temperature	• Lack of hydraulic oil • Loose fan belt	• Add oil to specified level, see CHECK BEFORE STARTING • Adjust fan belt tension, EVERY 250 HOURS SERVICE
Track comes off	• Track too loose	• Adjust track tension, see WHEN REQUIRED
Abnormal wear of sprocket		

Engine

- ( ): Always contact your Komatsu distributor when dealing with these items.
- In cases of abnormalities or causes which are not listed below, please contact your Komatsu distributor for repairs.

Problem	Main causes	Remedy
Engine oil pressure monitor lights up	• Oil level low in oil pan (sucking air in)	• Add oil to specified level, see CHECK BEFORE STARTING
	• Clogged oil filter cartridge	• Replace cartridge, see EVERY 500 HOURS SERVICE
	• Defective tightening of oil pipe, pipe joint, oil leakage from damaged point	(• Check, repair)
	• Defective engine oil pressure sensor	(• Replace sensor)
Steam spurts out from top of radiator (pressure valve)	• Cooling water level low, leakege of water	• Check, add water, repair, see CHECK BEFORE STARTING
	• Loose fan belt	• Adjust fan belt tension, see EVERY 250 HOURS SERVICE
	• Dirt or scale accumulated in cooling system	• Change coolant, flush inside of cooling system, seee WHEN REQUIRED
Red range of engine water temperature gauge lights up	• Clogged radiator fins or damaged fins	• Clean or repair, see EVERY 500 HOURS SERVICE
	• Defective thermostat	(• Replace thermostat)
	• Loose radiator filler cap (high altitude operations)	• Tightening cap or replace pxcking
	• Defective water level sensor	(• Replace sensor)
White range of engine water temperature gauge is lights up even after operating for long time	• Defective thermostat	(• Replace thermostat)
Engine dose not start when starting motor is turned	• Lack of fuel	• Add fuel, see CHECK BEFORE STARTING
	• Air in fuel system	• Repair place where air is sucked in, see EVERY 500 HOURS SERVICE
	• Water in fuel system	• Drain water. For details, see WHEN REQUIRED and CHECK BEFORE STARTING
	• Defective fuel injection pump or defective nozzle	(• Replace pump or nozzle)
	• Starting motor cranks engine sluggishly	• See ELECTRICAL SYSTEM
	• Preheating monitor dose not light up	• See ELECTRICAL SYSTEM
	• Defective compression • Defective valve clearance	(• Adjust valve clearance)
Exhaust gas is while or blue	• Too mach oil in oil pan	• Set oil to specified level, see CHECK BEFORE STARTING
	• Improper fuel	• Change to specified fuel
Exhaust gas sometimes becomes black	• Clogged air cleaner element	• Clean or replace, see WHEN REQUIRED
	• Defective nozzle	(• Replace nozzle)
	• Defective compession	(• See "Defective compression")

Problem	Main causes	Remedy
Combustion noise occasionally make breathing sound	• Defective nozzle	(• Replace nozzle)
Abnormal noise generated (combustion or mechanical)	• Low grade fuel being used • Overheating • Damage inside muffler • Excessive valve clearance	• Change to specified fuel • See "Red range of engine water temperature gauge lights up" • Replace muffler (• Adjust valve clearance)

MAINTENANCE

⚠ WARNING

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

MAINTENANCE INFORMATION

Do not carry out any inspection and maintenance operation that is not found in this manual.

Service Meter Reading

Check the service meter reading every day to see if the time has come for any necessary maintenance to be carried out.

Komatsu Genuine Replacement Parts

Use Komatsu genuine parts specified in the Parts Book as replacement parts.

Komatsu Genuine Lubricants

Use Komatsu genuine oils and grease. Choose oils and grease with proper viscosities specified for ambient temperature.

Windshield Washer Fluid

Use automobile window washer fluid, and be careful not to let any dirt get into it.

Fresh and Clean Lubricants

Use clean oil and grease. Also, keep the containers of the oil and grease clean. Keep foreign materials away from oil and grease.

Check Drained Oil and Used Filter

After oil is changed or filters are replaced, check the old oil and filters for metal particles and foreign materials. If large quantitie 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

- Turn off the engine starting switch.
- Do not apply more than 200V continuously.
- Connect grounding cable within 1m (3.3 ft) from the area to be welded. If grounding cable is connected near instruments, connectors, etc., the instruments may have troubles.
- Avoid seals or bearings from being between the area to be welded and the position of grounding point.
- 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 will cause damage and 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 Jobsite
When working at dusty worksites, do as follows:
- Inspect the dust indicator frequently to see if the air cleaner is dirty or clogged.
- 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 Lubricants
If a different type of oil has to be added, drain the old oil and replace all the oil with the new type of oil. Never mix different kinds of oil.

Cover on Right Side of the Machine
If the cover on the right side of the machine is fully opened and the boom is swung to the right, there is danger that the boom may hit the cover and break it.
If the boom must be swung to the right with the cover open, set the cover so that it is half-open.

Locking the Inspection Covers
If inspection or maintenance has to be carried out with the inspection cover open, lock it securely in position with the lock bar. If inspection or maintenance is carried out with the inspection cover not locked in position, there is a hazard that it may be suddenly blown shut by the wind and cause injury to the worker.

Hydraulic System - Air Bleeding
When hydraulic equipment has been repaired or replaced, or the hydraulic piping has been removed and installed again, the air must be bled from the circuit. For details, see "Hydraulic System - Bleed Air (PAGE 4-39)".

Hydraulic Hose Installation
- 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 into loops with a small radius.
  This will cause damage to the hose and markedly reduce its service life.

Checks After Inspection and Maintenance Works
If you forget to carry out the checks after inspection and maintenance, unexpected problems may occur, and this may lead to serious injury or property damage. Always do as follows.
- Checks after operation (with engine stopped)
  - Have any inspection and maintenance points been forgotten?
  - Have all inspection and maintenance items been carried out correctly?
  - Have any tools or parts been dropped inside the machine? It is particularly dangerous if parts are dropped inside machine and get caught in the lever linkage mechanism.
  - Is there any leakage of water or oil? Have all the bolts been tightened?
- Checks when operating engine
  - For details of the checks when operating the engine, see "Two Workers for Maintenance when Engine is Running (PAGE 2-34)" and pay careful attention to safety.
  - Are the inspection and maintenance items working properly?
  - Is there any leakage of oil when the engine speed is raised and load is applied to the oil pressure?

LUBRICANTS, COOLANT AND FILTERS

HANDLING OIL, FUEL, COOLANT, AND PERFORMING OIL CLINIC

Oil

- Oil is not dirty, always change the oil after the specified interval.
  Oil is used in the engine and work equipment under extremely severe conditions (high temperature, high pressure), and is deteriorates with use.
- Always use oil that matches the grade and temperature for use given in the Operation and Maintenance Manual.
- Never mix oils of different grades or brands.
- Oil corresponds to blood in the human body, so always be careful when handling it to prevent any impurities (water, metal particles, dirt, etc.) from getting in.
  Take particular care not to let any impurities get in when adding oil.
  The majority of problems with machine are caused by the entry of such impurities.
- Always add the specified amount of oil.
  Having too much oil or too little oil are both causes of problems.
- When changing the oil, always replace the related filters at the same time.
- 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.
- 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.

Fuel

- 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 the fuel specified in the Operation and Maintenance Manual.
  Fuel may congeal depending on the temperature when it is used (particularly in low temperature below -15°C (5 °F)). It is necessary to change for the fuel that is suitable for the temperature.
- 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.
- 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.

Cooling System Coolant

- If the coolant level is low, it will cause overheating and will also cause problems with corrosion from the air in the coolant.
- River water contains large amount of calcium and other impurities, so if it is used, scale will stick to the engine and radiator, and this will cause defective heat exchange and overheating.
- Do not use water that is not suitable for drinking.
- This anti-freeze is also effective in preventing corrosion on the parts of the engine cooling system. It may be continuously used for two years or 4000 hours of operation, so continue to use it in the other seasons than summer, too.
- When using anti-freeze, always observe the precautions given in the Operation and Maintenance Manual.
  Anti-freeze is flammable, so be extremely careful not to expose it to flame or fire.
  The proper mixing proportion of the antifreeze depends on the ambient temperature. For the mixing proportion, see "Cooling System Coolant - Clean/Change (PAGE 4-19)".

Grease

- Grease is used to prevent twisting and noise at the joints.
- The nipples not included in the MAINTENANCE section are nipples used when overhauling, so they do not need grease.
  If any part becomes stiff or generates noise after being used for a long time, grease it.
- 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.

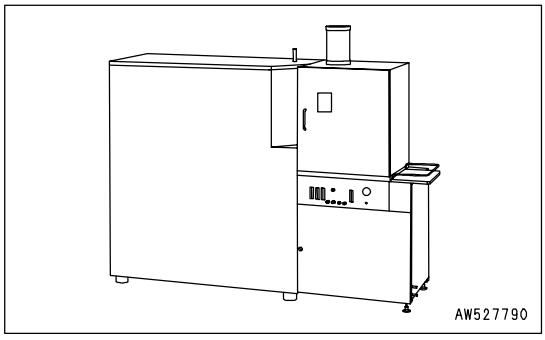
Carrying out KOWA (Komatsu Oil Wear Analysis)

KOWA is a maintenance service that makes it possible to prevent machine failures and down-time. With KOWA, the oil is periodically sampled and analyzed. This enables early detection of wear of the machine drive parts and other abnormalities.
Periodic use of KOWA makes the following possible:

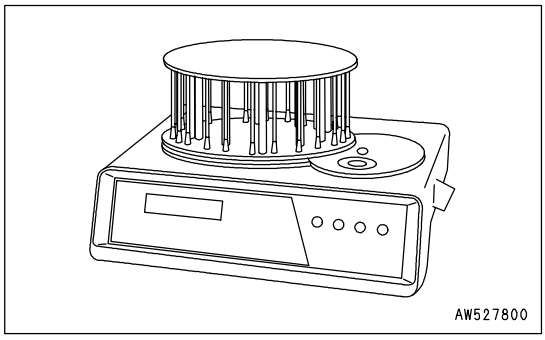
- It enables abnormalities to be detected early, leading to reduction of repair costs and machine downtime.
- It enables repair schedules to be planned, leading to improved machine availability.

KOWA analysis items

- Analysis of metal wear particles
  This uses an ICP (Inductively Coupled Plasma) analyzer to measure the density of metal wear particles in the oil.



- Measurement of particle quantity
  This uses a PQI (Particle Quantifier Index) measurer to measure the quantity of large iron particles in the oil.



- Others
  Measurements are made of items such as the ratio of water or fuel in the oil, and the dynamic viscosity.

Oil sampling

- Sampling interval
  250 hours: Engine
  500 hours: Other components
- Precautions when sampling
  - Make sure that the oil is well mixed before sampling.
  - Carry out sampling regularly at fixed intervals.
  - Do not carry out 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.

Oil And Fuel Storage

- 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 drum can is at the side. (To prevent moisture from being sucked in)
  If drum cans 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 affixed to the old filter. If any metal particles are found, please contact your Komatsu distributor.
- Do not open packs of spare filters until just before they are to be used.
- Always use Komatsu genuine filters.

ELECTRIC SYSTEM MAINTENANCE

- It is extremely dangerous if the electrical equipment becomes wet or the covering of the wiring is damaged. This will cause electrical leakage 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 check of fan belt tension, check of damage or wear in the fan belt and check of 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, so before installing a radio receiver or other wireless equipment, please contact your Komatsu distributor.
- 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.

WEAR PARTS

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 the latest part number when ordering parts.

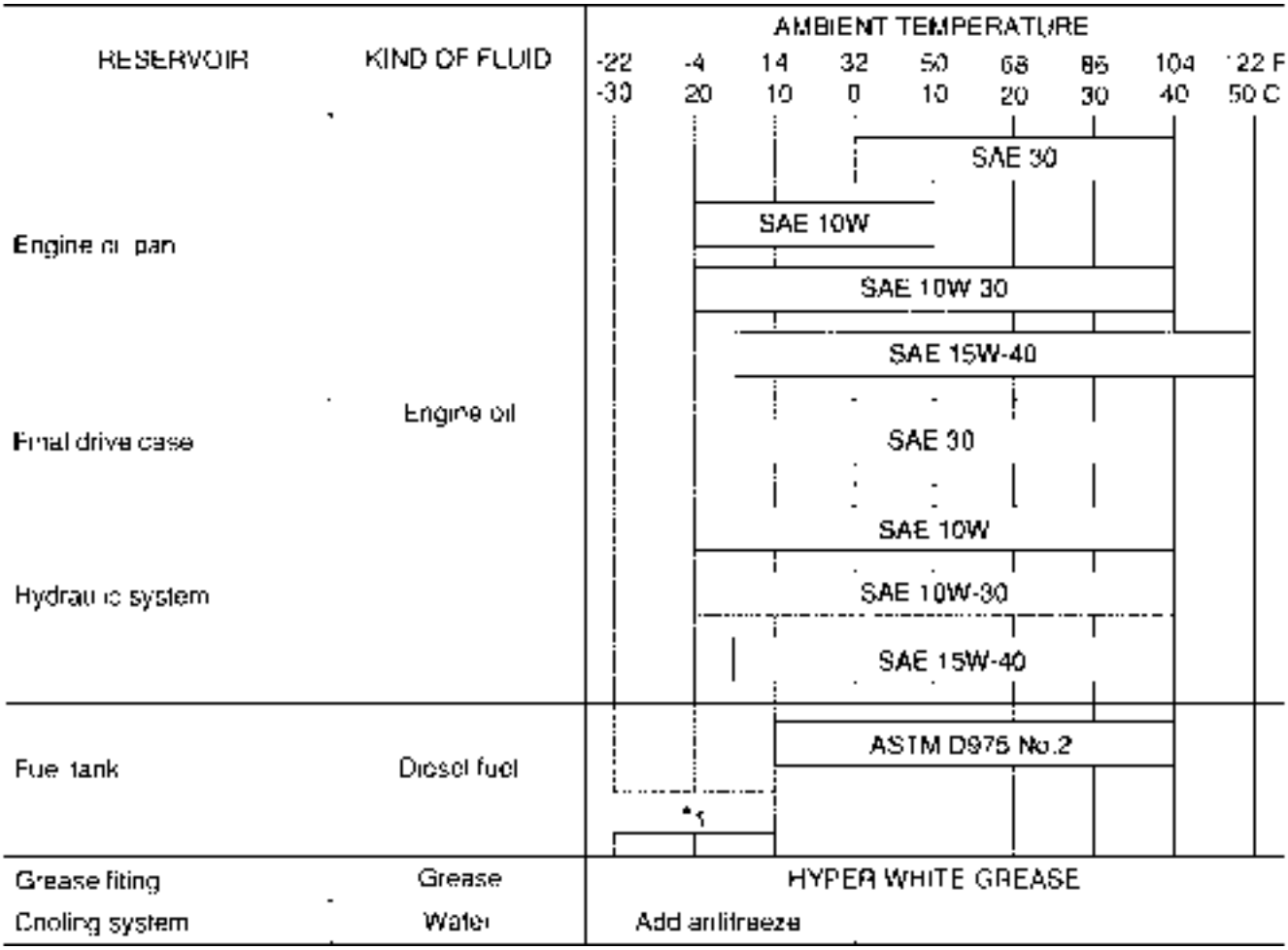
WEAR PARTS LIST

The parts in parentheses are to be replaced at the same time.

Item	Part No.	Part name	Q'ty	Replacement frequentcy
Hydraulic filter	07063-01054 (07000-02135)	Element (O-ring)	1 (1)	EVERY 250 HOURS
Engine oil filter	YM129150-35151	Cartridge	1	EVERY 500 HOURS
Fuel filter	YM129100-55650 (YM24311-000160) (YM24321-000650)	Element (O-ring) (O-ring)	1 (1) (1)	EVERY 500 HOURS
Water separator	YM171081-55910 (YM102103-55520)	Element (O-ring)	1 (1)	-
Air cleaner	YM119808-12520	Element	1	-
Standard backet (vertical pin)	20T-70-72320 (20T-70-71950) (20T-70-71960)	Tooth (Pin) (Lock)	4 (4) (4)	-
	20U-70-13241 20U-70-13251 (20U-70-28130) (203-32-51220)	Cutter (left) Cutter (right) (Bolt) (nut)	1 1 (8) (8)	-

LUBRICANTS, FUEL AND COOLANT SPECIFICATIONS

PROPER SELECTION



*1: ASTM D975 No. 1

		Engine oil pan	Final drive case (each)	Hydraulic system	Fuel tank	Cooling system
Specified capacity	Liter	8.6	0.8	68	60	7.5
	US gal	2.27	0.21	17.97	15.85	1.98
Refill capacity	Liter	8.0	0.8	33	-	-
	US gal	2.11	0.21	8.72	-	-

REMARK

- When fuel sulphur content is less than 0.5%, change oil in the oil pan according to every periodic maintenance hours described in this manual.
  Change oil according to the following table if fuel sulphur content is above 0.5%.

- When starting the engine with an atmospheric temperature of lower than 0°C (32°F), be sure to use engine oil of SAE10W, SAE10W-30 and SAE15W-40, even though the atmospheric temperature goes up to 10°C (50°F) more or less during the day.

- Use API classification CD as engine oil and if API classification CC, reduce the engine oil change interval to half.

- There is no problem if single grade oil is mixed with multigrade oil (SAE10W-30, 15W-40), but be sure to add single grade oil that matches the temperature range in the table.

- We recommend Komatsu genuine oil which has been specifically formulated and approved for use in engine and hydrauric work equipment applications.

Specified capacity: Total amount of oil including oil for components and oil in piping.

Refill capacity: Amount of oil needed to refill system during normal inspection and maintenance.

ASTM: American Society of Testing and Material
SAE: Society of Automotive Engineers
API: American Petroleum Insitute

Fuel sulphur content	Change interval of oil in engine oil pan
0.5 to 1.0%	1/2 of regular interval
Above 1.0%	1/4 of regular interval

No.	Supplier	Engine Oil [CD or CE] SAE10W, 30, 40 10W30, 15W40 (The 15W40 oil marked * is CE.)	Gear Oil [GL-4 or GL-5] SAE80, 90, 140	Grease [Lithium-Base] NLGI No.2	Anti-freeze Coolant [Ethylene Glycol Base] Permanent Type
1	KOMATSU	EO10-CD EO30-CD EO10-30CD EO15-40CD	GO90 GO140	G2-LI G2-LI-S	AF-ACL AF-PTL AF-PT(Winter, one season type)
2	AGIP	Diesel sigma S super dieselmulti-grade *Sigma turbo	Rotra MP	GR MU/EP	-
3	AMOCO	*Amoco 300	Multi-purpose gear oil	PYKON premium grease	-
4	ARCO	*Arcofleet S3 pius	Arco HD gear oil	Litholine HEP 2 Arco EP moly D	-
5	BP	Vanellus C3	Gear oil EP Hypogear EP	Energrease LS-EP2	Antifreeze
6	CALTEX	*RPM delo 400 RPM delo 450	Universal thuban Universal thuban EP	Marfak all purpose 2 Ultra-duty grease 2	AF engine coolant
7	CASTROL	*Turbomax *RX super CRD	EP EPX Hypoy Hypoy B Hypoy C	MS3 Spheerol EPL2	Anti-freeze
8	CHEVRON	*Delo 400	Universal gear	Ultra-duty grease 2	-
9	CONOCO	*Fleet motor oil	Universal gear lubricant	Super-sta grease	-
10	ELF	Multiperformance 3C Performance 3C	-	Tranself EP Tranself EP type 2	Glacelf
11	EXXON (ESSO)	Essolube D3 *Essolube XD-3 *Essolube XD-3 Extra *Esso heavy duty Exxon heavy duty	Gear oil GP Gear oil GX	Beacon EP2	All season coolant
12	GULF	Super duty motor oil *Super duty plus	Multi-purpose gear lubricant	Gulfcrown EP2 Gulfcrown EP special	Antifeeze and coolant
13	MOBIL	Delvac 1300 *Delvac super 10W-30, 15W-40	Mobilube GX Mobilube HD	Mobilux EP2 Mobilgease 77 Mobilgrease special	-

No.	Supplier	Engine Oil [CD or CE] SAE10W, 30, 40 10W30, 15W40 (The 15W40 oil marked * is CE.)	Gear Oil [GL-4 or GL-5] SAE80, 90, 140	Grease [Lithium-Base] NLGI No.2	Anti-freeze Coolant [Ethylene Glycol Base] Permanent Type
14	PENNZOIL	*Supreme duty fleet motor oil	Multi-purpose 4092 Multi-purpose 4140	Multi-purpose white grease 705 707L White-bearing grease	Anti-freeze and summer coolant
15	PETROFIN E	FINA kappa TD	FINA potonic N FINA potonic NE	FINA marson EPL2	FINA tamidor
16	SHELL	Rimura X	Spirax EP Spirax heavy duty	Albania EP grease	-
17	SUN	-	Sunoco GL5 gear oil	Sunoco ultra prestige 2EP Sun prestige 742	Sunoco antifreeze and summer coolant
18	TEXACO	*Ursa super plus Ursa premium	Multigear	Multifak EP2 Starplex 2	Coda 2055 startex antifreeze coolant
19	TOTAL	Rubia S *Rubia X	Total EP Total Transmission TM	Multis EP2	Antigal/antifreeze
20	UNION	*Guardol	MP gear lube LS	Unoba EP	-
21	VEEDOL	*Turbostar *Diesel star MDC	Multigear Multigear B Multigear C	-	Antifreeze

TIGHTENING TORQUE SPECIFICATIONS

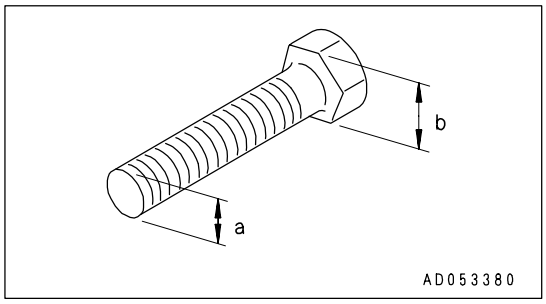
TIGHTENING TORQUE LIST

CAUTION

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.

