Operation & Maintenance Manual

SEAM044900T

PC15MRX-1

HYDRAULIC EXCAVATOR

SERIAL NUMBERS 10001 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

Operators and maintenance personnel must always do as follows before beginning operation or maintenance.

- **Always be sure to read and understand this manual thoroughly before performing operation and maintenance.**
- **Read the safety messages given in this manual and the safety labels affixed to the machine thoroughly and be sure that you understand them fully.**

Keep this manual at the storage location for the Operation and Maintenance Manual given below, and have all personnel read it periodically.

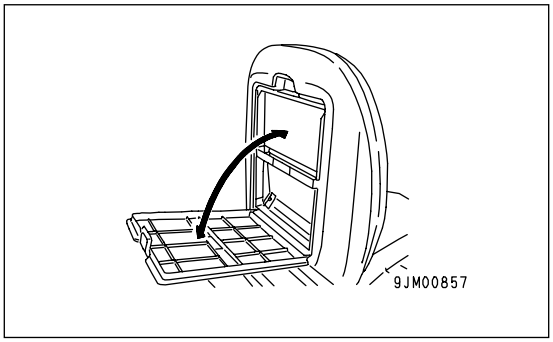
If this manual has been lost or has become dirty and cannot be read, request a replacement manual immediately from Komatsu or your Komatsu distributor.

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

Komatsu delivers machines that comply with all applicable regulations and standards of the country to which it has been shipped. If this machine has been purchased in another country or purchased from someone in another country, it may lack certain safety devices and speciffications that are necessary for use in your country. If there is any question about whether your product complies with the applicable standards and regulations of your country, consult Komatsu or your Komatsu distributor before operating the machine.

Storage location for the Operation and Maintenance Manual:

Manual luggage box behind operator's seat



EMISSION CONTROL WARRANTY

EMISSION CONTROL WARRANTY STATEMENT (APPLIES TO CANADA ONLY)

1. Products Warranted

Komatsu America International Company, Komatsu Mining Systems Inc. and Komatsu Utility Corporation (collectively "Komatsu") produce and/or market products under brand names of Komatsu, Dresser, Dressta, Haulpak and Galion. This emissions warranty applies to new engines bearing the Komatsu name installed in these products and used in Canada in machines designed for industrial off-highway use. This warranty applies only to these engines produced on or after January 1, 2000. This warranty will be administered by Komatsu distribution in Canada.

2. Coverage

Komatsu warrants to the ultimate purchaser and each subsequent purchaser that the engine is designed, built and equipped so as to conform, at the time of sale by Komatsu, with all U.S. Federal emission regulations applicable at the time of manufacture and that it is free from defects in workmanship or material which would cause it not to meet these regulations within five years or 3,000 hours of operation, whichever occurs first, as measured from the date of delivery of the engine to the ultimate purchaser.

3. Limitations

Failures, other than those resulting from defects in materials or workmanship, are not covered by this warranty. Komatsu is not responsible for failures or damage resulting from what Komatsu determines to be abuse or neglect, including, but not limited to: operation without adequate coolant or lubricants; over fueling; over speeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the engine. Komatsu is also not responsible for failures caused by incorrect fuel or by water, dirt or other contaminants in the fuel. Komatsu is not responsible for non-engine repairs, "downtime" expense, related damage, fines, all business costs or other losses resulting from a warrantable failure.

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 PARTICUALR PURPOSE.**

GARANTIE SUR LE CONTRÔLE DES ÉMISSIONS

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

1. Produits garantis:

Komatsu America International Company, Komatsu Mining Systems Inc. et Komatsu Utility Corporation (collectivement Komatsu) produisent et/ou font la mise en marché de produits portant les noms de marque Komatsu, Dresser, Dressta, Haulpak et Galion. Cette garantie sur les émissions s'applique à tous les nouveaux moteurs portant le nom Komatsu, installés dans ces produits et utilisés au Canada dans des machines conçues pour utilisation industrielle non-routière. Cette garantie s'applique seulement sur les moteurs produits à partir du 1er Janvier 2000. Cette garantie sera administrée par la distribution de Komatsu au Canada.

2. Couverture:

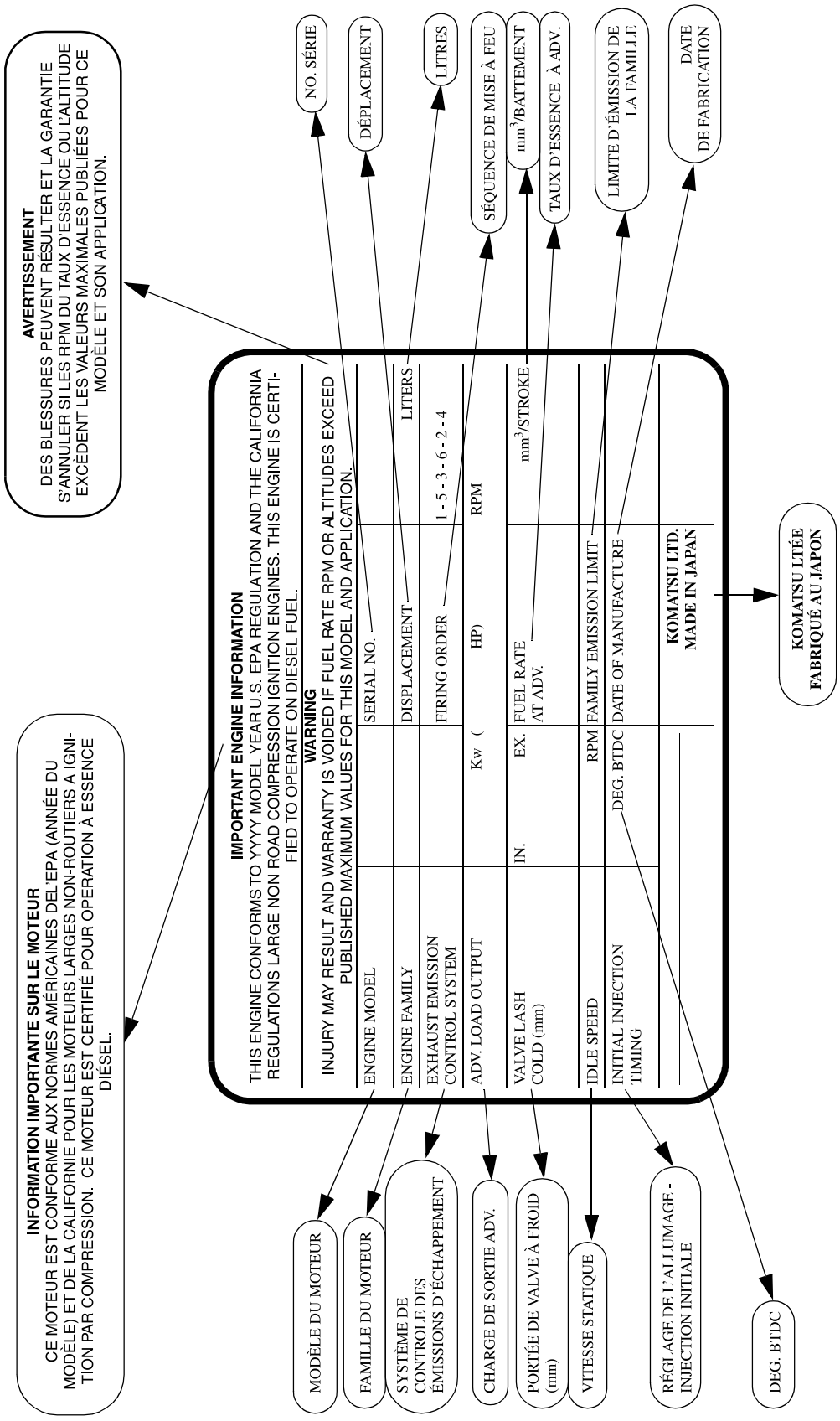
Komatsu garantit à l'acheteur ultime et chaque acheteur subséquent que le moteur est conçu, construit et équipé en toute conformité, au moment de la vente par Komatsu, avec toutes les Réglementations fédérales américaines sur les émissions applicables au moment de la fabrication et qu'il est exempt de défauts de construction ou de matériaux qui auraient pour effet de contrevenir à ces réglementations en dedans de 5 ans ou 3000 heures d'opération, mesuré à partir de la date de livraison du moteur au client ultime.

3. Limitations:

Les bris, autres que ceux résultant de défauts de matériaux ou de construction, ne sont pas couverts par cette Garantie. Komatsu n'est pas responsable pour bris ou dommages résultant de ce que Komatsu détermine comme étant de l'abus ou négligence, incluant mais ne se limitant pas à: l'opération sans lubrifiants ou agent refroidissants adéquats; la suralimentation d'essence; la survitesse; le manque d'entretien des systèmes de lubrification, de refroidissement ou d'entrée; de pratiques non-propices d'entreposage, de mise en marche, de réchauffement, de conditionnement ou d'arrêt; les modifications non-autorisées du moteur. De plus, Komatsu n'est pas responsable de bris causés par de l'essence inadéquate ou de l'eau, des saletés ou autres contaminants dans l'essence. Komatsu n'est pas responsable des réparations non-reliées au moteur, des dépenses encourues suite aux temps d'arrêts, des dommages relatifs, amendes, et de tout autre coût d'affaires ou autres pertes résultant d'un bris couvert par la garantie.

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 A UNE UTILISATION PARTICULIÈRE.**



ENGINE DATAPLATE - 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. This signal word is to be limited to most extreme situations.

⚠ 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. It may also be used to alert against unsafe practices.

Example of safety message using signal word

⚠ WARNING

To avoid hitting unlocked operation levers, lower equipment to ground and move SAFETY LOCK LEVER (located near seat) to LOCK position before starting up from operator's seat.
Sudden and unwanted machine movement can cause 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 are useful to know.

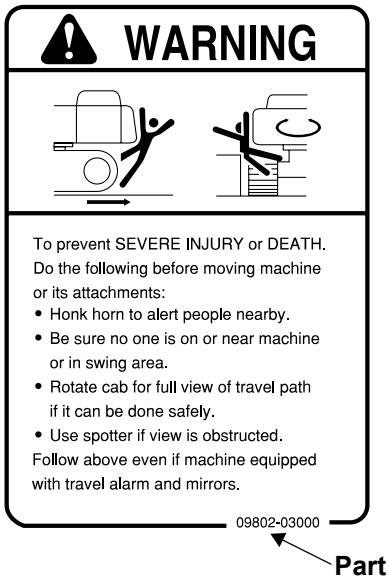
NOTICE This word is used for precautions that must be taken to avoid actions which could shorten the life of the machine.

REMARK This gives 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))

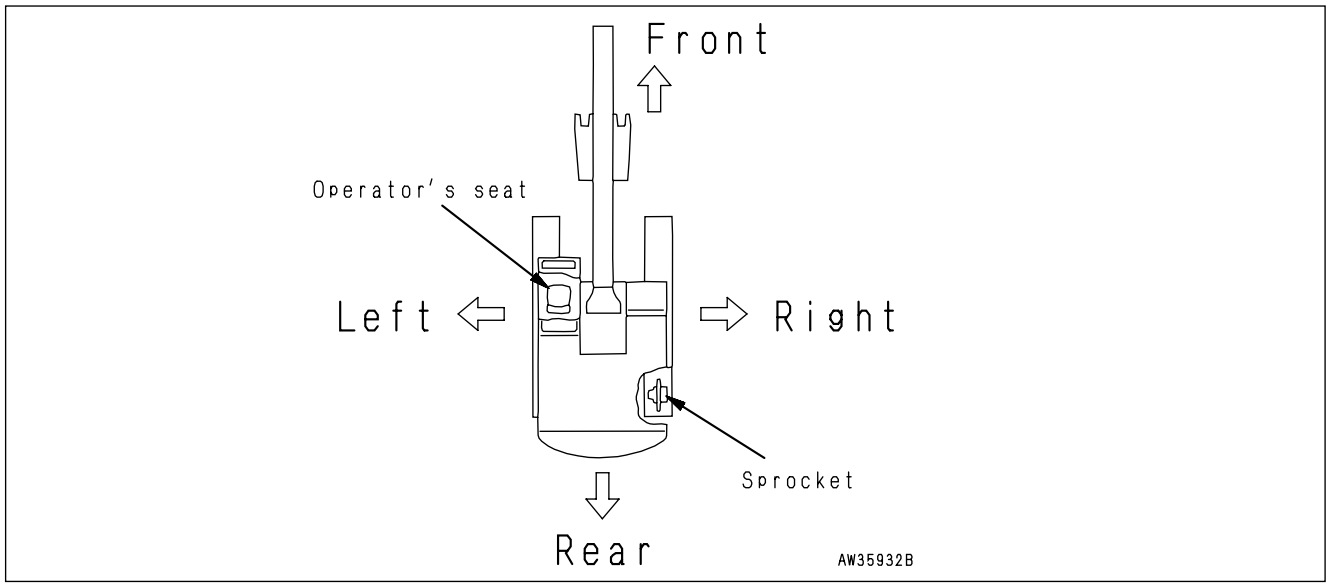
INTRODUCTION

This Komatsu HYDRAULIC EXCAVATOR is designed to be used mainly for the following works:

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

See the section "RECOMMENDED APPLICATIONS (PAGE 3-54)" for further details.

DIRECTIONS OF MACHINE



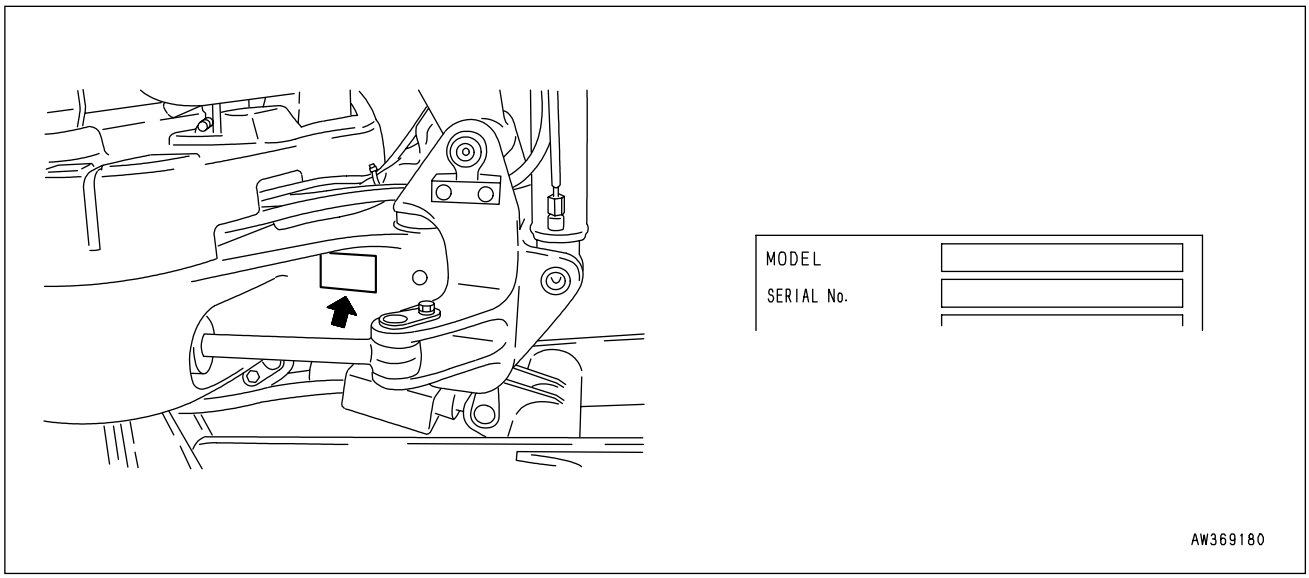
In this manual, the terms front, rear, left, and right refer to the travel direction as seen from the operator's cab when the operator's cab is facing the front and the sprocket is at the rear of the machine.

PRODUCT INFORMATION

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

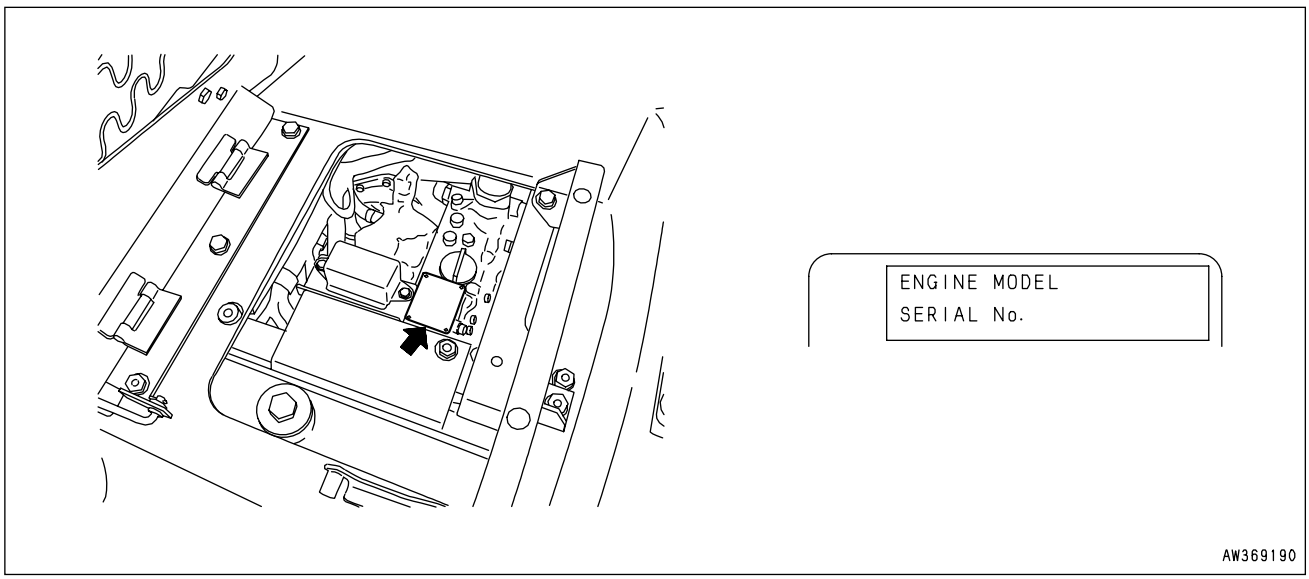
MACHINE SERIAL NUMBER PLATE AND ITS LOCATION

At the right side of the boom swing mount



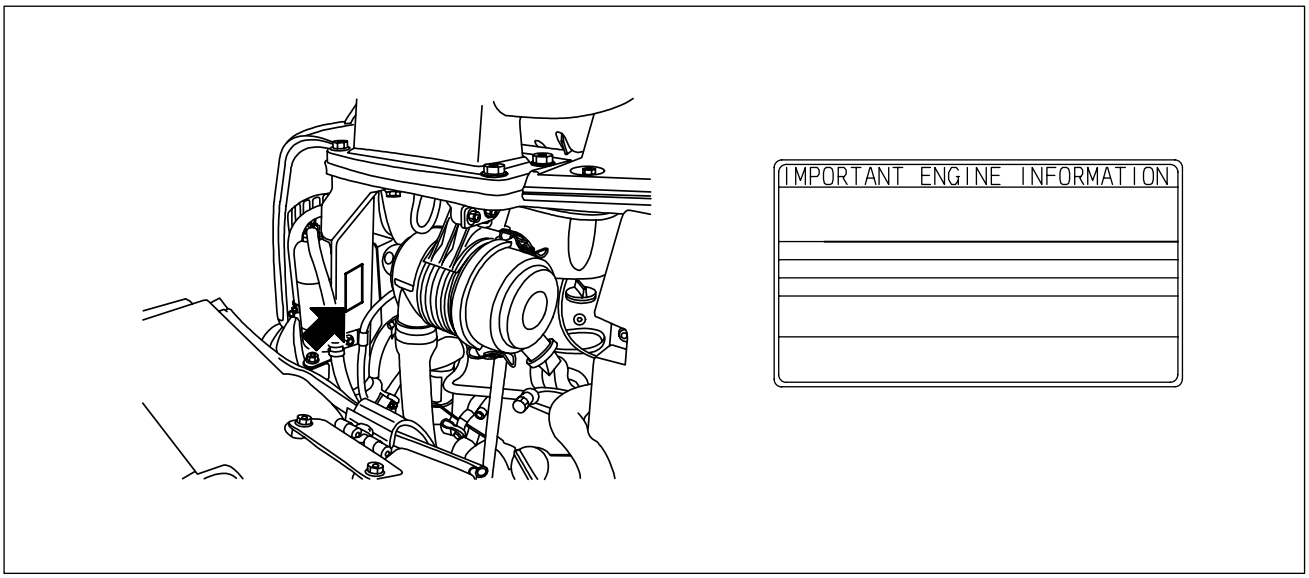
ENGINE SERIAL NUMBER PLATE AND ITS LOCATION

On the upper side of the engine cylinder head cover



EMISSION CONTROL INFORMATION LABEL

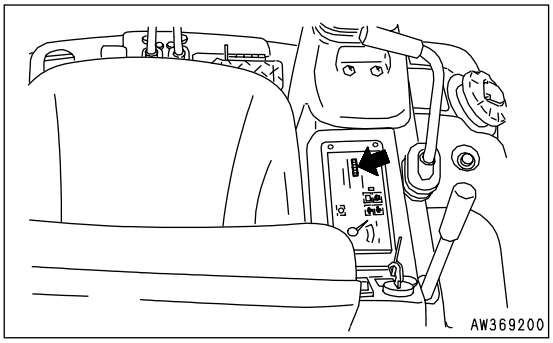
Inside surface of the left rear leg of the operatar's seat stand.



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 Personal Phone/Fax	

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SAFETY

⚠ WARNING

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

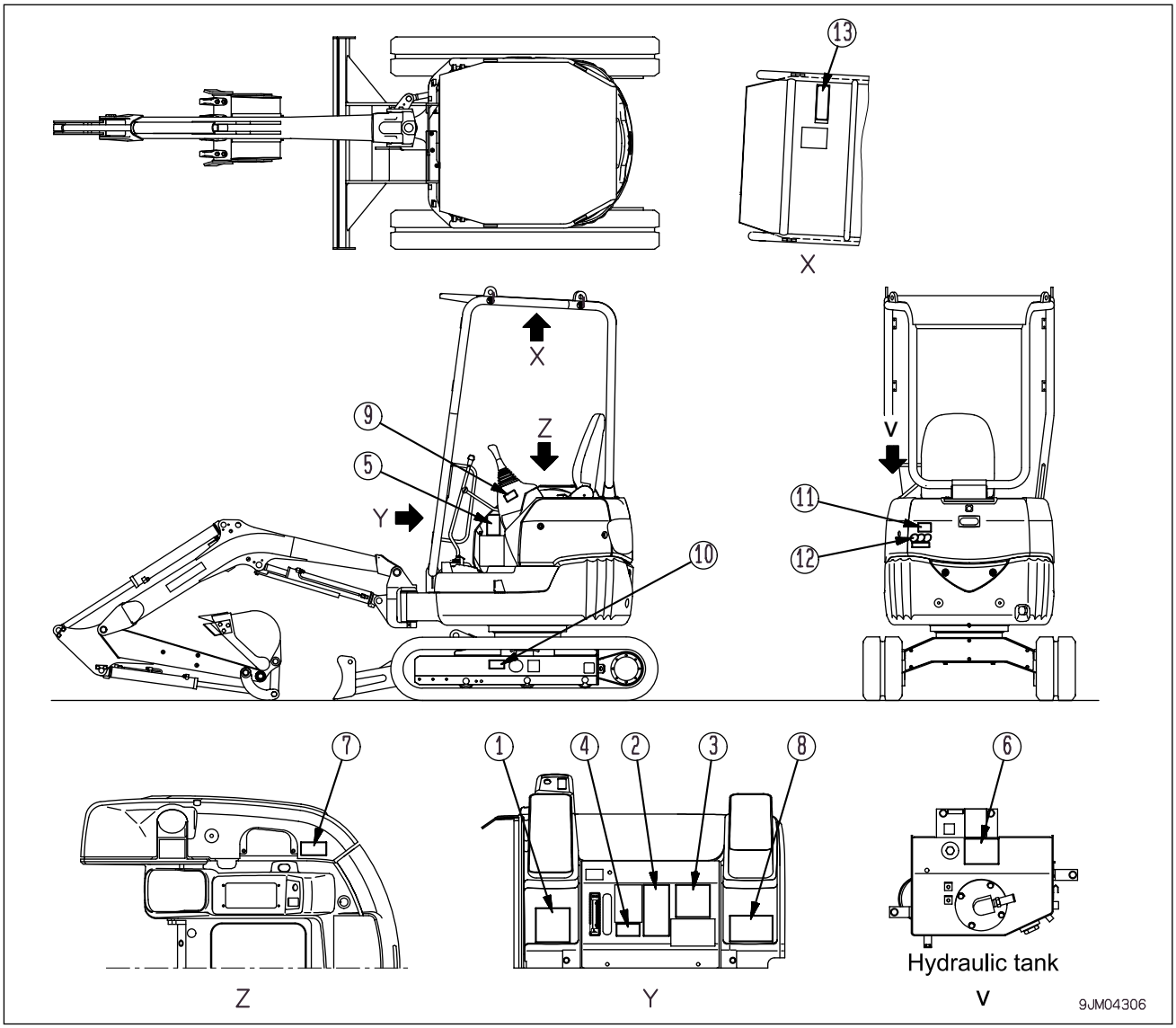
SAFETY INFORMATION

POSITION FOR ATTACHING SAFETY LABELS

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

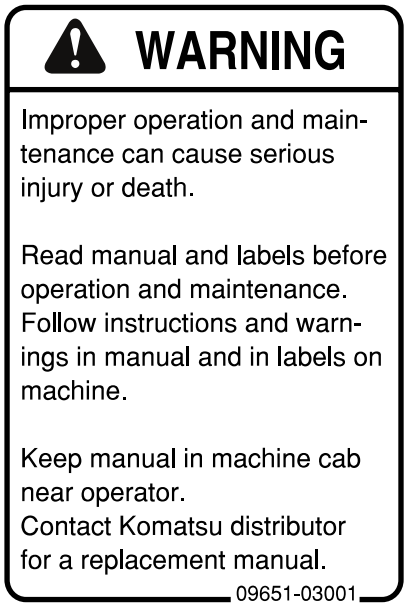
- Be sure that you fully understand the correct position and content of labels.
- To ensure that the content of labels can be read properly. Be sure that they are in the correct place and always keep them clean. When cleaning them, do not use organic solvents or gasoline, there may cause the labels to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

POSITION FOR ATTACHING SAFETY LABELS

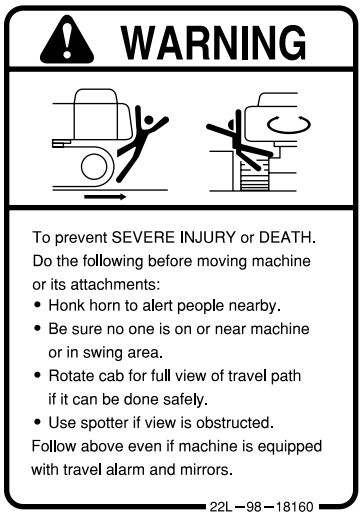


SAFETY LABELS

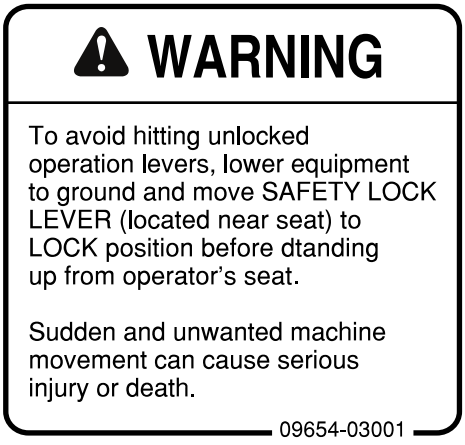
(1) Precautions for operation, inspection and maintenance (09651-03001)



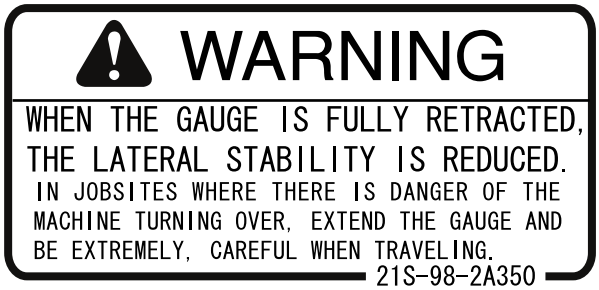
(2) Precautions for operation (22L-98-18160)



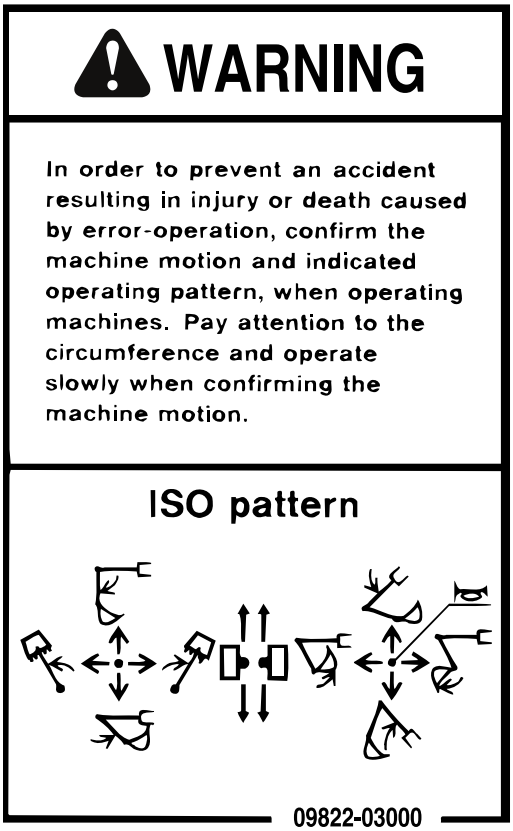
(3) Precautions for leaving the operator's seat (09654-03001)



(4) Precautions for minimum variable gauge (21S-98-2A350)

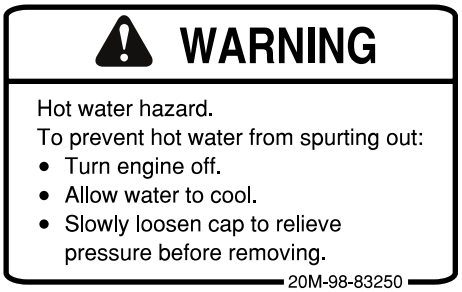


(5) Precautions for operating pattern
Standard machine (09822-03000)

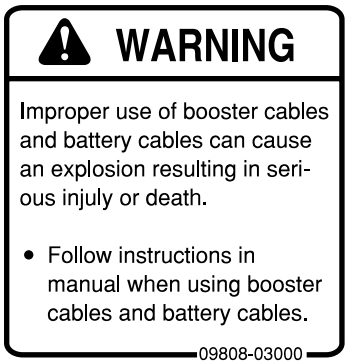


(6) Warning for hot oil hazard (09653-03001)

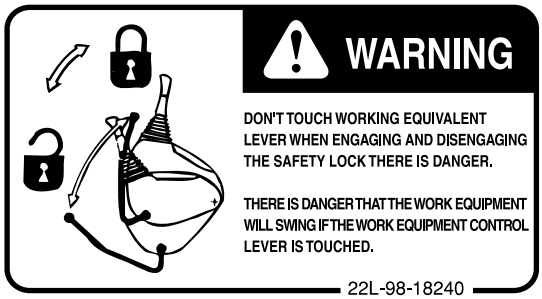
(7) Warning for hot water hazard (20M-98-83250)



(8) Precautions for handling electric wires
(09808-03000)



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



(10) Precautions for check and adjust track tension (09657-03003)

(11) Precautions for opening engine hood (09667-03001)

(12) Prohibited to enter range of swing (21R-98-18120, 21R-98-18130)

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

SAFETY INFORMATION

SAFETY RULES

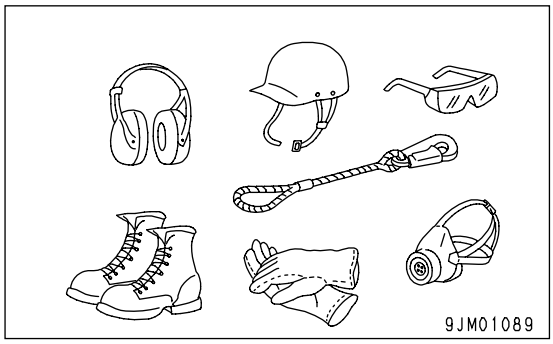
- Only trained and authorized personnel can operate and maintain the machine.
- Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
- If you are under the influence of alcohol or medication, your ability to safely operate or repair your machine 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

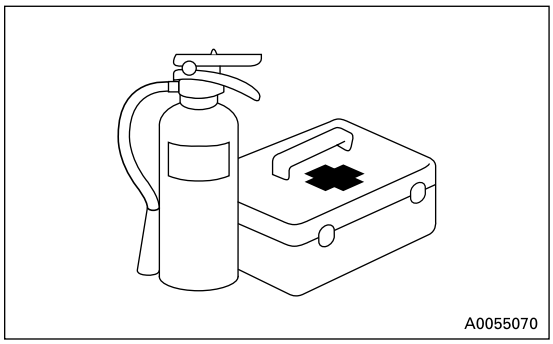
- Do not wear loose clothing and accessories. There is a hazardthat they may catch on control levers or other protruding parts.
- If you have long hair and it hangs out from your hard hat, there is a hazard that it may get caught up in the machine, so tie your hair up and be careful not to let it get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

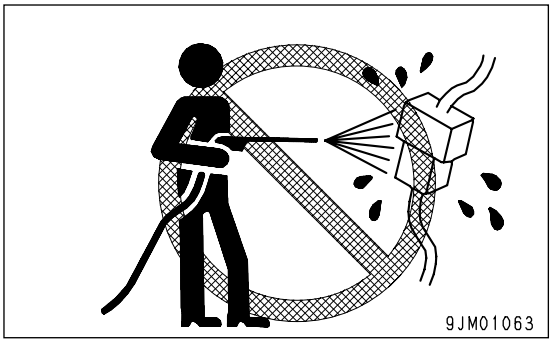


SAFETY EQUIPMENT

- 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.

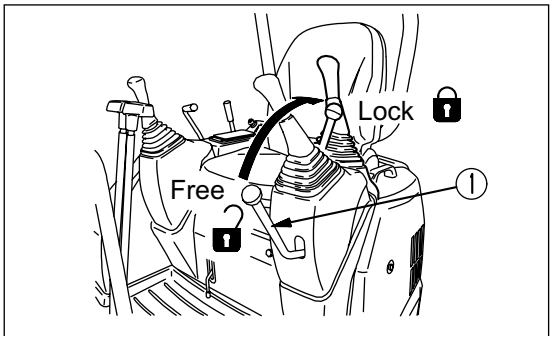


KEEP OPERATOR'S COMPARTMENT CLEAN

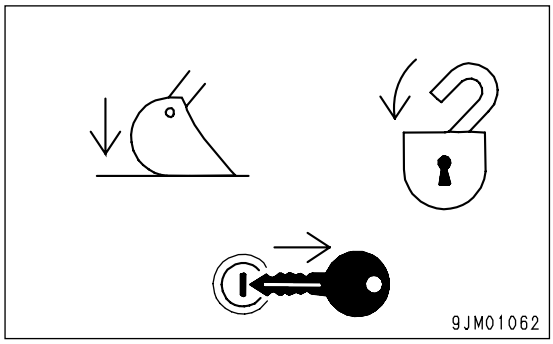
- When entering the operator's compartment, always remove all mud and oil from the soles of your shoes. If you operate the pedal with mud or oil affixed to your shoes, your foot may slip and this may cause a serious accident.
- Do not leave parts or tools lying around the operator's compartment.
- Do 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 cab.

LEAVING OPERATOR'S SEAT WITH LOCK

- Before standing up from the operator's seat (such as when opening or closing the front window or roof window, or when removing or installing the bottom window, or when adjusting the operator's seat), 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.



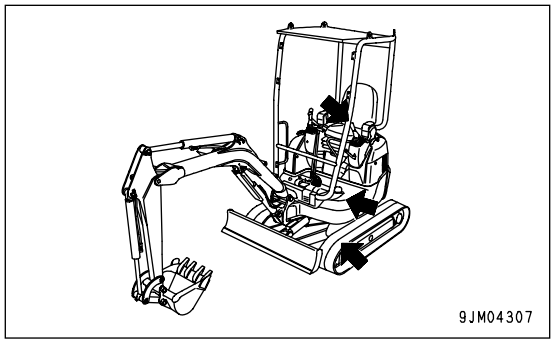
- When leaving the machine, always lower the work equipment completely to the ground, set safety lock lever (1) securely to the LOCK position, then stop the engine. Use the key to lock all the equipment. Always remove the key, take it with you, and keep it in the specified place.



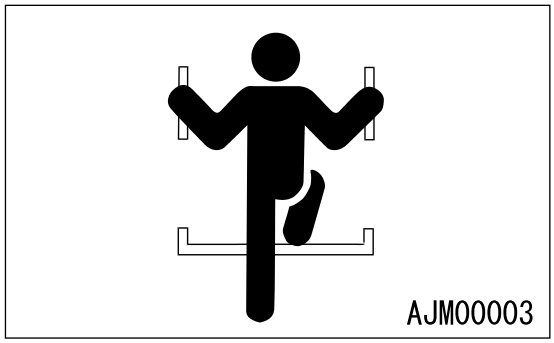
HANDRAILS AND STEPS

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.
- Use only the inspection path fitted with non-slip pads when climbing on top of 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.

CRUSHING OR CUTTING PREVENTION

Do not put your hand, arm or any other part of your body between movable parts such as the work equipment and cylinders, or between the machine and work equipment.When the work equipment is operated, the clearance will change and this may lead to serious damage or personal injury.

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.

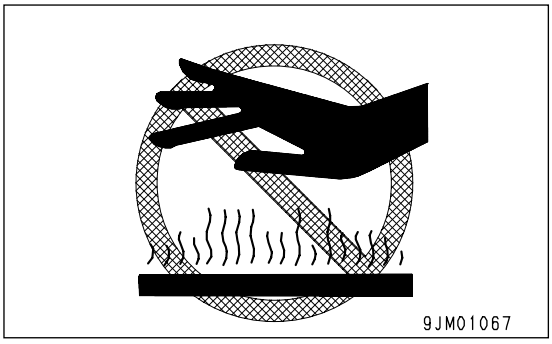
NO PERSONS ON ATTACHMENTS

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

BURN PREVENTION

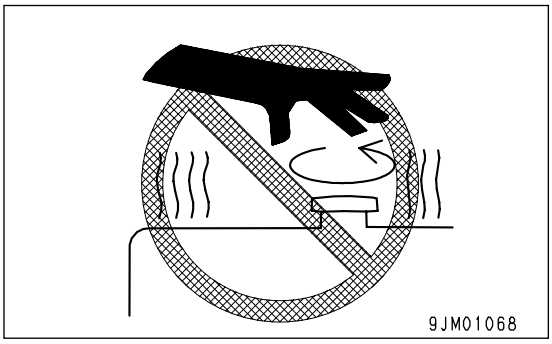
Hot coolant

- 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.



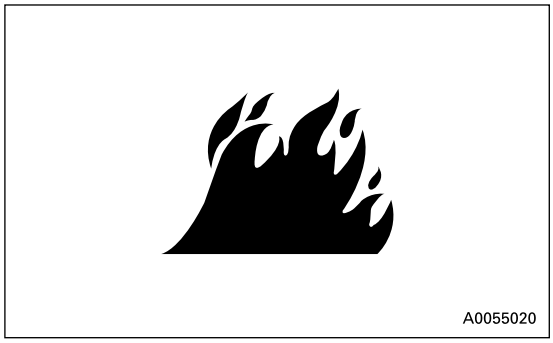
Hot oil

- To prevent burns from oil spurting out out or from contact with hot parts when checking or draining the oil, wait for the oil to cool to a 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.

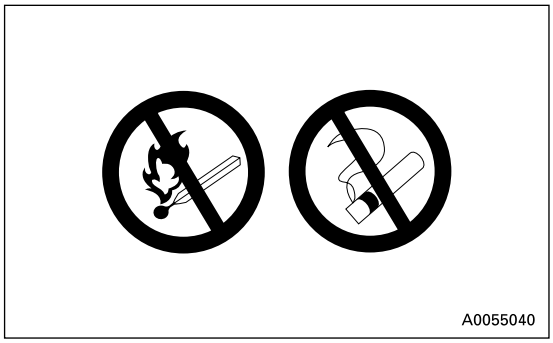


FIRE PREVENTION AND EXPLOSION PREVENTION

- **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, use explosion-proof lighting. If you do not use explosion-proof lighting, there is a hazard of serious injury or damage caused by explosion.
  - When taking the electrical power for the lighting from the machine, follow the instructions in this manual.

ACTION IF FIRE OCCURS

If a fire occurs, escape from the machine as follows.

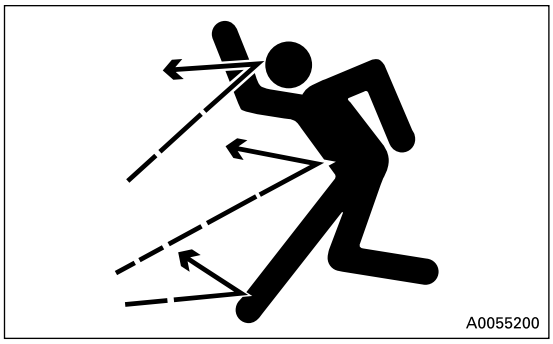
- Turn the starting switch OFF and stop the engine.
- Use the handrails and steps to get off the machine.

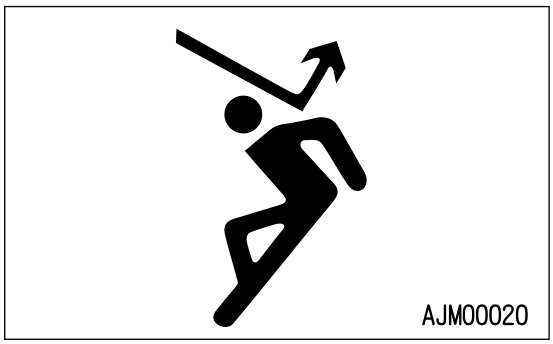
WINDSHIELD WASHER FLUID

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 carrying out operations in mines, quarries, or other places where there is danger of falling rocks, fit FOPS and a front guard, and stick a laminated coating sheet to 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, so please 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 WIDOW 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

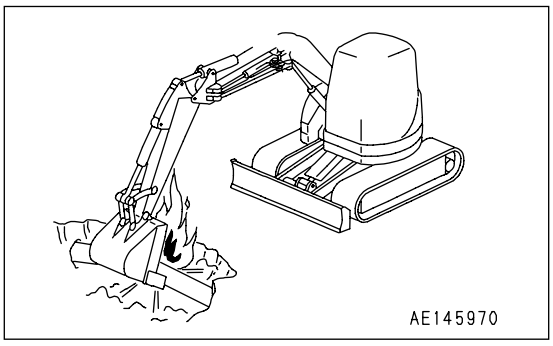
Any modification mode without authorization from Komatsu can create hazards. Before making a modification, consult your Komatsu distributor.

- Komatsu will not be responsible for any injuries, accidents, or product failures 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 combustable 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 necessary measures to prevent any unauthorized person from entering the operating area.
- 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.



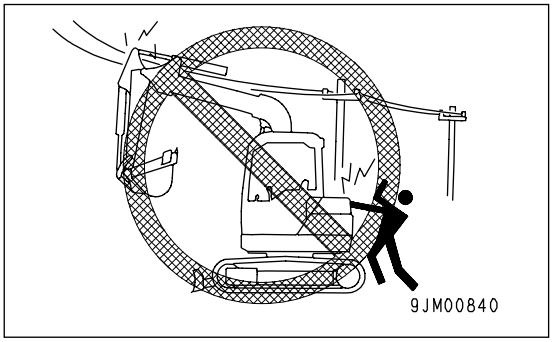
WORKING ON LOOSE GROUND

- 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	Min. safety distance
Low voltage	100V 200V	2m
	6,600V	2m
Very high voltage	22,000V	3m
	66,000V	4m
	154,000V	5m
	187,000V	6m
	275,000V	7m
	500,000V	11m

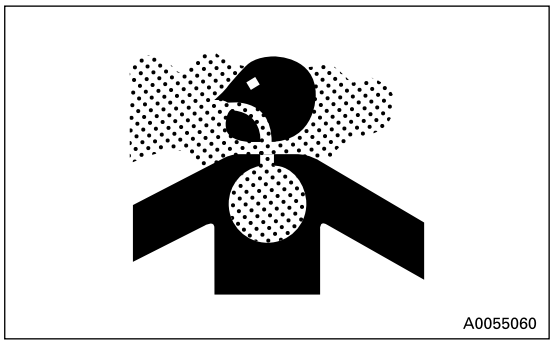
ENSURE GOOD VISIBILITY

- 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.
  - Position a signalman if there are areas at the rear of the machine where the visibility is not good.
  - 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.



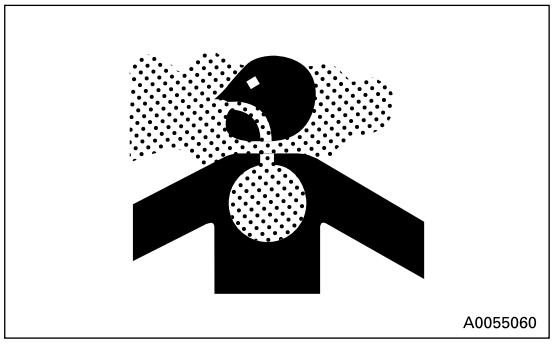
SIGNALMAN'S SIGNAL AND SIGNS

- 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.

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.



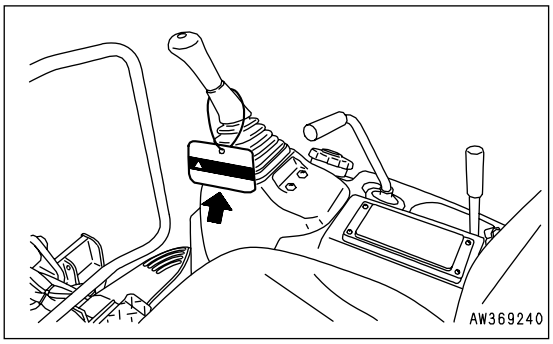
- Do not allow other persons to approach during the operation.
- Always observe the rules and regulations for the work site and environmental standards.

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 front lamps and working lamps, and check that they light up correctly.
- Check the coolant level, fuel level, and oil level in engine oil pan, check for clogging of the air cleaner, and check for damage to the electric wiring.
- 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, check that the safety lock lever is at the LOCK position.
- 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. It is not only dangerous, but will also cause damage to the equipment.

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.
  Before charging or starting the engine with a different power source, melt the battery electrolyte and check for frost and leakage of battery electrolyte before starting.

OPERATION

CHECKS AFTER STARTING ENGINE

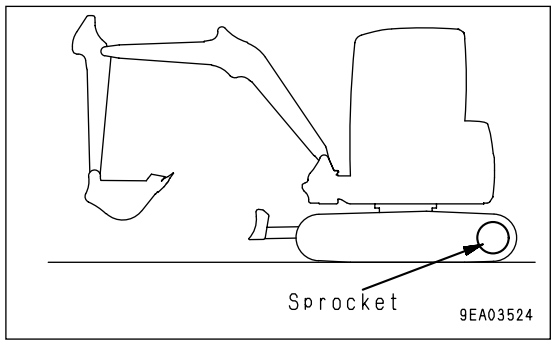
When carrying out the checks, move the machine to a wide area where there are no obstructions, and operate slowly. Do not allow anyone near the machine.

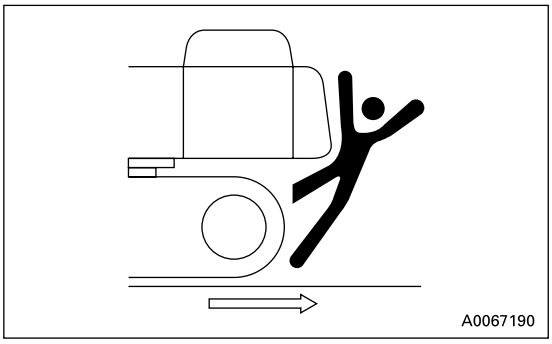
- Check that the movement of the machine matches the display on the control pattern card. If it does not match, replace it immediately with the correct control pattern card.
- Check the operation of the gauges and equipment, and check the operation of the bucket, arm, boom, travel system, swing system, and steering 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.

