

# Operation & Maintenance Manual

SEAM034106T



# PC60-7

**HYDRAULIC EXCAVATOR**

SERIAL NUMBERS PC60-59869 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.**

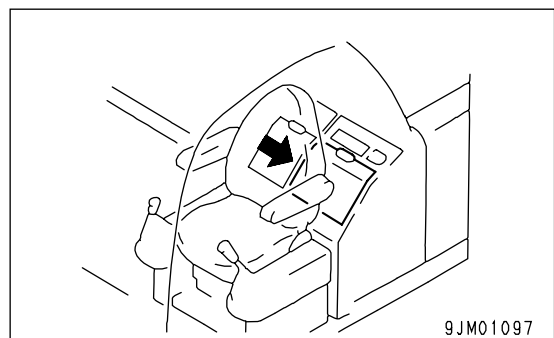
**If this manual has been lost or has become dirty and cannot be read, request a replacement manual immediately from Komatsu or your Komatsu distributor.**

**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 specifications that are necessary for use in your country. If there is any question about whether your product complies with the applicable standards and regulations of your country, consult Komatsu or your Komatsu distributor before operating the machine.**

Storage location for the Operation and Maintenance Manual:

Manual luggage box behind operator's seat



9JM01097

**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 PARTICULAR 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-relées 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.**

**INFORMATION IMPORTANTE SUR LE MOTEUR**  
 CE MOTEUR EST CONFORME AUX NORMES AMÉRICAINES DEL'EPA (ANNÉE DU MODÈLE) ET DE LA CALIFORNIE POUR LES MOTEURS LARGES NON-ROUTIERS A IGNITION PAR COMPRESSION. CE MOTEUR EST CERTIFIÉ POUR OPERATION A ESSENCE DIÉSEL.

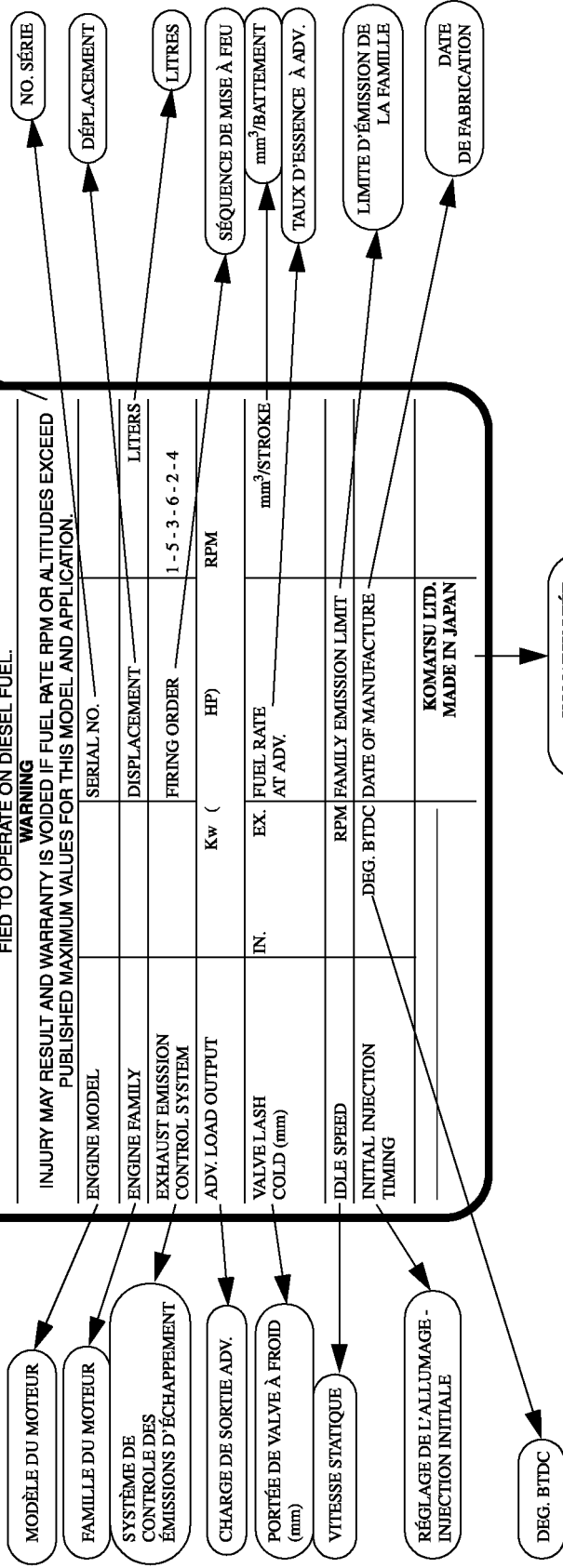
**AVERTISSEMENT**  
 DES BLESSURES PEUVENT RESULTER ET LA GARANTIE S'ANNULER SI LES RPM DU TAUX D'ESSENCE OU L'ALTITUDE EXCÈDENT LES VALEURS MAXIMALES PUBLIÉES POUR CE MODÈLE ET SON APPLICATION.

**IMPORTANT ENGINE INFORMATION**

THIS ENGINE CONFORMS TO YYYY MODEL YEAR U.S. EPA REGULATION AND THE CALIFORNIA REGULATIONS LARGE NON ROAD COMPRESSION IGNITION ENGINES. THIS ENGINE IS CERTIFIED TO OPERATE ON DIESEL FUEL.

**WARNING**  
 INJURY MAY RESULT AND WARRANTY IS VOIDED IF FUEL RATE RPM OR ALTITUDES EXCEED PUBLISHED MAXIMUM VALUES FOR THIS MODEL AND APPLICATION.

ENGINE MODEL	SERIAL NO.	DISPLACEMENT	LITERS
ENGINE FAMILY		FIRING ORDER	1 - 5 - 3 - 6 - 2 - 4
EXHAUST EMISSION CONTROL SYSTEM			
ADV. LOAD OUTPUT	Kw ( HP)		RPM
VALVE LASH COLD (mm)	IN.	EX. FUEL RATE AT ADV.	mm <sup>3</sup> /STROKE
IDLE SPEED		RPM FAMILY EMISSION LIMIT	
INITIAL INJECTION TIMING	DEG. BTDC	DATE OF MANUFACTURE	
			KOMATSU LTD. MADE IN JAPAN



KOMATSU LTD.  
 FABRIQUÉ AU JAPON

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 useful to know.

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

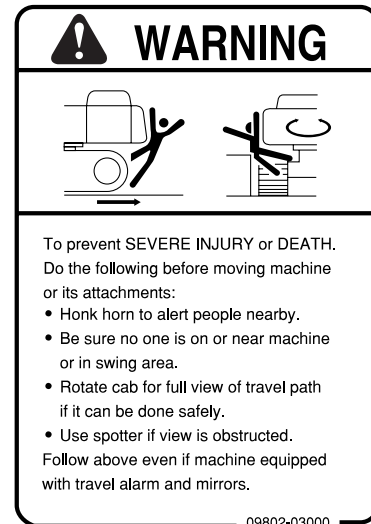
**REMARKS** This gives information that is useful to know.

### 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



Part No.

### 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.



Part No.

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))

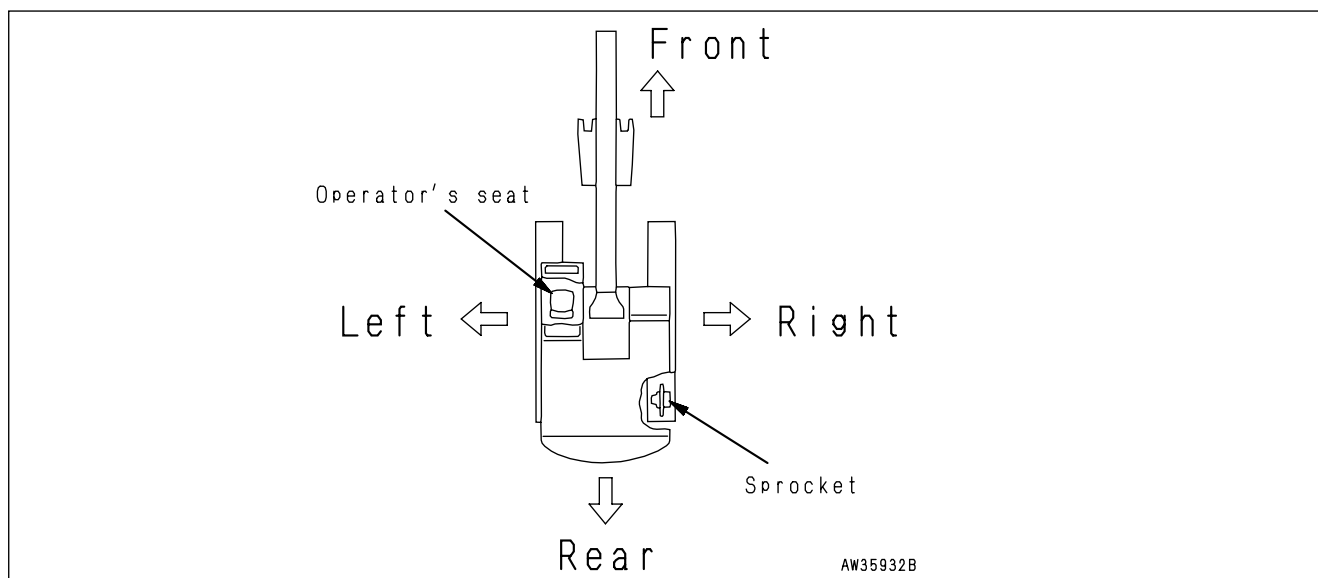
# INTRODUCTION

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 3-71)" for further details.

## DIRECTIONS OF MACHINE



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

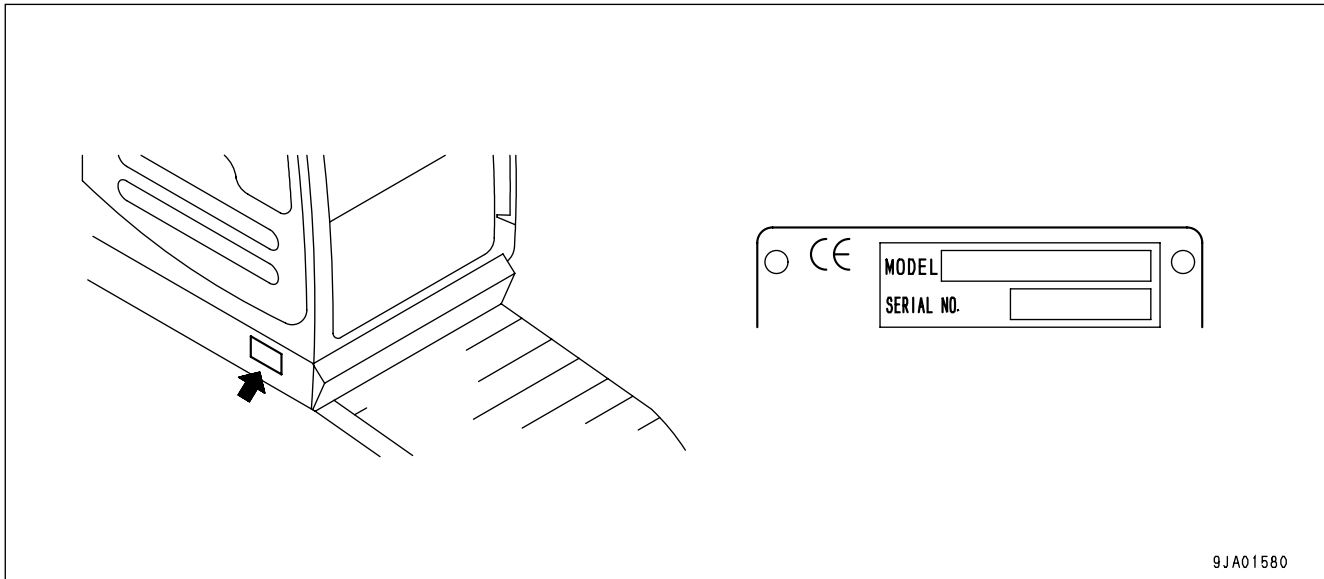


# PRODUCT INFORMATION

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

## MACHINE SERIAL NUMBER PLATE AND ITS LOCATION

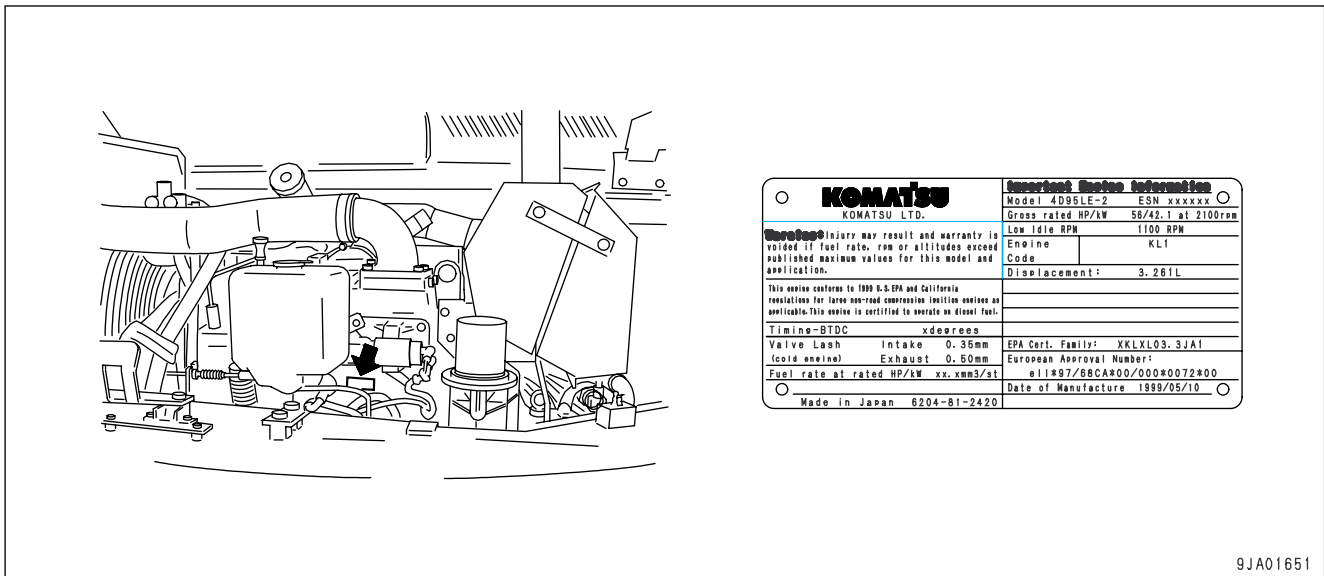
On the bottom right of the operator's cab



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## ENGINE SERIAL NUMBER PLATE AND ITS LOCATION

On the upper side of the engine cylinder head cover

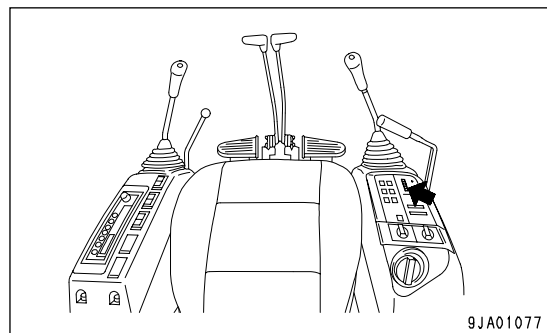


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<p><b>KOMATSU</b> KOMATSU LTD.</p>	<p><b>Important Engine Information</b></p>		
	<p>Model 4D95LE-2 ESN xxxxxx</p>	<p>Gross rated HP/kW 56/42.1 at 2100rpm</p>	
<p>Low Idle RPM 1100 RPM</p>	<p>Engine Code KLI</p>	<p>Displacement: 3.261L</p>	
<p><small>This engine conforms to 1999 U.S. EPA and California regulations for large non-road compression ignition engines as applicable. This engine is certified to operate on diesel fuel.</small></p>			
<p>Timing-BTDC x degrees</p>	<p>Valve Lash Intake 0.35mm (cold engine) Exhaust 0.50mm</p>	<p>EPA Cert. Family: XKLX103.3JA1</p>	
<p>Fuel rate at rated HP/kW xx.xmm3/st</p>	<p>European Approval Number: e11#S7/88CA#00/000#0072#00</p>		
<p>Made in Japan 6204-81-2420</p>		<p>Date of Manufacture 1999/05/10</p>	

## 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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**MEMO**

# SAFETY

## WARNING

Please be sure that you fully understand this manual and the precautions related to safety for the machine. When operating or servicing the machine, always follow these precautions strictly.

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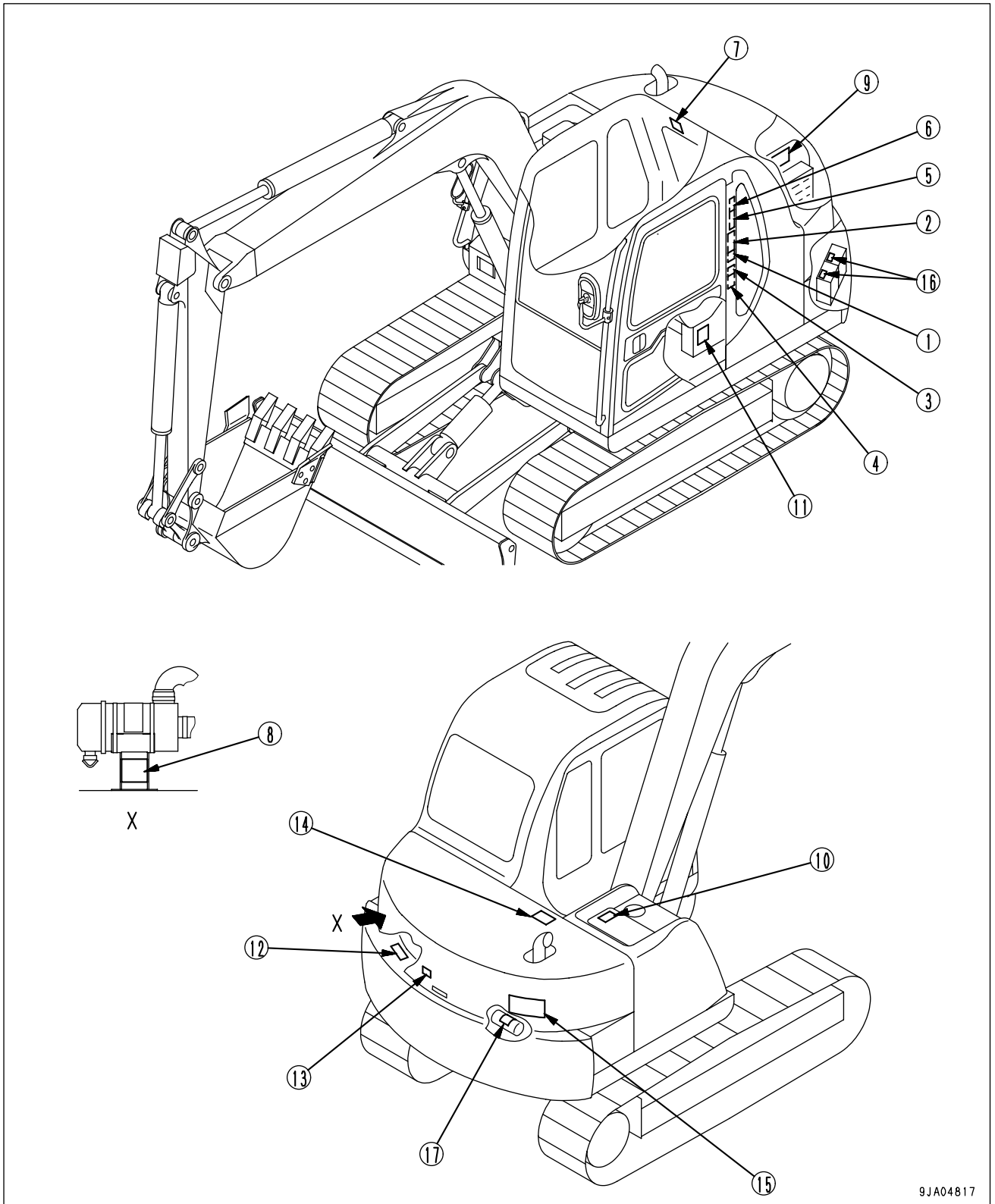
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# WARNING LABELS AND PICTOGRAMS

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

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

# WARNING LABELS AND PICTOGRAMS - LOCATION



9JA04817

WARNING LABELS AND PICTOGRAMS - ACTUAL

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

**WARNING**

Improper operation and maintenance can cause serious injury or death.

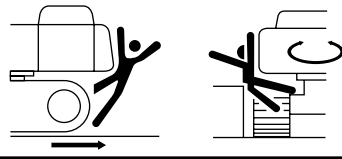
Read manual and labels before operation and maintenance. Follow instructions and warnings in manual and in labels on machine.

Keep manual in machine cab near operator.  
Contact Komatsu distributor for a replacement manual.

09651-03001

(2) Precautions for operation (09802-03000)

**WARNING**



To prevent SEVERE INJURY or DEATH. Do the following before moving machine or its attachments:

- Honk horn to alert people nearby.
- Be sure no one is on or near machine or in swing area.
- Rotate cab for full view of travel path if it can be done safely.
- Use spotter if view is obstructed.

Follow above even if machine equipped with travel alarm and mirrors.

09802-03000

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

**WARNING**

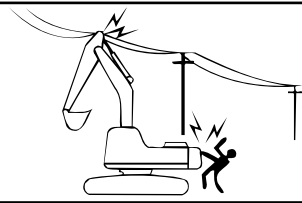
To avoid hitting unlocked operation levers, lower equipment to ground and move SAFETY LOCK LEVER (located near seat) to LOCK position before standing up from operator's seat.

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

09654-03001

(4) Precautions for going close to electric cables (09801-03000)

**DANGER**




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

VOLTAGE		SAFE DISTANCE
LOW VOLTAGE	100V 200V	2m
	6,600V	2m
	22,000V	3m
	66,000V	4m
SPECIAL HIGH VOLTAGE	154,000V	5m
	187,000V	6m
	275,000V	7m
	500,000V	11m

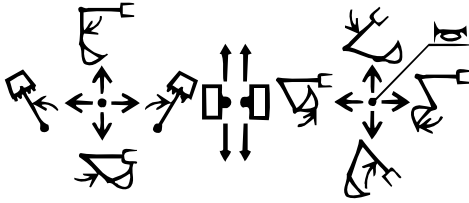
09801-03001

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


WARNING


**In order to prevent an accident resulting in injury or death caused by error-operation, confirm the machine motion and indicated operating pattern, when operating machines. Pay attention to the circumference and operate slowly when confirming the machine motion.**

**ISO pattern**



09822-03000

- Machine equipped with operating pattern selector valve (09822-03010)


WARNING

This machine is equipped with a control pattern selector valve. To prevent serious personal injury or death caused by mistaken operation, always check that movement of machine matches pattern shown on control pattern card before starting operations.


- When checking movement of the machine, check that surrounding area is safe and operate machine slowly.
- If movement does not match control pattern card, replace card with one correct control pattern.

Always do as follows when changing control pattern.

- Lower work equipment to the ground, stop engine, and set safety lock lever to LOCK position. Then change control pattern.

09822-03010

- (6) Precautions for opening the window  
(09839-03000)



WARNING

To avoid hitting unlocked operation levers, lower equipment to ground and move SAFETY LOCK LEVER (located near seat) to LOCK position before standing up from operator's seat, for the purpose of such as opening window and leaving the machine.

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

09839-03000

- (7) Precautions for stowage (09308-03000)



WARNING

When raising window, lock it in place with lock pins on both sides.

Falling window can cause injury.

09803-03000

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




## WARNING

- When changing the control pattern, set the machine in the parking condition, stop the engine, and set the safety lock lever to the LOCK position.
- Align the control pattern selector lever to the specified position. (Check the detent.)
- After changing the control pattern, do not forget to exchange the control pattern card and display the new control pattern card inside the operator's cab.

22M-98-11180

- (9) Precautions for high-temperature cooling water and hydraulic oil (09668-03001)



## WARNING

Hot water hazard.


To prevent hot water from spurting out:

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


09668-03001

- (10) Precautions for high-temperature cooling water and hydraulic oil (203-00-61260)

### HYDRAULIC OIL



---



## WARNING


Hot oil hazard

To prevent hot oil from spurting out:

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

203-00-61260

- (11) Precautions for check and adjust track tension (14X-98-11551)



## WARNING

High pressure hazard at track adjuster.

When adjusting track tension, never open plug more than one turn.

Turning further could cause injury from flying plug and grease.

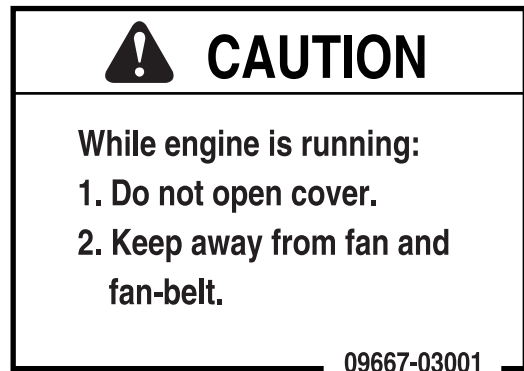
See manual for adjustment instructions.

14X-98-11551

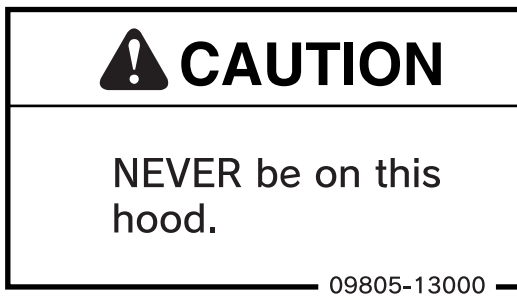
(12) Precautions for handling electric wires  
(09808-03000)



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



(14) Precautions for avoiding falling down  
(09805-13000)



(15) Prohibited to enter range of swing  
(09133-23000)





(16) Warning for battery (09664-30081)

**DANGER EXPLOSIVE GASES**  
 Cigarettes flames or sparks could battery to explode. Always shield eyes and face from battery. Do not charge or use booster cables or adjust post connections without proper instruction and trining.  
 KEEP VENT CAPS TIGHT AND LEVEL

**POISON CAUSES SEVERE BURNS**  
 Containssulfuric acid. Avoid contact with skin eyes or clothing. In event of accident flush with water and call a phisician immediately.  
 KEEP OUT OF REACH OF CHILDREN

09664-30081

(17) Jump start prohibited (09842-A0481)



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

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

# SAFETY INFORMATION

## Safety Rules

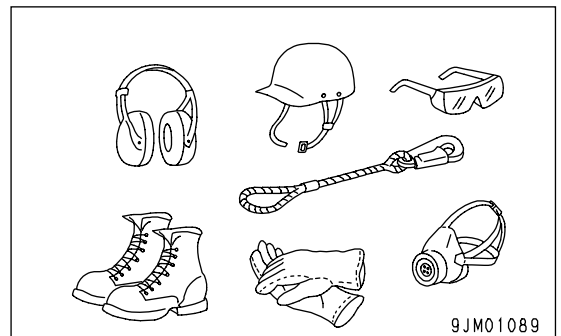
- Only trained and authorized personnel can operate and maintain the machine.
- Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
- If you are under the influence of alcohol or medication, your ability to safely operate or repair your machine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

## If Abnormalities are Found

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

## Working Wear and Personal Protective Items

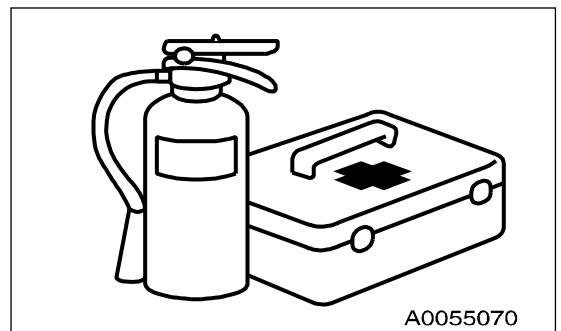
- Do not wear loose clothing and accessories. There is a hazard that they may catch on control levers or other protruding parts.
- If you have long hair and it hangs out from your hard hat, there is a hazard that it may get caught up in the machine, so tie your hair up and be careful not to let it get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



## Fire Extinguisher and First Aid Kit

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

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

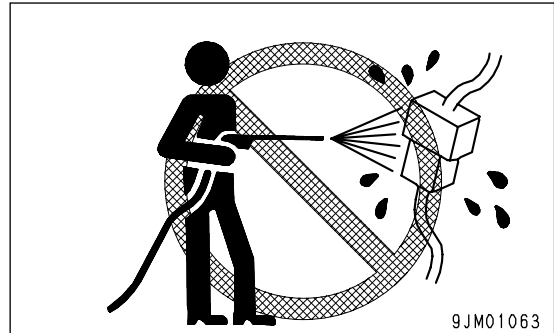


## Safety Equipment

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

## Keep Machine Clean

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



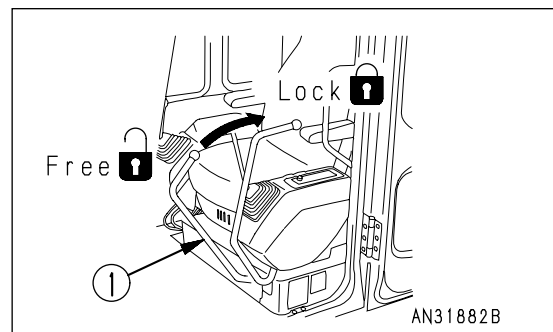
9JM01063

## 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.

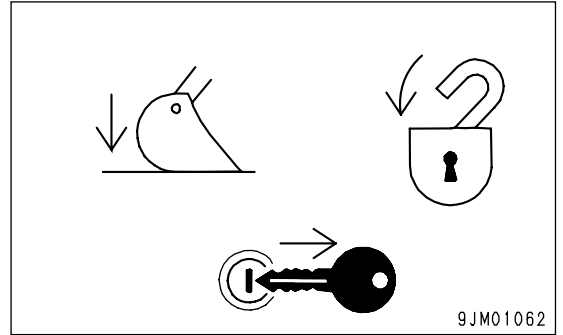
## Leaving Operator's Seat with Lock

- 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.



AN31882B

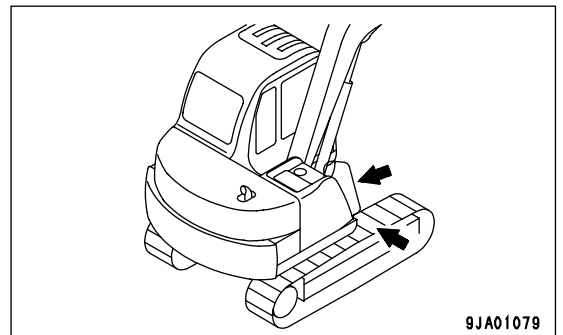
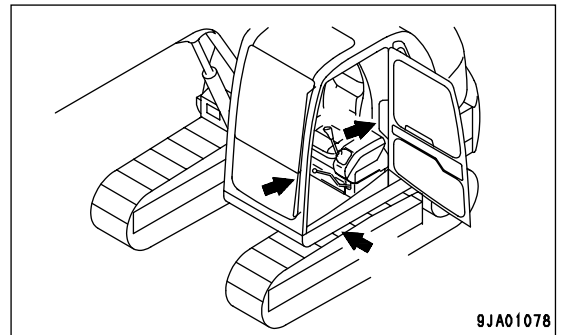
- When leaving the machine, always lower the work equipment completely to the ground, set safety lock lever (1) securely to the LOCK position, then stop the engine. Use the key to lock all the equipment. Always remove the key, take it with you, and keep it in the specified place.



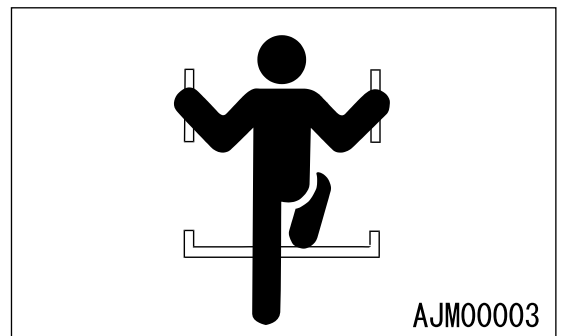
**Handrails and Steps**

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.

## 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.

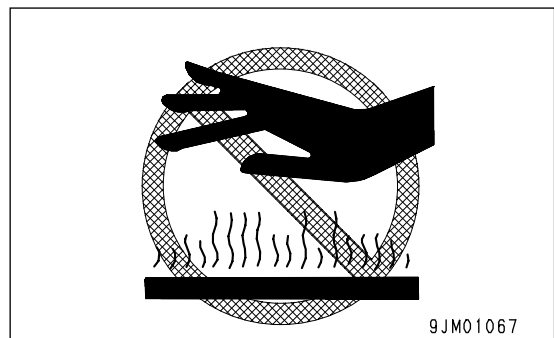
## No Persons on Attachments

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

## Burn Prevention

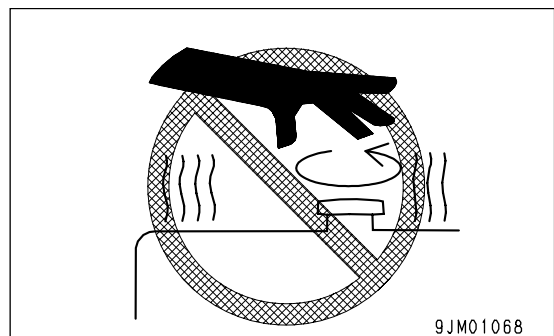
### Hot coolant

- 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 hot oil or other parts when checking or draining the oil, wait for the oil to cool to a temperature where it is possible to touch the cap by hand before starting the operation. Even when the oil has cooled down, loosen the plug slowly to relieve the internal pressure before removing the plug.

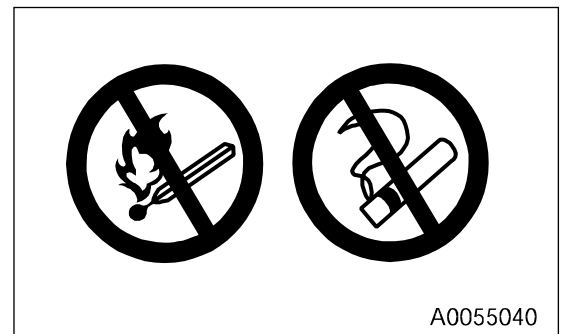


## Fire Prevention and Explosion Prevention

- **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.

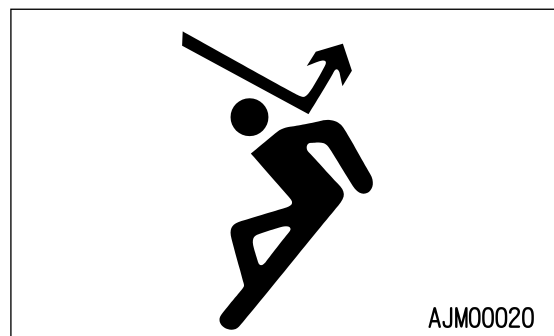
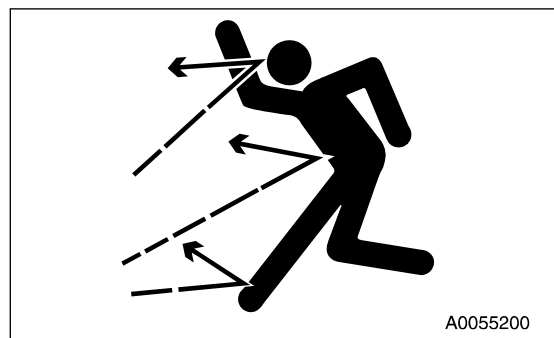
## Windshield Washer Fluid

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 working in mines or quarries where there is a hazard of falling rock, install FOPS (Falling Objects Protective Structure) and a front guard, and use a laminated coating sheet on the front glass.
- When carrying out the above operations, always close the front window. In addition, always ensure that bystanders 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 Window Glasses

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

## Unauthorized Modifications

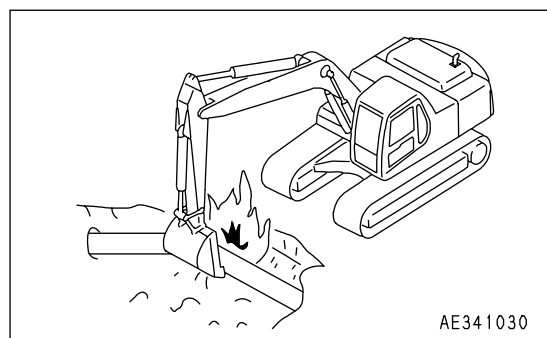
Any modification made without authorization from Komatsu can create hazards. Before making a modification, consult your Komatsu distributor.

- Komatsu will not be responsible for any injuries, accidents, 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 combustible materials such as thatched roofs, dry leaves or dry grass, there is a hazard of fire, so be careful when operating.
- Check the terrain and condition of the ground at the worksite, and determine the safest method of operation. Do not carry out operations at places where there is a hazard of landslides or falling rocks.
- If water lines, gas lines, or high-voltage electrical lines may be buried under the worksite, contact each utility and identify their locations. Be careful not to sever or damage any of these lines.
- Take 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

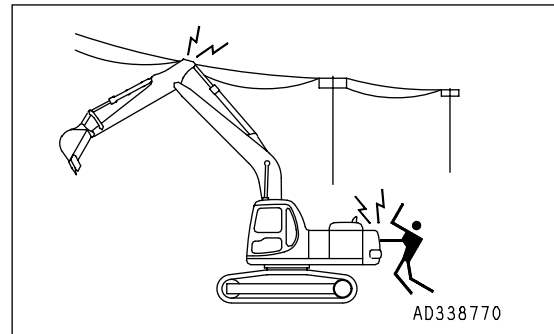
- Avoid traveling or operating your machine too close to the edge of cliffs, overhangs, and deep ditches. The ground may be weak in such areas. If the ground should collapse under the weight or vibration of the machine, there is a hazard that the machine may fall or tip over. Remember that the soil after 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

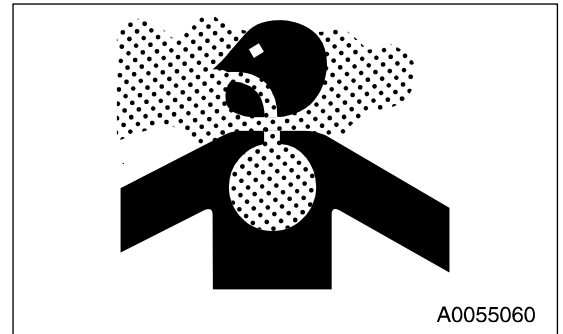
## Ensure Good Visibility

- 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 you provide adequate ventilation is provided to prevent gas poisoning.



A0055060

## Signalman's Signal and Signs

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

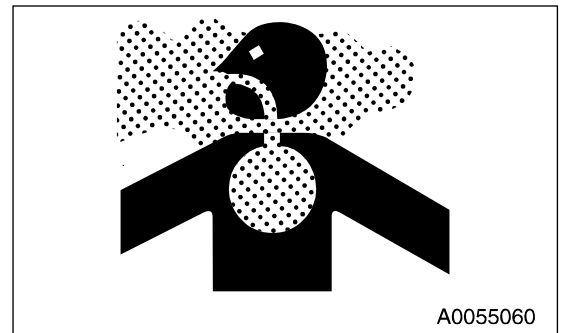
## Emergency Exit from Operator's Cab

If it should become impossible to open the cab door for any reason, open the rear window and use it as an emergency escape. For details, see EMERGENCY EXIT FROM OPERATOR'S CAB (PAGE 3-25) in this manual.

## 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.



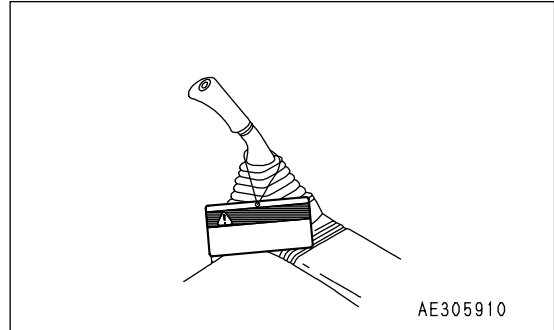
A0055060

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

## BEFORE 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.
- Adjust the mirrors so that the rear of the machine can be seen clearly from the operator's seat. When adjusting, see "Rearview Mirrors (PAGE 3-42)".
- Check that there are no persons or obstacles above, below, or in the area around the machine.

## Safety Rules for Starting Engine

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

## 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.

## AFTER STARTING ENGINE

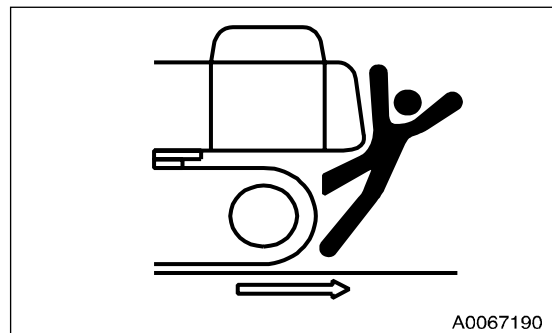
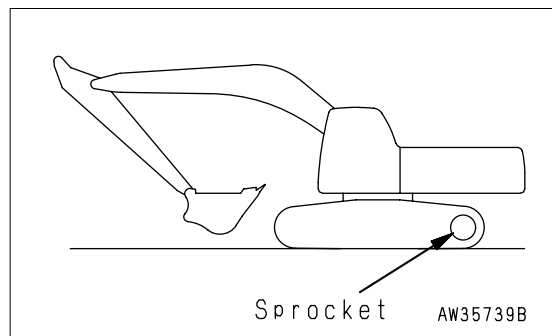
### Checks After Starting Engine

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.

- Always fasten your seat belt.
- Check that the movement of the machine matches the display on the control pattern card. If it does not match, replace it immediately with the correct control pattern card.
- Check the operation of the 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

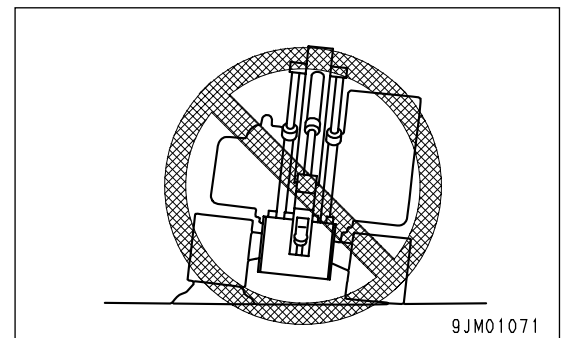
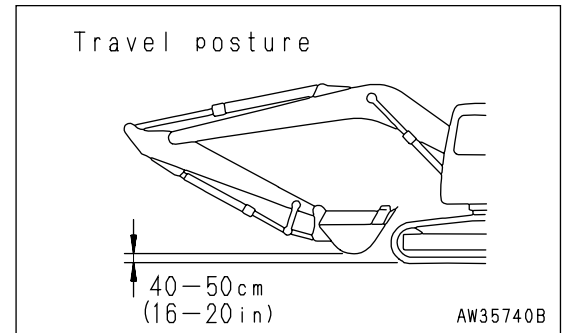
- Position the upper structure so that the sprocket is at the rear of the operator's cab before traveling.  
If the sprocket is at the front of the operator's cab, the direction of operations is reversed (for example, forward becomes reverse, and left becomes right).
- Before travelling, check again 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.
- Check that the travel alarm (if equipped) works properly.
- 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

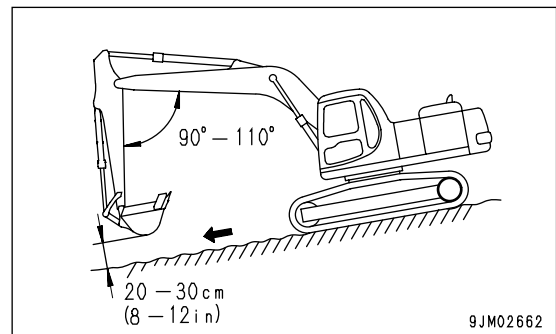
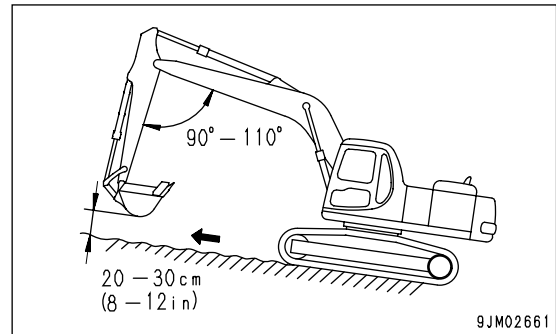
- It is dangerous to drive too fast, or to start suddenly, stop suddenly, or to turn sharply.
- When traveling on level ground, pull in the work equipment and keep it at a height of 40 to 50cm (16 to 20 in) from the ground.
- When traveling on rough ground, travel at low speed and do not operate the 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.
- Always turn the swift deceleration switch OFF when driving machines equipped with the swift deceleration function on rough ground or steep slopes. If the machine is operated with the switch 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.