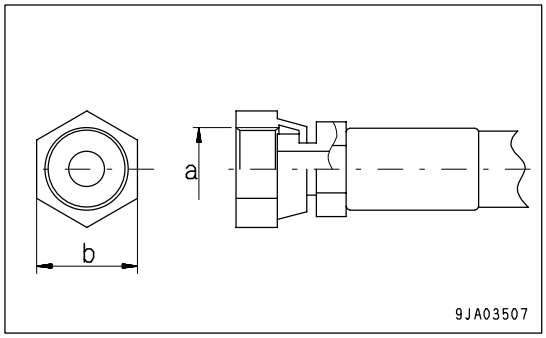
Unless otherwise specified, tighten the metric nuts and bolts to the torque shown in the table below.
If it is necessary to replace any nut or bolt, always use a Komatsu genuine part of the same size as the part that was replaced.

Thread diameter of bolt (a)(mm)	Width across flats (b)(mm)	Tightening torque					
		Target value			Service limit		
		N·m	kgf·m	lbft	N·m	kgf·m	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		
		N·m	kgf·m	lbft	N·m	kgf·m	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



SAFETY CRITICAL PARTS

For using the machine safely for an extended period of time, you are requested to periodically replace the safety -critical and fire prevention- related parts listed in the table of important parts.
Material quality of these parts can change as time passes and they are likely to wear our 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 irrespective of their conditions after a certain period of usage. This is important to ensure that these parts maintain their full performance at all the time.
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 parts has not yet arrived.
If any of the hose clamps show deterioration like deformation or crack, replace such a defective clamp with a new one together with a defective hose.
Also carry out the following checks with hydraulic hoses which need not be replaced periodically. Tighten a loosened clamp again or replace a defective hose, as such abnormality requires.
When replacing the hoses, always replace the O-rings, gaskets, and other such parts at the same time.
Ask your Komatsu distributor to replace the critical parts.
Check the hydraulic hoses and the fuel hose, too, when carrying out the following periodic inspections.

SAFETY CRITICAL PARTS LIST

No.	Safety critical parts for periodic replacement	Q'ty	Replacement interval
1	Fuel hose (fuel tank - feed pump pre-filter)	1	Every 2 years or 4000 hours, whichever comes sooner
2	Fuel hose (feed pump pre-filter - feed pump)	1	
3	Fuel hose (feed pump - fuel filter)	1	
4	Fuel hose (fuel filter - injection pump)	1	
5	Fuel hose (fuel filter - fuel tank)	1	
6	Spill hose (fuel filter - injection pump)	1	
7	Spill hose (between nozzles)	2	
8	Spill hose (nozzle - injection pump)	1	
9	Spill cap	1	
10	Hydraulic hose (main pump suction)	2	
11	Hydraulic hose (main pump delivery)	4	
12	Hydraulic hose (boom cylinder)	4	
13	Hydraulic hose (arm cylinder)	4	
14	Hydraulic hose (bucket cylinder)	4	
15	Hydraulic hose (swing cylinder)	2	
16	Seet belt (if equipped)	1	Every 3 years

MAINTENANCE SCHEDULE

If the machine is equipped with a hydraulic breaker, the maintenance schedule for some parts will be different. For details, see "MAINTENANCE INTERVAL FOR HYDRAULIC BREAKER (PAGE 4-15)" to confirm the correct maintenance schedule when carrying out maintenance.

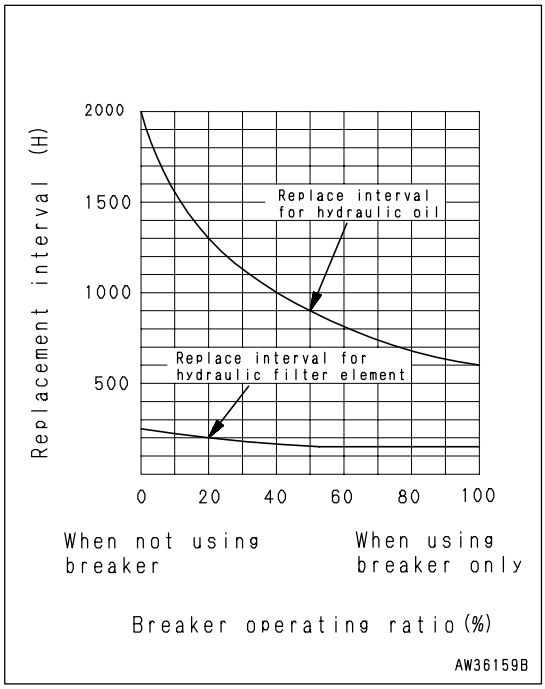
MAINTENANCE SCHEDULE CHART

Every 2000 Hours Maintenance

MAINTENANCE INTERVAL FOR HYDRAULIC BREAKER

For machine equipped with a hydraulic breaker, the hydraulic oil deteriorates faster than for normal bucket digging operations, so set the maintenance intervals as follows.

- **Replace hydraulic filter element**
  On a new machine, replace the element after the first 100 to 150 hours, then carry out further replacement of the element according to the table on the right.
- **Change oil in hydraulic tank**
  Change the oil according to the table on the right.



MAINTENANCE PROCEDURE

INITIAL 250 HOURS MAINTENANCE (ONLY AFTER THE FIRST 250 HOURS)

Carry out the following maintenance only after the first 250 hours.

- Engine Oil Filtrer Cartridge - Replace
- Fuel Filter Element - Replace

For details of the method of maintaining, see EVERY 500 HOURS MAINTENANCE.

WHEN REQUIRED

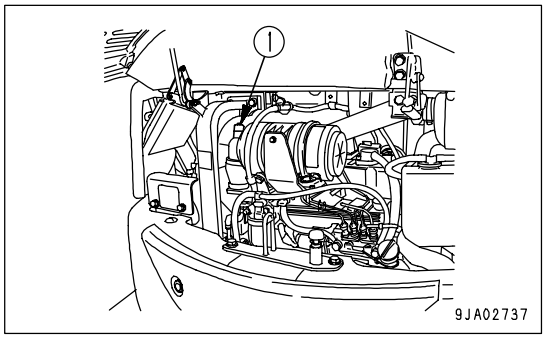
Air Cleaner Element - Check/Clean/Replace

WARNING

- **If inspection, cleaning, or maintenance is carried out with the engine running, dirt will get into the engine and the engine will suffer damage. 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 safety glasses, dust mask, and other protective equipment.**

Checking

Whenever the red piston in dust indicator (1) appears, clean the air cleaner element.



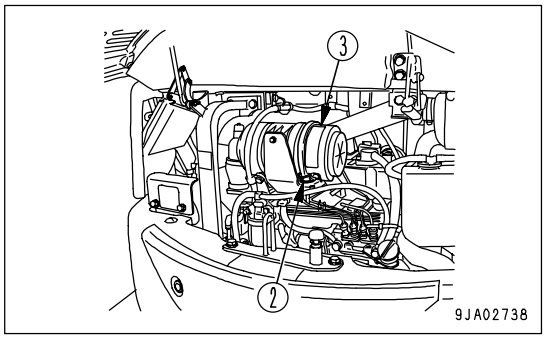
NOTICE

Do not clean the air cleaner element before the red piston in dust indicator (1) appears.

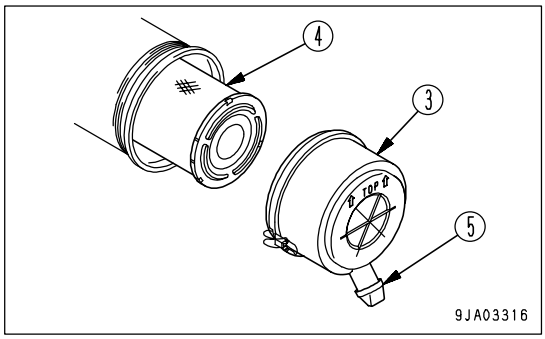
If the air cleaner element is cleaned frequently before the red piston in the dust indicator appears, the air cleaner cannot provide the proper performance and the cleaning efficiency is lowered.

Air cleaner Element - Clean/Replace

1. Open the engine hood, remove clip (2), then remove cover (3).

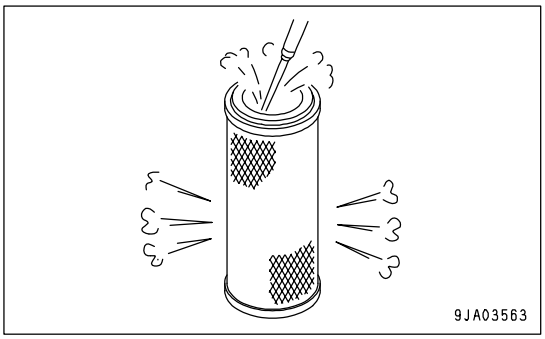


2. Take out element (4) and cover the air connector at the end of the air cleaner body with a clean cloth or tape.

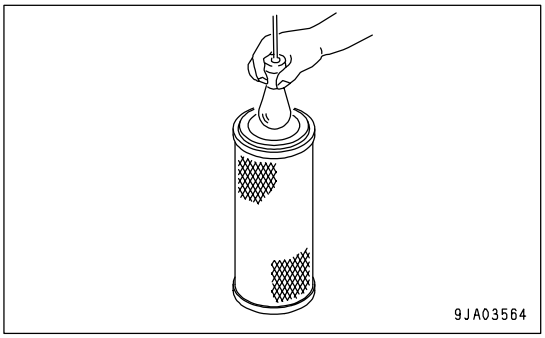


3. Clean the interior of the air cleaner body, cover (3) and vacuater valve (5).

4. Direct dry compressed air (Max. 0.69 MPa (7 kgf/cm^2, 99.4 PSI)) from the inside of the outer element along its folds. Then below with air along the folds from the outside, and finally blow again from the inside.
   1) Replace the element which has been cleaned 5 times repeatedly or used throughout a year.
   2) Replace element when the dust indicator red piston appears soon after installing the cleaned element even though it has not been cleaned 6 times.



5. 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.

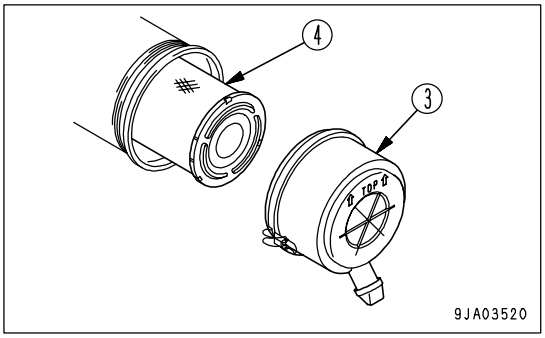


NOTICE

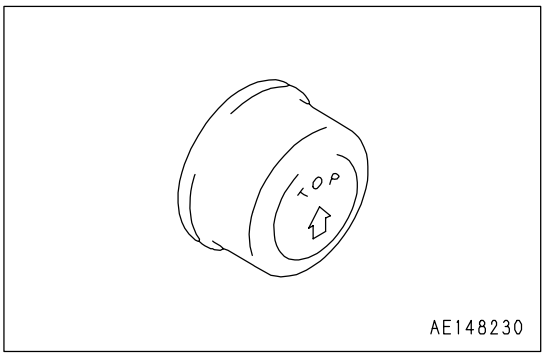
When cleaning the element, do not hit or beat it against anything.

Do not use an element whose folds, gasket or seal are damaged.

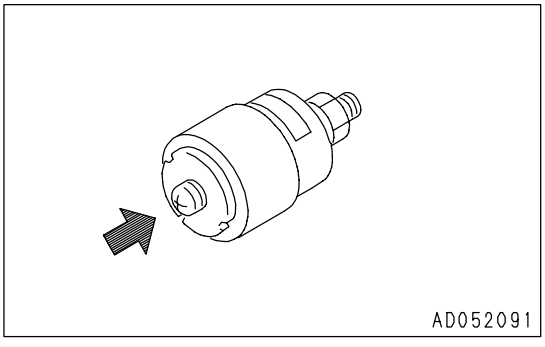
6. Remove the cloth or adhesive tape used to cover the air connector inside the air cleaner body.
7. Install cleaned element (4) or a new element.



8. Set the arrow mark on cover (3) at the top, install to the air cleaner body, then secure with clip (2).



9. Press the button of dust indicator (1) to return the red piston to its original position.



Cooling System Coolant - Clean/Change

WARNING

- **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 drain the coolant 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 before removing it.**
- **Cleaning is carried out with the engine running. When standing up or leaving the operator's seat, set the safety lock lever to the LOCK position.**
- **For details of starting the engine, see"BEFORE STARTING ENGINE (PAGE 3-33)" and "STARTING ENGINE (PAGE 3-46)" in the OPERATION section.**
- **The engine is operated when washing, so it is dangerous if the machine moves when you are standing behind it. Never stand behind the machine when the engine is running.**

Clean the inside of the cooling system, change the coolant and replace the corrosion resistor agent KI according to the table below.

Kind of coolant	Cleaning inside of cooling system and changing coolant	Adding corrosion resistor agent KI
Permanent type antifreeze (All season type)	Every year (autume)or every 2000 hours whichever comes first	Every 1000 hours and when cleaning the inside of the cooling system and when changing coolant.
Nom permanent type antifreeze containing ethylene glycol (winter, one season type)	Every 6 months (spring, autume) (Drain antifreeze in spring, add antifreeze in autume)	
When not using antifreeze	Every 6 months or every 1000 hours whichever comes first	

Stop the machine on level ground when cleaning or changing the coolant.
Use a permanent type of antifreeze.
If, for some reason, it is impossible to use permanent type antifreeze, use an antifreeze containing ethylene glycol. Super Coolant (AF-ACL) has an anti-corrosion effect as well as an antifreeze effect.
The ratio of antifreeze to water depends on the ambient temperature, but to obtain the corrosion resistance effect, a minimum ratio of 30% by volume is necessary.
In areas where the water is hard, always add Komatsu genuine corrosion resistor agent KI. One packet of corrosion resistor agent contains 100g (0.22 lb). The standard density of the mixture should be 7g/liter (0.065 oz/US gal).
When deciding the ratio of antifreeze to water, check the lowest temperature in the past, and decide from the mixing rate table given below.
It is actually better to estimate a temperature about 10°C (50°F) lower when deciding the mixing rate.

Mixing rate of water and antifreeze

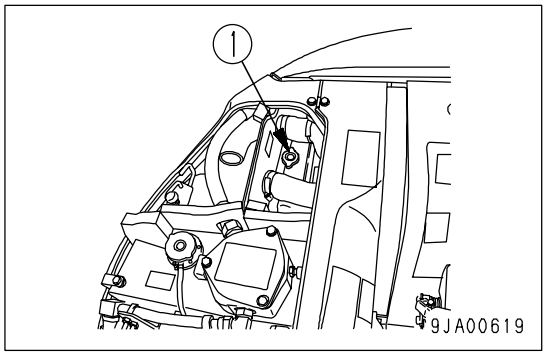
Min. atmospheric temperature	°C	Above -10	-15	-20	-25
	°F	Above 14	5	-4	-13
Amount of antifreeze	Liter	2.3	2.7	3.1	3.5
	US gal	0.61	0.71	0.82	0.92
Amount of water	Liter	5.2	4.8	4.4	4.0
	US gal	1.37	1.27	1.16	1.06

⚠ WARNING

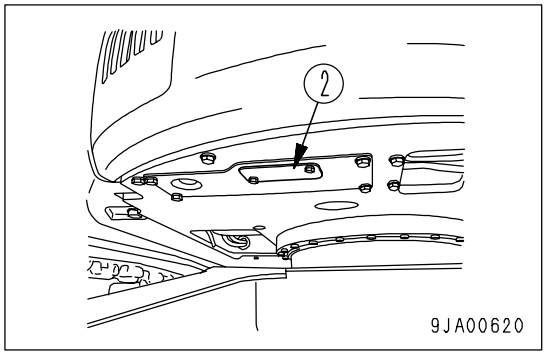
Antifreeze is flammable, so keep it away from flame.
Antifreeze is toxic. When removing the drain plug, be careful not to get water containing antifreeze on you. If it gets in your eyes, flush your eyes with large amount of fresh water and see a doctor at once.

Use city water for the cooling water.
If river water, well water or other such water supply must be used, contact your Komatsu distributor.
We recommend use of an antifreeze density gauge to control the mixing proportions.
- Prepare a container to catch the drained coolant (Min. 7.5 liter (1.98 US gal) capacity).
- Prepare a water inlet hose.

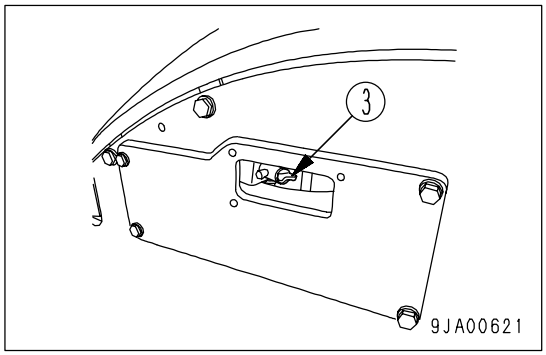
1. Open the cover at the right side of the machine.
2. Check that the cooling water temperature has gone down enough to make it possible to touch the radiator cap surface by hand, then turn radiator cap (1) slowly until it contacts the stopper to release the pressure.
3. Following this, push radiator cap (1), turn it until it contacts the stopper, then remove it.



4. Remove cover (2) at the rear right under the machine.

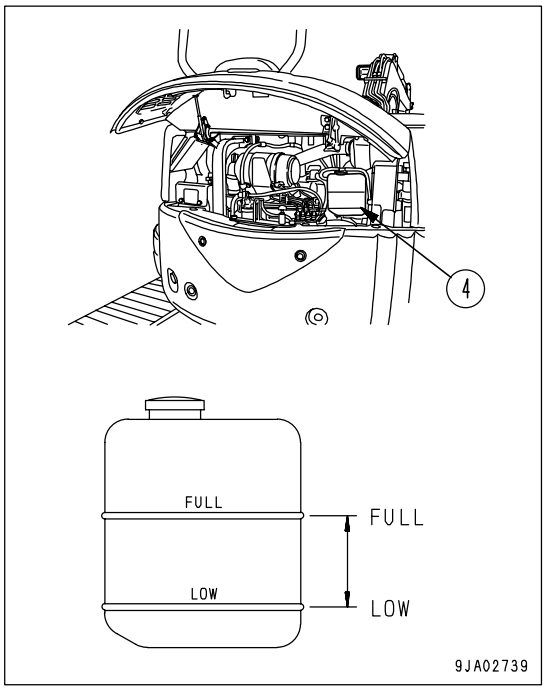


5. Set container to catch the coolant under drain valve (3) and drain plug of cylinder block.
6. Open drain valve (3) to drain the water.
   Remove drain plug to drain the water.
7. After drain the water, close drain valve (3) and drain plug, and add water. When the radiator is full, start the engine and run at low idling. Raise the water temperature to above 90°C (194° F) and run for approx. 10 minutes.



8. Stop the engine, then open drain valve (3) and remove the drain plug to drain the water.
9. After draining the water, clean the radiator with detergent.
   For the cleaning method, follow the instruction of detergent.
10. Close drain valve (3), wrap the drain plug with sealing tape, then close it.
11. Decide the proportions of antifreeze and water according to the table for the mixing rate of water and antifreeze.

12. After the engine warming up, check that each gauge and caution lamp are in normal condition. If any abnormality is found, carry out adjustment or repairs.
    Operate the machine under a light load until the engine water temperature gauge (2) points to the white range (monitor panel spec.) or the green range(gauge panel spec.).
    To remove the air in the cooling water, run the engine for 5 minutes at low idling, then for another 5 minutes at high idling. (While doing this, leave the radiator cap removed)
13. Drain the cooling water inside sub-tank (4), clean the inside of the sub-tank, then fill again with cooling water to a point midway betwee the FULL and LOW marks.
14. Stop the engine. About 3 minutes later, supply city water up to the water filler, then close radiator cap.



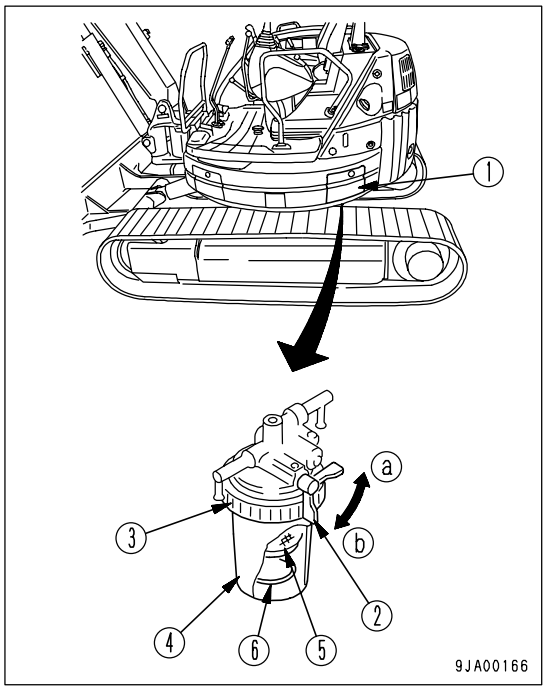
Water Separator Element - Clean

WARNING

Do not bring any fire or flame close.

- Prepare the filter wrench for fuel filter.

1. Open inspection cover (1) on the left side of the machine and set handle (2) of the filter inside to the CLOSED position (a).
2. Using a filter wrench, loosen ring (3), then remove element cup (4) and take out element (5).
   Be careful not to lose red ring (6) inside the case.
3. Wash element cup (4) and element (5) in diesel oil or flushing oil.
4. After washing, install element (5).
5. Insert a red ring (6) into element cover (4), fill with fuel, install to the filter holder, then tighten ring (3).
6. Set handle (2) to the OPEN position (b).
7. After completing the washing of the water separator, bleed the air.
   For details of the method for bleeding the air, see "Air Bleeding (PAGE 4-49)".