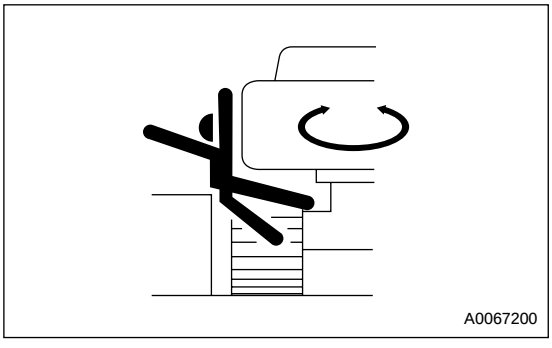
SAFETY RULES FOR CHANGING MACHINE DIRECTIONS

- Position the upper structure so that the sprocket is at the rear of the operator's cab before traveling.
  If the sprocket is at the front of the operator's cab, the direction of operations is reversed (for example, forward becomes reverse, and left becomes right).
- 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 fasten your seat belt.
- 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.
- If there is an area to the rear of the machine which cannot be seen, position a signal person. Take special care not to hit other machines or people when turning or swinging the machine.

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

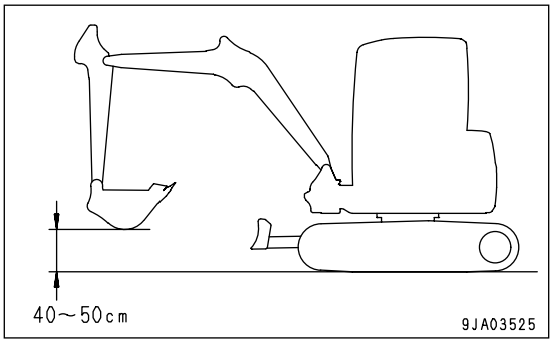




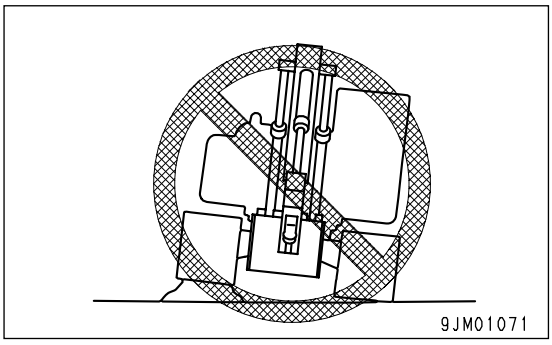


SAFETY RULES FOR TRAVELING

- It is dangerous to drive too fast, or to start suddenly, stop suddenly, or to turn sharply.
- When traveling on level ground, pull in the work equipment and keep it at a height of 40 to 50cm (16 to 20 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.
- When traveling on rough ground or steep slopes, if the machine is equipped with auto-deceleration, always turn the auto-deceleration switch OFF (cancel). If the auto-deceleration is ON, the engine speed may rise and the travel speed may suddenly increase.
- 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.

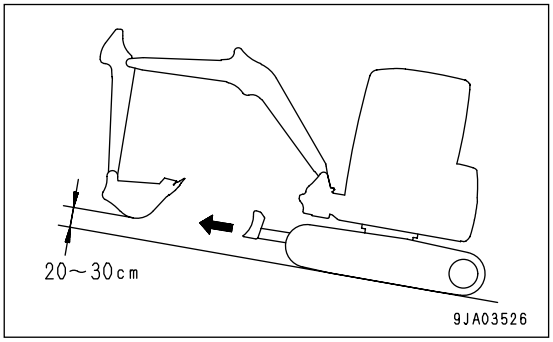


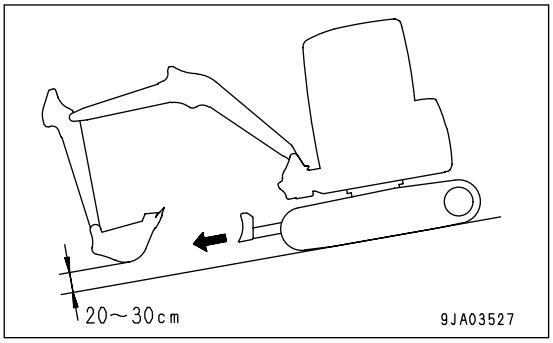
- When traveling or carrying out operations, always keep a safe distance from people, structures, or other machines to avoid coming into contact with them.
- When passing over bridges or structures, check first that the structure is strong enough to support the weight of the machine.
  When traveling 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

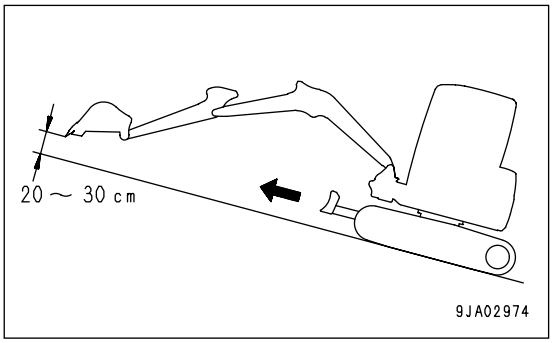
To prevent the machine from tipping over or slipping to the side, always do as follows.

- When traveling on slopes, keep the work equipment approximately 20 to 30cm (8 to 12 in) above the ground. In case of emergency, quickly 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.

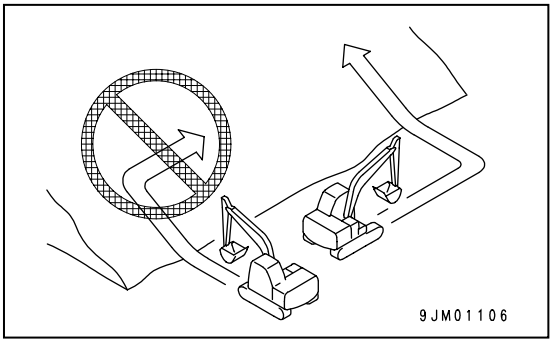




- When traveling up a steep slope, extend the work equipment to the front to improve the balance, keep the work equipment approximately 20 to 30cm (8 to 12 in) above the ground, and travel at low speed.
- When traveling downhill, lower the engine speed, keep the travel lever close to the neutral position,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

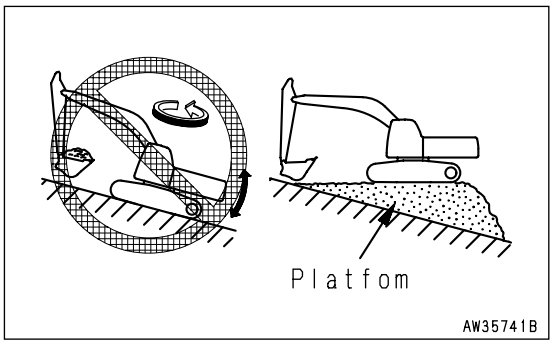


- Always travel straight up or down a slope. Traveling at an angle or across the slope is extremely dangerous.
- Do not turn on slopes or travel across slopes. Always go down to a flat place to change the position of the machine, then travel on to the slope again.
- Travel on grass, fallen leaves, or 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.



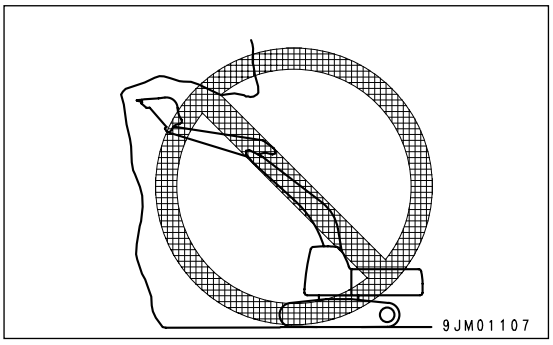
OPERATIONS ON SLOPES

- 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.

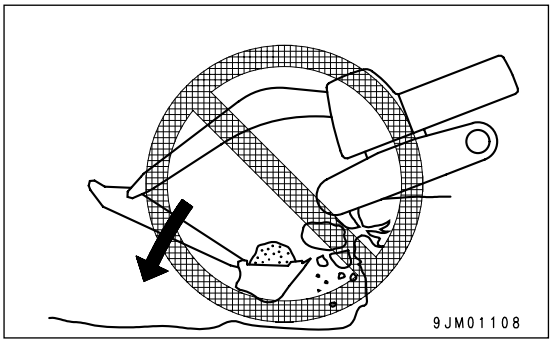


PROHIBITED OPERATIONS

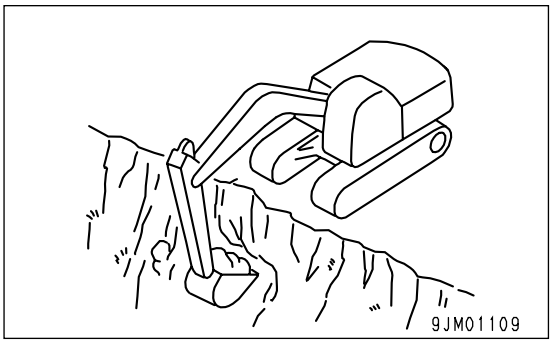
- Never dig the work face under an overhang. There is a hazard that rocks may fall or that the overhang may collapse and fall on top of the machine.



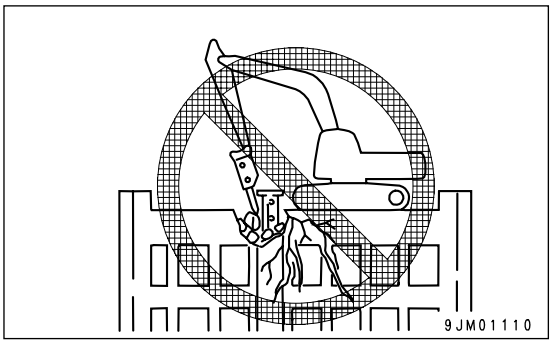
- Do not excavate too deeply under the front of the machine. The ground under the machine may collapse and cause the machine to fall.



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

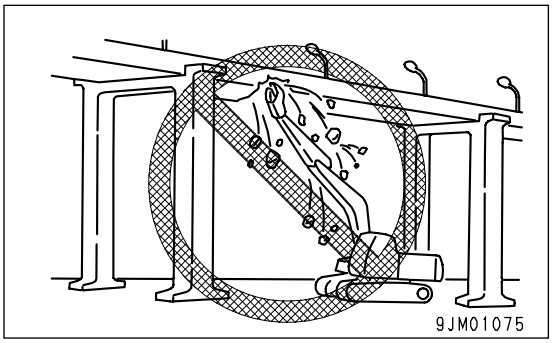


- Do not carry out demolition work under the machine. There is a hazard that the machine may become unstable and tip over.



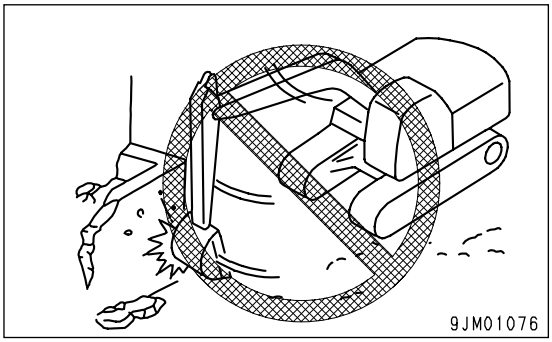
- When working on or from the top of buildings or other structures, check the strength and the structure before starting operations.
  There is a hazard of the building collapsing and causing serious injury or damage.

- 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 personal injury or property damage being caused by flying pieces of broken material or damage to the work equipment.

- 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.



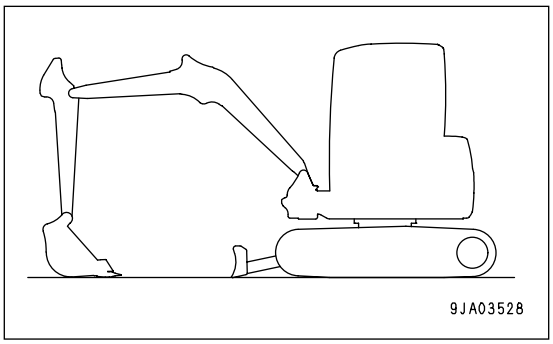
- When using a breaker or other heavy work equipment, there is a hazard of the machine losing its balance and tipping over. When operating on flat ground as well as on slopes.
  - Do not suddenly lower, swing, or stop the work equipment.
  - Do not suddenly extend or retract the boom cylinder. There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

OPERATIONS ON SNOW

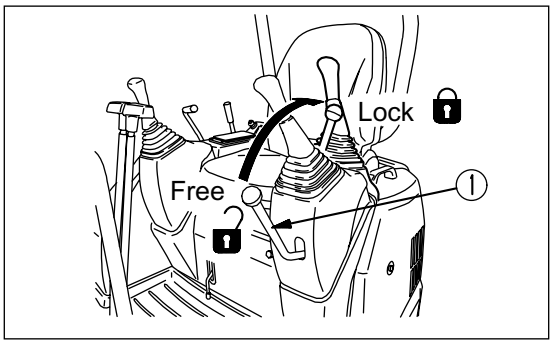
- Snow-covered or frozen surfaces are slippery, so be extremely careful when traveling or operating the machine, and do not operate the levers suddenly. Even a slight slope may cause the machine to slip, so be particularly careful when working on slopes.
- With frozen ground surfaces, the ground becomes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

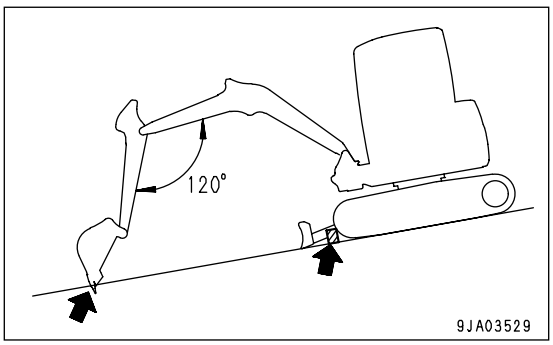
PARKING MACHINE

- 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.

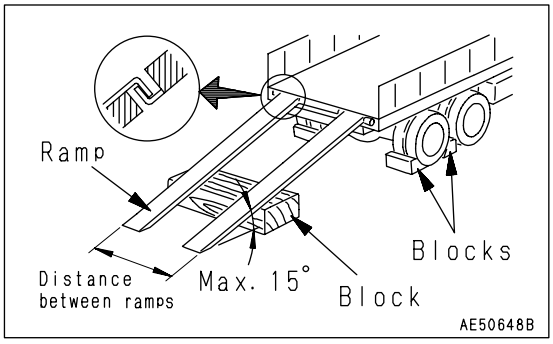




TRANSPORTATION

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, take extremely careful since the ramp surface is slippery.
- Run the engine at low speed, and operate the machine slowly.
- Never correct your steering on the ramps. If necessary, drive off the ramps, correct the direction, then enter the ramps again.
- When on the ramps, do not operate any lever except for the travel lever.
- 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 loading the machine. If this is not done, the door may suddenly open during transportation.
  Refer to "TRANSPORTATION (PAGE 3-64)".

SHIPPING THE MACHINE

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

- Investigate all state and local laws governing the weight, width, and length of a load. If necessary, disassemble the work equipment. The width, height and weight of the load differ according to the work equipment, so take this into account when determining the shipping route.
- 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 3-64) in the OPERATION section.

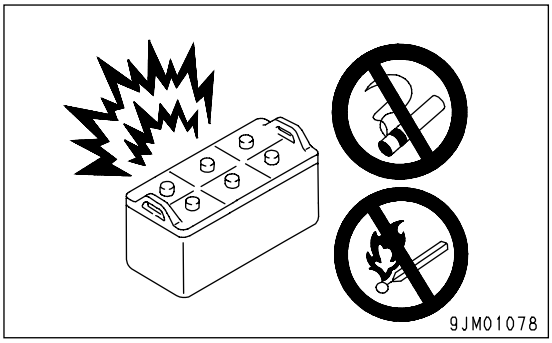
BATTERY

BATTERY HAZARD PREVENTION

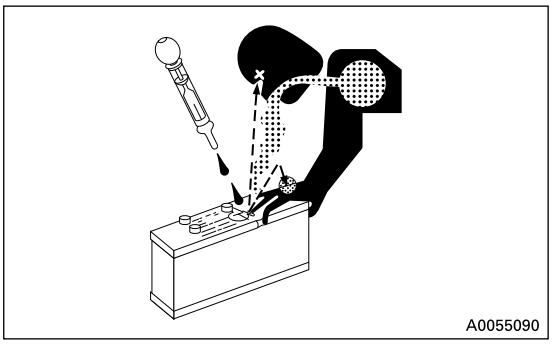
Battery electrolyte contains sulphuric acid, and batteries generate flammable hydrogen gas, which may explode.

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 amounts of water.
- If acid gets into your eyes, flush them immediately with large quantities of water and seek medical attention.



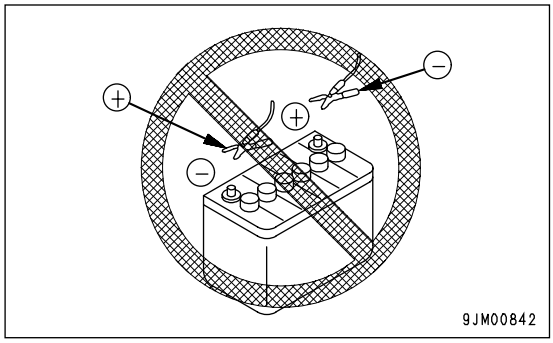
- Before working with batteries, turn the starting switch to the OFF position.

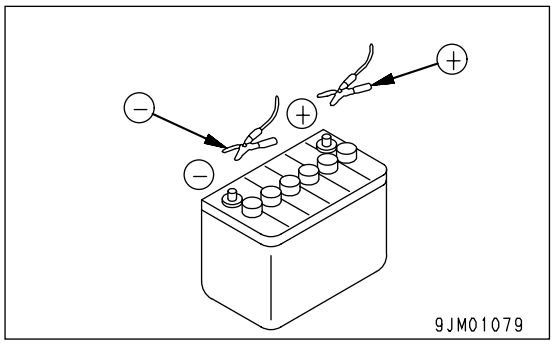
As there is a hazard that sparks will be generated, always do as follows.

- 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 ground or 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 3-81) in the OPERATION section.

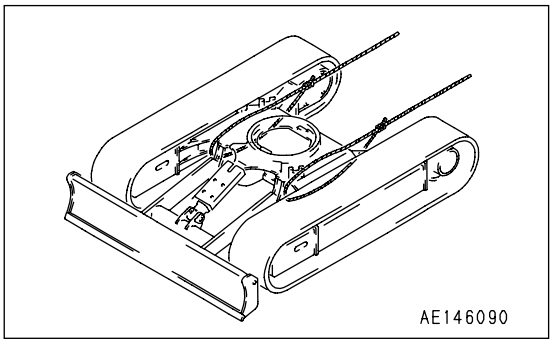
TOWING

SAFETY RULES FOR TOWING

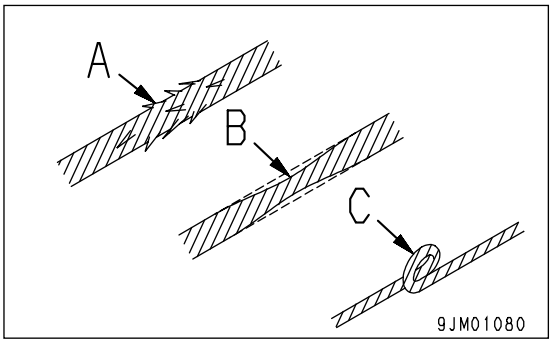
Serious injury or death could result if a disabled machine is towed incorrectly or if there is a mistake in the selection or inspection of the wire rope.

When towing, always use the method given in TOWING THE MACHINE (PAGE 3-78) in the OPERATION section.

- 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.



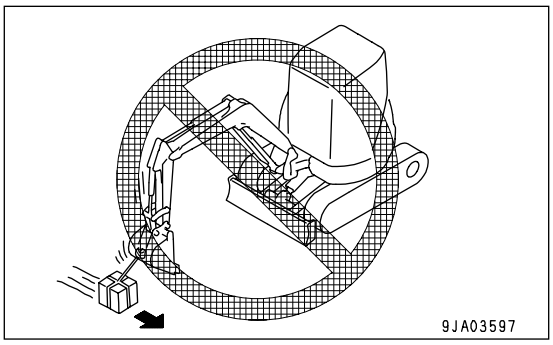
- Never use a wire rope which has cut strands (A), reduced diameter (B), or kinks (C). There is danger that the rope may break during the towing operation.

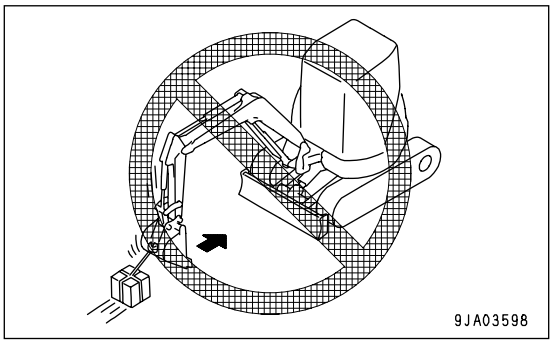


LIFTING OBJECTS WITH BUCKET

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 HANDLING BUCKET WITH HOOK (PAGE 6-5).
- 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.

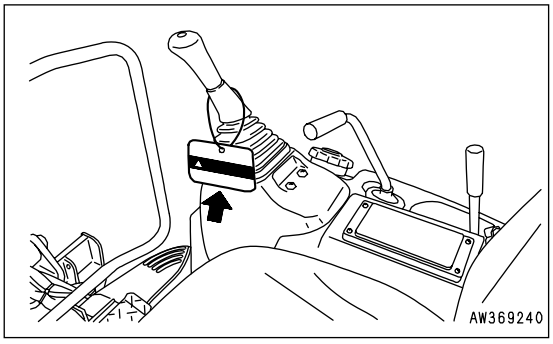




SAFETY MAINTENANCE INFORMATION

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

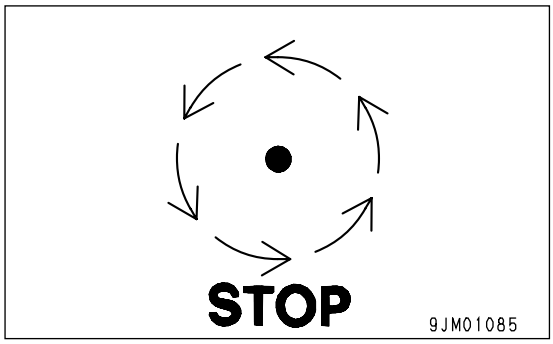
- Do not leave hammers or other tools lying around in the work place. Wipe up all grease, oil, or other substances that will cause you to slip. Always keep the work place clean the tidy to enable you to carry out operations safely.
  If the work place is not kept claen and tidy, there is the danger that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

APPOINT LEADER WHEN WORKING WITH OTHERS

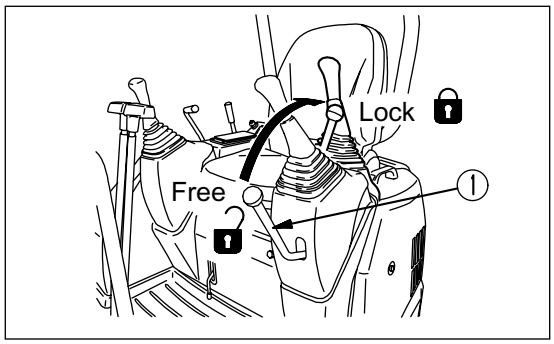
- When repairing the machine or when removing and installing the work equipment, appoint a leader and follow his instructions during the operation.
  When working with others, misunderstandings between workers can lead to serious accidents.

STOP ENGINE BEFORE CARRYING OUT MAINTENANCE

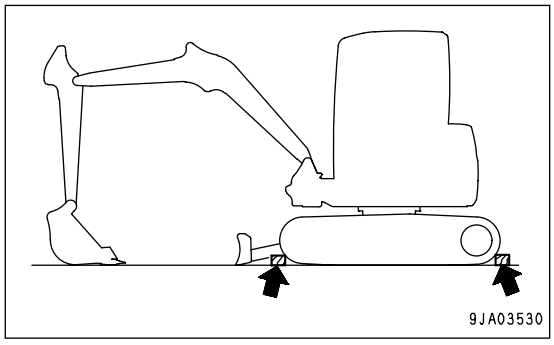
- Stop the machine on firm, level ground.
- Select a place where there is no danger of falling rocks, landslides, or flooding.
- Lower the work equipment completely to the ground and stop the engine.



- Place the work equipment control lever at HOLD, set safety lock lever (1) to the LOCK position, then stop the engine.



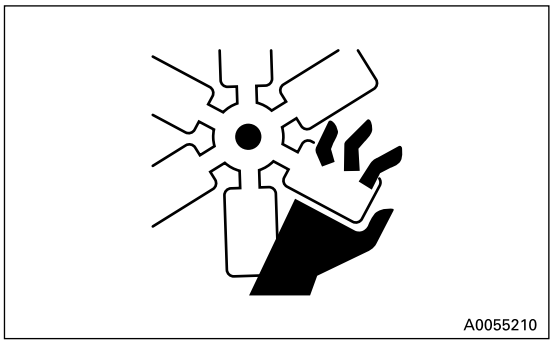
- Put blocks under the track to prevent the machine from moving.



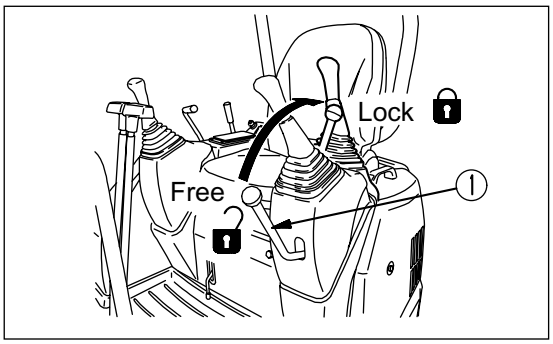
TWO WORKERS FOR MAINTENANCE WHEN ENGINE IS RUNNING

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.

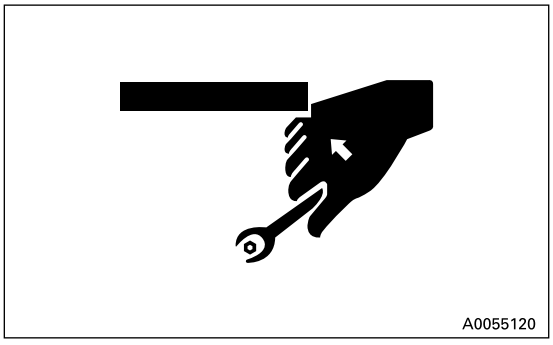


- Set safety lock lever (1) to the LOCK position.
- When carrying out operations near the fan, fan belt, or other rotating parts, there is a hazard of being caught in the parts, so be extremely careful.
- Do not touch any control levers. If any control lever must be operated, always give a signal to 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.



ACCUMULATOR

The accumulator is charged with high-pressure nitrogen gas.

When handling the accumulator, careless procedure may cause an explosion which could lead to serious injury or property damage. For this reason, always observe the following precautions.

- Do not disassemble the accumulator.
- Do not bring it near flame or dispose of it in fire.
- Do not make holes in it, weld it, or use a cutting torch.
- Do not hit or roll the accumulator, or subject it to any impact.
- When disposing of the accumulator, the gas must be released.
  Please contact your Komatsu distributor to have this work performed.

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 off the ground and the machine is supported only by the work equipment. If the control levers are touched by mistake, or there is a hazard to the hydraulicline, the work equipment or the machine may suddenly descend. This is extremely dangerous. Never work under the machine if the machine is not properly supported by blocks or stands.

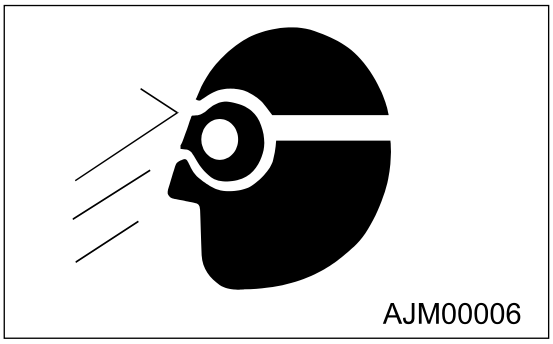
NOISE

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

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.

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.


AJM00006

- 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.
- If pins are hit with strong force, there is a hazard that the pin may fly out and injure people in the surrounding area.

WELDING WORKS

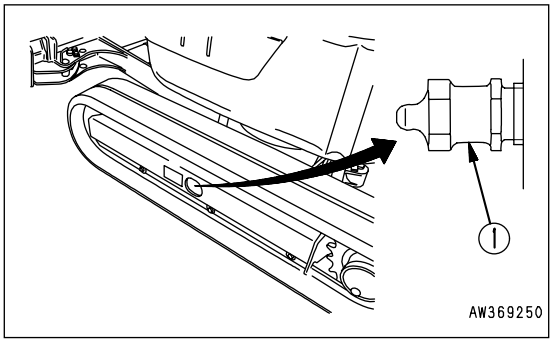
Welding operations must always be carried out by a qualified welder and in a place equipped with a proper equipment. There is a hazard of fire or electrocution when carrying out welding, so never allow any unqualified personnel to carry out welding.

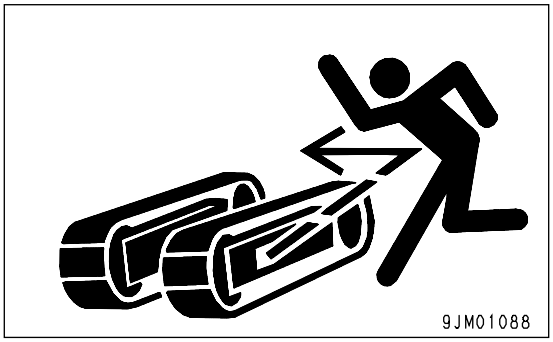
REMOVING BATTERY TERMINALS

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).





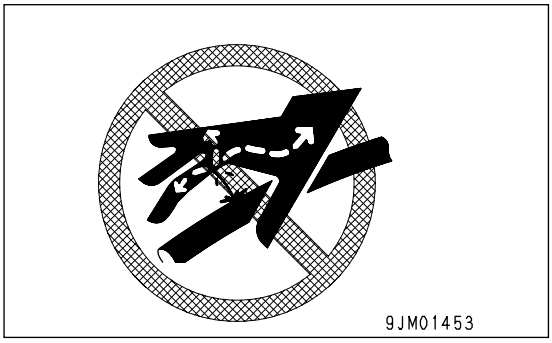
DO NOT DISASSEMBLE RECOIL SPRINGS

The recoil spring assembly is used to reduce the impact on the idler. It contains a spring under high pressure, so if it is disassembled by mistake, the spring will fly out and cause serious injury or even death. Never disassemble the recoil spring.

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 or property damage, so always do as follows.

- Do not carry out inspection or replacement work when the hydraulic system is under pressure.
- If there is any leakage from the piping or hoses, the surrounding area will be wet, 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 or property damage. 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.

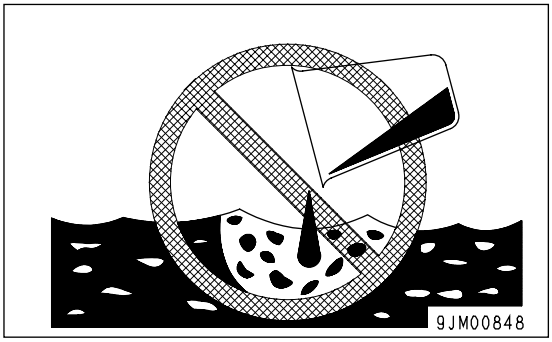
Replace the hose if any of the following problems are found.

- Damaged or leaking hydraulic fitting.
- Frayed or cut covering or exposed reinforcement layer of wire.
- 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 frost-bite.

Never touch refrigerant.

COMPRESSED AIR

- When carrying out cleaning with compressed air, there is a hazard of serious injury or property damage 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

- In order for the machine to be operated safely for a long time, it is necessary to add oil and to carry out service and maintenance at periodic intervals. In order to further increase safety, components with a strong relationship to safety, such as hoses and seat belts, must be replaced at periodic intervals.
  Replacement of safety critical parts: See "SAFETY CRITICAL PARTS (PAGE 4-16)".

- 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 property damage. 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.

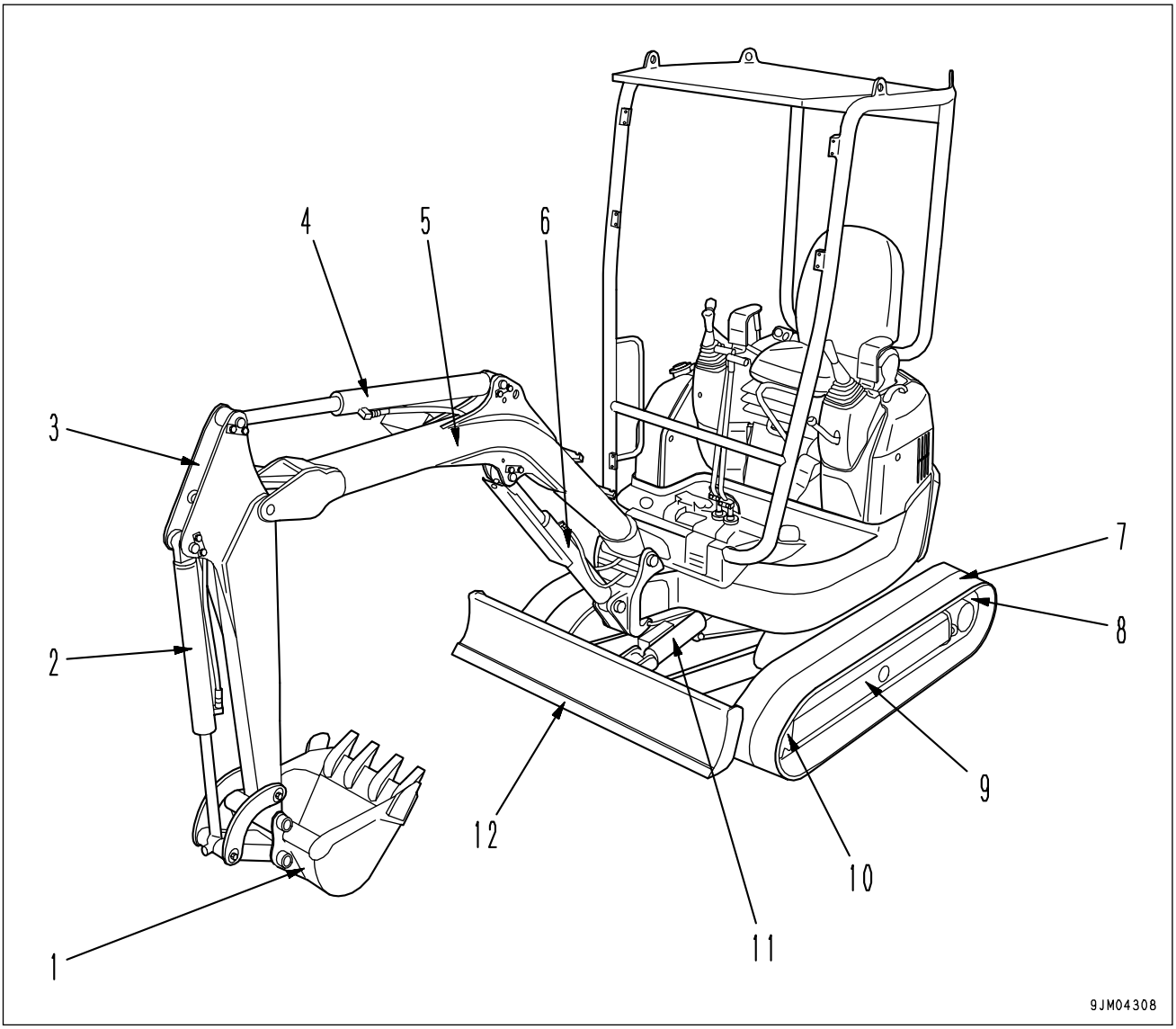
OPERATION

⚠ WARNING

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

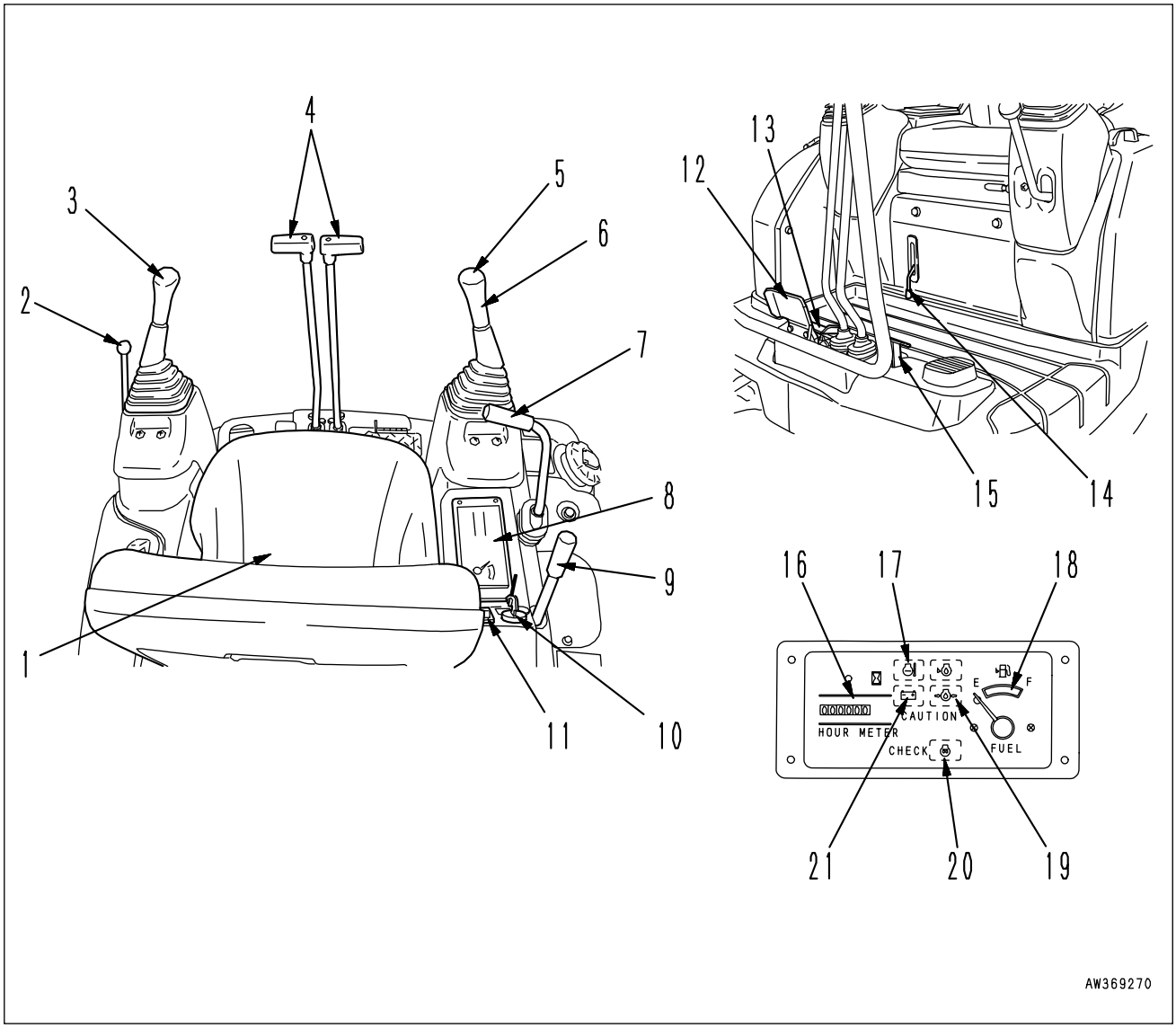
GENERAL VIEW

GENERAL VIEW OF MACHINE



(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) Front blade

GENERAL VIEW CONTROLS AND GAUGES



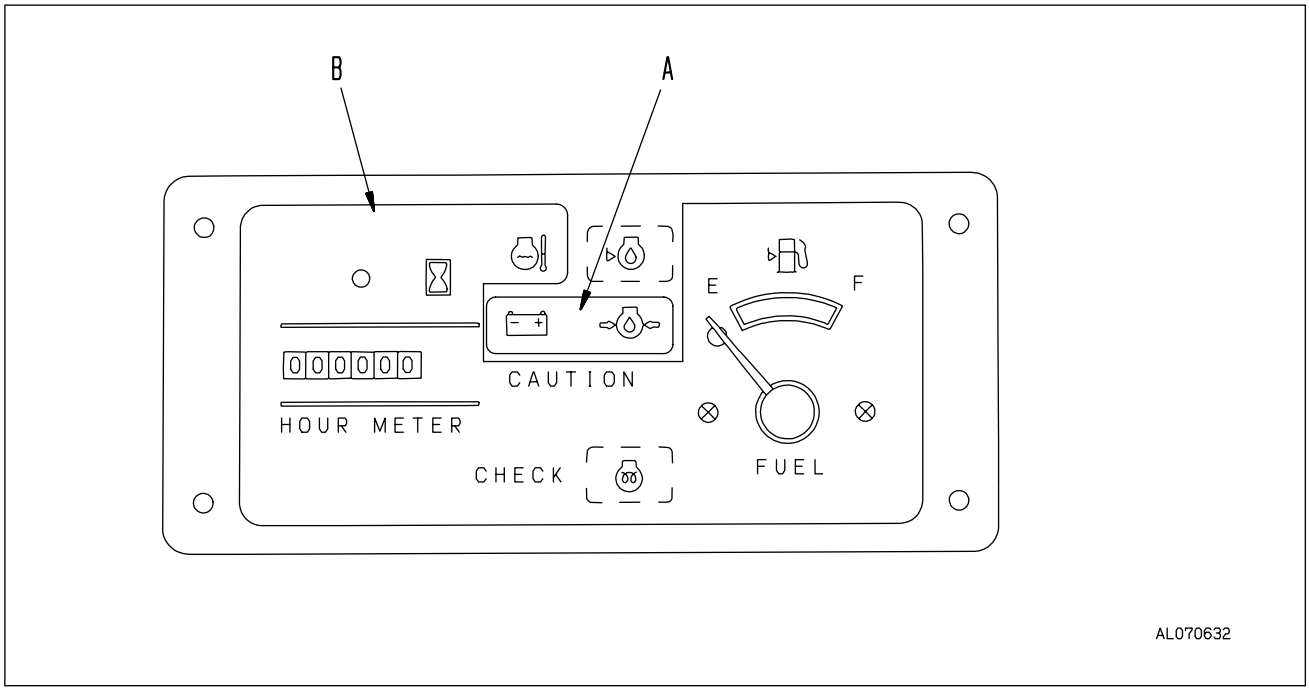
(1) Operator's seat
(2) Safety lock levers
(3) Left work equipment control lever
(4) Travel levers
(5) Horn switch
(6) Right work equipment switch
(7) Blade control lever
(8) Monitor panel
(9) Fuel control lever
(10) Starting switch
(11) Lamp switch
(12) Pedal lock
(13) Boom swing control pedal
(14)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

EXPLANATION OF COMPONENTS

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.

MACHINE MONITOR



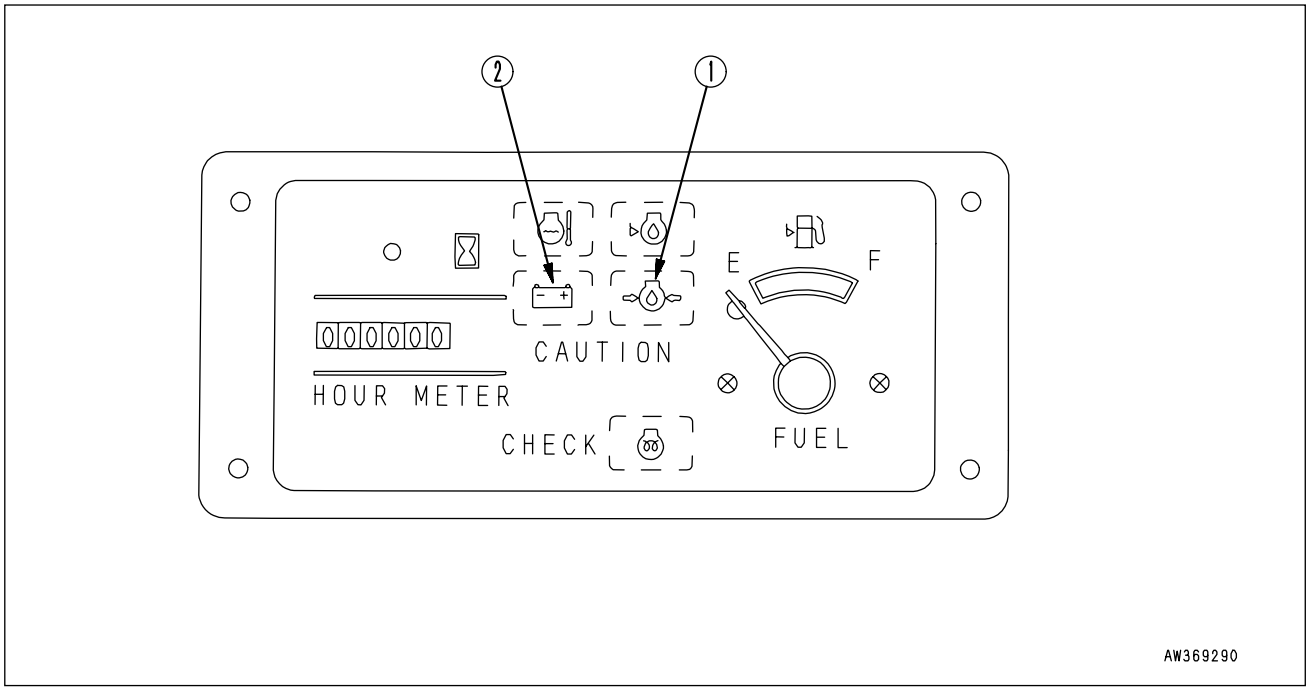
A:Emergency Stop Items B:Meter Display Portion

EMERGENCY STOP ITEMS

⚠ CAUTION

If the monitor flashes, stop the engine immediately or run at low idling, then inspect the problem point immediately and repair the problem.

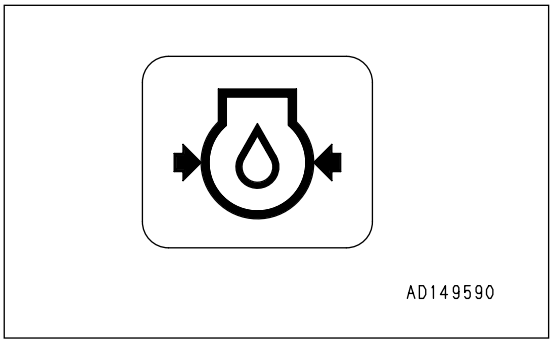
These are items that should be watched when the engine is running. If any abnormality occurs, the monitor for the problem point lights up and the buzzer sounds. Take action immediately.



(1)Engine Oil Pressure Monitor (2)Charge Level Monitor

ENGINE OIL PRESSURE MONITOR

If the engine lubricating pressure is below the normal value, this monitor (1) lights up and the buzzer sounds. If it lights up, stop the engine, and check the oil level in the oil pan and lubricating system.



REMARK

- While the starting switch is ON, the lamp will remain lit and will go off once the engine is started.
- 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.

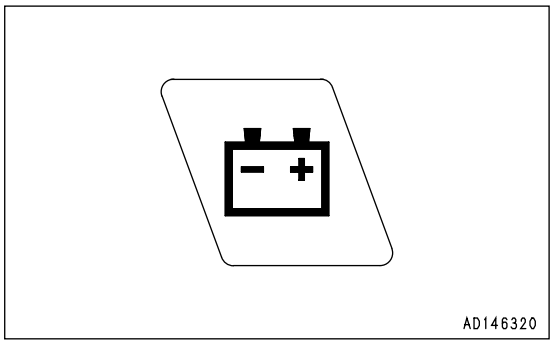
CHARGE LEVEL MONITOR

This monitor(1) indicates an abnormality in the charging system while the engine is running.