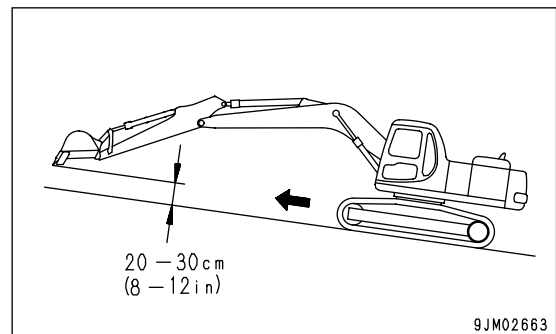
## Traveling on Slopes

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

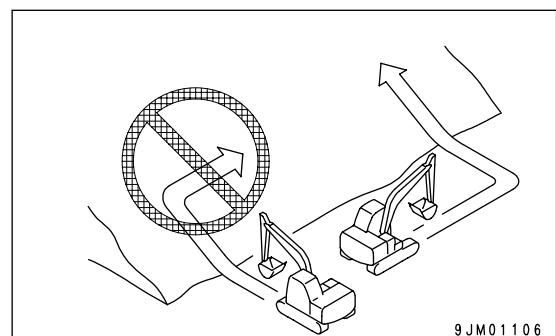
- When traveling on slopes, keep the work equipment approximately 20 to 30cm (8 to 12 in) above the ground. In case of emergency, quickly lower the work equipment to the ground immediately to help stop the machine.
- When travel up slopes, set the operator's cab facing uphill, when travel down slopes, 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.

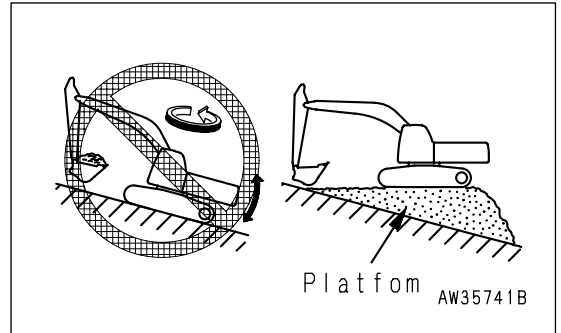


- Always travel straight up or down a slope. Traveling at an angle or across the slope is extremely dangerous.
- Do not turn on slopes or travel across slopes. Always go down to a flat place to change the position of the machine, then travel on to the slope again.
- Travel on grass, fallen leaves, or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



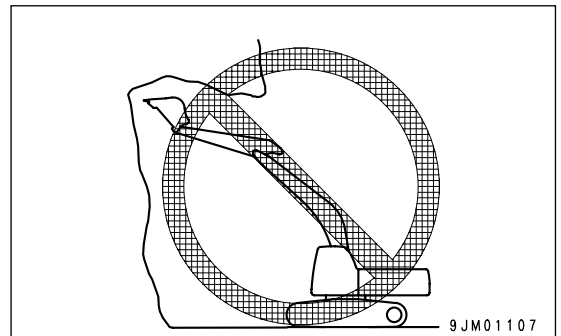
### Operations on Slopes

- 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.

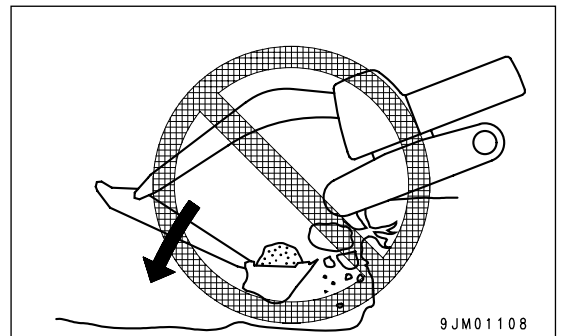


### Prohibited Operations

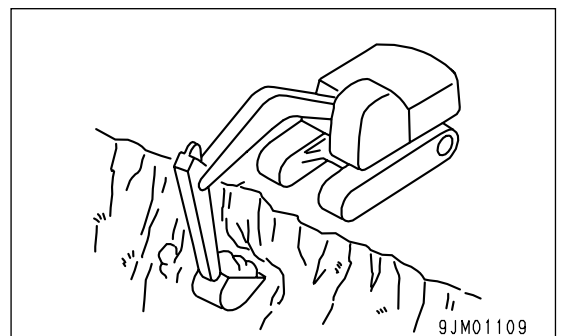
- Never dig the work face under an overhang. There is a hazard that rocks may fall or that the overhang may collapse and fall on top of the machine.



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

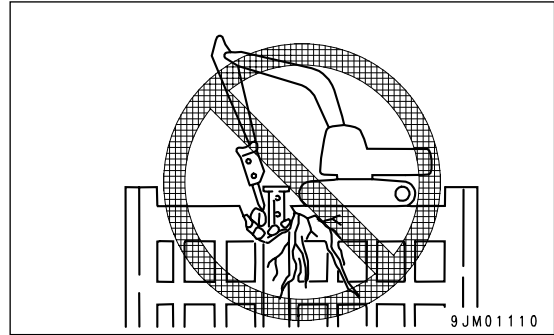


- To make it easier to escape if there is any problem, set the tracks at right angles to the road shoulder or cliff with the sprocket at the rear when carrying out digging operations.

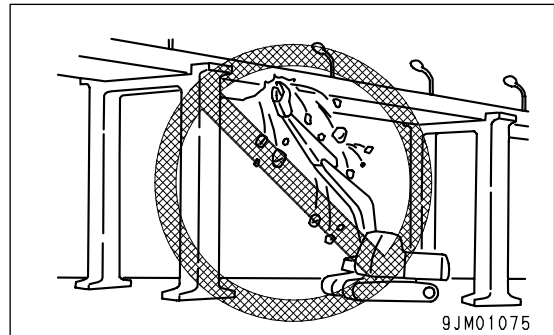




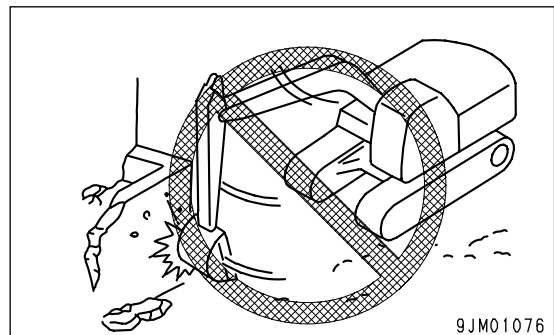
- Do not carry out demolition work under the machine. There is a hazard that the machine may become unstable and tip over.
- When working on or from the top of buildings or other structures, check the strength and the structure before starting operations. There is a hazard of the building collapsing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

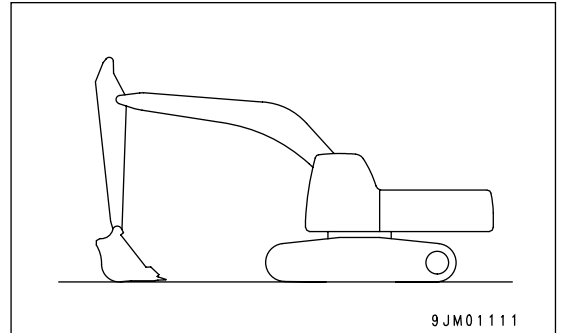
## Operations on Snow

- 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.

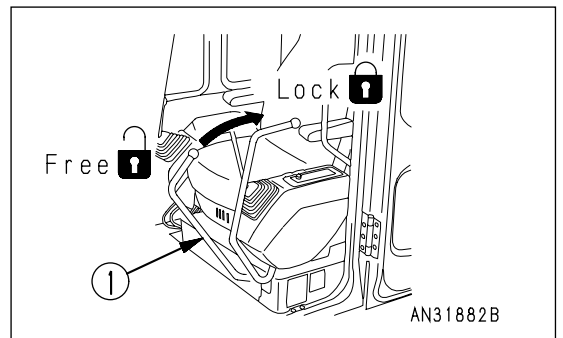
- When clearing snow, the road shoulder and objects placed beside the road are buried in the snow and cannot be seen. There is a hazard of the machine tipping over or hitting covered objects, so always carry out operations carefully.

**Parking Machine**

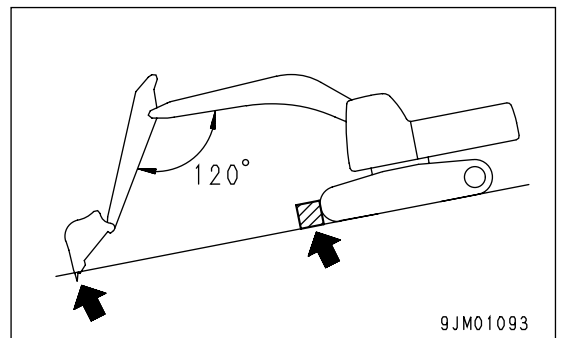
- Park the machine on firm, level ground.
- Select a place where there is no hazard of falling rocks or landslides, or of flooding if the land is low.
- Lower the work equipment completely to the ground.



- 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.

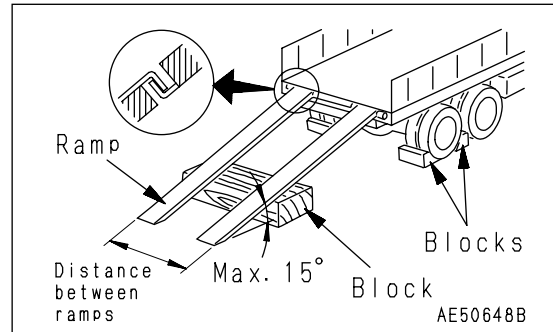


## TRANSPORTATION

### 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.
- Always turn the swift deceleration switch OFF when driving machines equipped with the swift deceleration function on rough ground or steep slopes. If the machine is operated with the switch ON, the engine speed may rise, the machine may suddenly start off, or the travel speed may increase.
- Run the engine at low idling, set to low speed, and operate the machine slowly when loading or unloading.
- 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 change suddenly at the joint between the ramps and the track or trailer, and there is danger of the machine losing its balance. Travel slowly over this point.
- When loading or unloading to an embankment or platform, make sure that it has suitable width, strength, and grade.
- 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.
- After loading, block the machine tracks and secure the machine with tie-downs.



## 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 3-84) in the OPERATION section.

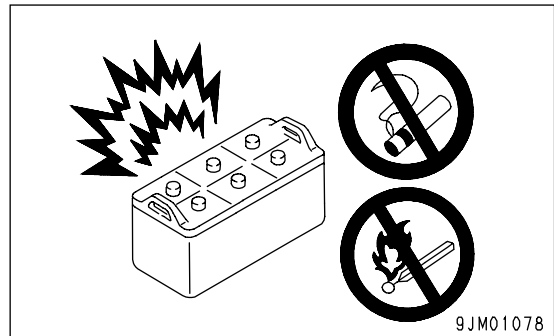
## BATTERY

### Battery Hazard Prevention

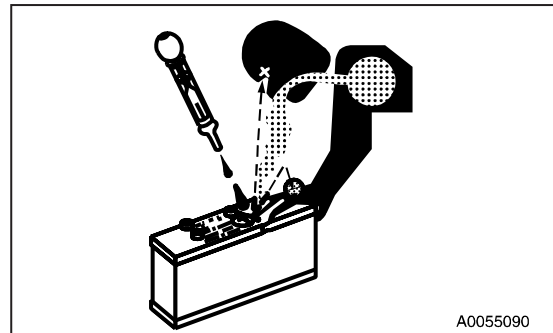
Battery electrolyte contains sulphuric acid, and batteries generate flammable hydrogen gas, which may explode.

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.

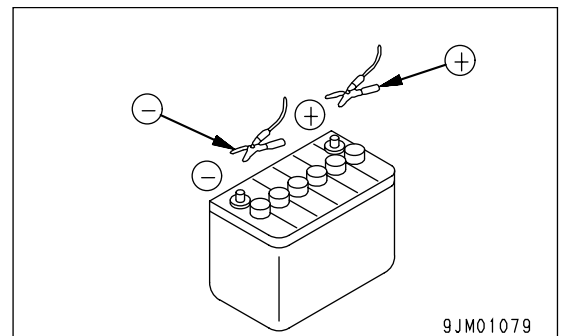
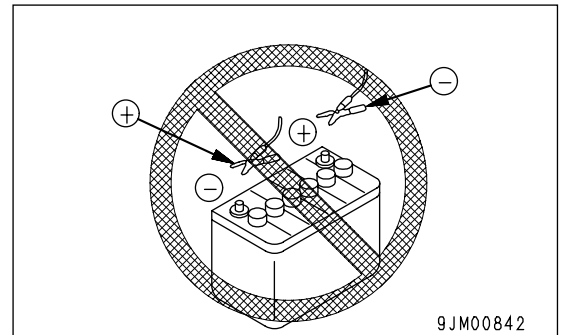
As there is a hazard that sparks will be generated, always do as follows.

- 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 3-104) in the OPERATION section.



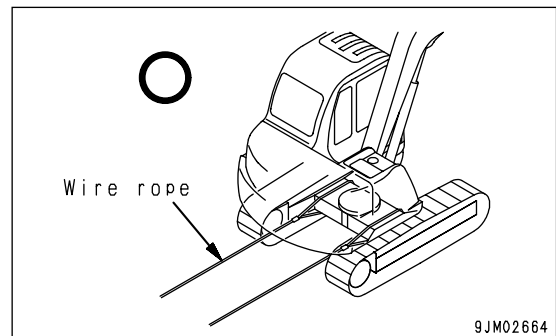
## TOWING

### Safety Rules for Towing

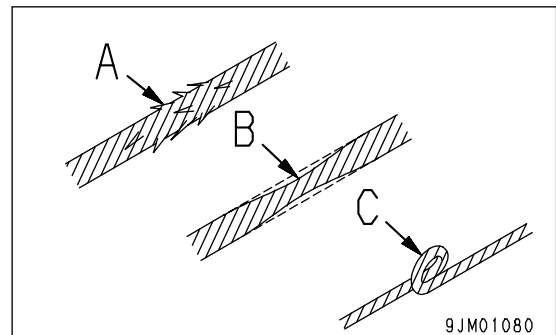
Serious injury or death could result if a disabled machine is towed incorrectly or if there is a mistake in the selection or inspection of the wire rope.

When towing, always use the method given in TOWING THE MACHINE (PAGE 3-101) 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.



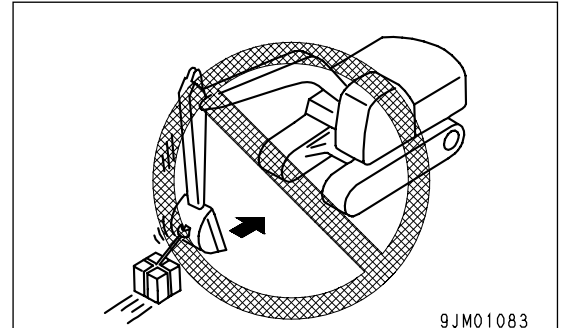
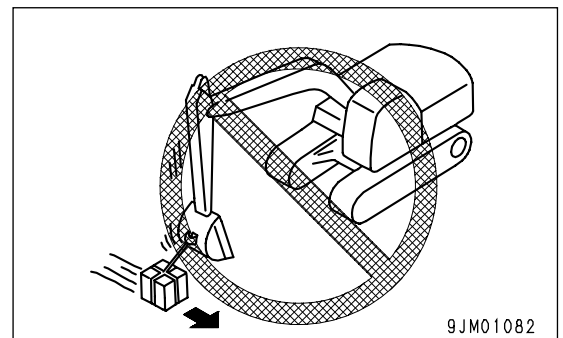
- Never use a wire rope which has cut strands (A), reduced diameter (B), or kinks (C). There is danger that the rope may break during the towing operation.



## 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 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.

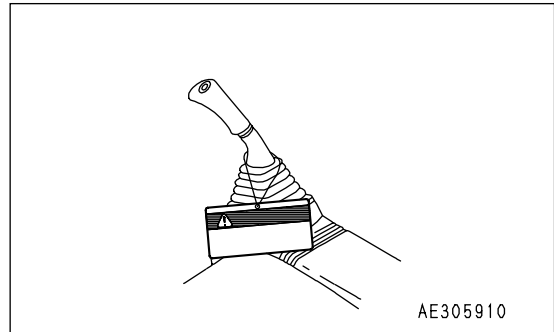




# SAFETY MAINTENANCE INFORMATION

## 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. 09963-03000  
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

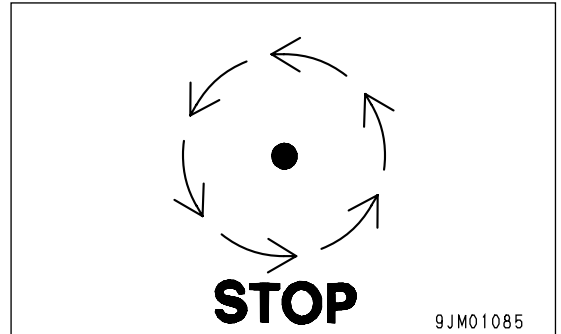
- Do not leave hammers or other tools lying around in the work place. Wipe up all grease, oil, or other substances that will cause you to slip. Always keep the work place clean and tidy to enable you to carry out operations safely.  
If the work place is not kept clean and tidy, there is the danger that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

## Appoint Leader when Working with Others

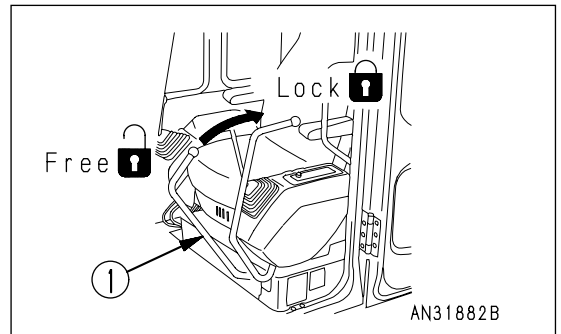
- When repairing the machine or when removing and installing the work equipment, appoint a leader and follow his instructions during the operation.  
When working with others, misunderstandings between workers can lead to serious accidents.

## Stop Engine Before Carrying Out Maintenance

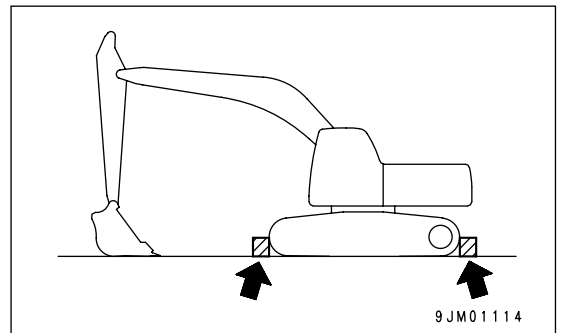
- Stop the machine on firm, level ground.
- Select a place where there is no danger of falling rocks, landslides, or flooding.
- Lower the work equipment completely to the ground and stop the engine.



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



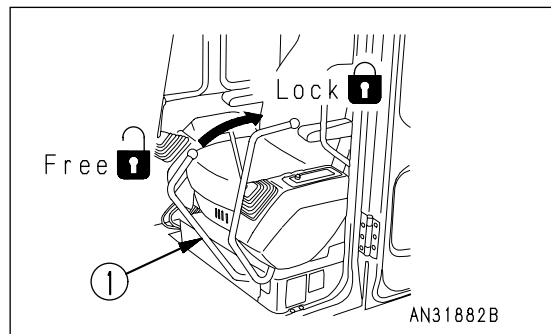
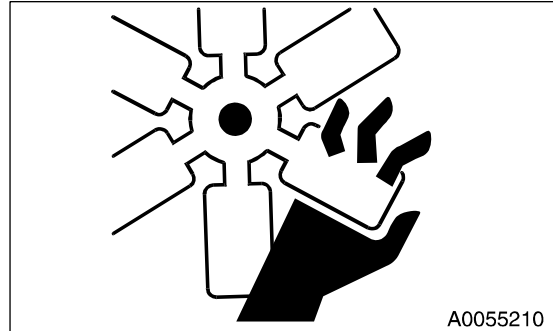
- Put blocks under the track to prevent the machine from moving.



## Two Workers for Maintenance when Engine is Running

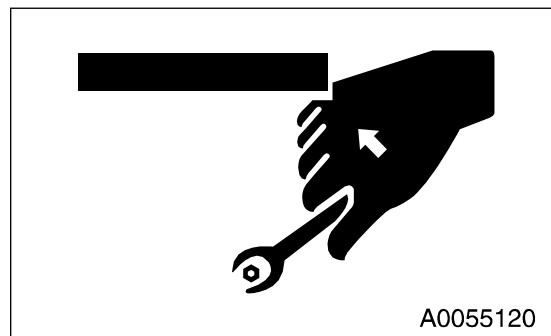
To prevent injury, do not carry out maintenance with the engine running. If maintenance must be carried out with the engine running, carry out the operation with at least two workers and do as follows.

- One worker must always sit in the operator's seat and be ready to stop the engine at any time. All workers must maintain contact with the other workers.
- Set safety lock lever (1) to the LOCK position.
- When carrying out operations near the fan, fan belt, or other rotating parts, there is a hazard of being caught in the parts, so be 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.

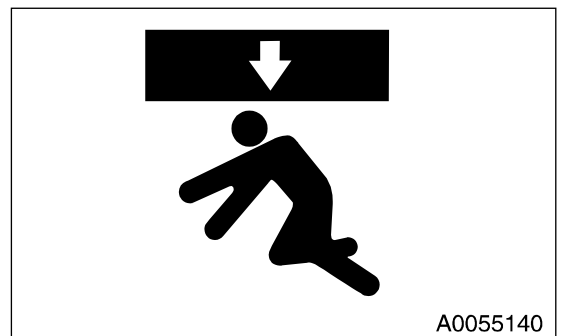
## Attachments

- 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 hydraulic line, 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

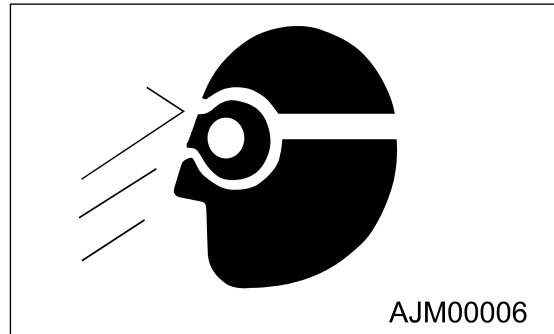
If the noise from the machine is too loud, it may cause temporary or permanent hearing problems.

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.

- 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

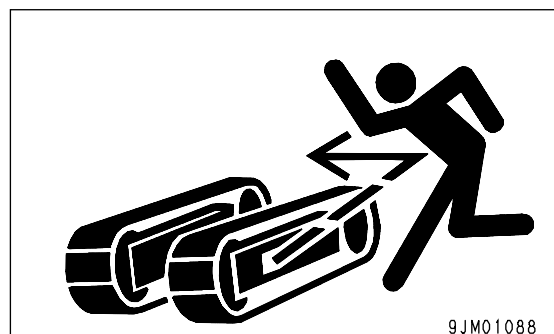
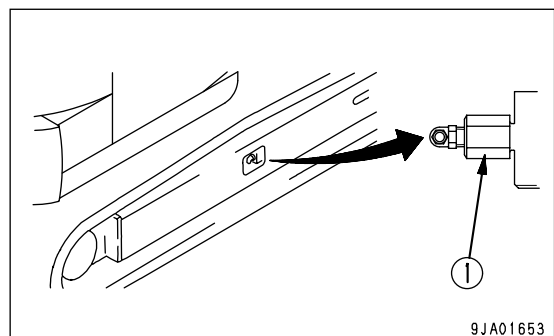
Welding operations must always be carried out by a qualified welder and in a place equipped with a proper equipment. There is a hazard of fire or electrocution when carrying out welding, so never allow any unqualified personnel to carry out welding.

## 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).



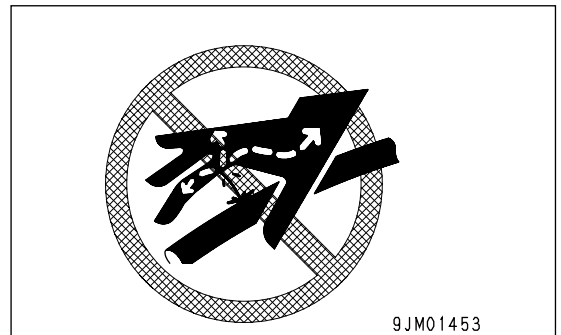
## Do Not Disassemble Recoil Springs

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.

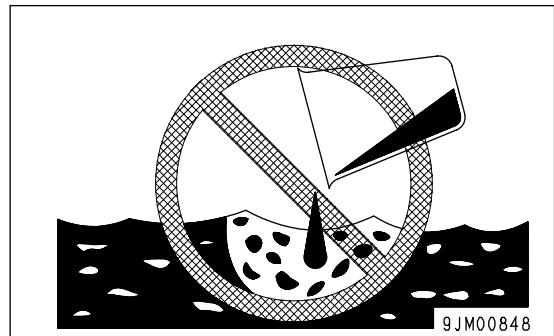
Replace the hose if any of the following problems are found.

- 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 4-15)".
- 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**

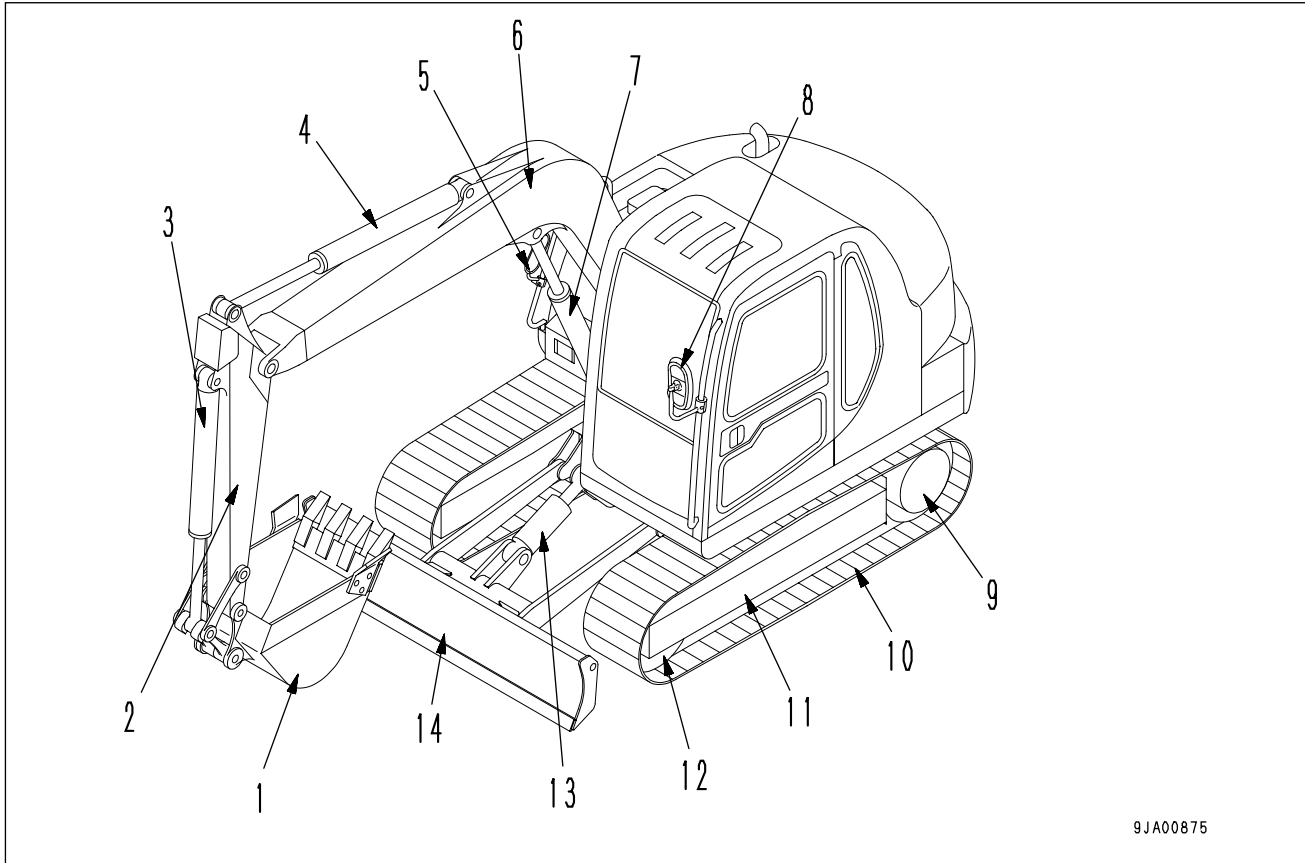
Please read and make sure that you understand the safety volume before reading this section.

---



# MACHINE VIEW ILLUSTRATIONS

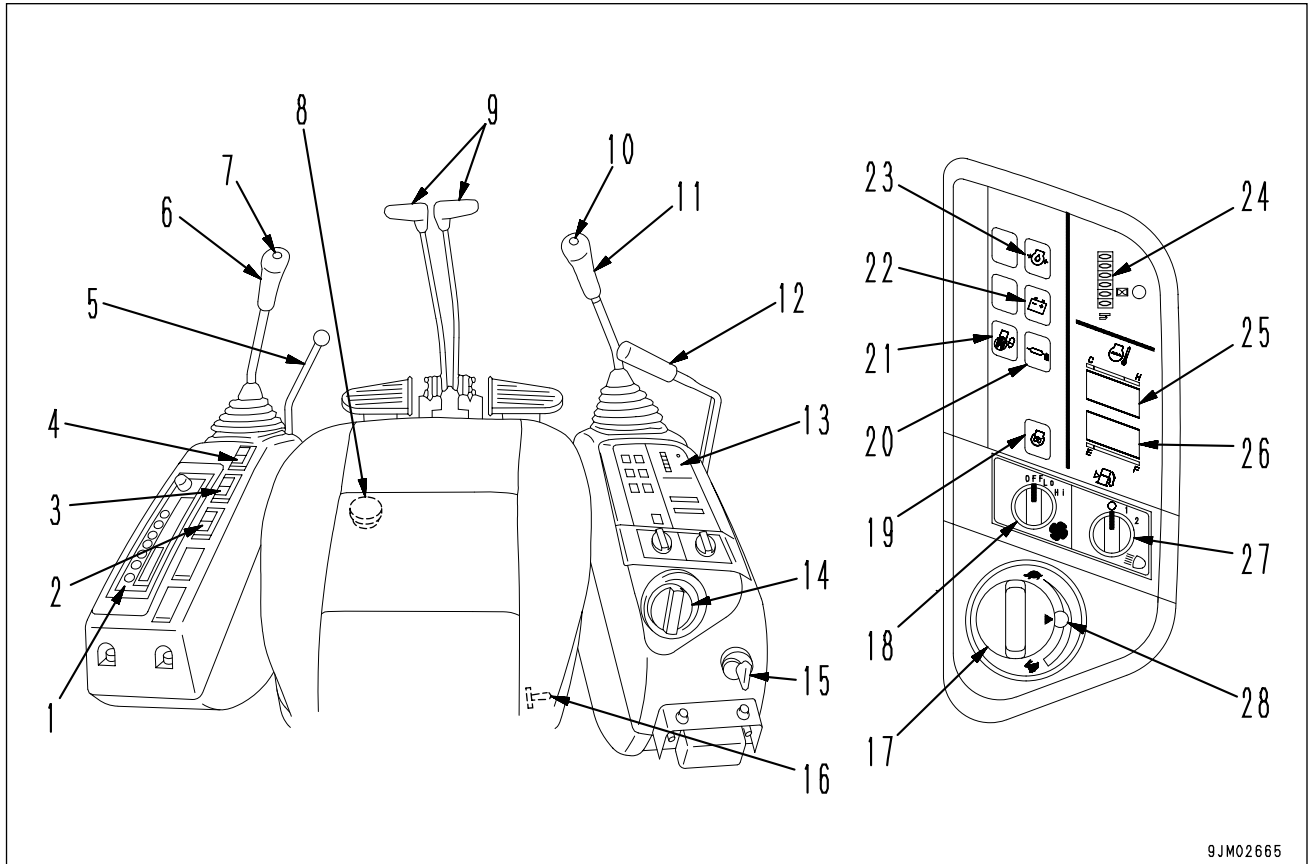
## OVERALL MACHINE VIEW



9JA00875

- |                      |                     |
|----------------------|---------------------|
| (1) Bucket           | (9) Sprocket        |
| (2) Arm              | (10) Track shoe     |
| (3) Bucket cylinder  | (11) Track frame    |
| (4) Arm cylinder     | (12) Idler          |
| (5) Rear view mirror | (13) Blade cylinder |
| (6) Boom             | (14) Front blade    |
| (7) Boom cylinder    |                     |
| (8) Rear view mirror |                     |
- (Only machines with blade specification)
- (Only machines with blade specification)

# CONTROLS AND GAUGES



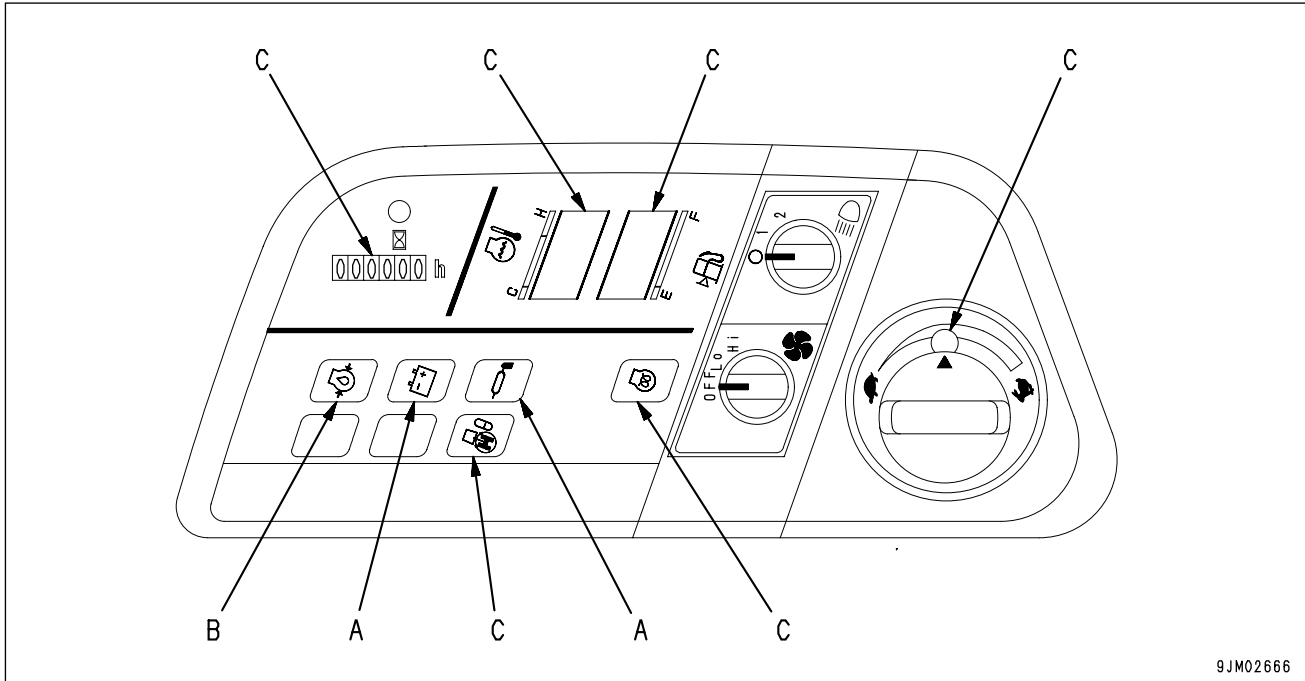
- |   |  |
|---|--|
| (1) Car radio(If equipped)  | (14) Fuel control dial                       |
| (2) Wiper switch  | (15) Starting switch                         |
| (3) Swing lock switch   | (16) Swing brake cancel switch               |
| (4) Travel speed switch<br>(except machines with blade specification)       | (17) Fuel control dial                       |
| (5) Safety lock levers  | (18) Heater switch(If equipped)              |
| (6) Left work equipment control lever                                       | (19) Preheating monitor                      |
| (7) Swift deceleration switch   | (20) Automatic greasing monitor(If equipped) |
| (8) Traveling accelerator pedal<br>(only machines with blade specification) | (21) Swing lock monitor                      |
| (9) Travel levers   | (22) Charge monitor                          |
| (10) Horn switch  | (23) Engine oil pressure monitor             |
| (11) Right work equipment control lever                                     | (24) Service meter                           |
| (12) Blade control lever<br>(only machines with blade specification)        | (25) Engine coolant temperature gauge        |
| (13) Monitor panel  | (26) Fuel gauge                              |
|   | (27) Lamp switch                             |
|   | (28) Swift deceleration pilot lamp           |

# DETAILED CONTROLS AND GAUGES

The following is an explanation of the devices needed for operating the machine.

To carry out suitable operations correctly and safely, it is important to understand fully the methods of operating the equipment and the meanings of the displays.

## MONITORING SYSTEM



9JM02666

A:Caution Items

C:Meter Display Portion

B:Emergency Stop Items

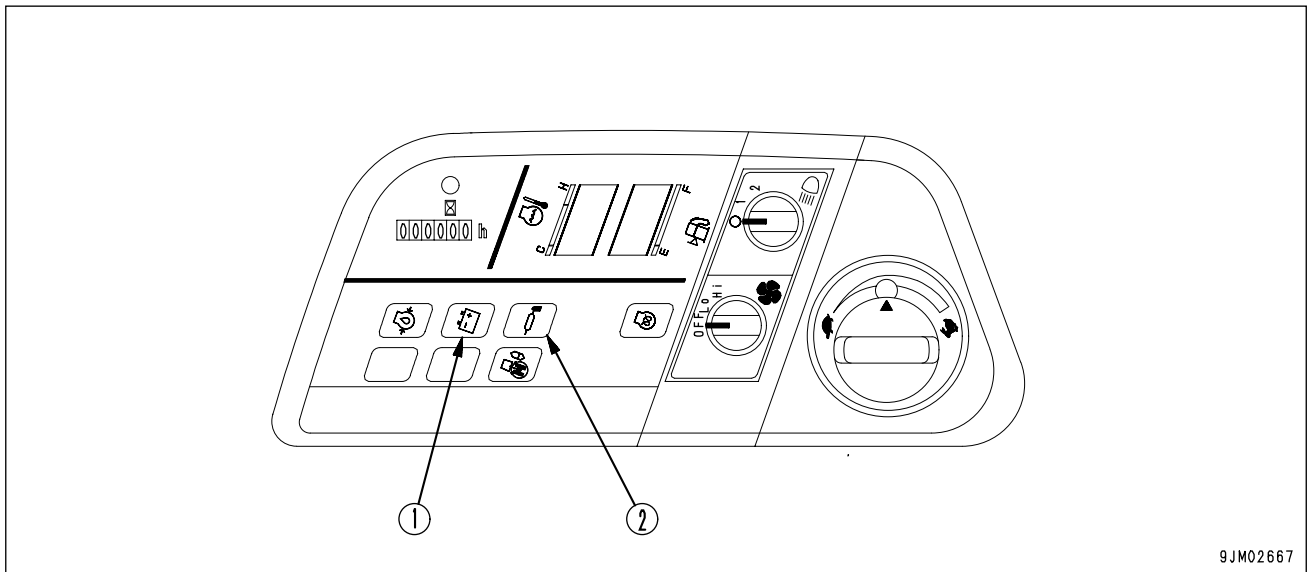
### Caution Monitors

## ⚠ CAUTION

If the warning monitor flashes or lights up, carry out inspection and maintenance of the appropriate point as soon as possible.

If the problem is not corrected, it may lead to failure of the machine.

These are items which need to be observed when the engine is running. If any abnormality occurs, the item needing immediate repair is displayed. If there is any abnormality, the abnormal location on the monitor will flash or light up.



(1)Charge Level Monitor

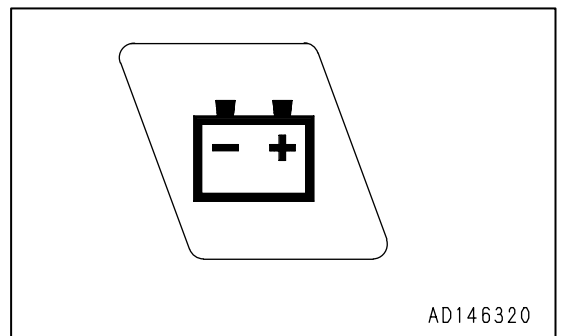
(2)Automatic Greasing System Monitor(If equipped)

### 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 3-106)".

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



AD146320

### REMARK

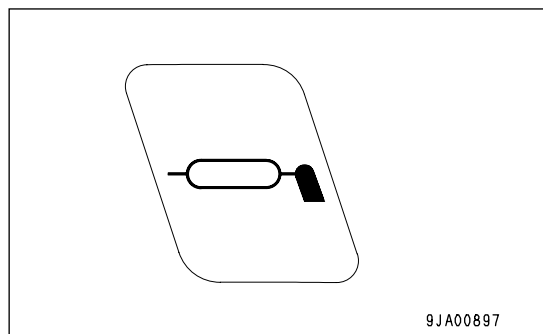
- While the starting switch is ON, the lamp will remain lit and will go off once the engine is started.
- When the engine is started or stopped with the starting switch at the ON position, the lamp may light up and the buzzer may sound momentarily, but this does not indicate any abnormality.

**Automatic Greasing System Monitor**

(If equipped)

This monitor (2) lights up if the automatic greasing system is not working normally.

If it lights up, see "OTHER TROUBLE (PAGE 3-106)".