Fuel Tank - Drain

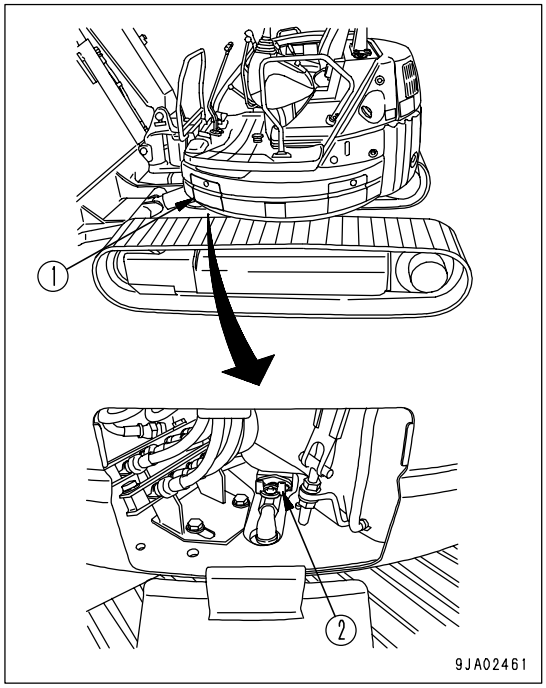
NOTICE

- **Never use trichlene for washing the inside of the tank. Use diesel fuel only.**
- **Carry out this procedure before operating the machine as a daily maintenance.**

Carry out this procedure before operating the machine.

- Prepare a container to catch the fuel that is drained.

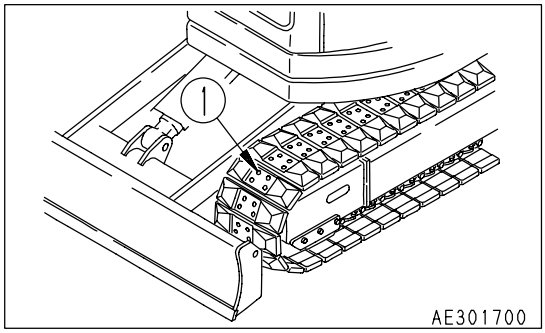
1. Swing the upper structure so that inspection cover (1) is between the tracks.
2. Open the inspection cover (1).
3. Open drain valve (2) and drain the sediment and water accumulated at the bottom together with the fuel. When doing this, be careful not to get fuel on yourself.
4. When only clean fuel comes out, close drain valve (2).
5. Close the inspection cover.



Track Shoe Bolts - Check/Tighten

(Machine equipped with road liner, Steel shoe)

If the machine is used with track shoe bolts (1) loose, they will break, so tighten any loose bolts immediately

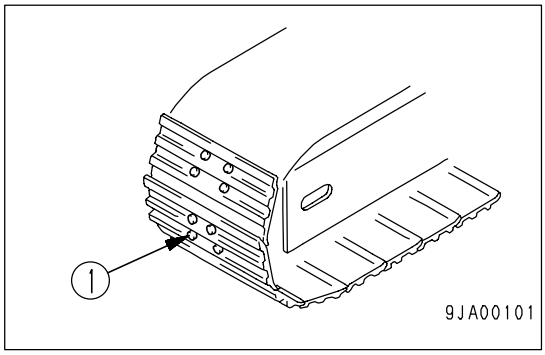


Method for further tightening of road liner

After tightening to a tightening torque of 137 ± 19.6 N·m (14 ± 2 kgf·m, 101.3 ± 14.5 lbft), check that the nut and shoe are in tight contact with the link mating surface.

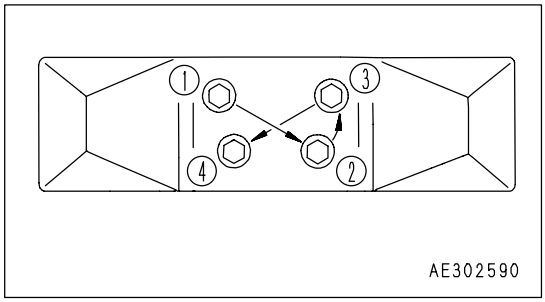
Method for further tightening of steel shoe

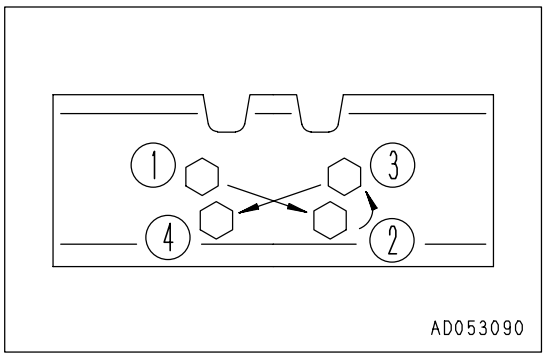
1. First tighten to a tightening torque of 137 ± 19.6 N·m (14 ± 2 kgf·m, 101.3 ± 14.5 lbft) then check that the nut and shoe are in close contact with the link contact surface.
2. After checking, tighten a further 90° ± 10°.



Order for tightening

Tighten the bolts in the order shown in the diagram on the right. After tightening, check that the nut and shoe are in close contact with the link mating surface.





Track Tension - Check/Adjust

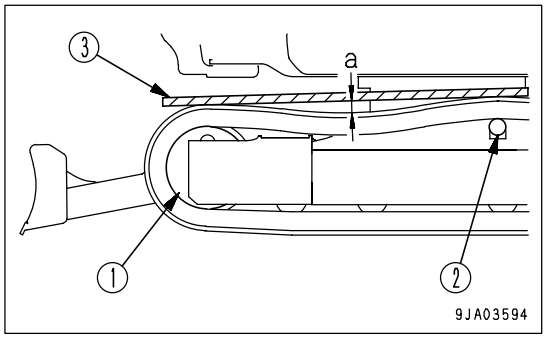
(Machine equipped with road liner, Steel shoe)

The wear of the pins and bushings on the undercarriage will vary with the working conditions and type of soil, so inspect the track tension frequently in order to maintain the standard tension.

Stop the machine on firm, horizontal ground when carrying out the inspection and maintenance.

Checking

1. Run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.
2. Choose wooden block (3) that will reach from idler (1) to carrier roller (2), then place it on top of the track.
3. Measure the maximum deflection between the top surface of the track and the bottom surface of the wooden block.
   - Standard deflection
     Deflection "a" should be 10 to 30 mm (0.4 to 1.2in).



If the track tension is not at the standard value, adjust it in the following manner.

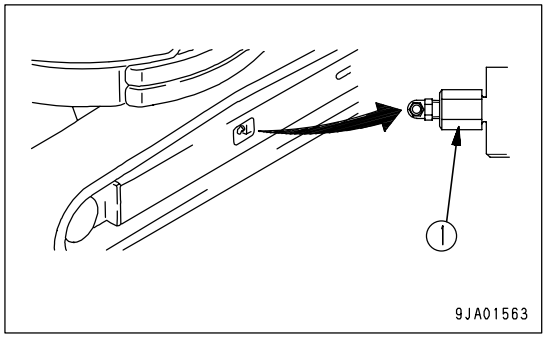
Adjustment

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).

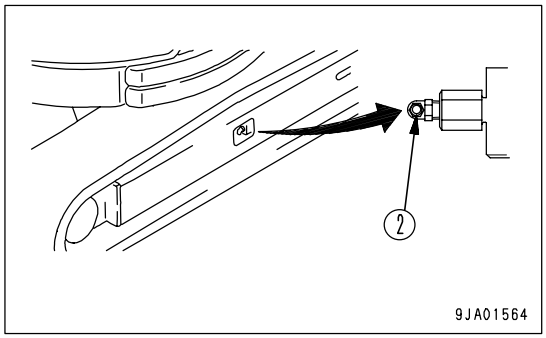
If the track tension cannot be loosened with the procedure given here, please contact your Komatsu distributor.



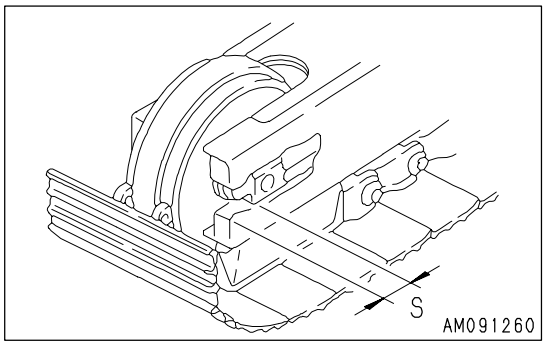
Increasing Track Tension

Prepare a grease gun.

1. Pump in grease through grease fitting (2) with a grease pump.
2. To check that the track tension is correct, run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.
3. Check the track tension again, and if the tension is not correct, adjust it again.



4. Continue to pump in grease until dimension S becomes zero (0). If the tension is still loose, the pin and bushing are excessively worn, so they must be either turned or replaced. Please contact your Komatsu distributor for repairs.

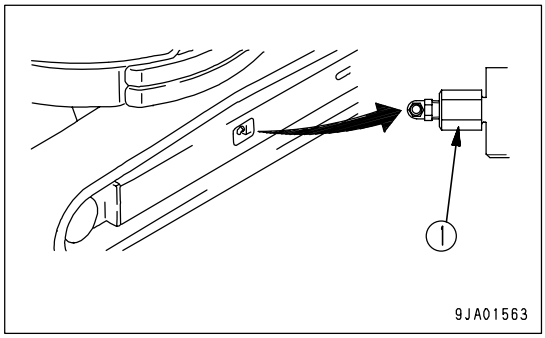


Loosening Track Tension

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 for repairs.

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 track tension is correct, run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.
6. Check the track tension again, and if the tension is not correct, adjust it again.



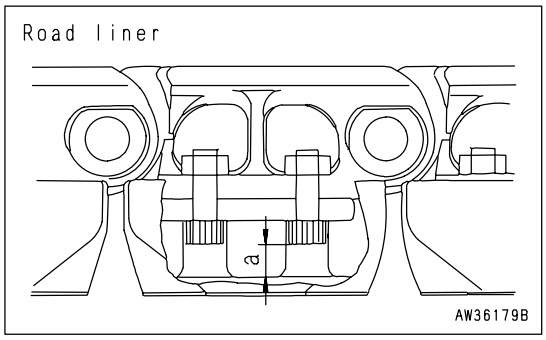
Rubber Shoes or Road Liners - Check

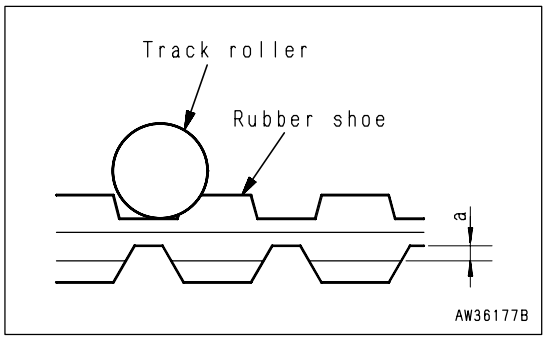
(Mechine equipped with rubber shoes, road liner)

If the rubber shoes or road liner are in the following condition, they must be repaired or replaced, so please contact your Komatsu distributor for repairs or replacement.

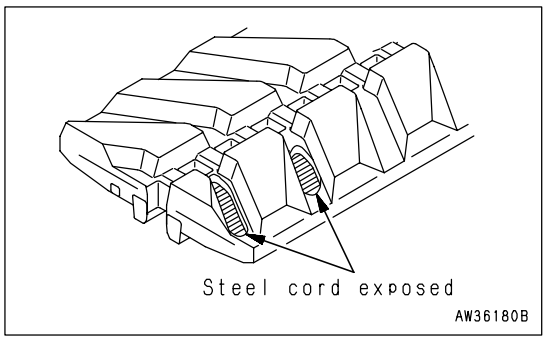
Lug Height

- If lug height "a" is reduced by wear, the drawbar pull will drop. If "a" is less than 5mm (0.2 in), replace with a new part.



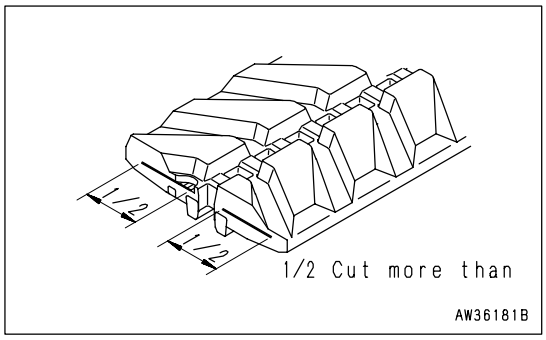


- If the lug wears and the steel cord inside the shoe is exposed for two links or more, replace with a new part. (Machine equipped with rubber shoes)



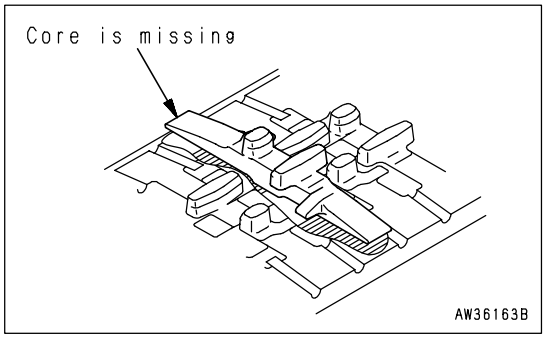
Rubber Shoe Steel Code Cuts

If more than half of the steel cord layer on one side is cut, replace with a new part.



Rubber Shoe Core Separations

If the rubber core has separated at one place or more, replace with a new part.



Rubber Shoe Tension

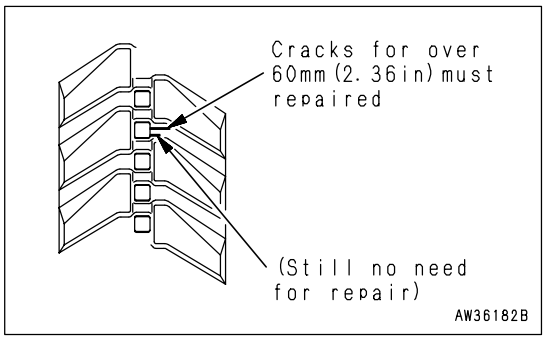
If the rubber shoe is still slack even when grease is pumped in, replace with a new part or replace the seal inside the cylinder.

If the track tension can only be increased to a level where the rubber shoe may come off, there may be not only elongation of the rubber shoe but also damage to the grease cylinder.

Rubber Shoe Cracks

If the cracks between the rubber shoe lugs increase to a size of approx. 60mm (2.36 in) the rubber shoe must be repaired. Even if the crack is small and short, if the steel cord can be seen inside, carry out repairs immediately.

If the length is less than 30mm (1.18 in) or the depth of the crack is less than 10mm (0.39 in), there is no particular need to carry out repairs.



When making judgement whether to replace, repair, or continue using rubber shoe and load liner, please contact your Komatsu distributor.

Rubber Shoe Tension - Check/Adjust

(Machine equipped with rubber shoes)

The wear of the rubber shoe will vary with the work conditions and type of soil, so inspect the wear and track tension whenever necessary. Stop the machine on firm, horizontal ground when carrying out the inspection and maintenance.

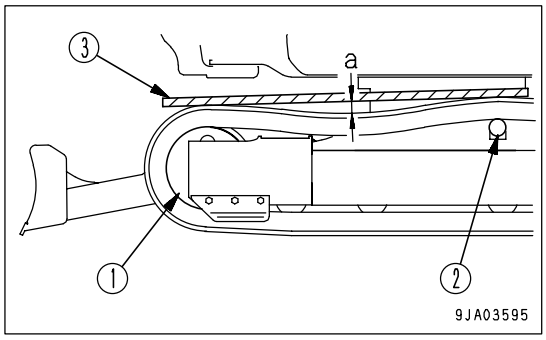
In particular, on new machines or after new tracks have been installed and the tension has been set to the specified value, the track tension will become loose in the first 5 to 30 hours when the machine has been used for a certain amount of repeated

travel. If the track tension is adjusted frequently until the initial loosening no longer occurs, this will prevent the shoes from coming off due to insufficient track tension.

If operations are carried out when the rubber shoe is loose, the track will come off and it will cause premature wear of the core.

Checking

1. Run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.
2. Choose wooden block (3) that will reach from idler (1) to carrier roller (2), then place it on top of the track.
3. Measure the maximum deflection between the top surface of the rubber shoe and the bottom surface of the wooden block.
   - Standard deflection
     Deflection "a" should be 1 to 3 mm (0.039 to 0.118 in).

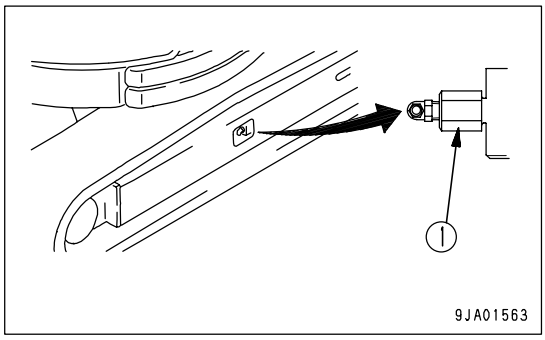


If the track tension is not at the standard value, adjust it in the following manner.

Adjustment

WARNING

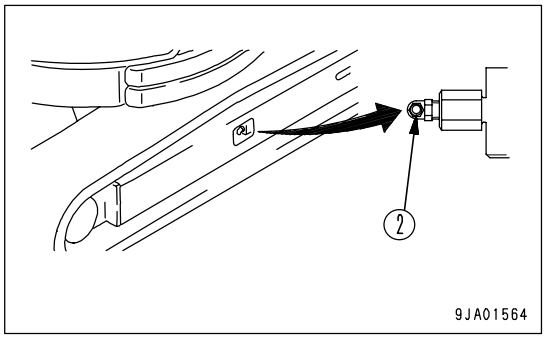
There is danger of the plug flying out under the high internal pressure of the grease. When loosening plug (1), never loosen it more than one turn. Never loosen any part other than plug (1). Never put your face in line with the mount of plug (1).
If the Rubber shoe tension is not relieved by this procedure, please contact your Komatsu distributor.



Increasing Track Tension
NOTICE
The standard value is low, so be careful not to tighten the rubber shoe too much.

Prepare a grease gun.

1. Pump in grease through grease fitting (2) with a grease pump.
2. To check that the track tension is correct, run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.
3. Check the rubber shoe tension again, and if the tension is not correct, adjust it again.
4. If the tension is still low after supplied grease, the rubber shoe needs to be replaced or the seal in the cylinder needs to be replaced. Ask your Komatsu distributor for replacement.

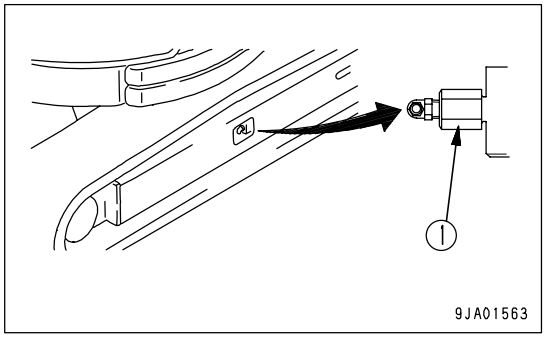


Loosening Track Tension

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 track tension is correct, run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.
6. Check the rubber shoe tension again, and if the tension is not correct, adjust it again.

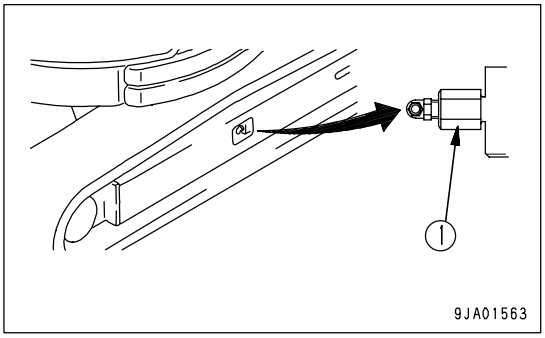


Rubber Shoes - Replace

(Machine equipped with rubber shoes)

WARNING

- **Carry out this operation with two workers. The operator must move the machine in accordance with the signals from the other worker.**
- **The rubber shoes are replaced with the machine raised, so it is extremely dangerous if the machine is lowered by mistake during the replacement operation. During the replacement operation, never move the rubber shoe track except the rubber shoe track to be replaced. In addition, never go under or put any part of your body under the rubber shoe or track frame during the replacement operation.**
- **To check that the track tension is correct, run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.**



NOTICE

It is possible to change from the rubber shoe to the road liner and steel shoe. However, it is necessary to remove the idler guard and to carry out adjustment, so always contact your Komatsu distributor to have the replacement carried out.

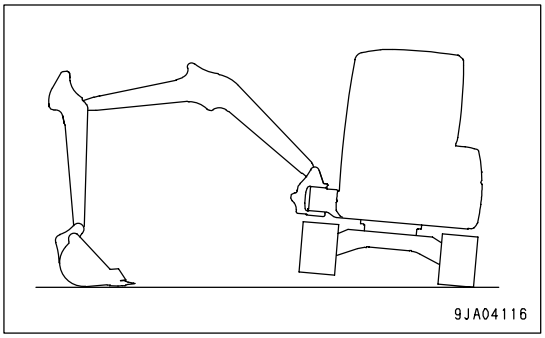
- Prepare a grease gun.
- Prepare a steel pipe

Rubber Shoes Removal

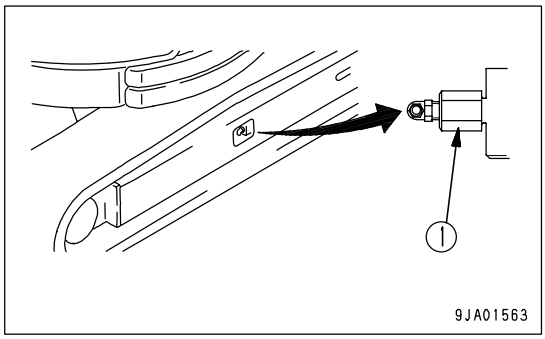
WARNING

- **It is extremely dangerous to release the grease by any method except the procedure given below. If the rubber shoe tension is not relieved by this procedure, please contact your Komatsu distributor for repairs.**
- **Check that all the grease has been released before rotating the sprocket to remove the rubber shoe.**

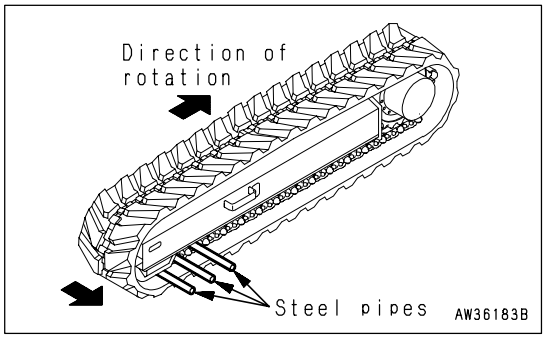
1. Raise the chassis with the boom and arm. When doing this, operate the levers slowly.