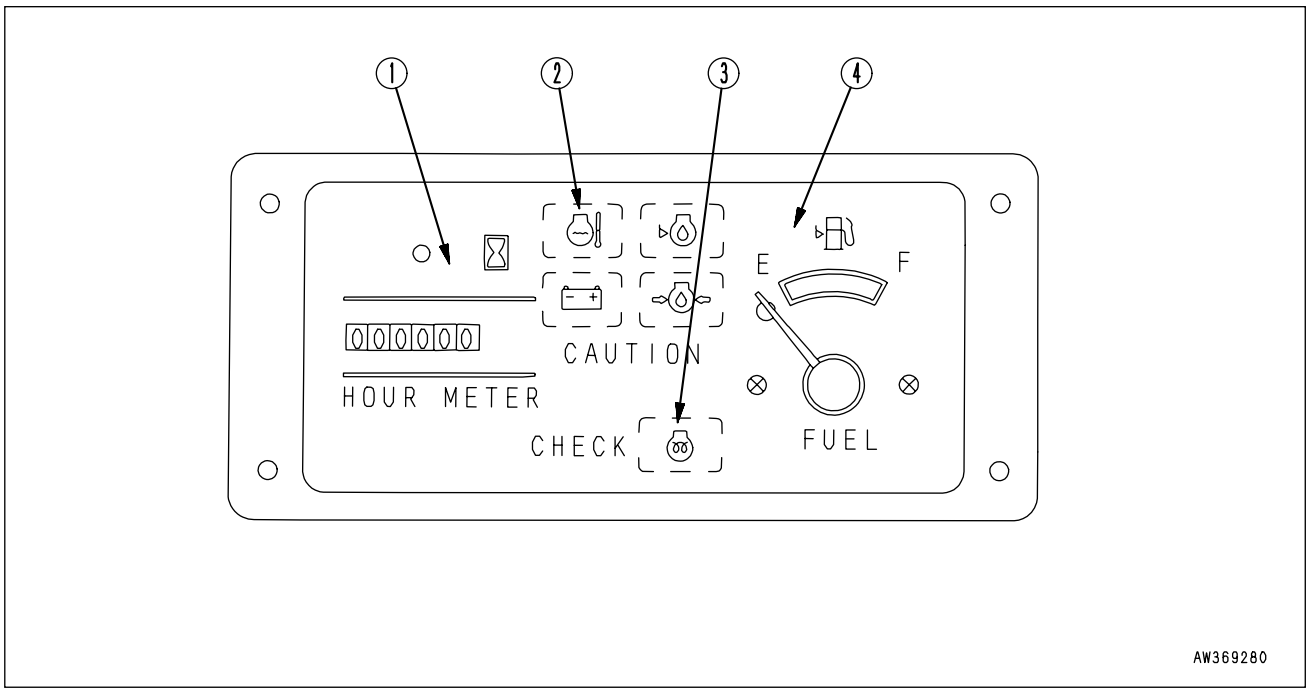
If the monitor lamp flashes, check the V-belt tension. If any abnormality is found, see "OTHER TROUBLE (PAGE 3-83)".

REMARK

- While the starting switch is ON, the lamp will remain lit and will go off once the engine is started.



METER DISPLAY PORTION



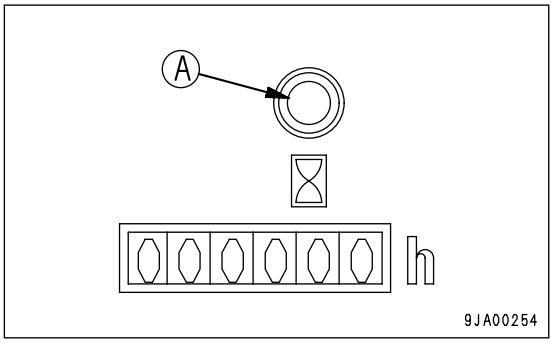
(1)Service Meter
(2)Engine Coolant Temperature Gauge
(3)Fuel Gauge
(4)Engine Pre-heating Monitor

SERVICE METER

This meter(1) 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.

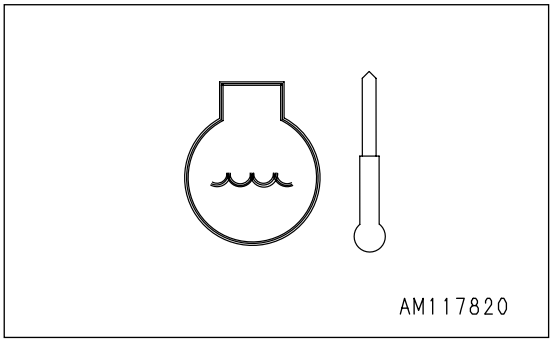
While the engine is running, operation display (A) at the top inside of the meter will light to show that the meter is advancing.

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



ENGINE COOLANT TEMPERATURE GAUGE

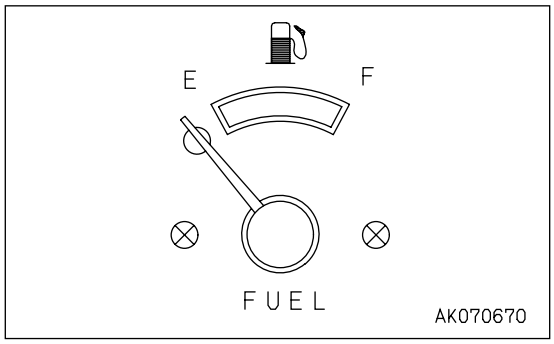
This monitor (2) lights up when the engine coolant temperature goes above the normal value. If it lights up, run the engine at low idling and wait until the monitor goes out (until the engine coolant temperature goes down).



FUEL GAUGE

This meter (3) shows the amount of fuel remaining in the fuel tank.
During normal operations, the indicator should be in the green range.
If the indicator goes down to the E position during operation, there is less than 3.5 ℓ remaining, so check and add fuel.

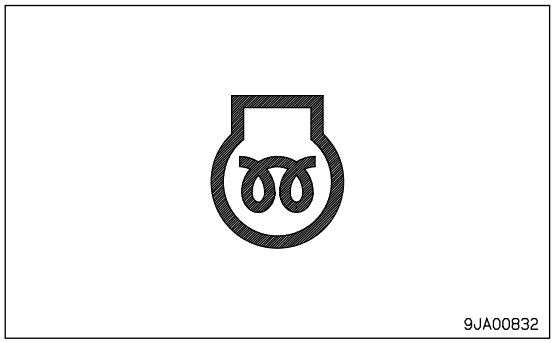
When the starting switch is turned ON, the meter may not indicate the actual level for a short time, but this is not an abnormality.



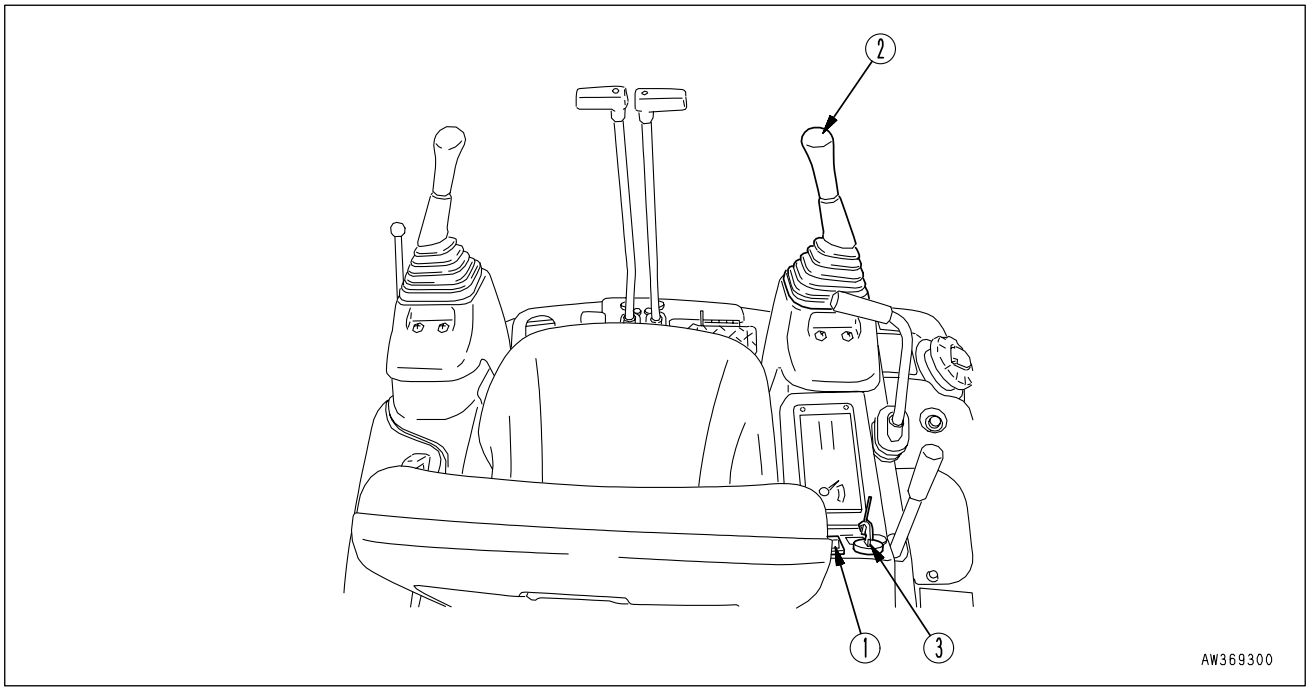
ENGINE PRE-HEATING MONITOR

This monitor lamp(4) indicates the pre-heating time required 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.



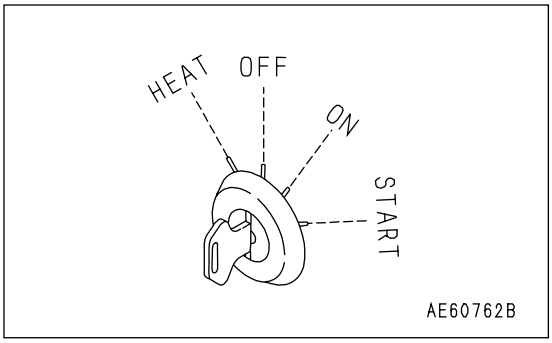
SWITCHES



(1) Starting Switch
(2) Horn Switch
(3) Lamp Switch

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 are all turned off and the engine is stopped.

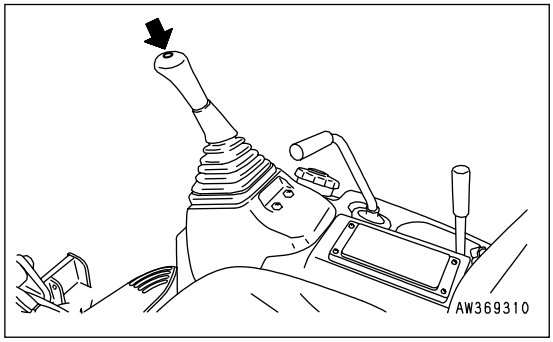
ON position
Electric current flows in the charging and lamp circuits. Keep the starting switch key at the ON position while the engine is running.

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 winter, set the key to this position. Whenthe key is set to the HEAT position, the pre-heating monitor lightsup. Keep the key at this position until the monitor lamp flashes.Immediately after the pre-heating monitor flashes, release the key.The key automatically returns to the OFF position. Then, start the engine by turning the key to the START position.

HORN SWITCH

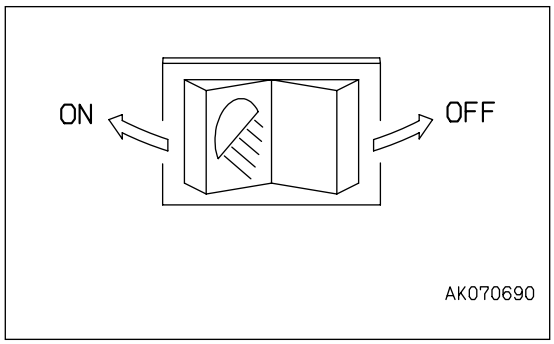
When the button(2) at the tip of the right work equipment control lever is pressed, the horn will sound.



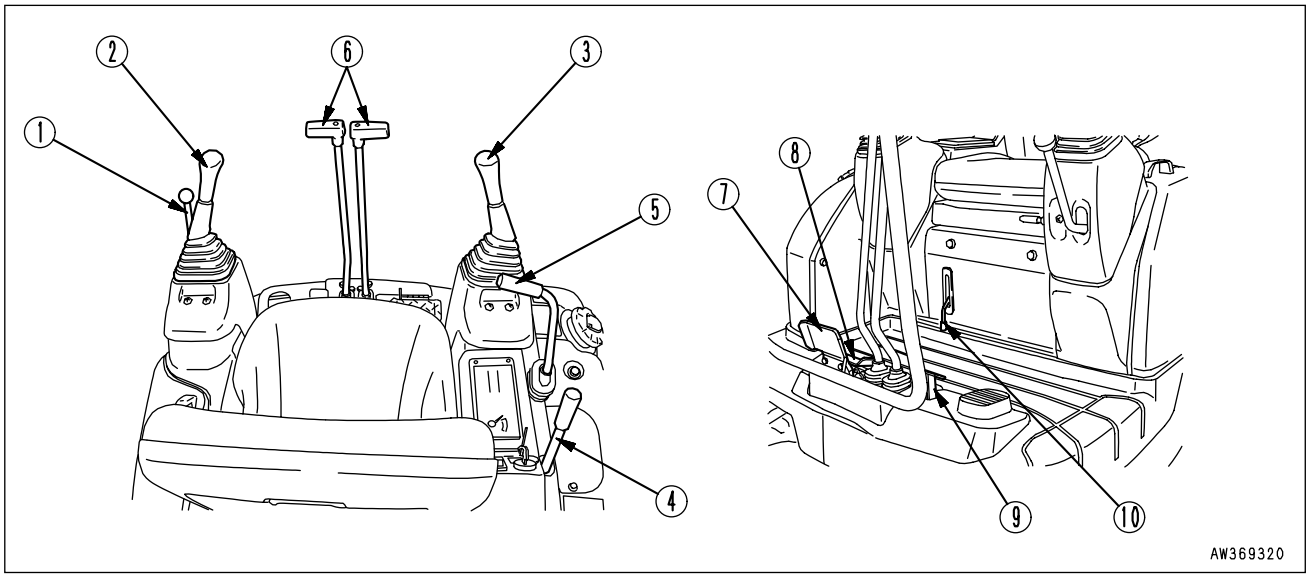
LAMP SWITCH

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

ON position : Panel lamp and head lamp lights up.
OFF position : Lamps goes off.



CONTROL LEVERS, 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/variable gauge lever
(6) Travel levers
(7) Pedal lock (for boom swing control pedal)
(8) Boom swing control pedal
(9) Traveling accelerator pedal
(10) Variable gauge/blade selector control lever

SAFETY LOCK LEVER

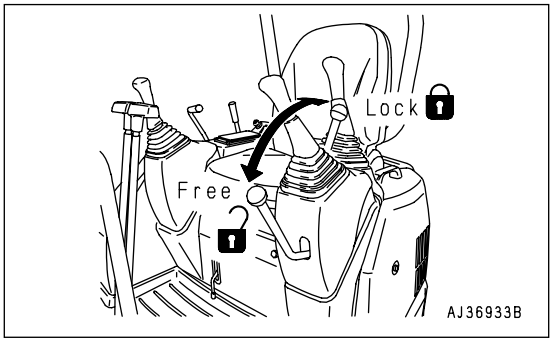
⚠ WARNING

- **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 lock lever up, be careful not to touch the work equipment control lever.**
- **When pushing the safety lock lever down, be careful not to touch the work equipment control lever.**

Lever (1) is a device to lock the work equipment, swing, travel, and blade control levers.

When the lever is pulled up, the lever stand springs up and is locked.

This lock lever is a hydraulic lock, so even if it is in the lock position, the work equipment control lever and travel lever will move, but the work equipment, travel motor, and swing motor will not work.



WORK EQUIPMENT CONTROL LEVER

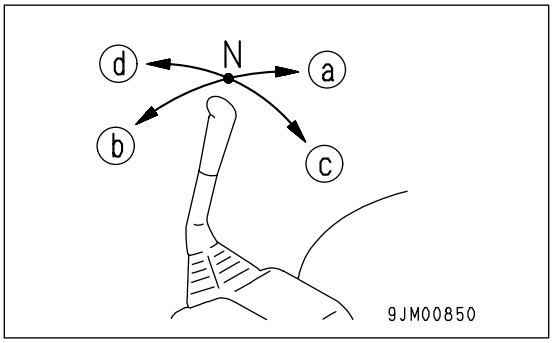
(with auto-deceleration device)

This Left work equipment control lever (2) is used to operate the arm and upper structure.

Arm operation Swing operation

(a) Swing to right
(b) Swing to left
(c) Arm IN
(d) Arm OUT

N (Neutral): The upper structure and arm are held in position and do not move.

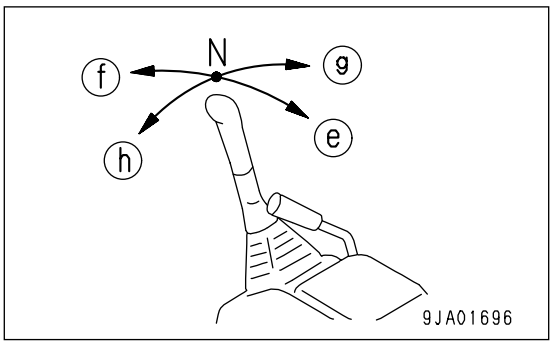


This Right work equipment control lever(3) is used to operate the arm and upper structure.

Boom operation Bucket operation

(e) RAISE
(f) LOWER
(g) DUMP
(h) CURL

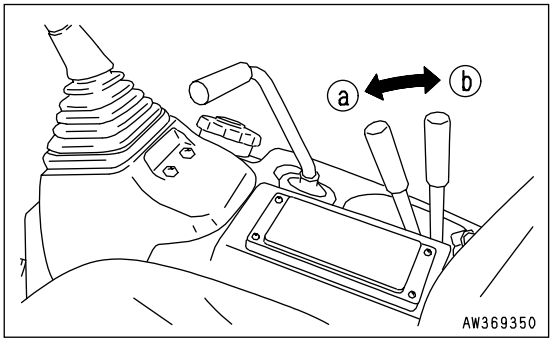
N (Neutral): The boom and bucket are held in position and do not move.



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.



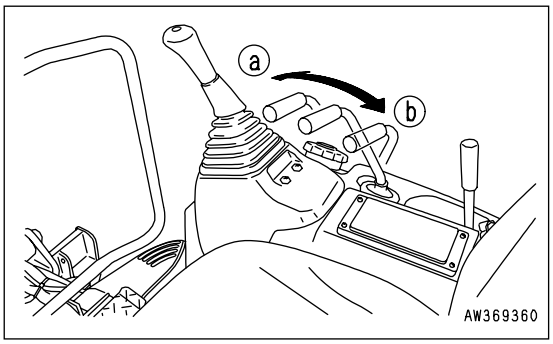
BLADE CONTROL/VARIABLE GAUGE LEVER

NOTICE

- **This lever is not locked even when the safety lock lever is set to the LOCK position, so be careful not to touch the blade control lever if blade operations are not being carried out.**
- **If the blade is used continuously for more than one hour for digging operations, the water temperature will rise.**
- **Before starting operations, check the setting of the variable gauge/blade selector control lever.**

This lever (5) is used to operate the blade and the variable gauge.

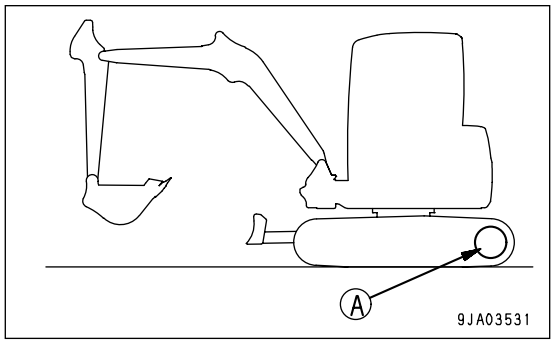
Direction of operation of control lever	(a)	(b)
Blade operation	LOWER	RAISE
Variable gauge operation	CLOSE	OPEN



TRAVEL LEVERS

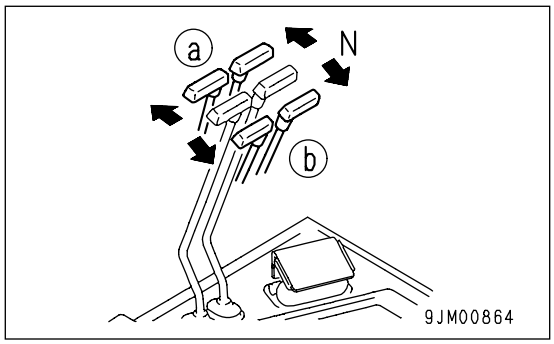
⚠ WARNING

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

REMARK
If the lever is shifted to the advance or reverse position from the neutral position, the alarm sounds to warm that the machine is starting to advance.



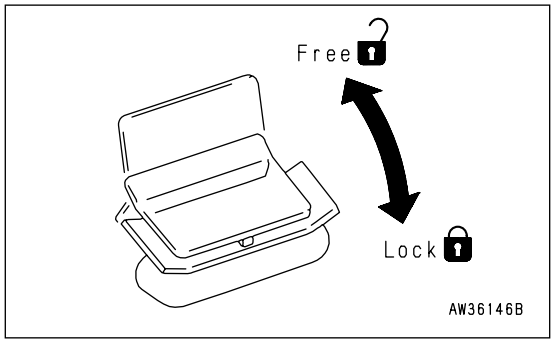
PEDAL LOCK

(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.

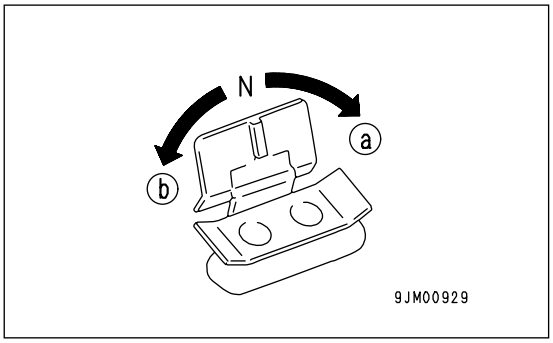


BOOM SWING CONTROL PEDAL

⚠ 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.

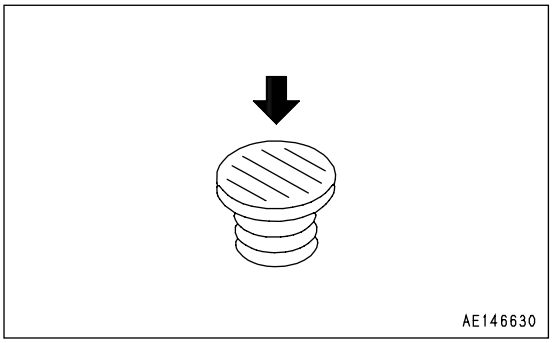


TRAVELING ACCELERATOR PEDAL

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

3.2km/h (2.0MPH) to 4.3km/h (2.7MPH) (when engine is at full throttle)

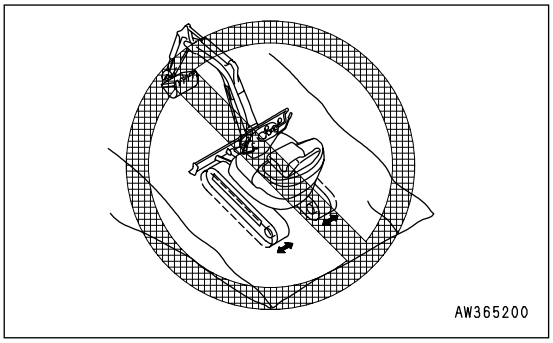
REMARK
This pedal functions only when the travel speed selector switch is in LOW position.
When the travel speed selector switch is at the HIGH position, the travel speed is automatically switched, so the machine speed will not change even if the pedal is depressed.



VARIABLE GAUGE/BLADE SELECTOR CONTROL LEVER

⚠ WARNING

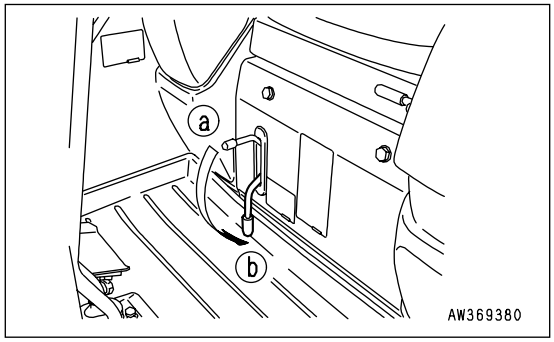
- **Adjust to the narrow gauge only when traveling or digging in confined spaces. In all other travel or digging operations, always set to the broad gauge.**
- **Do not change the variable gauge on slopes. There is danger that the left-to-right stability may change.**
- **Always operate the variable gauge on flat ground. When operating the blade control lever, check the position of the selector lever before operating.**



This lever (10) switches between the variable gauge and blade control.

Lever control	Direction of operation
(a) RAISE	Variable gauge
(b) LOWER	Blade

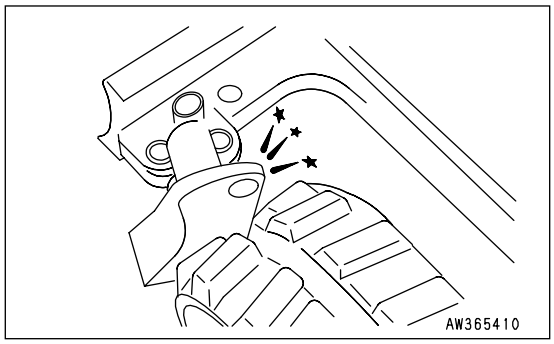
For details of the method of operating the variable gauge and blade, see the section on the "BLADE CONTROL/VARIABLE GAUGE LEVER (PAGE 3-13)".



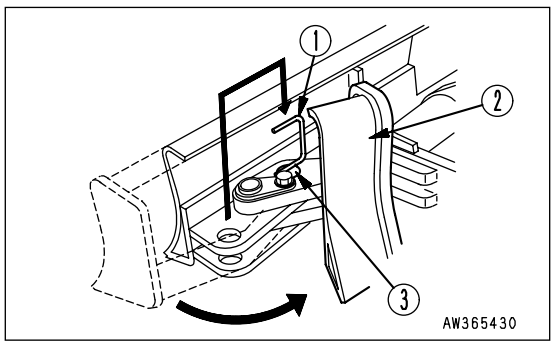
VARIABLE BLADE

NOTICE

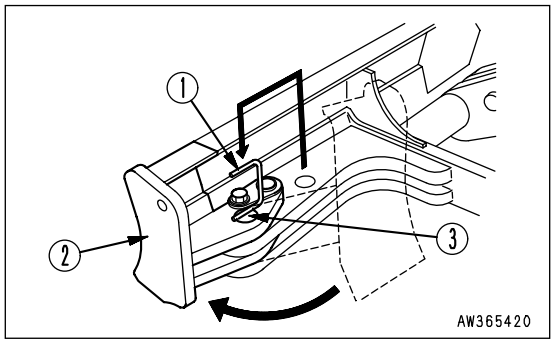
- **Use the same width for the variable gauge and blade.**
- **Operate the variable blade only when the variable gauge is fully retracted.**
  If the variable blade is operated when the variable gauge is extended, the blade will contact the rubber shoe and stop it from rotating.



- Setting blade to minimum width
  Remove pin (1), turn blade (2) to align pin hole (3) and the hole in blade (2), then insert pin (1) again.



- Setting blade to maximum width
  Remove pin (1), turn blade (2) to align pin hole (3) and the hole in blade (2), then insert pin (1) again.

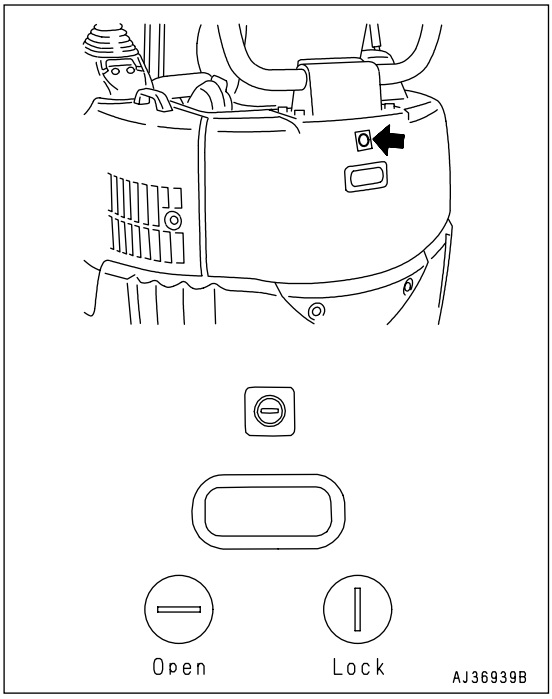


ENGINE HOOD

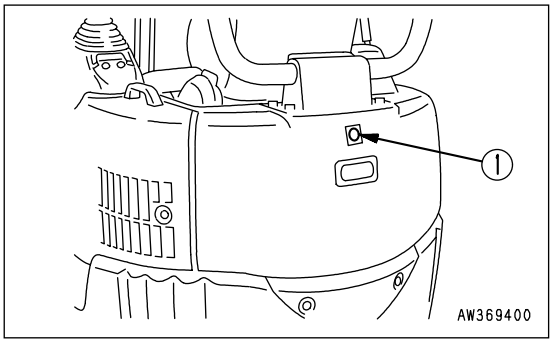
⚠ CAUTION

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

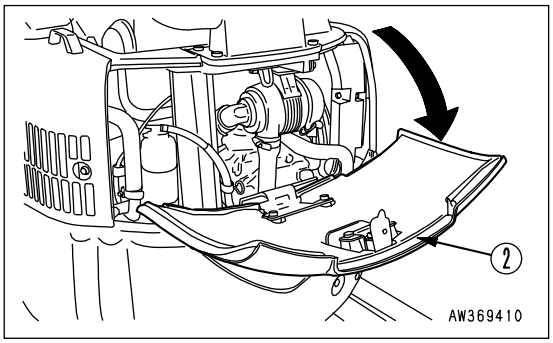
NOTICE
Check the direction of the key slot in the opening knob to check that it is locked.



1. Push engine hood open knob (1) to release the LOCK.

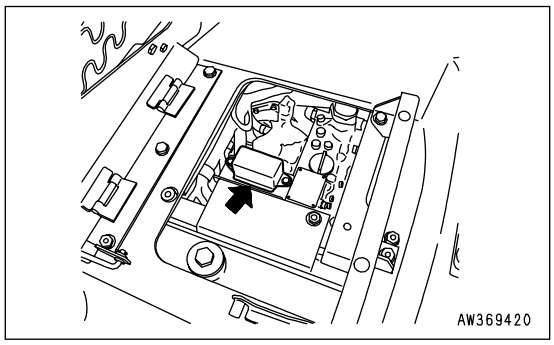


2. Push hood (2) down fully.



FUSE

The fuse box is under the seat.



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

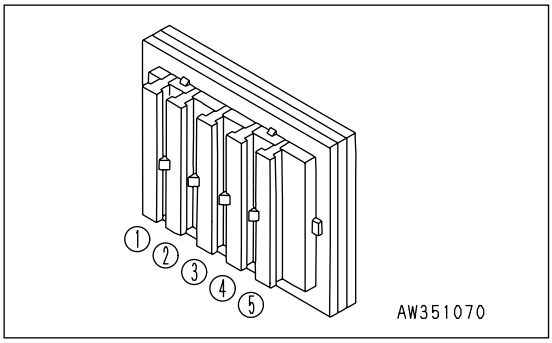
The fuses protect the electrical equipment and wiring from burning out.

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.

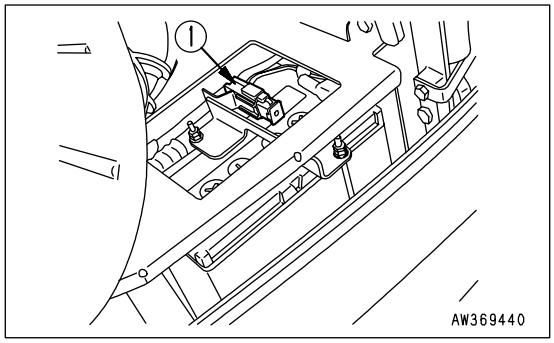
FUSE CAPACITIES AND CIRCUIT NAMES

	Fuse capacity	Name of circuit
(1)	30 A	Room lamp, radio (back-up), starting motor terminal B (stop solenoid)
(2)	20 A	Alarm buzzer, monitor panel, solenoid, pump adjuster
(3)	5 A	Wiper, radio, horn, window washer, throttle actuator
(4)	30 A	Stop solenoid, Stop relay, Timer
(5)	5 A	Spare fuse



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.



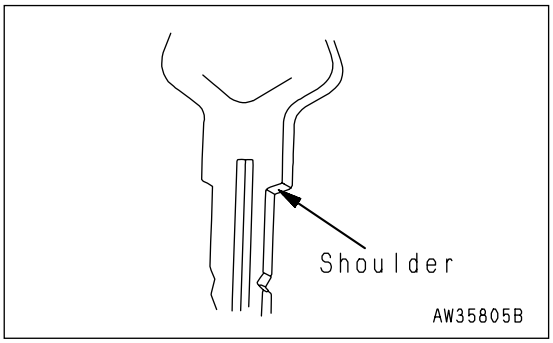
REMARK
A block fuse is a large fuse wire installed to the circuit where a large-capacity current is flowing. It acts in the same way as a normal fuse to protect the electrical equipment and wiring from burning out under abnormal current.

COVER WITH LOCK

Locks are installed to the cover on the right side of the machine, the operator's cab, engine hood, and tool box. Use the starting switch key to lock or unlock these places.

Opening and Closing Covers with Lock

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 the Cover

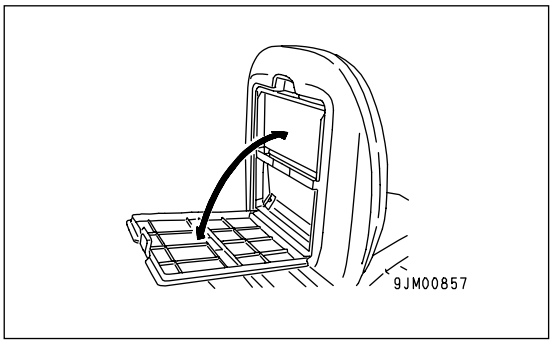
1. Insert the key into the cap.
2. Turn the key clockwise and open the cover.

Locking the Cover

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

OPERATION MANUAL STORAGE

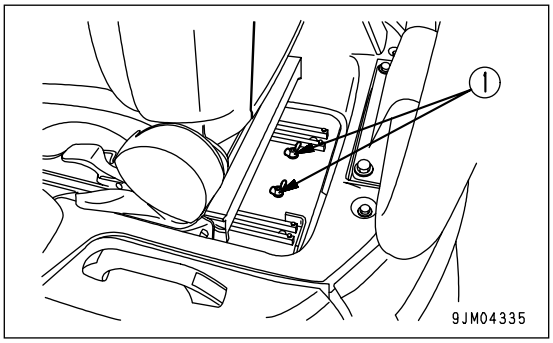
There is a box provided in the rear of the operator's seat to keep the Operation and Maintenance Manual.
Keep the operation manual in this box so that you can read it when you need it.



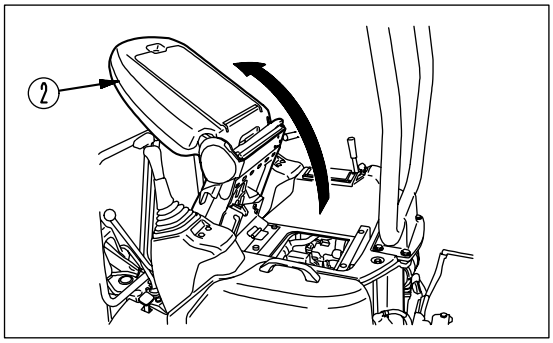
TIPPING OPERATOR'S SEAT

When carrying out inspection or maintenance, tip the operator's seat as follows.

1. Move the the operator's seat to the front, then remove butterfly nut (1) under the seat.



2. Tip operator's seat (2) up and over to the front and lock it in position.



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

- **If you open the engine hood, then fix the hood in position with hood stopper.**
- **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.**

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

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, radiator

   Check if there is any dirt or dust accumulated around the engine or radiator. Check also if there is any flammable material (dead leaves, twigs, grass, etc.) accumulated around the battery or high temperature engine parts, such as the engine muffler or turbocharger. Remove all such dirt or flammable material.

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

6. Check for damage to handrail, loose bolts

   Repair any damage and tighten any loose.

7. Check for damage to gauges, monitor, loose bolts

   Check that there is no damage to 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. Seat belt option 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.

CHECKS BEFORE STARTING

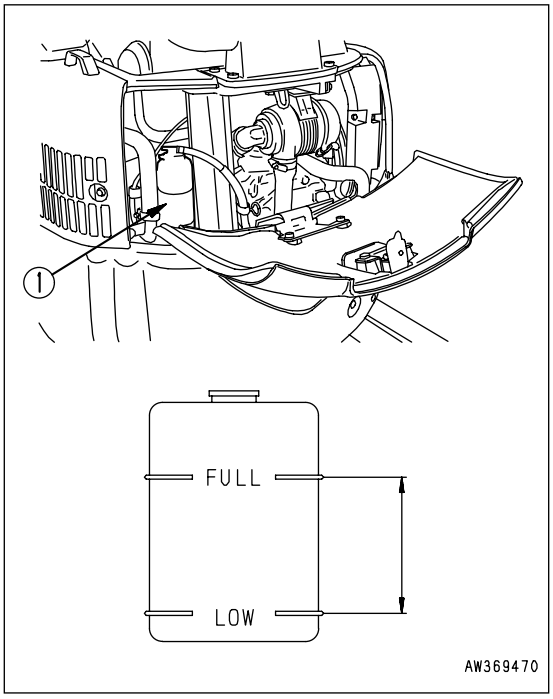
Always carry out the items of the checks in this section before starting the engine.

CHECK COOLANT LEVEL, ADD WATER

⚠ 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 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.

1. Open the engine hood on the machine 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 water through the water filler of reserve tank (1) to the FULL level.
2. After adding water, tighten the caps 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).

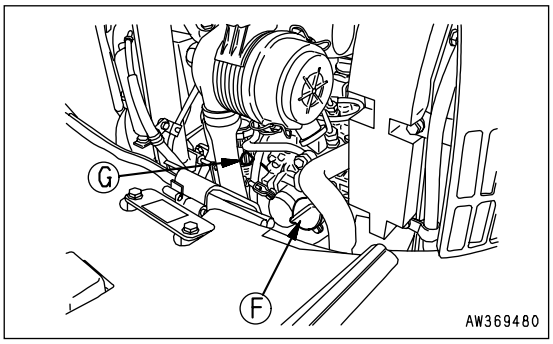


CHECK OIL LEVEL IN ENGINE OIL PAN, ADD OIL

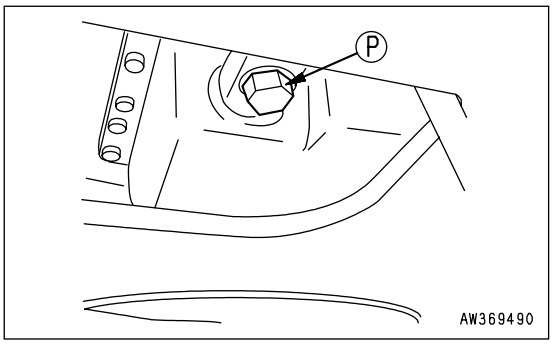
⚠ WARNING

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

1. Open the engine hood on the machine.
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 lever is above the H mark, remove undercover (1), drain the excess engine oil from drain valve (P), then check the oil level again.
6. If the oil level is correct, tighten the oil filler cap securely and close the engine hood.



REMARK

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

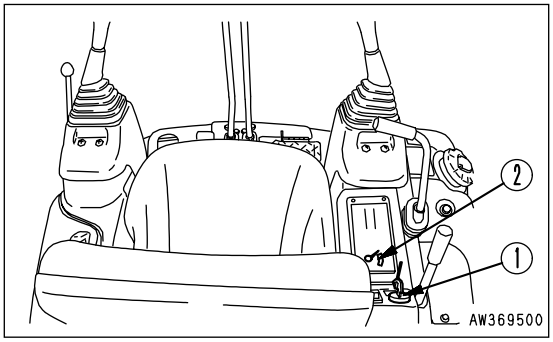
CHECK FUEL LEVEL, ADD FUEL

⚠ WARNING

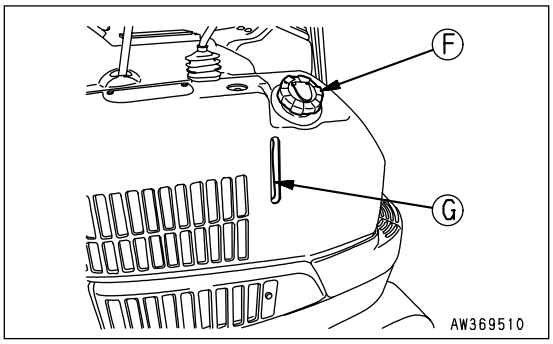
Be careful not to let the fuel overflow when adding fuel. This may cause a fire.

Wipe up all fuel that is spilled. If there is sand where the fuel is spilled, remove all the sand. Fuel is flammable and dangerous. Keep it away from any flame.

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 level is low, open the cover on the right side, and watch level gauge (G) while adding fuel through fuel filler port (F).
   Fuel capacity : 19 liters (5.02 US gal.)
3. After adding fuel, tighten the cap securely.



REMARK
If breather hole on the cap is clogged, the pressure in the tank will drop and fuel will not flow.
Clean the hole from time to time.

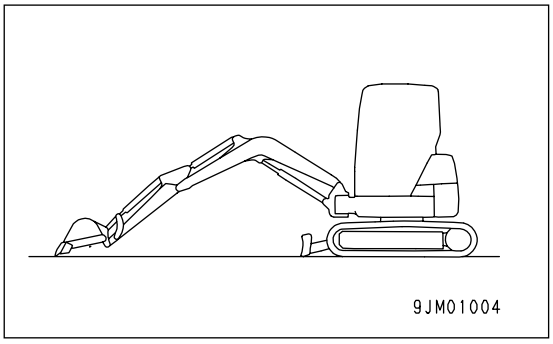


CHECK OIL LEVEL IN HYDRAULIC TANK, ADD OIL

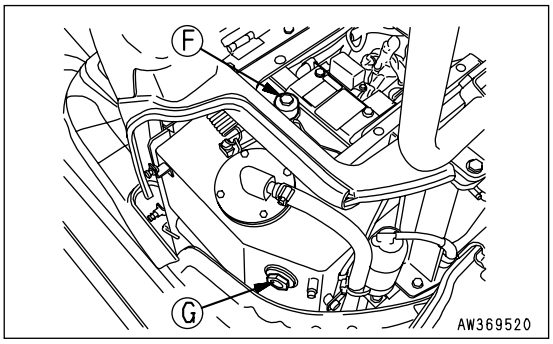
⚠ WARNING

When removing the oil filler cap, oil may spurt out, so turn the cap slowly to release the internal pressure before removing the cap.

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 cylinders, then lower the boom, set the bucket teeth in contact with the ground, and stop the engine.



2. Open the door of the pump room on the right side of the machine and check sight gauge (G). The oil level should be between the H and L lines.

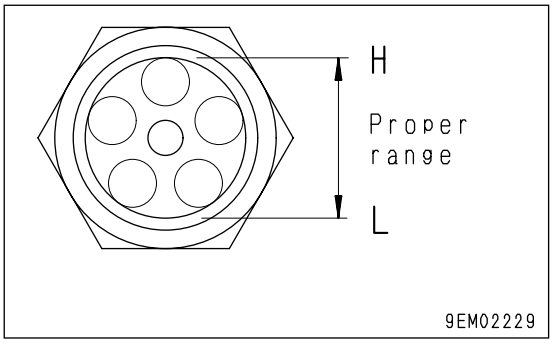


NOTICE
Do not add oil if the lebel is above the H line. This will damage the hydraulic equipment and cause the oil to spurt out.

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

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

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



CHECK ELECTRIC WIRINGS

⚠ WARNING

- **If the fuses frequently blowor 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.**
- **If flammable materials (dead leaves, twigs, dry grass, etc.) accumulate around the battery, they will cause fire, so always remove such material immediately.**
- **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 for damage and wrong capacity of the fuse and any sign of disconnection or short circuit in the electric wiring. Check also for loose terminals and tighten any loose parts.

Check the wiring of the "battery", "starting motor" and "afternator" carefully in particular.

When carrying out walk-around checks or checks before starting, always check if there is any accumulation of flammable material around the battery, and remove such flammable material.

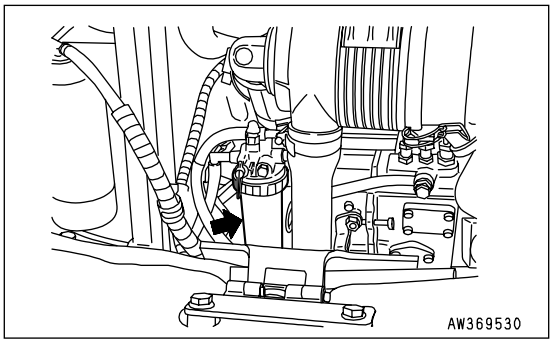
Please contact your Komatsu distributor for investigation and correction of the cause.

CHECK FUNCTION OF HORN

1. Turn the starting switch to the ON position.
2. Confirm that the horn sounds without delay when the horn button is pressed. If the horn does not sound, ask your Komatsu distributor for repair.

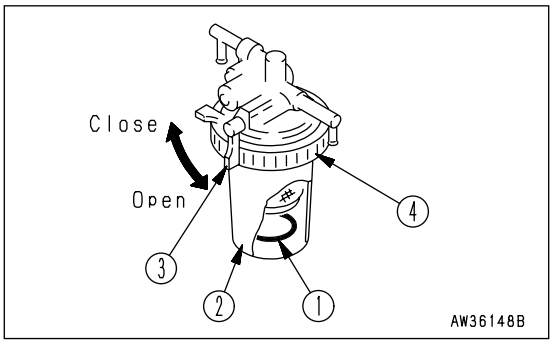
CHECK FOR WATER AND SEDIMENT IN WATER SEPARATOR, DRAIN WATER

If red ring (1) of the water separator is at the bottom of case (2), there is no water.
If the ring (1) 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 the engine hood, and set handle to the LOCK position.
2. Using the filter wrench, loosen ring (4), then remove case (2) and throw out the water inside it.
3. Set case (2) in position, then tighten ring (4) to install it.
4. Set handle (3) to the OPEN position.
5. Drain any water or sediment from the fuel tank. For details, see "DRAIN WATER AND SEDIMENT FROM FUEL TANK (PAGE 4-40)".



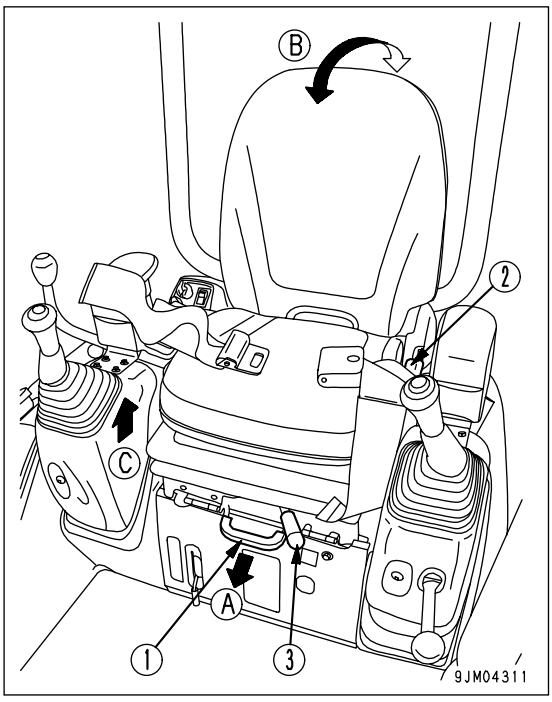
ADJUSTMENT

⚠ 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 poaition, then release the lever.
Fore-and-aft sdjustment: 100mm (3.9 in) (5 stages)
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 suspention
Pull lever (3) up, then move it to the left to make the suspemtion 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)



SEAT BELT

⚠ 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.**

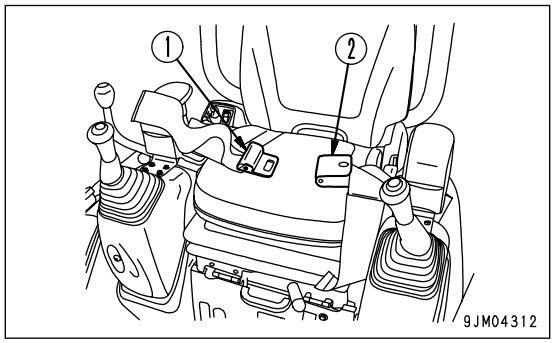
Check that the bolts of the clamp securing the belt to the chassis are not loose. Tighten them if they are loose.
The tightening torque for the mounting bolt is 24.5 ± 4.9 N•m (2.5 ± 0.5 kgf•m, 18.1 ± 3.6 lbft).
If the belt surface is scratched or frayed or if the fittings are broken or deformed, replace 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 back-rest.

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.