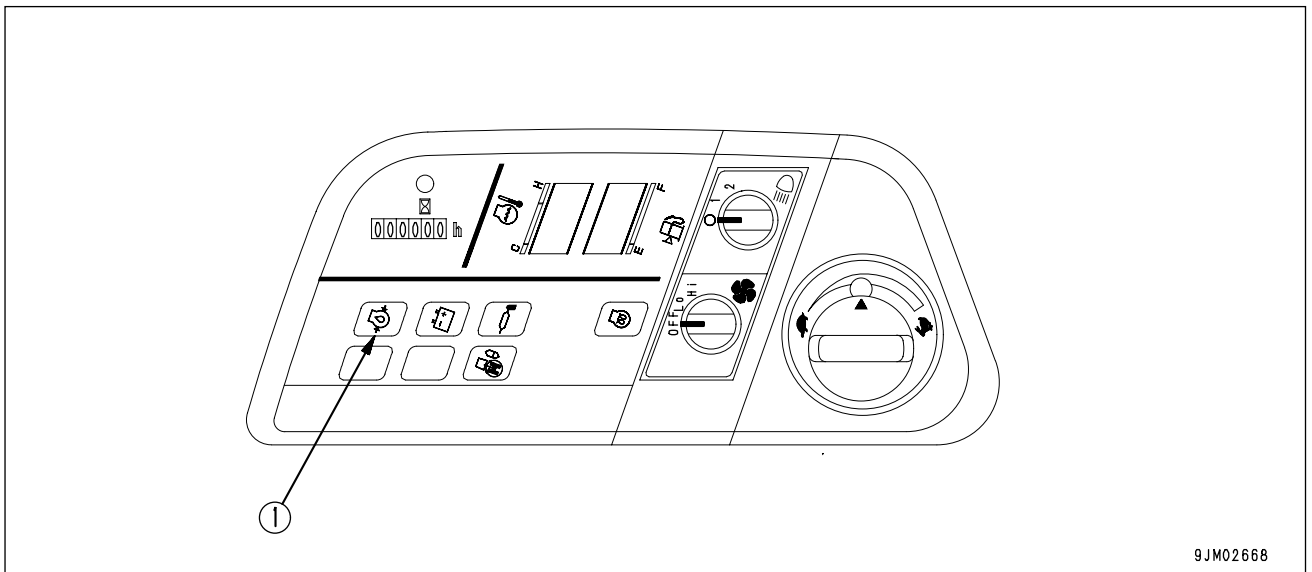


## Emergency Monitors

**⚠ 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 which need to be observed when the engine is running. If there is any abnormality, the abnormal location on the monitor will flash and the buzzer will sound. Carry out the necessary repairs immediately.



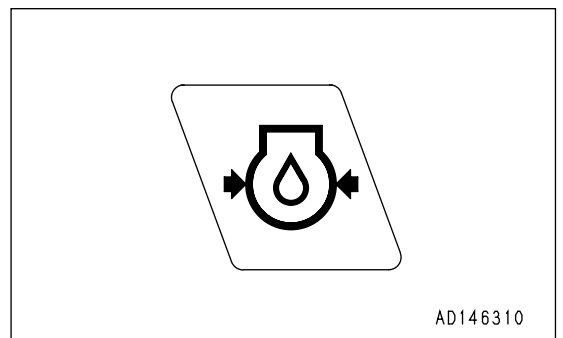
(1)Engine Oil Pressure Monitor

### Engine Oil Pressure Monitor

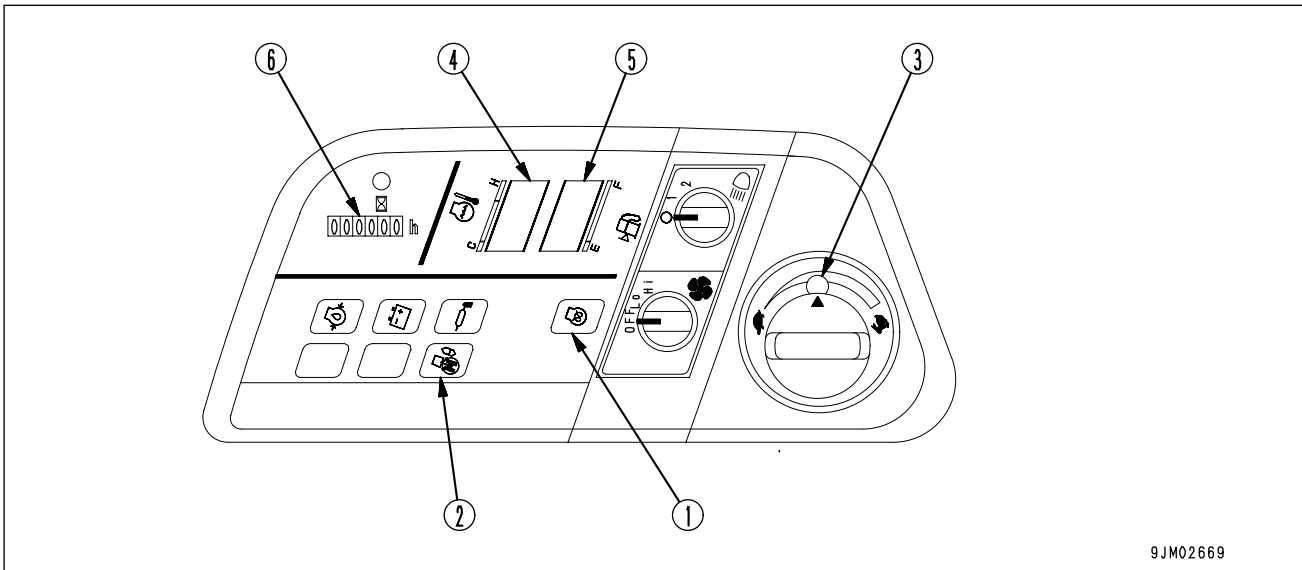
This monitor (1) flashes if the engine lubricating oil pressure goes below the specified level. If it flashes, stop the engine and inspect it according to "OTHER TROUBLE (PAGE 3-106)".

**REMARK**

While the starting switch is ON, the lamp remains lit and goes off once the engine is started. When the engine starts, the buzzer may sound for a short time, however, this does not indicate a fault.



### Gauges and Meter



9JM02669

#### Pilot Display

- (1) Engine Pre-heating Monitor
- (2) Swing Lock Monitor
- (3) Swift Deceleration Display Lamp

#### Gauges And Meter

- (4) Engine Coolant Temperature Gauge
- (5) Fuel Gauge
- (6) Service Meter

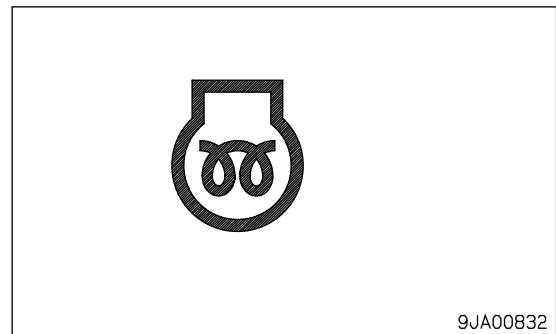
### Pilot Display

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

#### Engine Pre-heating Monitor

This monitor (1) lamp 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 flashes after about 30 seconds to show that the pre-heating is completed. (The monitor lamp will go off after about 10 seconds.)



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#### Swing Lock Monitor

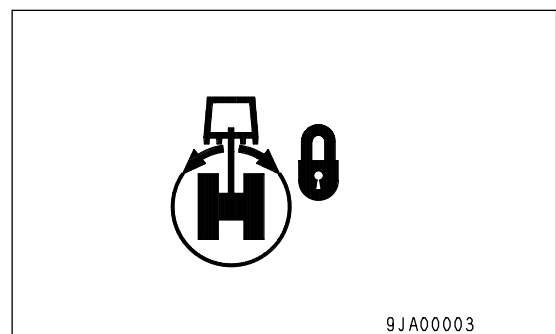
This monitor (2) informs the operator that the swing lock is being actuated.

Actuated: Lights up

When the swing lock switch is turned ON (ACTUATED), the monitor lamp lights up.

#### REMARK

The swing motor is equipped with a disc brake that mechanically stops the rotation. When the swing lock monitor lamp is lighted up, the brake remains applied.



9JA00003

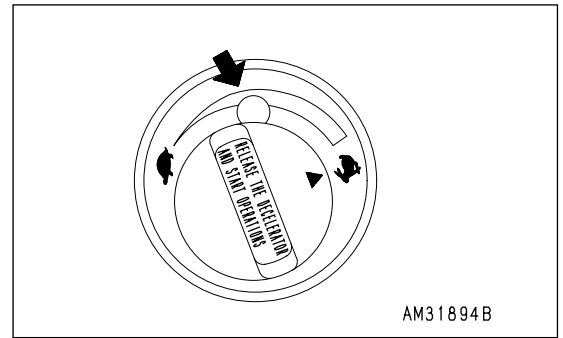
**Swift Deceleration Display Lamp**

This monitor (3) informs the operator that the swift deceleration function is being actuated.

Actuated: Lights up

Canceled: Goes out

When the swift deceleration switch is pressed, the swift deceleration display lamp lights up. When it is pressed again, the lamp goes out.



**REMARK**

When the swift deceleration display lamp is lighted up, the engine speed remains at low idling even if the fuel control dial is operated.

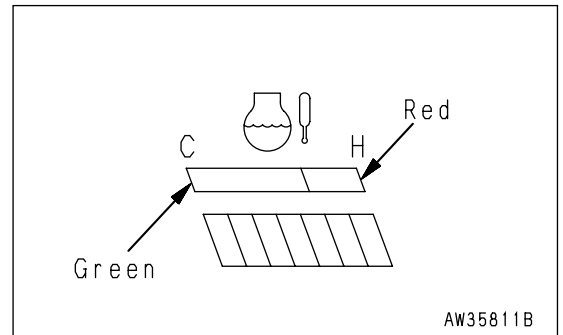
**Gauges and Meter**

**Engine Coolant Temperature Gauge**

This displays (4) the engine cooling water temperature. During normal operation, the lamp should light up in the green range.

If the lamp in the red range lights up during operation, run the engine at low idling and wait for the temperature to go down to the green range.

After starting the engine, warm up it until the green range lights up.

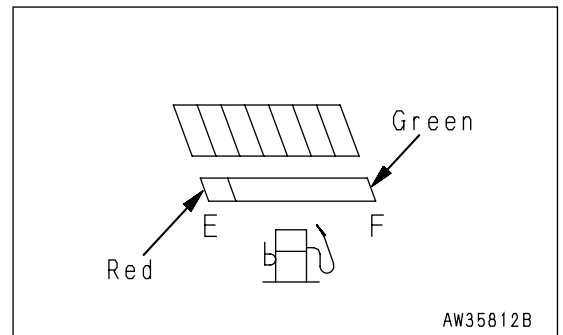


**Fuel Gauge**

This shows the fuel level in the fuel tank. During normal operation, the lamp should light up in the green range.

If the lamp in the red range flashes during operation, there is less than 13 liters (3.43 US gal) of fuel remaining, so check and add fuel.

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

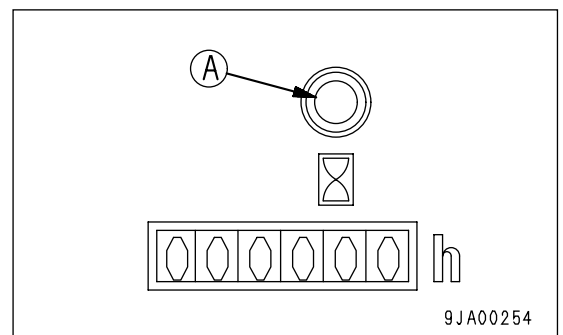


**Service Meter**

This meter (6) 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.

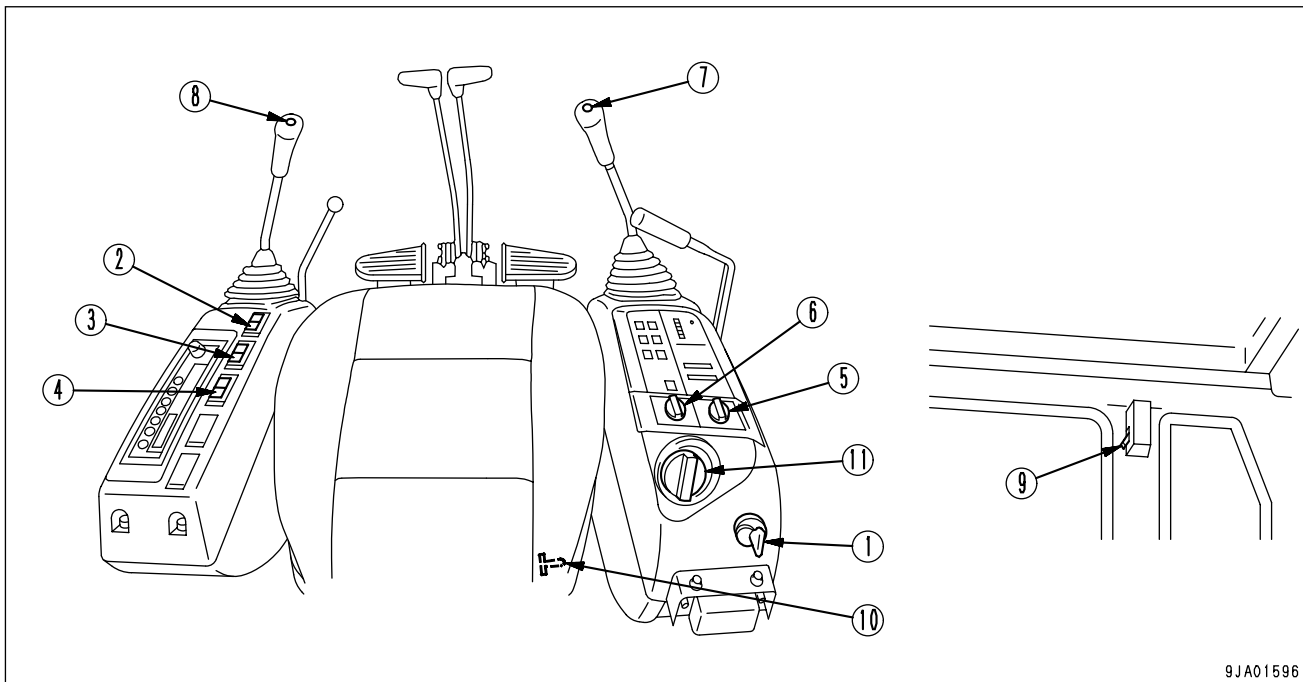
While the engine is running, operation display (A) at the top inside of the meter will light to show that the meter is advancing.

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





# SWITCHES



9JA01596

- |  |                                |
|--|--------------------------------|
| (1) Starting Switch  | (6) Cab Heater Switch          |
| (2) Travel Speed Selector Switch<br>(except machines with blade specification) | (7) Horn Switch                |
| (3) Swing Lock Switch  | (8) Swift Deceleration Switch  |
| (4) Windshield Wiper Switch  | (9) Room Lamp Switch           |
| (5) Lamp Switch  | (10) Swing Brake Cancel Switch |
|  | (11) Fuel Control Dial         |

## Starting Switch

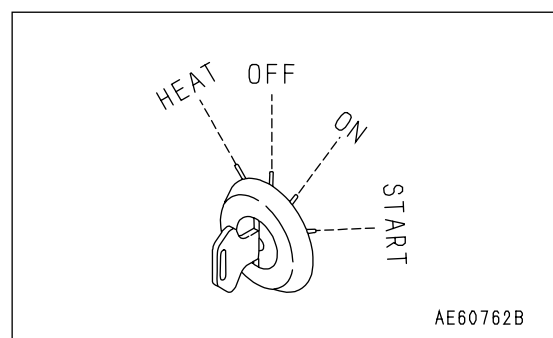
This switch (1) is used to start or stop the engine.

### 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.



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### 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

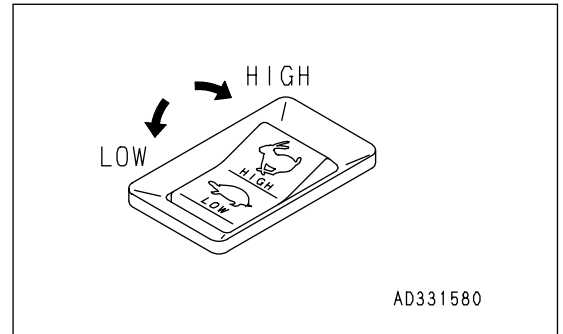
When starting the engine in winter, set the key to this position. When the key is set to the HEAT position, the pre-heating monitor lights up. Keep the key at this position until the monitor lamp flashes. Immediately after the pre-heating monitor flashes, release the key. The key automatically returns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

### Travel Speed Selector Switch

This is used (2) to select high or low travel speed.

LOW position: Low speed travel

HIGH position: High speed travel



### Swing Lock Switch

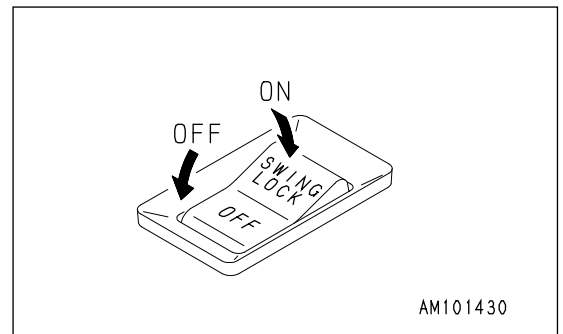
**⚠ WARNING**

- When traveling or when not using the swing operation, apply the swing lock.
- On slopes, even when the swing lock switch is at the ON position, the weight of the work equipment may cause the upper structure to swing if the swing control lever is operated in the downhill direction.

This switch (3) is used to lock the upper structure so that it cannot swing.

ON position (actuated): The swing lock is always applied, and the upper structure will not swing even if the swing is operated. In this condition, the swing lock lamp lights up.

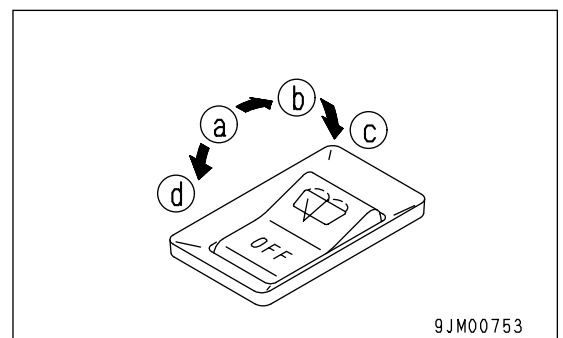
OFF position (canceled): The swing lock is applied only when the swing control lever is at neutral; when the swing control lever is operated, it is canceled. The swing lock is actuated approx. 4 seconds after the swing lever is placed in neutral.



### Windshield Wiper Switch

This switch (4) actuates the front window wiper.

- (a) OFF: The wiper stops.
- (b) ON: The wiper moves continuously.
- (c) Window washer fluid is sprayed out: When the switch is released, it returns to (b).
- (d) Window washer fluid is sprayed out: When the switch is released, it returns to (a).



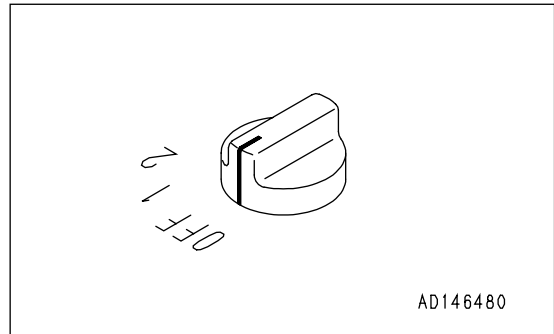
### Lamp Switch

This lights (5) up the head lamps and the panel lamp.

Position 1: Panel lamp lights up.

Position 2: Head lamps, panel lamp and working lamp light up.

Position OFF: Lamps go off.



### Cab Heater Switch

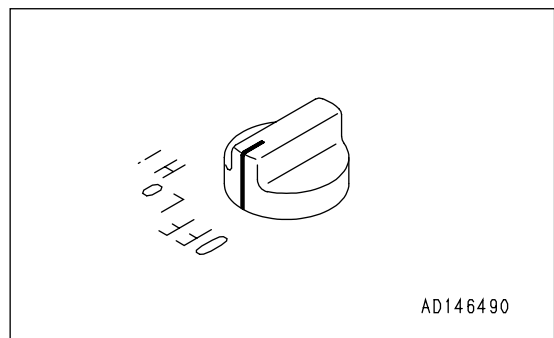
(If equipped)

This switch (6) is used to heat the operator's compartment. The flow rate of the hot air can be set to two levels.

Hi position: Strong

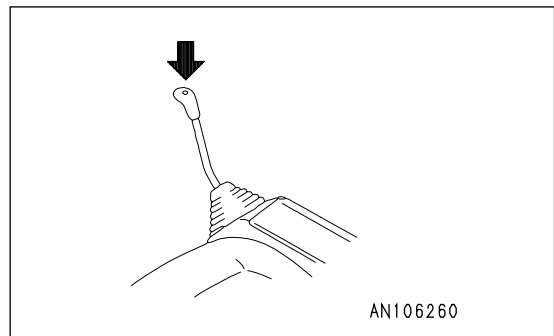
Lo position: Weak

The cab is heated by hot water from the engine, so if the engine cooling water temperature is low, the cab will not heat up.



### Horn Switch

When the button (7) at the tip of the right work equipment control lever is pressed, the horn will sound.



## Swift Deceleration Switch

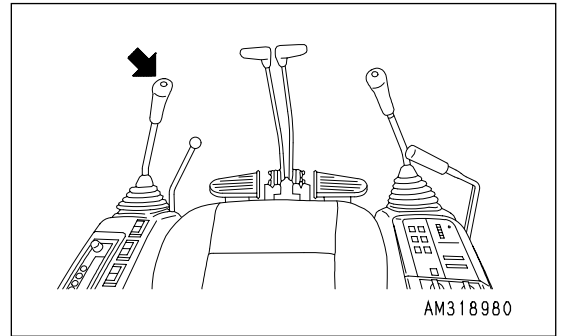
**⚠ WARNING**

Always return the work equipment and travel levers to the neutral position before operating the swift deceleration switch. If the switch is operated when any lever is being operated, the engine torque will suddenly change.

This switch (8) is used to activate the system to lower the engine speed and reduce the fuel consumption when the engine output is not required, such as when the travel levers and left and right work equipment control levers are at the neutral position.

When the swift deceleration switch in the center of the knob of the left work equipment control lever is pressed, the swift deceleration pilot lamp lights up and the engine speed goes down to low idling.

When the swift deceleration switch is pressed again, the deceleration pilot lamp goes out, and the engine speed returns to the speed set by the fuel control dial.



**REMARK**

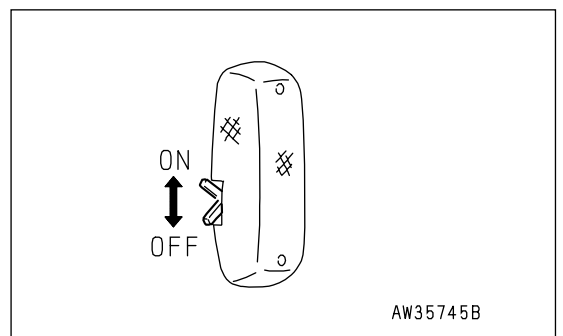
- When the fuel control lever is at the low idling position, the engine speed will not go down any lower even if this switch is pressed.
- If the engine speed does not rise, it is possible that this switch is ON. Look at the swift deceleration pilot lamp to check the condition of the switch.
- If the starting switch is turned OFF when the swift deceleration switch is ON, the deceleration function is canceled.

## Room Lamp Switch

This lights (9) up the cab lamp.

ON position: Lights up

OFF position: Lights go off

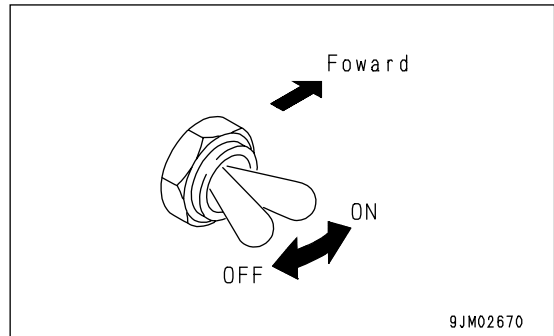


### Swing Brake Cancel Switch

This switch (10) is used to cancel the swing holding brake when the swing holding brake is applied.

OFF position: Automatic

ON position: Cancel



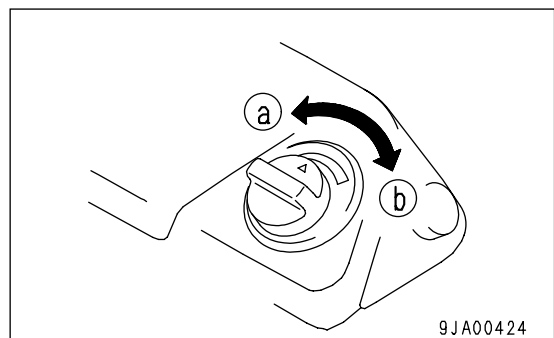
### Fuel Control Dial

This dial (11) is used to control the engine speed and output.

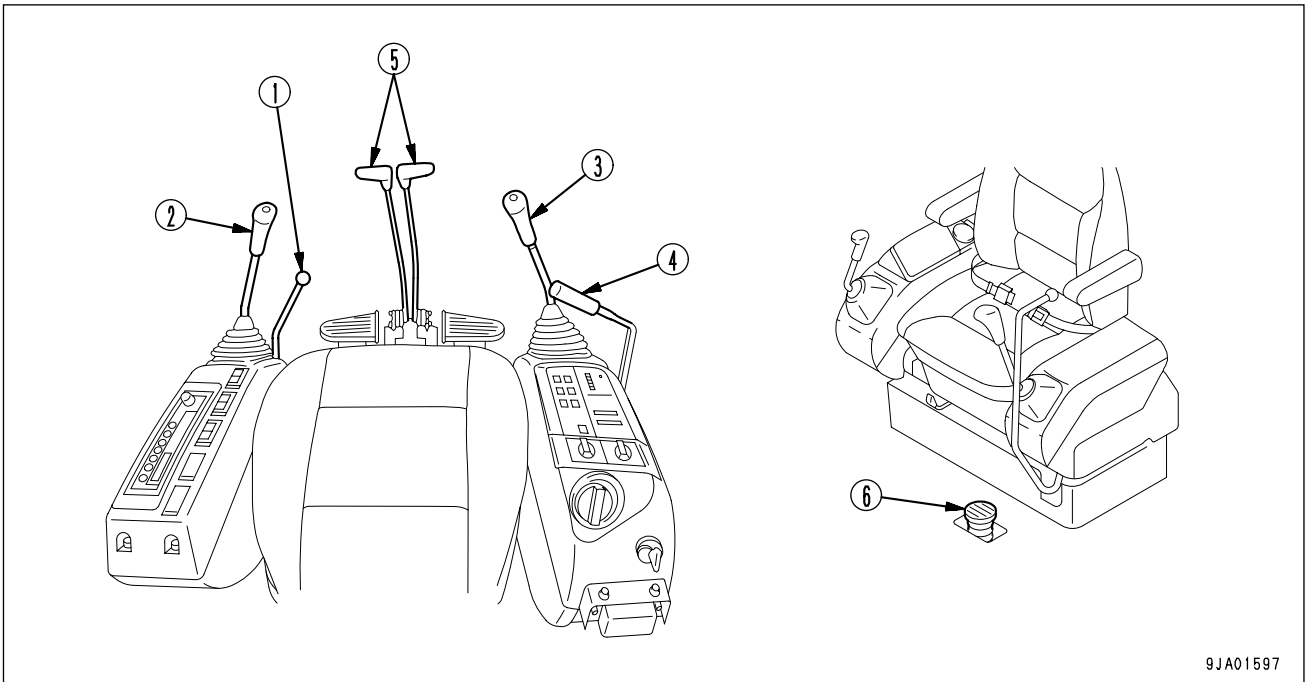
- (a) Low idling position: The dial is turned to the left (counter-clockwise)
- (b) High idling position: The dial is turned to the right (clockwise)

**REMARK**

When the swift deceleration display lamp is lighted up, the engine speed will remain at low idling even if the dial is operated. To restore the engine speed, press the swift deceleration switch on the left control lever to cancel the deceleration function.



## CONTROL LEVERS AND PEDALS



9JA01597

- |   |   |
|---|---|
| (1) Safety Lock Lever   | (5) Travel Levers (Machines with travel pedal)<br>(if equipped)             |
| (2) Left Work Equipment Control Lever                               |   |
| (3) Right Work Equipment Control Lever                              |   |
| (4) Blade Control Lever<br>(Only machines with blade specification) | (6) Traveling Accelerator Pedal<br>(Only machines with blade specification) |

## Safety Lock Lever

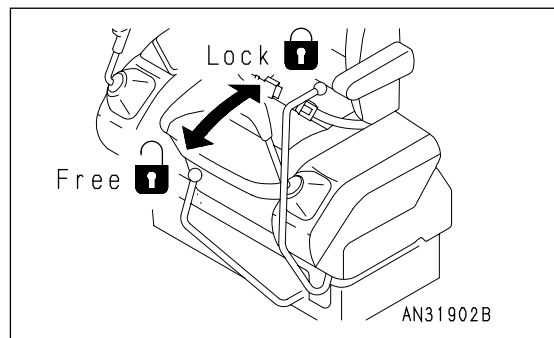
**⚠ WARNING**

- 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.
- 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.

Pull the lever up to apply the lock.

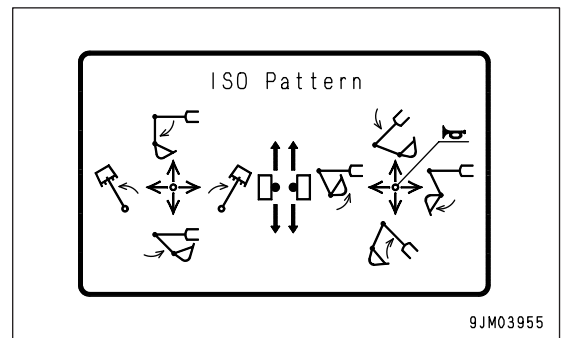
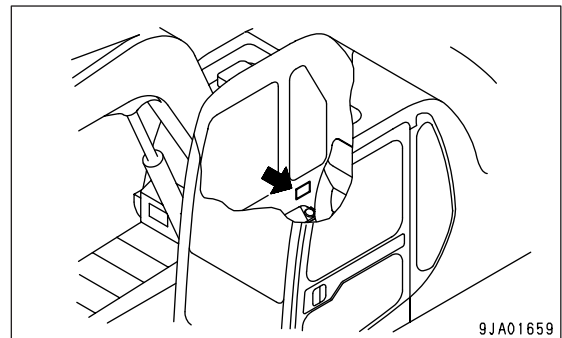
This lock lever is a hydraulic lock, so even if it is in the lock position, the work equipment control lever and travel lever will move, but the work equipment, travel motor, and swing motor will not work.



## Work Equipment Control Lever

**⚠ WARNING**

- The operating pattern is set to the standard operating pattern (ISO pattern).
- When changing the operating pattern, please contact your Komatsu distributor.
- The method of using operating patterns other than the ISO pattern is given in the ATTACHMENT AND OPTIONS section. Always read and understand the contents before operating the machine.
- When changing the operating pattern, change the operating plate at the same time to the operating plate that matches the movement of the machine. The place to attach the operating plate is on the right side of the operator's cab. careful not to touch the work equipment control lever.

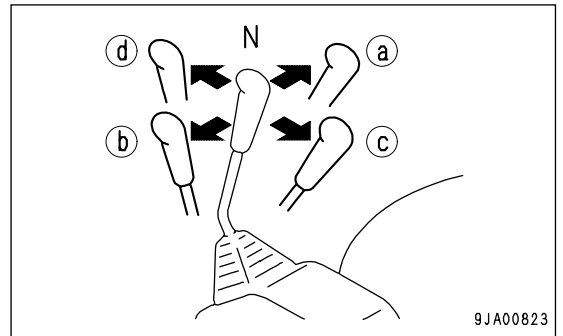


This Left work equipment control lever (2) is used to operate the arm and upper structure.

Arm operation Swing operation

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

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

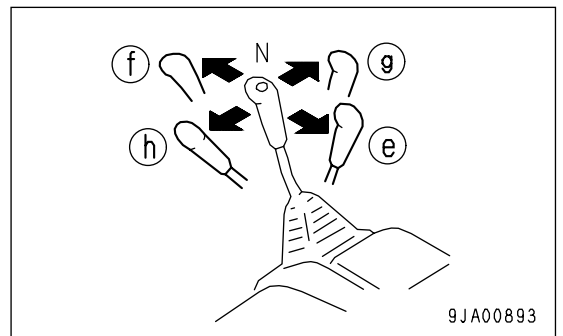


This Right work equipment control lever (3) is used to operate the arm and upper structure.

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.

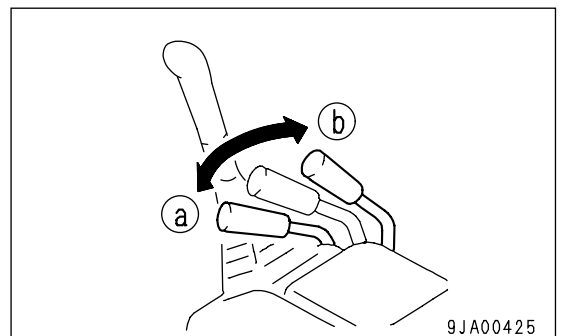


**Blade Control Lever**

(Only machines with blade specification)

This lever is(4) used to control the blade.

- (a) :LOWER
- (b) :RAISE





## Travel Levers

**⚠ WARNING**

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

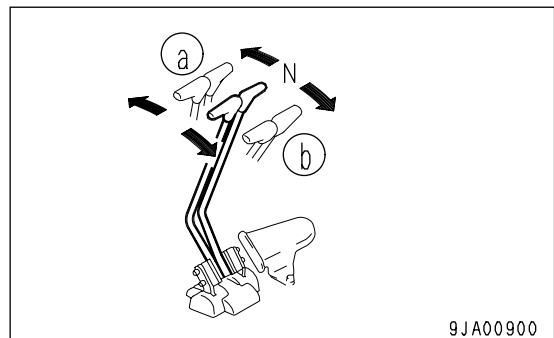
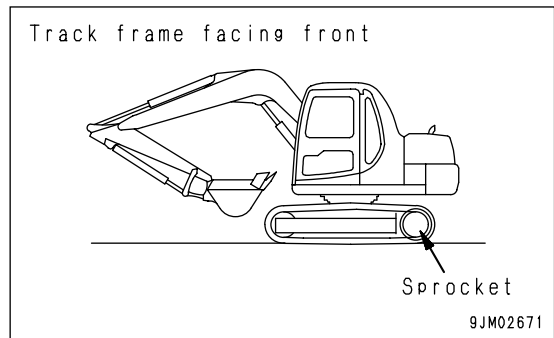
This lever (5) is used to select the direction of travel between forward and reverse.

- (a) FORWARD : Push the travel lever forward
- (b) REVERSE : Pull the travel lever back

N: The machine stops.

**REMARK**

Machines equipped with travel alarm (if equipped)  
If the lever is shifted from the neutral position, the alarm sounds to warn that the machine is starting to move.



### Machines with travel pedal

(If equipped)

#### WARNING

When the track frame is facing the rear, the direction of the travel operation is reversed.

Before operating the travel lever, check if the track frame is facing the front or the rear.  
(The track frame is facing the front if the sprocket is at the rear.)

(a) FORWARD: The lever is pushed forward (The lever is pushed forward)

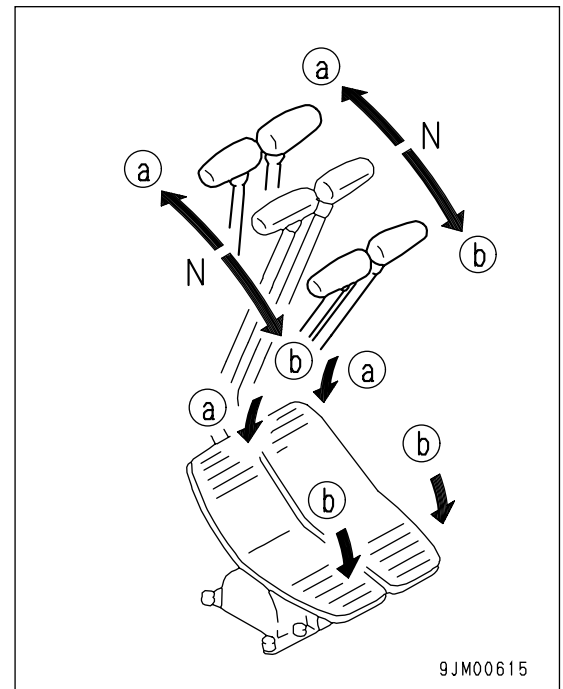
(b) REVERSE: The lever is pulled back (The lever is pulled back )

N (Neutral): The machine stops

( ): This indicates operation of the lever.

- Machines equipped with travel alarm

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



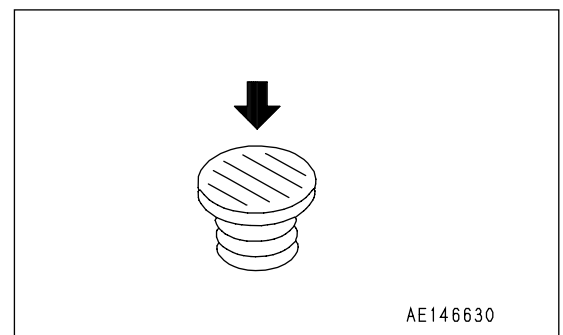
### Traveling Accelerator Pedal

(Only machines with blade specification)

If the pedal is (6) depressed, the machine speed will increase.

#### REMARK

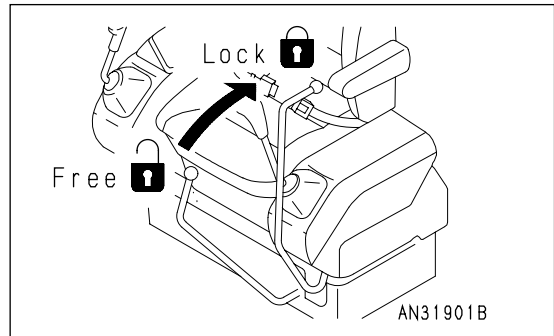
The travel speed selector switch is not available on the machines with blade specification.



# SUN ROOF

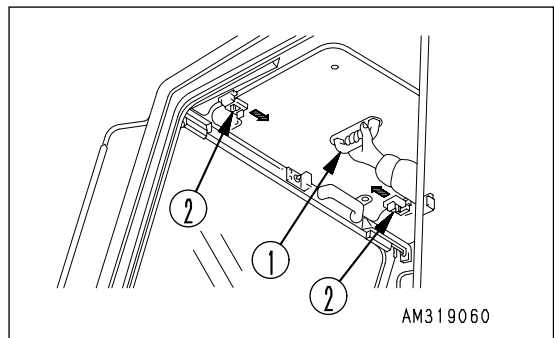
**⚠ WARNING**

When leaving the operator's compartment, set the safety lock lever securely to the LOCK position. If the safety lock lever is not locked and control levers are touched by accident, this may lead to a serious accident.



## Opening

1. Lock the safety lock lever securely.
2. Check for any ceiling window movement by pulling lock knob(2) located on front side, then push up and open the ceiling window with grip(1).



## Closing

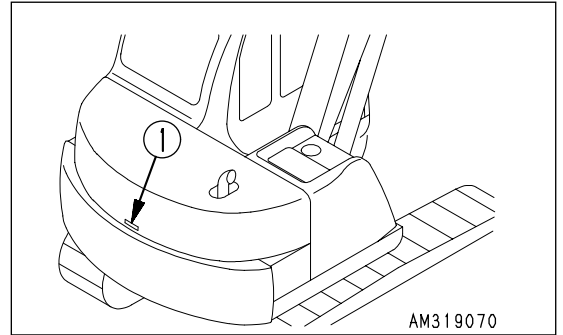
Hold grip (1), lower the ceiling window, and apply lock (2). If the lock cannot be applied, open the ceiling window, then pull it in again and apply the lock.

# ENGINE HOOD

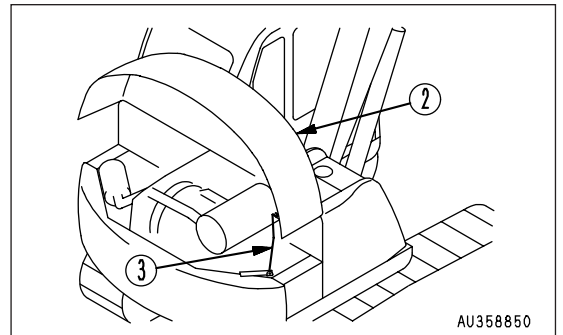
**⚠ WARNING**

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

1. Pull engine hood knob (1) to release the lock.



2. Push hood (2) up, then fix the hood in position with hood support lever (3).



3. To close hood (2), remove hood support lever (3), secure it firmly in the lever lock, then lower the hood slowly and push the hood down to apply the lock.

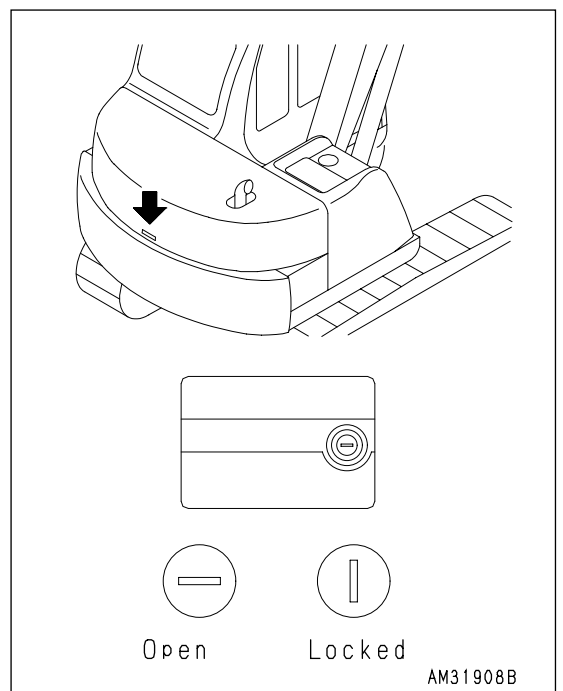
**NOTICE**

Always keep the hood locked except when opening the hood.

It is possible to check open or lock positions by looking at the direction of the key groove in the open knob.

**REMARK**

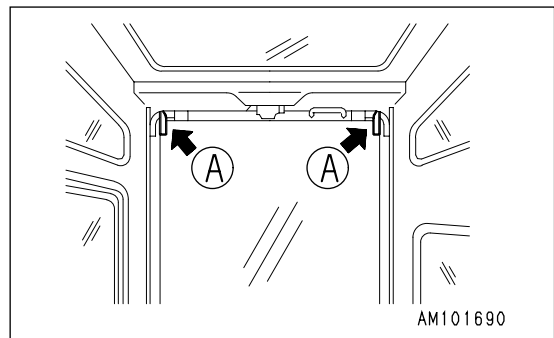
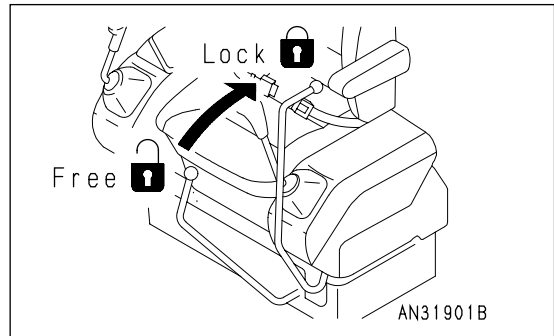
When the hood is locked, the hood knob will not move.