2. Loosen plug (1) gradually to release the grease.
3. When loosening plug (1), turn it a maximum of one turn.

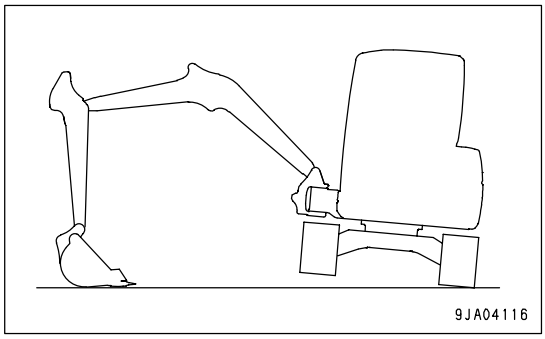


4. Fit the steel pipes inside the rubber shoe, rotate the sprocket in reverse, so that the steel pipes make the rubber shoe come up from the idler, then to the side to remove.

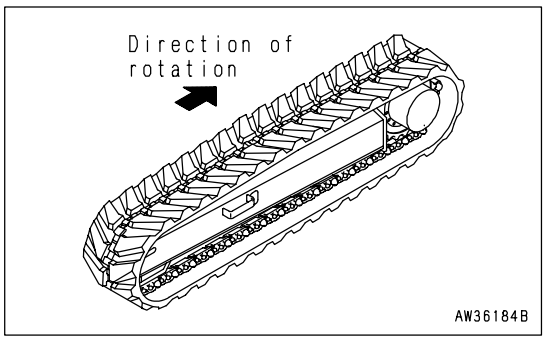


Rubber Shoes Installation

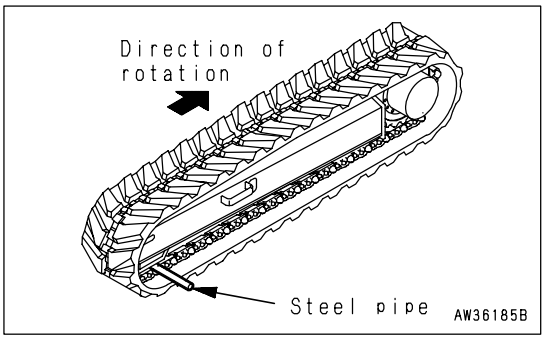
1. Raise the chassis with the boom and arm.
   When doing this, operate the levers slowly.



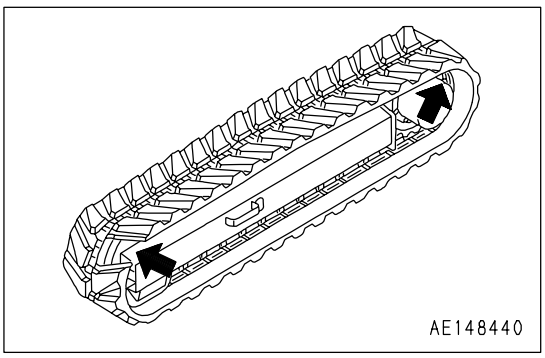
2. Mesh the rubber shoe with the sprocket and fit it over the idler.
3. Rotate the sprocket in reverse, then push in the rubber shoe and stop the rotation.



4. Fit a steel pipe in the rubber shoe, then rotate the sprocket again and fit the rubber shoe securely on the idler.



5. Stop the rotation, and check that the rubber shoe is securely fitted to the sprocket and idler.



6. Adjust the tension of the rubber shoe.
   For details, see "Rubber Shoe Tension - Check/Adjust (PAGE 4-28)".
7. Check that the track tension is correct and that the rubber shoe is correctly meshed on the sprocket and idler, then lower the machine to the ground.

Road Liners - Replace

(Machine equipped with road liner)

- When replacing all the road liner for the machine, please contact your Komatsu distributor to have the replacement carried out.
- When replacing only part of the road liner, use the special road liner removal tool. Please order the tool from your Komatsu distributor.

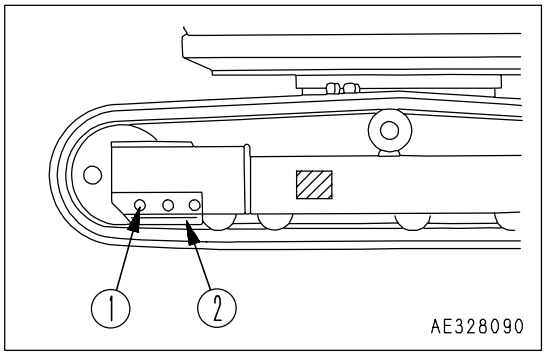
Road Liners or Steel Shoes to Rubber Shoes - Change

WARNING

When changing from the steel shoe or road liner to the rubber shoe, or when changing from the rubber shoe to the steel shoe or road liner, it is necessary to remove and adjust the idler cushion, so contact your Komatsu distributor to have the change carried out.

Changing from Road Liners or Steel Shoes to Rubber Shoes

1. Remove idler guard mounting bolts (1), then remove idler guard (2).
2. Remove the steel shoe or road liner and install the rubber shoe.



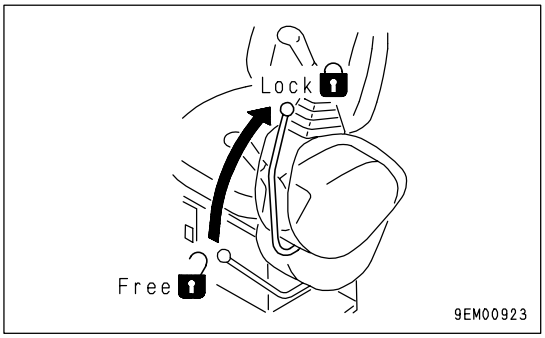
Changing from Rubber Shoes to Road Liners or Steel Shoes

1. Remove the rubber shoe and install the steel shoe or road liner.
2. Install idler guard (2) with idler guard mounting bolts (1).

Bucket Teeth - Check/Replace

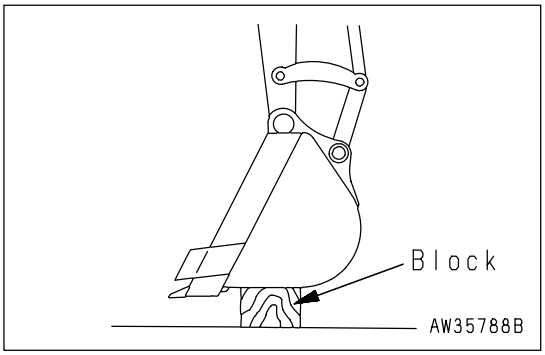
WARNING

- **It is dangerous if the work equipment moves by mistake when the teeth are being replaced.**
  Set the work equipment in a stable condition, then stop the engine and set the safety lock lever securely to the LOCK position.
- **The pins can be knocked out only with strong force, so there is a hazard that the pin may fly out. Check that there is no one in the surrounding area.**
- **There is a hazard that fragments will fly during the replacement work, so always wear protective equipment like safety glasses and gloves.**

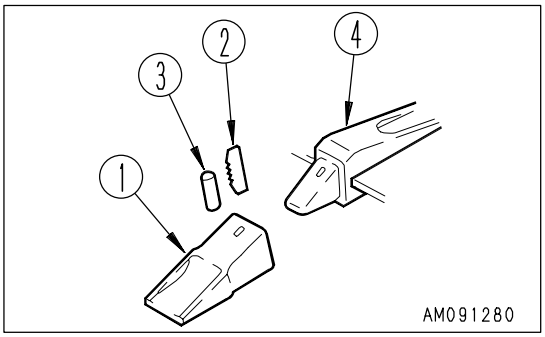


Replace the bucket teeth before the adapter starts to wear.

1. To make it possible to knock out the pin of tooth (1), set the bottom surface of the bucket on a block, check that the work equipment is in a stable condition, then set the safety lock lever to the LOCK position.
   Set so that thebottom face of the bucket is horizontal.

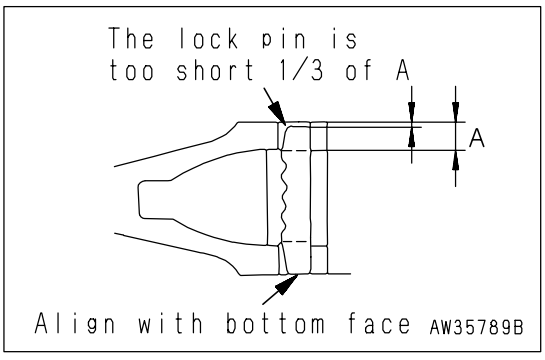


2. Use a hammer and drift to knock out lock pin (2). (If the drift is set against rubber pin lock (3) when it is hit, the rubber pin lock may break. Set it against the back of the pin.)
3. After removing lock pin (2) and rubber pin lock (3), check them.

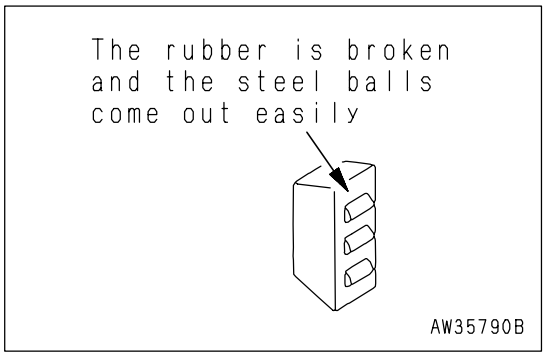


If lock pins and rubber pin locks with the following defects are used, the teeth may come off the bucket. Replace them with new ones.

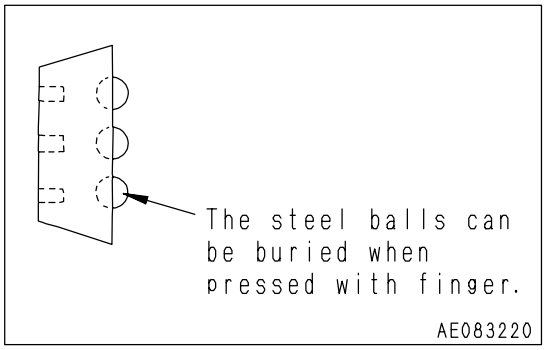
- The lock pin is too short.



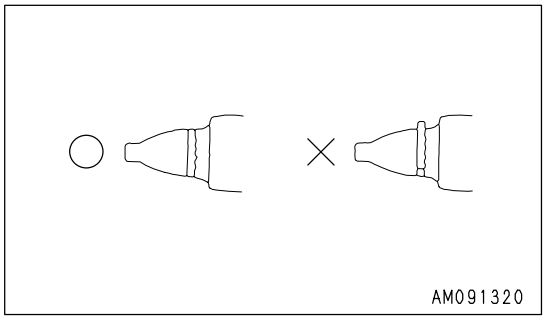
- The rubber of the rubber pin lock is torn, and the steel balls may come out.



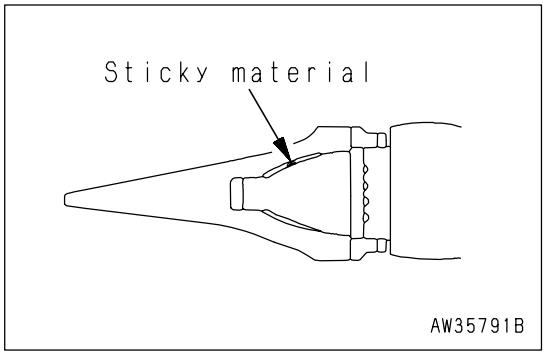
- The steel balls are buried when they are pressed by hand.



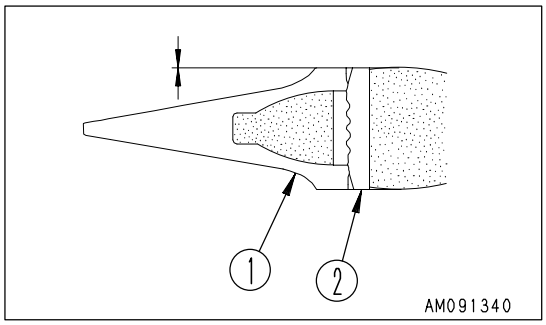
4. Clean the surface of adapter (4) and remove the soil with a knife.
5. Use your hand or a hammer to push rubber pin lock (3) into the hole of the adapter.
   When doing this, be careful that the rubber pin lock does not fly out from the adapter surface.



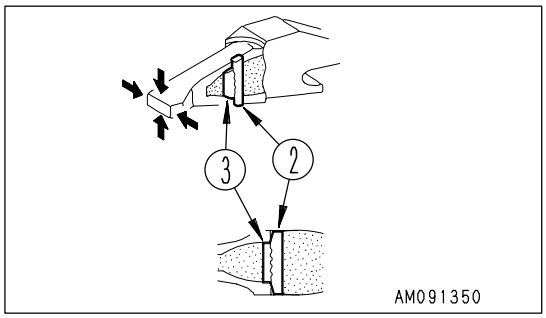
6. Clean the inside of teeth (1), then install it to adapter (4). If there is mud affixed to it or if there are protrusions, the teeth will not enter the adapter properly, and there will not be proper contact at the mating portion.
7. Fit teeth (1) to adapter (4), and confirm that when the pointer is pressed strongly, the rear face of the hole for the pin of the teeth is at the same level as the rear face of the hole for the pin of the adapter.
   If the rear face of the hole for the pin of teeth (1) is protruding to the front from the rear face of the pin hole for adapter (4), do not try to knock the pin in.
   There is something preventing teeth (1) from entering adapter (4) fully, so remove the obstruction. When teeth (1) enters adapter (4) fully, knock in lock pin (2).



8. Insert lock pin (2) in the hole of the teeth and hit it until its top is the same level as the surface of teeth (1).
9. After replacing a bucket tooth, always check the following.
   1) After the lock pin has been knocked in completely, check that it is secured by the point and surface.
   2) Lightly hit lock pin (2) in the reverse direction from which it was hit in.



   3) Lightly hit the tip of the point from above and below, and hit its sides from right and left.
   4) Confirm that rubber pin lock (3) and lock pin (2) are set as shown in the figure.



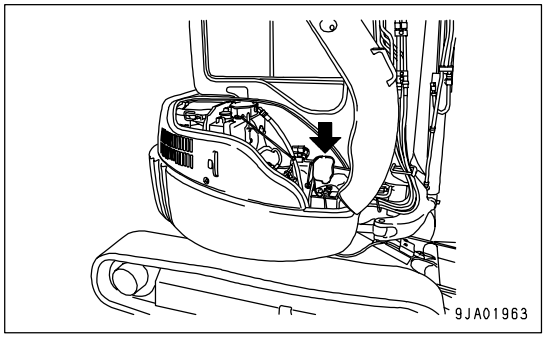
The life of the teeth can be lengthened and the frequency of its replacement can be reduced by turning it upside down so that it will wear evenly.
Replace the rubber pin lock and locking pin at the same time as replacing the teeth. This makes it possible to prevent the teeth from falling out.

Windshield Washer Fluid Level - Check/Add

(Machine equipped with cab)

If there is air in the window washer fluid, check the level of the fluid in window washer tank. Add automobile window washer fluid if necessary.

When adding fluid, be careful not to let any dust get in.



Washer Fluid Dilution Ratio

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)

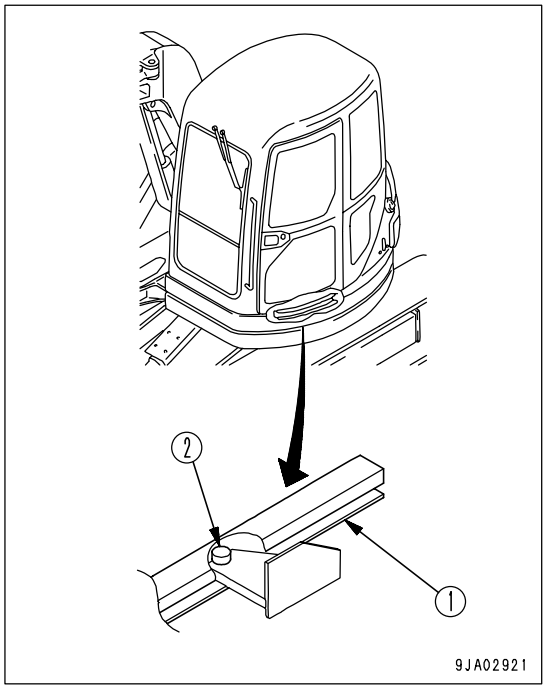
There are two types depending on the freezing temperature:
-10°C (14°F) (general use) and -30°C (-22°F) (cold area use), so select according to the area and season.

Cab Slide Door Rail And Roller - Check/Clean/Lubricate

(Machine equipped with cab)

Checking

When opening or closing the slide door, if it is clogged with mud and does not move freely, clean and supply grease to roller (2) and rail (1) of the slide door.



Cleaning

1. Open and close the door, and use a brush to remove any dirt from rail (1).
2. Use a cloth to wipe off any dirt from rail (1).

Greasing

NOTICE

Do not use high-viscosity oil for the lubricant.

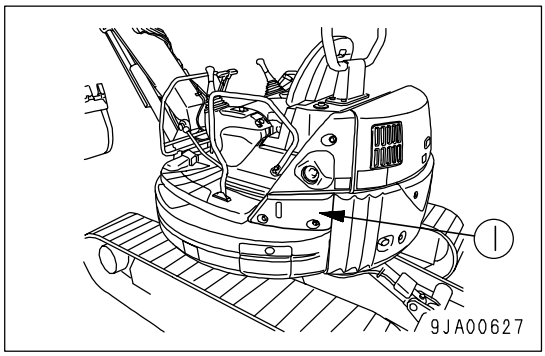
1. Spray rail (1) and roller (2) thoroughly with lubricant.
2. After spraying with lubricant, slide the door and check that the door opens and closes smoothly.
   If the movement is not smooth, contact your Komatsu distributor for repair.

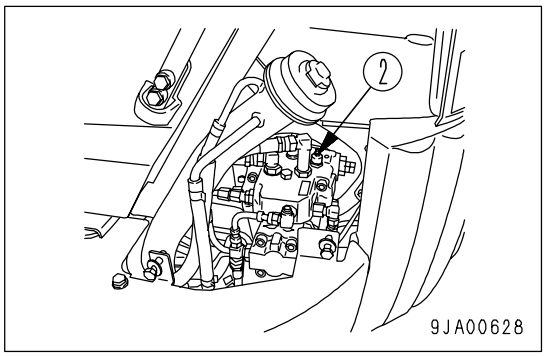
Hydraulic System - Bleed Air

NOTICE

If the pump is operated without filling the pump case with hydraulic oil, there is danger that the pump may be prematurely damaged. Be sure to bleed the air completely.

1. Bleeding air from piston pump
   1) Remove the oil filler cap from the hydraulic oil tank.
   2) Open cover (1) at left side of machine.
   3) Loosen air bleeder (2) and confirm that oil oozes through it (the all air has been bled.)
   4) After bleeding air, tighten the air bleeder.
      Tightening torque:
      8.83 ± 0.98 N·m (0.9 ± 0.1 kgf·m, 6.5 ± 0.7 lbft)
   5) Tighten the oil filler cap of the hydraylic oil tank.





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.

2. Start the engine. For details, see "STARTING ENGINE (PAGE 3-46)".
   Run the engine at low idling for 10 minutes, then do as follows.
3. Bleeding air from cylinders
   1) Run the engine at low idling, and extend and retract each cylinder 4 to 5 times, taking care so that a cylinder may not be brought up to its stroke end. (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) Finally, operate each cylinder 4 to 5 times to the end of its stroke to completely remove the air.

NOTICE

- **If the method of bleeding the air from the attachment itself is specified by the manufacturer, bleed the air according to the specified procedure.**
- **After completing the air bleeding operation, stop the engine, and leave the machine for 5 minutes before starting operations. This will remove the air bubbles in the oil inside the hydraulic cylinders.**
- **Check that there is no leakage of oil and wipe off any oil that has been spilled.**

4. Bleeding air from attachment (when installed)
   If a breaker or other attachment has been installed, run the engine at low idling and operate the attachment pedal repeatedly (approx. 10 times) until the air has been bled from the attachment circuit.

CHECK BEFORE STARTING

For details of the following items, see "Checks Before Starting (PAGE 3-35)" in the OPERATION section.

- Cooling System Coolant Level - Check/Add
- Engine Crankcase Oil Level - Check/Add
- Fuel Level - Check/Refill
- Hydraulic Oil Level - Check/Add
- Air Cleaner Dust Indicator - Check
- Water Separator - Check
- Electric Wiring - Inspect
- Horn Function - Check

EVERY 100 HOURS MAINTENANCE

Lubricating

WARNING

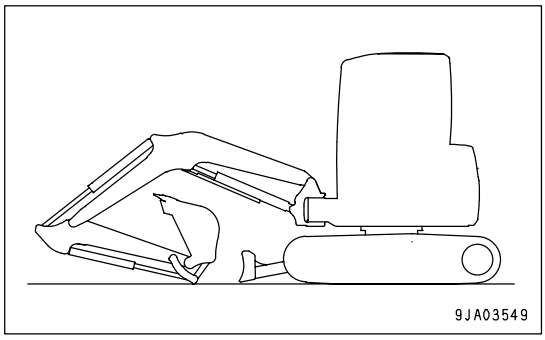
Do not swing the upper structure while greasing the swing pinion.