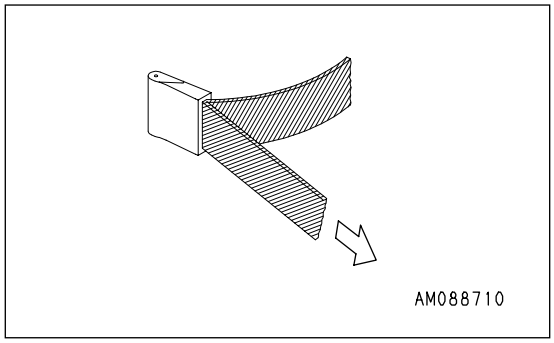


Fasten belt along your body without kinking it. Adjust the lengths of the belt on the tongue sides.

SEAT BELT ADJUSTMENT

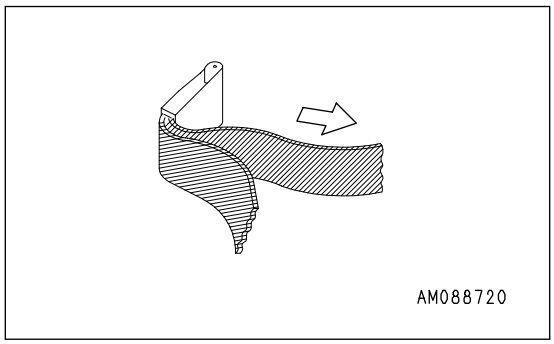
Shortening

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



Lengthening

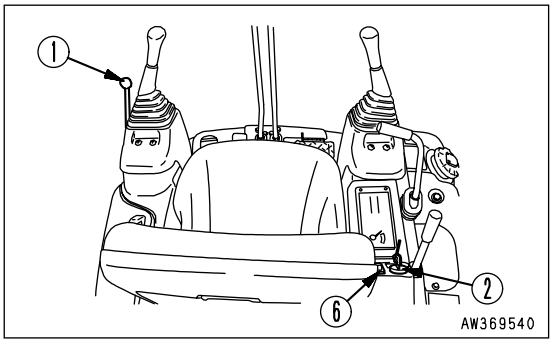
Pull the belt while holding it at a right angle to the buckle or tongue.



OPERATIONS BEFORE STARTING ENGINE

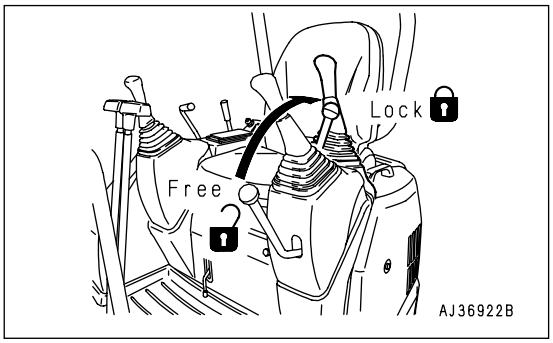
⚠ WARNING

- **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.
- **When standing up from the operator's seat, always set the safety lock lever to the LOCK position, regardless of whether the engine is running or stopped.**

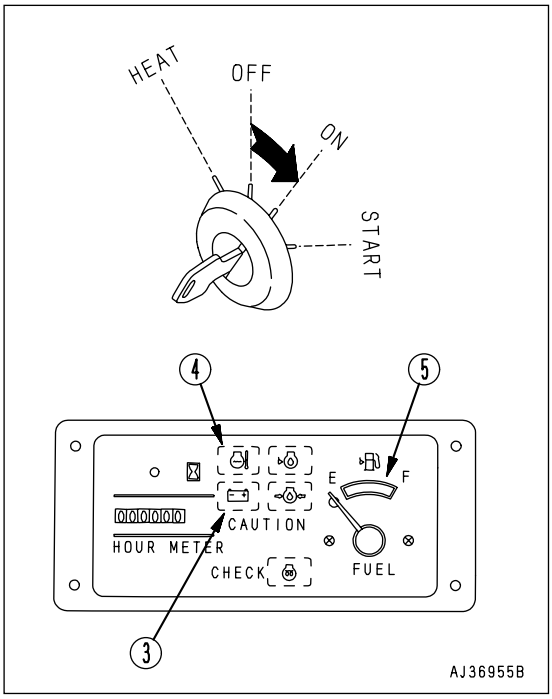


1. Check that safety lock lever (1) is at the LOCK position.
2. Check the position of each lever.

Set the control lever to the neutral position.
When starting the engine, never touch the knob button.



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 sec, and the following monitors and gauges will light up for approx. 3 sec.
      - Charge level monitor (3)
      - Engine water temperature gauge (4)
      - Fuel gauge (5)

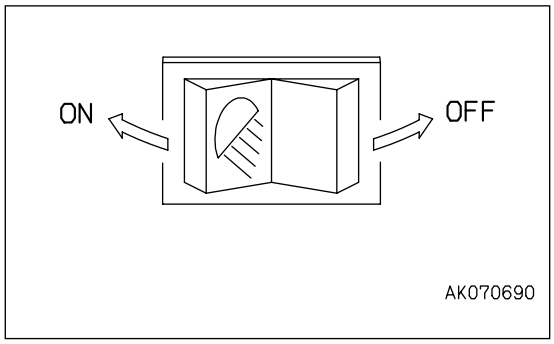


If the monitors or gauges do not light up or the buzzer does not sound, there is probably a broken bulb or disconnection in the monitor wiring, so contact your Komatsu distributor for repairs.

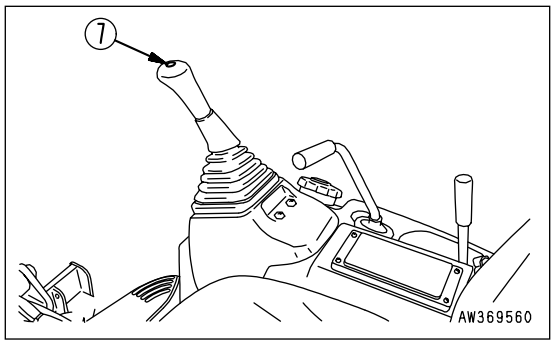
After approx. 3 sec, the following gauges will remain on and the other monitors will go out.

- Engine water temperature gauge (4)
- Fuel gauge (5)

2) Press lamp switch(6) to turn on the head lamps. If it does not light up, there is probably a blown bulb or disconnection, so please contact your Komatsu distributor for repairs.



3) Press horn switch (7) to confirm that the horn will sound.

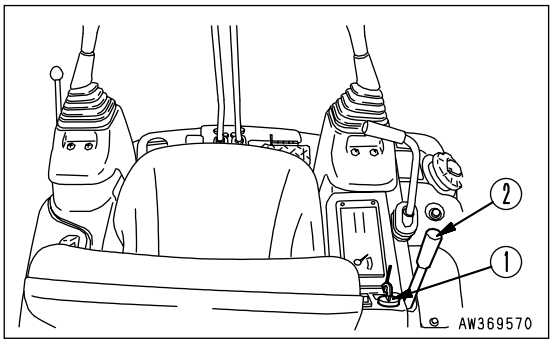


STARTING ENGINE

NORMAL STARTING

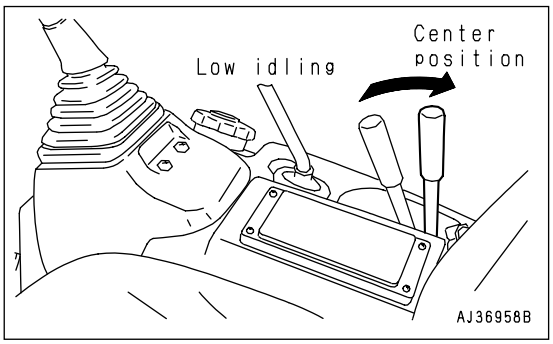
⚠ WARNING

- **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.**

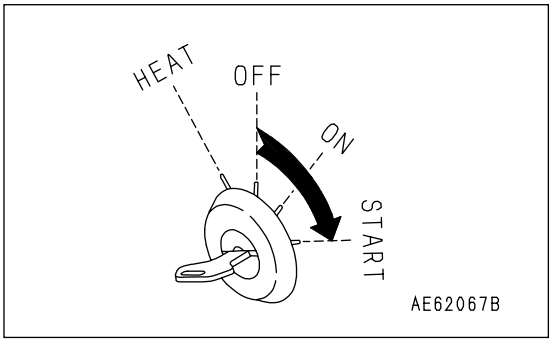


NOTICE
Do not keep the starting motor rotating continuously for more than 20 seconds.
If the engine will not start, wait for at least two minutes before trying to start the engine again.

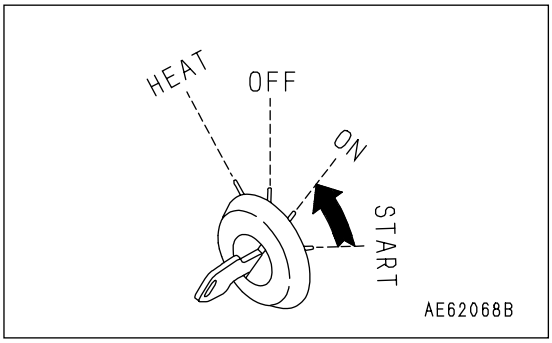
1. Pull fuel control lever (1) to the center position between LOW IDLING and HIGH IDLING.



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



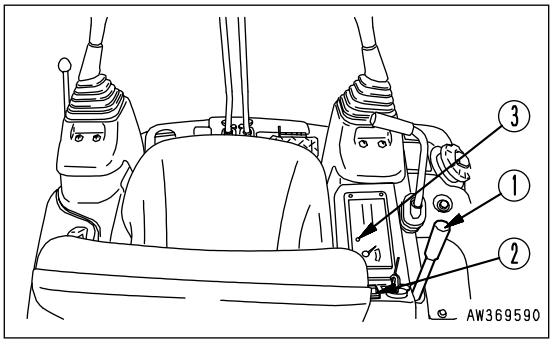
3. When the engine starts, release the key in starting switch (2).
   The key will return automatically to the ON position.



STARTING ENGINE IN COLD WEATHER

⚠ WARNING

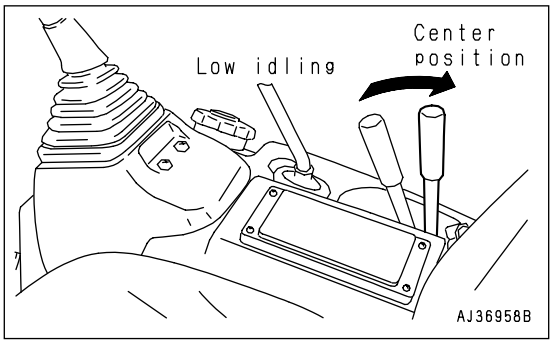
- **Check that there are no persons or obstacles in the surrounding area, then sound the horn and start the engine.**
- **Never use starting aid fluids as they may cause explosions.**



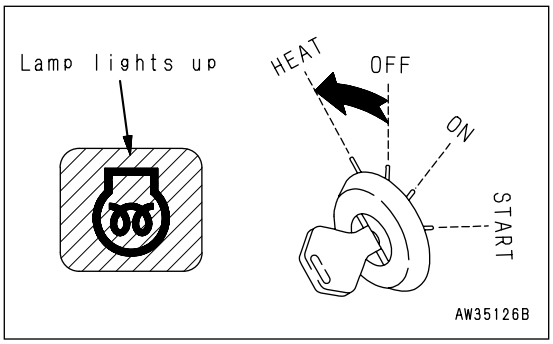
NOTICE
Do not keep the starter motor running for more than 20 seconds continuously.
If the engine does not start, wait for about 30 seconds and begin with the step 3. again.

When starting in low temperatures, do as follows.

1. Pull fuel control lever (1) to the center position between LOW IDLING and HIGH IDLING.

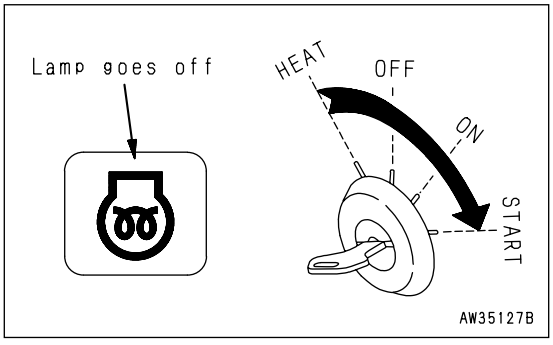


2. Hold the key in starting switch (2) at the HEAT position, and check that preheating monitor (3) lights up.
   After about 30 seconds, preheating monitor lamp (3) will flash to indicate that preheating is finished.

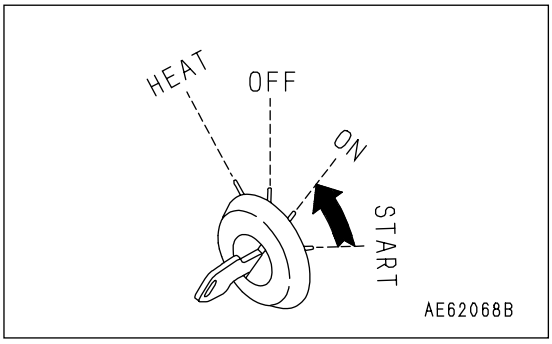


REMARK
The monitor and gauge also light up when the key is at the HEAT position, but this does not indicate any abnormality.

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



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



5. Continue idling for 15 seconds after the engine starts. During this time, do not operate the control levers or fuel control dial.

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

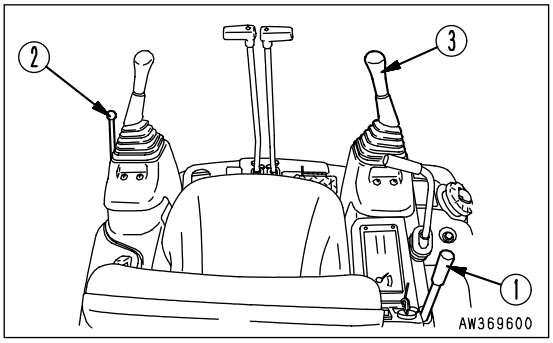
Your Komatsu machine has been thoroughly adjusted and tested before shipment. However, operating the machine under severe conditions at the beginning can adversely affect the performance and shorten the machine life.
Be sure to running-in the machine for the initial 100 hours (as indicated by the service meter).
During running-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.
- Avoid sudden starts, sudden acceleration, sudden steering and sudden stops except in cases of emergency.

WARMING-UP OPERATION

NOTICE

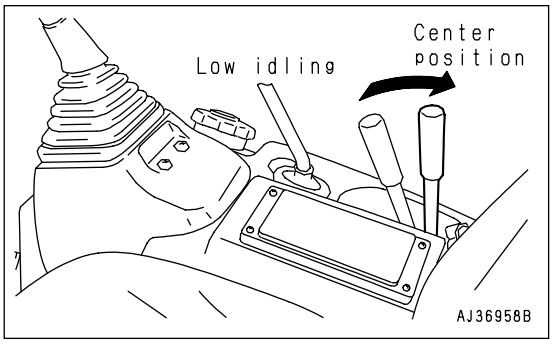
- **When the hydraulic oil is at a low temperature, do not carry out operations or move the levers suddenly. Always carry out the warming-up operation. This will help to extend the machine life.**
- **Do not suddenly accelerate the engine before the warming-up operation is completed.**
  Do not run the engine at low idling or high idling continuously for more than 20 minutes. This will cause leakage of oil from the turbocharger oil supply piping. 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.



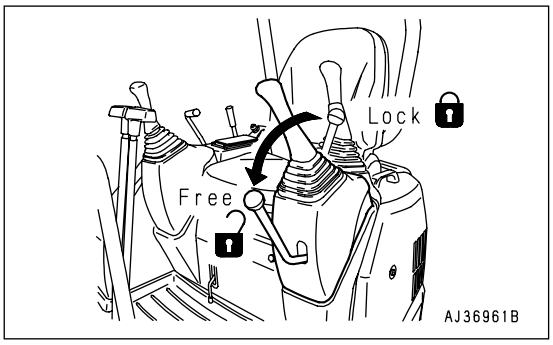
After starting the engine, do not immediately start operations. First, carry out the following operations and checks.

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.

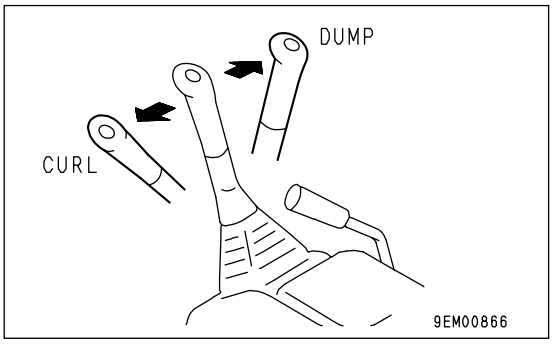
REMARK
When the ambient temperature is below 0°C (32°F), keep the fuel control lever close to the 1/4 position when carrying out the warming-up operation.



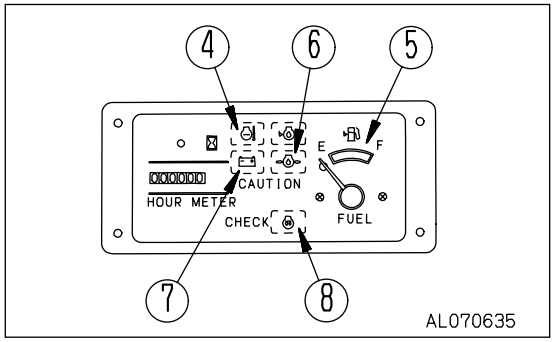
2. Set safety lock lever (2) to the FREE position, and raise the bucket from the ground.



3. Operate bucket control lever (3) and arm control lever (4) slowly to move the bucket cylinder and arm cylinder to the end of the stroke.

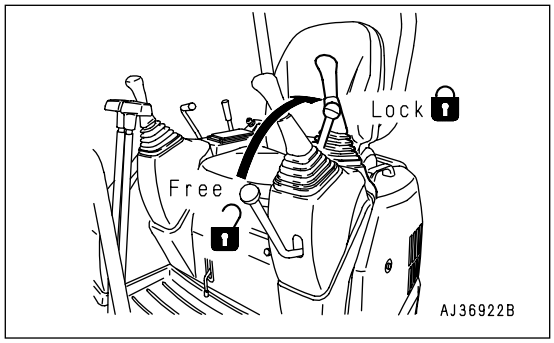


4. After carrying out the warming-up operation, check that each gauge and monitor lamp is in the following condition.
   If there is any abnormality, carry out maintenance and repair.
   - Engine water temperature gauge (4): Inside green range
   - Fuel gauge (5): Inside green range
   - Engine oil pressure monitor (6): OFF
   - Charging monitor (7): OFF
   - Preheating monitor (8): OFF



5. Check that there is no abnormal exhaust gas color, noise, or vibration. If any abnormality is found, repair it.

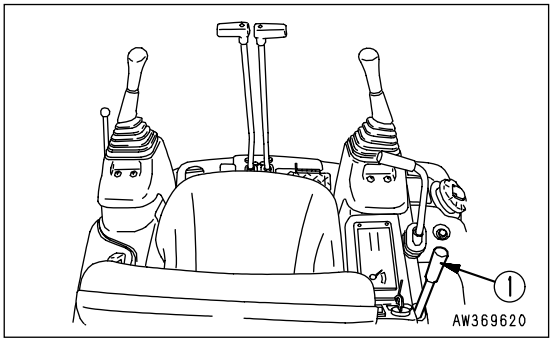
6. Set lock lever (2) to the LOCK position and check that it is impossible to operate the swing and work equipment with the left and right work equipment control levers.



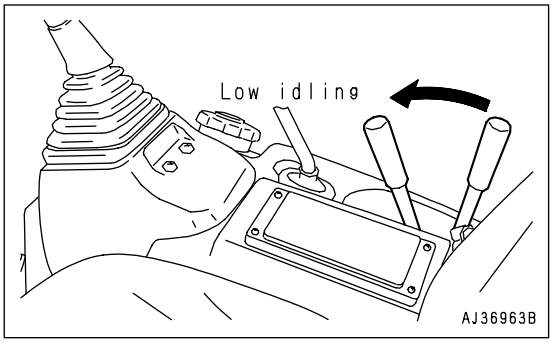
STOPPING THE ENGINE

NOTICE
If the engine is abruptly stopped before it has cooled down, engine life may be greatly shortened. Consequently, do not abruptly stop the engine apart from an emergency.

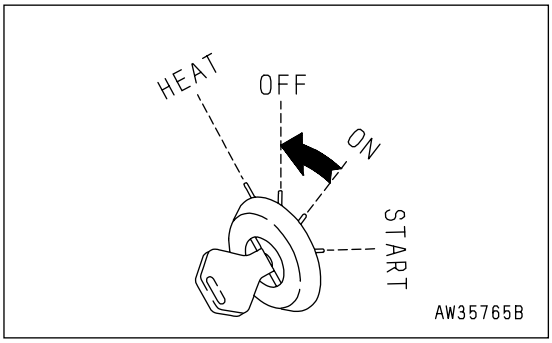
In particular, if the engine has overheated, do not abruptly stop it but run it at mediumspeed to allow it to cool gradually, then stop it.



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



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



CHECK AFTER SHUT OFF ENGINE

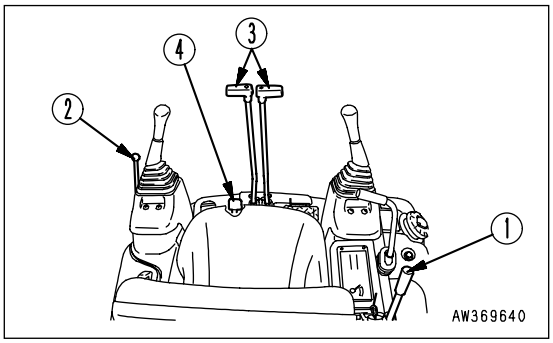
1. Walk around the machine and check the work equipment, machine exterior, and undercarriage, and check also for leakage of oil or water. If any abnormalities are found, repair them.
2. Fill the fuel tank.
3. Check the engine compartment for paper and debris. Clean out any paper and debris to avoid a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

MACHINE OPERATION

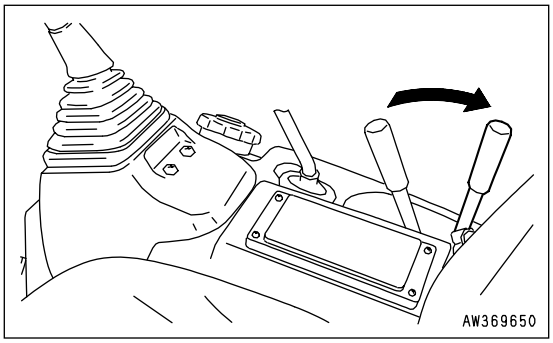
PREPARATIONS FOR MOVING THE MACHINE OFF

⚠ WARNING

- **Before operating the steering 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.**
- **Do not allow anyone in the area around the machine.**
- **Remove all obstacles from the travel path of the machine.**

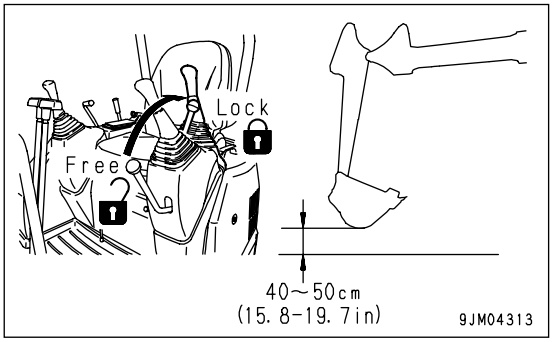


1. Pull fuel control lever (1) towards the high idling position to increase the engine speed.



MOVING MACHINE FORWARD

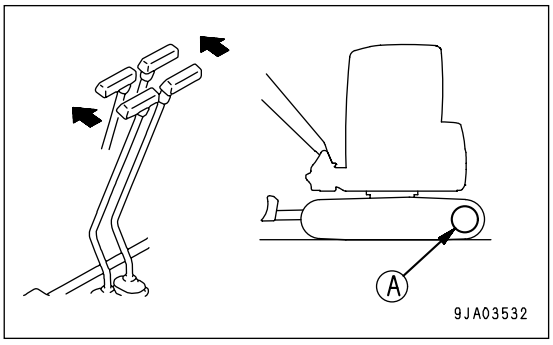
1. Set safety lock lever (4) in the FREE position, fold the work equipment, and raise it 40 to 50 cm (16 to 20 in) from the ground.



2. Operate right and left travel levers (3) as follows.

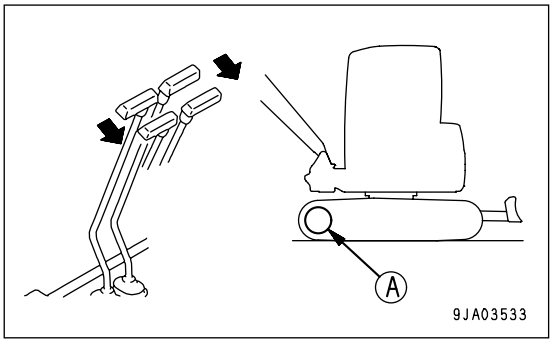
- When the sprocket (A) is at the rear of the machine

  Push levers (3) forward slowly to move the machine off.

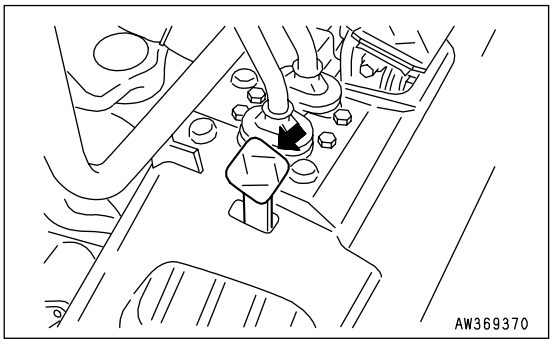


- When the sprocket (A) is at the front of the machine

  Pull levers (5) backward slowly to move the machine off.

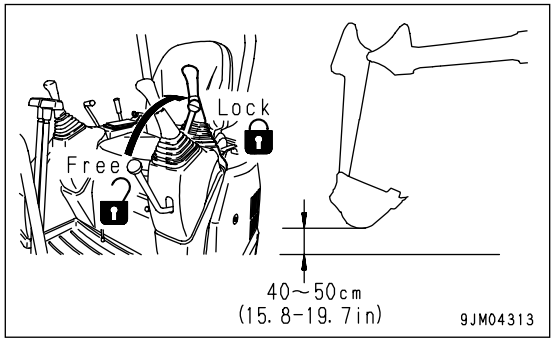


3. When travel accelerator pedal (4) depressed, the speed will increase.
   For details if the speed, see "SPECIFICATIONS (PAGE 5-2)".



MOVING MACHINE BACKWARD

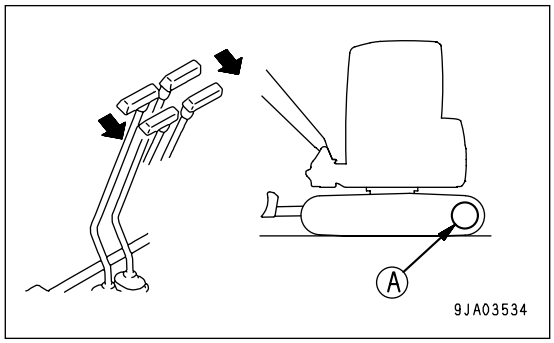
1. Set safety lock lever (2) in the FREE position, fold the work equipment, and raise it 40 to 50 cm (16 to 20 in) from the ground.



2. Operate right and left travel levers (5) as follows.

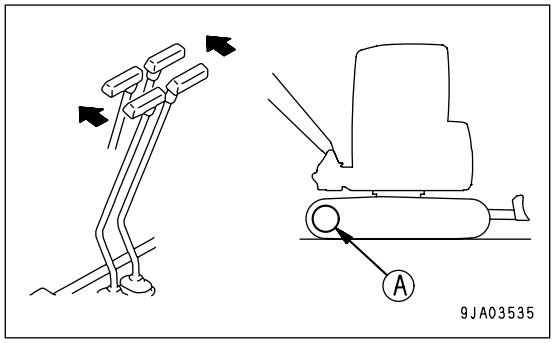
- When the sprocket (A) is at the rear of the machine

  Pull levers (3) backward slowly to move the machine off.

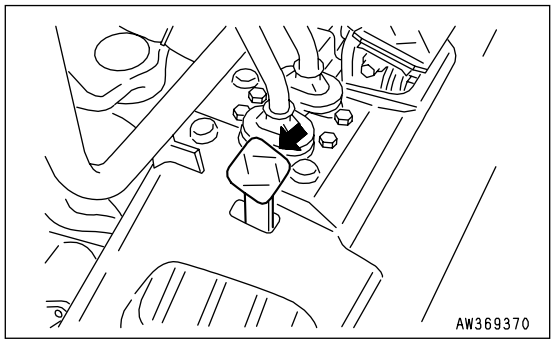


- When the sprocket (A) is at the front of the machine

  Push levers (3) forward slowly to move the machine off.



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

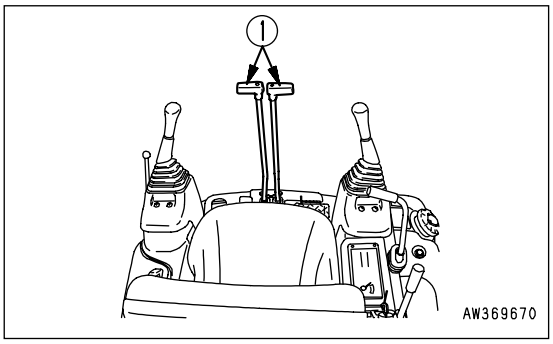


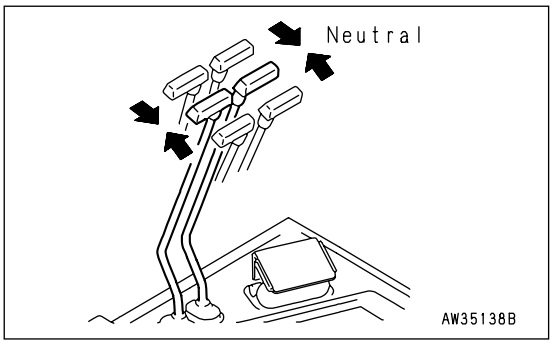
STOPPING MACHINE

⚠ WARNING

Avoid stopping suddenly. Give yourself ample room when stopping.

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





STEERING THE MACHINE

STEERING

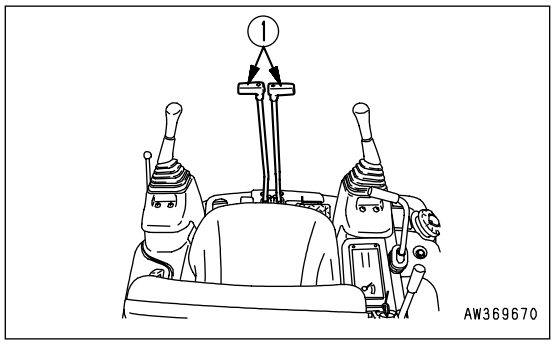
⚠ WARNING

Before operating the travel levers, check the position of the sprocket. If the sprocket is at the front, the operation of the travel levers is reversed.

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.

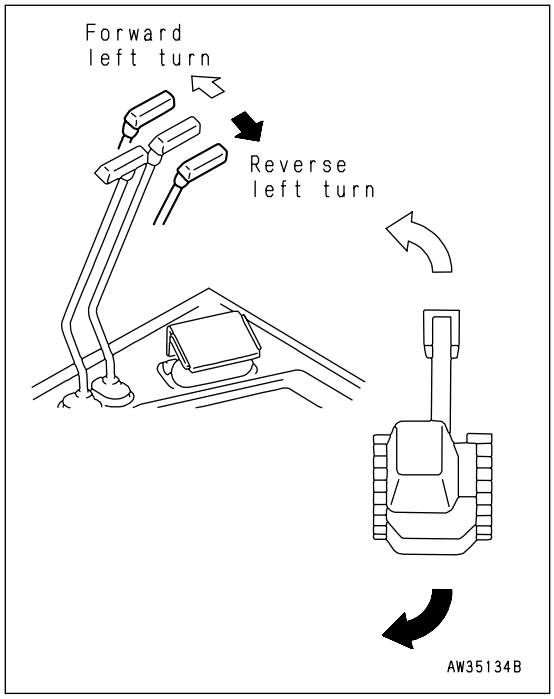


STEERING THE MACHINE WHEN STOPPED

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.

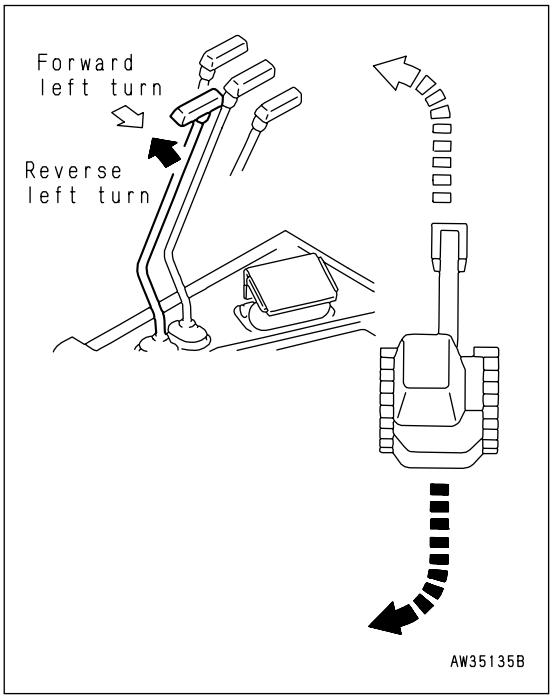


CHANGING DIRECTION OF THE MACHINE

When turning to the left:

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

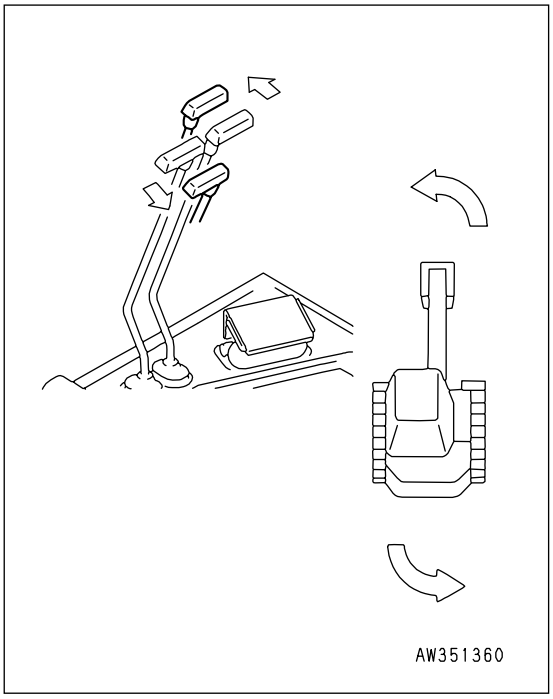
REMARK
When turning to the right, operate the right travel lever in the same way.



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.

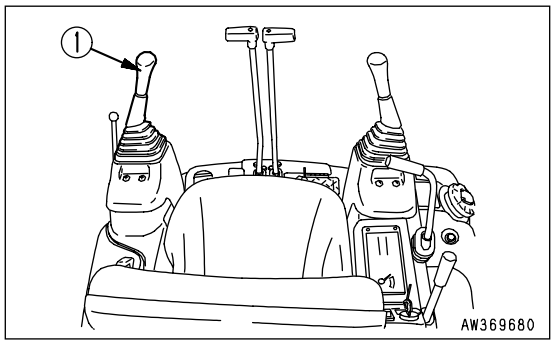
REMARK
When using counter-rotation to turn right, pull the right travel lever back and push the left travel lever forward.



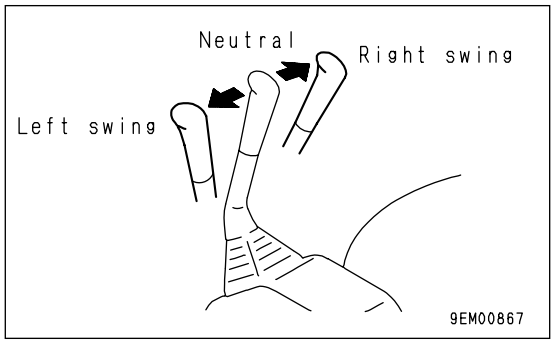
SWINGING

⚠ WARNING

- **The rear of the machine extends outside the track width. Check that the surrounding area is safe before swinging be upper structure.**
- **Check that swing lock monitor is not lighted up.**
- **If the swing control lever is operated quickly, the upper structure will move quickly; if it is operated slowly, the upper structure will move slowly.**



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

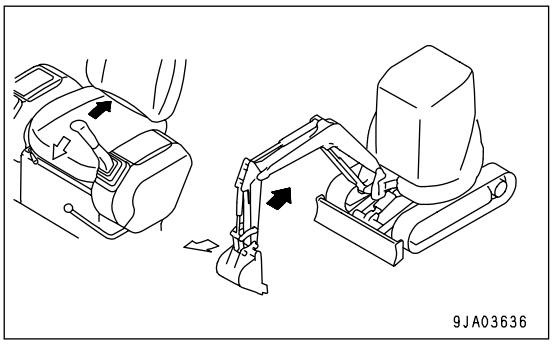
If the work equipment control lever is operated quickly, the work equipment will move quickly; and if it is operated slowly, the work equipment will move slowly.

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.

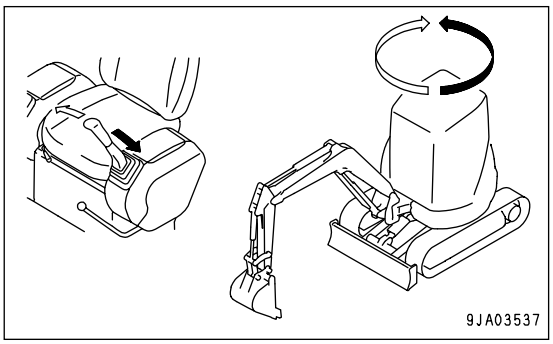
- Arm control

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



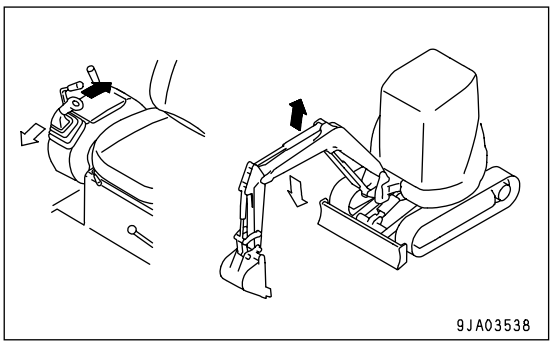
- Swing control

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



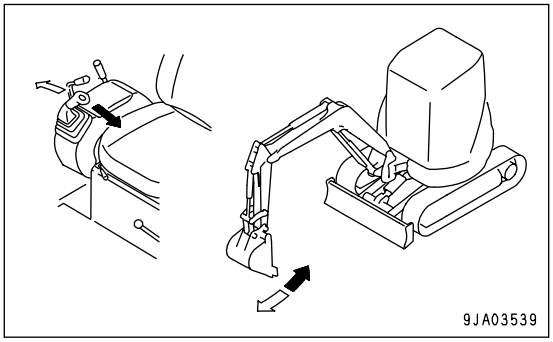
- Boom control

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



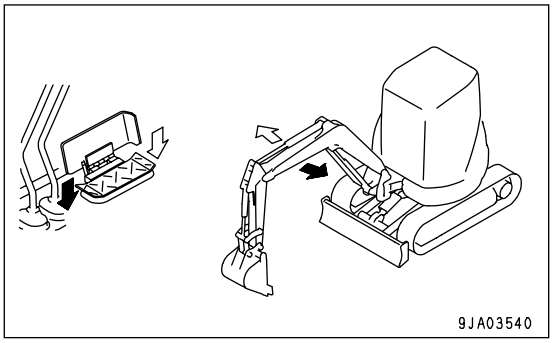
- Bucket control

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



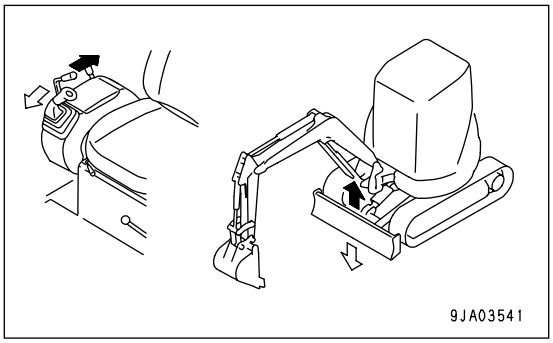
- Boom swing operation

  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.



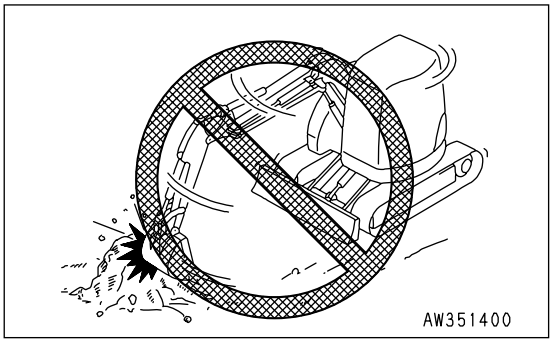
PROHIBITED OPERATIONS

⚠ WARNING

If it is necessary to operate the work equipment control lever when the machine is traveling, stop the travel and operate the control lever.

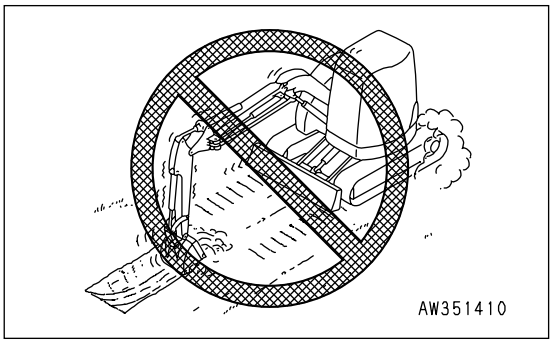
OPERATIONS USING SWING FORCE

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.



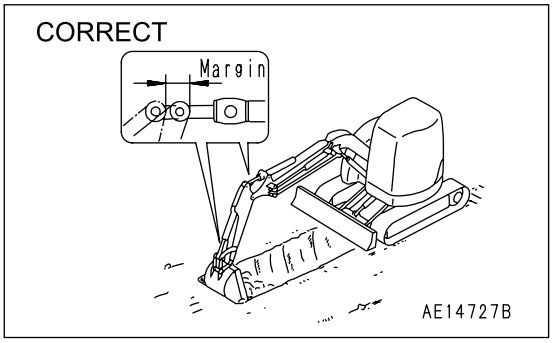
OPERATIONS USING TRAVEL FORCE

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.



OPERATIONS USING HYDRAULIC CYLINDER STROKE ENDS

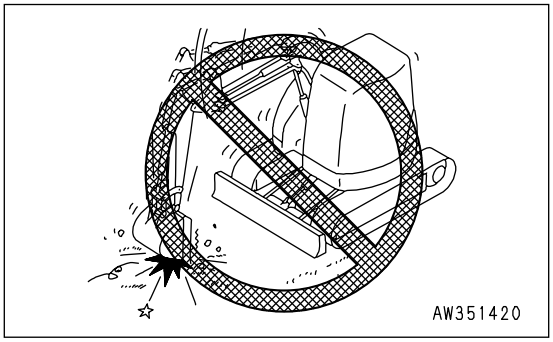
If the cylinder is used when the cylinder rod has been operated to the end of its stroke during operations, external force will cause impact to the work equipment, and this will damage the hydraulic cylinders. Avoid carrying out operations with the hydraulic cylinder fully retracted or fully extended.



OPERATIONS USING BUCKET DROPPING FORCE

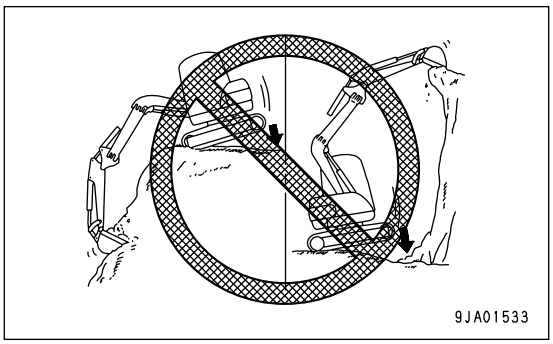
Do not use the dropping force of the machine for digging, or use the dropping force of the bucket as a pickaxe, breaker, or pile driver.

This will markedly reduce the life of the machine.



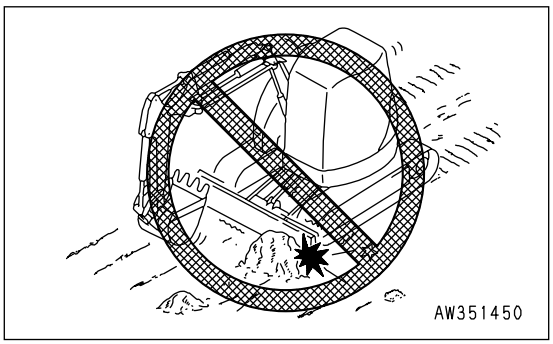
OPERATIONS USING MACHINE DROPPING FORCE

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



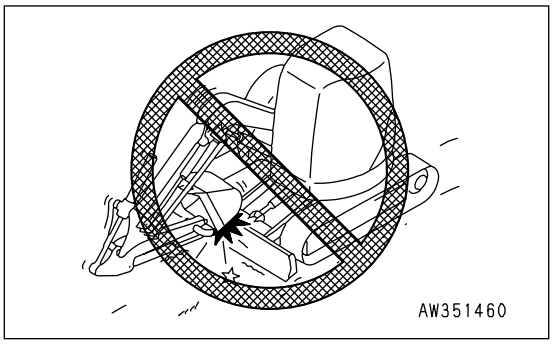
AVOID HITTING BLADE

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



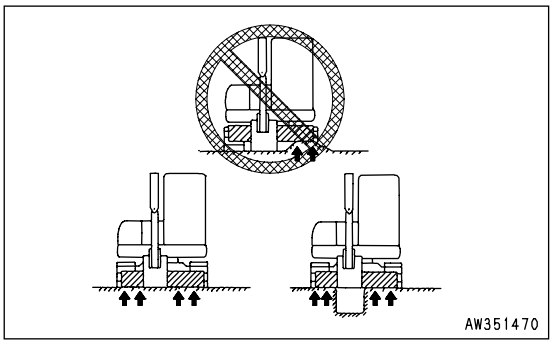
FOLDING IN WORK EQUIPMENT

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



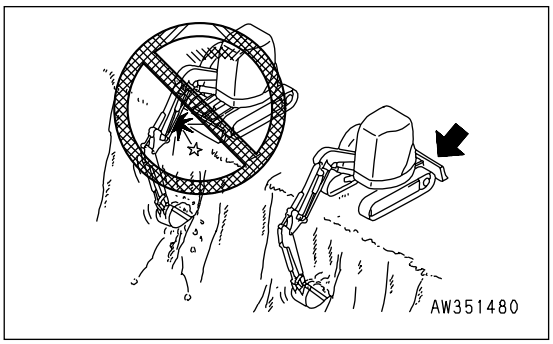
SUPPORT BLADE ON BOTH SIDES

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



BLADE DURING BACKHOE OPERATIONS

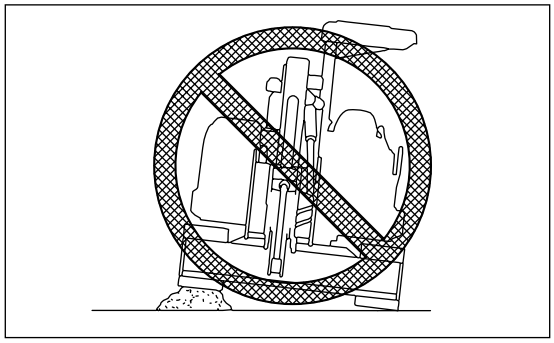
When carrying out deep digging operations with the blade at the front, be careful not to the boom cylinder hit the blade. Always position the blade at the back unless it is needed at the front.



GENERAL OPERATION INFORMATION

TRAVELING

When traveling over obstacles such as boulders or tree stumps, the machine (in particular, the undercarriage) is subjected to a large shock, so reduce the travel speed and travel over the obstacle at the center of the tracks. As far as possible, remove such obstacles or avoid traveling over them.

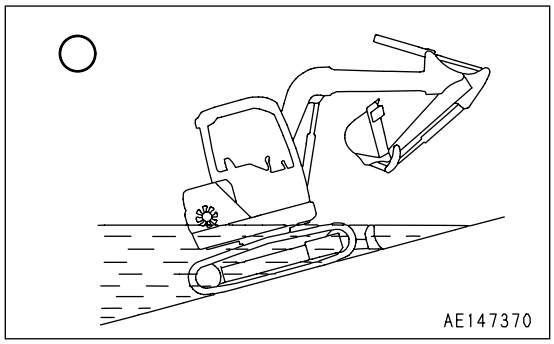


When the variable gauge is fully retracted, there is particular danger of the machine tipping over to the left or right if the rubber crawler on one side travels over obstacles such as boulders or tree stumps or goes into a ditch or hole. In such places, lower the travel speed and be extremely careful to maintain the machine balance when traveling.