# WINDSHIELD

**⚠ WARNING**

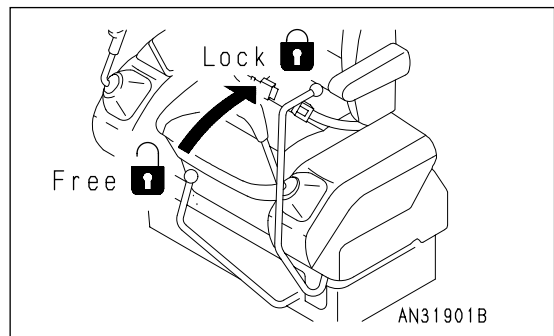
- When opening or closing the ceiling window, front window, bottom window, or door, always set the safety lock lever to the LOCK position. If the control levers are not locked and they are touched by accident, this may lead to a serious accident.
- When opening the front window, hold the grip securely with both hands, pull up, and do not let go until the automatic lock catch is locked.
- There is danger that it will fall, so always lock it with left and right lock pins (A).
- When closing the front window, the window will move quicker under its own weight. Hold the grip securely with both hands when closing it.



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

## Opening

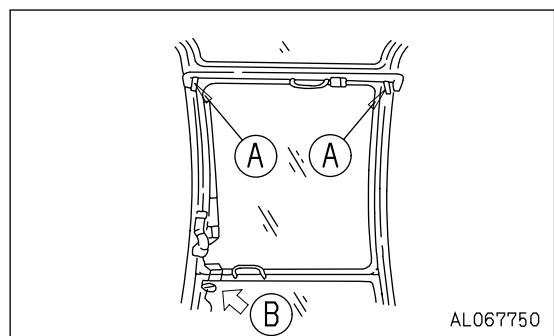
1. Stop the machine on level ground, lower the work equipment completely to the ground, then stop the engine.
2. Set the lock lever for the work equipment control levers securely to the LOCK position.



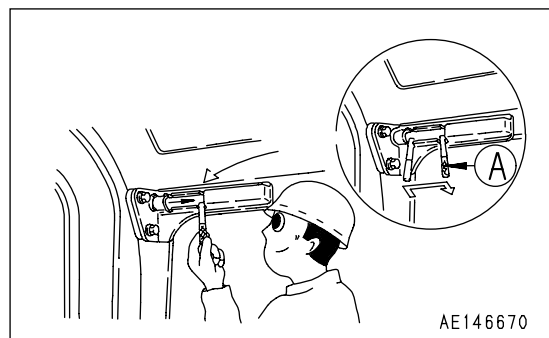
3. Disconnect the wiring for the wiper motor from socket (B).

**NOTICE**

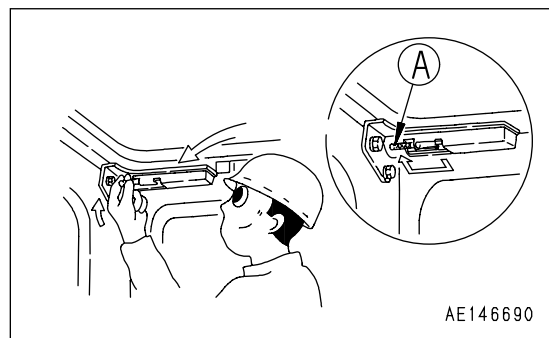
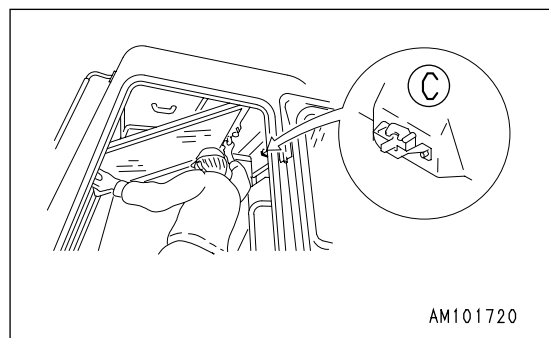
If it is attempted to open the front window without disconnecting the wiring, the wiring will be torn off.



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

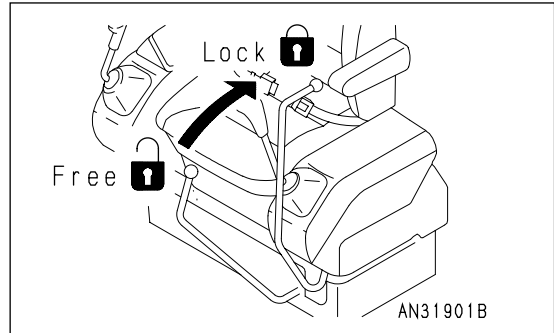


- 5. From the inside of the operator's cab, hold the bottom grip with your left hand and the top grip with your right hand, pull up the window, and push it securely into catch (C), then insert left and right lock pins (A) securely to lock it in position.

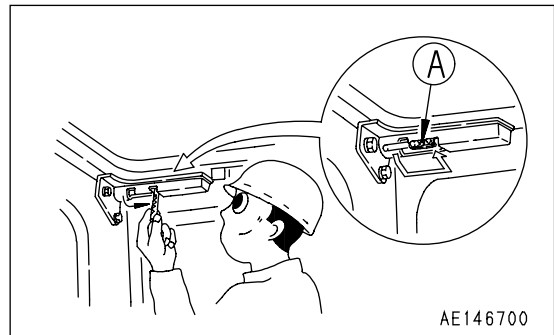


### Closing

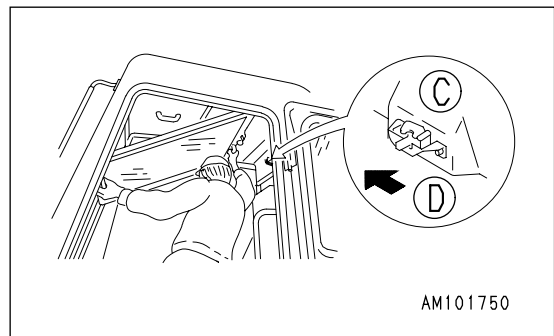
1. Stop the machine on level ground, lower the work equipment completely to the ground, then stop the engine.
2. Lock the safety lock lever securely.



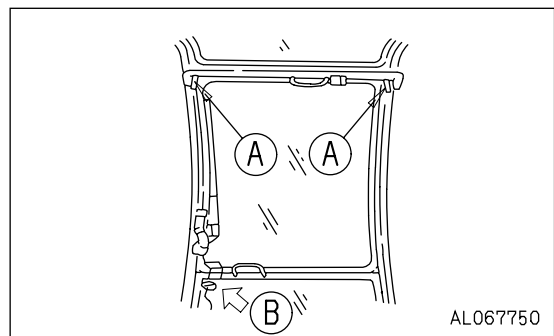
3. Release lock pins (A).



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

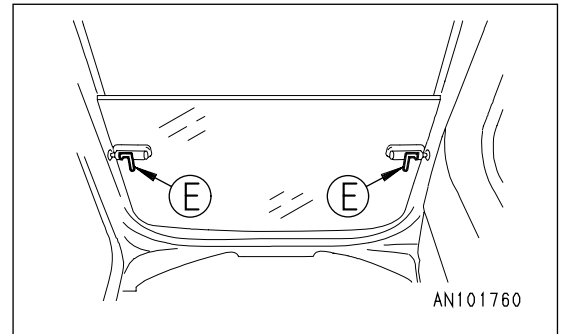


5. Lock securely with lock pins (A) at the left and right sides.
6. Connect the wiper motor wiring to socket (B).

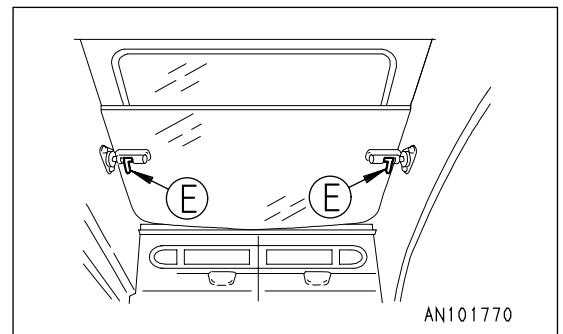


## Lower Windshield

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



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



## EMERGENCY EXIT FROM OPERATOR'S CAB

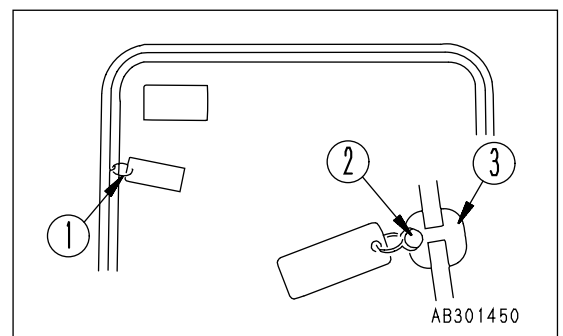
If it should become impossible to open the cab door, open the rear window and use it as an emergency escape.

Remove the rear window as follows.

1. Pull ring (1) and remove core rubber (2) completely from window frame rubber (3).
2. Push the corner of the glass strongly and remove it to the outside.

### NOTICE

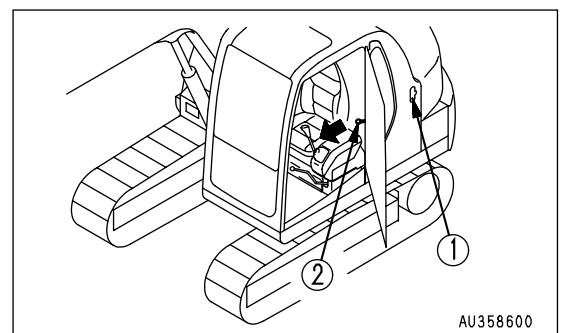
Remove the rear window only when using it as an escape route during emergencies. Do not remove it at any other time.



## DOOR LOCK

Use the door lock to fix the door in position after opening it.

1. Push the door against catch (1) to fix it in position.
2. To release the lock, pull knob (2) forward at the left side of the operator's seat to release the catch.
3. When fixing the door in position, fix it firmly to the catch.

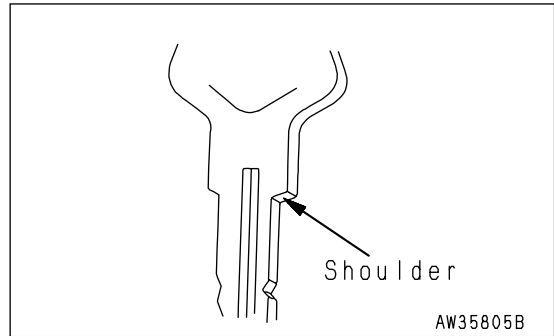




## CAP WITH LOCK

Locks are fitted to the fuel tank filler port, operator's cab, and engine hood. Use the starting key to open and close the cap.

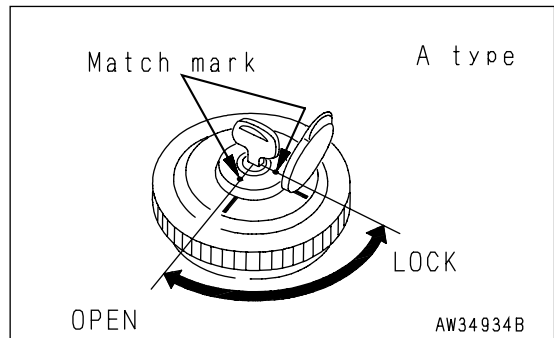
Insert the key fully to the shoulder, then turn it. If the key is turned when it is not fully inserted, it may break.



### Opening and Closing Caps with Lock

#### Opening the Cap

1. Insert the key into the key slot.
2. Turn the key clockwise, align the match marks on the cap with the groove in the rotor, then open the cap.



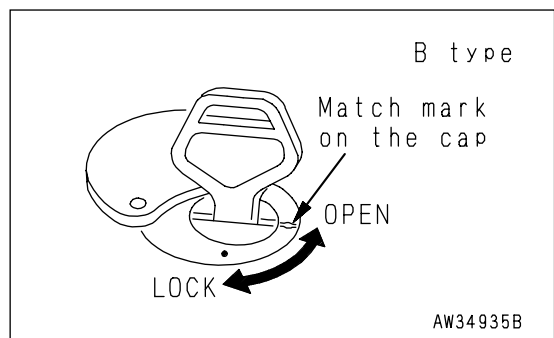
#### Locking the Cap

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

### Opening and Closing Covers with Lock

#### Opening the Cover

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



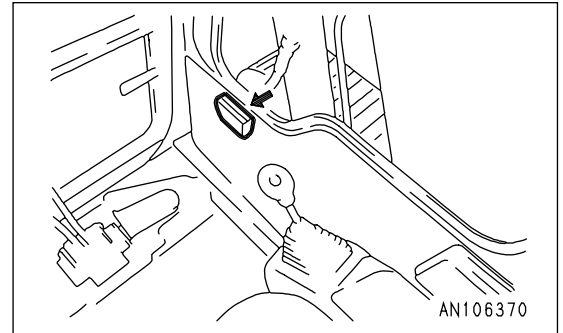
### Locking the Cover

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

## ASHTRAY

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

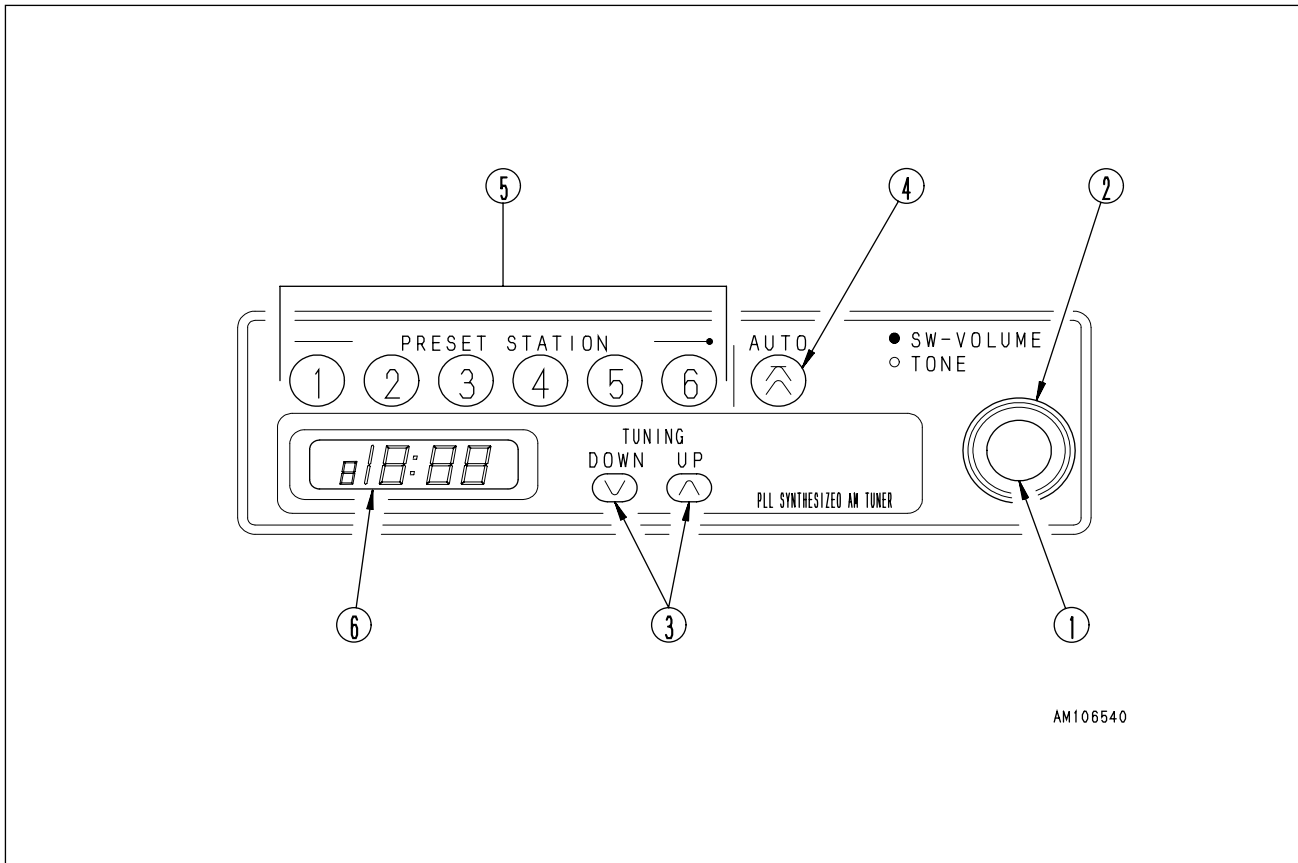
Always extinguish cigarettes before disposing of them in the ashtray, then close the lid.



# RADIO

(If equipped)

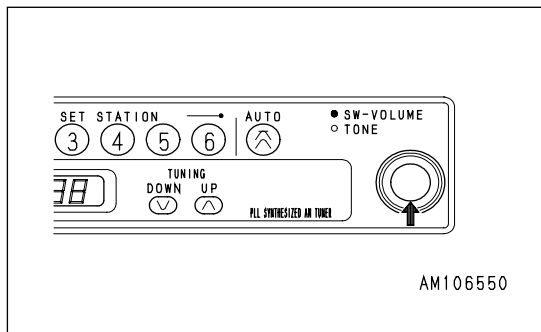
## Control Panel



- (1) Power switch/volume control knob (SW-VOLUME)
- (2) Tone control (TONE)
- (3) Manual tuning button (TUNING)
- (4) Auto tuning button (AUTO)
- (5) Preset button (1, 2, 3, 4, 5, 6) (PRESET STATION)
- (6) Display

### Power switch/volume control knob (SW-VOLUME)

When this switch (1) is depressed, the radio is turned on and the selected frequency appears on the display (6) . When the switch is pressed again, the power is turned off. When the knob is turned clockwise, the sound volume increases. Counter-clockwise turning lowers the volume.

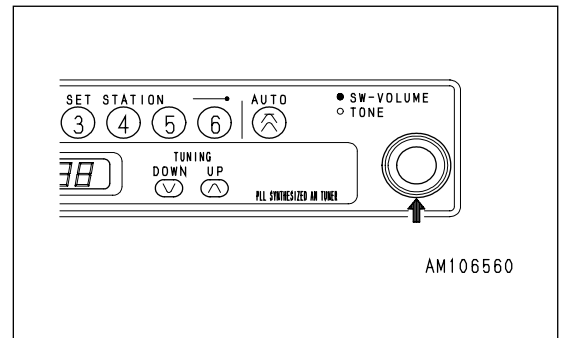


**Tone Control Knob (TONE)**

Turn the knob (2) to adjust the tone as follows.

Turn CLOCKWISE to emphasize the high sounds.

Turn COUNTERCLOCKWISE to suppress the high sounds.

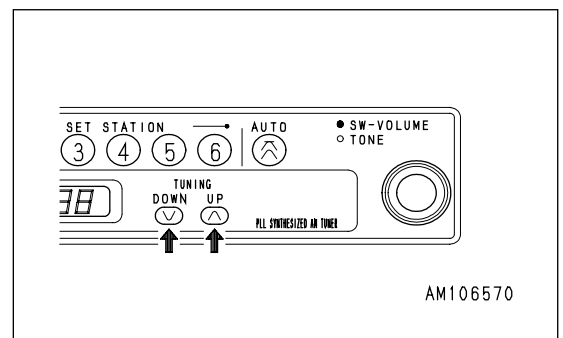


**Manual tuning button (TUNING)**

Use the buttons (3) to change the frequency.

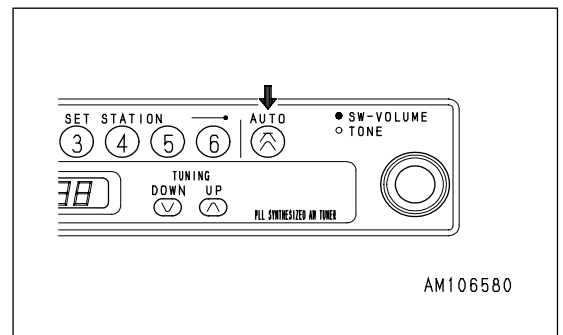
Up button (△): Each time the button is pressed, the frequency will go up in steps.

Down button (▽): Each time the button is pressed, the frequency will go down in steps.



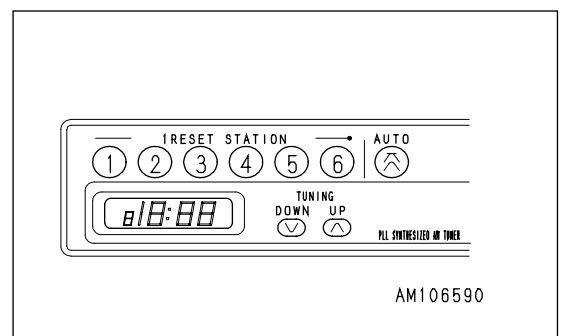
**Auto tuning button (AUTO)**

In frequency selection, when this button (4) is pressed, the frequency automatically moves to high frequency.



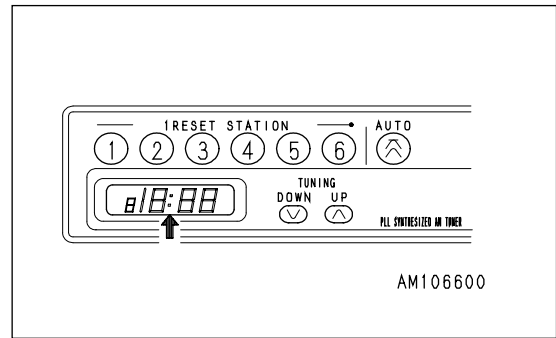
**Preset Station Buttons (1, 2, 3, 4, 5, 6)**

If a desired station is preset using this button (5), the station can be selected by one-touch action.



### Display

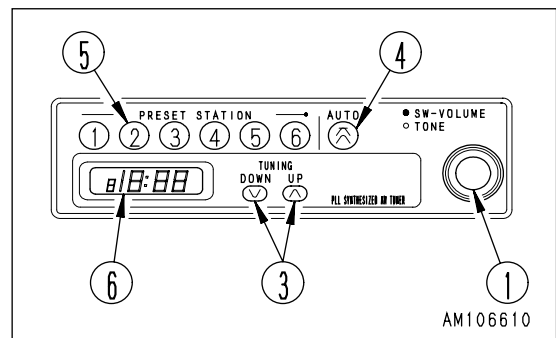
The frequency and preset No. are displayed(6).



### Controls Of Radio

#### Preset Station Buttons

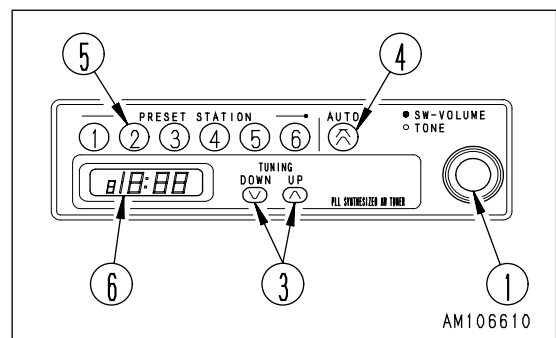
1. Press the power switch (1) . A frequency will appear on the display (6) .
2. Select a desired frequency using the auto-tuning button (4) or manualtuning button (3) .
3. Press the preset button for 1.5 sec or longer to store the number into the memory. The display (6) will show the preset number when storing is completed. Then, when preset button (5) is released after being pressed for less than 1.5 seconds, the stations stored in the memory can be selected. One station per button can be stored.



#### Manual Tuning

Select a desired frequency by pressing the manual tuning button (3). Each time the switch is pressed, the frequency is changed. If the button is continuously pressed for about 0.5 seconds or more, the frequency also increases or decreases until the button is released.

- △ button: Move to a lower frequency station
- ▽ button: Move to a higher frequency station
- If the frequency reaches the top or bottom limit, it will automatically change as follows: top limit → bottom limit, or bottom limit ← top limit



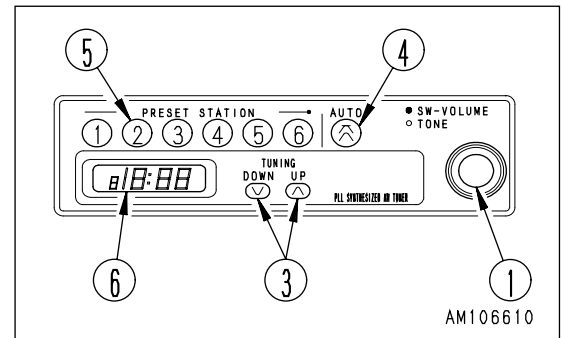
## Automatic Tuning

When the auto tuning button (4) is pressed, the frequency increases and once the desired station is selected, auto tuning will stop.

If wishing to select another station, press the auto tuning button again.

During auto tuning, when this button is pressed, auto tuning is released and the frequency prior to auto tuning is selected.

- When the frequency reaches the upper or lower limit, it is automatically changed to the opposite limit as the case may be.  
If the receiving wave is too weak to receive, select the desired frequency using the manual tuning button.

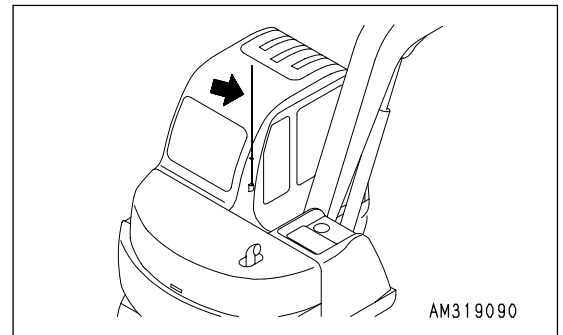


## Antenna

If the receiving wave is weak or generates noise, extend the antenna. If the wave is too strong, adjust the sensitivity by retracting the antenna.

### NOTICE

**When transporting the machine or parking it in a garage, always fully retract the antenna to avoid the possibility of breakage.**



## Use Radio With Care

- To ensure safety, always keep the sound to a level where it is possible to hear outside sounds during operation.
- If water gets into the speaker case or radio, it may lead to an unexpected failure, so be careful not to get water on the equipment.
- Do not wipe the scales or buttons with benzene, thinner, or any other solvent. Wipe with a soft dry cloth. Use a cloth soaked in alcohol if the equipment is extremely dirty.
- When the battery is replaced, the settings for the preset buttons are all cleared, so set them again.

# FUSE

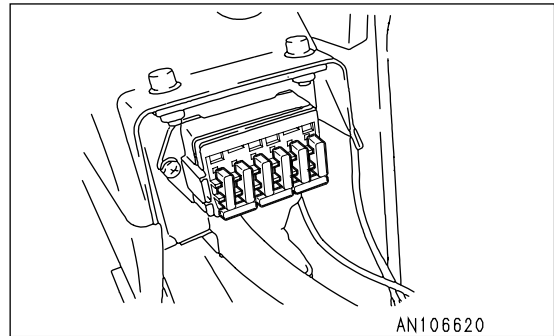
## NOTICE

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

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

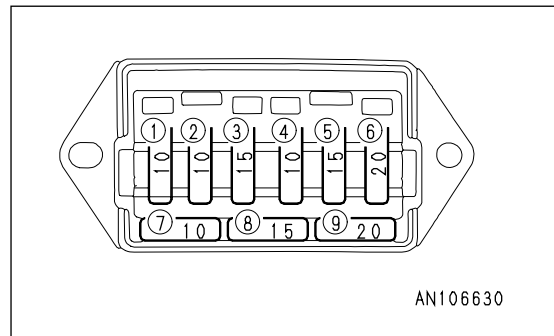
If the fuse becomes corroded, or white powder can be seen, or the fuse is loose in the fuse holder, replace the fuse.

Replace the fuse with another of the same capacity.



## Fuse Capacities and Circuit Names

	Fuse capacity	Name of circuit
(1)	10A	Automatic greasing, radio (back up)
(2)	10A	Controller, monitor panel, solenoid valve
(3)	15A	Wiper, radio, horn, room lamp, window washer
(4)	10A	Head lamp
(5)	15A	Heater, swift deceleration
(6)	20A	Spare fuse (Air conditioner)
(7)	10A	Spare fuse
(8)	15A	Spare fuse
(9)	20A	Spare fuse

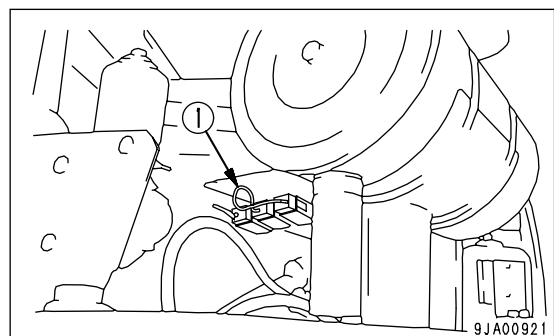


## FUSIBLELINK

If the starting motor does not move even when the starting switch is turned to the ON position, there is probably a break in the wire-shaped fusible link (1), so open the engine hood and check or replace.

## REMARK

A fusible link refers to the large-sized fuse wiring installed in the high current flow portion of the circuit to protect electrical components and wiring from burning, in the same way as an ordinary fuse.

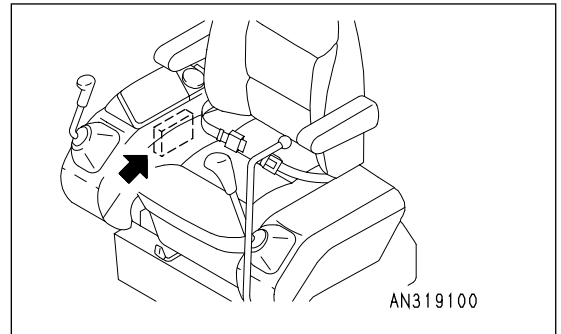


## CONTROLLERS

A swing-lock timer controller is provided.

### NOTICE

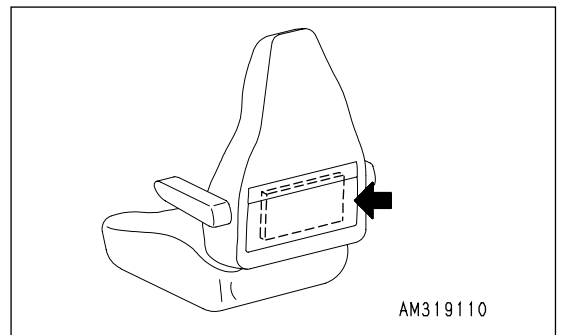
- Never splash or spill water, mud or drink over the controllers as this may cause a fault.
- If a fault occurs in the controller, do not attempt repair, but consult your Komatsu distributor.



## OPERATION MANUAL STORAGE

There is a pocket in the back of the operator's seat for keeping the Operation and Maintenance Manual.

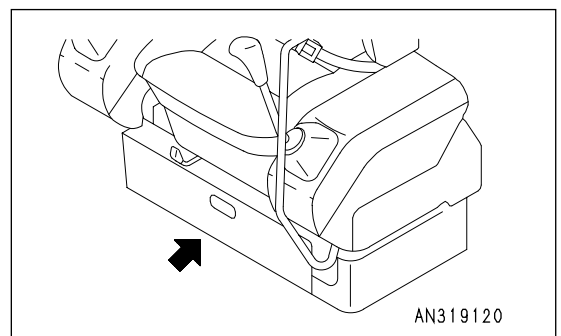
Keep the Operation and Maintenance Manual in the pocket so that it is possible to use it whenever it is needed.



## TOOL BOX

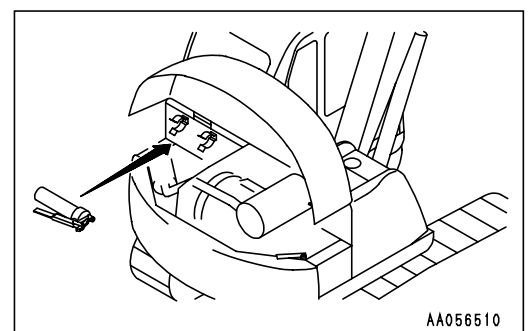
This is under the operator's seat.

This is used for keeping the tools.



## GREASE GUN HOLDER

This is inside the engine compartment. When not using the grease gun, fit it in the holder.





# MACHINE OPERATIONS AND CONTROLS

## BEFORE STARTING ENGINE

### Walk-Around Checks

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

#### WARNING

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

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 from around engine, battery, and radiator.  
Check that there is no dirt accumulated around the engine or radiator. Check also that there are no flammable materials (dry leaves, twigs, etc.) around the battery, engine muffler, or other high temperature parts of the engine. If any dirt or flammable materials are found, remove them.
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 for leakage of grease from grease piping  
Check that there is no leakage or oozing of grease. If any abnormality is found, repair it.
6. Check for abnormality in handrails, steps, loose bolts.  
If any abnormality is found, repair it. Tighten any loose bolts.
7. Check for abnormality in handrails, steps, loose bolts.  
If any abnormality is found, repair it. Tighten any loose bolts.
8. Check for abnormality in gauges, monitor, loose bolts.  
Check that there is no abnormality in the gauges and monitor in the operator's cab. If any abnormality is found, replace the parts. Clean off any dirt on the surface.
9. Clean, check rear view mirror  
Check that there is no damage to the rear view mirror. If it is damaged, replace it with a new mirror. Clean the surface of the mirror and adjust the angle so that the area at the rear can be seen from the operator's seat.
10. Seat belt 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.
11. Check bucket with hook(if equipped) for damage.

Check that there is no damage to the hook, guide, or hook mount. If any abnormality is found, please contact your Komatsu distributor for repair.

## Checks Before Starting

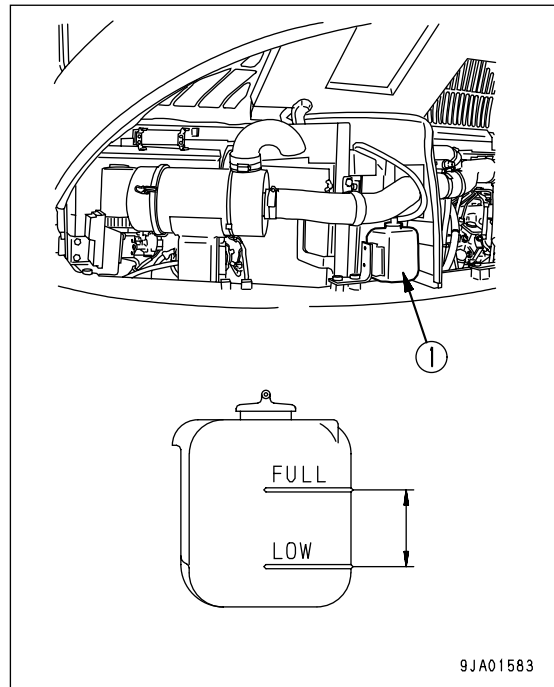
Always carry out the items of the checks in this section before starting the engine.

### Cooling System Coolant Level - Check/Add

#### WARNING

- Do not open the radiator cap unless necessary. When checking the coolant, always wait for the engine to cool down and check the sub tank.
- Immediately after the engine is stopped, the coolant is at a high temperature and the radiator is under high internal pressure.  
If the cap is removed to 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 and check that the cooling water level is between the FULL and LOW marks on sub-tank (1) (shown in the diagram on the right). If the water level is low, add water through the water filler of sub-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).

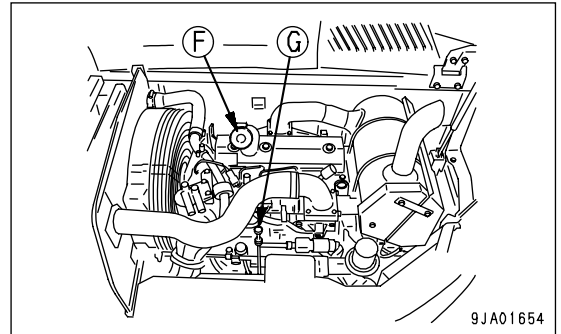


## Engine Crankcase Oil Level - Check/Add

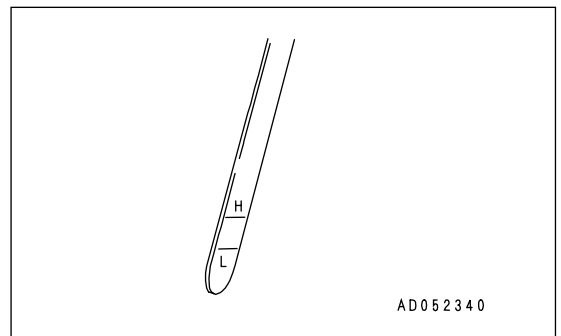
### WARNING

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.

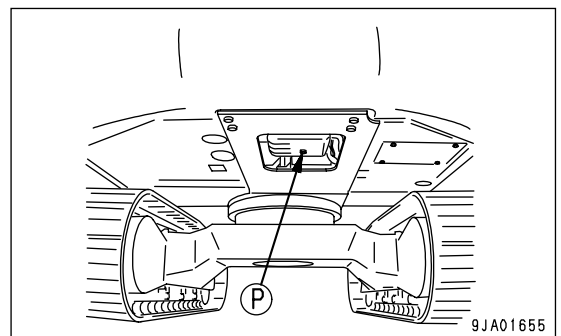
1. Open the engine hood and lock it securely with the hood support lever.
2. Remove dipstick (G) and wipe the oil off with a clean cloth.
3. Insert dipstick (G) fully in the dipstick guide pipe, then take it out again.



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



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



### REMARK

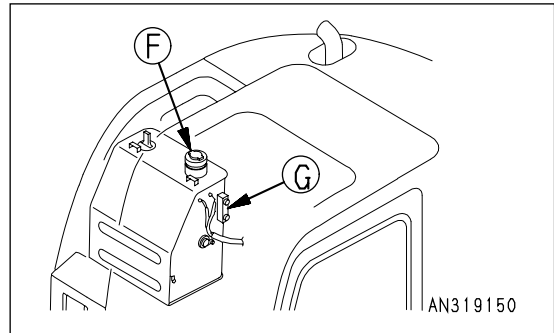
When checking the oil level after the engine has been operated, wait for at least 15 minutes after stopping the engine before checking.  
If the machine is at an angle, make it horizontal before checking.

## Fuel Level - Check/Refill

### WARNING

When adding fuel, never let the fuel spill or overflow. This will cause fire. If any fuel is spilled, wipe it up completely. Fuel is highly flammable and dangerous. Never bring flames near fuel.

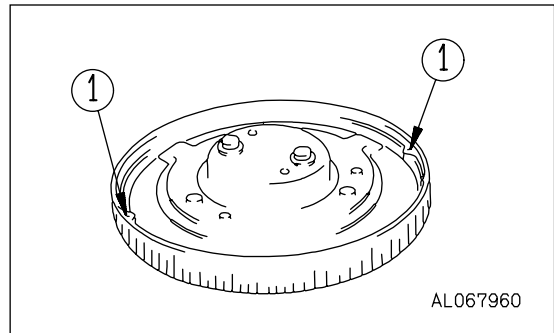
1. Use sight gauge (G) on the side of the fuel tank on the right side of the machine to check that the tank is full of fuel.
2. If the fuel level is not within the sight gauge, add fuel through filler port (F) while watching sight gauge (G).  
Fuel capacity:130 Liters (34.3 US gal)



3. After adding fuel, tighten the cap securely.

### REMARK

If breather hole (1) on the cap is clogged, the pressure in the tank will drop and fuel will not flow.  
Clean the hole from time to time.

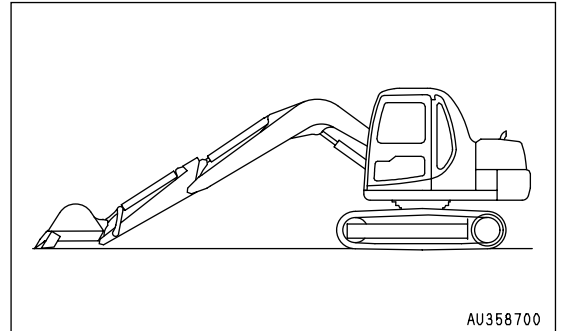


## Hydraulic Oil Level - Check/Add

**⚠ 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.

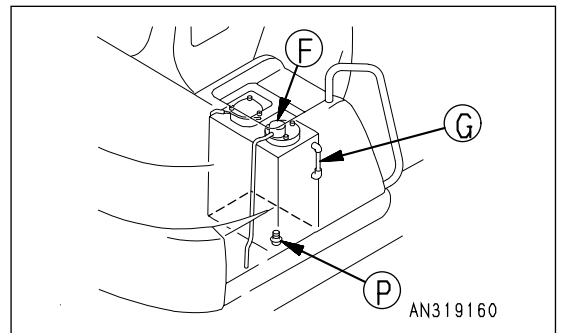
1. If the work equipment is not in the condition shown in the diagram on the right, start the engine, run the engine at low speed, retract the arm and bucket cylinder rods fully, then lower the boom, set the bucket teeth in contact with the ground, and stop the engine.



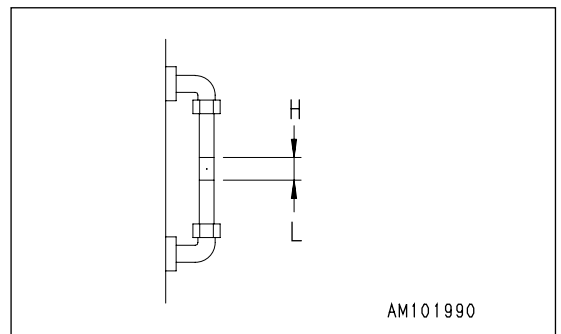
2. Open the door of the pump room on the right side of the machine, and check sight gauge (G). The oil level should be between the H and L lines.

**NOTICE**

Do not add oil above the H line. This will damage the hydraulic circuit or cause the oil to spurt out. If oil has been added to above the H level, stop the engine and wait for the hydraulic oil to cool down, then drain the excess oil from drain plug (P).



3. If the level is below the L mark, remove the upper cover of the hydraulic tank and add oil through oil filler (F).



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

**NOTICE**

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

**REMARK**

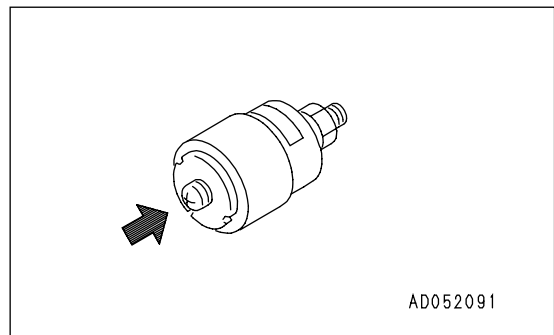
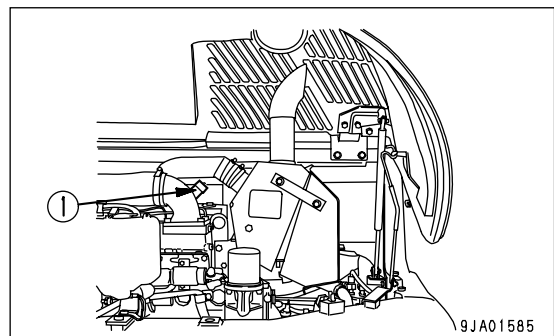
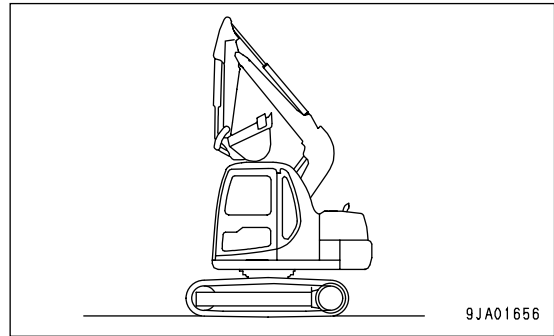
The oil level will vary depending upon the oil temperature.