NOTICE

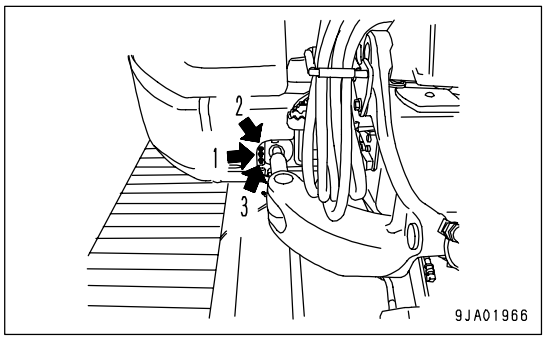
- **For the first 100 hours on new machines where the parts are settling in, carry out greasing every ten hours.**
- **After digging operations under water, be sure to grease the pins which were submerged.**

- Prepare a grease gun.

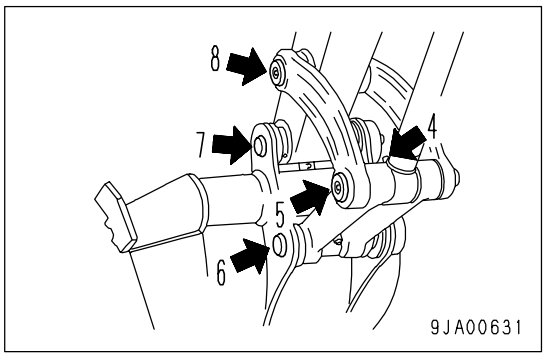
1. Set the machine to the greasing posture shown on the right diagram, lower the work equipment to the ground, then stop the engine.
2. Using a grease pump, pump in grease through the grease fittings shown by arrows.
3. After greasing, wipe off any old grease that was pushed out.



(1) Swing pinion (1 point)
When lubricating the swing pinion, turn the chassis little by little and apply grease through the gerase fitting.
(2) Swing circle (1 point)
(3) Boon swing cylinder foot pin (1 point)



(4) Bucket cylinder rod end (1 point)
(5) Link coupling pin (1 point)
(6) Bucket - Link coupling pin (1 point)
(7) Arm - Bucket coupling pin (1 point)
(8) Arm - Link coupling pin (1 point)



EVERY 250 HOURS MAINTENANCE

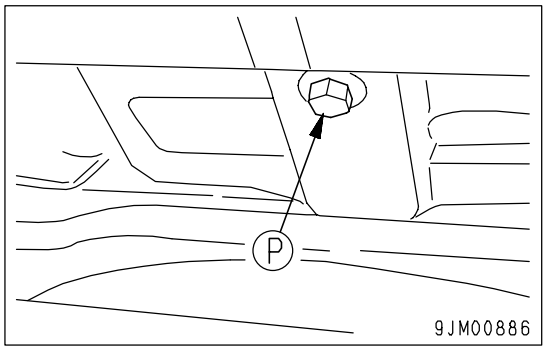
Engine Crankcase Oil - Change

⚠ WARNING

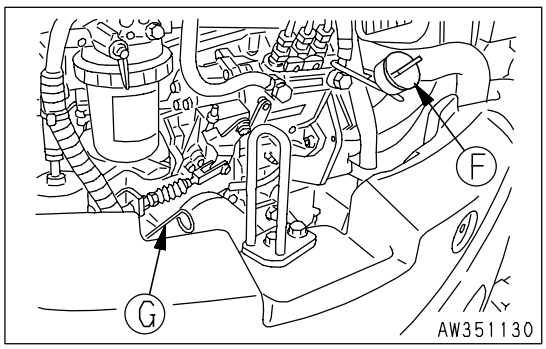
The parts and oil are at high temperature immediately after the engine is stopped, and may cause serious burns. Wait for the temperature to go down before starting the operation.

- Refill capacity: 8 liter (2.11 US gal)

1. Set a container to catch the oil immediately under the drain plug (P) at the bottom of the machine.
2. Remove drain plug (P) slowly to avoid getting oil on yourself, and drain the oil.
3. Check the drained oil, and if there are excessive metal particles or foreign material, please contact your Komatsu distributor.
4. Install drain plug (P).



5. Add engine oil through oil filler (F) up to between the H and L level on dipstick (G).
6. Run the engine idle for a while, then stop the engine and confirm that the oil level is between the H and L lines according to "Engine Crankcase Oil Level - Check/Add (PAGE 3-36)".



Hydraulic Oil Filter Element - Replace

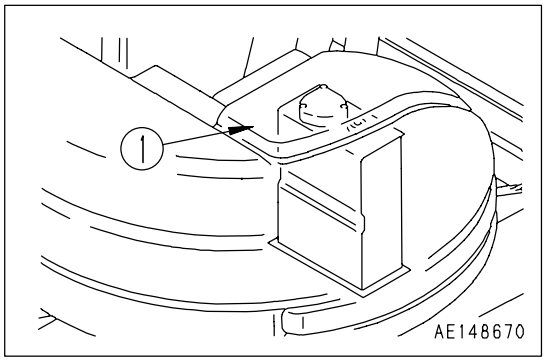
WARNING

- **The parts and oil are at high temperature after the engine is stopped, and may cause burns. Wait for the temperature to go down before starting the work.**
- **When removing the oil filler cap, turn it slowly to release the internal pressure, then remove it.**

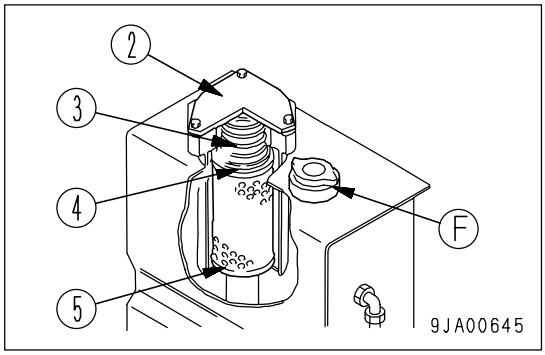
NOTICE

If the machine is equipped with a hydraulic breaker, the hydraulic oil will deteriorate much faster than during normal bucket operations. For details, see "MAINTENANCE INTERVAL FOR HYDRAULIC BREAKER (PAGE 4-15)" when carrying out maintenance.

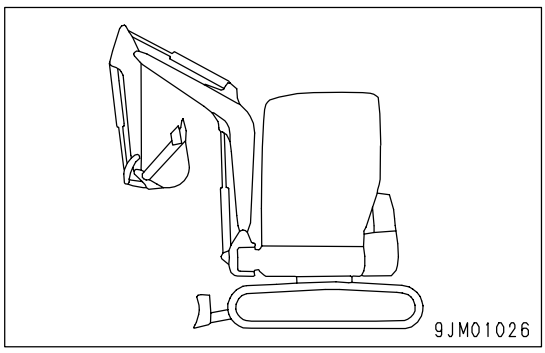
1. Open cover (1) at right side of the machine.



2. Remove the cap from oil filler (F), and release the internal pressure.
3. Loosen 3 bolts, then remove cover (2). When doing this , may fly out under, the force of spring (3), so hold the cover down when removing the bolts.
4. After removing spring (3) and vlve (4),take out element (5).
5. Clean the rempved parts in diesel oil.
6. Install the new element in the place where old element (5) was installed.
   Check the O-ring fitted to cover (2), and if it is scratched or damaged, replace it with a new O-ring.



7. Set valve (4) and spring (3) on top of the element.
8. Set cover (2) in position, push it down by hand, and install the cover (2) with the mounting bolts.
9. Extend the boom, arm, and bucket cylinder fully as shown in the diagram on the right, remove the oil filler cap, then install the cap and pressurize the inside of the tank.

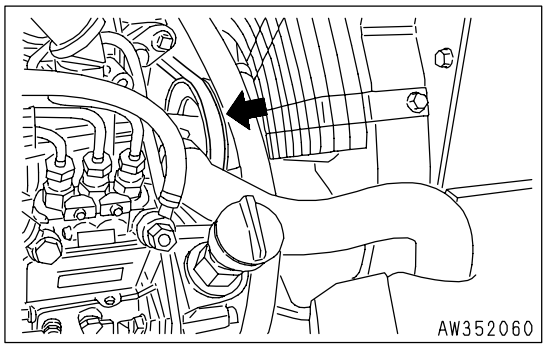


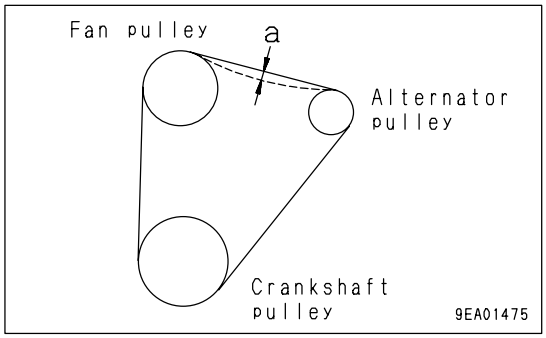
10. Close cover (1) at right side of the machine.

Cooling Fan Belt Tension - Inspect/Adjust

Inspection

The belt should deflect approx. 5 to 6 mm(0.197 to 0.236 in) when pressed with "a" finger force of approx. 58.8 N (6 kgf) at a point midway between the alternator pulley and fan pulley.

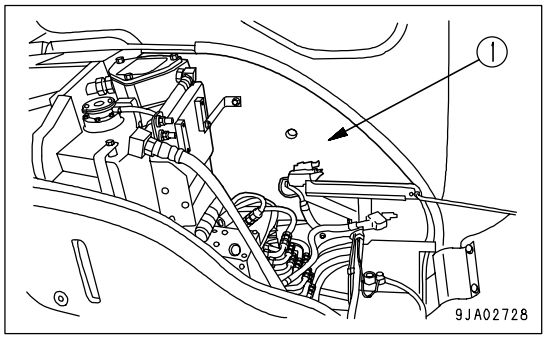




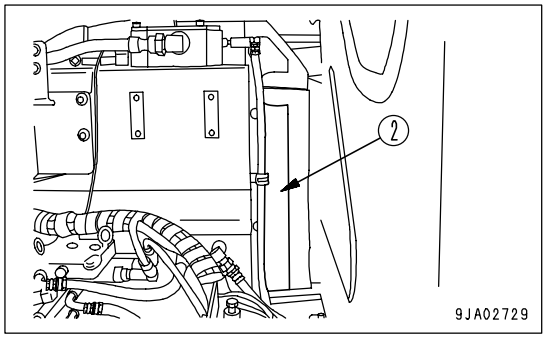
Adjustment

- Prepare a pinch bar.
- Prepare a wooden block.

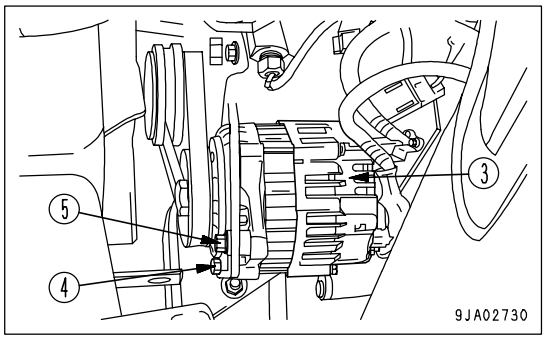
1. Remove cover (1) on the inside of the hydraulic tank.



2. Remove alternator cover (2).



3. Insert a bar between alternator (3) and the cylinder block to fix alternator (3) in position. When fixing alternator (3) in position, insert a wooden block between the bar and alternator (1) to prevent any damage to the alternator.
4. Loosen alternator fixing bolt (4) and adjust bolt (5).
5. Using a bar, move alternator (3) towards the front of the machine to adjust the belt tension so that the deflection is approx. 5 to 6 mm (0.197 to 0.236 in) (approx. 58.5 N (6 kgf)), then tighten adjustment bolt (5).
6. Tighten mounting bolt (4).



NOTICE

- **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.**
- **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.**

7. Install alternator cover (2) and cover (1) on the inside of the hydraulic tank.

Battery Electrolyte Level - Check

Carry out this check 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 also cause an explosion.**
- **The battery generates flammable gas and there is danger of explosion, so 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 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

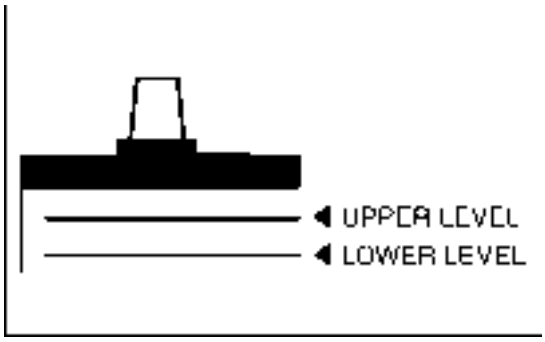
When adding distilled water in cold weather, add it before starting operations in the morning to prevent the electrolyte from freezing.

Inspect the battery electrolyte level at least once a month and follow the basic safety procedures given below.

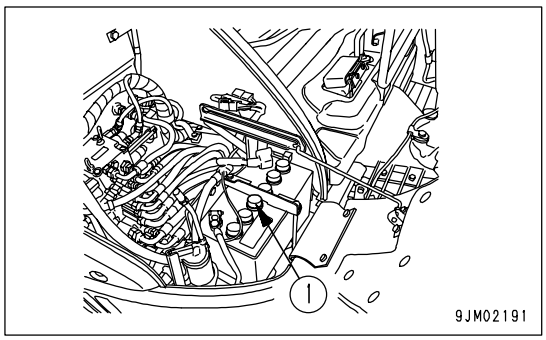
When Checking Electrolyte Level from side of Battery

If it is possible to check the electrolyte level from the side of the battery, check as follows.

1. Open the cover at the right 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.



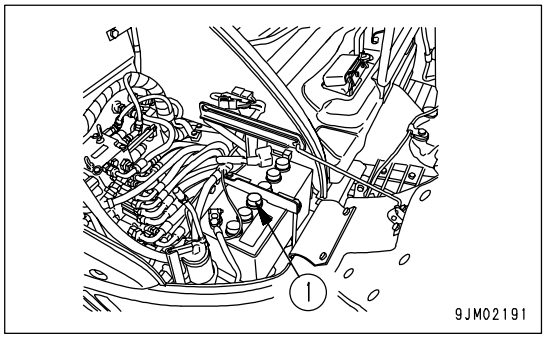
REMARK

If distilled water is added to above the U.L line, use a pipette 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.

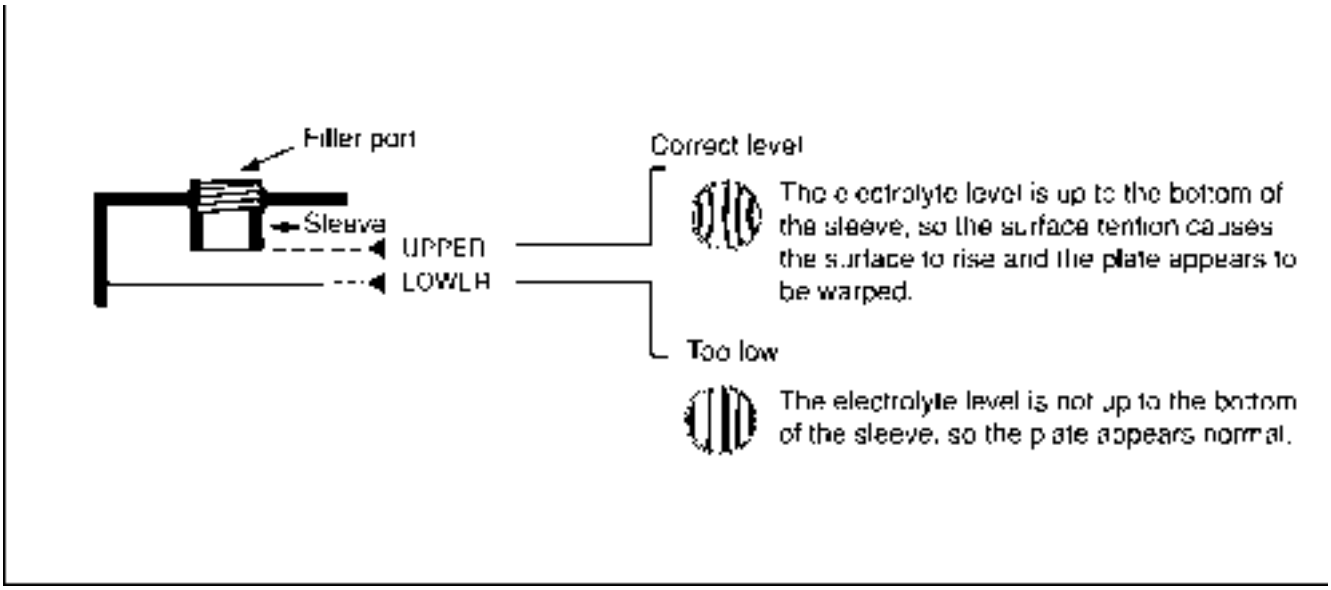
When It is Impossible to Check Electrolyte Level from Side of Battery

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 cover at the right side of the machine.
2. 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.



3. After adding distilled water, tighten cap (1) securely.

REMARK

If distilled water is added to above the bottom of the sleeve, use a pipette to lower the level to the bottom of the sleeve. 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 Possible to Use Indicator to Check Electrolyte Level

If it is possible to use and indicator to check the electrolyte level, follow the instructions given.

EVERY 500 HOURS MAINTENANCE

Maintenance for every 100 and 250 hours should be carried out at the same time.

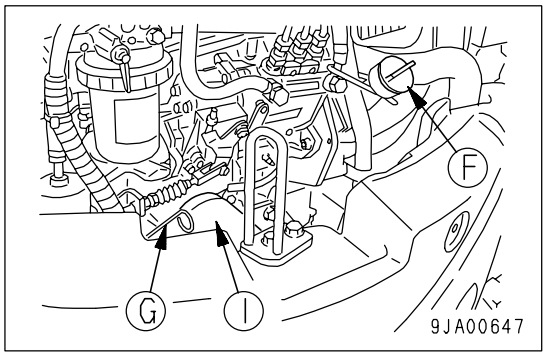
Engine Crankcase Oil Filter Cartridge - Replace

WARNING

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

- Change oil in engine oil pan should be carried out at the same time.
- Filter wrench

1. Drain the engine oil. For details, see "Engine Crankcase Oil - Change (PAGE 4-42)".
2. Using a filter wrench, turn filter cartridge (1) counterclockwise to remove it.
3. Clean the filter holder, coat the steel surface of the new filter cartridge with clean engine oil (or coat it thinly with grease), then install it.



REMARK

Confirm that no remnants of old packing still adhere to the filter holder as this may result in oil leakage.
Check that there is no old packing affixed to the filter holder. If there is any old packing affixed to the filter, it will cause leakage of oil.

4. When installing; tighten until the packing surface contacts the seal surface of the filter holder, then tighten it up 1/2 to 3/4 of a turn.
5. After replacing the filter cartridge, add engine oil through oil filler port (F) so that the oil level is between the H and L marks on dipstick (G).
6. Run the engine idle for a while, then stop the engine and confirm that the oil level is between the H and L lines according to "Engine Crankcase Oil Level - Check/Add (PAGE 3-36)".

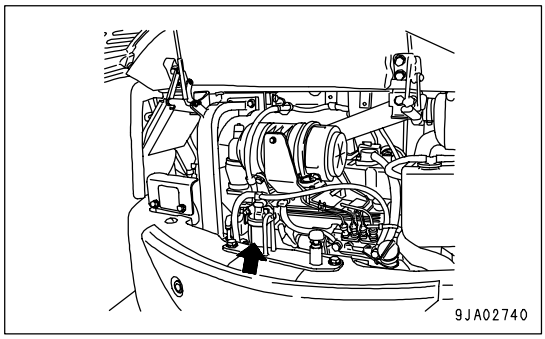
Fuel Filter Element - Replace

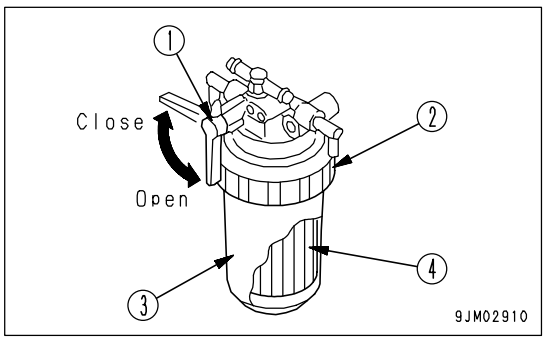
WARNING

- **Engine is at high temperature immediately after the machine has been operated. Wait for engine to cool down before replacing the filter.**
- **Do not bring fire or sparks near the fuel.**

- Prepare a filter wrench for fuel filter element.
- Prepare a container to catch the oil.

1. Place a container under the filter element to catch the oil.
2. Close valve (1) at the top of the filter.
3. Using a filter wrench, loosen ring (2), then remove element cup (3) and take out element (4).
4. Wash element cup (3) in diesel oil or in a cleaning oil and install a new element.
5. Fill the element cup with fuel, then install filter holder.
   When replacing a fuel filter element, replace the filter O-ring at the same time.
6. Open valve (1) at the top of the filter.

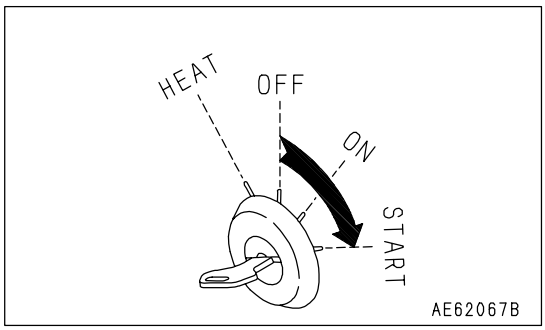




7. Set fuel control lever to the low idling position.
8. After replacing the fuel filter element, bleed the air.
   For details of the procedure, see "Air Bleeding (PAGE 4-49)".

Air Bleeding

1. Fill the fuel tank with fuel.
2. Turn and keep the starting switch key to the ON position for 15 to 20 seconds. Air is automatically bled by the automatic air bleeding device.



NOTICE

After running the starting motor once, wait at least 30 seconds before running it again.

REMARK

When the machine has run out of fuel, carry out the same procedure and crank the engine for 15 - 20 seconds. Repeat this operation 2 - 3 times to bleed the air.