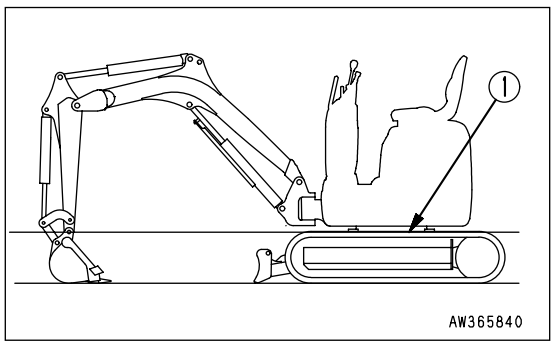
PERMISSIBLE WATER DEPTH

⚠ CAUTION

When driving the machine out of water, if the angle of the machine exceeds 15º, 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 drive the machine in water deepen than of the center of carrier roller(1).



Supply grease to the parts which have been under water for a long time until the used grease is projected out of the bearings (around the bucket pin, in particular).

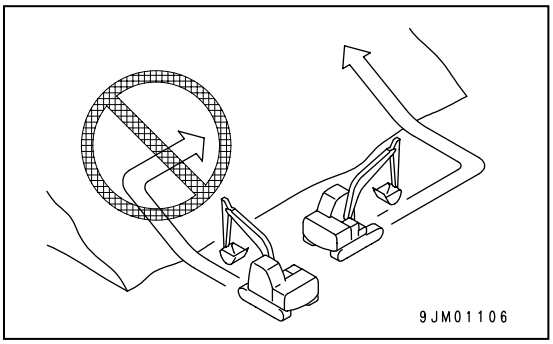
TRAVELING ON SLOPES

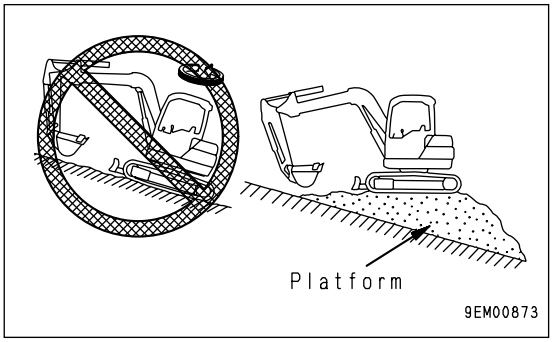
⚠ WARNING

When traveling, raise the bucket approx. 20 to 30cm (8 to 12 in) from the ground.

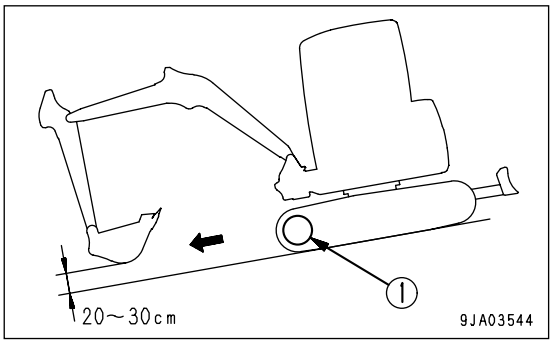
Do not travel downhill in reverse.

- **When traveling over ridges or other obstacles, keep the work equipment close to the ground and travel slowly.**
- **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.**
- **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 platformon 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 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.**

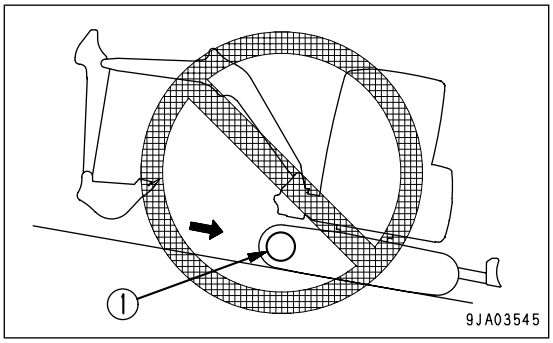




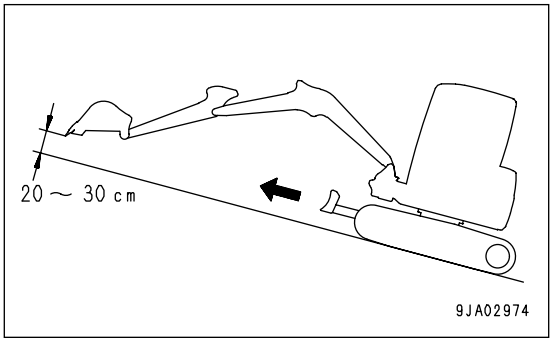
1. When traveling down steep hills, use the travel lever and fuel control lever to keep the travel speed low. When traveling down a steep hill of more than 15º, set the work equipment to the posture shown in the diagram on the right, and lower the engine speed.



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 15º, set the work equipment to the posture shown in the diagram on the right.



TRAVELING DOWNHILL

To brake the machine during downhill runs, 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 all levers to the neutral position, then start the engine again.

PRECAUTIONS ON SLOPES

- Do not open or close the sliding door when traveling or operating on slopes. The operating force may change suddenly.
  Always set the sliding door to the LOCK position.

ESCAPE FROM MUD

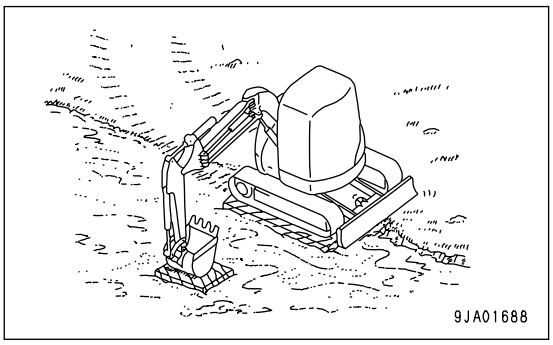
Always operate carefully to avoid getting affixed in mud. If the machine does get affixed in mud, do as follows to get the machine out.

STUCK ONE SIDE OF TRACK

NOTICE

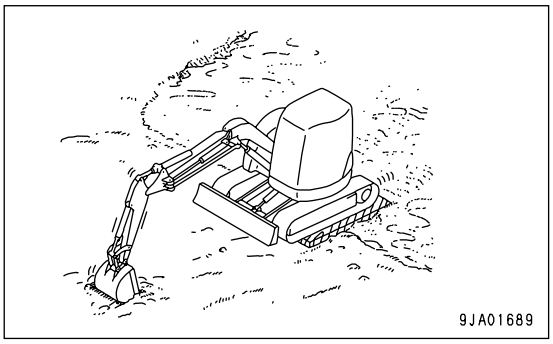
When using the boom or arm to raise the machine, always havethe bottom of the bucket in contact with the ground. (Never pushwith the teeth). The angle between the boom and arm should be 90ºt to 110º. The same applies when using the inverting bucket.

When only one side is stuck in mud, use the bucket to raise the track, then lay boards or logs and drive the machine out. If necessary, put a board under the bucket also.



STUCK BOTH SIDES OF TRACKS

When the tracks on both sides are stuck in mud and the machine will not move, lay boards as explained above, and dig the bucket into the ground in front. Then pull in the arm as in normal digging operations and put the travel levers in the FORWARD position 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

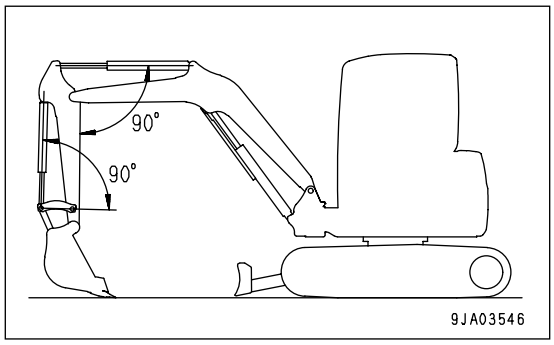
A backhoe is suitable for excavating at a position lower than the machine.

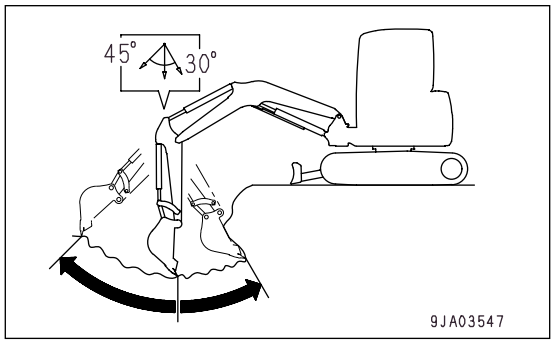
When the condition of the machine is as shown in the diagram at right, each cylinder's maximum pushing excavation force is obtained when the bucket cylinder and link, arm cylinder and arm are at 90º.

When excavating, use this angle effectively to optimize your work efficiency.

The range for excavating with the arm is from a 45º angle away from the machine to a 30º angle toward the machine.

There may be some differences depending on the excavation depth, but try to stay within the above range rather than operating the cylinder is the end of its stroke.

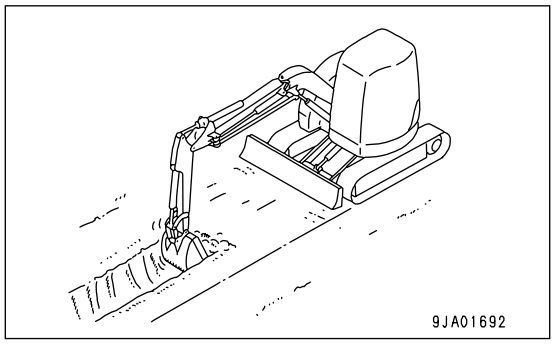




DITCHING WORK

Ditching work can be performed efficiently by attaching a bucket to match the width of the ditch and then setting the tracks parallel to the line of the ditch to be excavated.

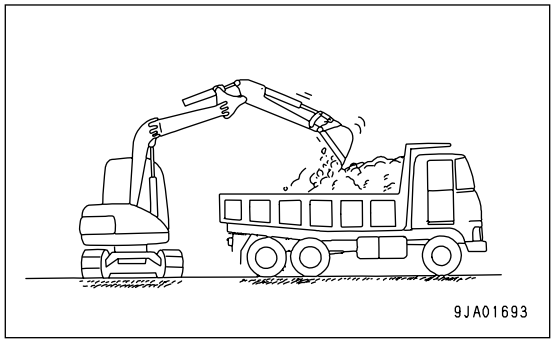
To excavate a wide ditch, first dig out both sides and then finally remove the center portion.



LOADING WORK

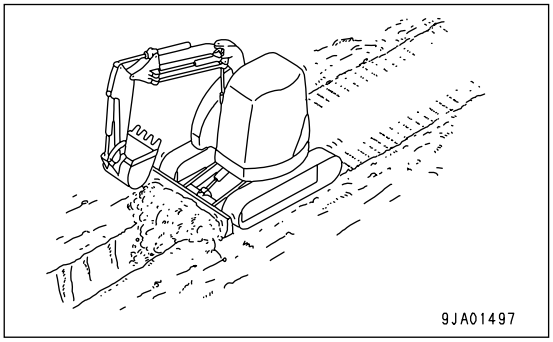
In places where the swing angle is small, work efficiency can be enhanced by locating the dump truck in a place easily visible to the operator.

Loading is easier and capacity greater if you begin from the front of the dump truck body than if loading is done from the side.



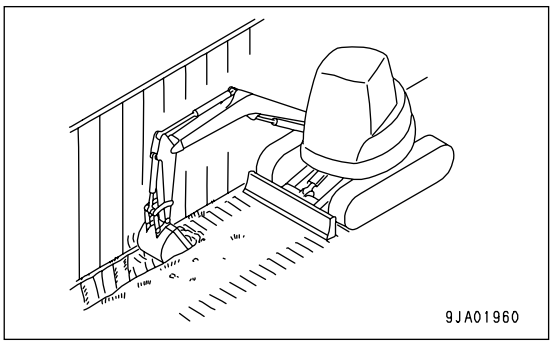
SMOOTHING WORK

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 work-site by combining the swing and boom swing operations.



REPLACEMENT AND INVERSION OF BUCKET

⚠ WARNING

- **When the pin is knocked in with a hammer, pieces of metal may fly into your eyes 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 the pins are hit with force, the pin may fly and injure people in the surrounding area, so check that the surrounding area is safe.**
- **When removing the pin, be extremely careful not to stand behind the bucket or to put your foot or any part of your body behind the bucket from the side.**
- **When removing or installing the pin, be extremely careful not to get your hands caught.**
- **Never put your fingers in the pin holes when aligning the holes.**

NOTICE
After removing the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushing on both sides do not become damaged.

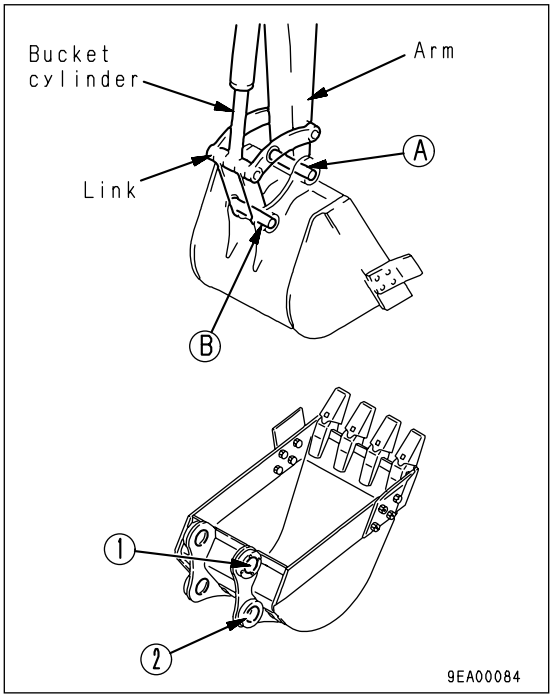
Stop the machine on a firm, flat surface. When performing joint work, make clear signals to each other and work carefully for safety's sake.

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.

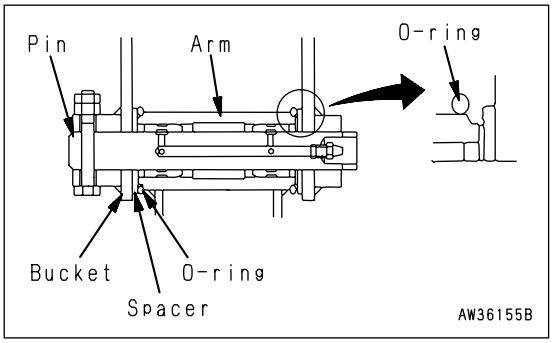
2. Remove the stopper bolts and nuts, then remove pins (A) and (B), and remove the bucket.

3. Align the arm with holes (1) and the link with holes (2), then coat with grease and install pins (A) and (B).



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 in the pins, move the O-ring down to the regular groove.

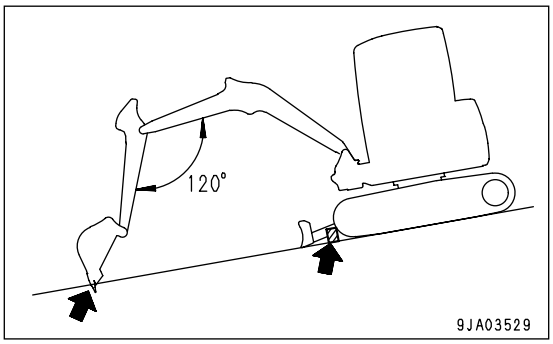


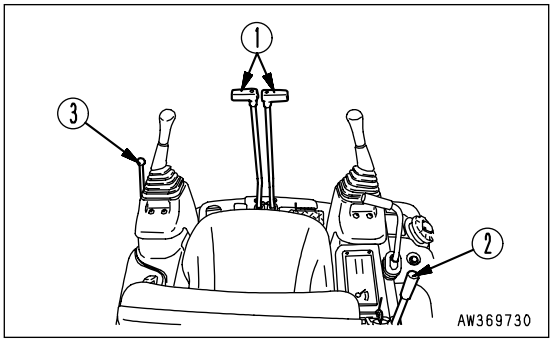
4. Install the stopper bolts and nuts for each pin, then grease the pin.

PARKING MACHINE

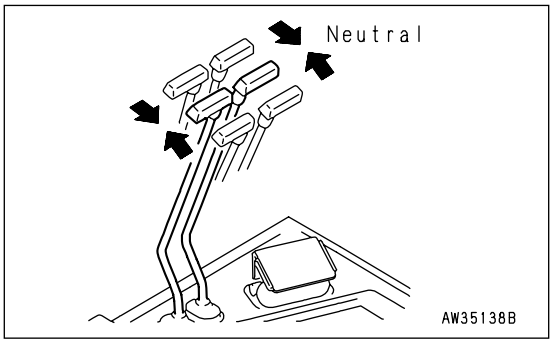
⚠ WARNING

- **Avoid stopping suddenly. Give yourself ample room when stopping.**
- **When stopping the machine, select flat hard ground and avoid dangerous places. If it is unavoidably necessary to park the machine on a slope, insert blocks underneath the track shoes. As an additional safety measure, thrust the bucket into the ground.**
- **If the control lever is touched by accident, the work equipment or the machine may move suddenly, and this may lead to a serious accident.**
  Before leaving the operator's compartment, always set the safety lock lever securely to LOCK position.

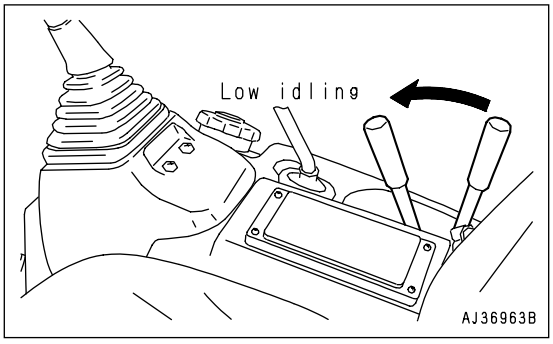




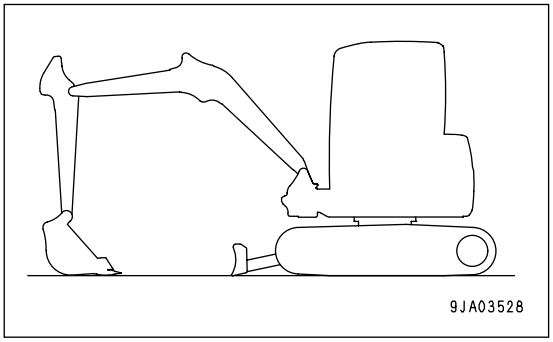
1. Put left and right travel levers (1) in the neutral position. The machine stops.



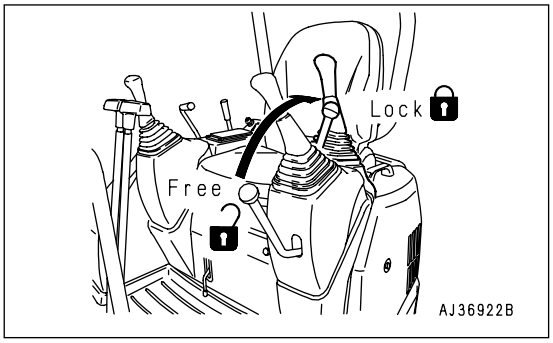
2. Lower the engine speed to low idling by fuel control dial (2) .



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

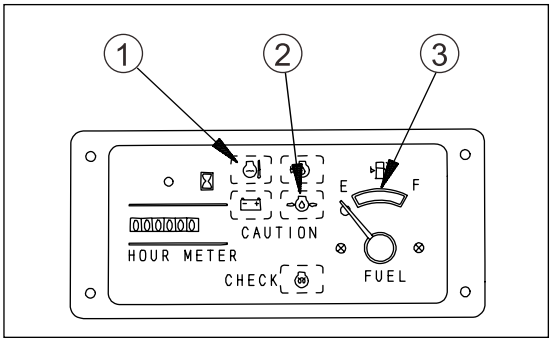


5. Set safety lock lever (3) in the LOCK position.



CHECK AFTER FINISHING WORK

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

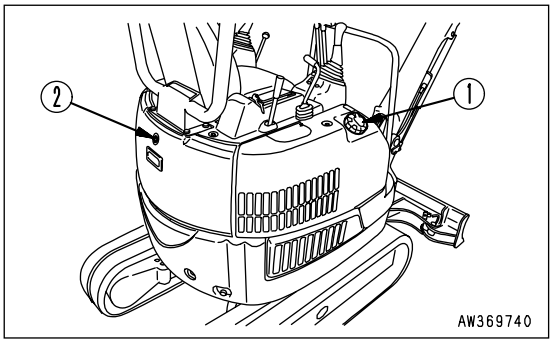


LOCKING

Always lock the following places.

(1) Fuel tank filler port
(2) Engine hood

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



RUBBER SHOES

RUBBER SHOES INFORMATION

Rubber shoes 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 of Rubber Shoes and Metal Shoes

	Rubber shoes	Metal shoes
Little vibration	Excellent	Average
Smooth travel (No creaks)	Excellent	Good
Little noise	Excellent	Average
No damage to paved surface	Excellent	Average
Easy to handle	Excellent	Average
Easily damaged	Average	Excellent
Strong drawber pull	Excellent	Excellent

Considering the properties of the material used, rubber shoes offer various advantages. However, thier weak point is lack of strength. Therefore, it is important to understand the advantages of rubber shoes, and to follow the precautions regarding handling and prohibited work. This will extend the life of the rubber shoes and will enable the machine to display the advantages of rubber shoes to the maximum. Before using rubber shoes, always read "USING RUBBER SHOES (PAGE 3-61)".

WARRANTY FOR RUBBER SHOES

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

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.
- 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 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.
- Be careful not to get oil, fuel, or chemical solvent on the rubber shoes. If such a substance should 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.

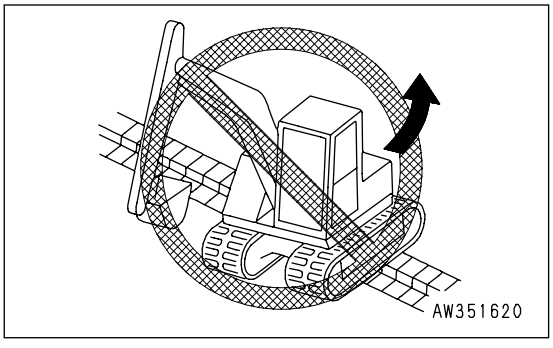
Long life operations

To avoid damage to the rubber shoes, be careful of the following points when carrying out work.

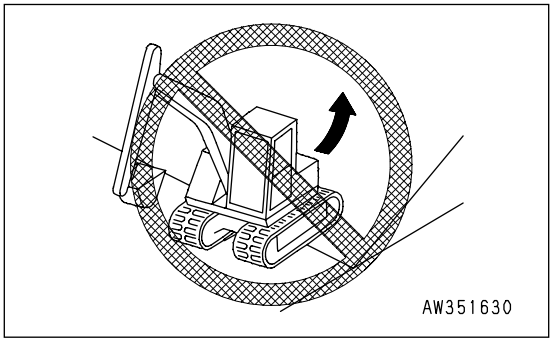
- Avoid carrying out counter-rotation turns on concrete surfaces.
- Avoid making sudden changes in direction. This may cause premature wear or damage to the rubber shoes.
- Avoid operating the steering when traveling over places where there is a big difference in height. When traveling over obstacles 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, 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 slip extremely easily on snow or frozen roads. Be careful not to slip when traveling or working on slopes.
- The properties of rubber shoes change when working in extermely cold places, and this will reduce the life of the rubber shoe.
- Because of the properties of rubber, use the rubber shoes within a range of -25°C to +55°C (-13°F to +131°F).
- When carrying out bucket operations, be careful not to damage the rubber shoes with the bucket.

To prevent the rubber shoes from coming off, pay careful attention to the following when carrying out operations. Even when the tension is correct, be extremely careful when carrying out operations.

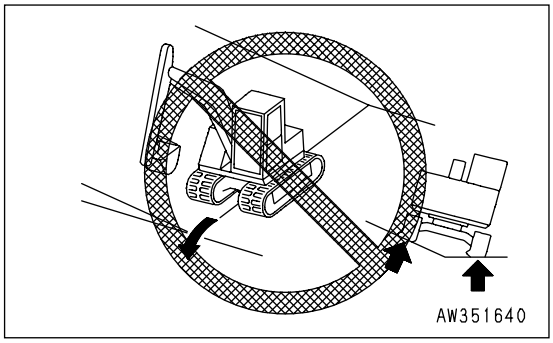
- Avoid operating the steering when traveling over curbs, rocks, or places where there is a big difference in height (more than approx. 20cm (8 in)). When traveling over such objects, always travel at right angles to the object.



- 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.

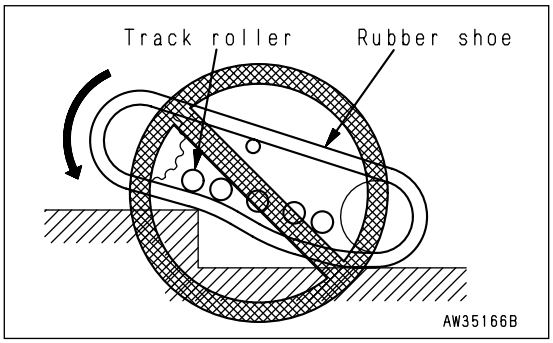


- Avoid traveling along the edge of slopes or on rough ground with the track on one side raised (with the machine tilting at an angle of more than approx. 10°) and with the track on the other side on flat ground. To avoid damage to the rubber shoes, travel with the tracks on both sides on flat ground.

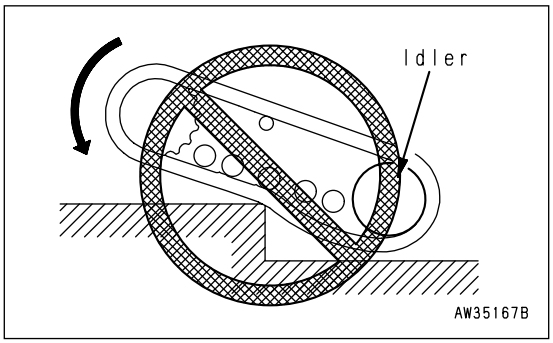


Mechanism of rubber shoe coming off track

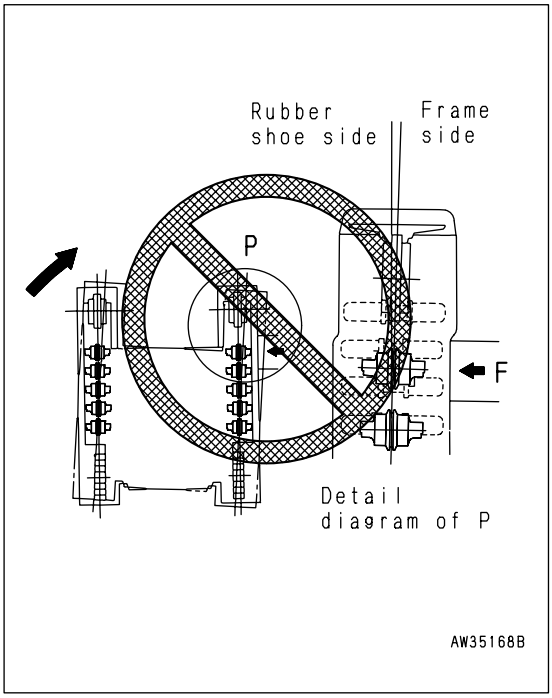
1) When traveling over an obstacle, a gap is formed between the track roller and the rubber shoe. In this condition, the rubber shoe may come off.



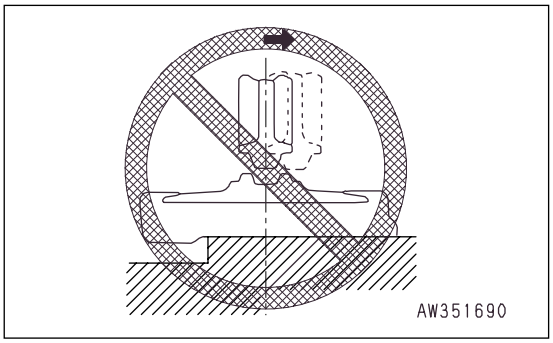
2) Furthermore, if the machine travels in reverse, a gap is formed between the track roller, idler, and rubber shoe.



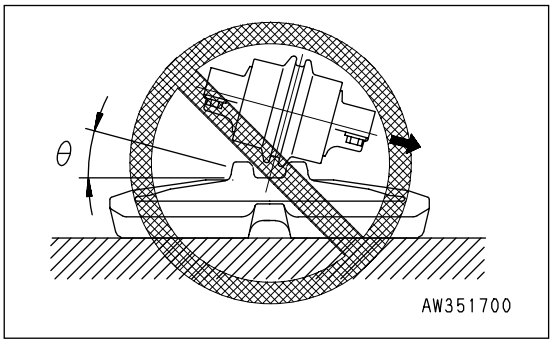
- When turning in a condition where the rubber shoe cannot move to the side because of the object it is passing over, or because of some other object.
- When the rubber shoe has moved out of alignment and the idler or track roller are not aligned with the core.



- 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.

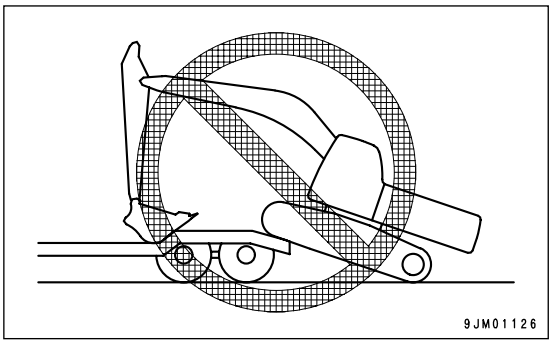
Select the trailer to match the weight and dimensions given in "SPECIFICATIONS (PAGE 5-2)".

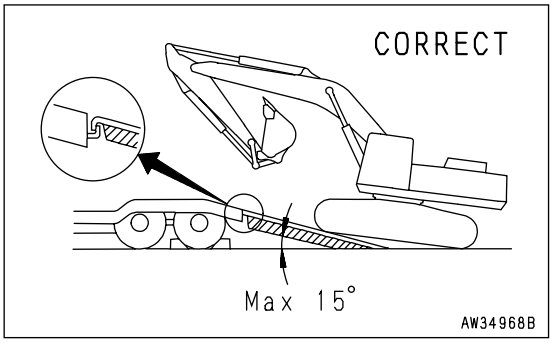
Note that the value for the weight and transportation dimensions given in SPECIFICATIONS may differ according to the type of shoe or type of arm or other attachments.

LOADING AND UNLOADING WITH TRAILER

⚠ WARNING

- **When loading or unloading on to a trailer, set to low speed, and do not operate the travel speed selector switch during the operation.**
- **Run the engine at low idling, set to low speed, and operate the machine slowly when loading or unloading.**
- **Select firm, level ground when loading or unloading the machine.**
  Maintain a safe distance from the edge of the road.
- **Use ramps with ample width, length, thickness, and strength and install them at a maximum slope of 15º.**
  When using piled soil, compact the piled soil fully and take action to prevent the slope face from collapsing.
- **Remove all mud and dirt from the machine tracks before starting in order to prevent the machine from slipping on the ramps.**
  Be sure that the ramp surface is clean and free of water, snow, ice, grease, or oil.
- **Never correct your steering on the ramps. There is danger that the machine may turn over.**
  If necessary, drive off the ramps, correct the direction, then enter the ramps again.
- **Do not use use the work equipment for loading and unloading operations. It is dangerous.**
- **When on the ramps, do not operate any lever except the travel lever.**
- **The center of gravity of the machine will change suddenly at the joint between the ramps and the track or trailer, and there is danger of the machine losing its balance. Travel slowly over this point.**
- **When swinging the upper structure on the trailer, the trailer is unstable, so pull in the work equipment and swing slowly.**
- **Extend the variable gauge before starting the operation.**



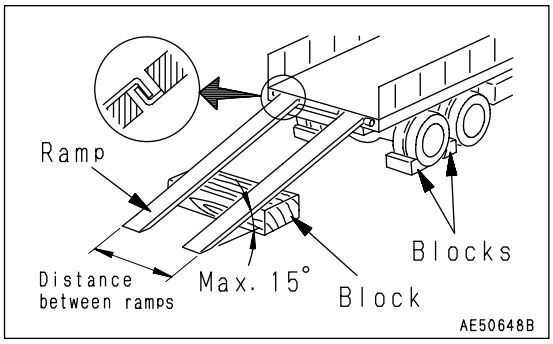


When loading or unloading, always use ramps or a platform and carry out the operation as follows.

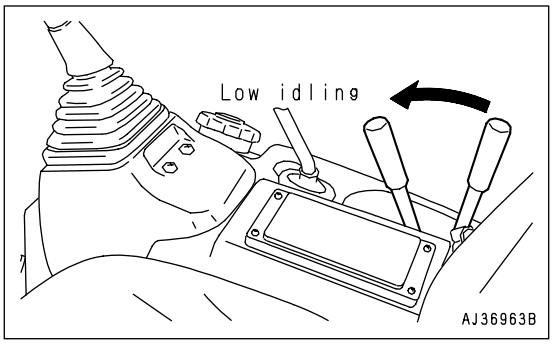
LOADING

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 blocks under the tires to ensure that the trailer does not move. Then fix the ramps in line with the centers of the trailer and the machine.
   Be sure that the two sides are at the same level as one another.
   Make the slope of the ramps a maximum of 15º.
   Set the distance between the ramps to match the center of the tracks.

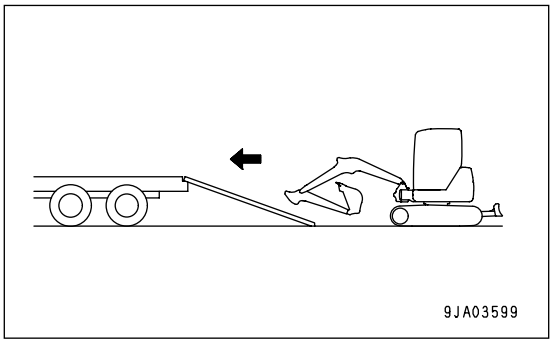


3. Run the engine at low speed.

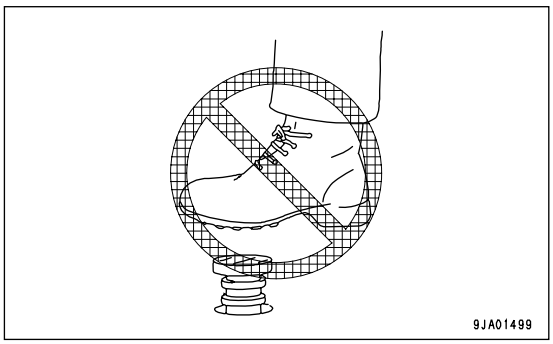


4. When loading, set the work equipment at the front and the blade at the rear, with the undercarriage and upper structure set parallel.

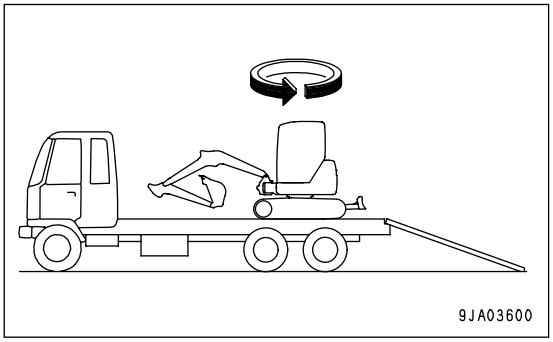
5. Align the direction of travel with the ramps and travel slowly.
   Lower the work equipment as far as possible without causing interference.
   When on the ramps, operate only the travel lever. Do not operate any other lever or pedal.



6. Do not operate the travel boost 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

⚠ WARNING

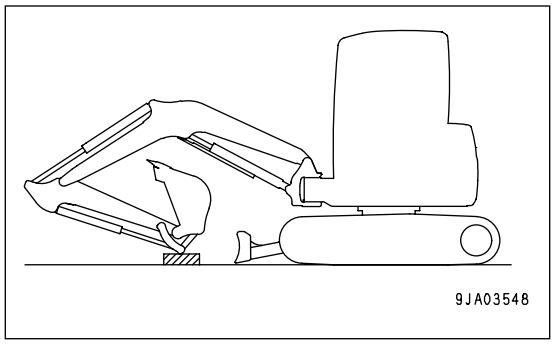
Load the machine on a level and hard place. Secure a sufficient distance between the road shoulder and the machine.

NOTICE

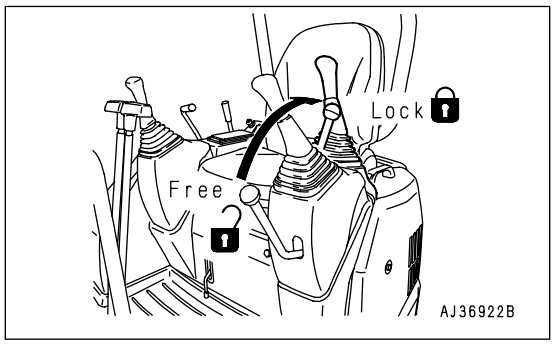
To prevent damage to the bucket cylinder during transportation, fit a wooden block at one end of the bucket cylinder to prevent it from touching the floor.

Load the machine on to a trailer as follows.

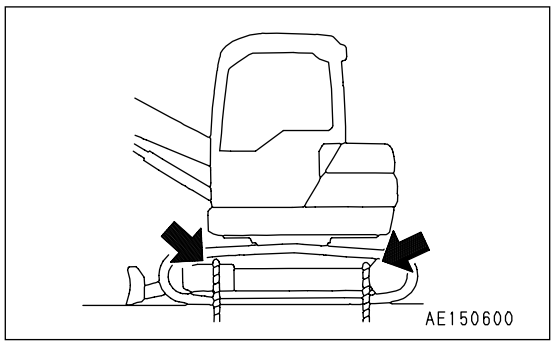
1. Lower the brade.
2. Extend the bucket and arm cylinders fully, then lower the boom slowly.
3. Stop the engine, then remove the key from the starting switch.



4. Lock the control levers securely with the safety lock lever.



5. 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.



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 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.**
- **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.**
- **It is dangerous to go under the machine when it is raised. Never go under the machine in such cases.**
- **Extend the variable blade and insert the pin securely.**

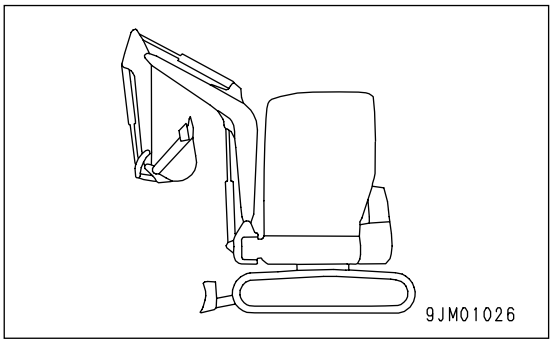
NOTICE
The lifting procedure applies to machines with standard specifications.
The method of lifting differs according to the attachments and options actually installed. In such cases, please contact your Komatsu distributor for information.

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

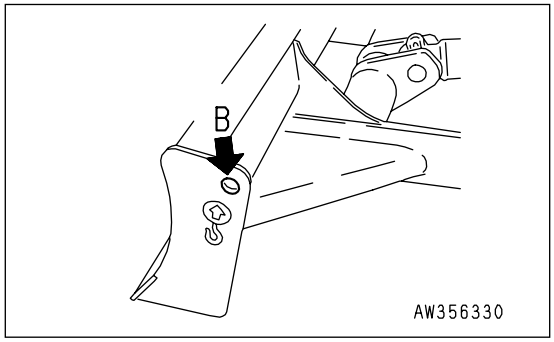
For details of the weight, see "SPECIFICATIONS (PAGE 5-2)".

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

1. Start the engine and swing the upper structure unit the blade is in the rear of the machine body.
2. Raise the blade to the end.
3. Extend the bucket cylinder and arm cylinder fully, operate the work equipment control lever so that the boom cylinder is perpendicular to the ground, then set the lock lever to the LOCK position.
4. Set the boom swing pedal to the neutral position without swinging the boom at all, then set the pedal lock to the LOCK position.
5. Stop the engine and confirm that there is nothing around the operator's seat, then get off the machine.
6. Extend the variable blade and insert the pin securely.



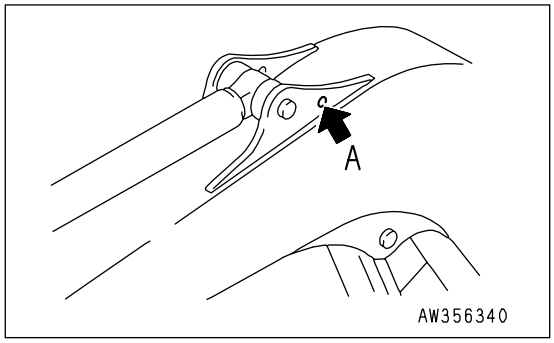
7. Install shackles to the lifting holes B (2 places) on both ends of the blade, then install the wire ropes.



8. Install shackles to the lifting holes A of the boom, then install the wire ropes.

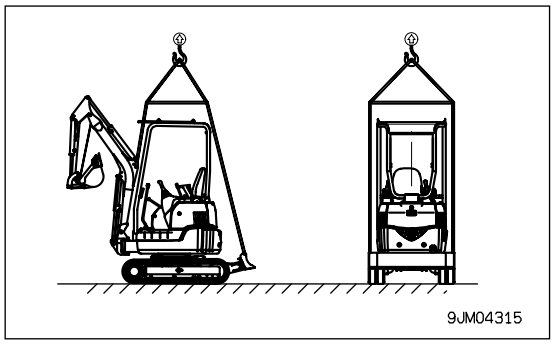
NOTICE

- **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. When lifting, set the hanging angle of the wire ropes to 30° to 40°.

10. After the machine leaves the ground, stop lifting once. After the machine is stabilized, lift it up 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 viscosity, see "USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE (PAGE 4-11)".

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 quantities of fresh water and see a doctor at once.**
- **Antifreeze is toxic. Be extremely careful when handling it. When replacing coolant containing antifreeze or when handling coolant when repairing the radiator, contact your Komatsu distributor or ask your local antifreeze dealer. Be careful not to let the water flow into drainage ditches or spray 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.**
- **Absolutely avoid using any water leak preventing agent irrespective of weather it is used independently or mixed with an antifreeze.**
- **Do not mix one antifreeze with a different brand.**

For details of the antifreeze mixture when changing the coolant, see "CLEAN INSIDE OF COOLING SYSTEM (PAGE 4-23)".

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 amounts 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.**

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.

Temp. of fluid / Rate of charge	20ºC (68ºF)	0ºC (32ºF)	-10ºC (14ºF)	-20ºC (-4ºF)
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.

AFTER DAILY WORK COMPLETION

⚠ WARNING

- **Performing idle-running of the tracks is dangerous, so stay well away from the tracks.**
- **After completion of operations, fill the fuel tank to prevent the formation of water caused by condensation of moisture in the empty space in the tank when the temperature goes down.**

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.

- Mud and water on the machine body should be completely removed. This is to prevent damage to the seal caused by mud or dirt getting inside the seal with frozen 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.

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 "USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE (PAGE 4-11)".

- 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

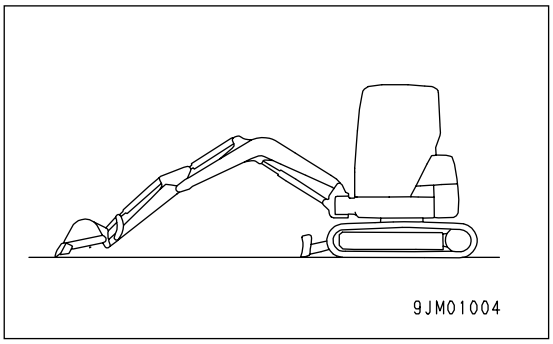
BEFORE STORAGE

NOTICE

When storing the machine, set the machine in the posture shown in the diagram on the right to protect the cylinder rod.

(To prevent rusting of the cylinder 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.
- Komatsu genuine Super Coolant (AF-ACL) is added to the cooling water, so there is no need to change the density for temperatures above -10°C (14ºF).
  If the temperature goes below -10°C (14ºF), adjust the density. For details, see "CLEAN INSIDE OF COOLING SYSTEM (PAGE 4-23)".
- Lock each control lever and pedal with the lock lever and pedal lock.
- Set the stop valve to the LOCK position on machines which can install attachments. Install a plug in the elbow.

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.

During storage, always operate the machine 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 all the grease coating the hydraulic cylinder rods.
- Add oil and grease to all places.
- When the machine has been stored for a long time, the moisture in the atmosphere will get into the oil. Check the oil at all parts before and after starting the engine. If there is water in the oil, change all the oil.

TROUBLESHOOTING

AFTER RUNNING OUT OF FUEL

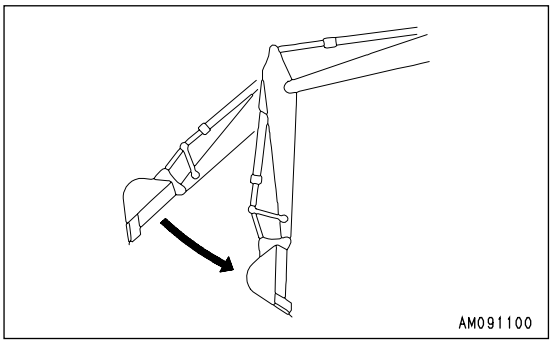
When starting after running out of fuel, fill with fuel and bleed the air from the fuel system before starting.

For details of bleeding the air, see "REPLACE FUEL FILTER ELEMENT (PAGE 4-48)".

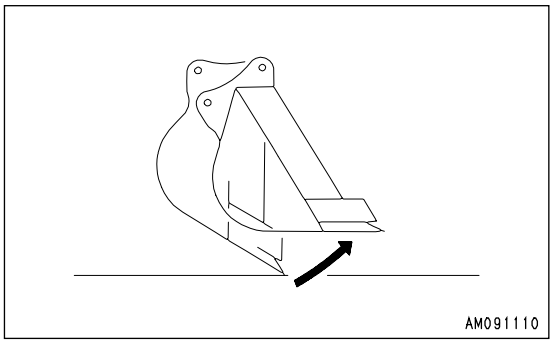
PHENOMENA THAT ARE NOT FAILURES

Note that the following phenomena are not failures:

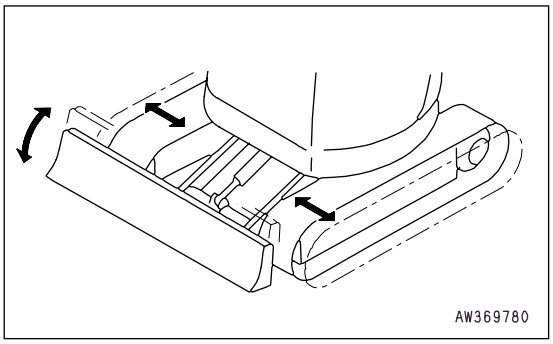
- When the arm is pulled in, the speed of movement will drop momentarily when the arm is more or less vertical.



- The arm speed will drop momentarily when the bucket teeth are more or less horizontal.



- 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.
- When the variable gauge is set to CLOSE and the blade is operated, the gauge expands slightly.
- When the blade is lowered and the variable gauge is operated, the blade moves momentarily.



TOWING THE MACHINE

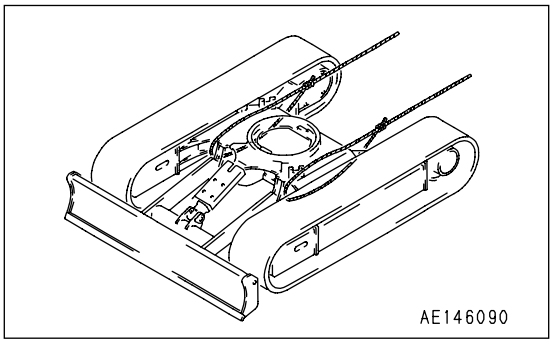
⚠ WARNING

- **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.

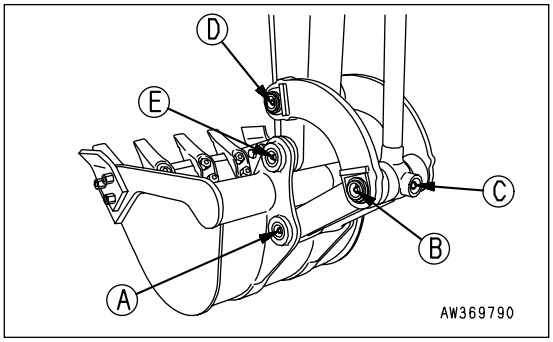
Place pieces of wood between wire ropes and body to prevent damage to ropes and body.