Accordingly, use the following as the guide:

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

**Air Cleaner Dust Indicator - Check**

1. Open the engine hood and check that the red piston is not showing in dust indicator (1) .
2. If the red piston has appeared, clean or replace the element immediately.  
For details of the method of cleaning the element, see "Air Cleaner Element - Check/Clean/Replace (PAGE 4-20)".
3. After checking, cleaning, and replacing, press the knob of dust indicator (1) to return the red piston to its original position.



## Electric Wiring - Inspect

### WARNING

- If the fuses frequently blow or if there are traces of short circuits on the electrical wiring, locate the cause immediately and carry out repairs, or contact your Komatsu distributor for repairs.
- 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 that there is no damage to the fuses and that a fuse of the correct capacity is being used. Check that there are no disconnections or traces of short circuits on the electrical wiring. Check also that there are no loose terminals.

Tighten any loose terminals.

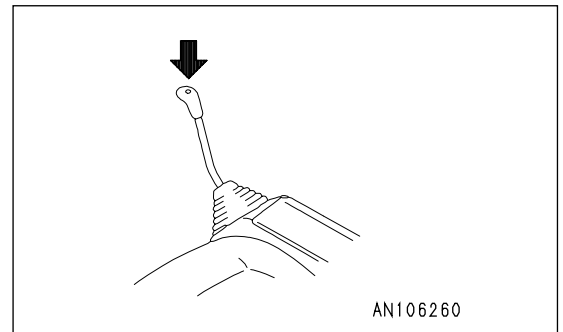
Be particularly careful to check the wiring of the battery, starting motor, and alternator.

Always check also that there are no flammable materials accumulated around the engine. Remove any such flammable materials.

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

## Horn Function - Check

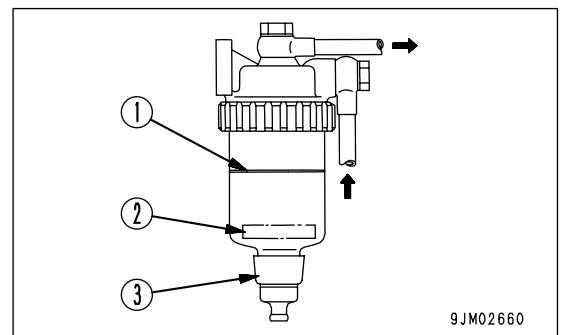
1. Turn the starting switch to the ON position.
2. Confirm that the horn sounds immediately when the horn button is pressed.  
If the horn does not sound, please contact your Komatsu distributor for repair.



## Water Separator (If Equipped) - Check/Drain

The water separator separates water mixed in the fuel. If float (2) is at or above red line (1), drain the water according to the following procedure:

1. Loosen drain plug (3) and drain the accumulated water until the float reaches the bottom.
2. Tighten drain plug (3).
3. If the air is sucked into fuel line when draining the water, be sure to bleed air in the same manner as for the fuel filter. See "Fuel Filter Cartridge - Replace (PAGE 4-63)".





## Adjustment

### ⚠ WARNING

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

### Seat Adjustment

#### (A) Fore-and-aft adjustment

The seat and the left and right console boxes slide to the front and rear.

Move lever (1) to the right, set the operator's seat at the desired position, then release the lever.

Fore-and-aft adjustment: 160 mm (6.3 in) (9 stages)

Adjust the position of the operator's seat to match the operation.

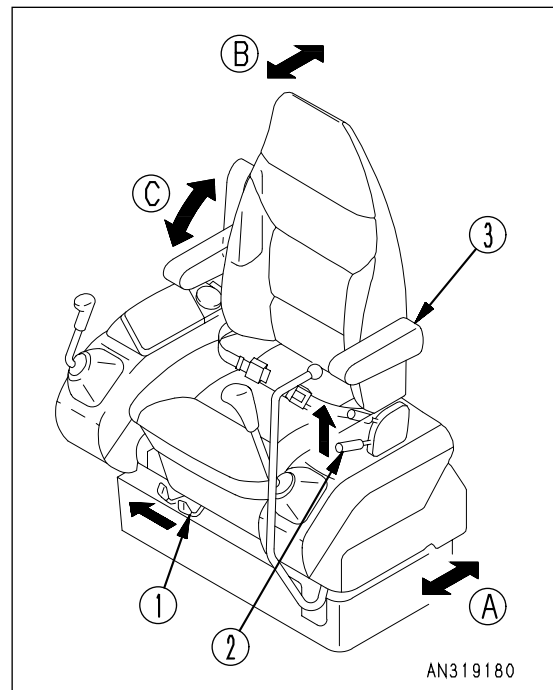
For example, when carrying out deep digging operations, slide the seat to the front to improve the view below the front of the machine.

#### (B) Adjusting reclining

Pull lever (2) in the direction of the arrow, set the seat-back to the desired position, then release the lever.

#### (C) Adjusting armrest

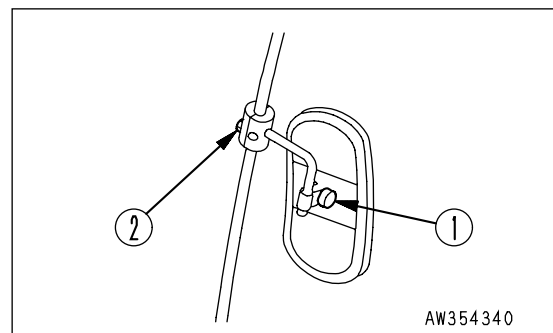
Left and right armrest (3) can be moved 90° in the direction of the arrow. Move them up or down as necessary.



### Rearview Mirrors

Loosen nut (1) and bolt (2) of the mirror mount, then adjust the mirror so that it is possible to see clearly the area to the rear left and right of the machine. These are a blind spots from the operator's seat.

- Adjust the mirror mount so that it is possible to see people (or objects with a height of 1m(3.3ft) or a diameter of 30cm(12in)) at the rear left and right of the machine



## Seat Belt

### WARNING

- Before fitting the seat belt, check that there is no abnormality in the belt mount bracket or mounting belt. If it is worn or damaged, replace the seat belt.
- Even if no abnormality can be seen in the belt, replace the seat belt every 3 years. The date of manufacture of the belt is shown on the back of the belt.
- Adjust the seat belt and fit it before starting operations.
- Always wear the seat belt during operations.
- Fit the seat belt so that it is not twisted.

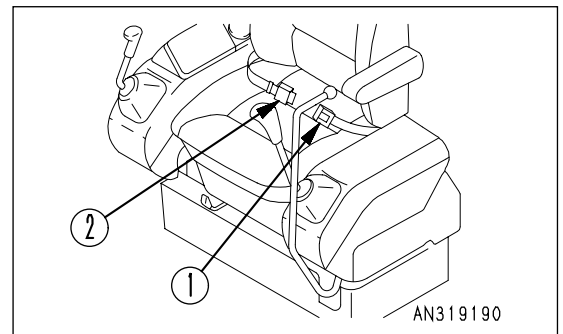
Check the mounting bolts of the belt fitting on the machine body for looseness, and re-tighten them if necessary.

The tightening torque for the mounting bolt is  $24.5 \pm 4.9 \text{ N}\cdot\text{m}$  ( $2.5 \pm 0.5 \text{ kgf}\cdot\text{m}$ ,  $18.1 \pm 3.6 \text{ lbft}$ ).

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. Sit in the seat with your back against the seat back, and adjust the belt so that it is easy to carry out operations.
2. After adjusting the seat position, 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.

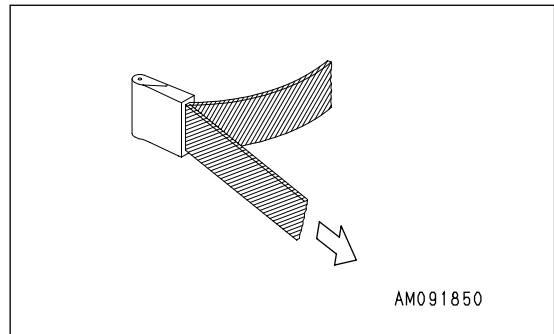


Fasten belt along your body without kinking it. Adjust the lengths of the belt on both the buckle and the tongue sides so that the buckle is located at the mid-point of your body front.

## Seat Belt Adjustment

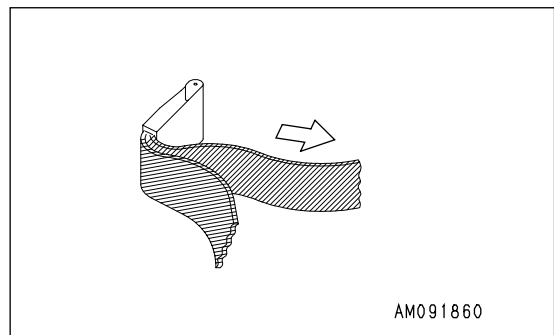
### Shortening

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



### Lengthening

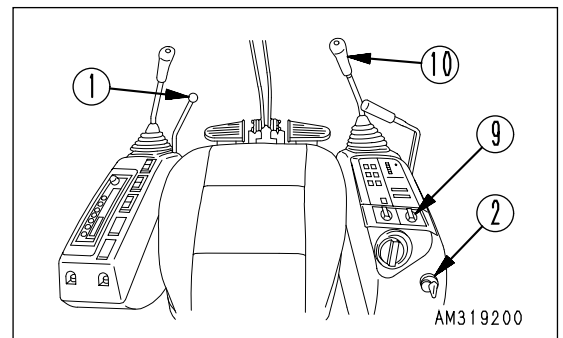
Pull the belt while holding it at a right angle to the buckle or tongue.



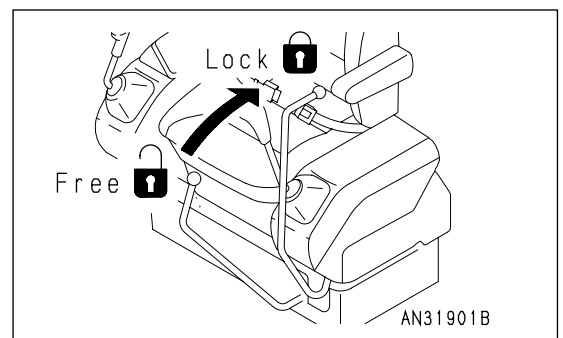
## Operations Before Starting Engine

### **⚠ WARNING**

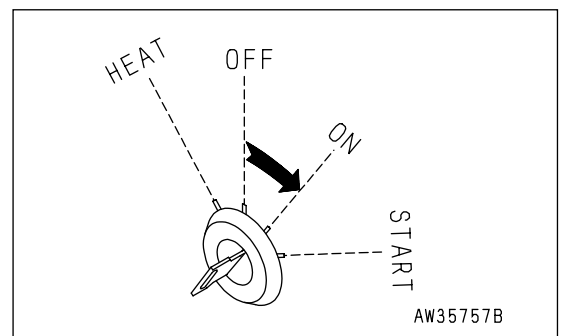
- When starting the engine, check that the safety lock lever is securely at the LOCK position. If the control levers are not locked and they are touched by accident when starting the engine, the work equipment may move unexpectedly, and this may lead to a serious accident.
- When standing up from the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



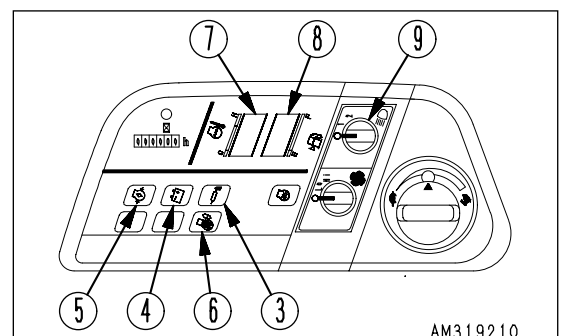
3. Insert the key in starting switch (2), turn the key to the ON position, then carry out the following checks.



- 1) The buzzer will sound for approx. 1 sec, and the following monitors and gauges will light up for approx. 3 sec.

Automatic greasing monitor (3) (If equipped)

- Charge level monitor (4)
- Engine oil pressure monitor (5)
- Swing lock monitor (6)
- Engine water temperature monitor (7)
- Fuel level monitor (8)



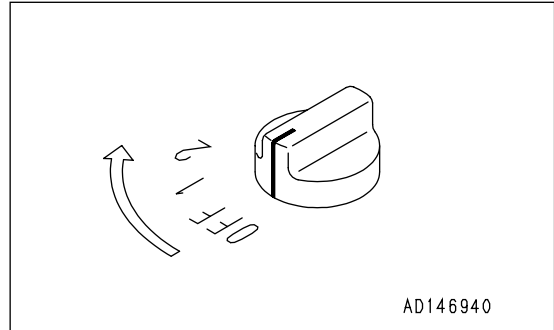
If the monitors or gauges do not light up or the buzzer does not sound, there is probably a broken bulb or disconnection in the monitor wiring, so contact your Komatsu distributor for repairs.

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

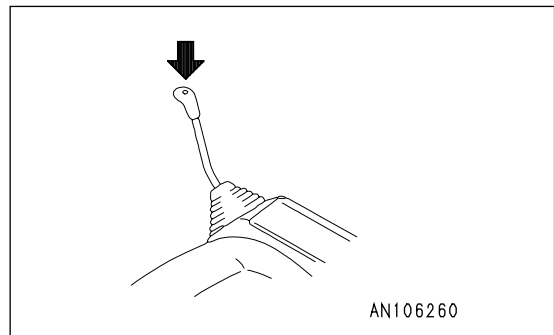
- Charge level monitor (4)
- Engine oil pressure monitor (5)
- Engine water temperature monitor (7)
- Fuel level monitor (8)

2) Turn lamp switch (9) to turn on the head lamps and working lamp.

If the lamps do not light up, there is probably a broken bulb or disconnection in the wiring, so contact your Komatsu distributor for repairs.



4. Press horn switch (10) and check that the horn sounds.

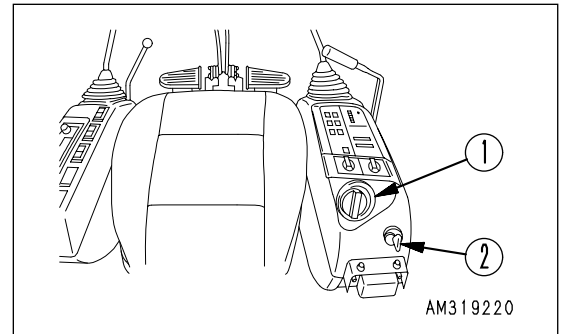


## STARTING ENGINE

### Normal Starting

#### WARNING

- Start the engine only after sitting down in the operator's seat.
- Do not attempt to start the engine by short-circuiting the engine starting circuit. Such an act may cause serious bodily injury or fire.
- Check that there are no persons or obstacles in the surrounding area, then sound the horn and start the engine.
- Exhaust gas is toxic. When starting the engine in confined spaces, be particularly careful to ensure good ventilation.

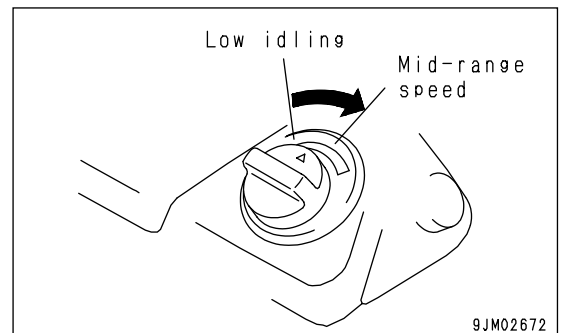


#### NOTICE

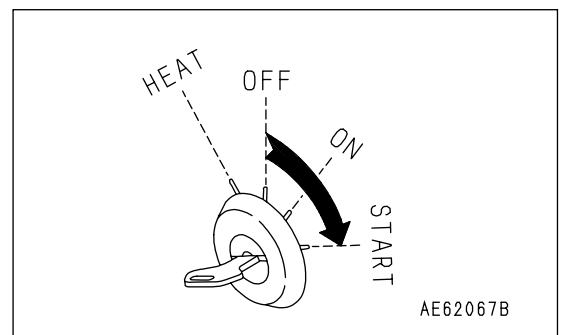
Do not keep the starting motor rotating continuously for more than 20 seconds.

If the engine will not start, wait for at least 2 minutes before trying to start the engine again.

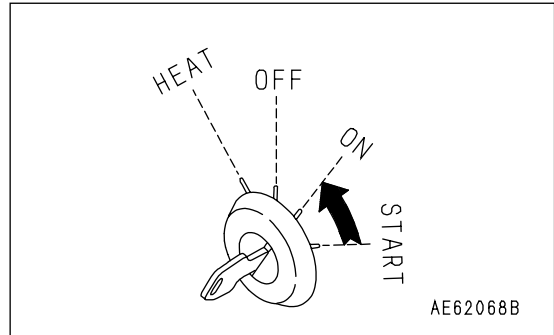
1. Turn fuel control dial (1) to the center position between LOW IDLING and HIGH IDLING.



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



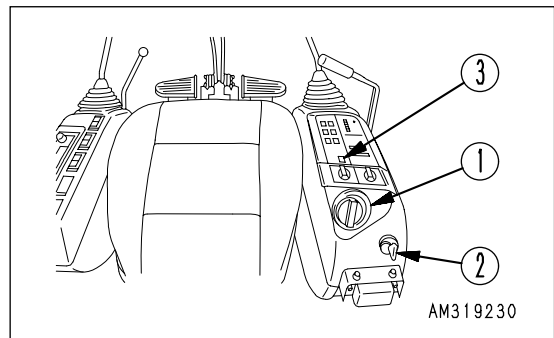
3. When the engine starts, release the key in starting switch (2).  
The key will return automatically to the ON position.



## Starting Engine In Cold Weather

### **⚠ WARNING**

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



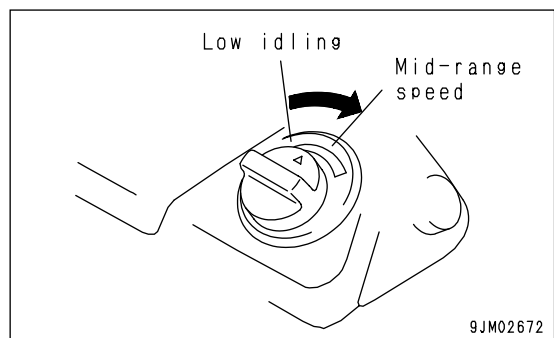
### NOTICE

Do not keep the starting motor rotating continuously for more than 20 seconds.

If the engine fails to start, wait for about 2 minutes and repeat from Step 2.

When starting in low temperatures, do as follows.

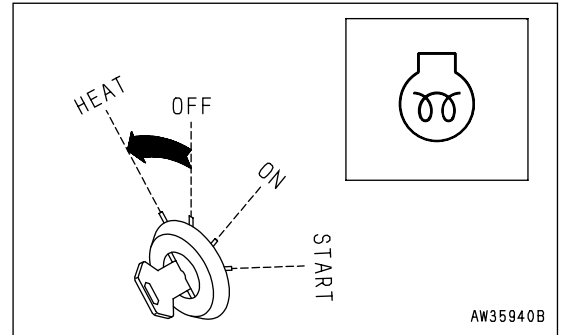
1. Turn fuel control dial (1) to the center position between LOW IDLING and HIGH IDLING.



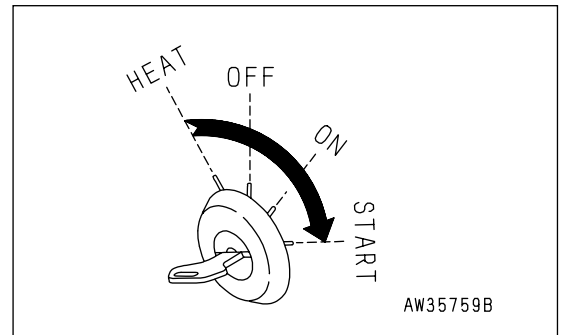
2. Hold the key in starting switch (2) at the HEAT position, and check that preheating monitor (3) lights up. After about 30 seconds, preheating monitor lamp (3) will flash for about 10 seconds to indicate that preheating is finished.

**REMARK**

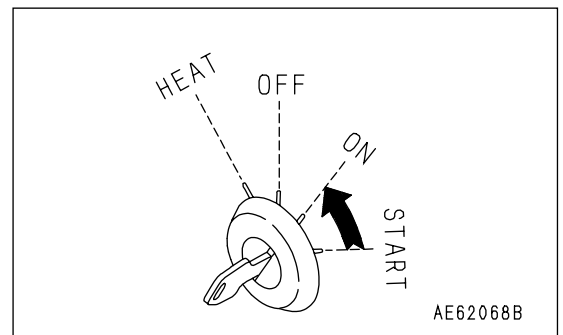
The monitor and gauge also light up when the key is at the HEAT position, but this does not indicate any abnormality.



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.





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

## 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.

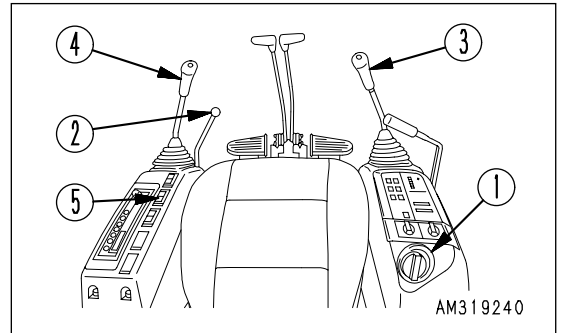
Be sure to running-in the machine for the initial 100 hours (as indicated by the service meter). During running-in operations, follow the precautions described in this manual.

- 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

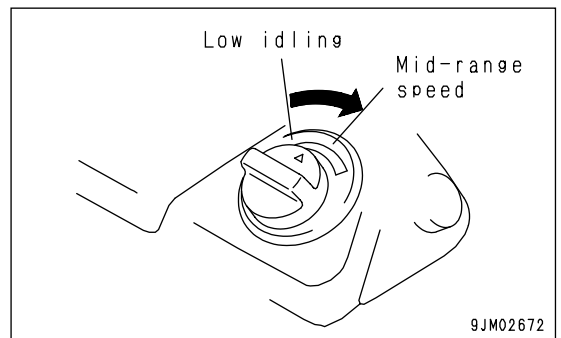
**NOTICE**

- The most suitable temperature for the hydraulic oil is 50° — 80°C. If it is necessary to operate the machine when the oil is at low temperature, the temperature must be raised to at least 20°C before starting work in order to extend the life of the machine.
- Do not operate the levers suddenly when the hydraulic oil temperature is below 20°C.
- After starting the engine, do not accelerate the engine suddenly until the warming-up operation is completed. In particular, if the engine is accelerated suddenly in very cold weather, white smoke may come out, but this does not indicate any abnormality.
- Do not run the engine at low idling or high idling continuously for more than 20 minutes.
- If it is necessary to continue to run the engine at idling, apply a load from time to time or run the engine at a mid-range speed.

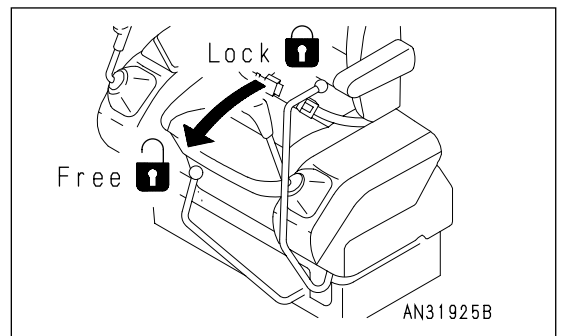


After starting the engine, do not immediately start operations. First, carry out the following operations and checks.

1. Turn fuel control dial (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.



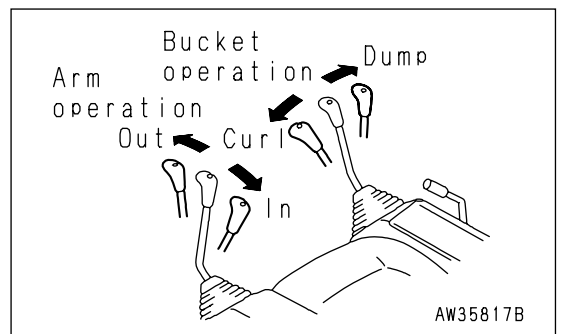
2. Set safety lock lever (2) to the FREE position, and raise the bucket from the ground.



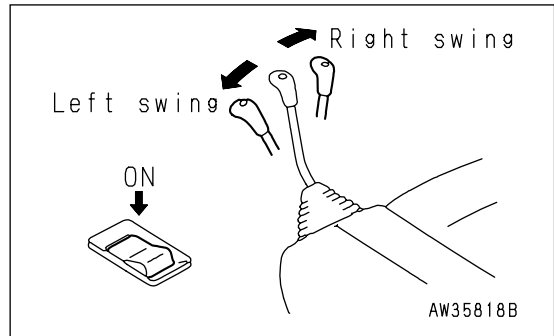
3. Operate bucket control lever (3) and arm control lever (4) slowly to move the bucket cylinder and arm cylinder to the end of the stroke.

**NOTICE**

When the work equipment is retracted, take care that it does not interfere with the machine body or ground.

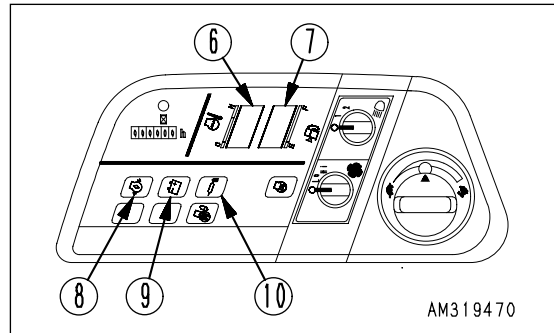


4. Carry out bucket and arm operation for 5 minutes at full stroke, alternating between bucket operation and arm operation at 30 second intervals.  
If the swing lock switch (5) is set to the ON (actuated) position and swing control lever (4) is operated at full stroke, oil temperature rise can be increased earlier.



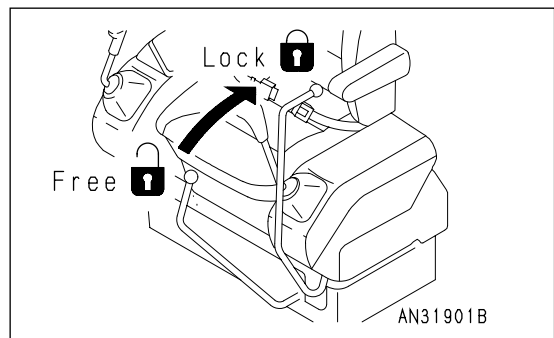
5. After carrying out the warming-up operation, check that each gauge and monitor lamp is in the following condition.

- Engine water temperature gauge (6) . Inside green range
- Fuel gauge (7) . Inside green range
- Engine oil pressure monitor (8) . OUT
- Charge level monitor (9) . OUT
- Automatic greasing monitor (10) . OUT



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

7. 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.



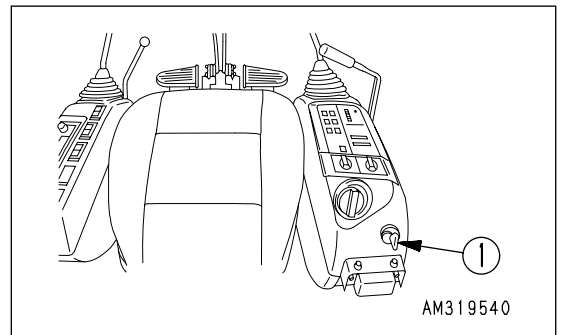
## STOPPING THE ENGINE

### NOTICE

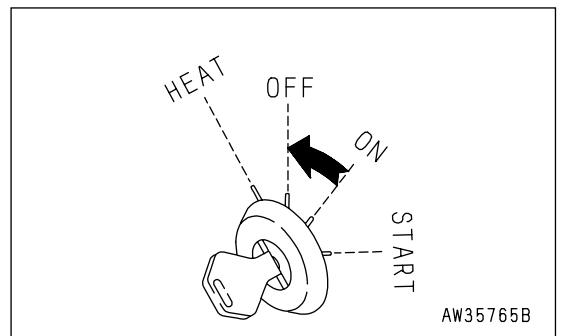
If the engine is abruptly stopped before it has cooled down, engine life may be greatly shortened. Consequently, do not abruptly stop the engine apart from an emergency.

In particular, if the engine has overheated, do not abruptly stop it but run it at medium speed 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

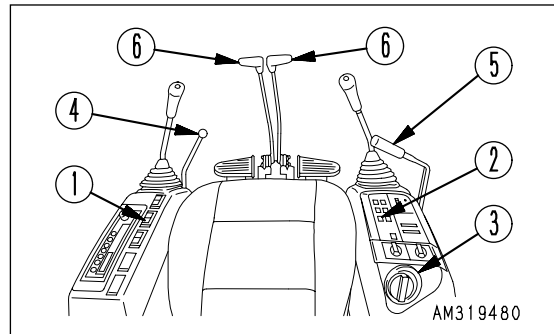
1. Walk around the machine and check the work equipment, machine exterior, and undercarriage, and check also for leakage of oil or water. If any abnormalities are found, repair them.
2. Fill the fuel tank.
3. Check the engine compartment for paper and debris. Clean out any paper and debris to avoid a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

## MACHINE OPERATION

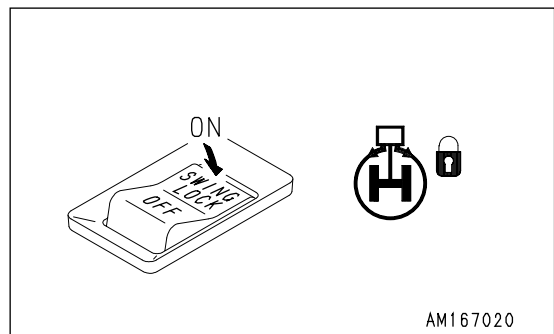
### Preparations For Moving The Machine Off

#### 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.
- The rear of the machine is a blind spot, so be particularly careful when travel in reverse.
- For machines equipped with a travel alarm (if equipped), check that the warning equipment works properly.



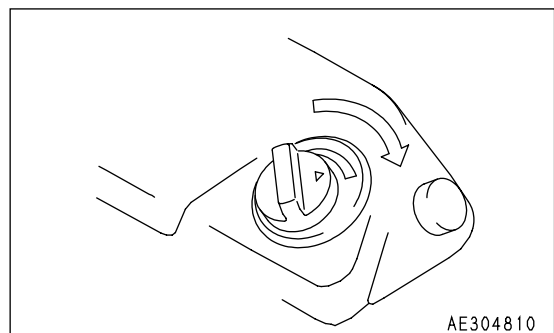
1. Set swing lock switch (1) to the ON (actuated) position and confirm that swing lock monitor lamp (2) lights up.



2. Turn fuel control dial (3) towards the full speed position to increase the engine speed.

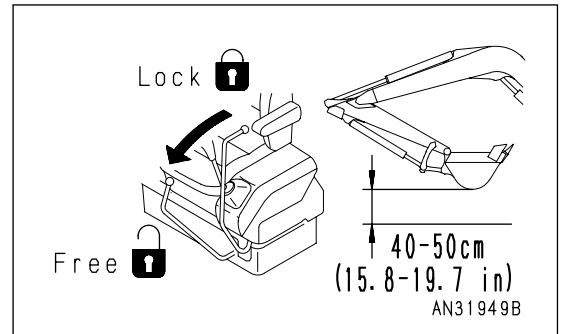
#### REMARK

If the engine speed does not rise, it is possible that the switch deceleration switch is ON. Check the swift deceleration display lamp. For details of operation of the swift deceleration switch, see Swift Deceleration Switch (PAGE 3-13).



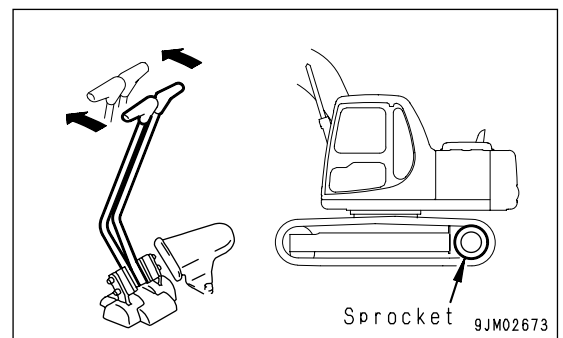
## Moving Machine Forward

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. Pull blade control lever (5) to raise the blade. (Only machines with blade specification)

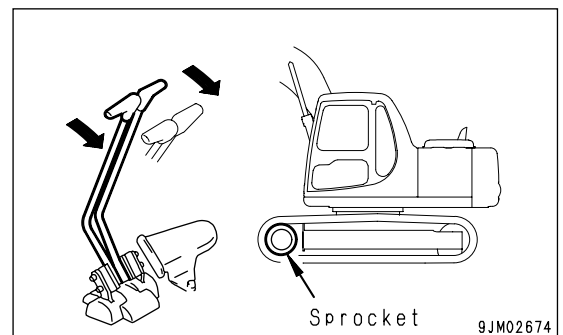


3. Operate right and left travel levers (6) as follows.
  - When the sprocket is at the rear of the machine

Push levers (6) forward slowly to move the machine off.



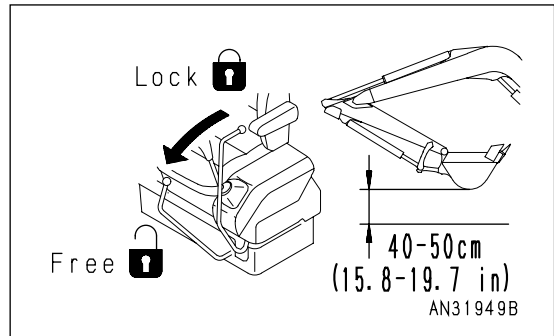
- When the sprocket is at the front of the machine
- Pull levers (6) backward slowly to move the machine off.



4. For machines equipped with a travel alarm (if equipped), check that the alarm sounds. If the alarm does not sound, please contact your Komatsu distributor for repairs.

### Moving Machine Backward

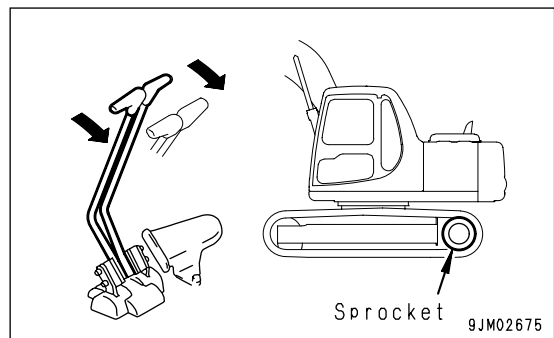
1. Set safety lock lever (4) in the FREE position, fold the work equipment, and raise it 40 to 50 cm (16 to 20 in) from the ground.
2. Pull blade control lever (5) to raise the blade. (Only machines with blade specification)



3. Operate right and left travel levers (6) as follows.

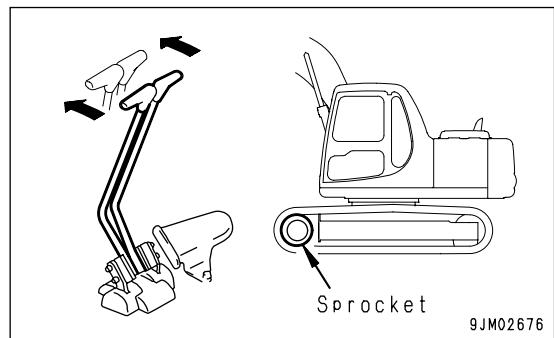
- When the sprocket is at the rear of the machine

Pull levers (6) backward slowly to move the machine off.



- When the sprocket is at the front of the machine

Push levers (6) forward slowly to move the machine off.



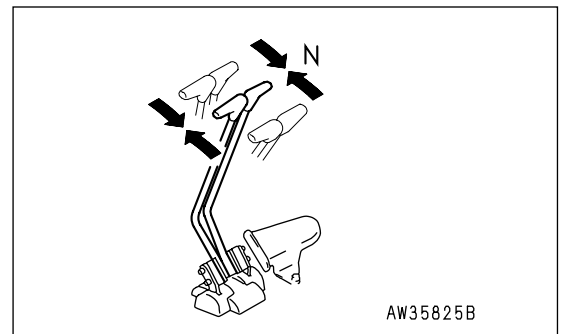
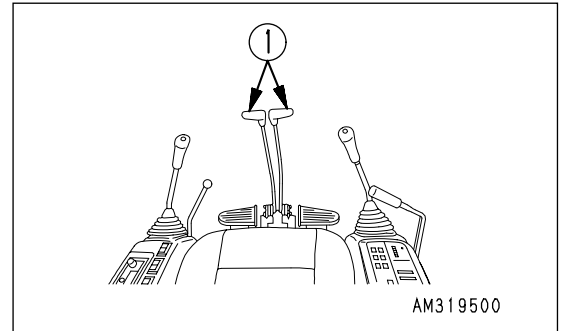
4. For machines equipped with a travel alarm (if equipped), check that the alarm sounds. If the alarm does not sound, please contact your Komatsu distributor for repairs.

## 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

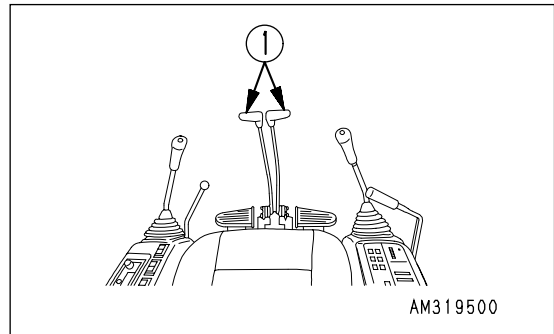
**⚠ WARNING**

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.



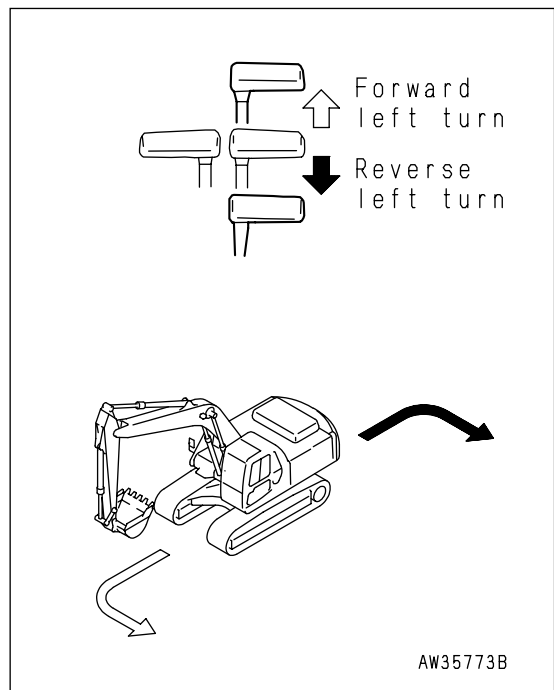
### Steering the Machine when Stopped

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.



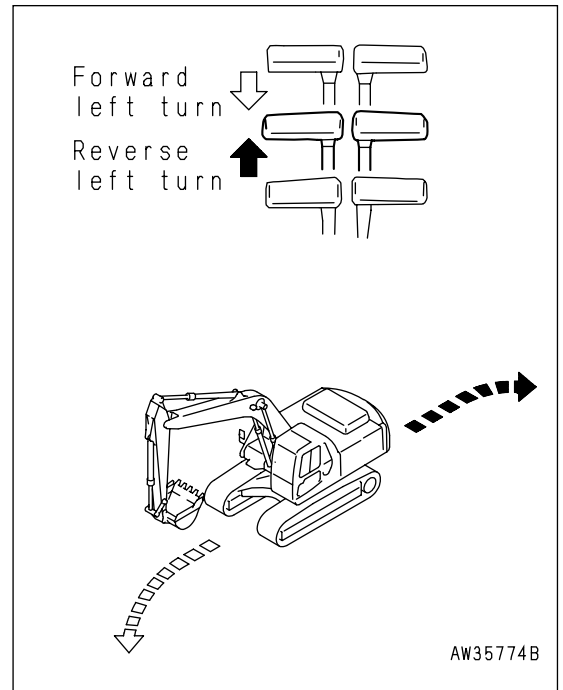
### Changing Direction of the Machine

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.

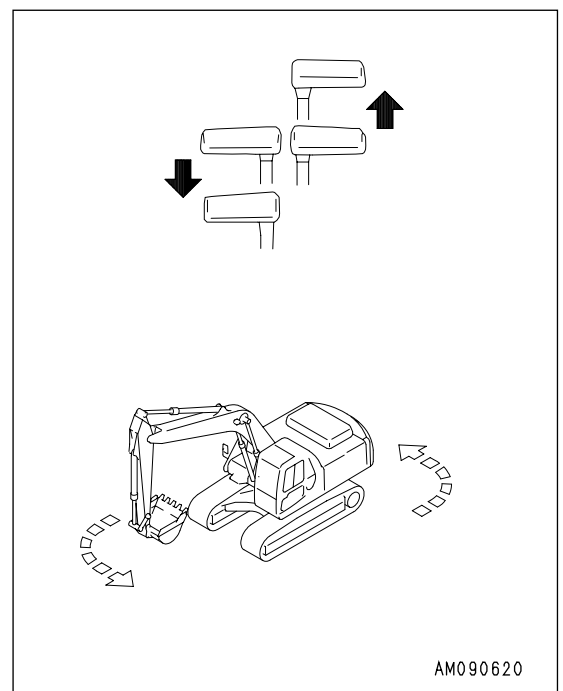


### Counter-rotation Turn (Spin Turn)

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

**REMARK**

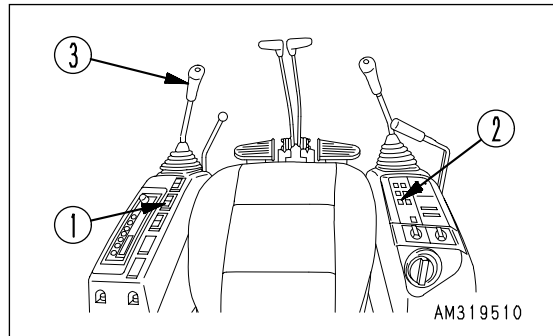
When using counter-rotation to turn right, pull the right travel lever back and push the left travel lever forward.



# SWINGING

**⚠ WARNING**

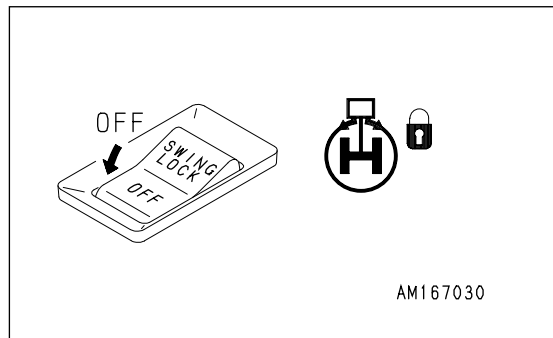
When operating the swing, check that the area around the machine is safe.