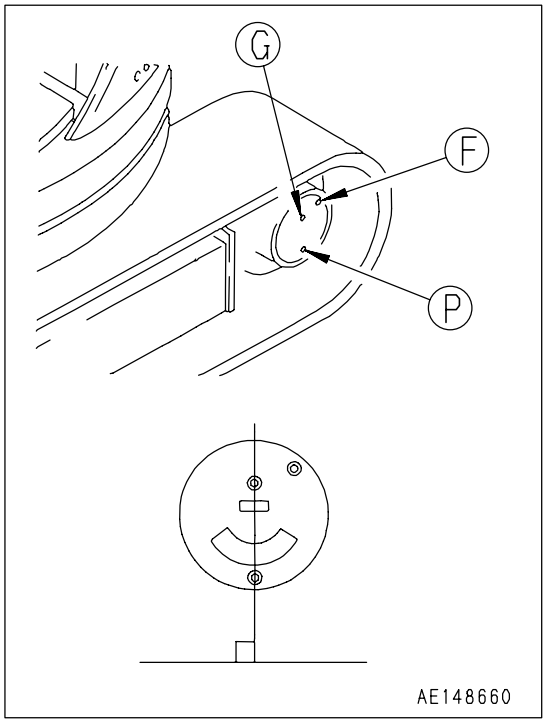
Final Drive Case Oil Level - Check/Add

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.**

- Prepare a container to catch drained oil.
- Prepare a hexagon wrench.

1. Set so that plug (G) is at the top, with plug (G) and plug (P) perpendicular to the ground.
2. Set the container to catch oil under plug (P).
3. Remove plug (G) with a hexagonal wrench. Oil level shouldbe near the bottom of the plug hole (G).
4. If the oil is insufficient, remove plug (F) with a hexagonal wrench, then add oil through plug (F), until oil flows out of level plug hole (G).
5. After checking the oil level, install plugs (F) and (G).



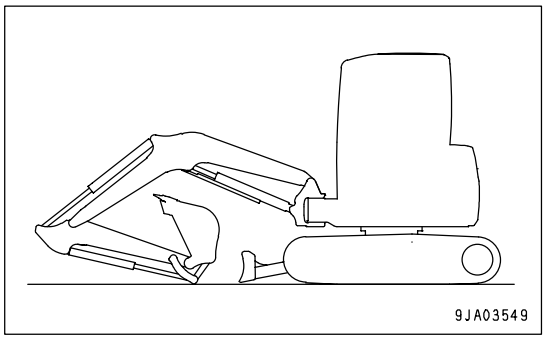
Lubricating

NOTICE

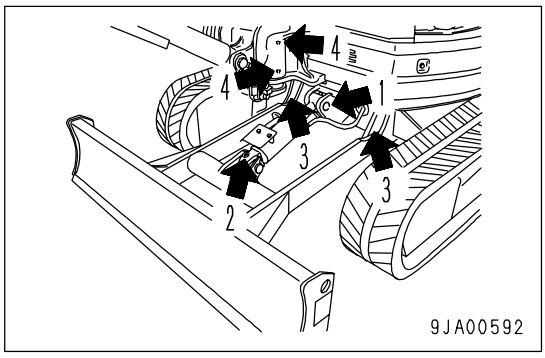
- **For the first 100 hours on new machines where the parts are settling in, carry out greasing every ten hours.**
- **After digging operations under water, be sure to grease the pins which were submerged.**

- Prepare a grease gun.

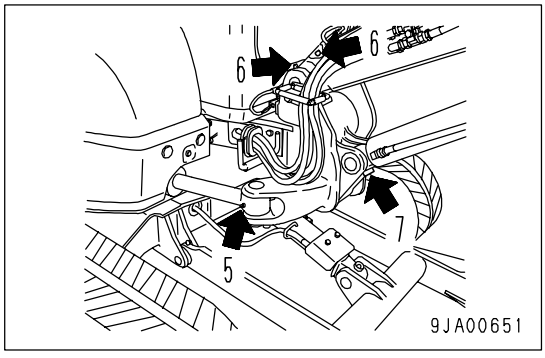
1. Set the machine to the greasing posture shown on the right diagram, lower the work equipment to the ground, then stop the engine.
2. Using a grease pump, pump in grease through the grease fittings shown by arrows.
3. After greasing, wipe off any old grease that was pushed out.



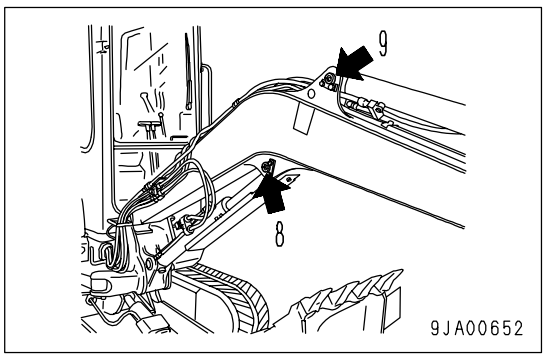
(1) Blade cylinder foot pin (1 point)
(2) Blade cylinder rod end (1 point)
(3) Blade foot pin (2 points)
(4) Boom swing bracket pin (2 points)



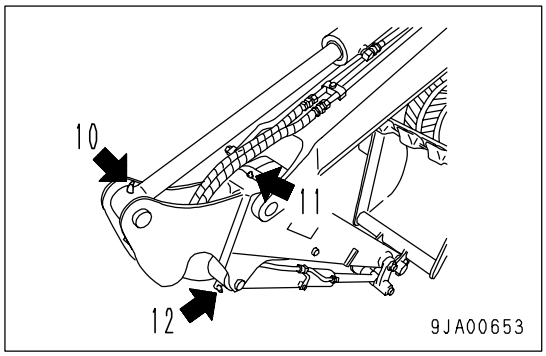
(5) Boom swing cylinder rod end pin (1 point)
(6) Boom foot pin (2 points)
(7) Boom cylinder foot pin (2 points)



(8) Boom cylinder rod end (1point)
(9) Arm cylinder foot pin (1 point)



(10) Arm cylinder rod end (1point)
(11) Boom - Arm coupling pin (1 point)
(12) Bucket cylinder foot pin (1 point)



Radiator Fins, Oil cooler fins - Clean/Check

WARNING

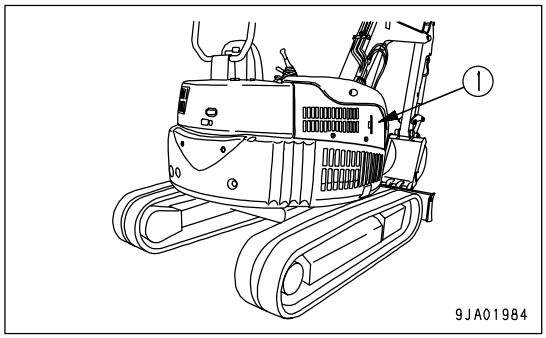
If compressed air, high-pressure water, or steam hit your body directly, or they cause dirt or dust to be blown up, there is a hazard of serious injury. Always use safety glasses, dust mask, or other protective equipment.

NOTICE

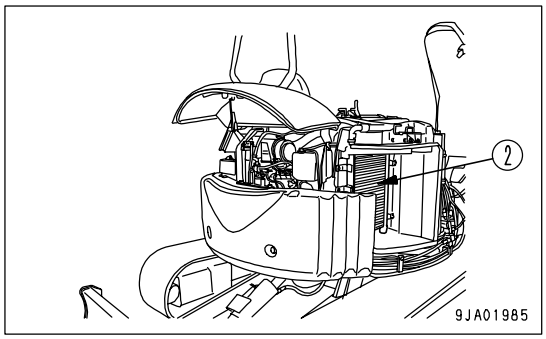
When using compressed air, keep the air nozzle at a distance to prevent damage to the fins. Especially for the aftercooler, blow the air from 300mm (11.8 in) or more, and at a 45 degree angle.

To prevent damage to the fins, apply compressed air from an appropriate distance. Damaged fins may cause water leakage or overheating. On dusty sites, check the fins daily, regardless of the maintenance interval.

1. Open the engine hood and cover.
2. Remove cover (1).



3. Use compressed air, steam, or water to blow off the mud, dirt, or leaves clogging the radiator fins or oil cooler fins (2).



EVERY 1000 HOURS MAINTENANCE

Maintenance for every 100, 250 and 500 hours should be carried out at the same time.

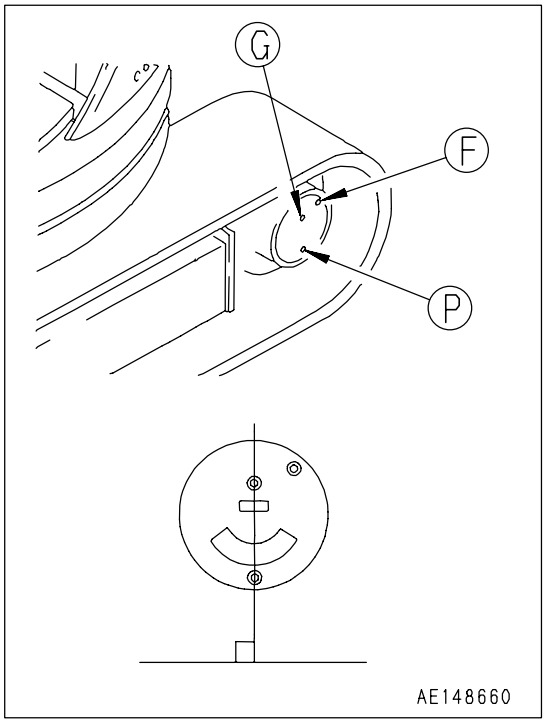
Final Drive Case Oil - Change

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 0.8 liter (0.21 US gal)
- Prepare a hexagon wrench

1. Set so that plug (G) is at the top, with plug (G) and plug (P) perpendicular to the ground.
2. Set the container to catch oil under plug (P).
3. Remove plugs (P), (G) and (F) with hexagonal wench to drain the oil.
4. Tighten plug (P).
5. Add oil through the hole of plug (F) up to the refill level.
6. After the oil flows out of the hole plug (G), install plugs (G) and (F).



Engine Valve Clearance - Check/Adjust

As special tool is required for removing and adjusting the parts, you shall request Komatsu distributor for service.

EVERY 2000 HOURS MAINTENANCE

Maintenance for every 100, 250, 500 and 1000 hours should be carried out at the same time.

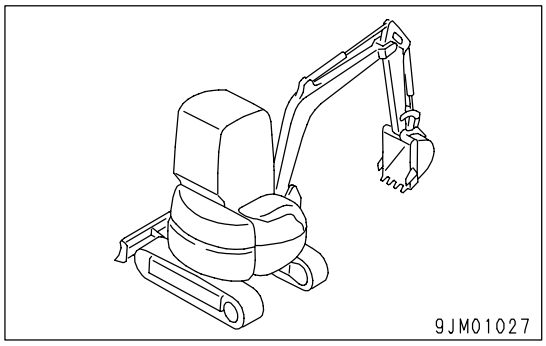
Hydraulic Oil and Strainer - Change/Clean

WARNING

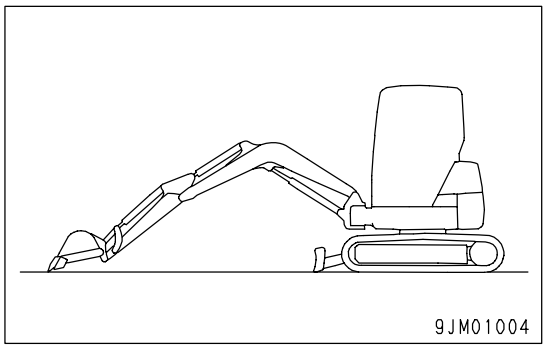
- **The parts and oil are at high temperature after the engine is stopped, and may cause burns. Wait for the temperature to go down before starting the work.**
- **When removing the oil filler cap, turn it slowly to release the internal pressure, then remove it.**

- Refill capacity: 33 liters (8.71 US gal)
- Prepare a handle (for the socket wrench).

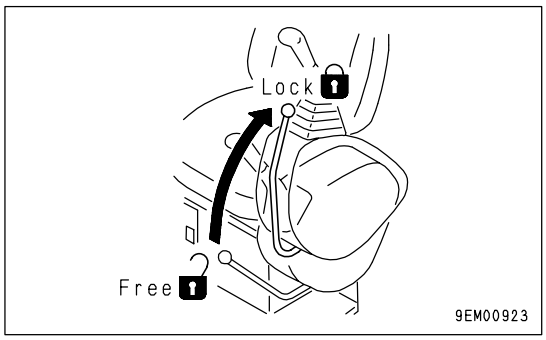
1. Swing the upper structure so that the drain plug under the hydraulic tank will be between both tracks.



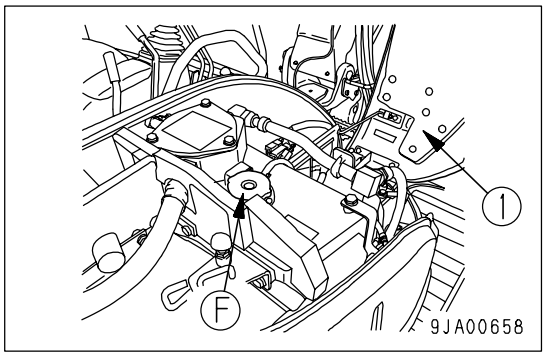
2. Retract the arm and bucket cylinders, then lower the boom and put the teeth in contact with the ground.
3. Lower the blade to the ground.



4. Set the safety lock lever to the LOCK position and stop the engine.

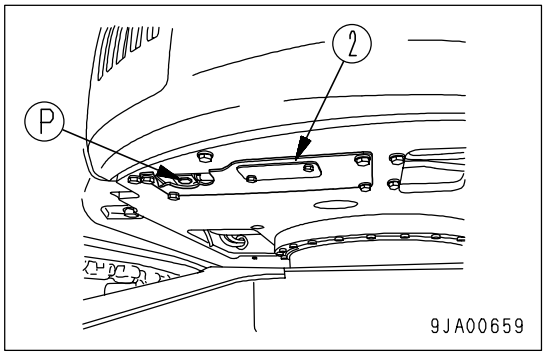


5. Open cover (1) at right side of the machine, then remove the cap of oil filler (F).

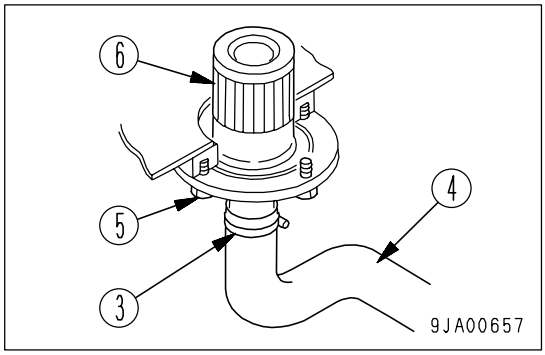


6. Set a container under the drain plug (P) on the underside of the machine body. Remove the drain plug (P) with the handle to drain oil. Check he O-ring fitted to plug (P). If they have any flaw, replace them. After draining the oil, tighten drain plug (P).

   - Take care not to get oil on yourself when you remove drain plug (P).



7. Loosen hose clamp (3) and remove hose (4). Remove bolt (5) and strainer (6).
8. Remove all dust from strainer (6) and wash it in diesel oil or in cleaning oil.
   If strainer (6) is broken, replace it with new one.
9. Fix strainer (6) with bolt (5), and insert and fix hose (4) with hose clamp (3).
10. Add the specified amount of new and clean engine oil (for hydraulic system) through oil filler port (F). Check that the oil level is between H and L on the sight gauge.

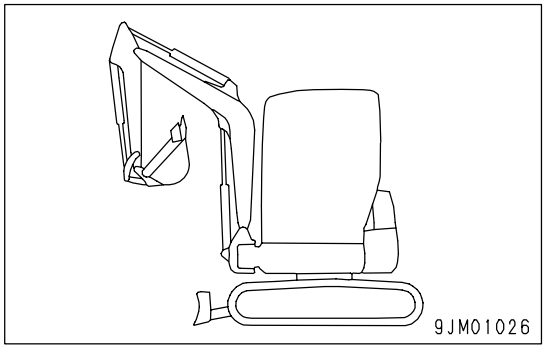


11. Extend the boom, arm, and bucket cylinder fully as shown in the diagram on the right, remove the oil filler cap, then install the cap and pressurize the inside of the tank.

NOTICE

Be sure to pressurize the hydraulic tank. If it is not pressurized, the pump will suck in air, and this will adversely affect the equipment.

12. After replacing the oil, set each control lever to the neutral positionand run the engine idle at a low speed for 2 to 3 minutes, then start the normal work.



Alternator and Starting Motor - Inspect

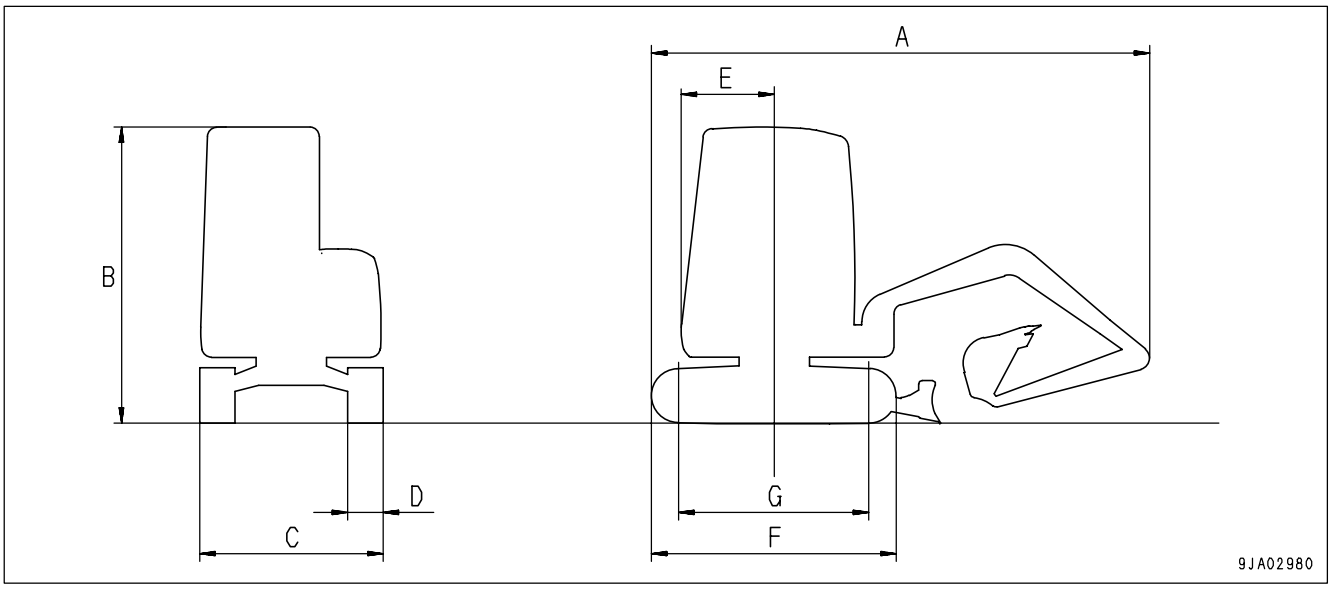
The brush may be worn or the bearing may have run out of grease. Contact your Komatsu distributor for inspection or repair.

If the engine is started frequently, carry out inspection every 1000 hours.