At this time, never use the hook for light-weight towing.



PRECAUTIONS ON PARTICULAR JOBSITES

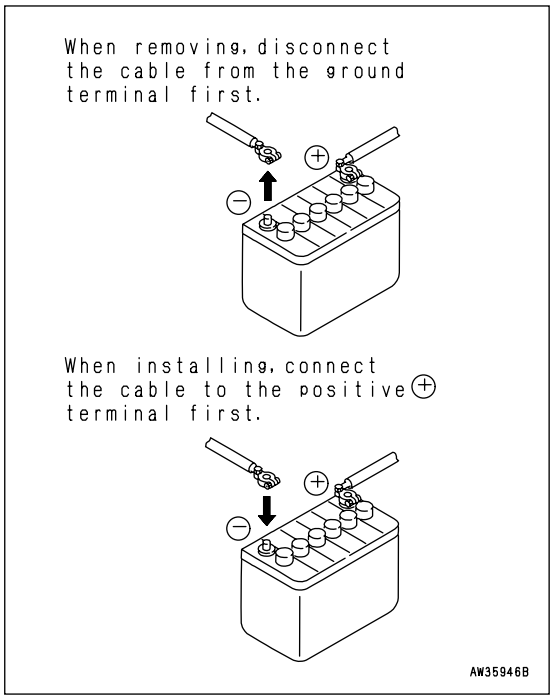
- When digging in water, if the water gets on to the work equipment mounting pins, add grease to bucket links (A), (B), (C), (D) and (E) for each operation.
- When carrying out heavy duty digging and deep digging operations, add grease to bucket links (A), (B), (C), (D) and (E) (total: 5 points) before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



DISCHARGED BATTERY

⚠ WARNING

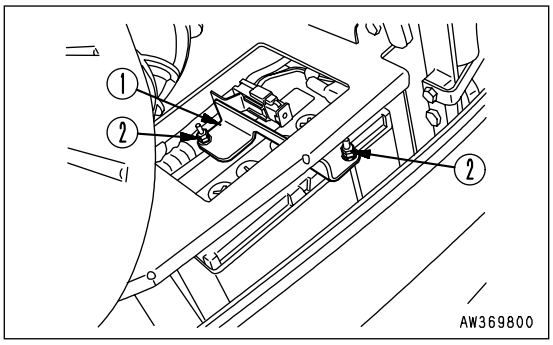
- **It is dangerous to charge the battery while it is still mounted on the machine. Always remove the battery before charging it.**
- **When checking or handling the battery, stop the engine and turn the starting switch key to the OFF position.**
- **The battery generates hydrogen gas, so there is a 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 amounts 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 installing the terminals, install them tightly. When removing or installing the terminals, check which is the positive (+) terminal and which is the negative (-) terminal.**
- **Green rust around the terminals is a cause of self-discharge of the battery. Polish the terminals with sandpaper. After removing the rust, coat the terminals thinly with grease before installing.**



REMOVAL AND INSTALLATION OF BATTERY

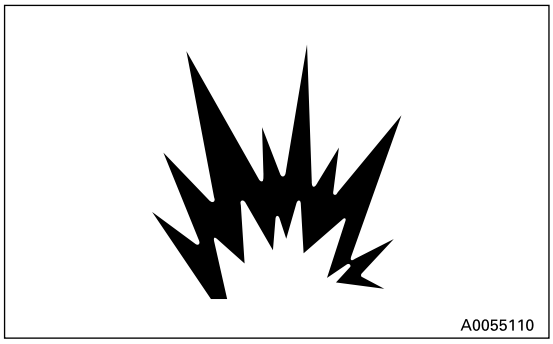
NOTICE
After securing the battery, check that it does not move. If it moves, tighten it again securely.

- 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, there is danger that the battery may explode if it is handled wrongly, so follow the instructions in "OTHER TROUBLE (PAGE 3-83)" and the instruction manual supplied with the charger, and be sure to observe the following precautions.



- 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.

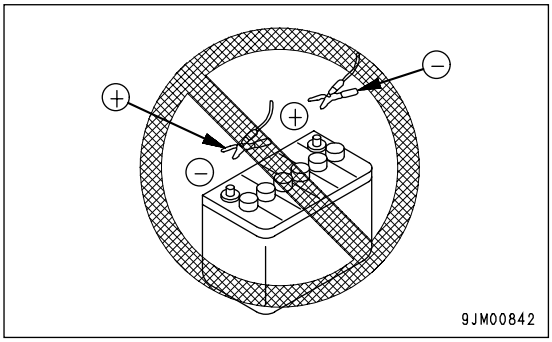
STARTING ENGINE WITH BOOSTER CABLES

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

CONNECTING AND DISCONNECTING BOOSTER CABLES

⚠ WARNING

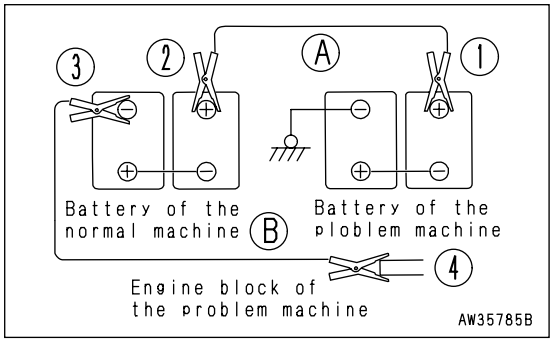
- **When connecting the cables, never contact the positive (+) and negative (-) terminals.**
- **When starting the engine with a booster cable, always wear safety glasses.**
- **Be careful not to let the normal machine and problem machine contact each other. This prevents sparks fromgenerating near the battery which could ignite the hydrogen gas given off by the battery. If hydrogen gas explodes, it could cause serious injury.**
- **Make sure that there is no mistake in the booster cable connections.**
  The final connection is to the revolving frame, but sparks will be generated when this is done, so connect to a place as far as possible from the battery. (However, avoid connecting the cable to the work equipment, as conduction is poor.)
- **Use care when removing the cables from the machine that has been started. To avoid hydrogen explosion, do not allow the cable ends to contact each other or the machine.**



NOTICE

- **The size of the booster cable and clip should be suitable for the battry size.**
- **The battry of the normal machine must be the same capacity as that of the engine to be started.**
- **Check the cables and clips for damage or corrosion.**
- **Make sure that the cables and clips are firmly connected.**
- **Check that the safety lock levers and parking brake levers of both machine are in the LOCK position.**
- **Check that each lever is in the NEUTRAL position.**

BOOSTER CABLE CONNECTION



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

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

1. Make sure that the starting switches of the normal machine and problem machine are both at the OFF position.
2. Connect one clip of booster cable (A) to the positive (+) terminal of the problem machine.
3. Connect the other clip of booster cable (A) to the positive (+) terminal of the normal machine.
4. Connect one clip of booster cable (B) to the negative (-) terminal of the normal machine.
5. Connect the other clip of booster cable (B) to the engine block of the problem machine.

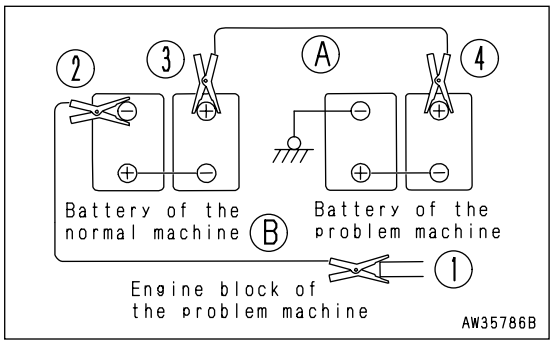
STARTING THE ENGINE

⚠ CAUTION

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 2 minutes 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 engine block 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 does not glow brightly even when the engine runs at high speed	● Defective wiring	(● Check, repair loose terminals, disconnections)
Lamp flickers while engine is running	● Defective adjustment of fan belt tension	● Adjust fan belt tension For details, see EVERY 250 HOURS SERVICE
Charge level monitor does not go out even when engine is running	● Defective alternator ● Defectivr wiring	(● Replace) (● Check, repair)
Abnormal noise is generated from alternator	● Defective alternator	(● Replace)
Starting motor does not turn when starting switch is turned to ON	● Defective wiring ● Defective starting motor ● Insufficient battery charge	(● Check, repair) (● Replace) ● Charge
Pinion of starting motor keeps going and out	● Insufficient battery charge ● Defective safety relay	● Charge (● Replace)
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 does not light	● Defective wiring ● Defective monitor	(● Check, repair) (● Replace)
Oil pressure monitor does not light up when engine is stopped (starting switch at ON position)	● Defective monitor ● Defective caution lamp 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	● Loose fan belt ● Dirty oil cooler ● Lack of hydraulic oil	● Adjust fan belt tension, EVERY 1000 HOURS SERVICE ● Clean, see EVERY 500 HOURS SERVICE ● Add oil to specified level, see CHECK BEFORE STARTING
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	● Engine oil pan oil level is low (sucking in air) ● Clogged oil filter cartridge ● Defective tightening of oil pipe, pipe joint, oil leakage from damaged point ● Defective engine oil pressure sensor ● Defective monitor	● Add oil to specified level, see CHECK BEFORE STARTING ● Replace cartridge, see EVERY 250 HOURS SERVICE (● Check, repair) (● Replace sensor) (● Replace)
Steam spurts out from top of radiator (pressure valve)	● Cooling water level low, leakage of water ● Loose fan belt ● Dirt or scale accumulated in cooling system	● Check, add water, repair, see CHECK BEFORE STARTING ● Adjust fan belt tension. For details, see EVERY 250 HOURS SERVICE. ● Change coolant, flush inside of cooling system, see WHEN REQUIRED
Radiator water level monitor lights up	● Clogged radiator fins or damaged fins ● Defective thermostat ● Loose radiator filler cap (high-altitude operations) ● Defective water level sensor	● Clean or repair, see EVERY 500 HOURS SERVICE (● Replace thermostat) ● Tighten cap or replace packing (● Replace sensor)
Engine does not start when starting motor is turned	● Lack of fuel ● Air in fuel system ● Defective fuel injection pump or defective nozzle ● Starting motor cranks engine sluggishly ● Preheating monitor does not light up ● Defective compression ❍ Defective valve clearance	● Add fuel, see CHECK BEFORE STARTING ● Repair place where air is sucked in, see EVERY 500 HOURS SERVICE (● Replace pump or nozzle) ● See ELECTRICAL SYSTEM ● See ELECTRICAL SYSTEM (● Adjust valve clearance)
Exhaust gas is white or blue	● Too much oil in oil pan ● Improper fuel	● Set oil to specified level, see CHECK BEFORE STARTING ● Change to specified fuel

Problem	Main causes	Remedy
Exhaust gas occasionally turns black	● Clogged air cleaner element ● Defective nozzle ● Defective compression	● Clean or replace, see WHEN REQUIRED (● Replace nozzle) (● See defective compression above)
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 ● Refer to "Radiator water level monitor lights up" as above ● Replace muffler (● Adjust clearance)

MAINTENANCE

⚠ WARNING

Please read and make sure that you understand the safety volume 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 windshield washer fluid, and be sure 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 quantities of metal particles or foreign materials are found, always report to the person in charge, and carry out suitable action.

FUEL STRAINER

If your machine is equipped with a fuel strainer, do not remove it while fueling.

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:

- Check the clogging of the air cleaner more frequently with the dust indicator. Clean the air cleaner element more frequently.
- 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

Never mix different kinds of oil. 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.

LOCKING THE INSPECTION COVERS

When carrying out maintenance with the inspection cover open, lock it in position securely with a lock bar. If inspection or maintenance is carried out with the inspection cover open and 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 "Air Bleeding (PAGE 4-49)".

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 injuly 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 2-35)" 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?

SELECTING FUEL AND LUBRICANTS TO MATCH AMBIENT TEMPERATURE

It is necessary to use fuel and lubricants that match the ambient temperature.

For details, see "USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE (PAGE 4-11)".

LUBRICANTS, COOLANT AND FILTERS

OUTLINE OF OIL, FUEL, COOLANT

OIL

- 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.

  Even if the oil is not dirty, always change the oil after the specified interval.

- 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.

  The majority of problems with machine are caused by the entry of such impurities.

  Take particular care not to let any impurities get in when storing or adding oil.

- Never mix oils of different grades or brands.

- Always add the specified amount of oil.

  Having too much oil or too little oil are both causes of problems.

- If the oil in the work equipment is not clear, there is probably water or air getting into the circuit. In such cases, please contact your Komatsu distributor.

- When changing the oil, always replace the related filters at the same time.

- We recommend you to 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 -15ºC (5ºF)), so it is necessary to change to a fuel that matches 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.

COOLING SYSTEM COOLANT

- River water contains large amounts 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.

- When using anti-freeze, always observe the precautions given in the Operation and Maintenance Manual.
- Komatsu machines are supplied with Komatsu specified anti-freeze in the coolant.

  This anti-freeze is effective in preventing corrosion of the cooling system.

  The anti-freeze can be used continuously for 2 years or 4000 hours. Therefore, it can be used as it is even in hot areas.

- Anti-freeze is flammable, so be extremely careful not to expose it to flame or fire.
- The ratio for the mixture of water and anti-freeze differs according to the ambient temperature.

  For details of the ratio, see "CLEAN INSIDE OF COOLING SYSTEM (PAGE 4-23)".

- If the engine overheats, wait for the engine to cool before adding coolant.
- In addition to causing overheating, lack of cooling water also causes corrosion of the cooling circuit due to entry of air.

CARRYING OUT KOWA (Komatsu Oil Wear Analysis)

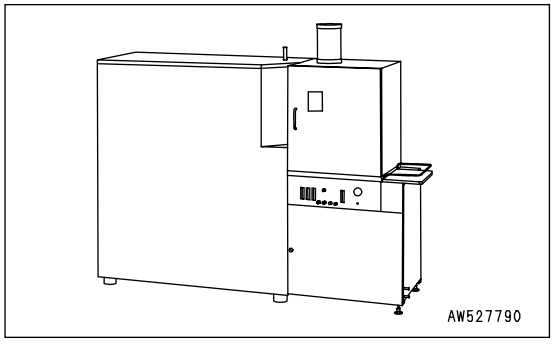
KOWA is a maintenance service that makes it possible to prevent machine failures and down-time. With KOWA, the oil is periodically sampled and analyzed. This enables early detection of wear of the machine drive parts and other abnormalities.

Periodic use of KOWA makes the following possible:

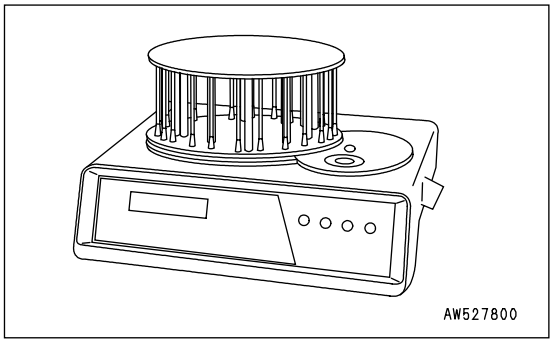
- It enables abnormalities to be detected early, leading to reduction of repair costs and machine downtime.
- It enables repair schedules to be planned, leading to improved machine availability.

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.

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.

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 there specified by Komatsu.
- External electrical 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 an operator's cab cooler or any other electrical equipment, connect it to an independent power source connector. The optional power source must never be connected to the fuse, starting switch, or battery relay.

HANDLING HYDRAULIC SYSTEM

- During and after operations, the hydraulic system is at high temperature. During operations, it is also under high pressure, so always pay careful attention to the following when carrying out inspection and maintenance of the hydraulic system.
- Stop the machine on level ground, lower the bucket to the ground, and set so that there is no pressure on the cylinder circuit.
- Always stop the engine.
- Immediately after operations, the hydraulic oil and lubricating oil are under pressure and at high temperature, so always wait for the temperature to go down before starting maintenance.
- Even when the temperature goes down, there may still internal pressure, so when loosening plugs, screws, or hose connections, do not stand directly in front, and loosen gradually to release the internal pressure before removing.

- When carrying out inspection or maintenance of the hydraulic circuits, always bleed the air to release the internal pressure.
- Inspection or maintenance consists of checking the hydraulic oil level, replacing the filters, and changing the hydraulic oil.
- When removing high-pressure hoses, check that the O-ring is not damaged. If it is damaged, replace it.

WEAR PARTS LIST

Wear parts such as the filter element, bucket tooth, etc. are to be replaced at the time of periodic maintenance or before their abrasion limits.

The wear parts should be changed correctly in order to use the machine economically.

For part change, Komatsu genuine parts of excellent quality should be used.

When ordering parts, please check the part number in the parts book.

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

Item	Part No.	Part Name	Q'ty	Replacement frequency
Hydraulic oil filter	22J-60-11410	Element	1	Every 250 hours
Engine oil filter	YM119305-35150	Oil filter assembly	1	Every 500 hours
Fuel filter (with water separator)	YM119810-55650 (YM102103-55520)	Element (O-ring)	1 (1)	Every 500 hours
Feed pump pre-filter	YM129052-55630	Filter	1	Every 500 hours
Air cleaner	YM119655-12560	Element	1	-
Standard bucket	20W-70-15130 (02090-10850) (02290-10813)	Tooth (Bolt) (Nut)	4 (8) (8)	-
	20M-70-75140 20M-70-75130 (01675-31234) (01803-21213)	Cutter (Right) Cutter (Left) (Bolt) (Nut)	1 1 (6) (6)	-

USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE

PROPER SELECTION OF FUEL, COOLANT AND LUBRICANTS

RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE	CAPACITY	
		-22 -4 14 32 50 68 86 104 122°F -30 -20 -10 0 10 20 30 40 50°C	Specified	Refill
Engine oil pan	Engine oil	SAE30 SAE 10W SAE 10W-30 SAE 15W-40	4 liters 1.06 US gal	3 liters 0.79 US gal
Final drive case (each)		SAE 30	0.33 liters 0.09 US gal	0.33 liters 0.09 US gal
Hydraulic system		SAE 10W SAE 10W-30 SAE 15W-40	24 liters 6.34 US gal	21 liters 4.62 US gal
Fuel tank	Diesel fuel	ASTM D975 No.2 *1	19 liters 5.02 US gal	-
Grease fitting	Grease	HYPER WHITE GREASE	-	-
Cooling system	Water	Add antifreeze	3.4 liters 0.90 US gal	-

***ASTM D975 No. 1**

REMARK

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

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

- When starting the engine in an atmospheric temperature of lower than 0ûC, be sure to use engine oil of SAE10W, SAE10W-30 and SAE15W-40, even though an atmospheric temperature goes up to 10ûC more or less in the day time.
- 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 in the table.
- We recommend Komatsu genuine oil which has been specifically formulated and approved for use in engine and hydraulic 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 Institute

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 Mobilgrease 77 Mobilgrease special	-
14	PENNZOIL	*Superme duty fleet motor oil	Multi-purpose 4092 Multi-purpose 4140	Multi-purpose white grease 705 707L White-bearing grease	Anti-freeze and summer coolant

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
15	PETROFINA	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

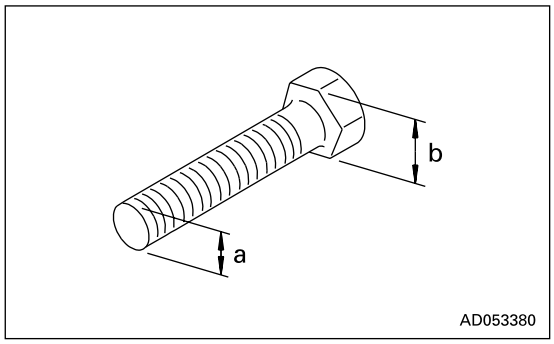
If nuts, bolts, or other parts are not tightened to the specified torque, it will cause looseness or damage to the tightened parts, and this will cause failure of the machine or problems with operation.
Always pay careful attention when tightening parts.

Unless otherwise specified, tighten the metric nuts and bolts to the torque shown in the table below.

The tightening torque is determined by the width across the flats of the nut and bolt.

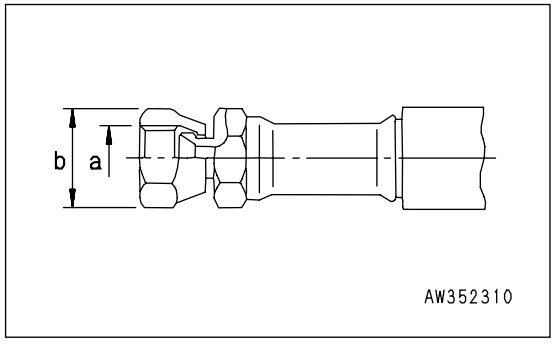
If it is necessary to replace any nut or bolt, always use a Komatsu genuine part of the same size as the part that was replaced.

Thread diameter a(mm)	Width across flat 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	11	11.5	83.2	98 - 123	10.0 - 12.5	72.3 - 90.4
14	22	177	18	130.2	157 - 196	16.0 - 20.0	115.7 - 144.7
16	24	279	28.5	206.1	245 - 309	25.0 - 31.5	180.8 - 227.8
18	27	382	39	282.1	343 - 425	35.0 - 43.5	253.2 - 314.6
20	30	549	56	405.0	490 - 608	50.0 - 62.0	361.7 - 448.4
22	32	745	76	549.7	662 - 829	67.5 - 84.5	488.2 - 611.2
24	36	927	94.5	683.5	824 - 1030	84.0 - 105.0	607.6 - 759.5
27	41	1320	135.0	976.5	1180 - 1470	120.0 - 150.0	868.0 - 1085.0
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.

Thread diameter a(mm)	Width across flat b(mm)	Tightening torque					
		Target value			Service limit		
		N•m	kgf•m	lbft	N•m	kgf•m	lbft
14	19	29.4	3.0	21.7	27.5 - 39.2	2.8 - 4.0	20.3 - 28.9
18	24	78.5	8.0	57.3	58.8 - 98.1	6.0 - 10.0	43.4 - 72.3
22	27	117.7	12.0	86.8	88.3 - 137.3	9.0 - 14.0	65.1 - 101.3
24	32	147.1	15.0	108.5	117.7 - 176.5	12.0 - 18.0	86.8 - 130.2
30	36	215.7	22.0	159.1	176.5 - 245.2	18.0 - 25.0	130.2 - 180.8
33	41	255.0	26.0	188.1	215.7 - 284.4	22.0 - 29.0	159.1 - 209.8



PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS

To ensure safety at all times when operating or driving the machine, the user of the machine must always carry out periodic maintenance. In addition, to further improve safety, the user should also carry out periodic replacement of the parts given in the table. These parts are particularly closely connected to safety and fire prevention.

With these parts, the material changes as time passed, or they easily wear or deteriorate. However, it is difficult to judge the condition of the parts simply by periodic maintenance, so they should always be replaced after a fixed time has passed, regardless of their condition. This is necessary to ensure that they always maintain their function completely.

However, if these parts show any abnormality before the replacement interval has passed, they should be repaired or replaced immediately.

If the hose clamps show any deterioration, such as deformation or cracking, replace the clamps at the same as the hoses.

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 safety critical parts.

SAFETY CRITICAL PARTS

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)	1	
8	Spill hose (Nozzle - Injection pump)	1	
9	Spill cap	1	
10	Hydraulic hose (Main pump suction)	2	
11	Hydraulic hose (Main pump delivery)	1	
12	Hydraulic hose (Boom cylinder)	2	
13	Hydraulic hose (Arm cylinder)	2	
14	Hydraulic hose (Bucket cylinder)	2	
15	Hydraulic hose (Swing cylinder)	2	
16	Seat belt	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 4-19)" to confirm the correct maintenance schedule when carrying out maintenance.

MAINTENANCE SCHEDULE CHART

Initial 250 Hours Maintenance (Only after the first 250 hours)

When Required

Checks Before Starting

Every 100 Hours Maintenance

Every 250 Hours Maintenance

Every 500 Hours Maintenance

Every 1000 Hours Maintenance

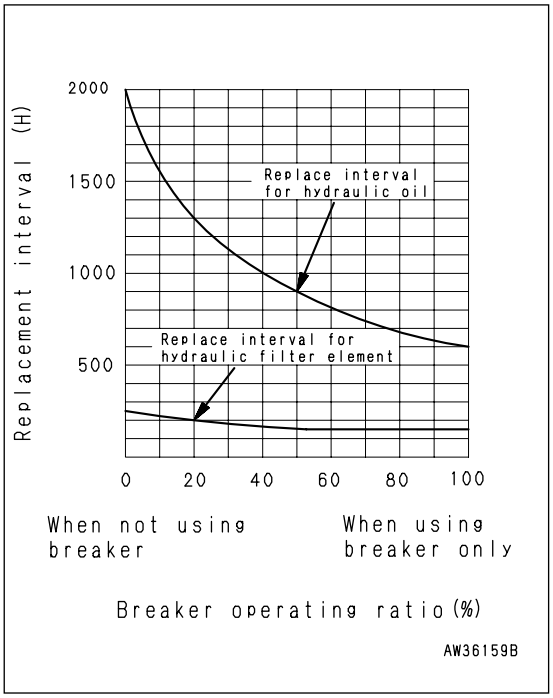
Every 2000 Hours Maintenance

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.

REPLACING HYDRAULIC ELEMENT

- On new machines, 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.



CHANGING 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 of operation on new machines.

- Replace engine oil filter cartridge
- Replace fuel filter element
- Inspect engine valve clearances

  Special tools are needed for inspection and maintenance, so contact your Komatsu distributor.

For details of the method of replacing or maintaining, see the section on EVERY 500 HOURS and 2000 HOURS SERVICE.

WHEN REQUIRED

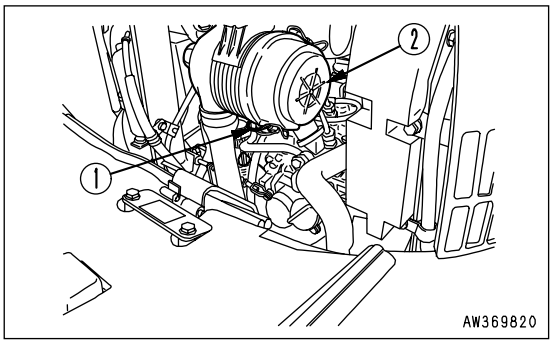
CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT

⚠ WARNING

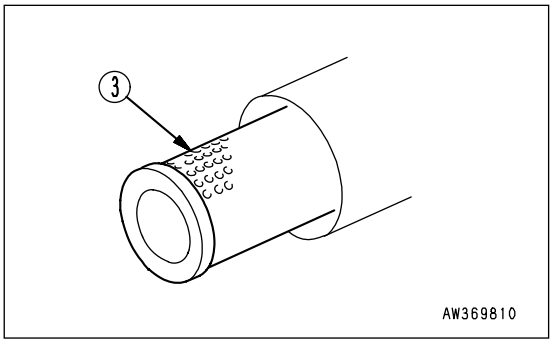
- **If inspection, cleaning, or maintenance is carried out with the engine running, dirt will get into the engine and the engine will suffer damage. Always stop the engine before carrying out these operations.**
- **When using compressed air, there is danger that dirt may be blown around and cause serious injury. Always use safety glasses, dust mask, and other protective equipment.**

Cleaning the outer element

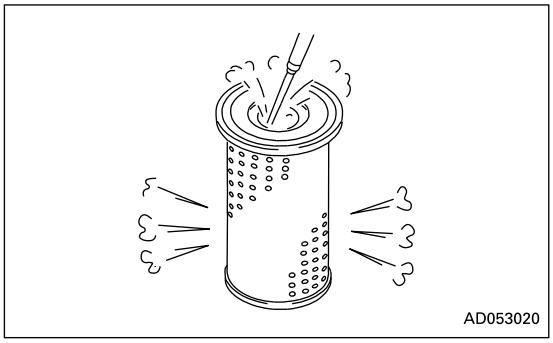
1. Open the engine hood at the rear of the machine, loosen clip (2), remove dust cup (3).
2. Throw away the dust inside dust cup (3) and clean the inside of the cup.



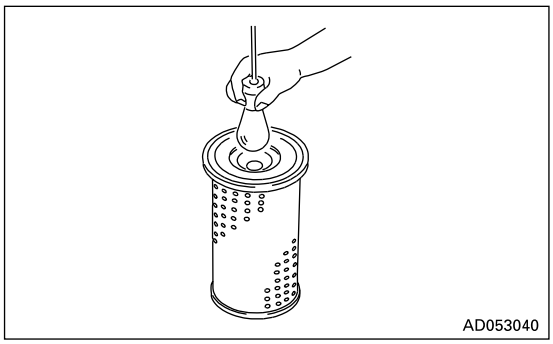
3. Take out element (4) and cover the air connector at the end of the air cleaner body with a clean cloth or tape.
4. Clean interior of the air cleaner body.



5. Direct dry compressed air (less than 0.69MPa (7kg/cm^2, 100 PSI)) to the element from inside along its folds, then direct it from outside along its folds and again from inside.
   1) Replace the element which has been cleaned 6 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.

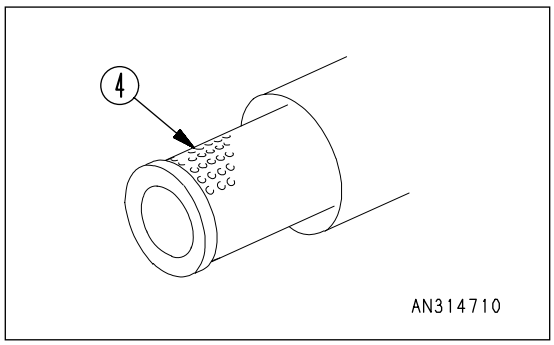


6. If small holes or thinner parts are found on the element when it is checked by shining a light through it after cleaning, replace the element.

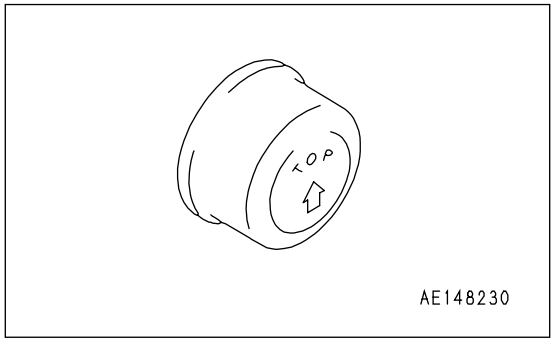


NOTICE
When cleaning the element, do not hit it or beat it against something.
Do not use an element whose folds or gasket or seal are damaged.
Wrap unused element and store them in a dry place.

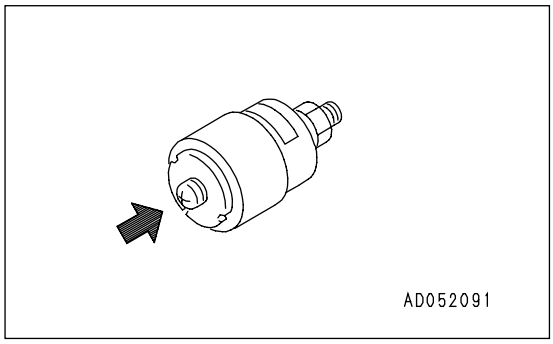
7. Remove the clothe or taps used as a cover in Step 3.
8. Set the cleaned element (4) in position.



9. Set dust cup (3) with the arow pointing up, then set it to the air cleaner body and secure it with clip (2).



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



CLEAN INSIDE OF COOLING SYSTEM

⚠ 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 3-21)" and "STARTING ENGINE (PAGE 3-31)" in the OPERATION section.**
- **There is danger of touching the fan if the undercover is left removed.**
  Never enter 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 (autumn)or every 2000 hours whichever comes first	Every 1000 hours and when cleaning the inside of the cooling system and when changine coolant.
Nom permanent type antifreeze containing ethylene glycol (winter, one season type)	Every 6 months (spring, autumn) (Drain antifreeze in spring, add antifreeze in autumn)	
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/liters (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	-10	-15	-20	-25
	°F	14	5	-4	-13
Amount of antifreeze	liters	1.1	1.2	1.4	1.6
	US gal	0.29	0.32	0.37	0.59
Amount of water	liters	2.3	2.2	2.0	1.8
	US gal	0.61	0.81	0.53	0.48

⚠ 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. l If it gets in your eyes, flush your eyes with large quantities of fresh water and see a doctor at once.

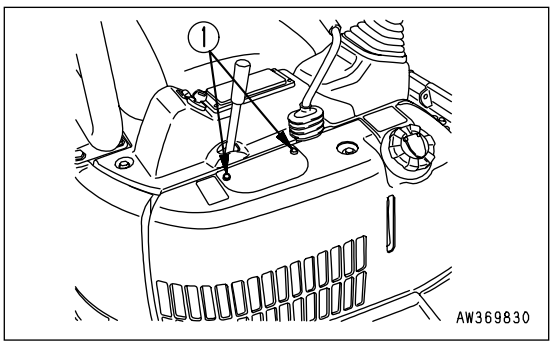
Use city water for the cooling water.

If river water, well water or other such water supply must be used, contact your Komatsu distributor.

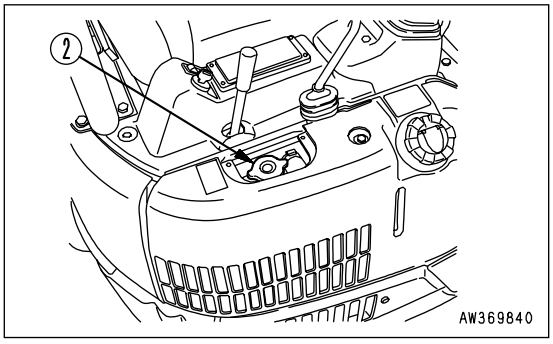
We recommend use of an antifreeze density gauge to control the mixing proportions.

- Prepare a container to catch drained coolant: Min 5.6 liters (1.48 US gal) capacity.
- Prepare a water inlet hose.

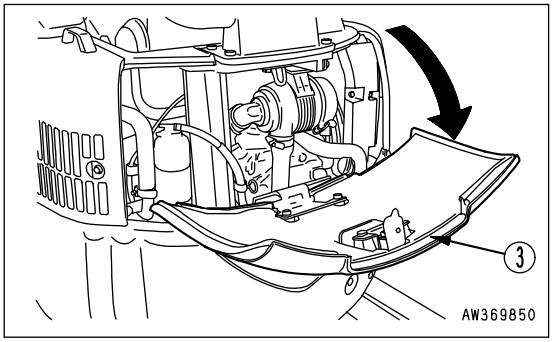
1. Remove 2 bolts (1) from the cover on the right side of the machine, then remove the cover above the radiator cap.



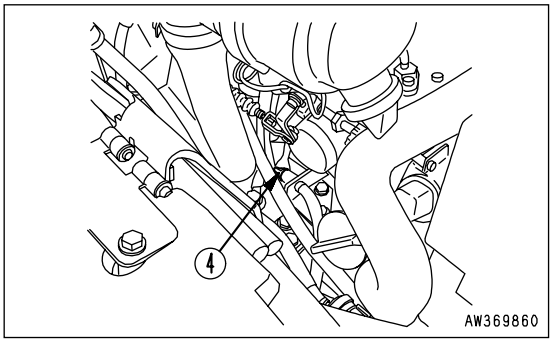
2. Check that the cooling water temperature has gone down enough to make it possible to touch the radiator cap surface by hand, then turn radiator cap (2) slowly until it contacts the stopper to release the pressure.
3. Following this, push radiator cap (2), turn it until it contacts the stopper, then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



4. Open the hood (3) at the rear of the machine.

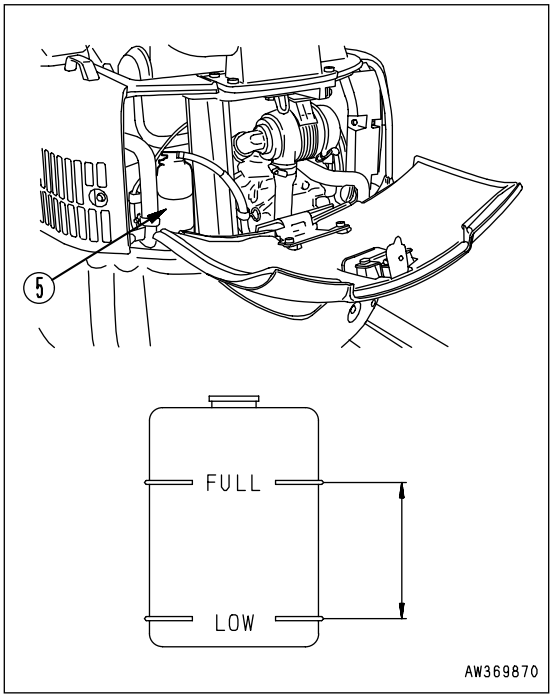


5. Set container to catch the coolant under drain valve (4).
6. Open drain valve (4) to drain the water.
   Remove drain plug to drain the water.
7. After drain the water, close drain valve (4) and drain plug, and add water. When the radiator is full, start the engine and run at low idling. Raise the water temperature to above 90°C and run for approx. 10 minutes.
8. Stop the engine, then open drain valve (4) 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 (4), 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 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 (5), 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.



CHECK BATTERY ELECTROLYTE LEVEL

Carry out this check before operating the machine.

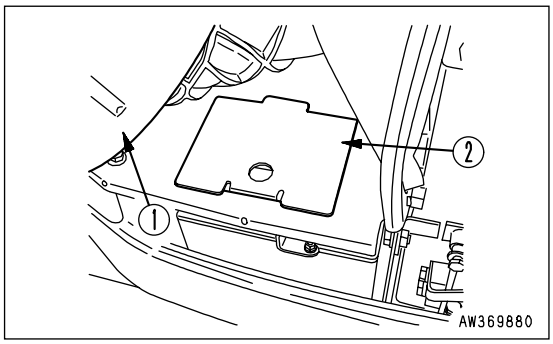
⚠ WARNING

- **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.

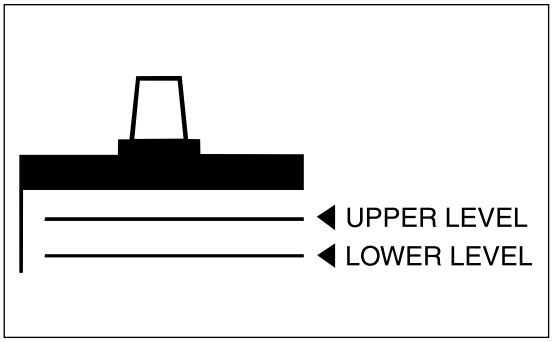
1. Remove floor mat (1) and cover (2).



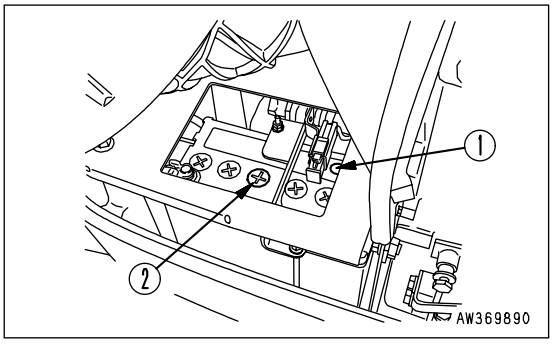
When Checking Electrolyte Level from side of Battery

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.

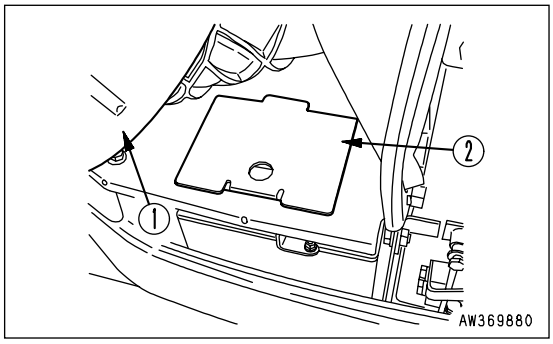


REMARK
If distilled water is added to above the U.L line, use a pipette to lower the level to the U.L line. Neutralize the removed fluid with baking soda (sodium bicarbonate), then flush it away with a large amount of water or consult your Komatsu distributor or battery maker.

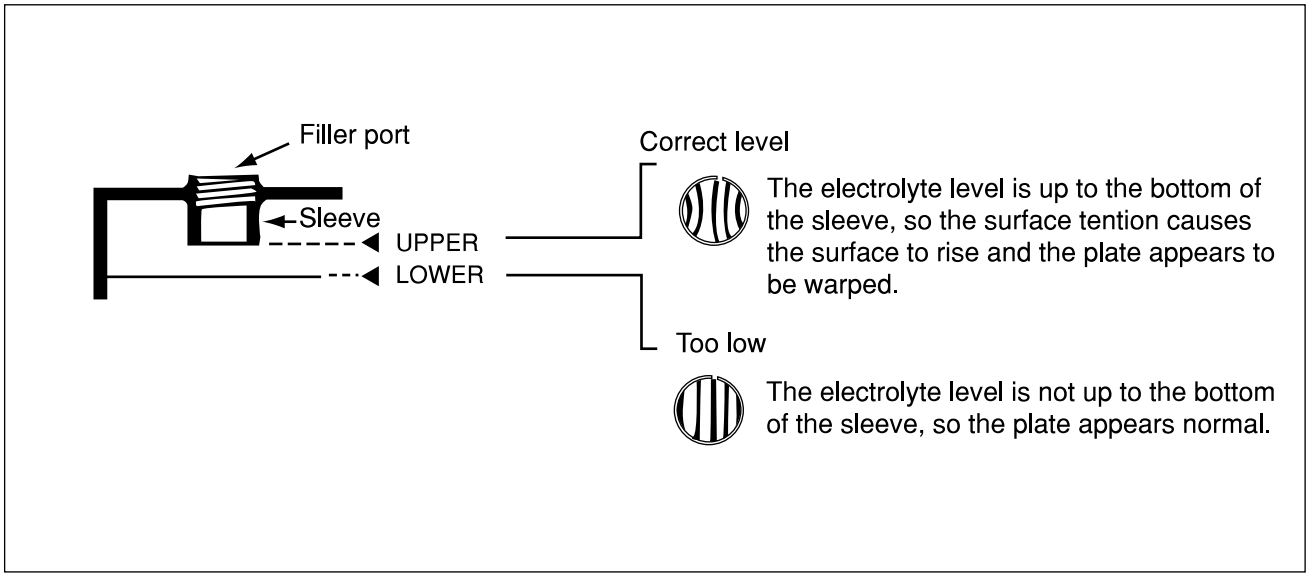
When It is Impossible to Check Electrolyte Level from Side of Battery

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.

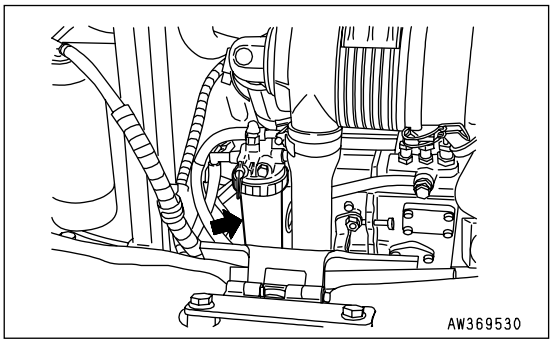
When It is Possible to Use Indicator to Check Electrolyte Level

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

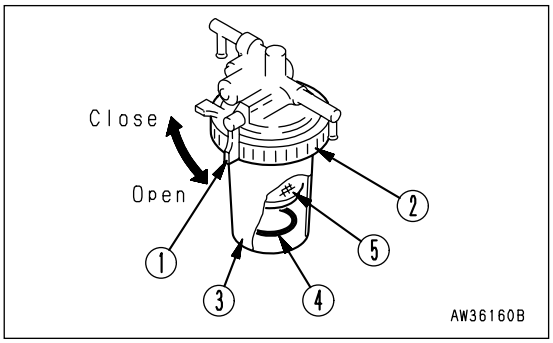
CLEAN FUEL FILTER

(With water separator)

- Prepare a filter wrench for fuel filter.
- Prepare a container to catch drain fuel.



1. Open the engine hood, and set handle to the LOCK position.
   See "ENGINE HOOD (PAGE 3-17)".
2. Using a filter wrench, loosen ring (2), remove case (3), then throw out the water inside.
   Be careful not to lose red ring (4) inside the case.
3. Wash element (5) and the inside of the case with diesel fuel.
4. Set case (3) in position, then tighten ring (2) to install.
5. Set handle (1) to the OPEN position.



CHECK AND ADJUST TRACK TENSION

⚠ WARNING

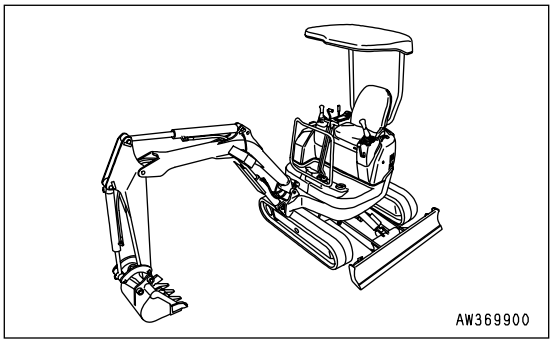
- **The track tension is checked with the machine raised, so it is extremely dangerous if the machine comes down by mistake during the inspection. Stop the engine and set the safety lock lever to the LOCK position to prevent the machine from moving.**
  Never put any part of your body under the track or track frame while measuring, and be extremely careful when taking the measurements.
- **For details of starting the engine and operating the work equipment, see "BEFORE STARTING ENGINE (PAGE 3-21)", "STARTING ENGINE (PAGE 3-31)", "AFTER STARTING ENGINE (PAGE 3-34)", and "WORK EQUIPMENT CONTROLS AND OPERATIONS (PAGE 3-45)" in the OPERATION section.**

The condition of wear of the undercarriage pins and bushings differs according to the working conditions and type of soil, so check the track tension regularly and be sure to maintain it at the standard value.

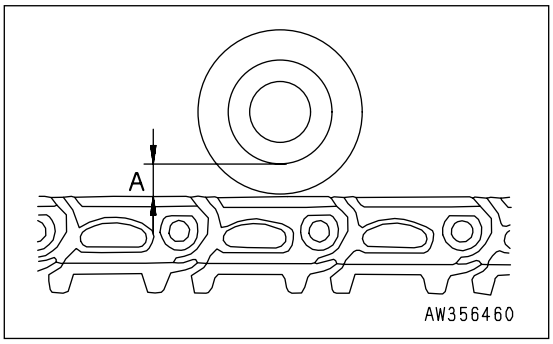
Carry out the inspection and maintenance under the same conditions as normal operations (with mud clogging the parts normally clogged by mud).

Inspection

1. Raise the chassis with the boom and arm.
   When doing this, operate the levers slowly.
2. Measure the clearance between the bottom of the track frame and the top of the track shoe at a position that is safe even if the chassis should come down.



3. The standard tension is clearance A (25 to 30mm (1.0 to 1.2 in)) between the roller contact surface of the track link and the track roller tread at the 2nd track roller from the sprocket.



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

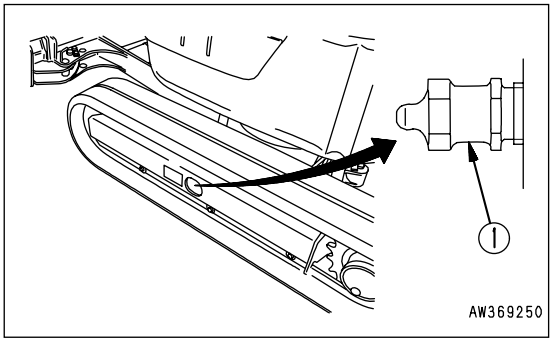
Adjustment

⚠ WARNING

There is danger of plug (1) flying out under the high internal pressure of the grease. Never loosen plug (1) more than 1 turn.

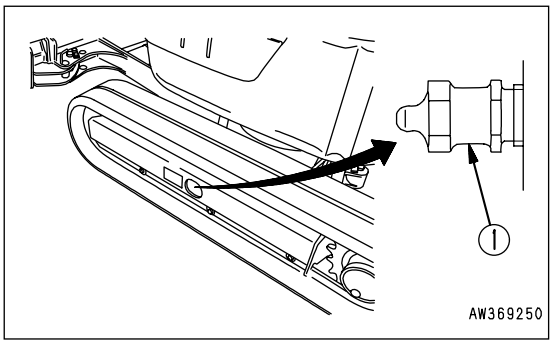
Never loosen any part other than plug (1). Never put your face in the mounting direction of plug (1).

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

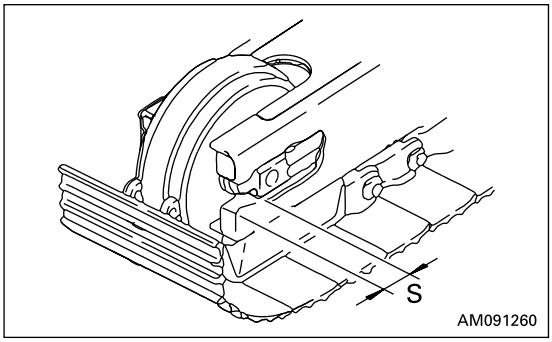


When increasing tension
Prepare a grease gun.