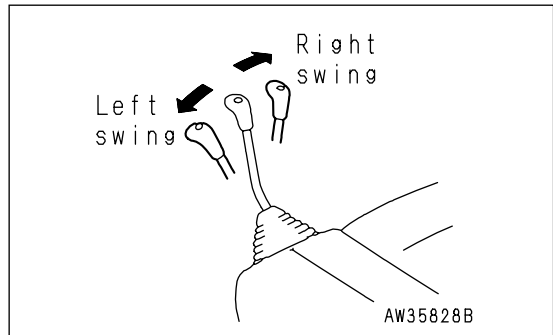
1. Before operating the swing, turn swing lock switch (1) OFF (CANCELED).

**NOTICE**

Check that swing lock monitor (2) goes out at the same time.



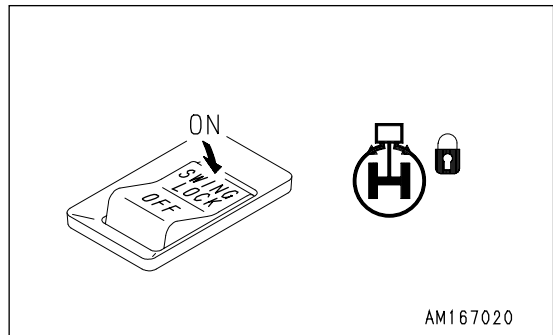
2. Operate left work equipment control lever (3) to swing the upper structure.



3. When not operating the swing, turn swing lock switch (1) ON (ACTUATED).

**NOTICE**

Check that swing lock monitor (2) goes out at the same time.



## WORK EQUIPMENT CONTROLS AND OPERATIONS

### WARNING

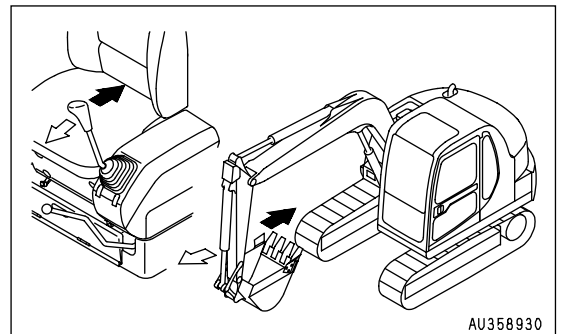
For operation modes other than the standard one (ISO pattern), refer to the chapter of **ATTACHMENTS AND OPTIONS** in this manual.

Use the control levers to operate the work equipment.

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

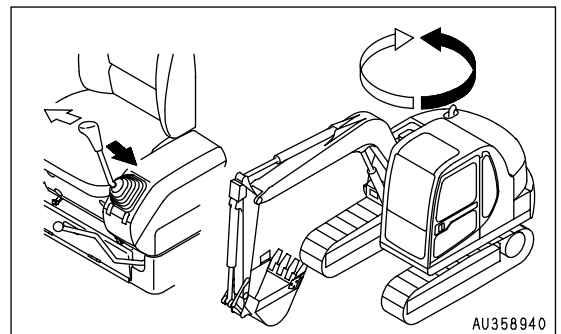
- Arm control

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



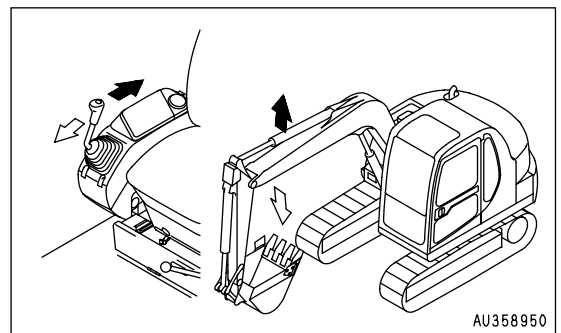
- Swing control

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



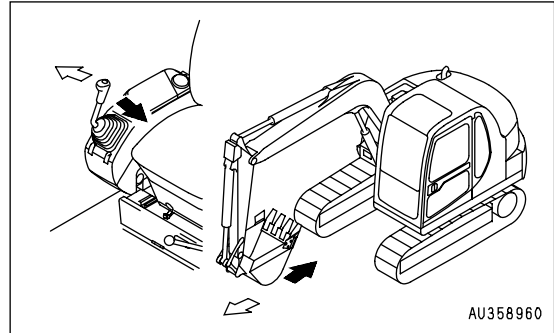
- Boom control

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



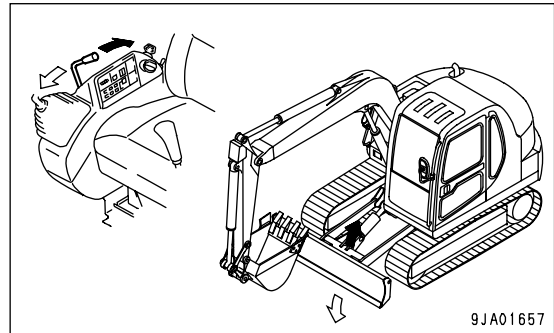
- Bucket control

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



- Blade control (blade specification)

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



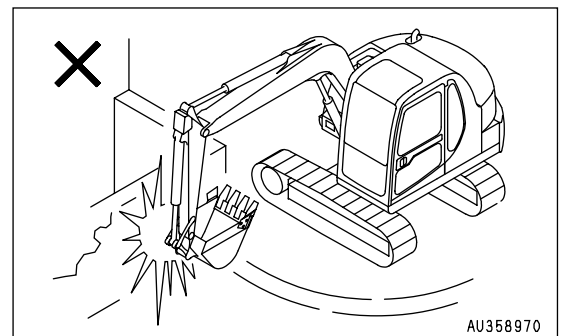
## PROHIBITED OPERATIONS

### WARNING

- If it is necessary to operate the work equipment control lever when the machine is traveling, be extremely careful when operating.
- If any lever is operated when the deceleration is being actuated, the engine speed will suddenly increase, so be careful when operating.

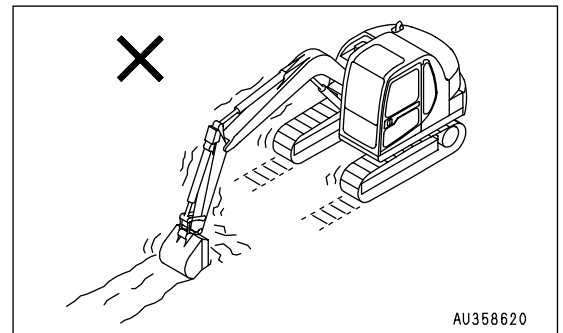
### Operations Using Swing Force

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.



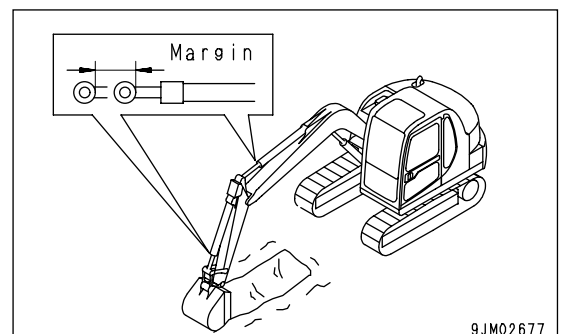
### Operations Using Travel Force

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

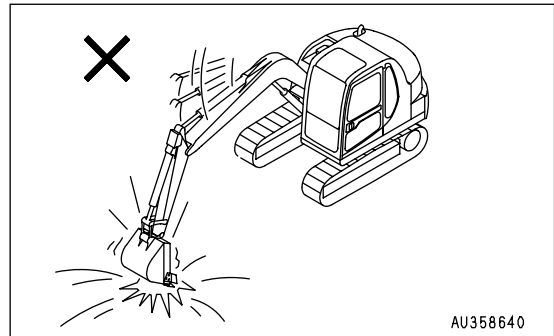
If the cylinder is used when the cylinder rod has been operated to the end of its stroke during operations, external force will cause impact to the work equipment, and this will damage the hydraulic cylinders. Avoid carrying out operations with the hydraulic cylinder fully retracted or fully extended.



### Operations Using Bucket Dropping Force

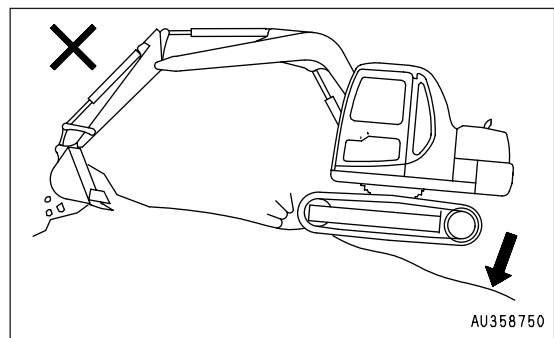
Do not use the dropping force of the machine for digging, or use the dropping force of the bucket as a pickaxe, breaker, or pile driver.

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.

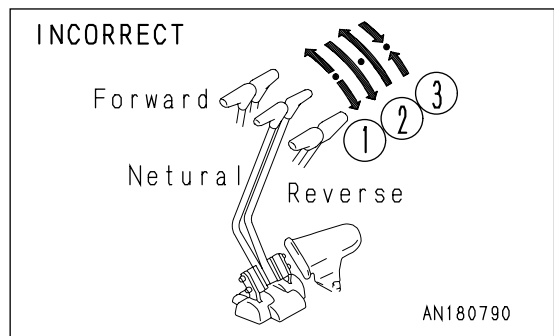


### Digging Hard Rocky Ground

It is better to excavate hard rocky ground after breaking it up by some other means. This will not only reduce damage to the machine but make for better economy.

### Sudden Lever Shifting High Speed Travel

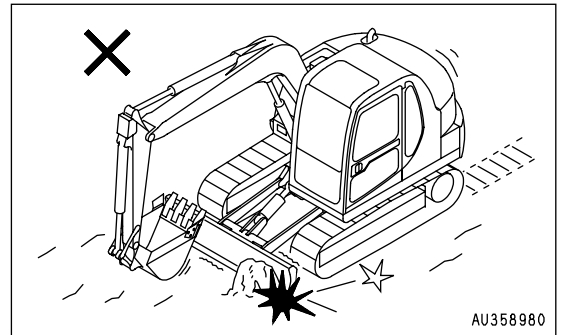
- (1) Never carry out sudden lever shifting as this may cause sudden starting.
- (2) Avoid sudden lever shifting from forward to reverse (or from reverse to forward).
- (3) Avoid sudden lever shifting change such as sudden stopping from near top speed (lever release operation).



### Avoid Hitting Blade

(Only machines with blade specification)

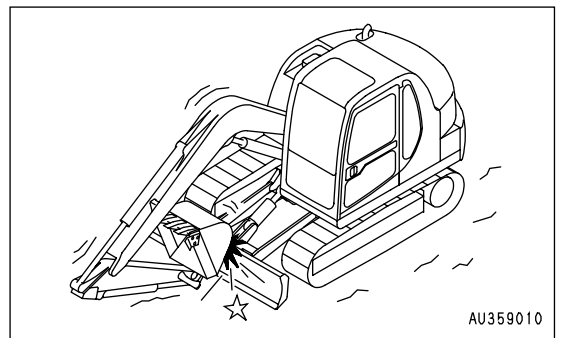
Be careful not to hit the blade against rocks or boulders. This will cause premature damage to the blade or cylinders.



### Folding in Work Equipment

(Only machines with blade specification)

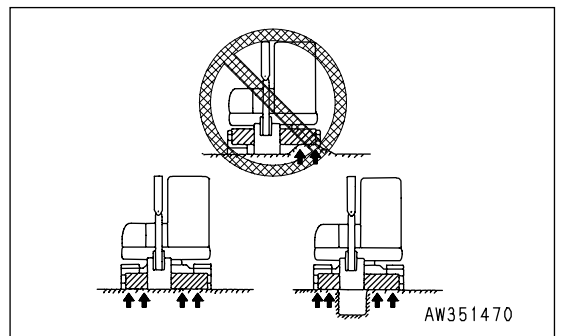
When folding in the work equipment to the travel or transportation posture, be careful not to let the bucket hit the blade.



### Support Blade on Both Sides

(Only machines with blade specification)

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

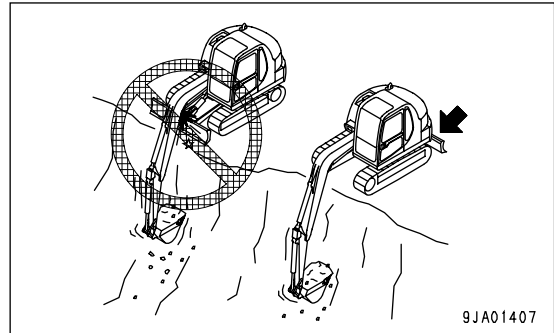




## Blade During Backhoe Operations

(Only machines with blade specification)

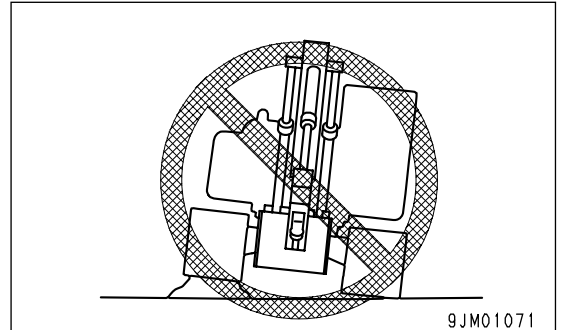
When carrying out deep digging operations with the blade at the front, be careful not to let the boom cylinder hit the blade. Always position the blade at the back unless it is needed at the front.



## GENERAL OPERATION INFORMATION

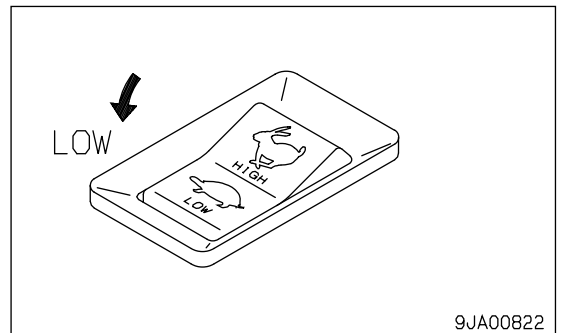
### Traveling

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.



### High Speed Travel

On uneven roadbeds such as rock beds or uneven roads with large locks, travel at Lo speed. When Hi-speed traveling, set the idler in the forward direction.

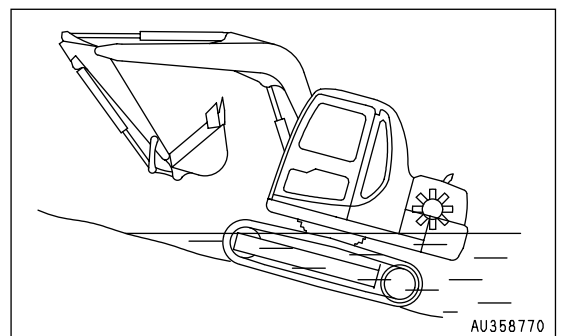


### Permissible Water Depth

#### ⚠ CAUTION

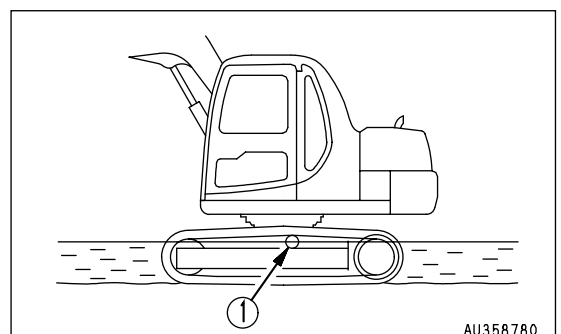
When driving the machine out of water, if the angle of the machine exceeds 15°, the rear of the upper structure will go under water, and water will be thrown up by the radiator fan. This may cause the fan to break.

Be extremely careful when driving the machine out of water.



Do not drive the machine in water deeper 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).



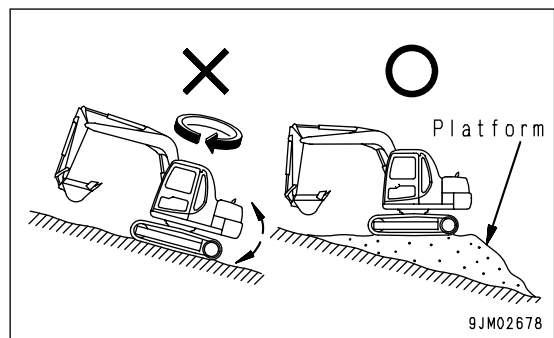
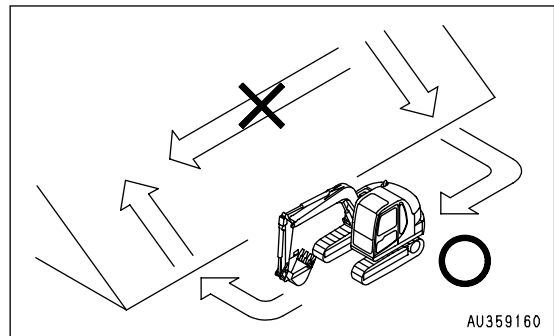
# TRAVELING ON SLOPES

**⚠ WARNING**

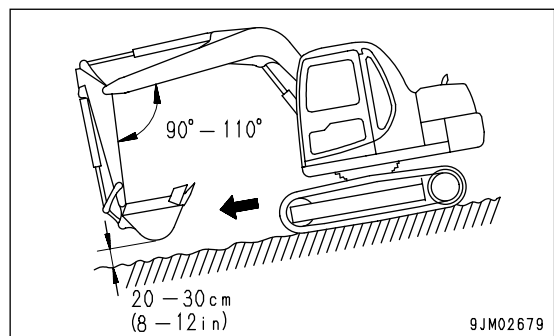
When traveling, raise the bucket approx. 20 to 30cm (8 to 12 in) from the ground.

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 its balance and turn over, so avoid such operations. It is particularly dangerous to swing downhill when the bucket is loaded. If such operations have to be carried out, pile soil to make a platform on the slope so that the machine can be kept horizontal when operating.
- Do not travel up or down steep slopes. There is danger that the machine may turn over.
- When traveling uphill, if the shoes slip or it is impossible to travel uphill using only the force of the tracks, do not use the pulling force of the arm to help the machine travel uphill. There is danger that the machine may turn over.

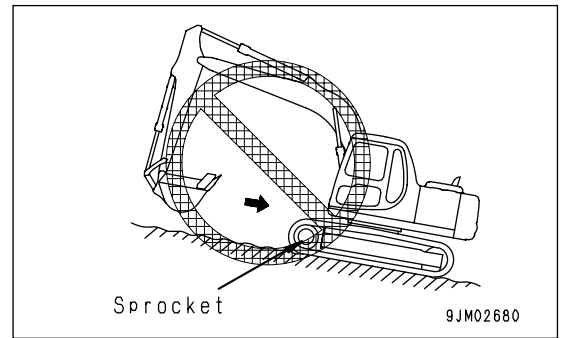


1. When traveling down steep hills, use the travel lever and fuel control lever to keep the travel speed low. When traveling down a steep hill of more than 15°, set the work equipment to the posture shown in the diagram on the right, and lower the engine speed.

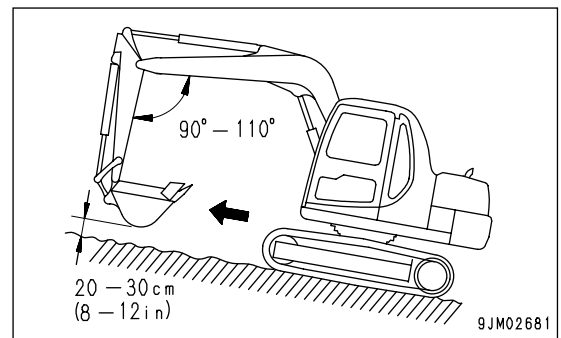


**REMARK**

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



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

**Traveling Downhill**

To brake the machine during downhill runs, put the travel lever in the neutral position. This will cause the brake to be automatically applied.

**If shoes slip**

When traveling uphill, if the shoes slip or it is impossible to travel uphill using the force of the track only, it is possible to use the pulling force of the arm to help the machine travel uphill.

**Engine Stopped on Slope**

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

**Cab Doors on Slope**

- If the engine stops when the machine is on a slope, never use the left work equipment control lever to carry out swing operations. The upper structure will swing under its own weight.
- Be extremely careful when opening or closing the door on slopes. The weight of the door may cause the door to open or close suddenly.  
Always set the door so that it is firmly locked in position.

## ESCAPE FROM MUD

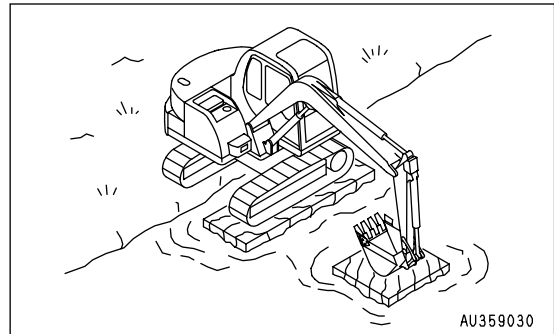
Always operate carefully to avoid getting affixed in mud. If the machine does get affixed in mud, do as follows to get the machine out.

### Stuck One Side Of Track

#### NOTICE

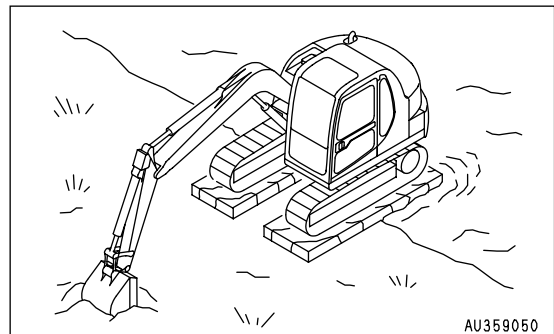
When using the boom or arm to raise the machine, always have the bottom of the bucket in contact with the ground. (Never push with the teeth). The angle between the boom and arm should be  $90^{\circ}$  to  $110^{\circ}$ . The same applies when using the inverting bucket.

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

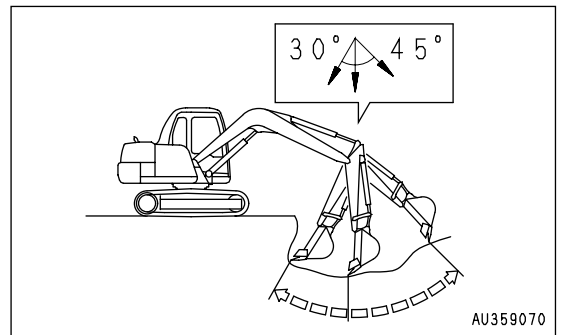
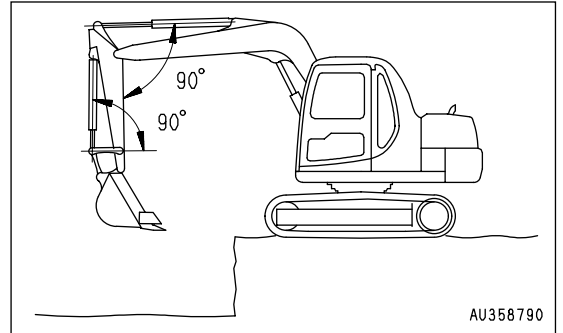
A backhoe is suitable for excavating at a position lower than the machine.

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 90°.

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

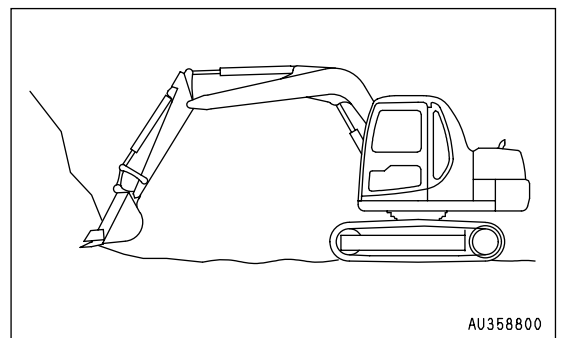
The range for excavating with the arm is from a 45° angle away from the machine to a 30° angle toward the machine.

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



### Shovel Work

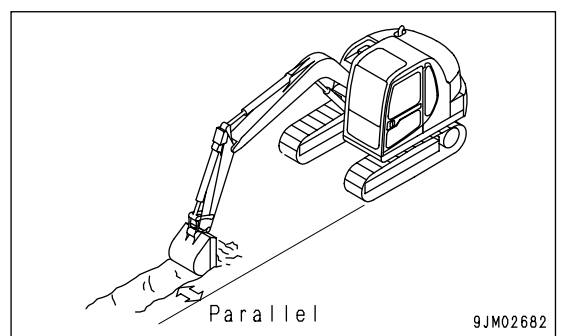
A shovel is suitable for excavating at a position higher than the machine. Shovel work is performed by attaching the bucket in the reverse direction.



### 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.

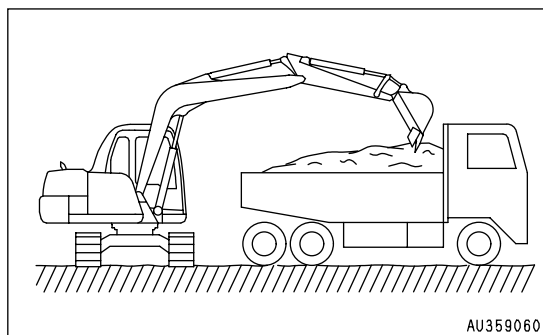
To excavate a wide ditch, first dig out both sides and then finally remove the center portion.



## 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.



## BUCKET REPLACEMENT AND INVERSION

### 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.

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.

### Replacement

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

#### REMARK

When removing the pins, place the bucket so that it is in light contact with the ground.

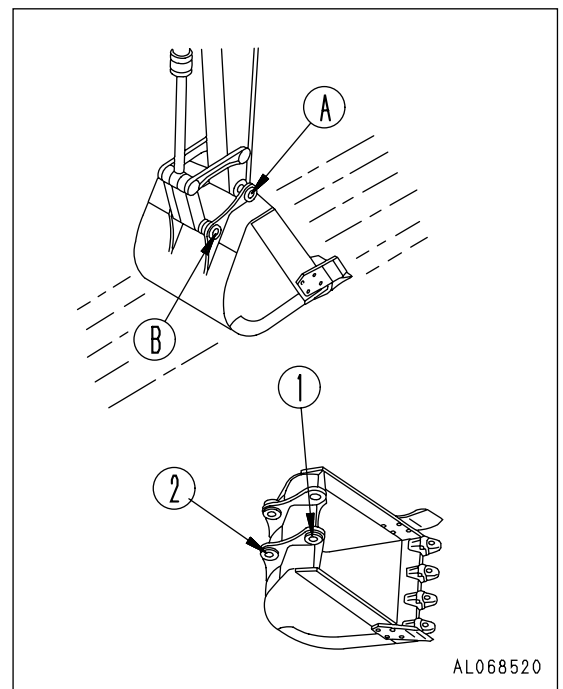
If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.

#### NOTICE

After removing the pins, make sure that mud or sand does not get on them.

Dust seals are fitted at both ends of the bushings, so be careful not to damage them.

2. Remove the ring plate and stopper pin, then pull out pins (A) and (B), and remove the bucket.
3. Align the arm with holes (1) and the link with holes (2), then install grease coating pins (A) and (B).



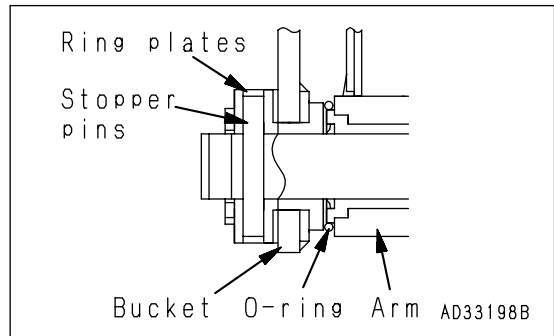


**REMARK**

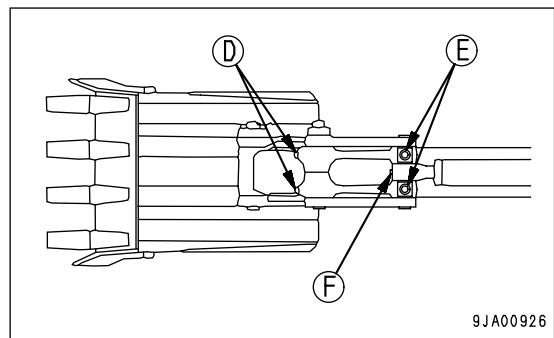
When installing the bucket, the O-rings are easily damaged, so fit the O-rings on the boss of the arm end as shown in the diagram.

When knocking the pin, move the O-ring down to the regular groove.

4. Install the ring plates and stopper pins to each pin.



Add grease through fittings (D), (E), and (F)(total: 5 points) on the bucket link.



**Inversion**

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

**REMARK**

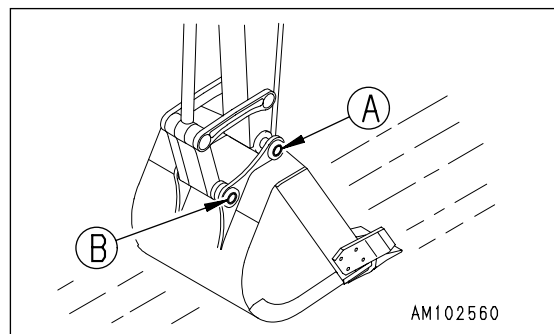
When removing the pins, place the bucket so that it is in light contact with the ground.

If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.

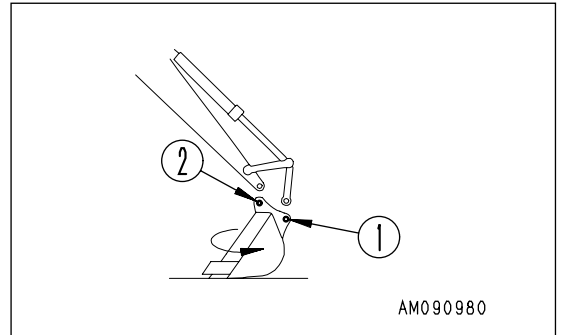
**NOTICE**

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

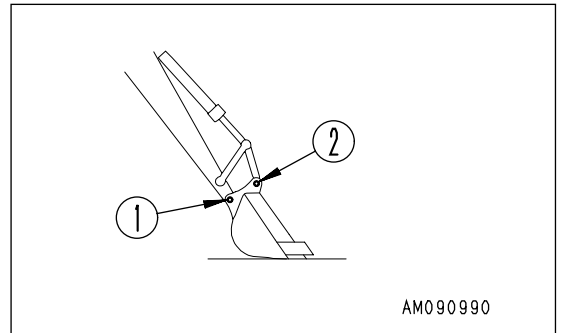
2. Remove the ring plate and stopper pin, then pull out pins (A) and (B), and remove the bucket.



3. Install the bucket inversely.  
After the bucket is inverted, correct the inclination and direction of the retaining pin holes (1) and (2) and stabilize the bucket securely.

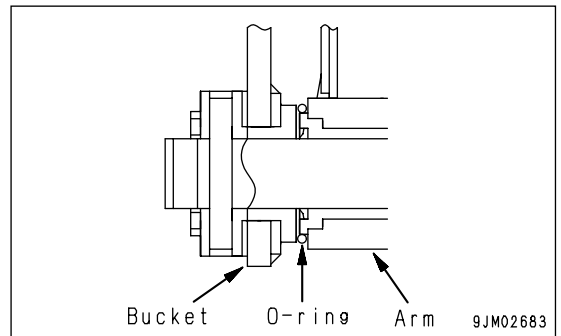


4. Align the arm with holes (1) and the link with holes (2), then install grease coating pins (A) and (B).

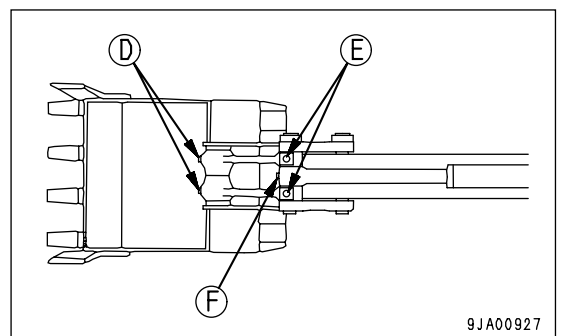


**REMARK**

Install the O-rings into retaining hole (1) of the arm and bucket. When installing the bucket, the O-rings are easily damaged, so fit the O-rings on the boss of the arm end as shown in the diagram. When knocking the pin, move the O-ring down to the regular groove.



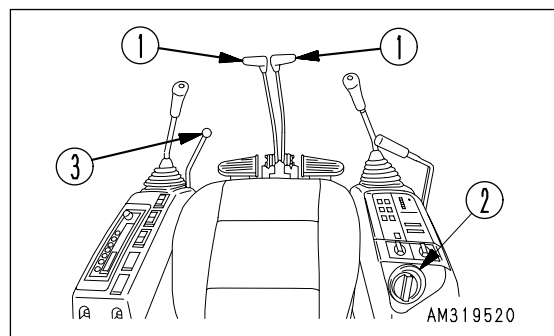
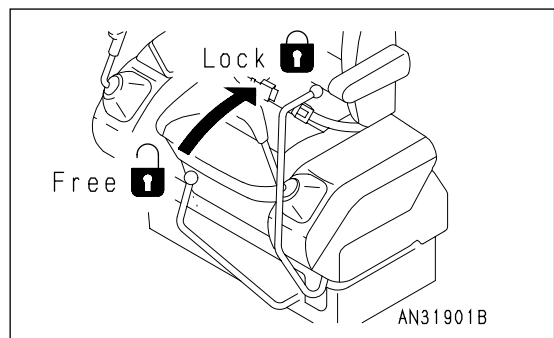
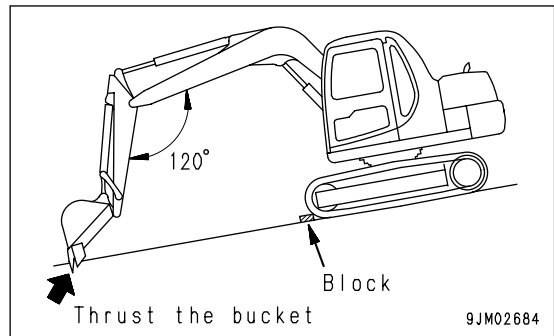
5. Install the ring plates and stopper pins to each pin.  
Add grease through fittings (D), (E), and (F)(total: 5 points) on the bucket link.



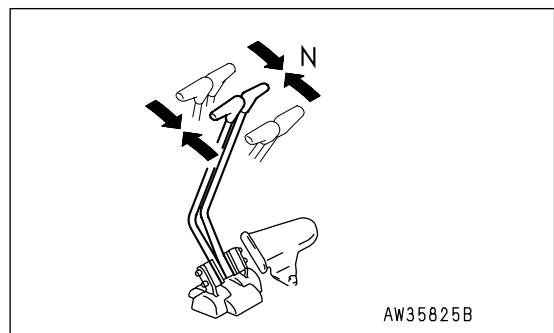
# PARKING MACHINE

**⚠ WARNING**

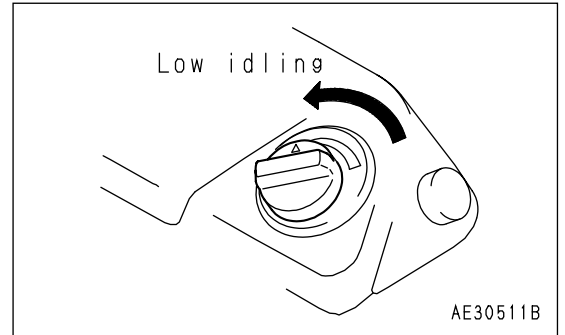
- Avoid stopping suddenly. Give yourself ample room when stopping.
- When stopping the machine, select flat hard ground and avoid dangerous places. If it is unavoidably necessary to park the machine on a slope, insert blocks underneath the track shoes. As an additional safety measure, thrust the bucket 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.



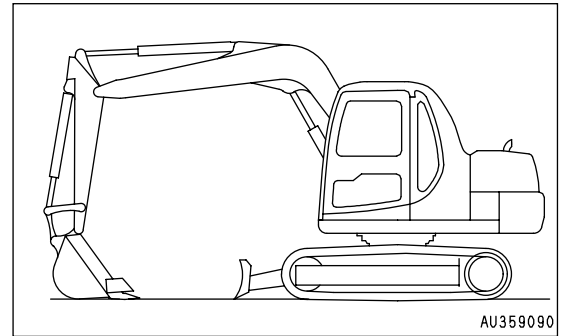
1. Put left and right travel levers (1) in the neutral position. The machine stops.



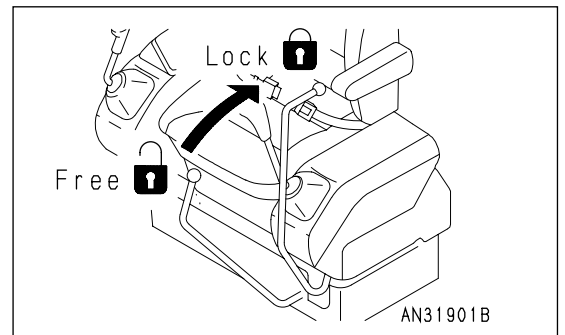
- 2. Lower the engine speed to low idling by fuel control dial (2) .



- 3. Lower the bucket horizontally until the bottom touches the ground.
- 4. Lower the blade to the ground. (Only machines with blade specification)

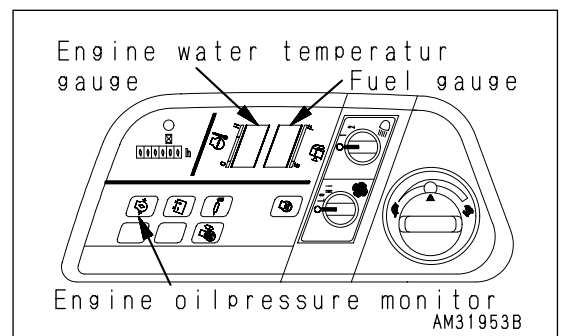


- 5. Set safety lock lever (3) in the LOCK position.



**MACHINE INSPECTION AFTER DAILY WORK**

Check the engine water temperature, engine oil pressure, and fuel level on the machine monitor.



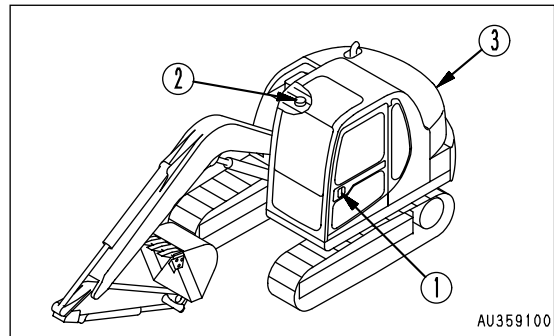
## LOCKING

Always lock the following places.

- (1) Door of operator's cab  
Always remember to close the window.
- (2) Fuel tank filler port
- (3) Engine hood

### REMARK

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



## RUBBER SHOES AND ROAD LINERS

(Mechine equipped with rubber shoes, road liner)

### Rubber Shoes And Road Liners Information

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

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

### Comparison Among Rubber Shoes

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

Considering the properties of the material used, rubber shoes and road liners offer various advantages. However, thier weak point is lack of strength. Therefore, it is important to understand the advantages of rubber shoes and road liners, and to follow the precautions regarding handling and prohibited work. This will extend the life of the rubbershoes and road liners and will enable the machine to display the advantages of rubber shoes and road liners to the maximum. Before using rubber shoes and road liner, always read "Using Rubber Shoes And Road Liners (PAGE 3-80)".

### Warranty For Rubber Shoes And Road Liners

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

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

## Using Rubber Shoes And Road Liners

### Prohibited Works

Do not carry out the following types of work.

- Carrying out operations and steering on crushed rock, extremely rough hard rock, steel beams, scrap iron, or near the edges of steel plates will cause damage to the rubber shoes and road liners.
- In places such as river beds where there are large numbers of large and small boulders, the stones may get caught and damage the rubber shoes and road liners or make the shoes come off. If dozing operations are carried out when the shoes are slipping, this will reduce the life of the rubber shoes and road liner.
- Be careful not to get oil, fuel, or chemical solvent on the rubber shoes and road liners. If such a substance 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.
- When the rubber parts of the road liner are so worn or broken that the head of the mounting bolts are scratched, replace the shoe immediately. If the bolt heads are broken, the bolt cannot be removed.
- When installing road liners, always install them to all links on both sides. If they are installed to only one part of the links, their durability will be greatly reduced.

### Long Life Operations

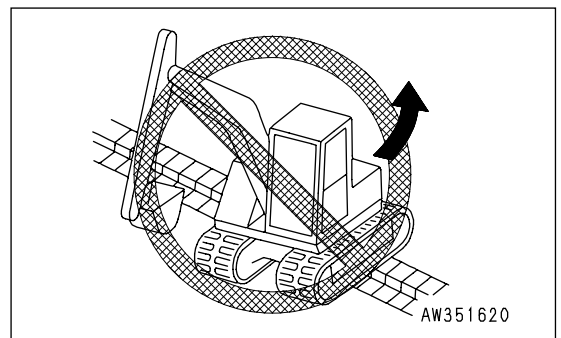
Be careful of the following points when carrying out work.

- Avoid carrying out counter-rotation turns on concrete surfaces.
- Avoid making sudden changes in direction. This may cause premature wear or damage to the rubber shoes and road liners.
- Avoid operating the steering when traveling over places where there is a big difference in height. When traveling over obstacles or places where there is a difference in height, drive the machine at right angles to the obstacle to prevent the shoes from coming off.
- If the machine has been raised using the bucket, lower it slowly.
- Avoid doing work with materials that produce oil when crushed (soya beans, corn, or remains of vegetables squeezed for oil); or wash the machine after use.
- Avoid handling materials that will attack the adhesion of the steel core, such as salt, ammonium sulphate, potassium chloride, potassium sulphate, or calcium superphosphate; or wash the machine after use.
- The adhesion of the core will be attacked by salt, so avoid using the machine in coastal areas.
- When handling salt, sugar, wheat, or soya beans, if there is any deep cut in the rubber shoes and road liners, these substances may get into the lugs or cut portion of the rubber. Always repair the rubber before use.
- Do not carry out work that involves scraping against walls or concrete embankments.

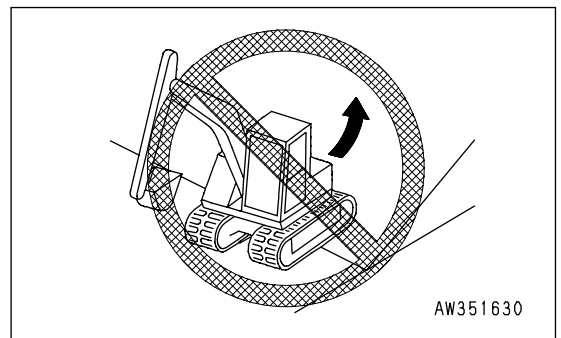
- Rubber shoes and road liners slip extremely easily on snow or frozen roads. Be careful not to slip when traveling or working on slopes.
- The properties of rubber shoes and road liners change when working in extremely cold places, and this will reduce the life of the rubber shoes and road liners.
- Because of the properties of rubber, use the rubber shoes within a range of -25°C - +55°C (-13°F - +131°F).  
Because of the properties of rubber, use the road liners within a range of -25°C - +65°C (-13°F - +149°F).
- When carrying out bucket operations, be careful not to damage the rubber shoes and road liners with the bucket.
- Always maintain the rubber shoes at the proper tension to prevent them from coming off.

If the tension is low, the rubber shoes will come off under the following conditions.