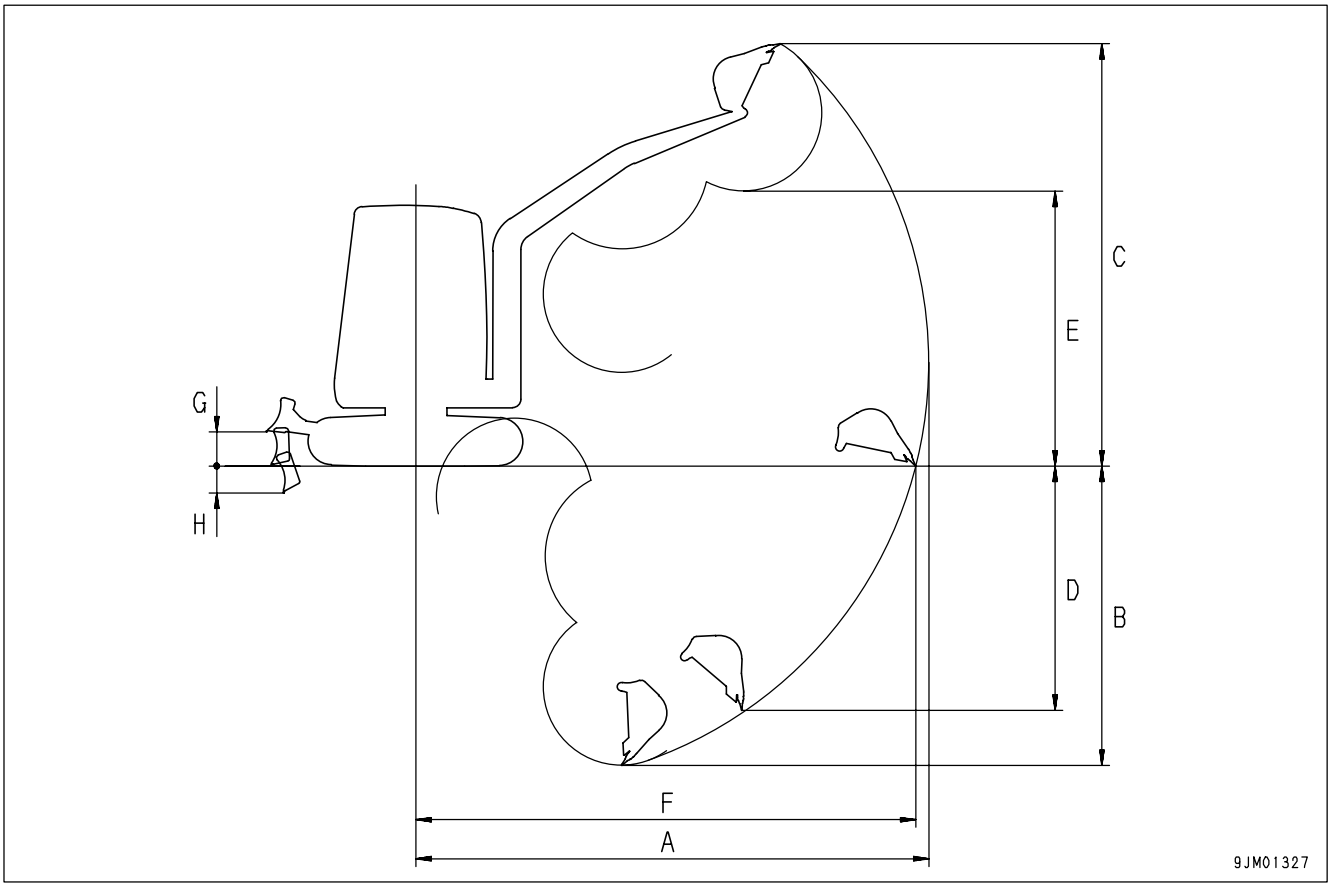
SPECIFICATIONS

SPECIFICATIONS

	Item		Unit	PC40MRx-1	
				Rubber shoe specified	Steel shoe specified
	Machine weight	Canopy specified	kg (lb)	4490 (9900)	4580 (10100)
		Cab specified		4580 (10100)	4670 (10300)
	Bucket capacity		m^3 (cu/yd)	0.14 (0.18)	
	Name of engine		-	Komatsu 4D88E-3HB diesel engine	
	Engine horsepower		kW(HP)/rpm	28.32 (38)/2500	
A	Overall length		mm (ft in)	5215 (17'1")	5215 (17'1")
B	Overall height	Canopy specified	mm (ft in)	2570 (8'5")	2570 (8'5")
		Cab specified		2590 (8'6")	2590 (8'6")
C	Overall width		mm (ft in)	1960 (6'5")	1960 (6'5")
D	Track width		mm (ft in)	400 (1'4")	400 (1'4")
E	Radius of upper structure		mm (ft in)	1235 (4'1")	1235 (4'1")
F	Length of track		mm (ft in)	2460 (8'1")	2460 (8'1")
G	Tumbler center distance		mm (ft in)	1940 (6'4")	1940 (6'4")
	Min. ground clearance		mm (ft in)	320 (1'1")	320 (1'1")
	Travel speed (Low/High)		km/h (MPH)	2.8 (1.7)/4.6 (2.9)	
	Continuous swing speed		rpm	9.0	



	Working ranges	Unit	PC40MRx
A	Max. digging reach	mm (ft in)	5650 (18'6")
B	Max. digging depth	mm (ft in)	3400 (11'2")
C	Max. digging height	mm (ft in)	5190 (17'0")
D	Max. vertical all depth	mm (ft in)	2700 (8'10")
E	Max. dumping height	mm (ft in)	3530 (11'7")
F	Max. reach at ground level	mm (ft in)	5510 (18'1")
G	Max. blade lifting height	mm (ft in)	430 (1'5")
H	Max. blade lowering depth	mm (ft in)	330 (1'1")



ATTACHMENTS, OPTIONS

⚠ WARNING

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

ATTACHMENTS AND OPTIONS - GENERAL INFORAMTION

SAFETY FIRST

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 thoroughly, and do not use this attachment unless you are sure that you have understood the guides completely.**
  If you lose the instruction manual, always ask the manufacturer or your Komatsu distributors for a new copy.
- **Depending on the attachment, install the necessary front guard to the machine.**
- **Depending on the attachment, the impact noise may make it difficult for fellow workers to transmit instructions for the operation. Before starting operation, decide a leader and determine the signals to be used.**
- **Do not carry out swinging operations to the side with a heavy load on the attachment. This is particularly dangerous on slopes.**
- **Comparing with a machine equipped with a bucket, a machine equipped with a breaker has a heavy load at the front of the work equipment and is unstable. To avoid a hazard of tipping over, do not carry out operations with the attachment swung to the side.**
- **When an attachment is installed, the swing range and center of gravity of the machine are different, and the machine may move in an unexpected way. Be sure that you understand the condition of the machine properly.**
- **Before starting operations, set up a fence around the machine to prevent people from entering.**
  Never operate the machine when there are people near the machine.
- **To prevent serious accidents caused by misoperation, do not put your foot on the pedal except when operating the pedal.**

Precautions for removal and installation operations

When removing or installing the attachments, obey the following precautions and take care to ensure safety during the operation.

- **Carry out the removal and installation operation on a flat, firm ground surface.**
- **When the operation is carried out by two or more workers, determine the signals and follow these during the operation.**
- **When carrying heavy objects (more than 25kg or 55 lb), use a crane.**
- **When removing heavy parts, always support the part before removing it.**
  When lifting such as heavy parts with a crane, always pay careful attention to the position of the center of gravity.
- **It is dangerous to carry out operations with the load kept suspended. Always set the load on a stand, and check that it is safe.**
- **When removing or installing attachments, make sure that it is in a stable condition and will not fall over.**
- **Never go under a load suspended from a crane.**
  Always stand in a position that 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.

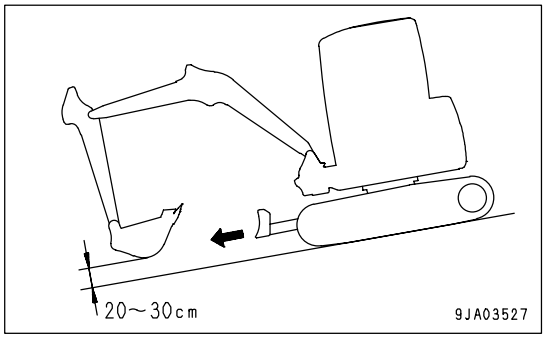
For details of removal and installation operations, contact your Komatsu distributor.

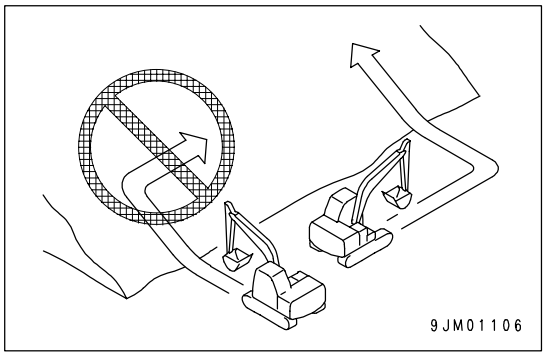
ATTACHMENT INSTALLATION

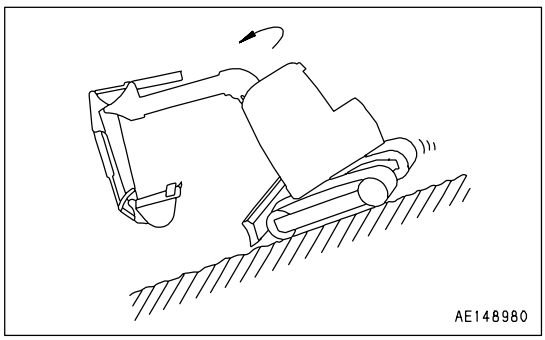
WARNING

Long work equipment or heavy work equipment cause the machine to have poor stability, so there is danger of the machine losing its balance and tipping over when traveling down steep hills or when swinging on slopes. Never do any of the following. They are extremely dangerous.

- **Traveling downhill with the work equipment raised**
- **Traveling across slopes**
- **Swinging upper structure on slopes**
- **If heavy-load work equipment is installed, there will be excessive overrun when swinging (the distance from operating to stop the swing to the point where the swing stops completely), so there is danger of mistaking the distance and hitting other objects.**
  Allow a margin to the stopping point when operating.
  In addition, the hydraulic drift (the gradual downward movement caused by the weight of the work equipment when the work equipment is stopped in a raised condition) will also increase.
- **If the correct procedure is not used when installing the boom and arm, it may lead to serious damage. Please consult your Komatsu distributor.**
- **When long work equipment is installed, the working range will suddenly become larger, so there is danger of mistaking the distance and hitting other objects. Allow an ample margin between the work equipment and surrounding obstacles when operating.**







BUCKET WITH HOOK

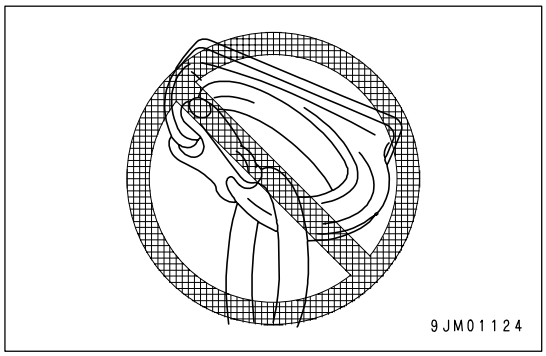
HOOK CONDITION

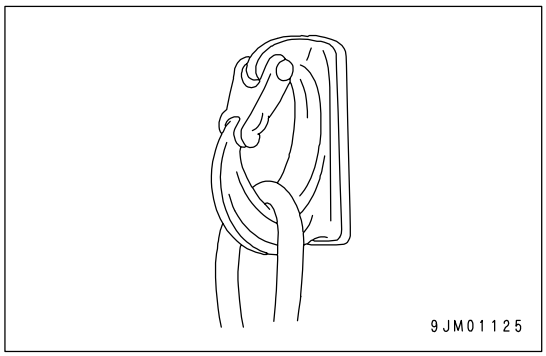
Check that there is no damage to the hook, stopper, or hook mount. If there is any abnormality, contact your Komatsu distributor.

PROHIBITED OPERATIONS

Operations with Care

- When carrying out lifting operations, reduce the engine speed and operate slowly.
- Depending on the operating posture, there is danger that the wire or ring may come off the hook. To prevent this, pay careful attention to the angle of the hook.
- Never travel the machine while lifting a load.
- If the bucket with hook is turned and used for operations, it will hit the arm during dumping operations, so be careful when using it.

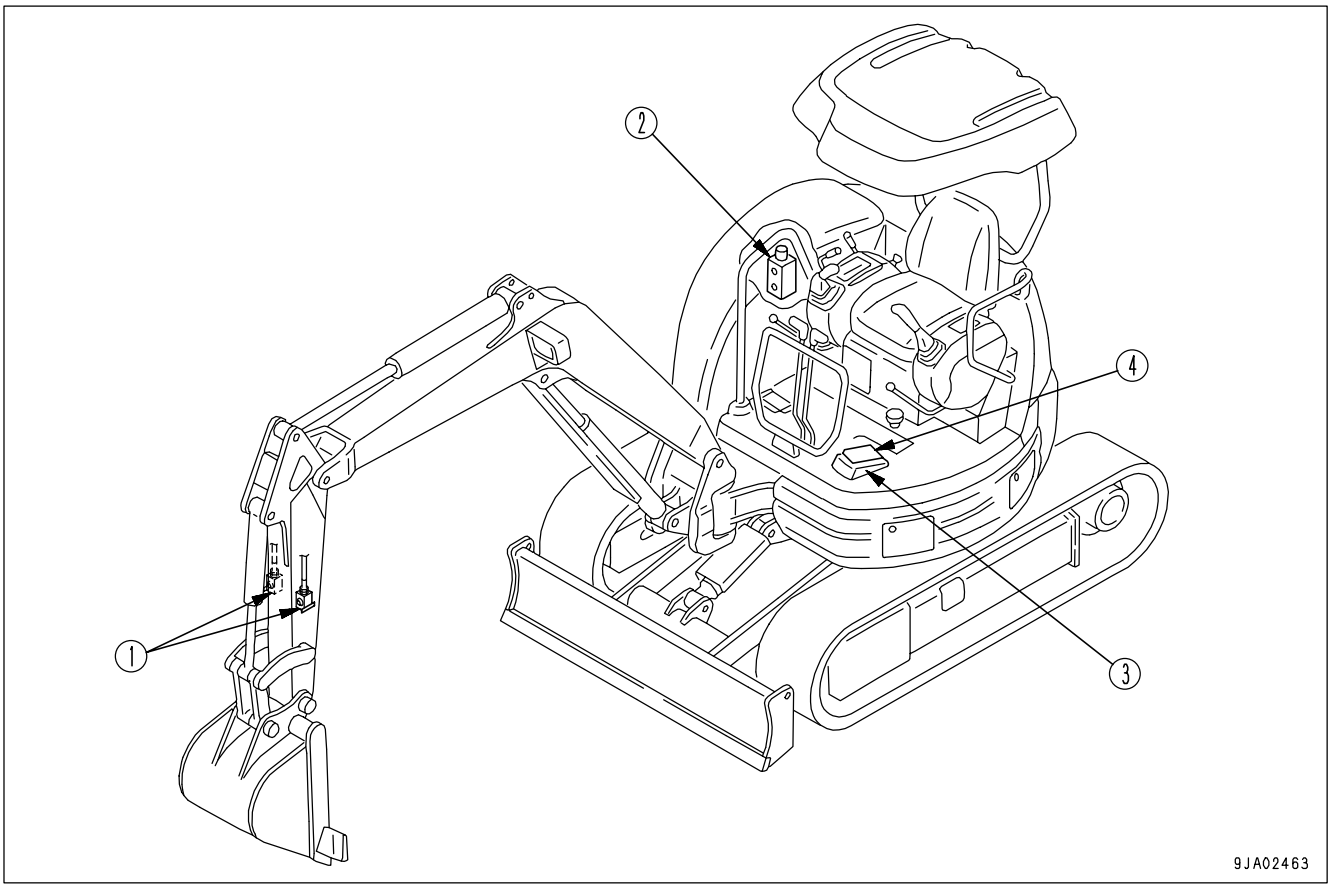




- If you are planning to newly install a hook, contact your Komatsu distributor.

MACHINE READY FOR ATTACHMENT

LOCATIONS



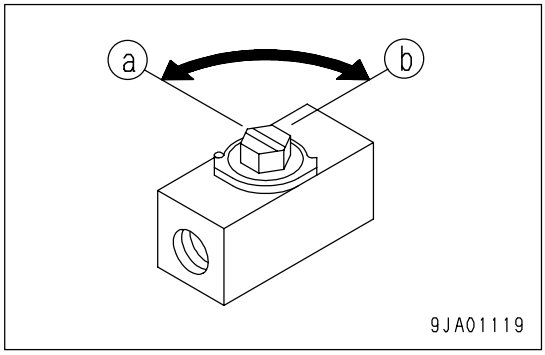
(1) Stop valve
(2) Selector valve
(3) Attachment control pedal
(4) Pedal lock (for attachment control pedal)

Stop Valve

This valve (1) stop the flow of the hydrauric oil.

irection of slit at hexagonal portion
Position (a): Hydraulic oil stops.
Position (b): Hydraulic oil flows.

When removing or installing attachments, set this valve to the position (a).
Rotate the hexagonal portion to the point where it is stopped by the stopper.
Width across flats of hexagonal portion: 19 mm (0.7 in)

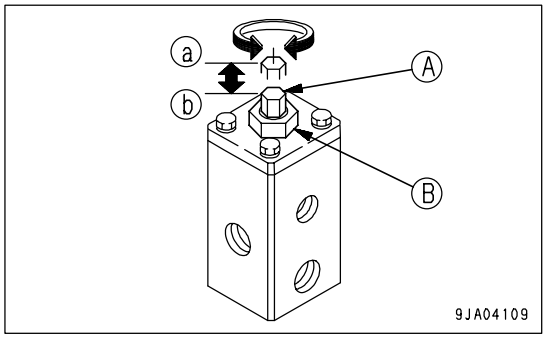


Selector Valve

This valve (2) switches the flow of hydraulic oil.

Position (a): When using breaker
Turn spool (A) to the left until it is stopped by the stopper.

Position (b): When using general attachment
Turn spool (A) to the right until it is stopped by the stopper.



- In switching, loosen lock nut (B), then turn spool (A).

- After switching, tighten lock nut (B) securely to fix spool (A).
  Lock nut tightening torque: 53.9 to 73.5 N·m (5.5 to 7.5 kgf·m, 39.8 to 54.2 lbft)

NOTICE

When tightening lock nut (B), hold spool (A) with a proper tool (socket wrench or spanner) so that it does not turn together.

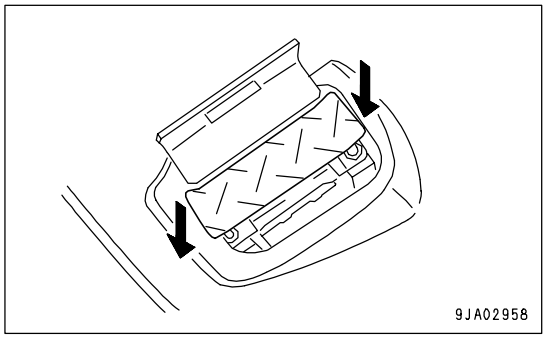
Dimension of hexagon face width across flats of spool (A): 13 mm (0.5 in)
Dimension of hexagon face width across flats of lock nut (B): 24 mm (0.9 in)

Attachment Control Pedal

This pedal (3) is used to operate the attachment.

Top of pedal depressed: Oil flows to right side of arm (hydraulic tank side).

Bottom of pedal depressed: Oil flows to left side of arm (operator's seat side).



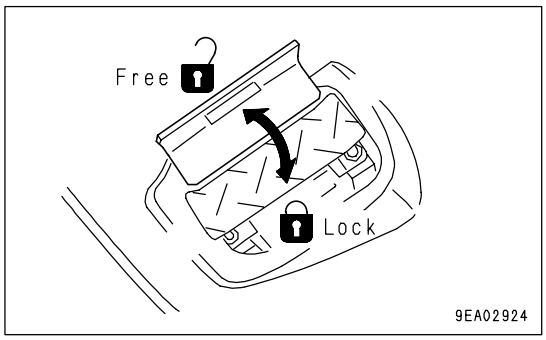
Pedal lock

(for attachment control pedal)

WARNING

When attachment operation is not required, lock the attachment control pedal with the pedal lock.
If the attachment control pedal is accidentally pressed while it is not locked, a serious accident may occur.

This plate (4) is a device to lock the attachment control pedal.
When the pedal is covered by the plate, it is locked.



HYDRAULIC CIRCUIT

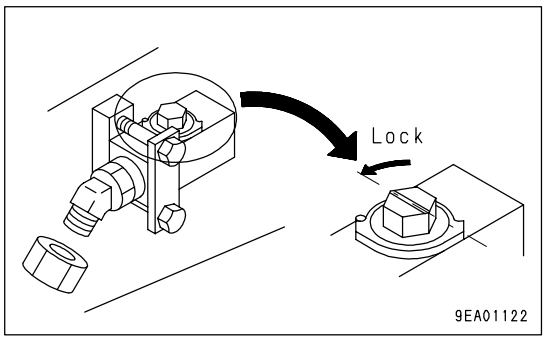
Hydraulic Circuit Connection

NOTICE

The pressure in the attachment hydraulic circuit on this machine is set at 20.6 MPa (210 kgf/cm^2, 2982 PSI), so check the ability of the attachment to withstand the pressure before installing it.

When connecting the attachment, connect the hydraulic circuit as follows.

1. Check that the stop valve is at the LOCK position, then remove the plug.
   Be caraful not to lose or damage any part that is removed.



2. Connect the piping for the attachment provided by the attachment maker.
   The thread size of the elbow installed to the stop valve is PF1/2.

REMARK

If the elbow thread size does not match, please contact your Komatsu distributor.

3. After connecting the piping, bleed the air from the circuit.
   1) Start the engine and run it at low idling for 10 minutes. For details, see "STARTING ENGINE (PAGE 3-46)". Then carry out the following operation.
   2) Run the engine at low idling until the air in the attachment circuit is completely removed, then operate the attachment pedal repeatedly (approx. 10 times) to bleed the air.

NOTICE

If the attachment maker specifies an air bleeding procedure for the attachment itself, follow the specified procedure to bleed the air.

   3) 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.
   4) Check that there is no oil leakage, and wipe off any oil that has been spilled.

ATTACHMENT OPERATIONS

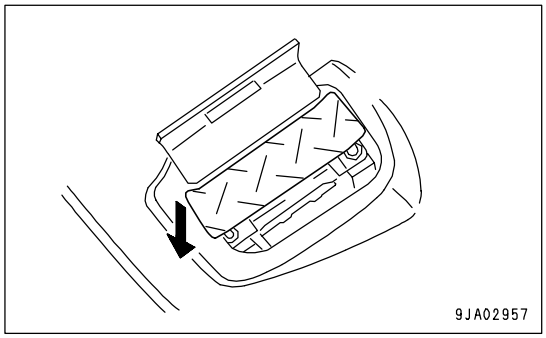
NOTICE

If the pedal is operated when a breaker or general attachment is not installed, it will cause overheating or other problems.

Operate the attachment as follows.

When Using Breaker

Depress the bottom of the pedal to operate the breaker.

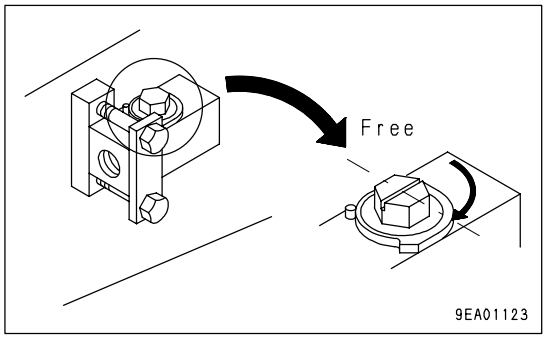


REMARK

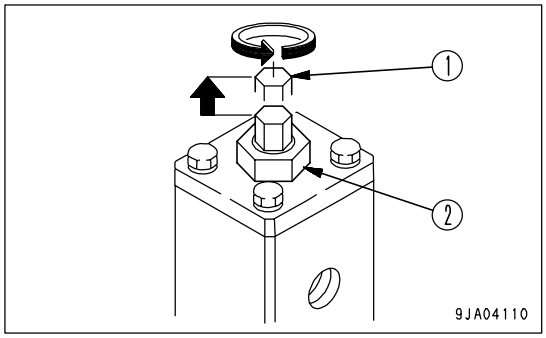
If it is necessary to adjust the oil flow, please ask your Komatsu distributor to carry out the adjustment.

Precautions When Using

- Check that the stopper valve is in the FREE position.