1. Pump in grease through grease plug (1) with a grease gun.
2. To check that the tension is correct, move the machine slowly forward (7 - 8 m (23 ft - 26 ft 3 in)).
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.



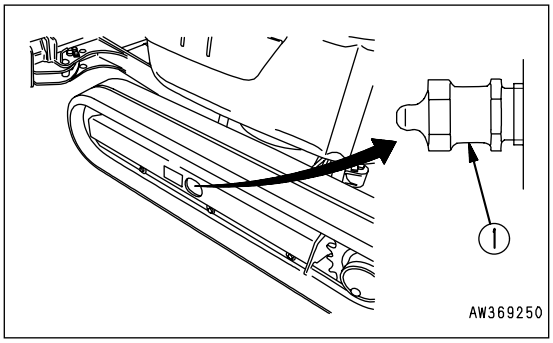
When loosening tension

⚠ WARNING

It is extremely dangerous to release the grease by any method except the procedure given below.

If the track tension is not relieved by this procedure, please contact your Komatsu distributor for repairs.

1. Loosen plug (1) gradually to release the grease.
2. Turn plug (1) 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 tension is correct, move the machine slowly forward (7 - 8 m (23 ft - 26 ft 3 in).
6. Check the track tension again, and if the tension is not correct, adjust it again.



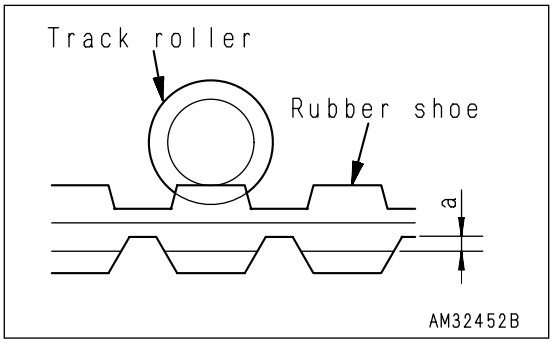
CHECK RUBBER SHOES

(Machine equipped with rubber shoe)

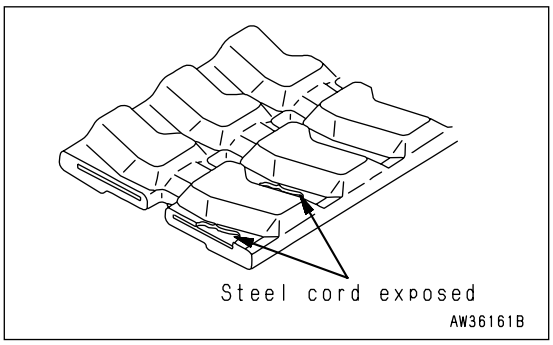
If the rubber shoes are in the following condition, they must be repaired or replaced, so please contact your Komatsu distributor for repair or replacement.

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.

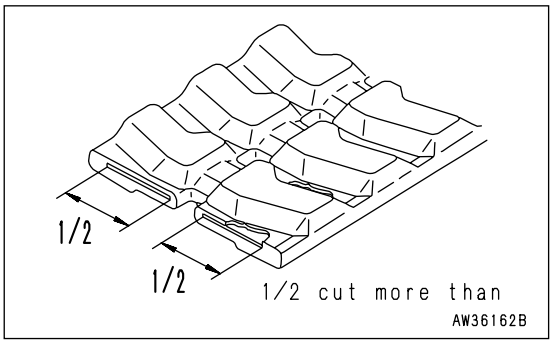


- If the lug wears and the steel cord inside the shoe is exposed for two links or more, replace with a new part.



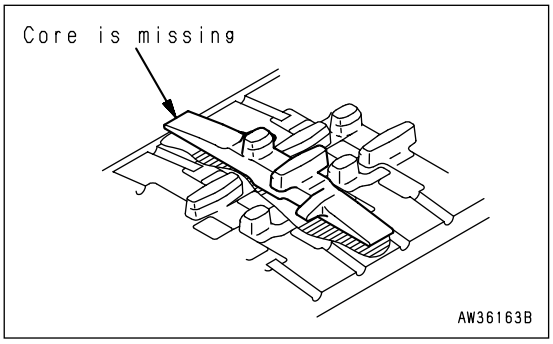
Rubber Shoe Steel Code Cuts

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



Rubber Shoe Core Separations

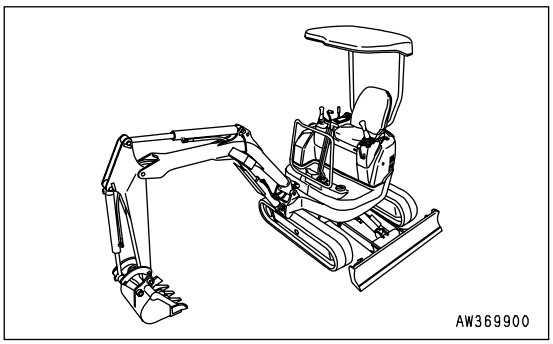
If the rubber core has separated at one place or more, replace with a new part.



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.

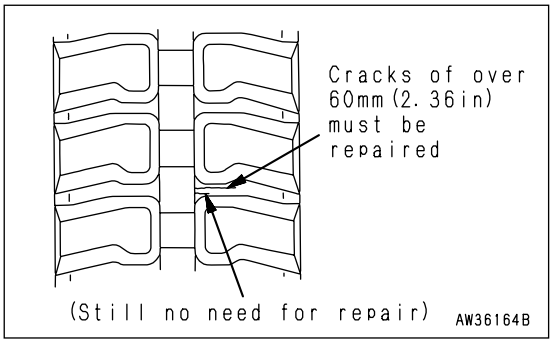


Rubber Shoe Cracks

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.



CHECK AND ADJUST TRACK TENSION

(Machine equipped with rubber shoe)

⚠ WARNING

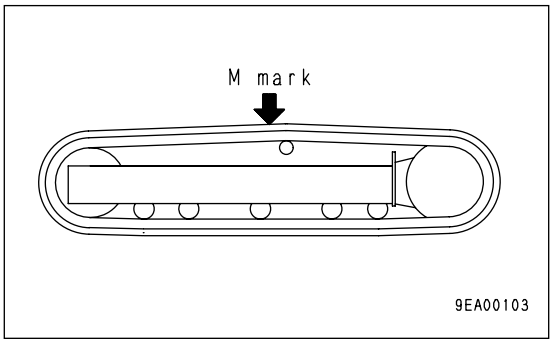
- **The track tension is checked with the machine raised, so it is extremely dangerous if the machine comes down by mistake during the inspection. Stop the engine and set the safety lock lever to the LOCK position to prevent the machine from moving. Never put any part of your body under the track or track frame while measuring, and be extremely careful when taking the measurements.**
- **For details of starting the engine and operating the work equipment, see "BEFORE STARTING ENGINE (PAGE 3-21)", "STARTING ENGINE (PAGE 3-31)", "AFTER STARTING ENGINE (PAGE 3-34)", and "WORK EQUIPMENT CONTROLS AND OPERATIONS (PAGE 3-45)" in the OPERATION section.**

The wear of the rubber shoe will vary according to the working conditions and type of soil. Therefore, it is necessary to inspect the wear and track tension frequently.

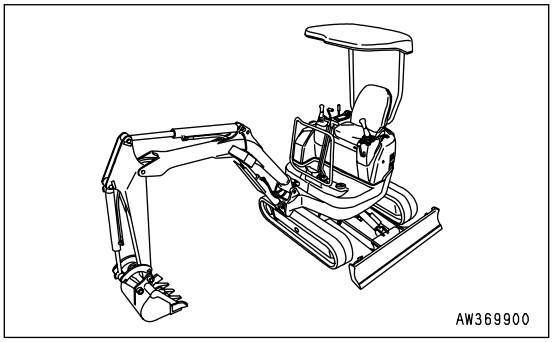
In particular, after fitting new parts, be sure to carry out the first inspection after 30 hours of use.

Checking

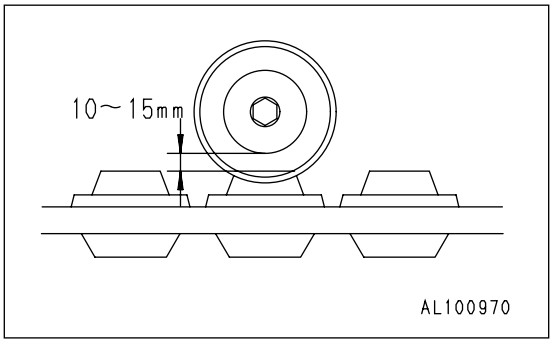
1. Move the machine to set the connection (M mark) of the rubber shoe at the top at a point midway between the sprocket and idler.



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



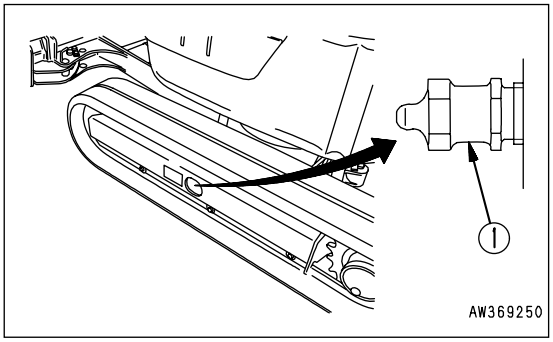
3. The standard clearance is 10 to 15mm (0.40 to 0.60 in) between the shoulder of the rubber shoe and the tread surface of the 2nd track roller from the sprocket.
   If the track tension is not at the standard value, adjust it in the following manner.
   If operations are carried out with the rubber shoe loose (when the clearance for the track tension is more than 20 mm(0.8 in)), it will cause the track to come off, and this will lead to premature wear of the core.



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

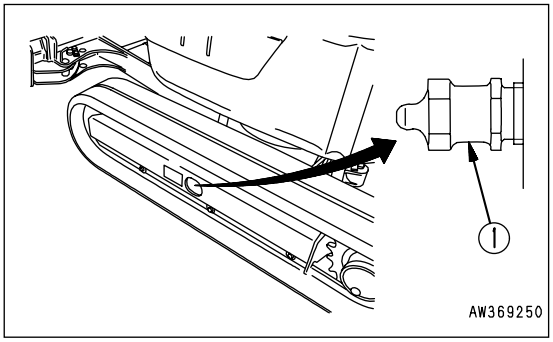
Prepare a grease gun.

1. Pump in grease through plug (1) with a grease gun.
2. To check that the tension is correct, move the machine slowly forward and backward.
3. Check the track tension again, and if the tension is not correct, adjust it again.
4. If the track tension is still loose after grease is pumped in, it is necessary to replace the rubber shoe or replace the seal inside the cylinder. Please contact 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 for repairs.



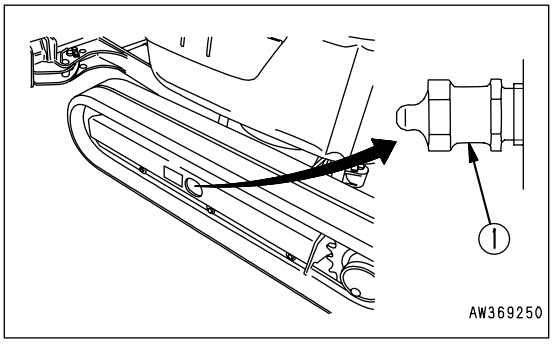
1. Loosen plug (1) gradually to release the grease.
2. Turn plug (1) a maximum of one turn.
3. If the grease does not come out smoothly, move the machine forwards and backwards a short distance.
4. Tighten plug (1).
5. To check that the correct tension has been achieved, move the machine forwards and backwards.
6. Check the track tension again, and if the tension is not correct, adjust it again.

REPLACE RUBBER SHOES

(Machine equipped with rubber shoe)

⚠ WARNING

- **Carry out this operation with two workers. The operator must move the machine in accordance with the signals from the other worker.**
- **The track tension is checked with the machine raised, so it is extremely dangerous if the machine comes down by mistake during the inspection. Stop the engine and set the safety lock lever to the LOCK position to prevent the machine from moving. Never put any part of your body under the track or track frame while measuring, and be extremely careful when taking the measurements.**



NOTICE

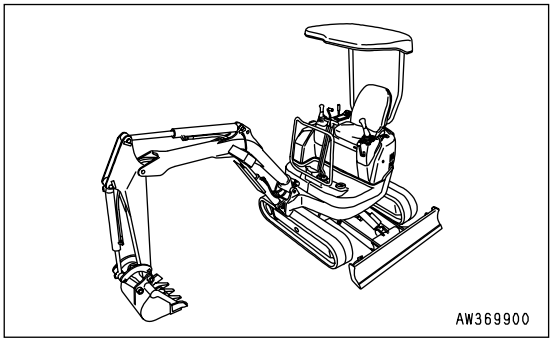
It is possible to replace rubber shoes with steel shoes, but this makes it necessary to remove and adjust the idler cushion, so please contact your Komatsu distributor.

- Prepare a grease gun
- Prepare a steel pipe

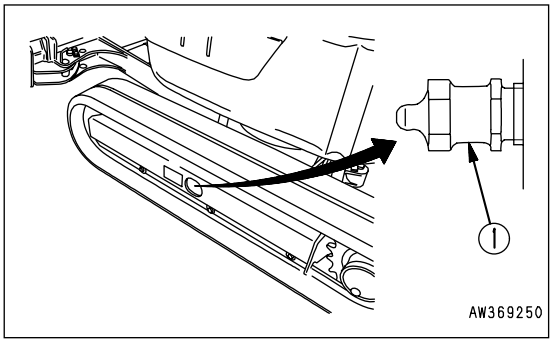
Rubber Shoes Removal

⚠ WARNING

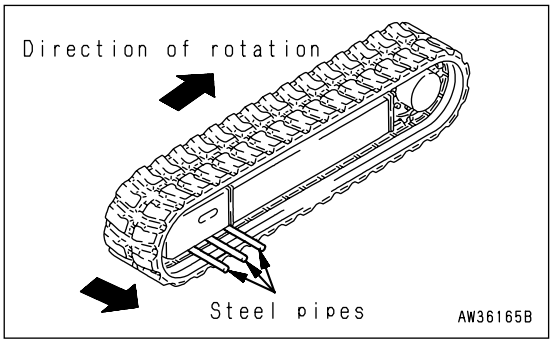
- **It is extremely dangerous to release the grease by any method except the procedure given below. If the track tension is not relieved by this procedure, please contact your Komatsu distributor.**
- **Check that all the grease has been released before rotating the sprocket to remove the rubber shoe.**



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. Turn plug (1) a maximum of one turn.

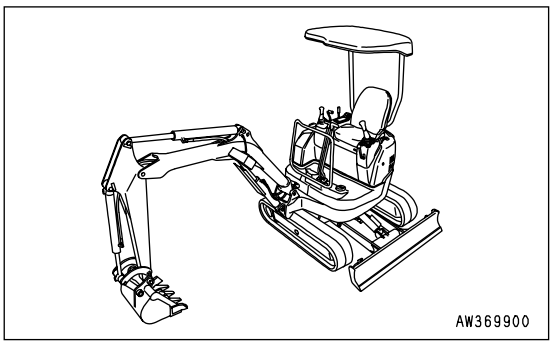


4. Fit the steel pipes inside the rubber shoe, rotate the sprocket in reverse, so that the steel pipes make the rubber shoe come up from the idler, then to the side to remove.

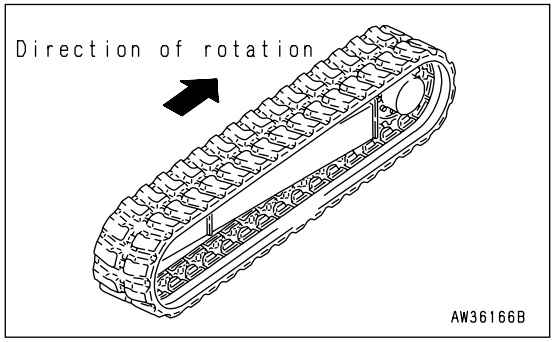


Rubber Shoes Installation

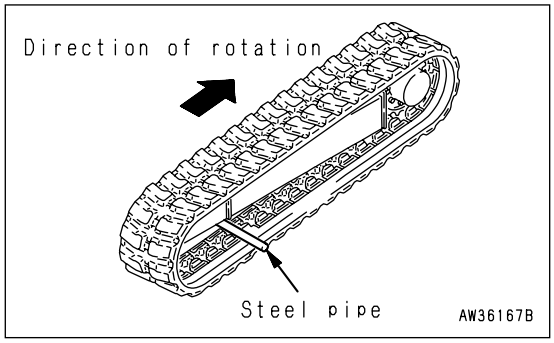
1. Raise the chassis with the boom and arm.
   When doing this, operate the levers slowly.



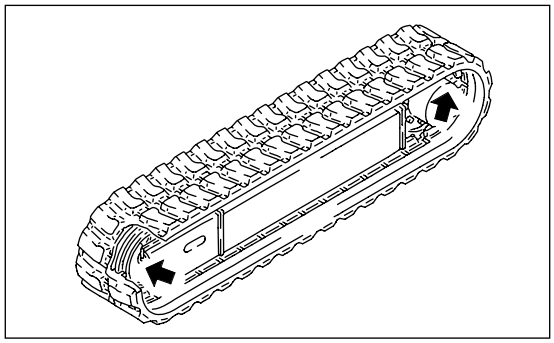
2. Mesh the rubber shoe with the sprocket and fit it over the idler.
3. Rotate the sprocket in reverse, then push in the rubber shoe and stop the rotation.



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 "CHECK AND ADJUST TRACK TENSION (PAGE 4-30)".
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.

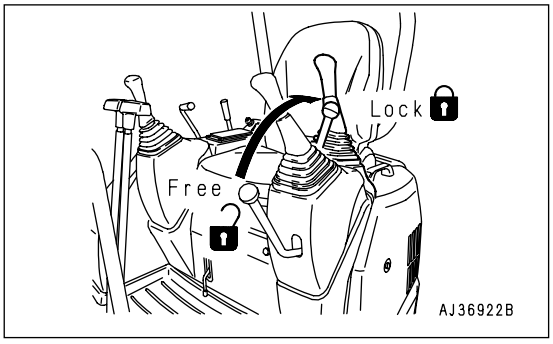


REPLACE BUCKET TEETH

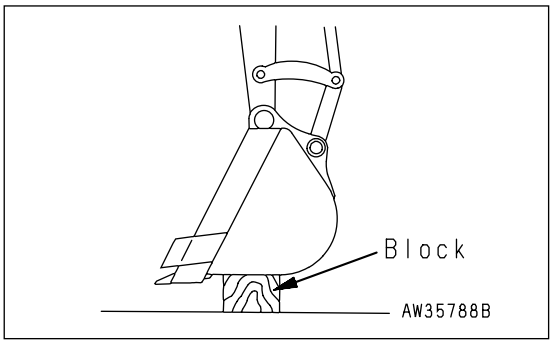
Replace the teeth before the wear reaches the adapter.

⚠ WARNING

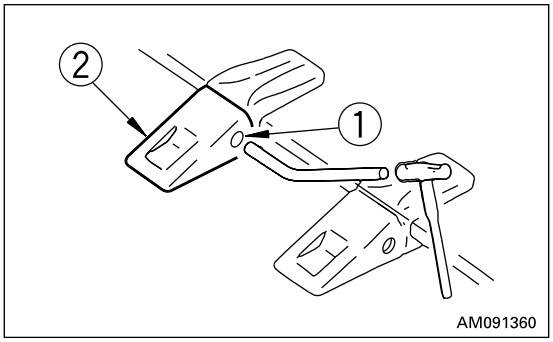
- **It is dangerous if the work equipment moves by mistake when the teeth are being replaced. Set the work equipment in a stable condition, then stop the engine and apply the locks securely to the levers.**
- **If the locking pin is knocked out with excessive force, there is a hazard that the pin may fly out. Check that there is no one in the surrounding area.**
- **Pieces will often fly during the replacement operation, so always wear safety glasses, gloves, and other protective equipment.**



1. Set the bottom of the bucket on a block to make it possible to remove pin (1), check that the work equipment is stable, then set the safety lock lever to the LOCK position.
   Set so that the bottom of the bucket is horizontal.

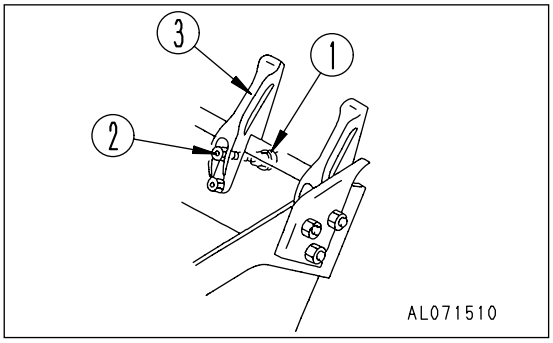


2. Place a bar on the pin head and strike the bar with a hammer to knock out pin (1). Remove tooth (2).



3. Install a new tooth to the bucket.
   Bolt tightening torque:
   167 ± 20 Nm (17 ± 2 kgm, 123 ± 14 lbft)

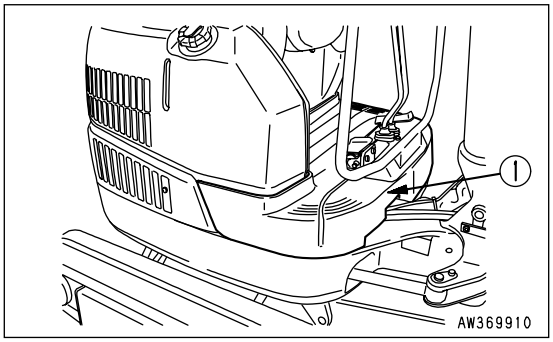
   After operating for several hours, retighten the tooth mounting bolt.



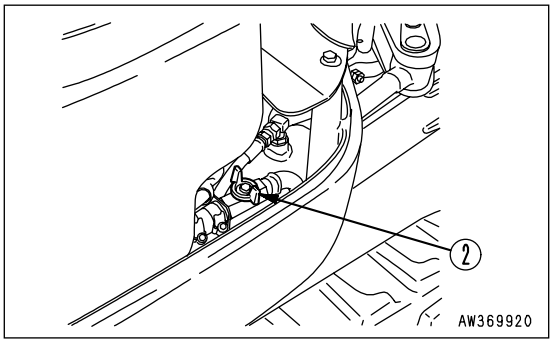
DRAIN WATER AND SEDIMENT FROM FUEL TANK

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.**

1. Carry out this procedure before operating the machine.
2. Prepare a container to catch the fuel that is drained.
3. Remove floor mat (1) from the machine.



4. Open the drain valve (2) under the fuel tank on the right side of the machine, then drain the sediment and water accumulated at the bottom together with the fuel.
   When doing this, be careful not to get fuel on yourself.
5. When only clean fuel comes out, close drain valve (2).



CHECK BEFORE STARTING

For details of the following items, see "CHECKS BEFORE STARTING (PAGE 3-22)" in the OPERATION section.

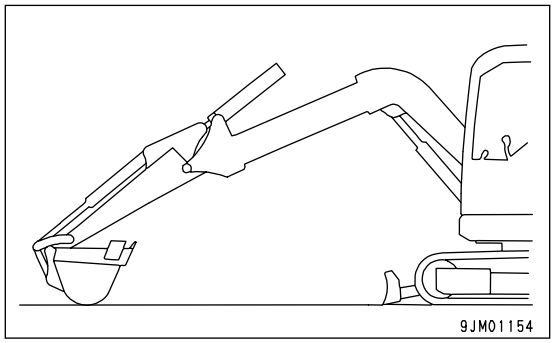
- Check coolant level, add water
- Check oil level in engine oil pan, add oil
- Check fuel level, add fuel
- Check oil level in hydraulic tank, add oil
- Check electric wirings
- Check function of horn
- Check for water and sediment in water separator, drain water

EVERY 100 HOURS MAINTENANCE

LUBRICATING

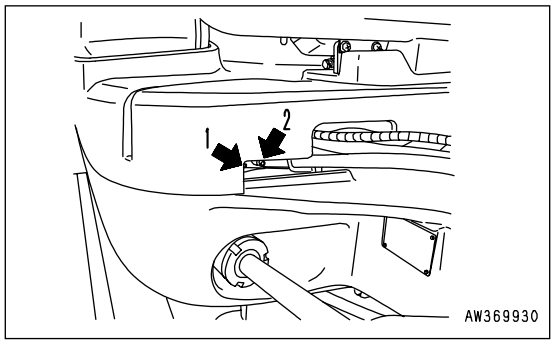
NOTICE
- **For the first 100 hours on new machines where the parts are settling in, carry out greasing every 10 hours.**
- **After digging operations under water, be sure to grease the pins which were submerged.**

1. Set the work equipment in the greasing posture below, then lower the work equipment to the ground and 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)



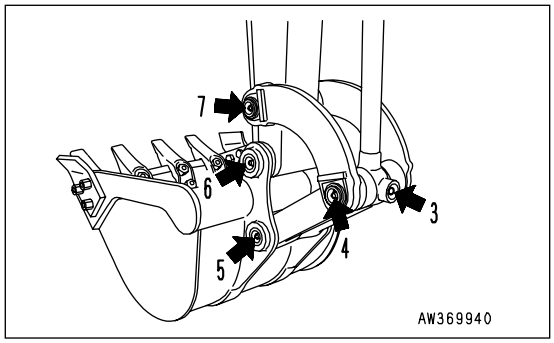
(3) Bucket cylinder rod end (1 point)

(4) Link coupling pin (1 point)

(5) Bucket - Link coupling pin (1 point)

(6) Arm - Bucket coupling pin (1 point)

(7) Arm - Link coupling pin (1 point)



EVERY 250 HOURS MAINTENANCE

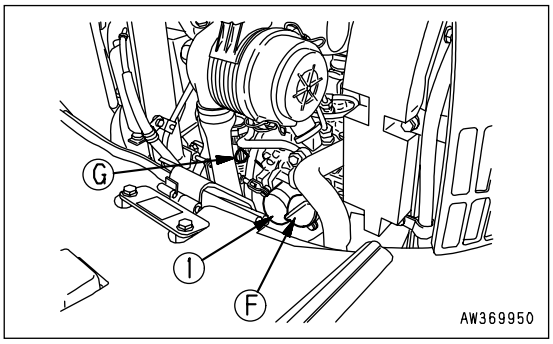
CHANGE OIL IN ENGINE OIL PAN, REPLACE ENGINE OIL FILTER CARTRIDGE

⚠ WARNING

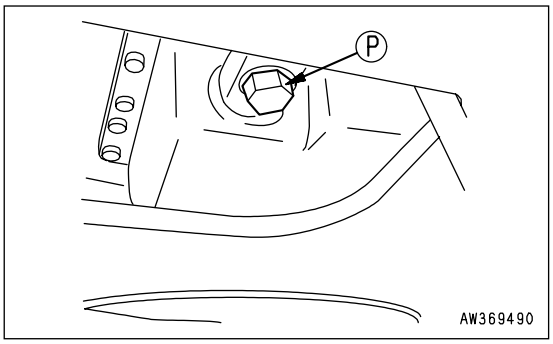
The parts and oil are at high temperature immediately after the engine is stopped, and may cause serious burns. Wait for the temperature to go down before starting the operation.

- Container to catch drained oil: Minimum 4 liters (1.06 US gal) capacity
- Refill capacity: 3 liters (0.79 US gal)
- Filter wrench

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, contact your Komatsu distributor.
4. Install drain plug (P).



5. Using a filter wrench, turn filter cartridge (1) counterclockwise to remove it.
   A large amount of oil will come out if this procedure is carried out immediately after stopping the engine, so wait for 10 minutes before starting the maintenance.
6. Clean the filter holder, fill the new filter cartridge with clean engine oil, coat the thread and packing surface of the new filter cartridge with clean engine oil (or coat it thinly with grease), then install it to the filter holder.



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.

7. 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.
8. After replacing the filter cartridge, add engine oil through oil filler (F) until the oil level is between the H and L marks on the dipstick (G).
9. 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 "CHECK OIL LEVEL IN ENGINE OIL PAN, ADD OIL (PAGE 3-23)".

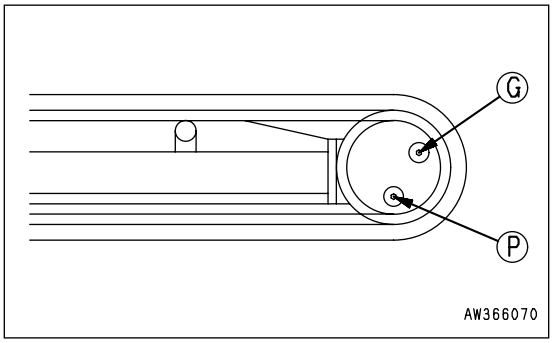
CHECK OIL LEVEL IN FINAL DRIVE CASE, ADD OIL

⚠ WARNING

- **The parts and oil are at high temperature after the engine is stopped, and may cause serious burns. Wait for the temperature to go 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 hexagonal wrench.

1. Set so that drain plug (P) is at the bottom.
2. Set a container under plug (G) to catch the oil.
3. Remove level plug (G) with a hexagon wrench (Width across flats: 8mm). Oil level should be near the bottom of the plug hole.
4. If the oil level is still too low, add engine oil through the hole in plug (G) until the oil overflows.
5. After checking, install plug (G).



REPLACE HYDRAULIC OIL FILTER ELEMENT

⚠ WARNING

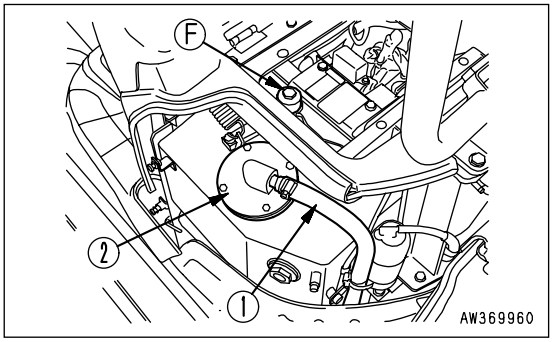
- **The parts and oil are at high temperature after the engine is stopped, and may cause serious burns. Wait for the temperature to go down before cleaning the hydraulic tank strainer.**
- **When the oil filler cap is removed, oil may spurt out, so turn the cap slowly to release the internal pressure,then remove it carefully.**

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 4-19)" when carrying out maintenance.

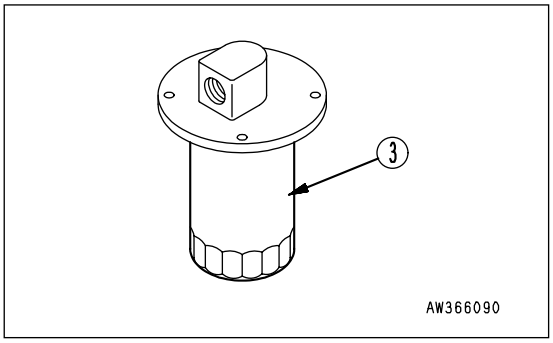
- Prepare a filter wrench for hydraulic filter cartridge.

1. Tip the operator's seat and remove the toolbox from under the seat. For details, see "TIPPING OPERATOR'S SEAT (PAGE 3-20)".
2. Remove cover at the left side of the machine.

3. Remove the cap from oil filler (F), and release the internal pressure.
4. Loosen the clamp of hose (1), then loosen 4 bolts.
5. Take out element assembly (2).

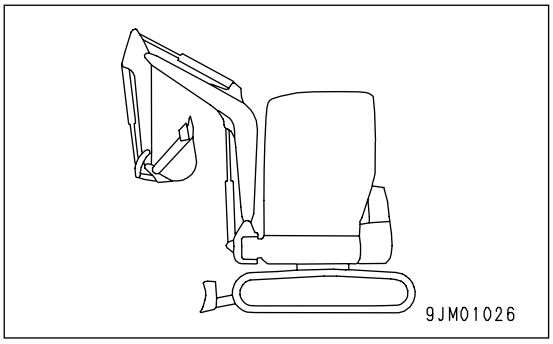


6. Using a filter wrench, turn filter cartridge (3) to the left to remove it.
7. Clean the filter holder, then coat of the seal surface of the new filter cartridge with engine oil (or coat it thinly with grease).
8. When installing, bring the packing surface into contact with the seal surface of the filter holder, then tighten a further 1/2 - 3/4 turns.



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.

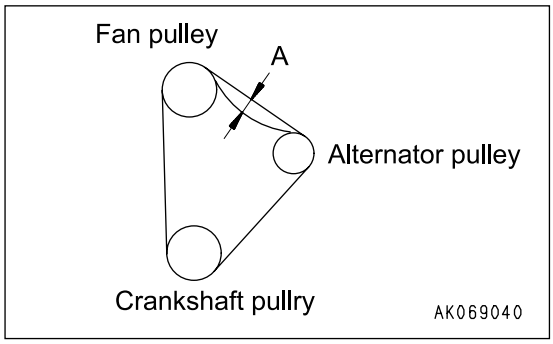
9. Leave hydraulic tank cap (F) removed, and extend the boom, arm, and bucket cylinders fully as shown in the diagram on the right. Then install the cap and pressurize the inside of the tank.
10. Install cover.



INSPECT AND ADJUST COOLING FAN BELT TENSION

Inspection

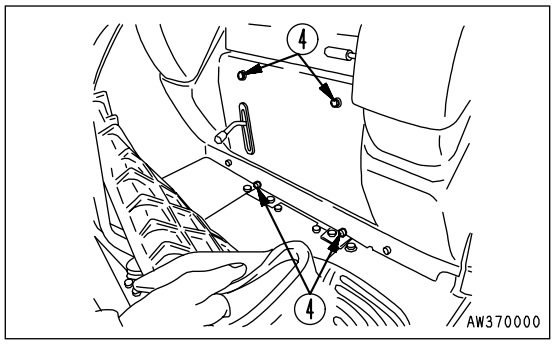
The belt should deflect 10 to 15mm (0.4 to 0.6 in) when press with (A) finger force of approx. 58.8N (6kg, 13.2 lb) at a point midway between alternator pulley and fan pulley.



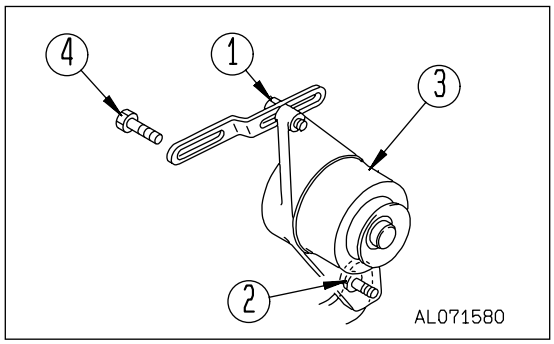
Adjustment

- Prepare a pinch bar
- Prepare a wooden block

1. Tip the operator's seat over to the front, then remove the toolbox from under the seat. For details, see "TIPPING OPERATOR'S SEAT (PAGE 3-20)".
2. Remove 4 bolts (4) from the panel under the operator's seat, then remove the cover.



3. Insert a bar between alternator (1) and the cylinder block to fix alternator (1) in position. When fixing alternator (1) in position, insert a wooden block between the bar and alternator (1) to prevent damage to the alternator.
4. Loosen bolts and nuts (2), (3) and (4).
5. Move alternator (1) with a bar so that the deflection of the belt is 10 to 15 mm (0.4 to 0.6 in) (approx. 6 kg (13 lb)).
6. Tighten the bolts and nuts (2), (3) and (4) to fix alternator (1) in position.
7. 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 the V-groove.
8. If the belt is stretched, leaving no allowance for adjustment, or if it is cut or cracked, contact your Komatsu distributor for replacement.

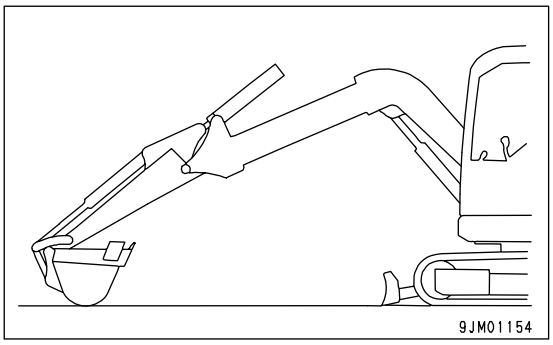


EVERY 500 HOURS MAINTENANCE

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

LUBRICATING

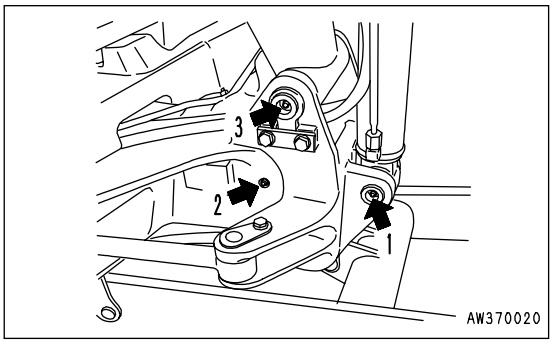
1. Set the machine to the greasing posture shown on the right, lower the work equipment to the ground, then stop the engine.
2. Using a grease pump, pump in grease through the grease fittings shown by arrows.
3. After greasing, wipe off any old grease that was pushed out.



(1) Boom cylinder foot pin (1 point)

(2) Boom swing bracket pin (2 point)

(3) Boom foot pin (2 points)



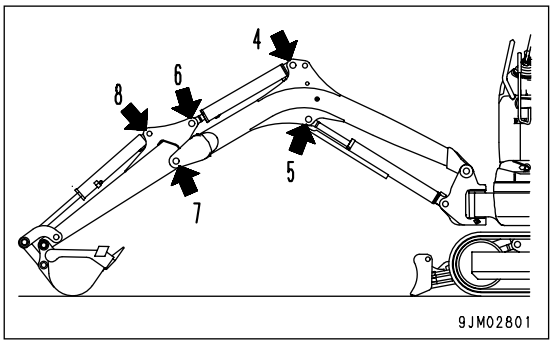
(4) Arm cylinder foot pin (1 point)

(5) Boom cylinder rod end (1 point)

(6) Arm cylinder rod end (1 point)

(7) Boom - Arm coupling pin (1 point)

(8) Bucket cylinder foot pin (1 point)



REPLACE FUEL FILTER ELEMENT

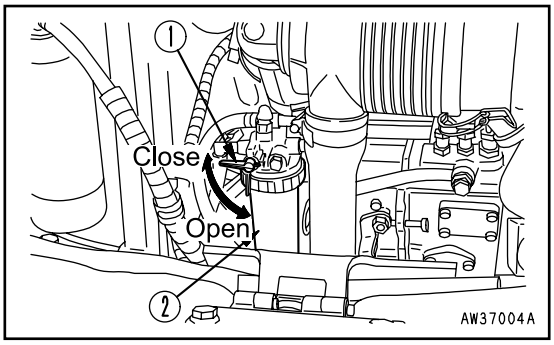
(With water separator)

⚠ WARNING

- **The engine is at a high temperature immediately after the engine is stopped. Wait for all parts to cool down before replacing the filter.**
- **Do not bring fire or spark near the fuel.**

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

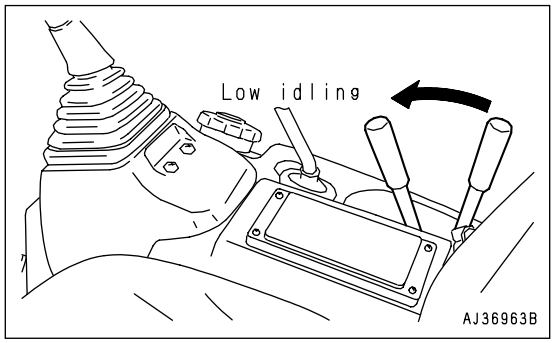
1. Set the container to catch the fuel under the filter element and element cup.
2. Close valve (1) at the top of the filter.
3. Using a filter wrench, turn filter element cup (2) counter-clockwise to remove it.
4. Clean the filter holder, fill the new filter element cup with fuel, coat the packing surface with engine oil, then install it to the filter holder.
5. When installing, tighten unit the packing surface contacts the seal surface of the filter holder, then tighten it up 2/3 of a turn.



NOTICE

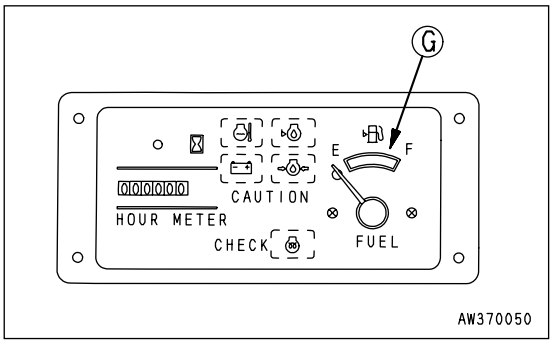
If the filter element cup is tightened too far, the packing will be damaged and this will lead to leakage of fuel. If the filter element cup is too loose, fuel will also leak from the packing, so always tighten to the correct amount.

6. Set fuel control lever to the low idling position.
7. After replacing the fuel filter element, bleed the air.
   For details of the procedure, see the section on bleeding the air in this paragraph.
8. After replacing the filter element, start the engine and check that there is no leakage of fuel from the filter seal surface. If there is any leakage of fuel, check the tightening of the filter element cup. If there is still leakage of fuel, follow Steps 1 and 3 to remove the filter element cup, then check the packing surface for damage or foreign material. If any damage or foreign material is found in the packing, replace the packing with a new part, then repeat Steps 4 to 7.

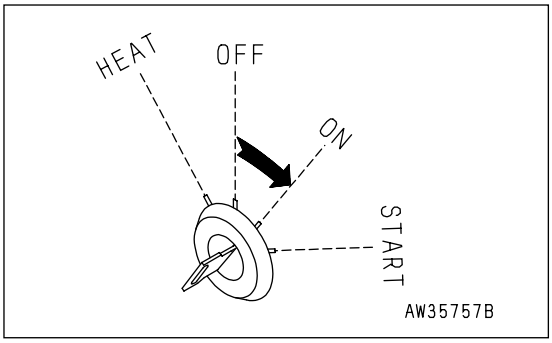


Air Bleeding

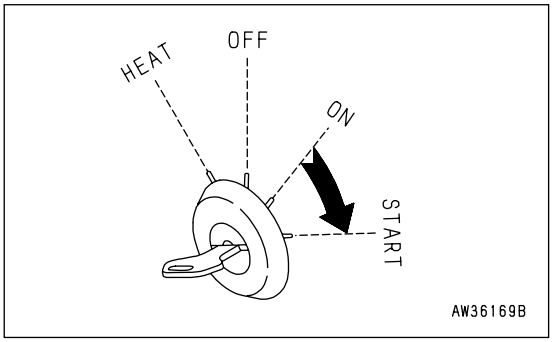
1. Fill the fuel tank with fuel (until fuel gauge (G) indicates F).



2. Turn and keep the starting key to the ON position for 10 to 20 seconds.
   Air is automatically bled by the automatic air bleeding device.



3. Turn the starting key to the START position, and the engine starts.



REMARK
This air bleeding procedure can also be applied when the fuel has run out.

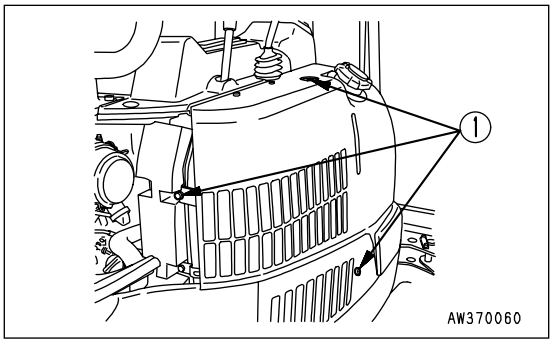
CLEAN AND INSPECT RADIATOR FINS

⚠ WARNING

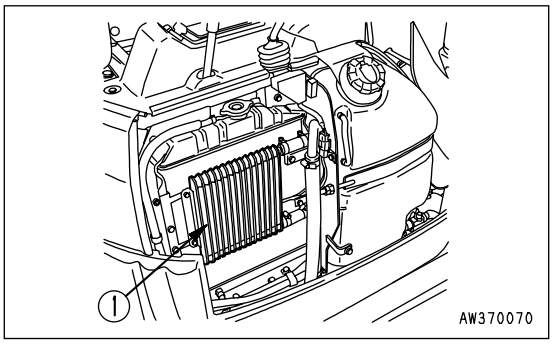
If compressed air, high-pressure water, or steamhit your body directly, or they cause dirt or dust to be blown up, there is a hazard of serious injury. Always use safety glasses, dust mask, or other protective equipment.

NOTICE
When using compressed air, if the nozzle is brought too near the fins, the fins may be damaged. Carry out the cleaning from a reasonable distance to prevent damage to the fins.
Do not direct the jet directly at the core. If the fins are damaged, it will cause leakage of water and overheating. On dusty jobsites, carry out this inspection every day, regardless of the maintenance interval.

1. Remove 3 bolts (1), then remove the grill on the right side of the machine.



2. Use compressed air to blow off the mud, dirt, or leaves clogging radiator fins (1).



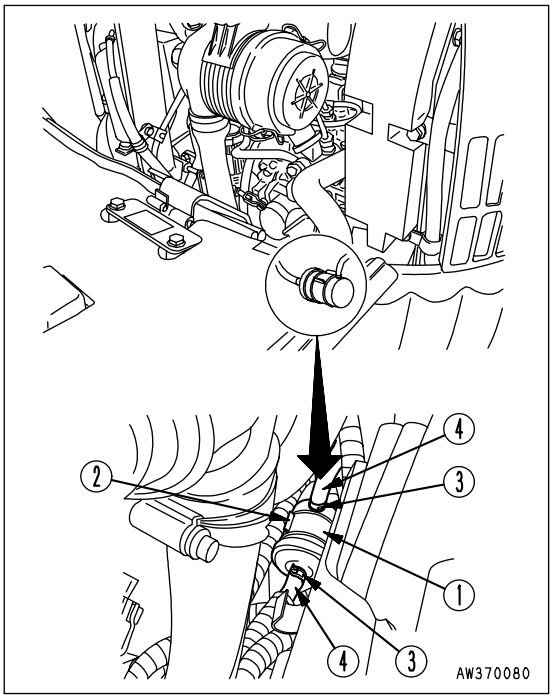
REPLACE FUEL FEED PUMP PRE-FILTER

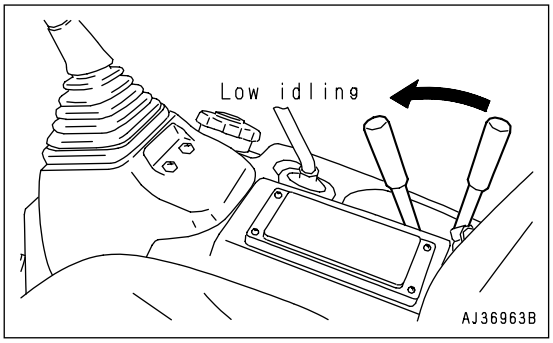
⚠ WARNING

- **Do not replace the pre-filter just after stopping the engine, since each part is still hot. Wait until each part has cooled down.**
- **After replacing the pre-filter, connect the fuel hoses securely ao that fuel will not leak.**
- **Do not bring fire or spark near the pre-filter.**

- Prepare a container to catch the fuel.

1. Set the container to catch the fuel under the pre-filter (1).
2. Set the fuel control lever to the low idling position.
3. Remove pre-filter (1) from the clamp (2).
4. Loosen clamp (3) and remove fuel hose (4) from pre-filter (1).
5. Loosen clamp (5) and remove fuel hose (6) from pre-filter (1).
6. Connect fuel hoses (4) and (6) of new pre-filter (1), then secure them with clamps (3) and (5).
7. Install pre-filter (1) to clamp (2).
8. After replacing the pre-filter, bleed air. For the air bleeding procedure, see "REPLACE FUEL FILTER ELEMENT (PAGE 4-48)".