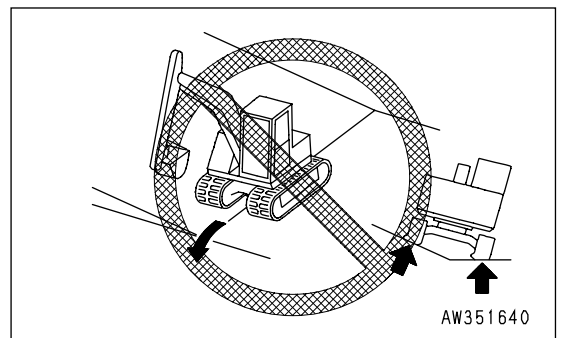
1. Avoid operating the steering when traveling over curbs, rocks, or places where there is a big difference in height (more than approx. 20cm (8 in)). When traveling over such objects, always travel at right angles to the object.



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

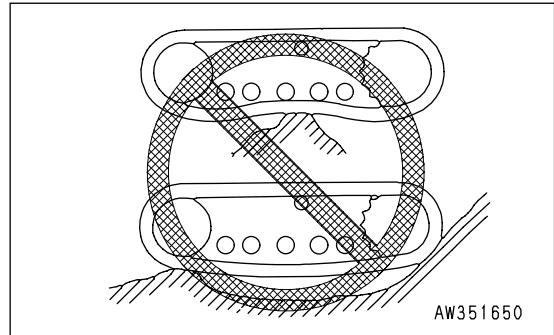


3. Avoid traveling along the edge of slopes or on rough ground with the track on one side raised (with the machine tilting at an angle of more than approx. 10°) and with the track on the other side on flat ground. To avoid damage to the rubber shoes and road liners, travel with the tracks on both sides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



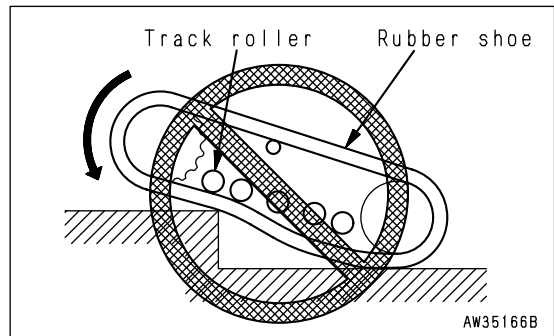


4. If the machine is operated as explained in 1 to 3 above, the rubber shoes is slackened. Do not steer the machine in the positions shown in the figure.

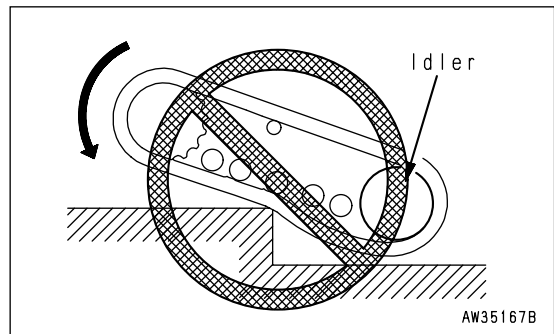


Mechanism of rubber shoe coming off track

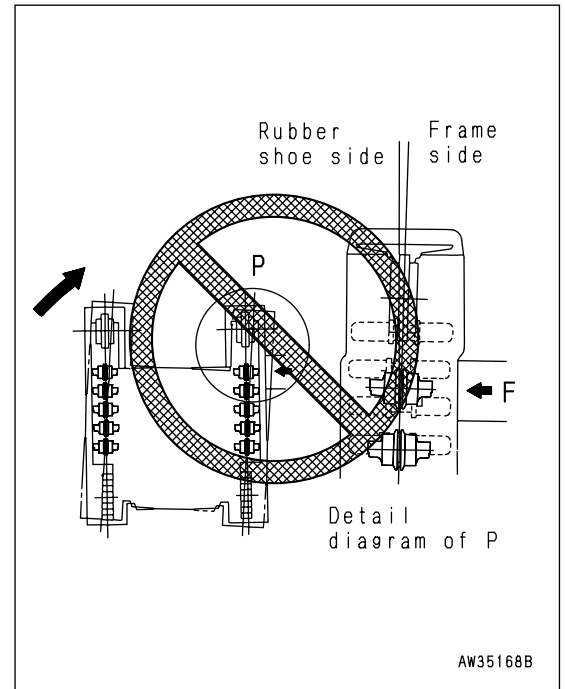
- 1) When traveling over an obstacle, a gap is formed between the track roller and the rubber shoe. In this condition, the rubber shoe may come off.



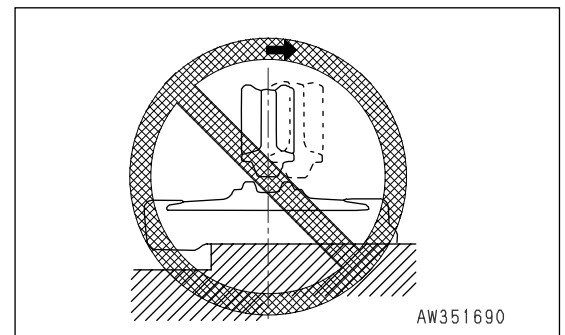
- 2) Furthermore, if the machine travels in reverse, a gap is formed between the track roller, idler, and rubber shoe.



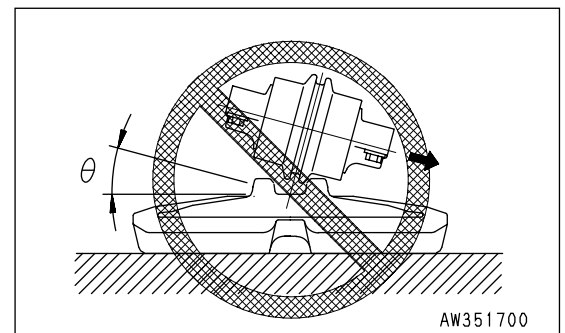
- When turning in a condition where the rubber shoe cannot move to the side because of the object it is passing over, or because of some other object.
- When the rubber shoe has moved out of alignment and the idler or track roller are not aligned with the core.



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



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



# TRANSPORTATION

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

## TRANSPORTATION PROCEDURE

As a basic rule, transport the machine by trailer.

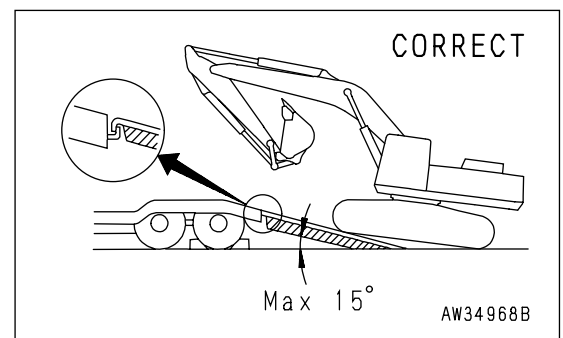
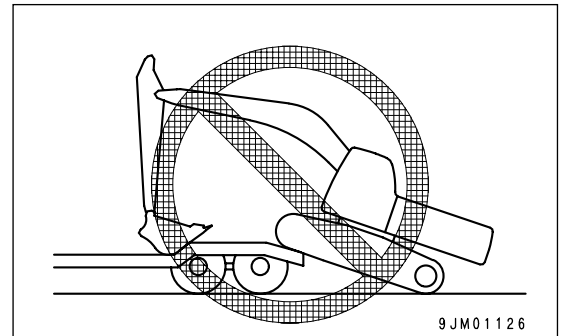
Select the trailer to match the weight and dimensions given in "SPECIFICATIONS (PAGE 5-2)".

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

## LOADING AND UNLOADING WITH TRAILER

### **⚠ WARNING**

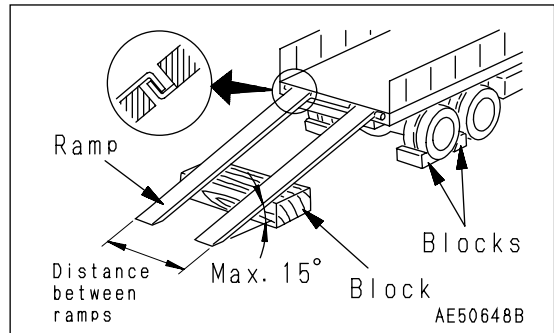
- Always turn the swift deceleration switch OFF during loading and unloading operations. If the swift deceleration switch is left ON, the machine may suddenly start moving.
- When loading or unloading on to a trailer, set to low speed, and do not operate the travel speed selector switch during the operation.
- 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 15°. 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.



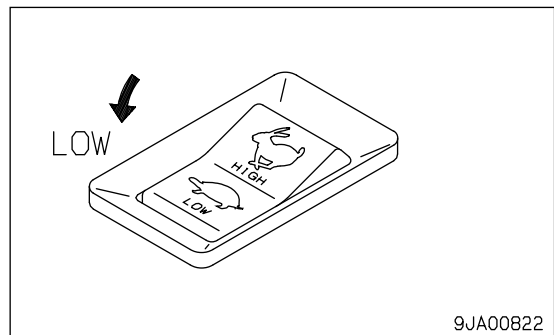
When loading or unloading, always use ramps or a platform and carry out the operation as follows.

### Loading

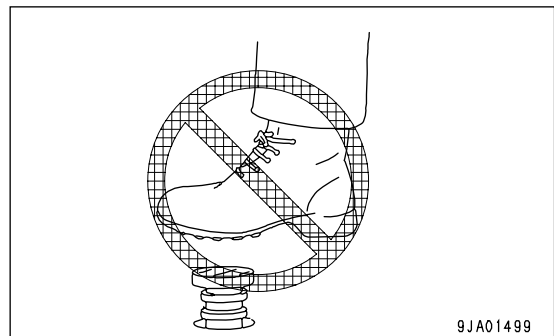
1. Perform loading and unloading on firm, level ground only. Maintain a safe distance from the edge of a road.
2. Properly apply the brakes on the trailer and put blocks under the tires to ensure that the trailer does not move. Then fix the ramps in line with the centers of the trailer and the machine.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



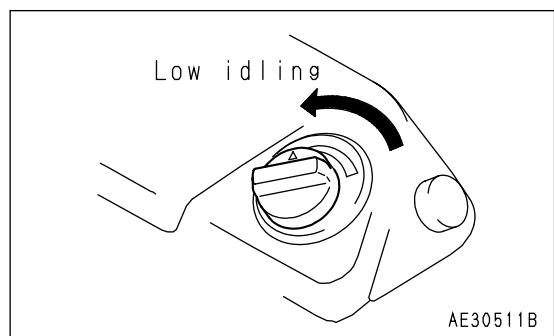
3. Set the travel speed selector switch to the LOW position. (Except machines with blade specification)



Do not operate the travel boost pedal. (Only machines with blade specification)



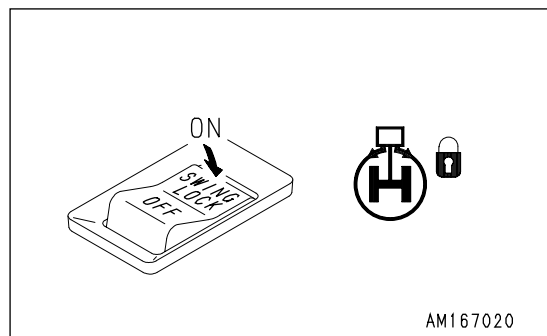
4. Lower the engine speed to low idling fuel control dial.



5. Turn the swing lock switch ON to apply the swing lock.

**NOTICE**

Turn the swing lock switch ON to apply the swing lock.



6. Set the machine facing the ramps and travel slowly. Keep the work equipment as low as possible without letting it hit the trailer when loading or unloading the machine.  
When the work equipment is installed, load machine from the front; when no work equipment is installed, load the machine from the rear.

When on the ramps, do not operate any lever except the travel lever.

7. Turn the switch lock switch OFF to reset the swing lock.  
Turn the upper structure slowly by 180°.
8. Load the machine correctly in the specified position on the trailer.

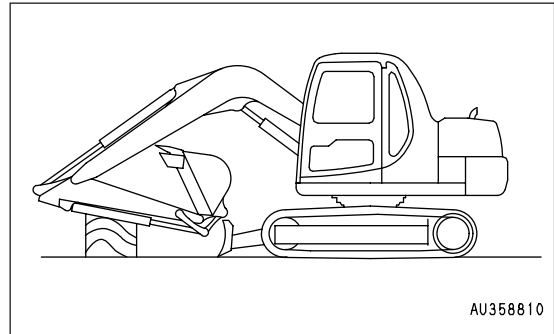
## Securing Machine

### NOTICE

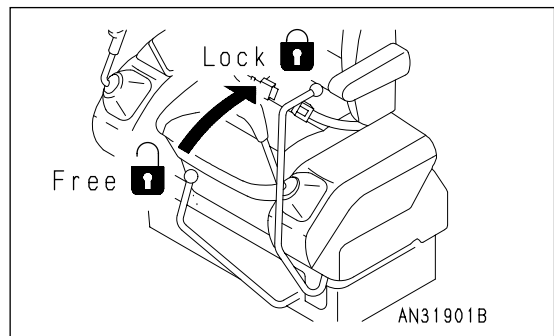
- Retract the car radio antenna.
- To prevent damage to the bucket cylinder during transportation, fit a wooden block at one end of the bucket cylinder to prevent it from touching the floor.

Load the machine on to a trailer as follows.

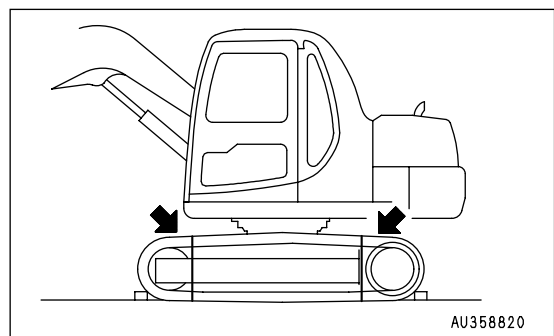
1. Lower the blade. (Only machines with blade specification)
2. Extend the bucket and arm cylinders fully, then lower the boom slowly.
3. Stop the engine, then remove the key from the starting switch.



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

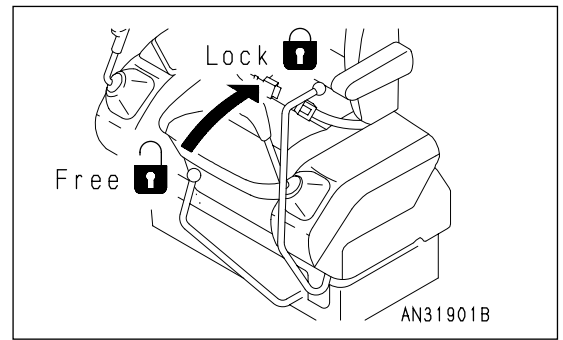
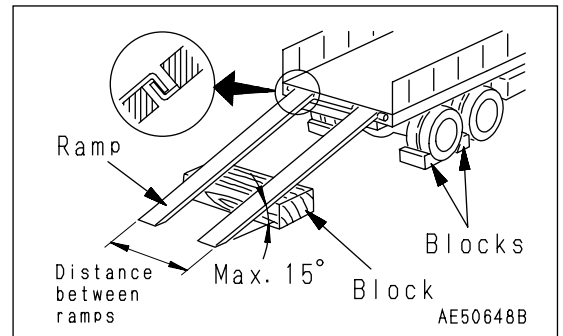


5. Put blocks under both ends of the tracks to prevent the machine from moving during transportation, and tie the machine down securely with chains or wire rope of suitable strength. Be particularly careful to fix the machine in position securely so that it does not slip to the side.

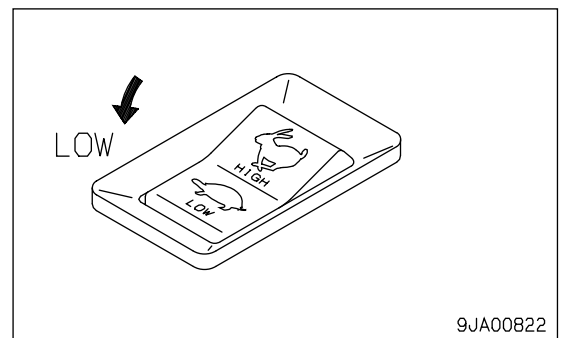


## Unloading

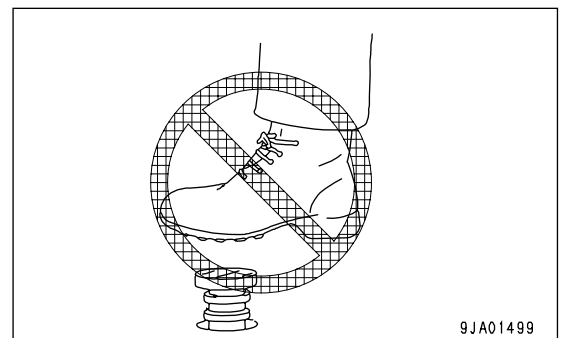
1. Perform loading and unloading on firm, level ground only. Maintain a safe distance from the edge of a road.
2. Properly apply the brakes on the trailer and put blocks under the tires to ensure that the trailer does not move. Then fix the ramps in line with the centers of the trailer and the machine.  
Be sure that the two sides are at the same level as one another.  
Make the slope of the ramps a maximum of 15°. Set the distance between the ramps to match the center of the tracks.
3. Remove the chains or wire rope holding the machine.
4. Start the engine.
5. Set the safety lock lever to the FREE position.



6. Set the travel speed selector switch to the LOW position. (Except machines with blade specification)



Do not operate the travel boost pedal. (Only machines with blade specification)

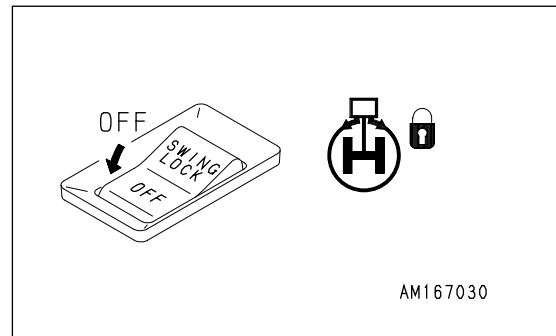




7. Turn the swing lock switch OFF to release the swing lock.

**NOTICE**

Check that swing lock monitor goes out at the same time.



8. Raise the work equipment and swing the upper structure slowly 180°.
9. Raise the blade. (Blade specification only)
10. Set the machine facing the ramps and travel slowly.  
Keep the work equipment as low as possible without letting it hit the ground or any other object.  
When on the ramps, do not operate any lever other than the travel levers.

## 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.

### NOTICE

The lifting procedure applies to machines with standard specifications.

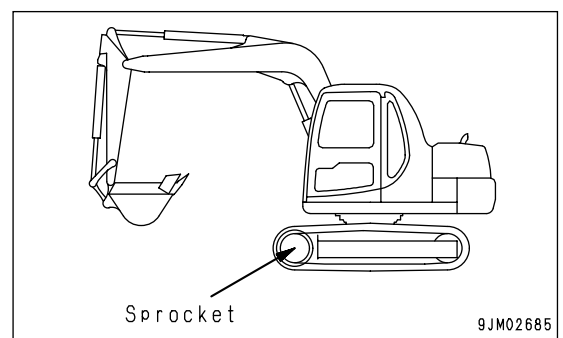
The method of lifting differs according to the attachments and options actually installed. In such cases, please contact your Komatsu distributor for information.

### Standard Specification Machine

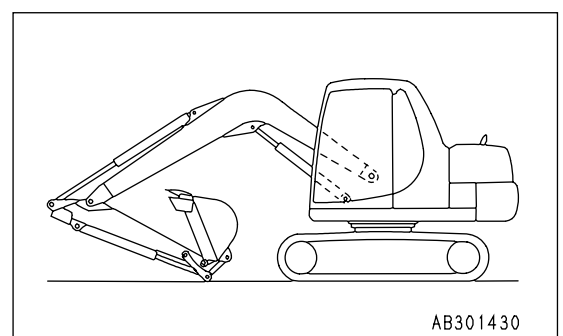
When lifting the machine, carry out the operation on flat ground as follows.

For machines with a blade, raise the blade.

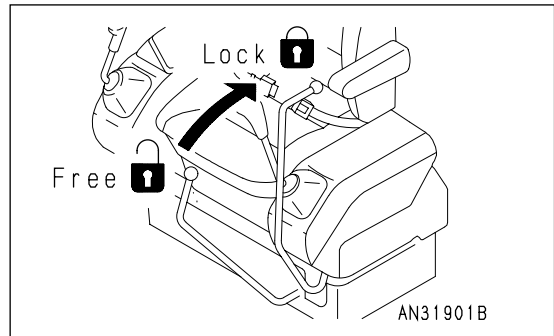
1. Start the engine, then swing the upper structure so that the work equipment is at the rear of the machine.



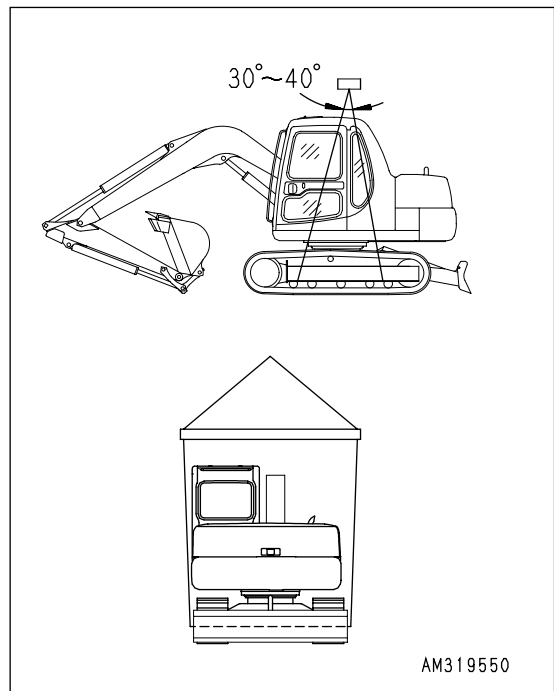
2. Extend the bucket cylinder and arm cylinder fully, then lower the work equipment to the ground as shown in the diagram on the right using the boom cylinder.



3. Lock the lock levers securely.



4. Stop the engine, check that there is nothing around the operator's compartment, then get off the machine. Close the cab door and front glass securely.
5. Pass wire ropes between the 1st and 2nd track rollers from the front and between the 1st and 2nd track rollers from the rear.
6. Set the lifting angle of the wire rope to 30° to 40°, then lift the machine slowly.
7. After the machine comes off the ground, check carefully that the machine is balanced, then lift slowly.

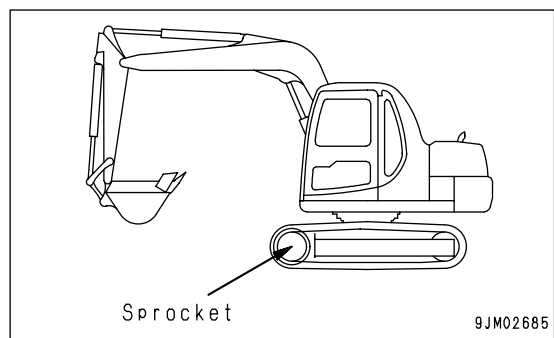


### Machines With Lifting Hook

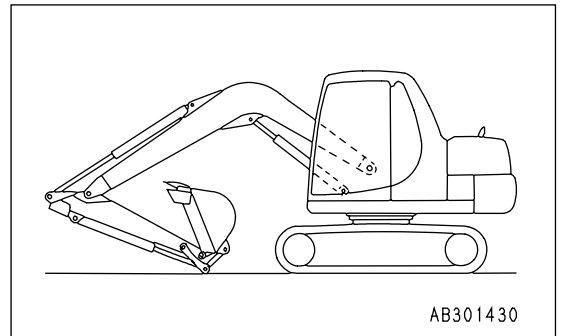
When lifting the machine, select a flat place and do as follows.

For machines with a blade, raise the blade.

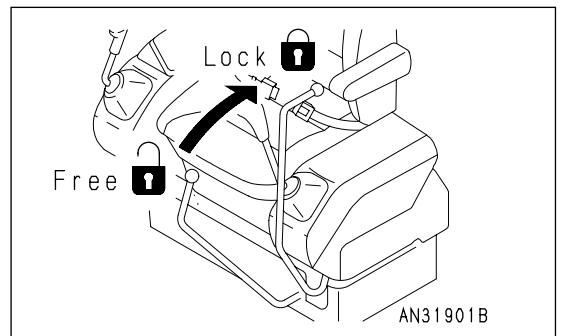
1. Start the engine, then swing the work equipment so that the work equipment is at the rear of the machine (sprocket end).



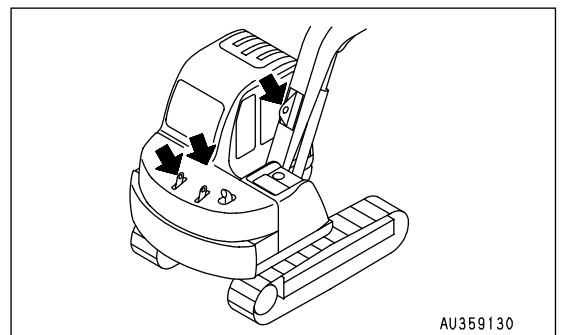
2. Extend the bucket cylinder and arm cylinder fully, then lower the work equipment to the ground as shown in the diagram on the right using the boom cylinder.



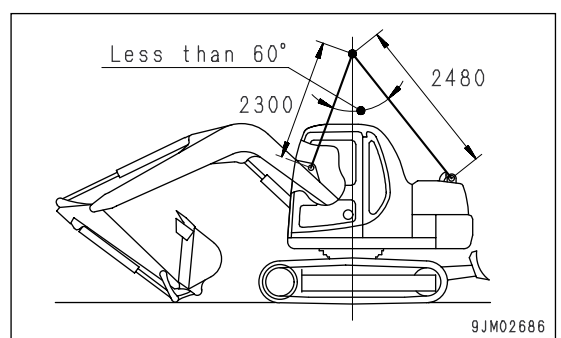
3. Lock the lock levers securely.



4. Install shackles at 3 places to the boom and counterweight, then use lifting hooks and install the wire ropes so that the lifting angle is less than 60°.



5. When raising the machine, check that there is no change in the posture caused by leakage from the hydraulic circuit at the boom cylinder head end.
6. When the machine leaves the ground, stop for a moment and wait for the machine to stabilize, then continue the lifting operation 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 "RECOMMENDED FUEL, COOLANT, AND LUBRICANT (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 amounts of fresh water and see a doctor at once.
- When changing the coolant or when handling coolant containing antifreeze that has been drained when repairing the radiator, please contact your Komatsu distributor or request a specialist company to carry out the operation. Antifreeze is toxic. Do not let it flow into drainage ditches or spray it onto the ground surface.
- Antifreeze is flammable. Do not bring any flame close. Do not smoke when handling antifreeze.

#### NOTICE

- Use Komatsu Supercoolant wherever available, or use permanent type antifreeze coolant.
- Never use methanol, ethanol, or propanol-based antifreeze.
- Do not use any water leakage prevention agent, either alone, or in combination with antifreeze.
- Do not mix one brand of antifreeze with a different brand.

For details of the antifreeze mixture when changing the coolant, see "Cooling System Coolant - Clean/Change (PAGE 4-24)".

## Battery

**⚠ WARNING**

- The battery generates flammable gas. Do not bring fire or sparks near the battery.
- Battery electrolyte is dangerous. If it gets in your eyes or on your skin, wash it off with a large amount of water and consult a doctor.
- Battery electrolyte dissolves paint. If it gets on the bodywork, wash it off immediately with water.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source. There is danger that the battery may explode.
- Battery electrolyte is toxic. Do not let it flow into drainage ditches or spray it on to the ground surface.

When the ambient temperature drops, the capacity of the battery will also drop. If the battery charge ratio is low, the battery electrolyte may freeze. Maintain the battery charge as close as possible to 100%, 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.

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

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

## Grease For Automatic Greasing System

(The automatic greasing system is optional)

Use NLGI No. 2 grease for the automatic greasing system. There is no particular need to change it in temperatures down to -15°C. If the temperature goes below -15°C, the grease inside the greasing piping and cartridge must be changed to NLGI No. 0 grease, which has low viscosity.

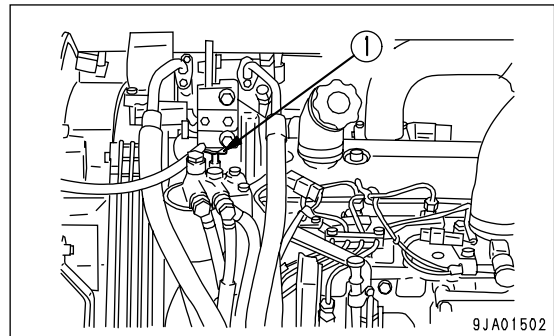
This system is available as an option. Please contact your Komatsu distributor when changing the grease.

## Preparing The Cab Heater

When the ambient temperature becomes cold, use the car heater.

When using the car heater, turn valve (1) on the water manifold counterclockwise to open it.

At the end of the cold season, when not using the car heater for a long period, turn the valve (1) clockwise to close it.



## AFTER DAILY WORK COMPLETION

### WARNING

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

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

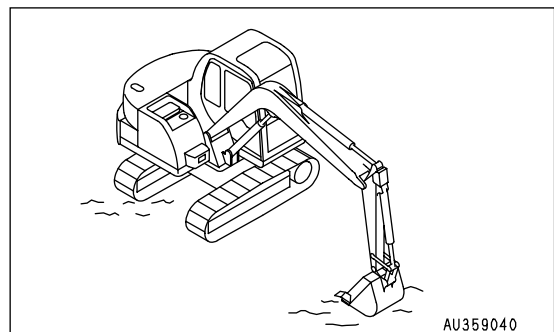
- Remove all the mud and water from the machine body. In particular, wipe the hydraulic cylinder rod clean to prevent damage to the seal caused by mud, dirt, or drops of water on the rod from getting inside the seal.
- Park the machine on hard, dry ground.

If this is impossible, park the machine on 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.
- Fill the fuel tank to capacity. This minimizes moisture condensation in the tank when the temperature drops.
- After operation in water or mud, remove water from undercarriage as described below to extend undercarriage service life.

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



## AFTER COLD WEATHER SEASON

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

- Replace the fuel and oil for all parts with oil of the viscosity specified.

For details, see "RECOMMENDED FUEL, COOLANT, AND LUBRICANT (PAGE 4-11)".



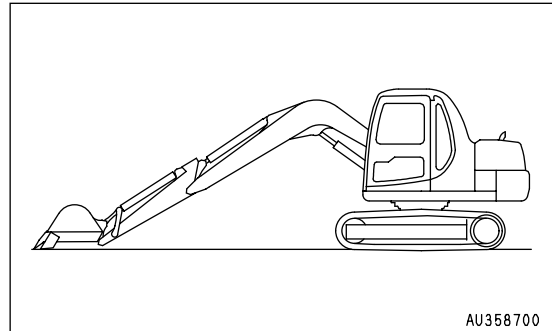
# LONG TERM STORAGE

## BEFORE STORAGE

### NOTICE

When storing the machine (1 month or more), set the machine in the posture shown in the diagram on the right to protect the cylinder rod.

When keeping in long-term storage (more than one month), store as follows.



- Clean and wash all parts, then store the machine indoors. If the machine has to be stored outdoors, select level ground and cover the machine with a sheet.
- Completely fill the fuel tank. This prevents moisture from collecting.
- Lubricate and change the oil before storage.
- Coat the exposed portion of the hydraulic cylinder piston rod with grease.
- Disconnect the negative terminals of the battery and cover it or remove it from the machine and store it separately.
- Lock each control lever and pedal with the lock lever and pedal lock.
- Set the stop valve to the LOCK position on machines ready for attachments. Install the blind plugs to the elbows.
- Set the selector valve on the machines which can install attachments to the "Crusher or general attachment" position.
- To prevent corrosion, be sure to fill the cooling system with Supercoolant (AF-NAC) or permanent type anti-freeze (density between 30% and 68%).

## DURING STORAGE

### WARNING

If it is necessary to perform the rust-prevention operation while the machine is indoors, open the doors and windows to improve ventilation and prevent gas poisoning.

- During storage, operate and move the machine for a short distance once a month so that a new film of oil will coat moving parts. At the same time, also charge the battery.
- When operating the work equipment, wipe off all the grease from the hydraulic cylinder rods.
- If the machine is equipped with an air conditioner, operate the air conditioner for 3 to 5 minutes once a month to lubricate all parts of the air conditioner compressor. Always run the engine at low idling when doing this. In addition, check the refrigerant level twice a year.

## 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.

## STARTING MACHINE AFTER LONG-TERM STORAGE

When starting the engine after long-term storage, cancel the automatic warming-up operation as follows.

1. Turn the starting switch key to the ON position.
2. Turn the fuel control dial from the low idling position to the FULL position and hold it there for at least 3 seconds.  
Then return it to the idling position and start the engine.

# TROUBLES AND ACTIONS

## RUNNING OUT OF FUEL

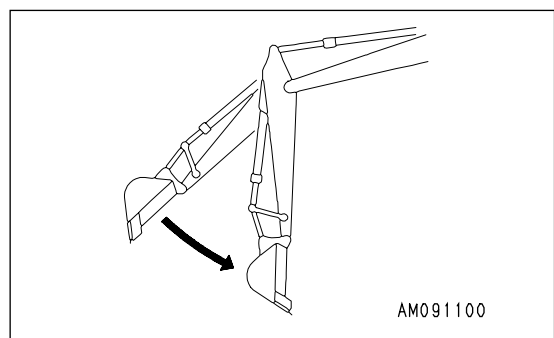
When starting after running out of fuel, fill with fuel and bleed the air from the fuel system before starting.

For details of bleeding the air, see "Fuel Filter Cartridge - Replace (PAGE 4-63)".

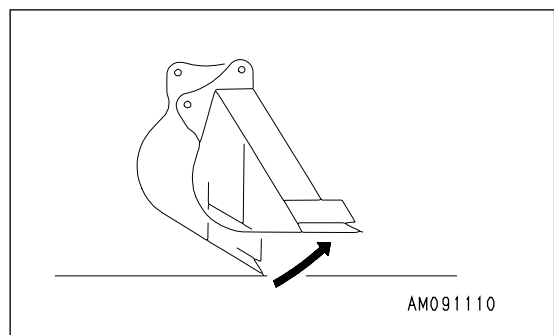
## PHENOMENA THAT ARE NOT FAILURES

Note that the following phenomena are not failures:

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



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



- When starting or stopping the swing, noise will be emitted from the brake valve.
- When going down a steep slope at low speed, a noise will be emitted from the travel motor.
- When the starting switch is turned ON, the automatic greasing pump is actuated for 3 to 5 seconds.

## TOWING THE MACHINE

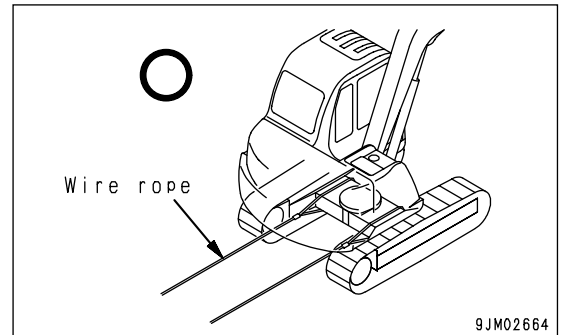
### ⚠ WARNING

- 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.

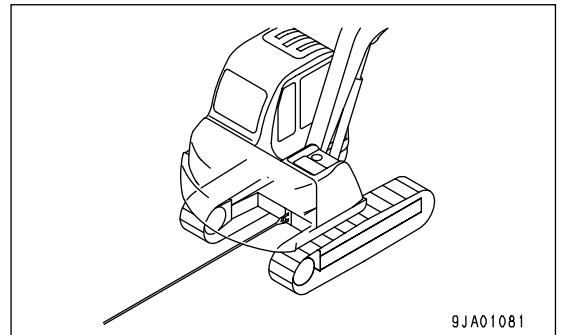


## LIGHTWEIGHT TOWING HOOK

### ⚠ WARNING

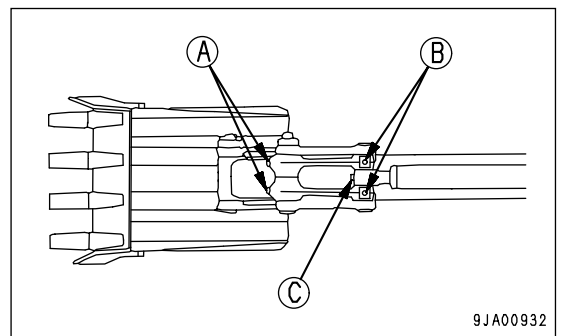
- The shackle must always be used.
- Hold the rope level and direct it straight to the track frame.
- Move the machine slowly in the Lo mode.

The track frame has been equipped with a hook to pass the shackle for towing light objects.  
(Except machines with blade specification)



## SEVERE JOB CONDITION

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

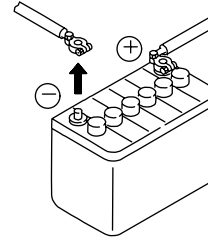


## DISCHARGED BATTERY

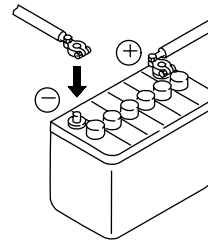
### **⚠ WARNING**

- When checking or handling the battery, stop the engine and turn the starting switch key to the OFF position.
- The battery generates hydrogen gas, so there is a hazard of explosion. Do not bring lighted cigarettes near the battery, or do anything that will cause sparks.
- Battery electrolyte is dilute sulphuric acid, and it will attack your clothes and skin. If it gets on your clothes or on your skin, wash it immediately off with large 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.

When removing, disconnect the cable from the ground terminal first.



When installing, connect the cable to the positive (+) terminal first.



AW35946B

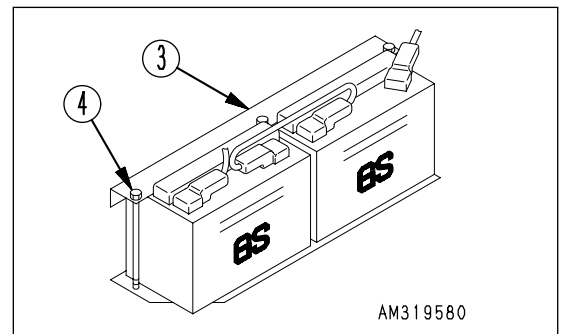
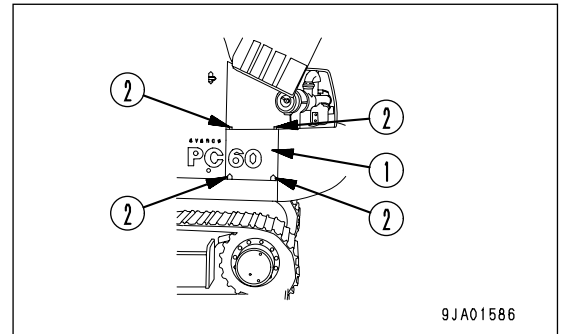
## Battery Removal And Installation

- When removing and charging the battery, remove 4 bolts (2) of cover (1), then remove the cover.
- When removing the battery, disconnect the ground cable (normally the negative (-) terminal) first.  
Be careful not to touch with any tool between the terminal and the machine. There is danger that this may cause a spark.
- When installing the battery, connected the ground cable last.
- When replacing the battery, fix the battery securely with battery clamp (3).

Tightening torque of mounting bolt (4): 5.88 to 6.86 N•m  
(0.6 to 0.7 kgf•m, 4.3 to 5.1 lbf)

### NOTICE

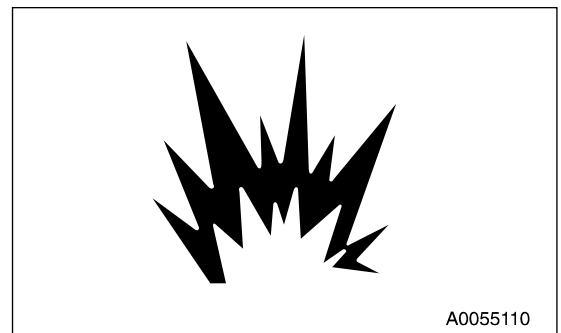
**After securing the battery, check that it does not move. If it moves, tighten it again securely.**



## 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 3-106)" 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.



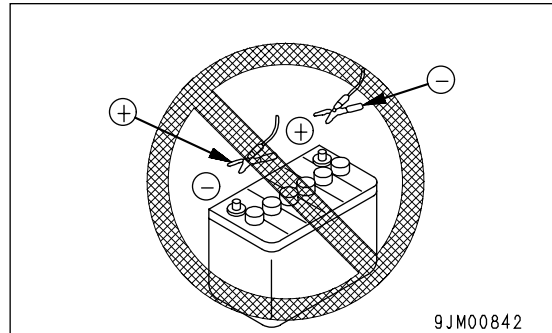
## Starting Engine With Booster Cables

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

### Connecting a and Disconnecting Booster Cables

#### **⚠ WARNING**

- When connecting the cables, never contact the positive (+) and negative (-) terminals.
- When starting the engine with a booster cable, always wear safety glasses.
- Be careful not to let the normal machine and problem machine contact each other. This prevents sparks from generating near the battery which could ignite the hydrogen gas given off by the battery. If hydrogen gas explodes, it could cause serious injury.
- 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

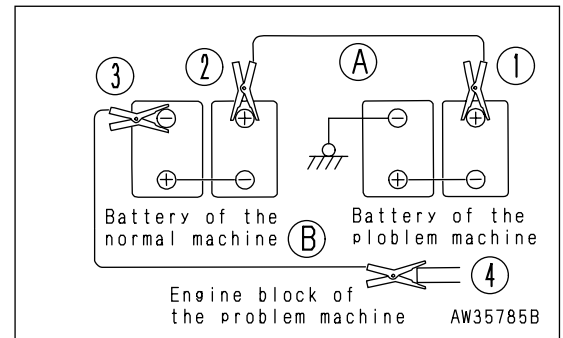
- The size of the booster cable and clip should be suitable for the battery size.
- The battery of the normal machine must be the same capacity as that of the engine to be started.
- Check the cables and clips for damage or corrosion.
- Make sure that the cables and clips are firmly connected.
- Check 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 normal machine and problem machine both at the OFF position.

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

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



### Starting the Engine

#### ⚠ CAUTION

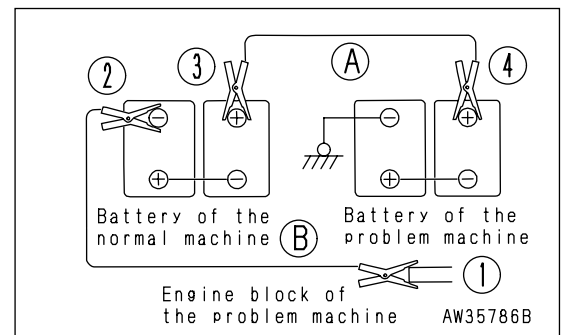
Always check that the safety lock lever is set to the LOCK position, regardless of whether the machine is working normally or has failed. Check also that all the control levers are at the HOLD or neutral position.