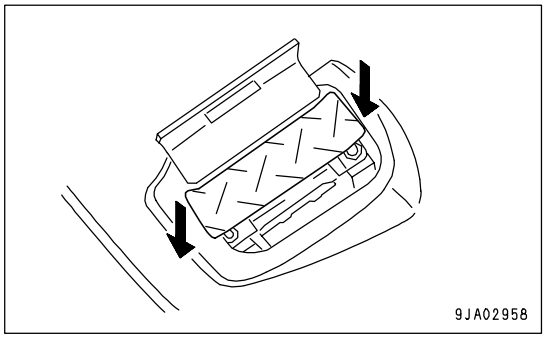
- Check that spool (1) of the selector valve is in the position for the breaker.
- Check that lock nut (2) of the selector valve is locked securely.



- For details of pther precautions when handling the breaker, read and use correctly the instruction manual provided by the breaker manufacturer.

When Using General Attachment

When the pedal is depressed, the attachment is actuated.

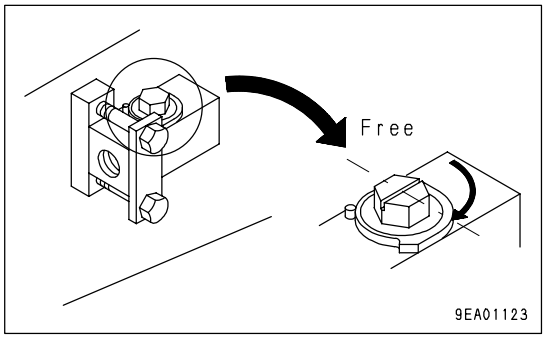


REMARK

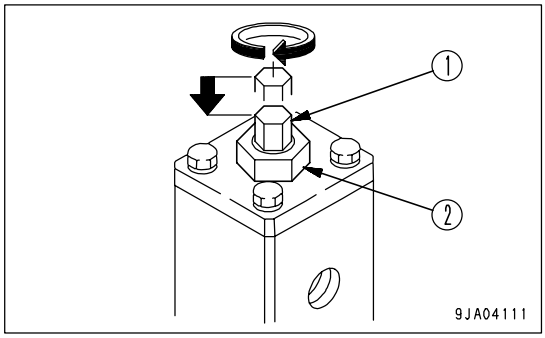
If it is necessary to adjust the oil flow, please ask your Komatsu distributor to carry out the adjustment.

Precautions When Using

- Check that the stopper valve is in the FREE position.



- Check that spool (1) of the selector valve is in the position for the general attachment.
- Check that lock nut (2) of the selector valve is locked securely.

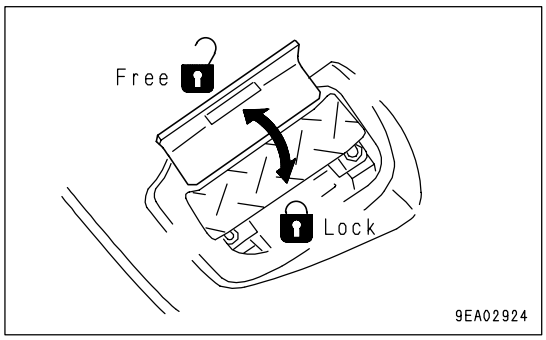


- For details of pther precautions when handling the attachment, read and use correctly the instruction manual provided by the attachment manufacturer.

LONG TERM STORAGE

If the machine is not to be used for a long time, do as follows.

- Set the stop valve in the LOCK condition.
- Install a blind plug to the elbow installed to the stop valve.
- Set the selector valve to the position for general attachment.
- Set the lock plate to the LOCK position to make it impossible to depress the pedal.



If the pedal is operated when a breaker or general attachment is not installed, it will cause overheating or other problems.

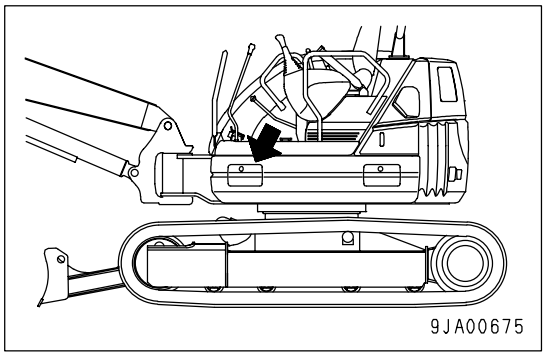
CHANGING MACHINE CONTROL PATTERN (IF PATTERN CHANGE VALVE EQUIPPED)

⚠ WARNING

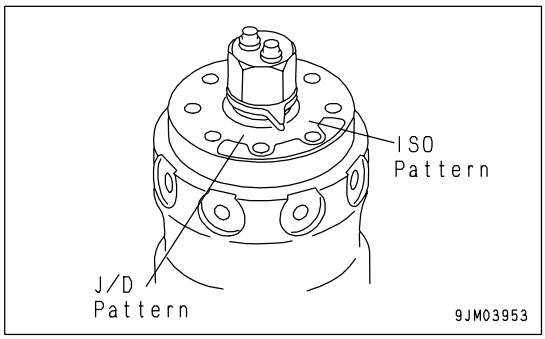
- **When changing the operating pattern of the machine, set the machine in the parking posture, stop the engine, check that the safety lock lever is at the LOCK position, then change the operating pattern.**
- **To prevent personal injury caused by mistaken operation, test operate the machine and check that the display on the operating pattern card is the same as the movement of the machine.**
  If it is not the same, replace the operating pattern card immediately with the card that matches the operating pattern.
- **When checking the movement of the machine, check carefully that the surrounding area is safe, and operate slowly.**

CONTROL PATTERN CHANGE PROCEDURE

1. After setting the machine in the parking posture, set the safety lock lever to the LOCK position, then stop the engine.
2. Open the inspection cover on the left side of the machine. The selector valve is inside.



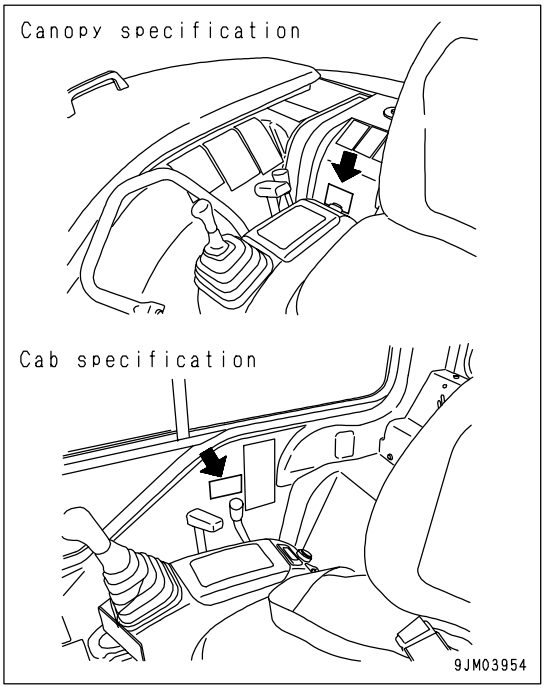
3. Change the pattern according to the operating plate stuck to the selector valve.
4. Change to an operating pattern card (insert it in the holder) that matches the selected operating pattern.
5. Start the engine, set the safety lock lever to the FREE position, operate the work equipment levers slowly, and check that the operating pattern has changed.



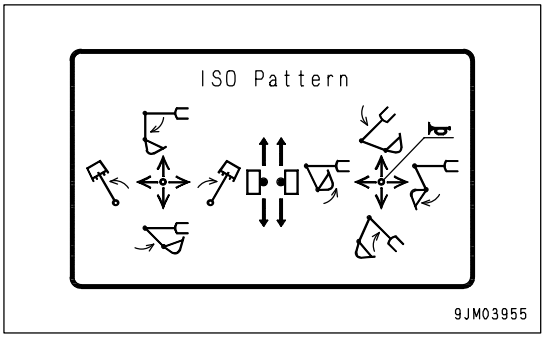
MACHINE CONTROL PATTERNS

WARNING

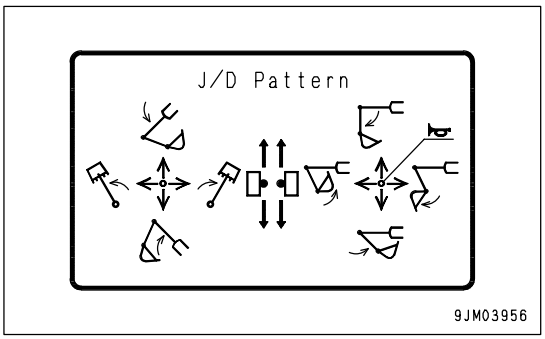
After changing the operating pattern, always change the operating pattern card in the operator's compartment.



- ISO pattern



- J/D pattern



ATTACHMENT GUIDE

WARNING

- **Please read the instruction manual for the attachment and the sections of this manual related to attachments and options.**
- **When installing any attachment or option, there may be problems with safety, so please contact your Komatsu distributor before installing.**
- **Installing attachments or options without consulting your Komatsu distributor may not only cause problems with safety, but may also have an adverse effect on the operation of the machine and the life of the equipment.**
- **Any injuries, accidents, or damage resulting from the use of unauthorized attachments or options will not be the responsibility of Komatsu.**

ATTACHMENT COMBINATIONS

WARNING

Depending on the type or combination of work equipment, there is danger that the work equipment may hit the cab or machine body.
When using unfamiliar work equipment for the first time, check before starting if there is any danger of interference, and operate with caution.

This table lists the combination of bucket which can be installed to the standard arm and long arm.
○: Can be used
△: Can be used only for light duty work
×: Cannot be used

NOTICE

- **When an A lock is installed and the bucket is pulled in fully, it will hit the boom cylinder cover, so operate carefully.**
- **When the boom is lowered fully for diagonal digging, it will hit the undercarriage, so operate carefully.**

Categories of use
For general digging: Digging or loading sand, gravel, clay etc.
For light duty digging: Digging or loading dry, uncaked earth and sand, mud etc.
For loading work: Loading dry, loose earth and sand

	Capacity [m^3 (cu/yd)]	Outside width [mm (in)]	Use	Standard arm	Long arm
Standard bucket	0.14(0.18)	600 (23.6)	General digging	○	×
Narrow bucket	0.11(0.14)	500 (19.7)	Narrow digging	○	○

RECOMMENDED ATTACHMENT OPERATIONS

Below described are instructions which must be followed without fail when doing the work using a hydraulic excavator equipped with an attachment.

NOTICE

Select the optimum model of attachment for a hydraulic excavator on which it is to be mounted.

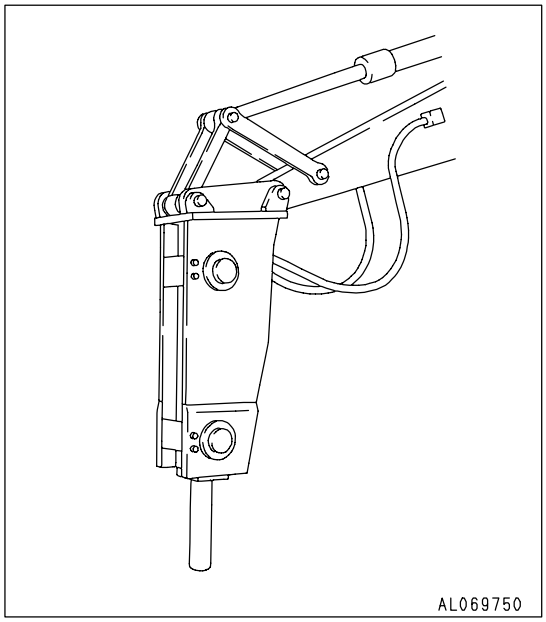
- **Depending on machine models of hydraulic excavator, the kind of attachments or the model of specific attachments that can be mounted will vary. Hence, consult your Komatsu distributor for the selection of optimum attachments.**

HYDRAULIC BREAKER

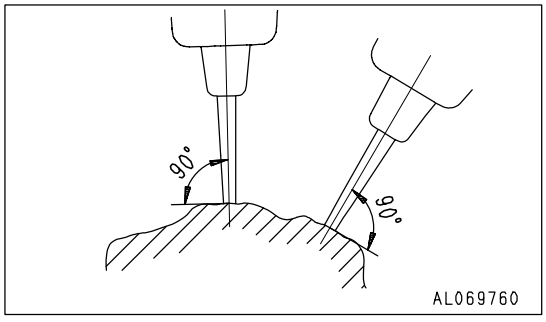
Main Applications

- Crushed rock
- Demolition work
- Road construction

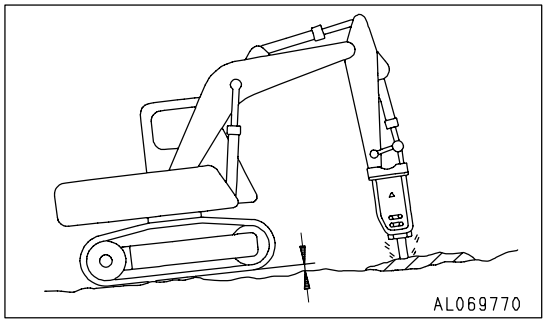
This attachment can be used for a wide range of applications including demolition of buildings, breaking up road surfaces or slag, tunnel work, rock crushing and breaking operations in quarries.



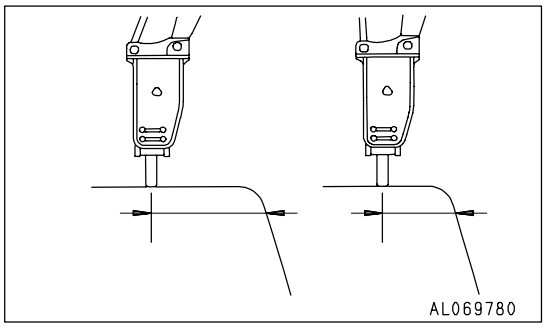
Keep the chisel pushed perpendicularly against the impact surface when carrying out breaking operations.



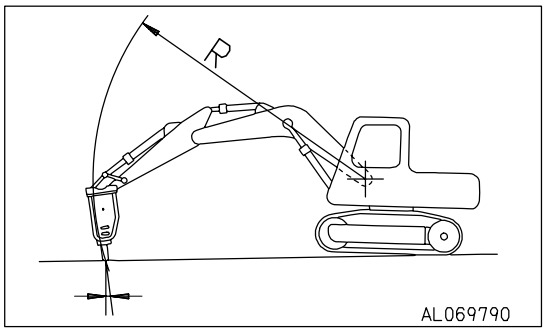
When applying impact, push the chisel against the impact surface and operate so that the chassis rises approx. 5 cm (2 in) off the ground. Do not let the machine come further off the ground than this amount.



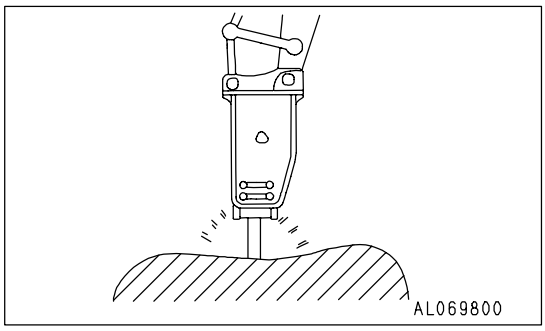
When applying continuous impact to the same impact surface, if the chisel does not penetrate or break the surface within 1 minute, change the point of impact and carry out breaking operations closer to the edge.



The direction of penetration of the chisel and the direction of the breaker body will gradually move out of line with each other, so always adjust the bucket cylinder to keep them aligned.



Always keep the chisel pressed against the impact surface properly to prevent using the impact force when there is no resistance.

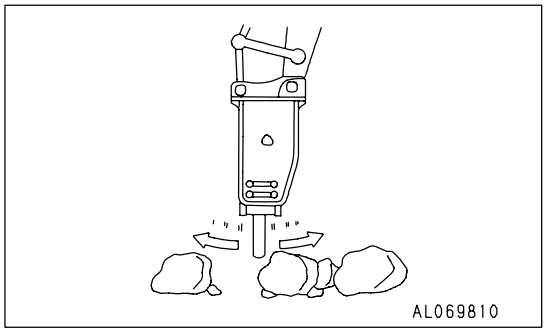


Prohibited Works

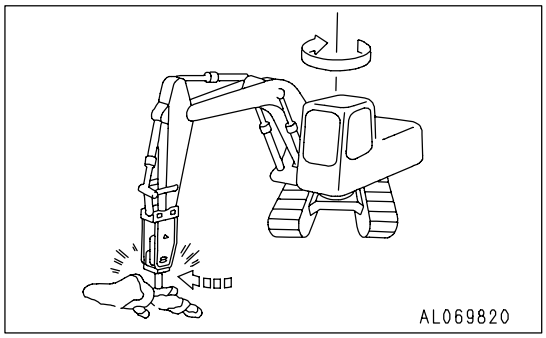
To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

- Do not operate all cylinders to the end of their strokes. Always leave approx. 5 cm (2 in) to spare.

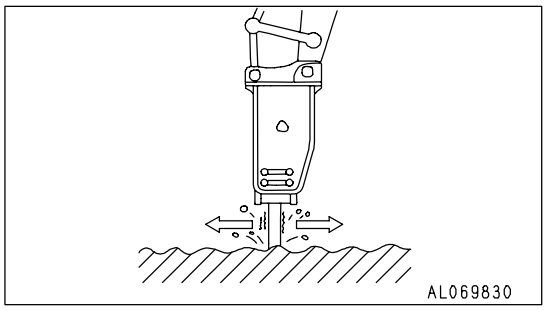
Using the mount to gather in pieces of rock



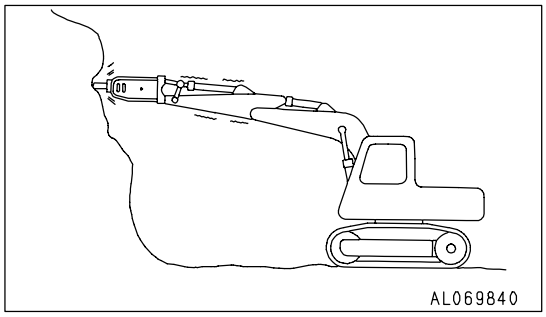
Operations using the swing force



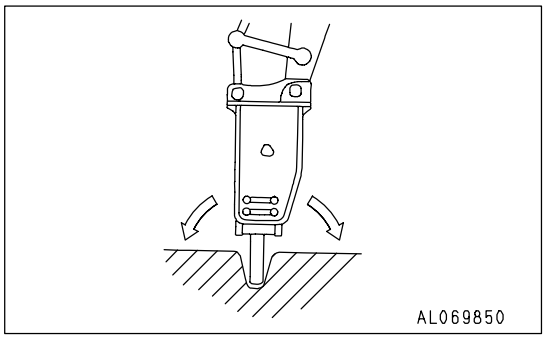
Moving the chisel while carrying out impacting operations



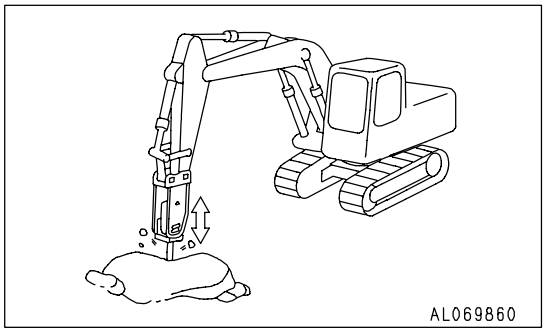
Holding the chisel horizontal or pointed up when carrying out impacting operations



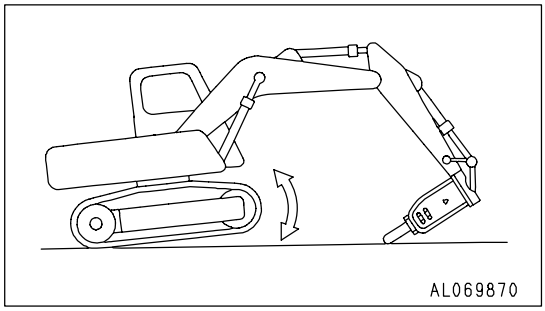
Twisting the chisel when it has penetrated the rock



Pecking operations

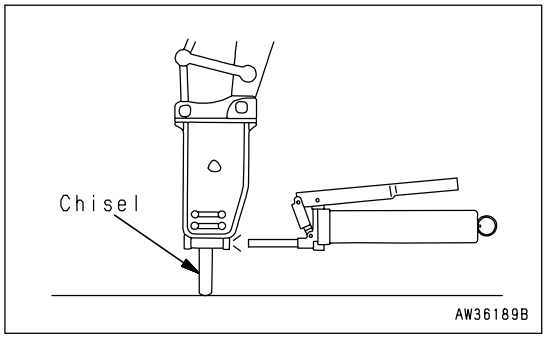


Extending the bucket cylinder fully and thrusting to raise the machine off the ground



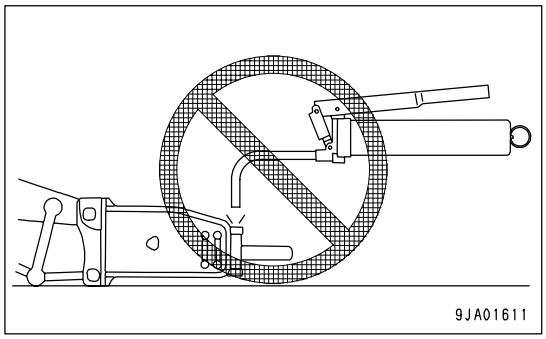
Greasing

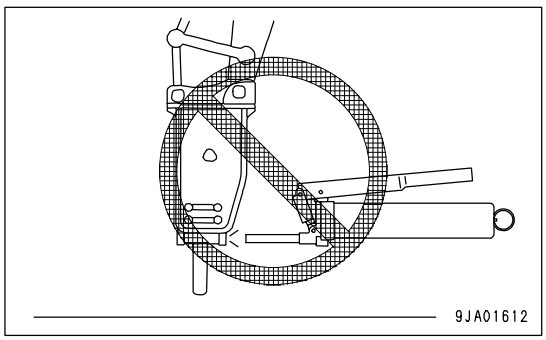
Supply grease in the correct position.



NOTICE

If the breaker is greased in an improper posture, it is filled with more grease than necessary. As a result, soil and san will enter the hydraulic circuit and can damage the hydraulic components, while the breaker is in use. Therefore, be sure to grease the breaker, holding it in the right posture.





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