EVERY 1000 HOURS MAINTENANCE

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

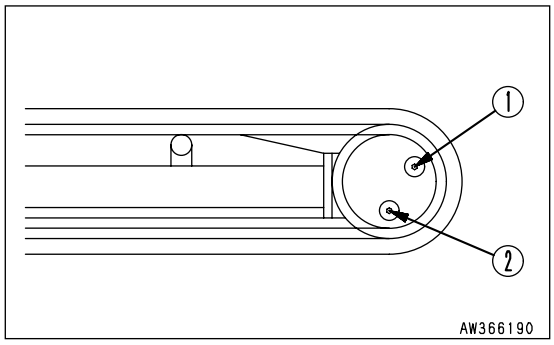
CHANGE OIL IN FINAL DRIVE CASE

⚠ WARNING

- **The parts and oil are at high temperature after the engine is stopped, and may cause serious burns. Wait for the temperature to go 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.**

- Container to catch drain oil: Minimum 0.5 liters (0.13 US gal) capacity
- Refill capacity: 0.33 liters (0.09 US gal)
- Prepare a hexagonal wrench.
  Drain plug: 8 mm (0.315 in)

1. Set so that drain plug (2) is at the bottom.
2. Set the container to catch the drained oil under drain plug (2).
3. Using the hexagonal wrench, remove level plug (1) and drain plugs (2), and drain the oil.
4. Tighten drain plug (2).
5. Supply oil through the hole of level plug (1) up to the specified level.
6. When oil flows out from the hole of level plug (1), install level plug (1).



EVERY 2000 HOURS MAINTENANCE

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

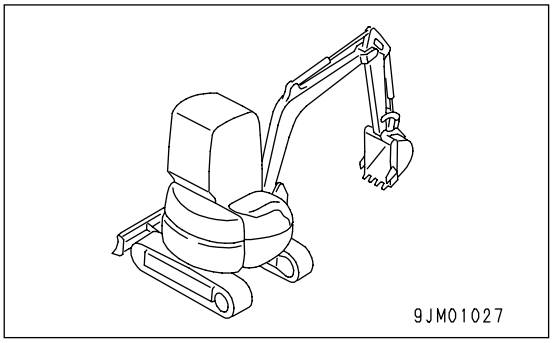
CHANGE AND CLEAN HYDRAULIC OIL AND STRAINER

⚠ WARNING

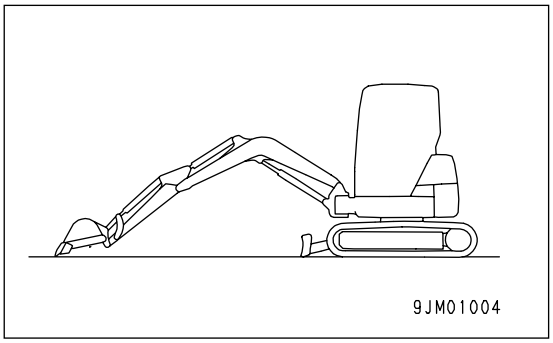
- **The parts and oil are at high temperature after the engine is stopped, and may cause serious burns. Wait for the temperature to go down before changine the oil in the hydraulic tank.**
- **When the oil filler cap is removed, oil may spurt out, so turn the cap slowly to release the pressure before removing the cap.**

- Prepare a container to catch drained oil: Minimum 23 liters (6.08 US gal) capacity
- Refill capacity: 21 liters (5.54 US gal)
- Prepare a handle (for the socket wrench).

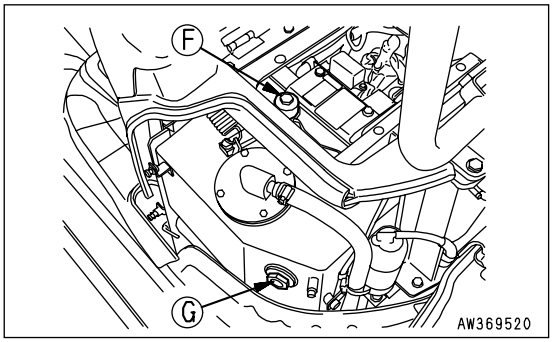
1. Swing so that the drain plug at the bottom of the hydraulic tank is in the middle between the left and right tracks.



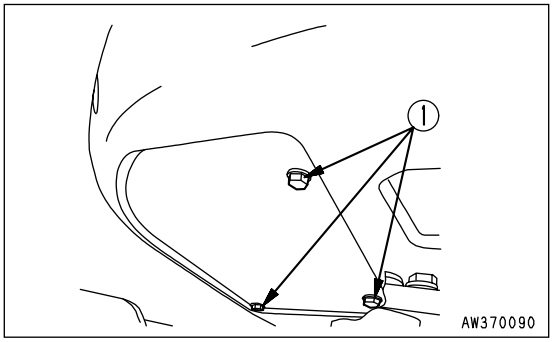
2. Retract the arm and bucket cylinders, then lower the boom and put the teeth in contact with the ground.
3. Lower the blade to the ground.
4. Set the safety lock lever to the LOCK position and stop the engine.



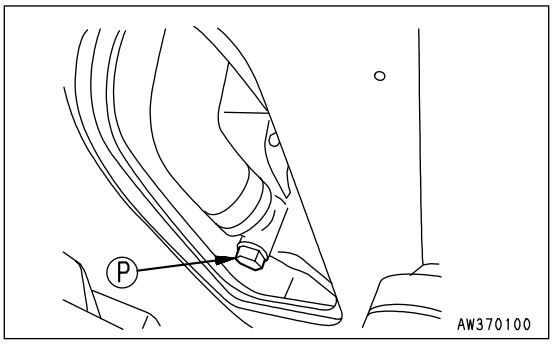
5. Tip the operator's seat over to the front, then remove the toolbox from under the seat. For details, see "TIPPING OPERATOR'S SEAT (PAGE 3-20)".
   Use the tool to remove the cap from oil filler (F).



6. Remove 3 bolts (1) under the rear left of the machine, then remove the cover of the drain plug.



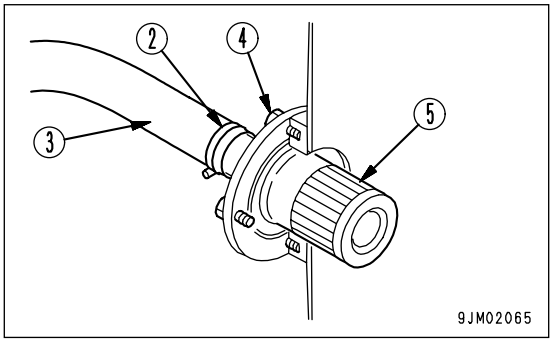
7. Set the oil container under the drain plug under the machine.
   Using the handle, remove drain plug (P) and drain the oil. Check the O-ring installed to plug (P), and if it is damaged, replace the O-ring. After draining the oil, tighten drain plug (P).
   Tightening torque: 68.6 ± 9.81Nm (7 ± 1kgm, 50.6 ± 7.2 ftlb)
   Take care not to get oil on yourself when you remove drain plug (P).



8. Loosen hose clamp (2) and remove hose (3), then loosen bolt (4) and take out strainer (5).

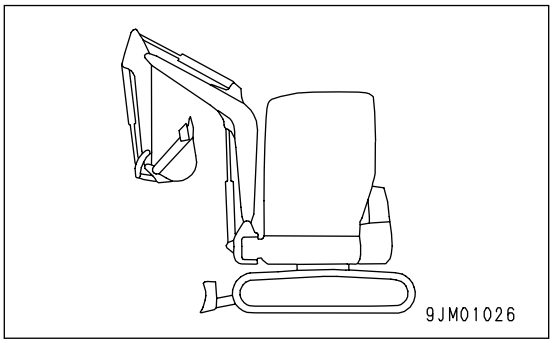
9. Remove all dust from strainer (5) and wash it in clean diesel fuel or flushing oil. If strainer (5) is damaged, replace it with a new part.

10. Secure strainer (5) in position with bolt (4), then install hose (3) and secure it with hose clamp (2).



11. 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.

12. 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.

13. 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.

INSPECT ALTERNATOR AND STARTING MOTOR

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.

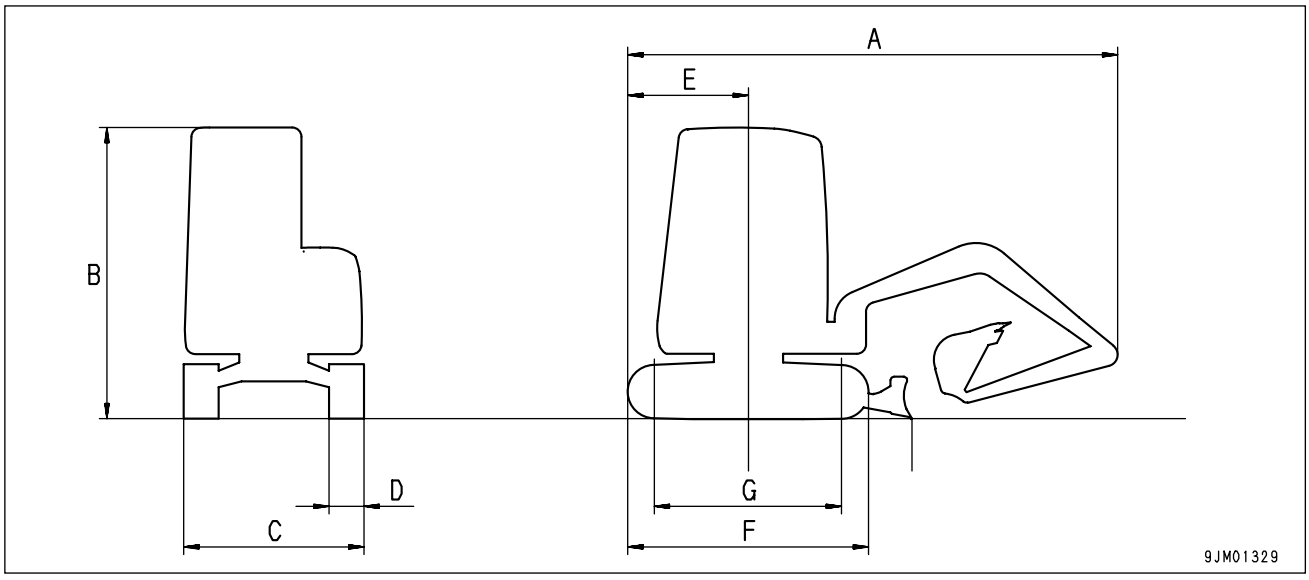
INSPECT ENGINE VALVE CLEARANCES

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

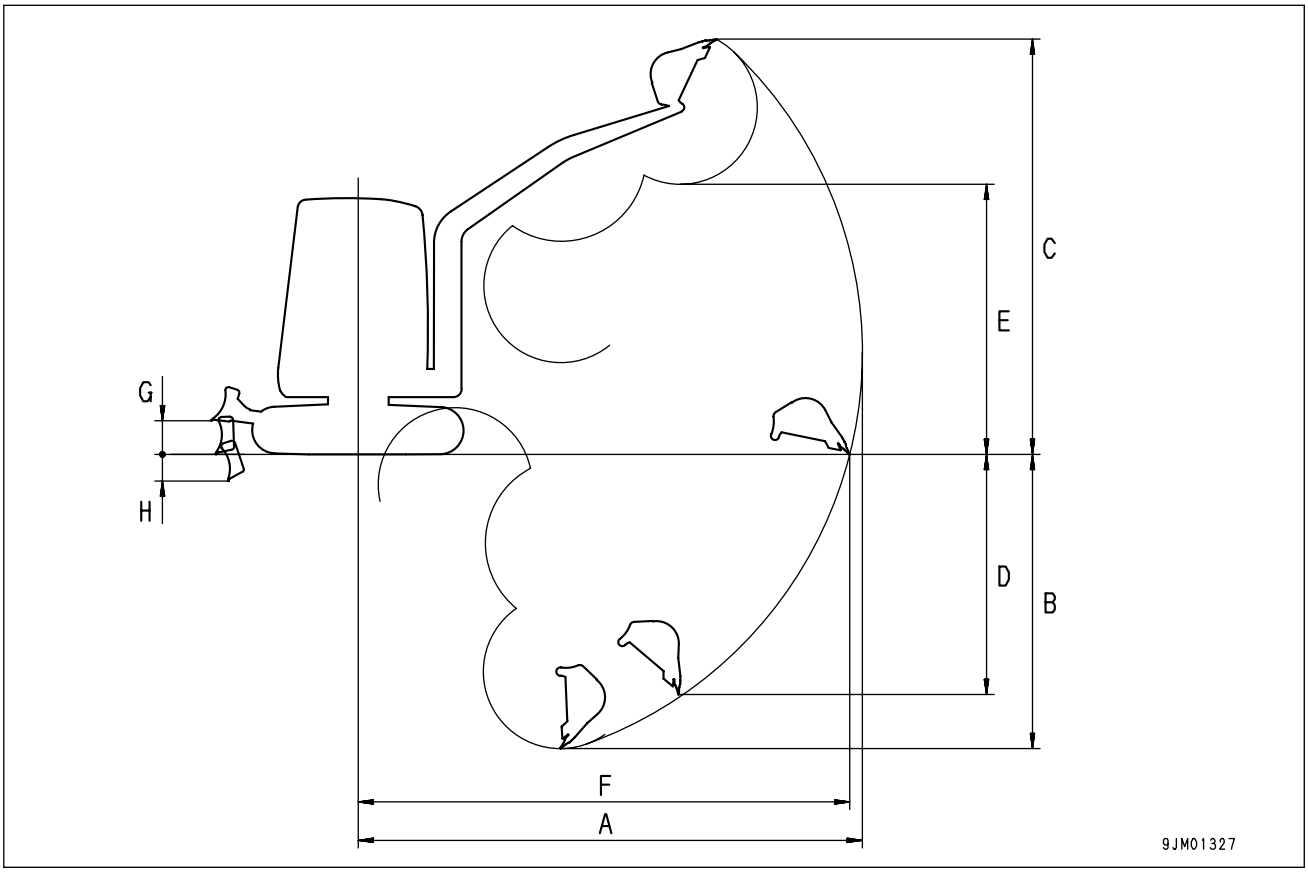
SPECIFICATIONS

SPECIFICATIONS

	Item	Unit	PC15MRx-1
	Operating weight	kg (lb)	1,590 (3,506)
	Bucket capacity	m^3 (cu.yd)	0.044 (0.05)
	Name of engine		KOMATSU 3D68EK-3K diesel engine
	Engine horsepower	kW (HP)/rpm	11.20 (15) / 2,600
A	Overall length	mm (ft in)	3,570 (11'9")
B	Overall height	mm (ft in)	2,430 (7'12")
C	Overall width	mm (ft in)	1,000 (3'3") 1,250 (4'1")
D	Track width	mm (ft in)	230 (9")
E	Tail swing radius	mm (ft in)	790 (2'7")
F	Overall length of track	mm (ft in)	1,555 (5'1")
G	Length of track on ground	mm (ft in)	1,212 (3'12")
	Min. ground clearance	mm (ft in)	205 (8")
	Travel speed (Low/High)	km/h (MPH)	2.3 / 4.3 (1.4 / 2.7)
	Swing speed	rpm	8.3



	Working ranges	Unit	PC15MRx-1
A	Max. digging reach	mm (ft in)	3,880 (12'9")
B	Max. digging depth	mm (ft in)	2,150 (7'1")
C	Max. digging height	mm (ft in)	3,540 (11'7")
D	Max. vertical wall depth	mm (ft in)	1,760 (5'9")
E	Max. dumping height	mm (ft in)	2,550 (8'4")
F	Max. reach at ground level	mm (ft in)	3,790 (12'5")
G	Max. blade lift	mm (ft in)	280 (11")
H	Max. blade digging depth	mm (ft in)	155 (6")



ATTACHMENTS AND OPTIONS

⚠ WARNING

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

GENERAL PRECAUTIONS

PRECAUTIONS RELATED TO SAFETY

If attachments or options other than those authorized by Komatsu are installed, this will not only affect the life of the machine, but will also cause problems with safety.

When installing attachments not listed in this Operation and Maintenance Manual, contact your Komatsu distributor first.

If you do not contact Komatsu, we cannot accept any responsibility for any accidents or failures.

⚠ WARNING

General precautions

- **Read the instruction manual for the attachment 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 attachment sales company 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.**
- **Compared 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 the danger 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.**

⚠ WARNING

Precautions for removal and installation operations

When removing or installing the attachment, always do as follows to ensure safety in the operation.

- **Carry out the removal and installation operation on firm, level ground.**
- **When carrying out the operation with two or more workers, determine the signals and follow these during the operation.**
- **Always use a crane when you lift or carrying heavy objects (more than 25kg or 55 lb).**
- **When removing heavy components, always support the component before removing it.**
  When lifting with a crane, be particularly careful about the position of the center of gravity.
- **It is dangerous to carry out operations with a load left raised by a crane. Always prepare a stand and ensure that the condition is safe.**
- **When leaving an attachment removed or when installing the attachment, make sure that it is in a stable condition and cannot fall over.**
- **Never go under a load raised by a crane.**
  Stay in a safe place where there is no danger 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.

PRECAUTIONS WHEN INSTALLING ATTACHMENTS

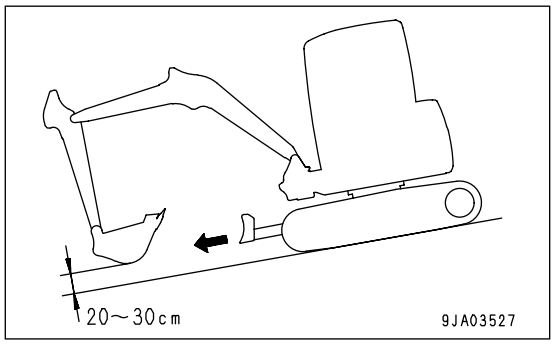
⚠ WARNING

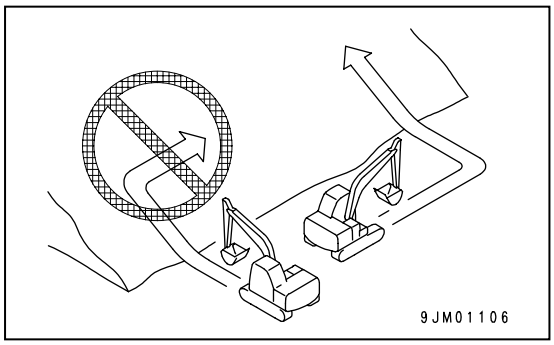
Long work equipment reduces the stability of the machine, so if the swing is operated on a slope, or when going down a steep hill, the machine may lose its balance and overturn.

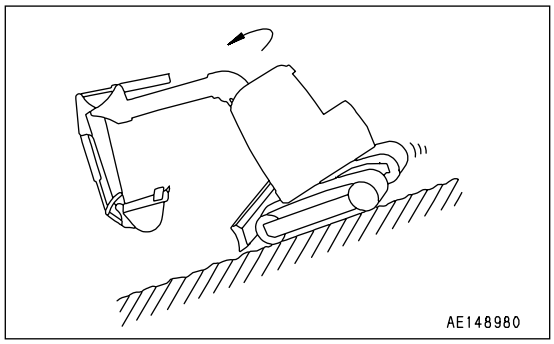
The following operations are particularly dangerous, so never operate the machine in these ways.

- **Traveling downhill with the work equipment raised**
- **Traveling across slopes**
- **Swing operations on slopes**
- **If heavy work equipment is installed, the overrun of the swing becomes greater (the distance from the point where the operator operates the control levers to stop the swing to the point where the upper structure stops completely), so there is danger of mistaking the distance and hitting something.**
  Always operate so that there is an ample margin to the stopping point.
  Furthermore, the hydraulic drift also becomes larger (when the work equipment is stopped in mid-air, it will gradually move down under its own weight).
- **Always follow the correct procedure when installing the boom and arm.**
  If the correct procedure is not followed, this may lead to serious damage or injury, so consult your Komatsu distributor before carrying out installation.

If long work equipment is installed, the working range will suddenly become larger, so there is danger of mistaking the distance and hitting something.
Always operate the work equipment so that there is ample space from any obstacles in the area.







HANDLING BUCKET WITH HOOK

CHECKING FOR DAMAGE TO BUCKET WITH HOOK

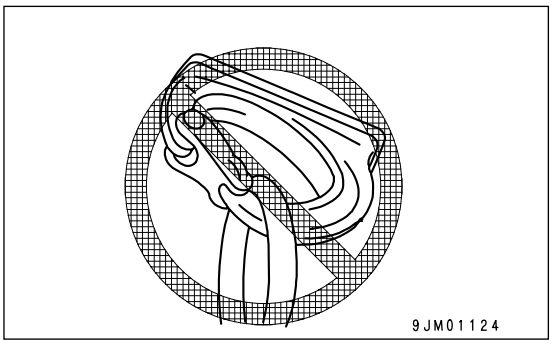
Check that there is no damage to the hook, stopper, or hook mount. If there is any abnormality, contact your Komatsu distributor.

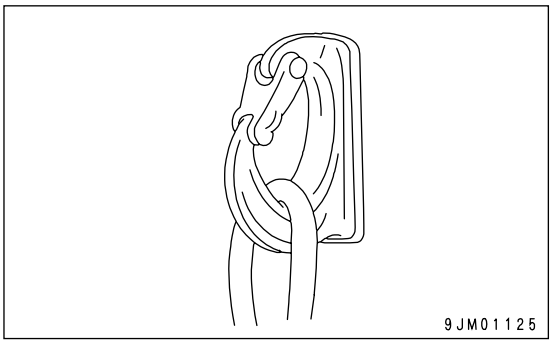
PROHIBITED OPERATIONS

PRECAUTIONS DURING OPERATIONS

- When carrying out lifting operations, reduce the engine speed and use the lifting operation mode.
- Depending on the posture of the work equipment, there is the danger that the wire or load may slip off the hook.

  Always be careful to maintain the correct hook angle to prevent this from happening.
- Never steer 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 install a hook, contact your Komatsu distributor.

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 is the combination table for buckets that can be installed to the standard arm.
If a long arm is installed, do not pull the bucket fully in towards the machine. It will hit the machine body.
When lowering the boom while digging diagonally, be careful not to let the bucket hit the undercarriage.

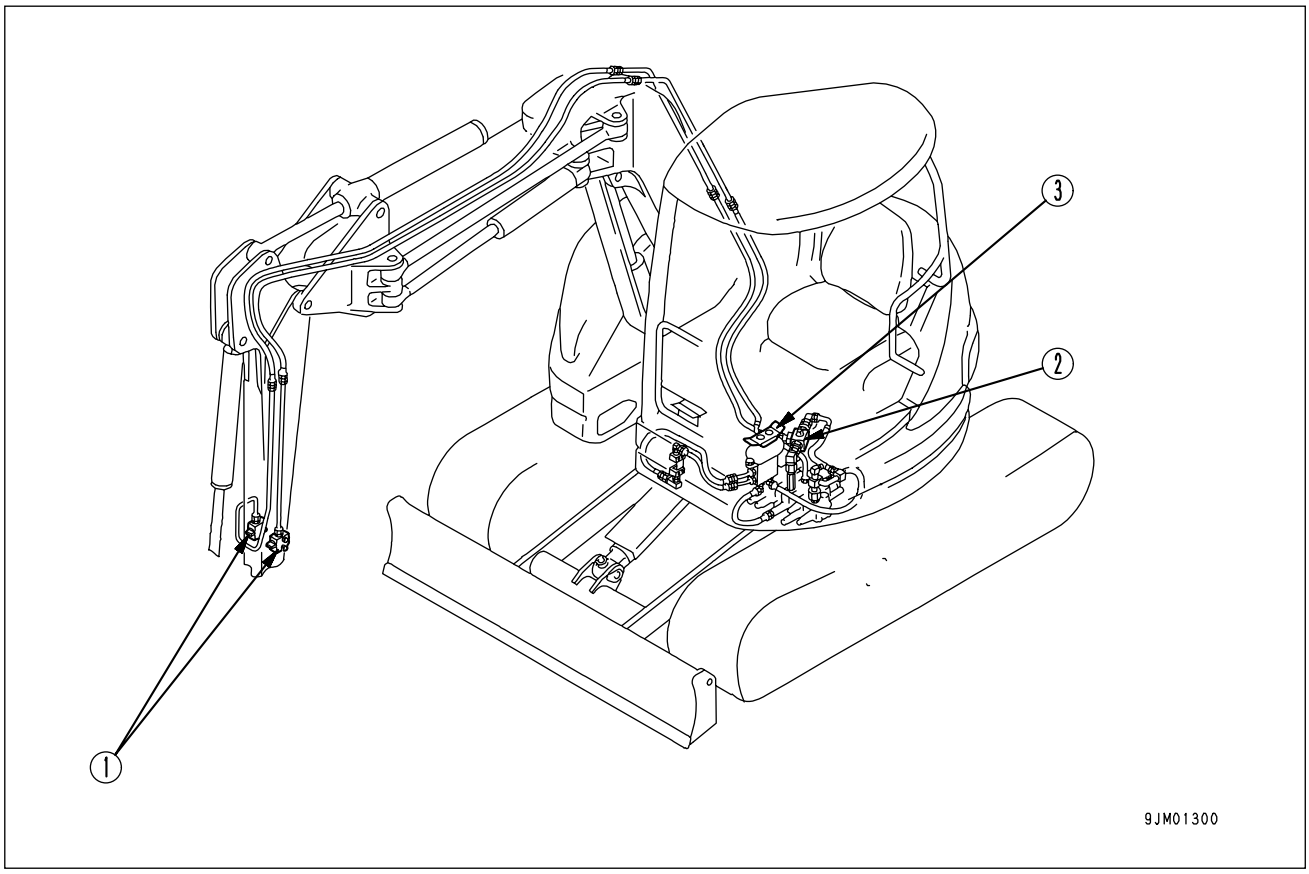
Categories of use
For general digging: Digging or loading sand, gravel, clay etc.
For light duty digging: Digging or loading dry, uncaked earth and sand, mud etc.
For loading work: Loading dry, loose earth and sand

Judgement
○ : Can be used
△ : Can be used only for light duty work
× : Cannot be used

	Capacity m^3 (cu.yd)	Bucket width mm (in)	Application	Standard arm	Long arm
Standard bucket	0.044 (0.06)	500 (19.69)	For general digging	○	×
Narrow bucket	0.040 (0.05)	250 (9.84)	For narrow digging	○	○
Narrow bucket	0.028 (0.04)	350 (13.78)	For narrow digging	○	○

MACHINES READY FOR ATTACHMENTS

EXPLANATION OF COMPONENTS



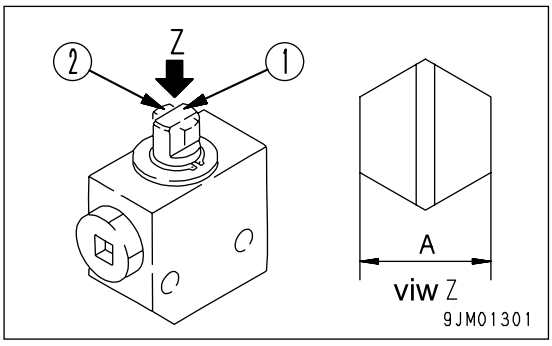
(1) Stop valve
(2) Selector valve
(3) Attachment control pedal

STOP VALVE

This valve (1) stops the flow of the hydraulic oil.

(a) FREE: Hydraulic oil flows
(b) LOCK: Hydraulic oil stops

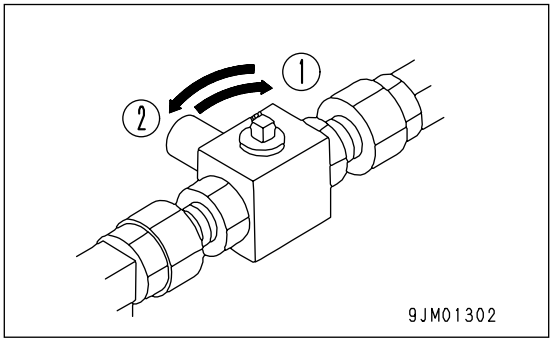
Set this valve to the LOCK position when removing or installing attachments.



SELECTOR VALVE

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

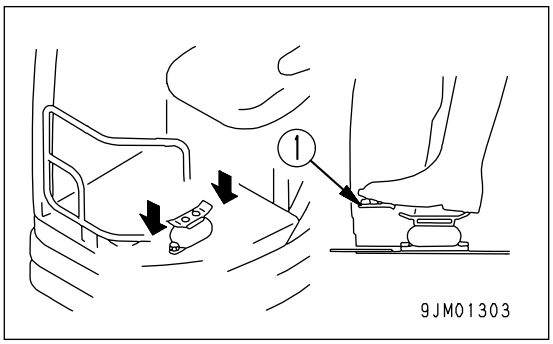
Position (1): When breaker is used
Position (2): When general attachment is used (crusher, etc.)



ATTACHMENT CONTROL PEDAL

This pedal (3) is used to operate the attachment.

REMARK
When depressing the rear of the pedal (mainly when operating the breaker), put the tip of your foot on plate (1) at the bottom left of the handrail and depress the pedal with your heel. This makes it possible to operate the pedal smoothly.

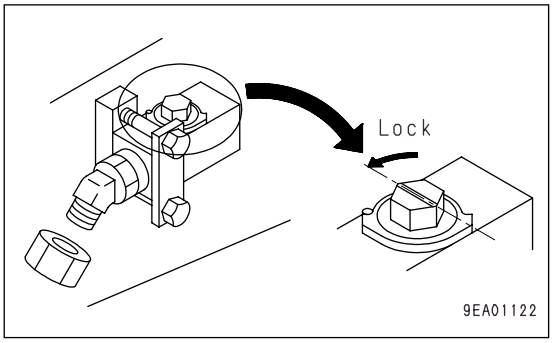


HYDRAULIC CIRCUIT

HYDRAULIC CIRCUIT CONNECTION

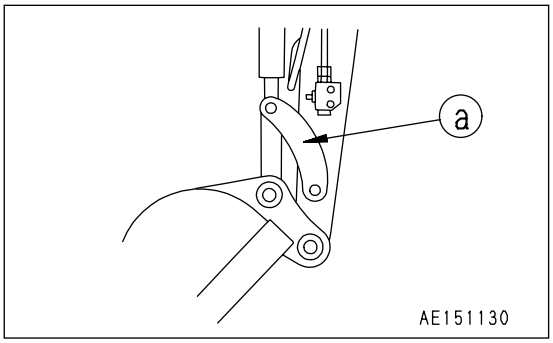
When connecting the attachment, connect the hydraulic circuit as follows.

1. Check that the stop valve is at the LOCK position, then remove the plug.
   Be careful not to lose or damage any part that is removed.



2. Connect the elbow and nipple provided by the attachment maker, then connect the attachment piping.

NOTICE
When connecting the piping, operate the bucket fully to the dump position and be careful not to interfere with link (a).



Air Bleeding

1. Starting engine
   Start the engine according to "STARTING ENGINE (PAGE 3-31)" keep running the engine at low idling for 10 minutes, and carry out the following procedure.

2. Bleeding air from cylinders
   1) Run the engine low idling, and extend and retract each cylinder 4 to 5 times without operating it to the end of its storoke. (Stop approx. 100 mm (4 in) before the end of the stroke.)
   2) Next, operate each cylinder to the end of its stroke 3 to 4 times.

NOTICE
If, at first, the engine is run at high speed or the cylinder is operated to the end of its stroke, the air inside the cylinder may cause damage to the piston packing or other parts.

3. Bleeding air from attachment (if equipped)
   For machine equipped with attachment such as the breaker, actuate the attachment pedal about 10 times to bleed the air completely from the attachment circuit while running the engine at low idling.

NOTICE
If the attachment bleeding procedure is specified by the manufacture, bleed the attachment according to such procedure.

4. Operation
   1) After completion of bleeding the air, stop the engine, and wait for at least 5 minutes before starting operations. In this way, the air bubbles are removed from the oil inside the hydraulic tank.
   2) Check for any leakage of oil, and wipe off any oil that has been spilled.

OPERATION

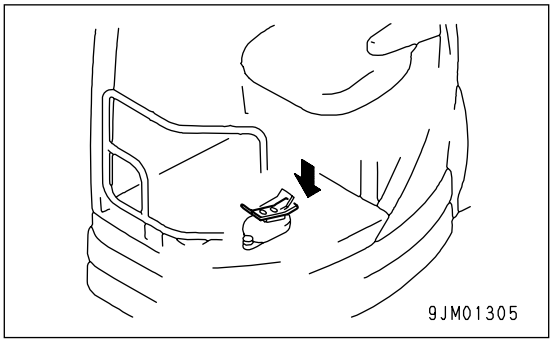
⚠ WARNING

Do not put your foot on the pedal except when operating thepedal. If rest your foot on the pedal during operations, and it is depressed by accident, the attachment may move suddenly and cause serious damage or injury.

The operation of the attachment is as follows.

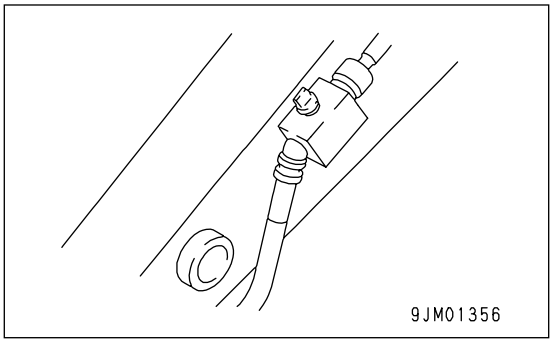
WHEN USING BREAKER

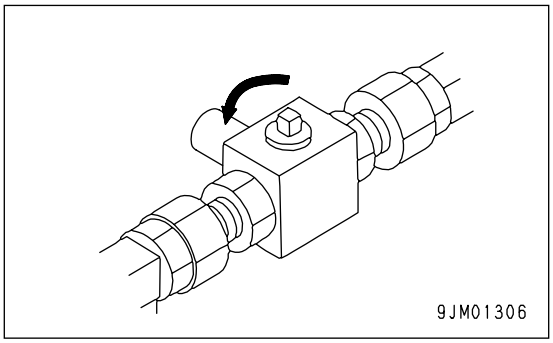
Depress the bottom of the pedal to operate the breaker.



Precautions when using

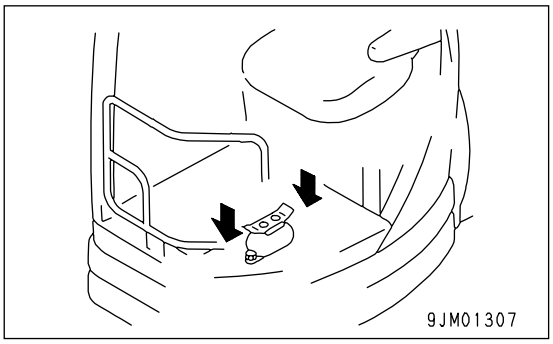
- Check that the stopper valve is in the FREE position.
- Check that the selector valve is in the position for 1-WAY (using the breaker).
- When using the breaker, pull the fuel control lever back fully, then return it slightly and keep it in this position for operations.
  (The position for 80% of engine output)
  If the breaker is operated with the engine at full throttle, it will lead to failure.
- When using the breaker, the hydraulic oil deteriorates more and replace the element at a shorter interval.
  (For details, see "MAINTENANCE INTERVAL FOR HYDRAULIC BREAKER (PAGE 4-19)".)
- For details of other precautions when handling the breaker, read and use correctly the instruction manual provided by the breaker manufacturer.





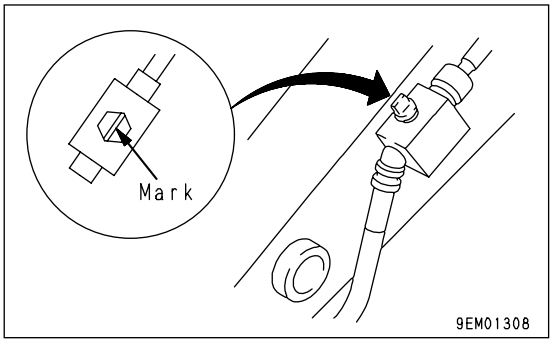
WHEN USING GENERAL ATTACHMENT SUCH AS CRUSHER

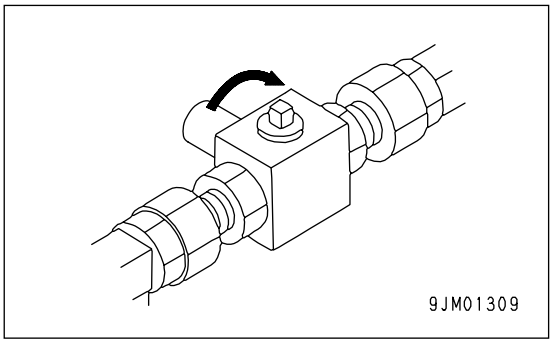
Depress the bottom of the pedal to operate the breaker.



Precautions when using

- Check that the stopper valve is in the FREE position.
- Check that the selector valve is in the position for 2-WAY (for crusher and other general attachment).
- For details of other precautions when handling the breaker, read and use correctly the instruction manual provided by the breaker manufacturer.





RECOMMENDED ATTACHMENT OPERATIONS

This section describes the necessary precautions to be observed when operating a hydraulic excavator equipped with an attachment.

NOTICE
Select the attachment most suited to the machine body.

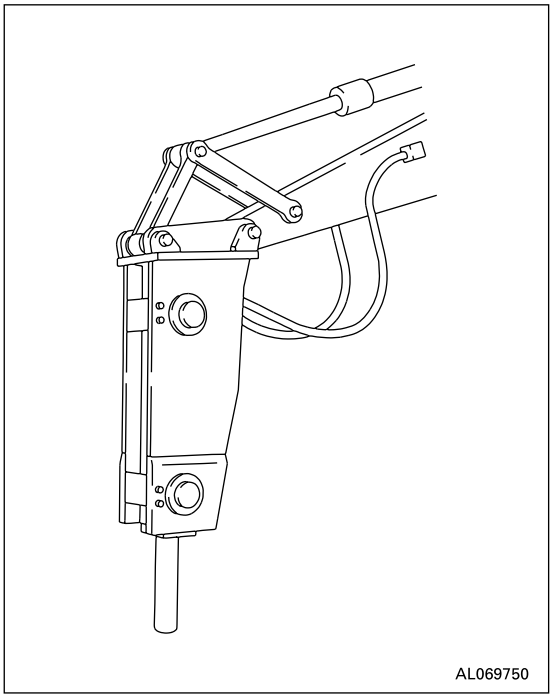
- **The machine models to which attachments can be mounted vary. For selection of attachment and machine model, consult your Komatsu distributor.**

HYDRAULIC BREAKER

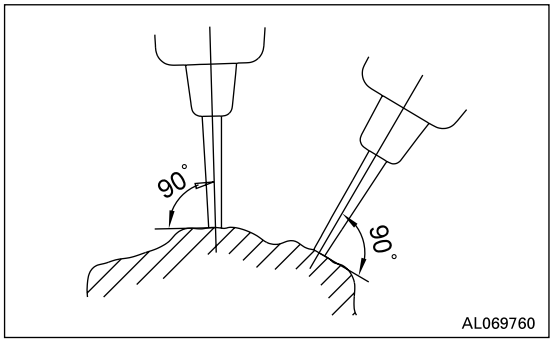
MAIN APPLICATIONS

- Crushed rock
- Demolition work
- Road construction

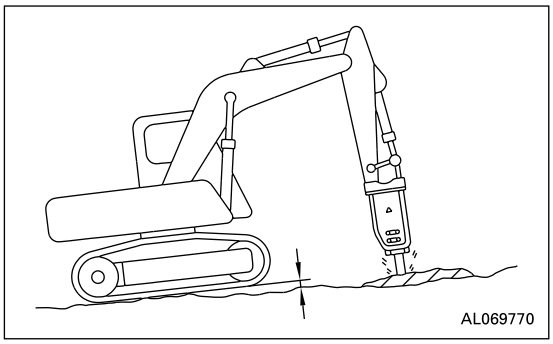
This attachment can be used for a wide range of work including demolition of buildings, breaking up of road surfaces, tunnel work, breaking up slag, rock crushing, and breaking operations in quarries.



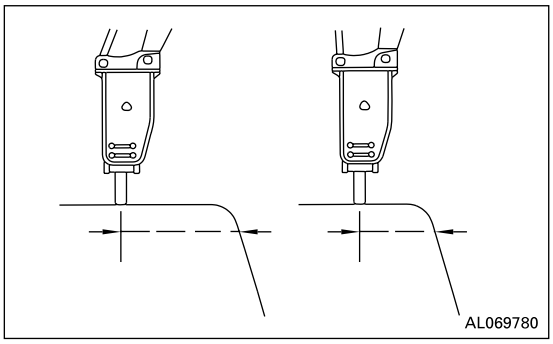
Keep the chisel pushed perpendicularly against the impact surface when carrying out breaking operations.



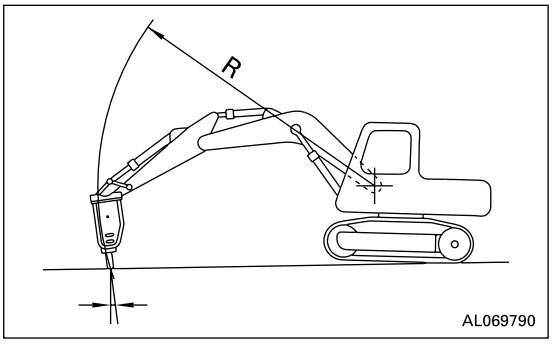
When applying impact, push the chisel against the impact surface and operate so that the chassis rises approx. 5 cm (2 in) off the ground. Do not let the machine come further off the ground than this amount.



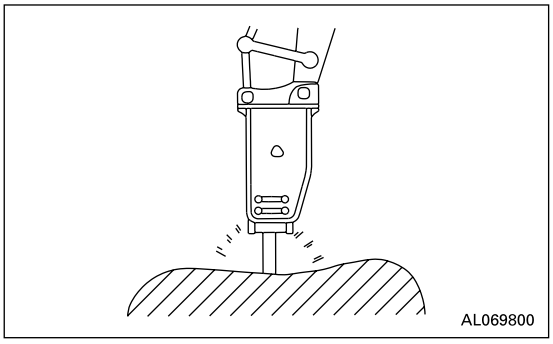
When applying continuous impact to the same impact surface, if the chisel does not penetrate or break the surface within 1 minute, change the point of impact and carry out breaking operations closer to the edge.



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.

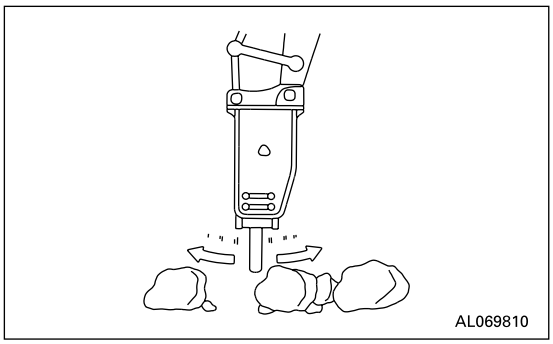


PROHIBITED WORKS

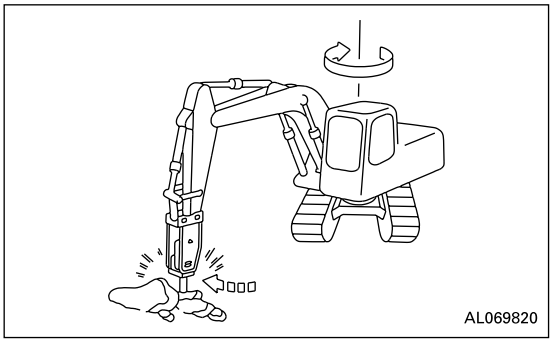
To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

- Do not operate all cylinders to the end of their strokes. Always leave approx. 5 cm (2 in) to spare.

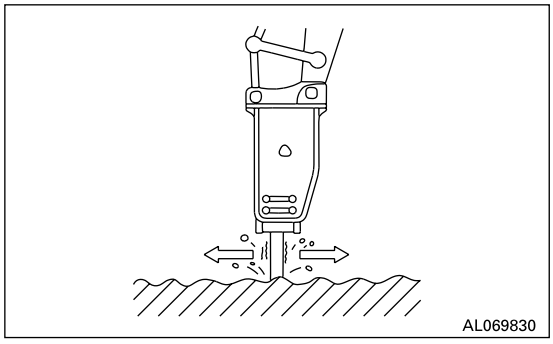
Using the mount to gather in pieces of rock



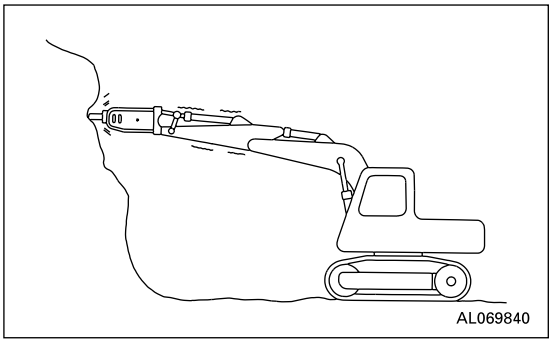
Operations using the swing force



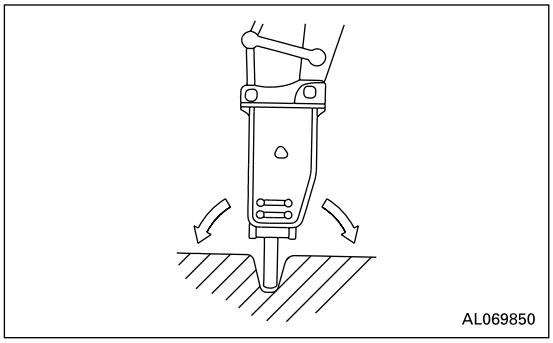
Moving the chisel while carrying out impacting operations



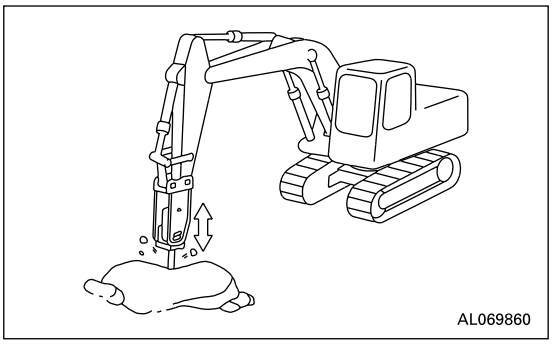
Applying impact horizontally or in upward direction



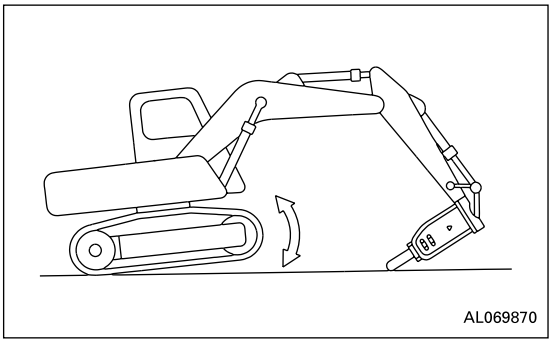
Twisting the chisel when it has penetrated the rock



Pecking operations



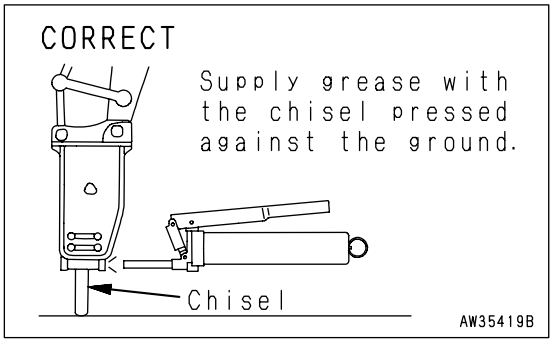
Extending the bucket cylinder fully and thrusting to raise the machine off the ground

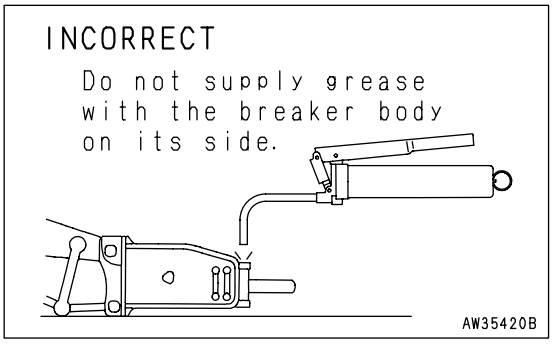


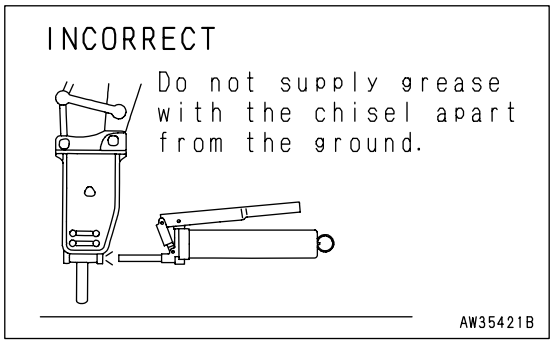
GREASING POSITION FOR HYDRAULIC BREAKER

Supply grease in the correct position.

NOTICE
If grease is supplied in an incorrect position, the breaker is filled with more grease than necessary. As a result, soil and sand will enter the hydraulic circuit and can damage the hydraulic devices while the breaker is used. Accordingly, be sure to supply grease in the correct position.







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PC15MRx-1 HYDRAULIC EXCAVATOR

Form No. SEAM044900T