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 1000 HOURS SERVICE
Charge level monitor does not go out even when engine is running	● Defective alternator ● Defective wiring	( ● Replace) ( ● Check, repair)
Abnormal noise is generated from alternator	● Defective alternator	( ● Replace)
Starting motor does not turn when starting switch is turned to ON	● Defective wiring ● Defective starting motor ● Insufficient battery charge ● Defective safety relay	( ● Check, repair) ( ● Replace) ● Charge ( ● Replace)
Pinion of starting motor keeps going	● 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 heater relay ● Defective monitor ● Disconnected glow plug	( ● Check, repair) ( ● Replace) ( ● Replace) ( ● Replace)
Oil pressure monitor does not light up when engine is stopped (starting switch at ON position)	● Defective monitor	( ● Replace)
When outside of electric heater is touched by hand, it is not warm	● Defective wiring ● Disconnection in electric heater ● Defective operation of heater	( ● Check, repair) ( ● Replace) ( ● Replace)
Automatic greasing monitor lights	See AUTOMATIC GREASING CONTROLLER	

## Chassis

- 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	<ul style="list-style-type: none"> <li>● Lack of hydraulic oil</li> </ul>	<ul style="list-style-type: none"> <li>● Add oil to specified level, see CHECK BEFORE STARTING</li> </ul>
Pump generates abnormal noise	<ul style="list-style-type: none"> <li>● Clogged element in hydraulic tank strainer</li> </ul>	<ul style="list-style-type: none"> <li>● Clean, see EVERY 2000 HOURS SERVICE</li> </ul>
Excessive rise in hydraulic oil temperature	<ul style="list-style-type: none"> <li>● Loose fan belt</li> <li>● Dirty oil cooler</li> <li>● Lack of hydraulic oil</li> </ul>	<ul style="list-style-type: none"> <li>● Adjust fan belt tension, EVERY 1000 HOURS SERVICE</li> <li>● Clean, see EVERY 500 HOURS SERVICE</li> <li>● Add oil to specified level, see CHECK BEFORE STARTING</li> </ul>
Track comes off	<ul style="list-style-type: none"> <li>● Track too loose</li> </ul>	<ul style="list-style-type: none"> <li>● Adjust track tension, see WHEN REQUIRED</li> </ul>
Abnormal wear of sprocket		
Bucket rises slowly, does not rise	<ul style="list-style-type: none"> <li>● Lack of hydraulic oil</li> </ul>	<ul style="list-style-type: none"> <li>● Add oil to specified level, CHECK BEFORE STARTING</li> </ul>
Does not swing	<ul style="list-style-type: none"> <li>● Swing lock switch still applied</li> </ul>	<ul style="list-style-type: none"> <li>● Turn swing lock switch OFF</li> </ul>

## 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.

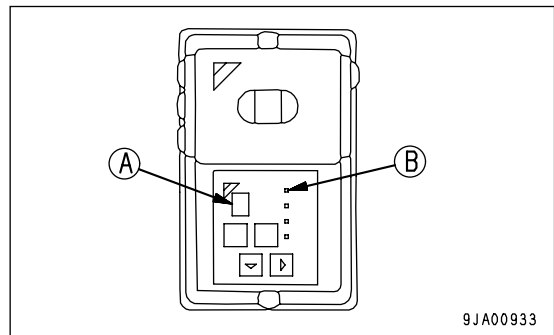
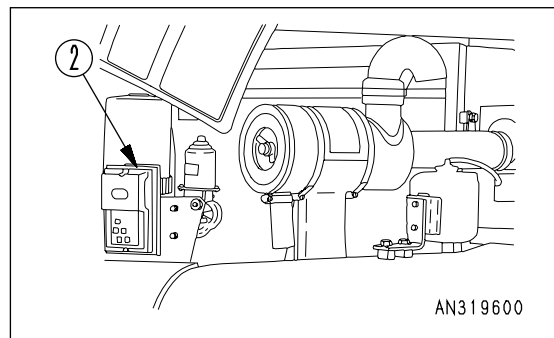
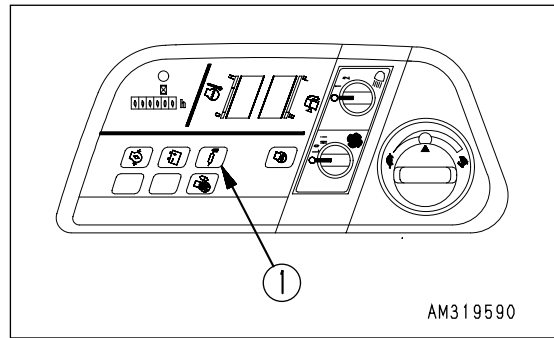
Problem	Main causes	Remedy
Engine oil pressure monitor lights up	<ul style="list-style-type: none"> <li>● Oil level low in oil pan (sucking air in)</li> <li>● Clogged oil filter cartridge</li> <li>● Defective tightening of oil pipe, pipe joint, oil leakage from damaged point</li> <li>● Defective monitor</li> </ul>	<ul style="list-style-type: none"> <li>● Add oil to specified level, see CHECK BEFORE STARTING</li> <li>● Replace cartridge, see EVERY 500 HOURS SERVICE</li> <li>( ● Check, repair)</li> <li>( ● Replace)</li> </ul>
Steam spurts out from top of radiator (pressure valve)	<ul style="list-style-type: none"> <li>● Cooling water level low, leakage of water</li> <li>● Dirt or scale accumulated in cooling system</li> </ul>	<ul style="list-style-type: none"> <li>● Check, add water, repair, see CHECK BEFORE STARTING</li> <li>● Change coolant, flush inside of cooling system, see WHEN REQUIRED</li> </ul>
Red range of engine water temperature gauge lights up	<ul style="list-style-type: none"> <li>● Clogged radiator fins or damaged fins</li> <li>● Defective thermostat</li> <li>● Loose radiator filler cap (high-altitude operations)</li> <li>● Defective water level sensor</li> </ul>	<ul style="list-style-type: none"> <li>● Clean or repair, see EVERY 500 HOURS SERVICE</li> <li>( ● Replace thermostat)</li> <li>● Tighten cap or replace packing</li> <li>( ● Replace sensor)</li> </ul>
White range of engine water temperature gauge is lighted up even after operating for long time	<ul style="list-style-type: none"> <li>● Defective thermostat</li> </ul>	<ul style="list-style-type: none"> <li>( ● Replace thermostat)</li> </ul>
Engine does not start when starting motor is turned	<ul style="list-style-type: none"> <li>● Lack of fuel</li> <li>● Air in fuel system</li> <li>● Defective fuel injection pump or defective nozzle</li> <li>● Starting motor cranks engine sluggishly</li> <li>● Preheating monitor does not light up</li> <li>● Defective compression</li> </ul>	<ul style="list-style-type: none"> <li>● Add fuel, see CHECK BEFORE STARTING</li> <li>● Repair place where air is sucked in, see EVERY 500 HOURS SERVICE</li> <li>( ● Replace pump or nozzle)</li> <li>● See ELECTRICAL SYSTEM</li> <li>● See ELECTRICAL SYSTEM</li> <li>( ● Adjust valve clearance)</li> </ul>
Exhaust gas is white or blue	<ul style="list-style-type: none"> <li>● Oil level in oil tank is too high</li> <li>● Improper fuel</li> <li>● Sudden acceleration immediately after starting engine in cold weather</li> </ul>	<ul style="list-style-type: none"> <li>● Set oil to specified level, see CHECK BEFORE STARTING</li> <li>● Change to specified fuel</li> <li>● Avoid sudden acceleration until warming-up operation is completed</li> </ul>
Exhaust gas sometimes becomes black	<ul style="list-style-type: none"> <li>● Clogged air cleaner element</li> <li>● Defective nozzle</li> <li>● Defective compression</li> </ul>	<ul style="list-style-type: none"> <li>● Clean or replace, see WHEN REQUIRED</li> <li>( ● Replace nozzle)</li> <li>( ● See "Defective")</li> </ul>

Problem	Main causes	Remedy
Combustion noise occasionally make breathing sound	<ul style="list-style-type: none"> <li>● Defective nozzle</li> </ul>	( ● Replace nozzle)
Abnormal noise generated (combustion or mechanical)	<ul style="list-style-type: none"> <li>● Low-grade fuel being used</li> <li>● Overheating</li>   <li>● Damage inside muffler</li> <li>● Excessive valve clearance</li> </ul>	<ul style="list-style-type: none"> <li>● Change to specified fuel</li> <li>● See "Red range of engine water temperature gauge lights up"</li> <li>● Replace muffler</li> <li>( ● Adjust clearance)</li> </ul>
Engine stops during operation	<ul style="list-style-type: none"> <li>● Clogging of feed pump prefilter</li> <li>● Defective engine and fuel circuit</li> </ul>	<ul style="list-style-type: none"> <li>● Replace filter cartridge</li> <li>( ● Check, repair)</li> </ul>

### Automatic greasing system

(If equipped)

If automatic greasing monitor (1) on the machine monitor lights up, open the hood and inform your Komatsu distributor of the display on display portion (A) of greasing controller (2).



Display	Failure mode	Main case	Remedy
and  flash in turn	Abnormally high pressure	<ul style="list-style-type: none"> <li>● Grease cartridge is being operated empty</li> <li>● Grease leaking from main grease piping (piping from pump to divider valve)</li> <li>● Grease leaking from divider valve</li> <li>● Defective pump</li> </ul>	<ul style="list-style-type: none"> <li>( ● Bleed air from grease pump)</li> <li>( ● Replace grease cartridge)</li> <li>( ● Inspect, repair)</li> <li>( ● Replace)</li> <li>( ● Replace)</li> </ul>
and  flash in turn	Abnormal loss of pressure	<ul style="list-style-type: none"> <li>● Defective pump</li> </ul>	<ul style="list-style-type: none"> <li>( ● Replace)</li> </ul>
and  flash in turn	Abnormal pressure detection		
No display Power source LED (B) is off	Abnormal flow of electricity	<ul style="list-style-type: none"> <li>● Blown fuse</li> </ul>	<ul style="list-style-type: none"> <li>( ● Replace)</li> </ul>

# MAINTENANCE

 **WARNING**

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

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# 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 "Hydraulic System - Bleed Air (PAGE 4-48)".

## Hydraulic Hose Installation

- When removing parts at locations where there are O-rings or gasket seals, clean the mounting surface, and replace with new parts.

When doing this, be careful not to forget to assemble the O-rings and gaskets.

- When installing the hoses, do not twist them or bend them into loops with a small radius.

This will cause damage to the hose and markedly reduce its service life.



## Checks After Inspection and Maintenance Works

If you forget to carry out the checks after inspection and maintenance, unexpected problems may occur, and this may lead to serious injury or property damage. Always do as follows.

- Checks after operation (with engine stopped)
  - Have any inspection and maintenance points been forgotten?
  - Have all inspection and maintenance items been carried out correctly?
  - Have any tools or parts been dropped inside the machine? It is particularly dangerous if parts are dropped inside machine and get caught in the lever linkage mechanism.
  - Is there any leakage of water or oil? Have all the bolts been tightened?
- Checks when operating engine
  - For details of the checks when operating the engine, see "Two Workers for Maintenance when Engine is Running (PAGE 2-36)" 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?

# OUTLINE OF SERVICE

- Always use Komatsu genuine parts for replacement parts, grease or oil.
- When changing the oil or adding oil, do not mix different types of oil. When changing the type of oil, drain all the old oil and fill completely with the new oil. Always replace the filter at the same time. (There is no problem if the small amount of oil remaining in the piping mixes with the new oil.)
- Unless otherwise specified, when the machine is shipped from the factory, it is filled with the oil and coolant listed in the table below.

Item	Type
Engine oil pan	Engine oil EO15W40DH (Komatsu genuine parts)
Swing machinery case Final drive case PTO gear case	Power train oil TO30 (Komatsu genuine parts)
Hydraulic system	Power train oil TO10 (Komatsu genuine parts)
Radiator	Supercoolant AF-NAC (Density: 30% or above) (Komatsu genuine parts)

## HANDLING OIL, FUEL, COOLANT, AND PERFORMING OIL CLINIC

### Oil

- Oil is used in the engine and hydraulic equipment under extremely severe conditions (high temperature, high pressure), and deteriorates with use.

Always use oil that matches the grade and maximum and minimum ambient temperatures recommended in the Operation and Maintenance Manual. Even if the oil is not dirty, always change the oil 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 have an analysis made of the oil periodically to check the condition of the machine. For those who wish to use this service, please contact your Komatsu distributor.
- When using commercially available oil, it may be necessary to reduce the oil change interval.

We recommend that you use the Komatsu oil clinic to carry out a detailed checks of the characteristics of the oil.

## Fuel

- To prevent the moisture in the air from condensing and forming water inside the fuel tank, always fill the fuel tank after completing the day's work.
- The fuel pump is a precision instrument, and if fuel containing water or dirt is used, it cannot work properly.
- Be extremely careful not to let impurities get in when storing or adding fuel.
- Always use the fuel specified in the Operation and Maintenance Manual.

Fuel may congeal depending on the temperature when it is used (particularly in low temperature below -15°C (5°F)), so it is necessary to change to a fuel that matches the temperature.

- Before starting the engine, or when 10 minutes have passed after adding fuel, drain the sediment and water from the fuel tank.
- If the engine runs out of fuel, or if the filters have been replaced, it is necessary to bleed the air from the circuit.
- If there is any foreign material in the fuel tank, wash the tank and fuel system.

## Coolant and Water for Dilution

- The coolant has the important function of preventing corrosion as well as preventing freezing.

Even in the areas where freezing is not an issue, the use of antifreeze coolant is essential.

Komatsu machines are supplied with Komatsu Supercoolant (AF-NAC). Komatsu Supercoolant (AF-NAC) has excellent anticorrosion, antifreeze and cooling properties and can be used continuously for 2 years or 4000 hours.

Komatsu Supercoolant (AF-NAC) is strongly recommended wherever available.

- When diluting the antifreeze coolant, use distilled water or tap water (soft water).

Natural water, such as a river water or well water (hard water), contains large amounts of minerals (calcium, magnesium, etc.), and this makes it easier for scale to form inside the engine or radiator. Once scale is deposited inside the engine or radiator, it is extremely difficult to remove. It also causes overheating due to poor heat exchange, so when you dilute the coolant, we recommend that you use water with an overall hardness of less than 100 PPM.

- When using antifreeze, always observe the precautions given in the Operation and Maintenance Manual.
- Antifreeze coolant is flammable, so be sure to keep it away from flame.
- The ratio of Supercoolant (AF-NAC) to water differs according to the ambient temperature.

For details of the ratio when mixing, see "Cooling System Coolant - Clean/Change (PAGE 4-24)".

Supercoolant (AF-NAC) may be supplied already mixed. In such cases, never dilute with water.

- If the engine overheats, wait for the engine to cool before adding coolant.
- If the coolant level is low, it will cause overheating, and will also cause problems with corrosion due to air entering the coolant.

## Grease

- Grease is used to prevent seizure and noises at the joints.
- Construction equipment is operated under heavy-duty conditions. Always use the recommended grease and keep to the replacement intervals and temperatures for use listed in this Operation and Maintenance Manual.
- The nipples not included in the MAINTENANCE section are nipples used when overhauling, so they do not need grease.

If any part becomes stiff or generates noise after being used for a long time, grease it.

- Always wipe off all of the old grease that is pushed out when greasing.

Be particularly careful to wipe off the old grease in places where sand or dirt sticking in the grease would cause wear of the rotating parts.

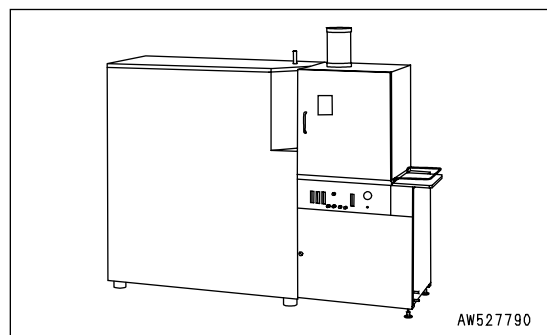
## CARRYING OUT KOWA (Komatsu Oil Wear Analysis)

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

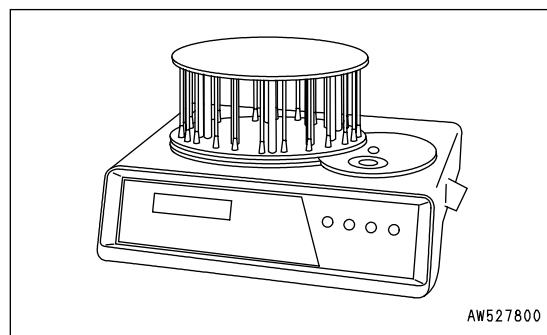
We strongly recommend you to use this service. The oil analysis is carried out at actual cost, so the cost is low, and the results of the analysis are reported together with recommendations which will reduce repair costs and machine downtime.

### KOWA ANALYSIS ITEMS

- Measurement of density of metal wear particles  
This uses an ICP (Inductively Coupled Plasma) analyzer to measure the density of iron, copper, and other metal wear particles in the oil.



- Measurement of quantity of particles  
This uses a particle quantifier index measurement machine to measure the quantity of iron particles of 5 $\mu$  or more, enabling early detection of failures.



- Others  
Measurements are made of items such as the ratio of water in the oil, density of the antifreeze coolant, ratio of fuel in the oil, and dynamic viscosity, enabling a highly precise diagnosis of the machine's health.

## OIL SAMPLING

- Sampling interval
  - 250 hours: Engine
  - 500 hours: Other components
- Precautions when sampling
  - Make sure that the oil is well mixed before sampling.
  - Carry out sampling regularly at fixed intervals.
  - Do not carry out sampling on rainy or windy days when water or dust can get into the oil.

For further details of KOWA, please contact your Komatsu distributor.

## OIL AND FUEL STORAGE

- Keep indoors to prevent any water, dirt, or other impurities from getting in.
- When keeping drum cans for a long period, put the drum on its side so that the filler port of the drums is at the side to prevent moisture from being sucked in.  
If drums have to be stored outside, cover them with a waterproof sheet or take other measures to protect them.
- To prevent any change in quality during long-term storage, be sure to use in the order of first in - first out (use the oldest oil or fuel first).

## Filters

- Filters are extremely important safety parts. They prevent impurities in the fuel and air circuits from entering important equipment and causing problems.

Replace all filters periodically. For details, see the Operation and Maintenance Manual.

However, when working in severe conditions, replace the filters at shorter intervals according to the oil and fuel (sulfur content) being used.

- Never try to clean the filters (cartridge type) and use them again. Always replace with new filters.
- When replacing oil filters, check if any metal particles are affixed to the old filter. If any metal particles are found, contact your Komatsu distributor.
- Do not open packs of spare filters until just before they are to be used.
- Always use Komatsu genuine filters.

## ELECTRIC SYSTEM MAINTENANCE

- It is extremely dangerous if the electrical equipment becomes wet or the covering of the wiring is damaged. This will cause an electrical short circuit and may lead to malfunction of the machine. Do not wash the inside of the operator's cab with water. When washing the machine, be careful not to let water get into the electrical components.
- Service relating to the electric system is checking fan belt tension, checking damage or wear to the fan belt and checking battery fluid level.
- Never install any electric components other than those specified by Komatsu.
- External electro-magnetic interference may cause malfunction of the control system controller, so before installing a radio receiver or other wireless equipment, contact your Komatsu distributor.
- When working at the seashore, carefully clean the electric system to prevent corrosion.
- When installing electrical equipment, connect it to the special power source connector. Do not connect the optional power source to the fuse, starting switch, or battery relay.

## WEAR PARTS

Wear parts such as the filter element, air cleaner element 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.

When changing parts, use Komatsu genuine parts of excellent quality.

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

## WEAR PARTS LIST

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

Item	Part No.	Part Name	Q'ty	Replacement frequency
Engine oil filter	600-211-2110	Cartridge	1	Every 500 hours service
Hydraulic oil filter	201-60-71180 (07000-02135)	Element (O-ring)	1 (1)	Every 500 hours service
Fuel filter	600-311-7441	Cartridge	1	Every 500 hours service
Air cleaner	600-181-7300 600-181-7400	6-inch single element ass'y 6-inch double element ass'y	1 1	—
Additional filter for breaker(if equipped)	201-973-7480	Element (incl. O-ring)	1	—
Bucket	20X-70-23160 (203-70-43212) (203-70-43220)	Vertical pin type Tooth (Pin) (Lock)	4 (4) (4)	—
	201-70-74171 201-70-74181 (01802-02265) (01803-02228)	Side cutter (left) Side cutter (right) (Bolt) (Nut)	1 1 (6) (6)	
Bucket (if equipped)	20X-70-14160 (20X-70-00100)	Horizontal pin type Tooth (Pin)	4 (4)	—
Grease cartridge for automatic greasing (if equipped)	201-70-75710	Grease	1	—
	201-70-75630	Grease (for cold areas)	1	
Blade(machines with blade specification)	201-910-7190	Edge (welded)	1	—

# RECOMMENDED FUEL, COOLANT, AND LUBRICANT

- Komatsu genuine oils are adjusted to maintain the reliability and durability of Komatsu construction equipment and components.

In order to keep your machine in the best conditioner for long periods of time, it is essential to follow the instructions in this Operation and Maintenance Manual.

- Failure to follow these recommendations may result in shortened life or excess wear of the engine, power train, cooling system, and/or other components.
- Commercially available lubricant additives may be good for the machine, but they may also cause harm. Komatsu does not recommend any commercially available lubricant additive.
- Use the oil recommended according to the ambient temperature in the chart below.
- Specified capacity means the total amount of oil including the oil in the tank and the piping. Refill capacity means the amount of oil needed to refill the system during inspection and maintenance.
- When starting the engine in temperatures below 0°C (32°F), be sure to use the recommended multi-grade oil, even if the ambient temperature may become higher during the course of the day.
- If the machine is operated at a temperature below -20°C (-4°F), a separate device is needed, so consult your Komatsu distributor.
- When the fuel sulfur content is less than 0.5%, change the engine oil according to the period inspection table given in this Operation and Maintenance Manual.

If the fuel sulfur content is more than 0.5%, change the oil according to the following table.

Fuel sulfur content	Engine oil change interval
0.5 to 1.0%	1/2 of regular interval
Above 1.0%	1/4 of regular interval



# USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE

Reservoir	Fluid Type	Ambient Temperature, degrees Celsius										Recommended Komatsu Fluids
		-22	-4	14	32	50	68	86	104	122°F		
		-30	-20	-10	0	10	20	30	40	50°C		
Engine Oil Pan	Engine Oil	SAE10W30DH										Komatsu EO10W30DH
		SAE15W40DH										Komatsu EO15W40DH
		SAE30DH										Komatsu EO30DH
Swing Machinery Case Final Drive Case PTO Gear Case or Damper Case	Power train Oil (Note 1)	TO30										TO30
Hydraulic System	Power train Oil	TO10										TO10
	Hydraulic Oil	HO46-HM										HO46-HM
	Engine Oil	SAE10W30DH										Komatsu EO10W30DH
		SAE15W40DH										Komatsu EO15W40DH
Grease Fitting	Hyperwhite Grease (Note 2)	G2-T										G2-T
	Lithium EP Grease	G2-LI										G2-LI
Cooling System	Supercoolant AF-NAC	AF-NAC (Note 3)										AF-NAC
Fuel Tank	Diesel Fuel	No.2-D										ASTM No.2-D
		No.1-D										ASTM No.1-D

		Engine oil pan	Swing machinery case	Final drive case (each)	PTO gear case	Hydraulic system	Fuel tank	Cooling system
Specified capacity	liters	11	1.5	1.7	0.35	90	130	10.3
	US gal	2.90	0.40	0.45	0.09	23.76	34.32	2.72
Refill capacity	liters	10.5	1.5	1.7	0.35	57	—	—
	US gal	2.77	0.40	0.45	0.09	15.05	—	—

Note 1: Power train oil has different properties from engine oil. Be sure to use the recommended oil.

Note 2: Hyper white grease (G2-T) has a high performance.

When it is necessary to improve the lubricating ability of the grease in order to prevent squeaking of pins and bushings, the use of G2-T is recommended.

Note 3: Supercoolant (AF-NAC)

- 1) The coolant has the important function of preventing corrosion as well as preventing freezing. Even in the areas where freezing is not an issue, the use of antifreeze coolant is essential. Komatsu machines are supplied with Komatsu Supercoolant (AF-NAC). Komatsu Supercoolant (AF-NAC) has excellent anticorrosion, antifreeze and cooling properties and can be used continuously for 2 years or 4000 hours. Komatsu Supercoolant (AF-NAC) is strongly recommended wherever available.
- 2) For details of the ratio when diluting super coolant with water, see "Cooling System Coolant - Clean/Change (PAGE 4-24)".  
When the machine is shipped from the factory, it may be filled with coolant containing 30% or more Supercoolant (AF-NAC). In this case, no adjustment is needed for temperatures down to -10°C (14°F). (never dilute with water)
- 3) To maintain the anticorrosion properties of Supercoolant (AF-NAC), always keep the density of Supercoolant between 30% and 68%.

## **RECOMMENDED BRANDS, RECOMMENDED QUALITY FOR PRODUCTS OTHER THAN KOMATSU GENUINE OIL**

When using commercially available oils other than Komatsu genuine oil, or when checking the latest specifications, refer to the Komatsu web page or consult your Komatsu distributor.

# TIGHTENING TORQUE SPECIFICATIONS

## TIGHTENING TORQUE LIST

**⚠ CAUTION**

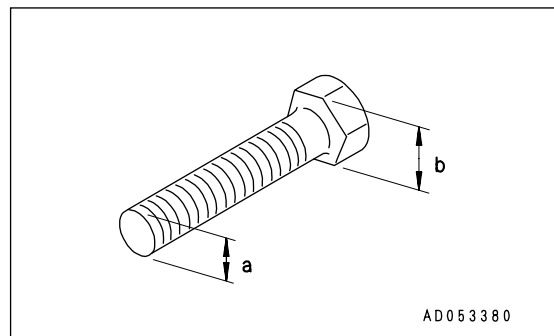
If nuts, bolts, or other parts are not tightened to the specified torque, it will cause looseness or damage to the tightened parts, and this will cause failure of the machine or problems with operation. Always pay careful attention when tightening parts.

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.

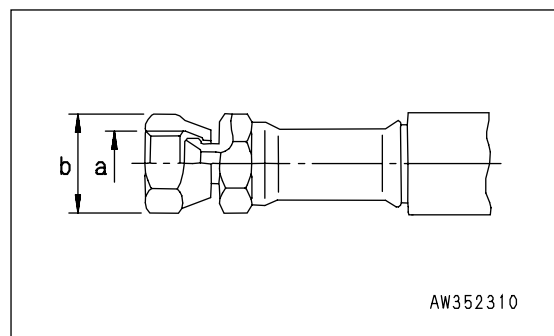
If it is necessary to replace any nut or bolt, always use a Komatsu genuine part of the same size as the part that was replaced.

Thread diameter a(mm)	Width across flat b(mm)	Tightening torque [N•m (kgf•m)]	
		Target value	Service limit
6	10	13.2 (1.35)	11.8 - 14.7 (1.2 - 1.5)
8	13	31 (3.2)	27 - 34 (2.8 - 3.5)
10	17	66 (6.7)	59 - 74 (6.0 - 7.5)
12	19	113 (11.5)	98 - 123 (10.0 - 12.5)
14	22	177 (18.0)	157 - 196 (16.0 - 20.0)
16	24	279 (28.5)	245 - 309 (25.0 - 31.5)
18	27	382 (39.0)	343 - 425 (35.0 - 43.5)
20	30	549 (56.0)	490 - 608 (50.0 - 62.0)
22	32	745 (76.0)	662 - 829 (67.5 - 84.5)
24	36	927 (94.5)	824 - 1030 (84.0 - 105.0)
27	41	1320 (135.0)	1180 - 1470 (120.0 - 150.0)
30	46	1720 (175.0)	1520 - 1910 (155.0 - 195.0)
33	50	2210 (225.0)	1960 - 2450 (200.0 - 250.0)
36	55	2750 (280.0)	2450 - 3040 (250.0 - 310.0)
39	60	3280 (335.0)	2890 - 3630 (295.0 - 370.0)



Apply the following table for Hydraulic Hose.

Thread diameter a(mm)	Width across flat b(mm)	Tightening torque(N•m{kgf•m})	
		Target valve	Service limit
10	14	14.7 (1.5)	12.7 - 16.7 (1.3 - 1.7)
14	19	29.4 (3.0)	27.5 - 39.2 (2.8 - 4.0)
18	24	78.5 (8.0)	58.8 - 98.1 (6.0 - 10.0)
22	27	117.7 (12.0)	88.3 - 137.3 (9.0 - 14.0)
24	32	147.1 (15.0)	117.7 - 176.5 (12.0 - 18.0)
30	36	215.7 (22.0)	176.5 - 245.2 (18.0 - 25.0)
33	41	255.0 (26.0)	215.7 - 284.4 (22.0 - 29.0)



# PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS

To ensure safety at all times when operating or driving the machine, the user of the machine must always carry out periodic maintenance. In addition, to further improve safety, the parts in the safety-critical parts list on the next page must also be replaced at the specified interval. These parts are particularly closely connected to safety and fire prevention, so please contact your Komatsu distributor to have them replaced.

With these parts, the material changes as time passes, or they easily wear out 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.

In addition, carry out the following checks for the hydraulic hoses not listed as periodic replacement parts. If any abnormality is found, tighten or replace the parts.

When replacing the hoses, always replace the O-rings, gaskets, and other such parts at the same time.

## SAFETY CRITICAL PARTS

No	Safety critical parts for periodic replacement	Q'ty	Replacement interval
1	Fuel hose (Fuel tank - injection pump)	1	Every 2 years or 4000 hours, whichever comes sooner
2	Fuel hose (Fuel filter - injection pump)	1	
3	Spill hose (Nozzle - fuel tank)	1	
4	Hydraulic hose (Main pump delivery)	1	
5	Hydraulic hose (Pump drain)	1	
6	Hydraulic hose (Main pump suction)	1	
7	Hydraulic hose (Boom cylinder - control valve)	4	
8	Hydraulic hose (Arm cylinder - control valve)	4	
9	Hydraulic hose (Bucket cylinder - control valve)	4	
10	Hydraulic hose (Swing motor - control valve)	2	
11	Heater hose (Engine - car heater)	2	
12	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 4-18)" to confirm the correct maintenance schedule when carrying out maintenance.

## MAINTENANCE SCHEDULE CHART

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

- Change Oil In Engine Oil Pan, Replace Engine Oil Filter Cartridge..... 4-61
- Fuel Filter Cartridge - Replace ..... 4-63
- Engine Valve Clearances - Inspect ..... 4-70

### When Required

- Air Cleaner Element - Check/Clean/Replace ..... 4-20
- Cooling System Coolant - Clean/Change ..... 4-24
- Track Shoe Bolts - Check/Tighten (Machine equipped with steel shoes, road liners)..... 4-27
- Track Tension - Check/Adjust (Machine equipped with steel shoes, road liners) ..... 4-28
- Rubber Shoes or Road Liners - Check (Machine equipped with rubber shoes, road liner) ..... 4-30
- Rubber Shoe Tension - Check/Adjust (Machine equipped with rubber shoes) ..... 4-32
- Road Liners - Replace (Machine equipped with road liner) ..... 4-36
- Steel Shoes or Road Liners to Rubber Shoes - Change..... 4-37
- Electrical Intake Air Heater - Inspect..... 4-37
- Bucket Teeth (Vertical Pin Type) - Replace..... 4-38
- Bucket Teeth (Horizontal Pin Type) - Replace..... 4-41
- Bucket Clearance - Adjust..... 4-42
- Windshield Washer Fluid Level - Check/Add ..... 4-43
- Breaker Circuit Additional Oil Filter Element - Replace..... 4-44
- Wash Washable Floor (If equipped)..... 4-45
- Hydraulic System - Bleed Air ..... 4-48

**Checks Before Starting**

**Every 50 Hours Maintenance**

Fuel Tank - Drain..... 4-52

**Every 100 Hours Maintenance**

Lubricating..... 4-53

Swing Machinery Case Oil - Check/Add ..... 4-55

**Every 250 Hours Maintenance**

Final Drive Case Oil Level - Check/Add..... 4-56

Battery Electrolyte Level - Check..... 4-57

Cooling Fan Belt Tension - Inspect/Adjust ..... 4-59

**Every 500 Hours Maintenance**

Change Oil In Engine Oil Pan, Replace Engine Oil Filter Cartridge..... 4-61

Fuel Filter Cartridge - Replace ..... 4-63

Swing Pinion Gear Oil Level - Check/Add..... 4-64

Swing Circle - Lubricate ..... 4-64

Clean And Inspect Radiator Fins, Oil Cooler Fins And Condenser Fins..... 4-65

Hydraulic Oil Filter Element - Replace ..... 4-66

**Every 1000 Hours Maintenance**

Swing Machinery Case Oil - Change ..... 4-67

Final Drive Case Oil - Change ..... 4-68

**Every 2000 Hours Maintenance**

PTO Gear Case Oil Level - Check/Add..... 4-69

Alternator And Starting Motor - Inspect..... 4-70

Engine Valve Clearances - Inspect ..... 4-70

**Every 4000 Hours Maintenance**

Water Pump - Inspect ..... 4-71

**Every 5000 Hours Maintenance**

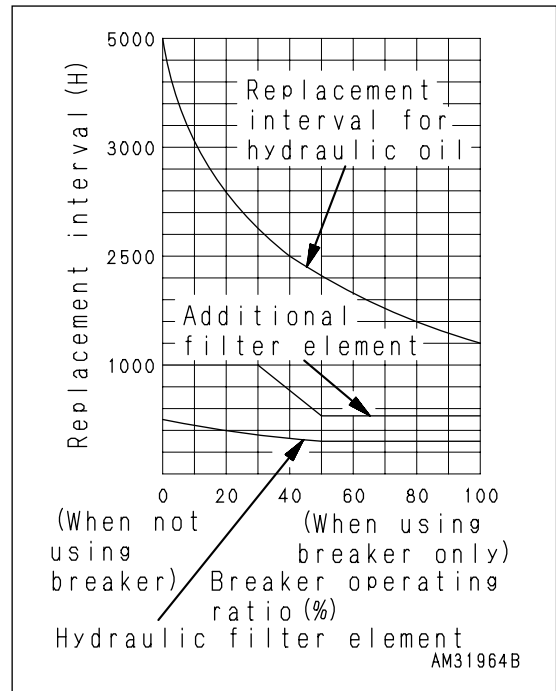
Change Oil In Hydraulic Tank, Clean Strainer..... 4-72

## 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.

### Hydraulic Oil Filter Element - Replace

- 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.



### Hydraulic Oil - Change

- Change the oil according to the table on the right.

### Breaker Circuit Additional Oil Filter Element - Replace

- Use a guideline of 250 hours for use of the breaker (operating ratio for the breaker: 50 % or more), and replace the element 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.

- Change Oil In Engine Oil Pan, Replace Engine Oil Filter Cartridge
- Replace Fuel Filter Cartridge
- Check and adjust engine valve clearance

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

### Air Cleaner Element - Check/Clean/Replace

#### **⚠ WARNING**

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

### Machines Equipped With Singel Element

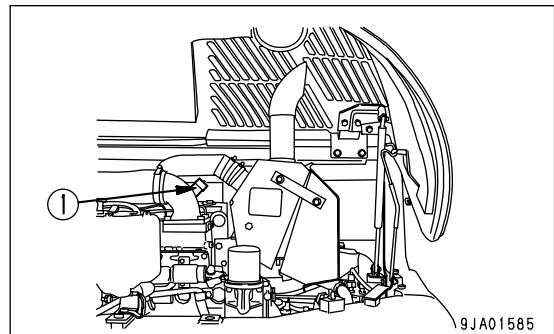
#### Checking

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

#### NOTICE

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

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

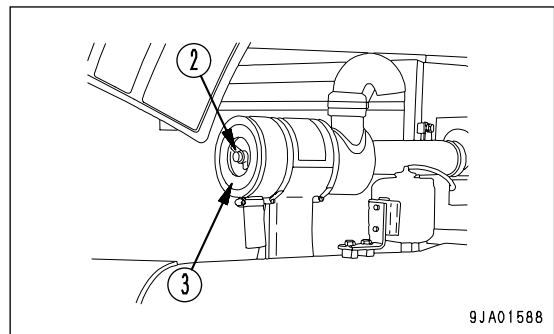


#### Cleaning the element

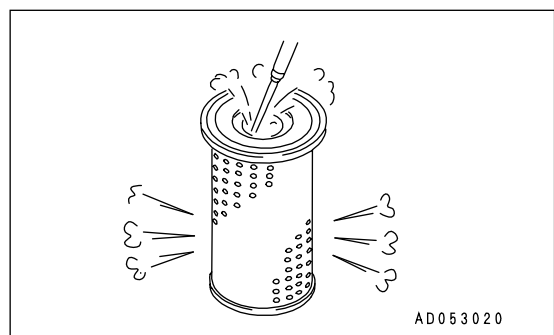
1. Open the engine food on the rear of the machine, remove wingnut (2) and take out element (3) .

To prevent entry of dirt and dust, cover the air connector side of the rear end of the air cleaner with a clean cloth and adhesive tape.

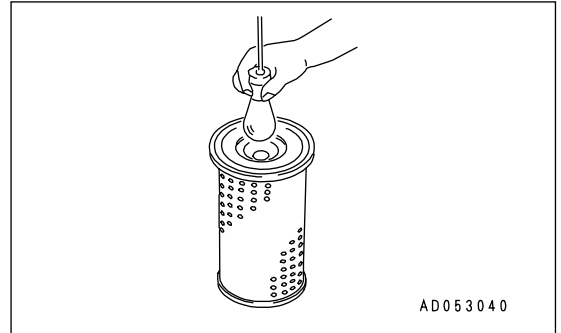
2. Clean interior of the air cleaner body.
3. Direct dry compressd air (less than 0.69MPa (7 kgf/cm<sup>2</sup> , 99.4 PSI)),to element 3 from inside along its folds, then direct it from outside along its folds and again from inside.



- 1) Remove one seal from the element whenever the element has been cleaned.
- 2) Replace the element which has been cleaned 6 times repeatedly or used throughout a year.
- 3) Replace the element when the dust indicator red piston appears soon after installing the cleaned element even though it has not been cleaned 6 times.



4. 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 .**

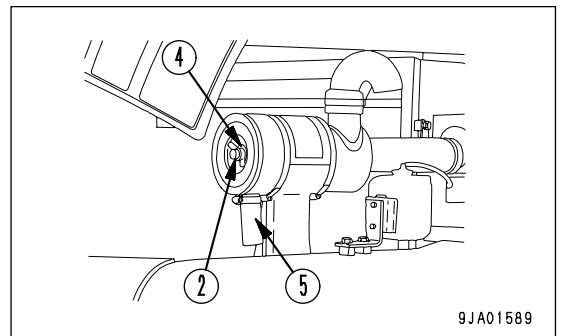
**Do not use an element whose folds or gasket or seal are damaged.**

**Wrap unused element and store them in a dry place.**

5. Remove the cloth and tape used for cover in Step 1.
6. Install the cleaned element and fix it with the wing nut.
7. Replace seal washer (4) or wing nut (2) with new parts if they are broken.
8. Remove vacuator valve (5) and clean with compressed air.

After cleaning, install again.

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

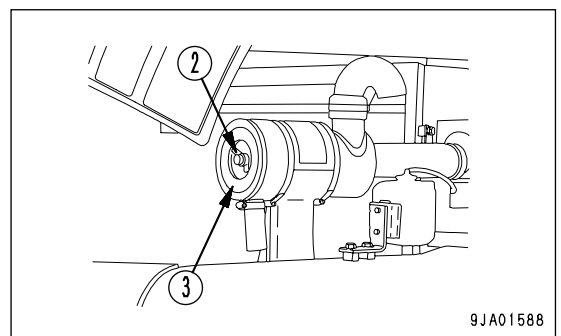


**Replacing element**

1. Open the engine food on the rear of the machine, remove wingnut (2) and take out element (3) .

To prevent entry of dirt and dust, cover the air connector side of the rear end of the air cleaner with a clean cloth and adhesive tape.

2. Clean the air cleaner body interior, then remove the cover installed in Step 1.
3. Install a new element and fix it with wing nut (2) .



### Machines Equipped With Double Element

(If equipped)

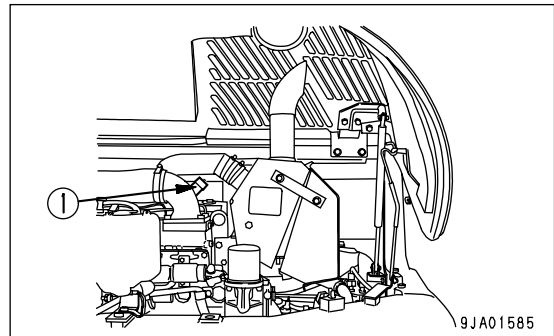
#### Checking

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

#### NOTICE

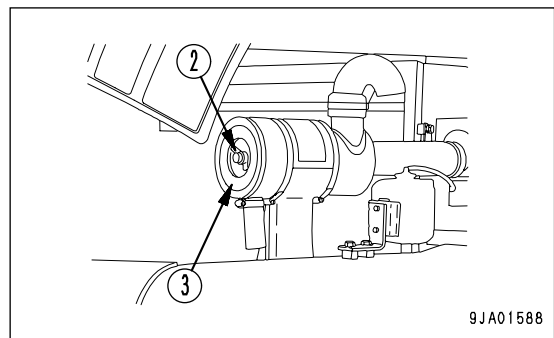
**Do not clean the air cleaner element before the red piston in dust indicator (1) appears.**

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

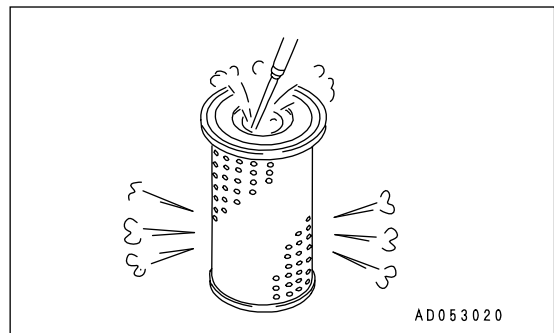


#### Cleaning or replacing outer element

1. Open the engine food on the rear of the machine, remove wing nut (2) and take out element (3) .
2. Clean interior of the air cleaner body.
3. Direct dry compressed air (less than 0.69MPa(7 kgf/cm<sup>2</sup>, 99.4 PSI)) to element 3 from inside along its folds, then direct it from outside along its folds and again from inside.

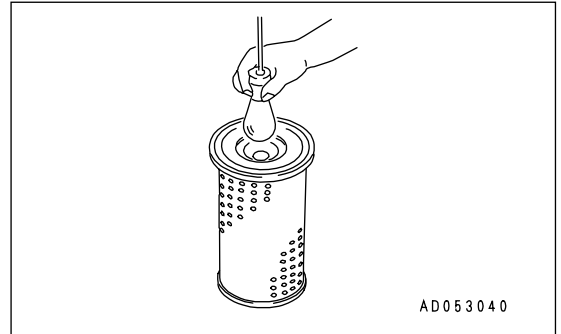


- 1) Remove one seal from the element whenever the element has been cleaned.
- 2) Replace the outer element if it has been cleaned 6 times repeatedly or used throughout a year. Replace the inner element at the same time.
- 3) Replace both inner and outer elements when the dust indicator red piston appears soon after installing the cleaned outer element even though it has not been cleaned 6 times.
- 4) Check inner element mounting nuts for looseness and, if necessary, retighten.



Tightening torque:4.9 to 5.88 N•m(0.5 to 0.6 kgf•m,  
3.6 to 4.3 lbft)

4. 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**

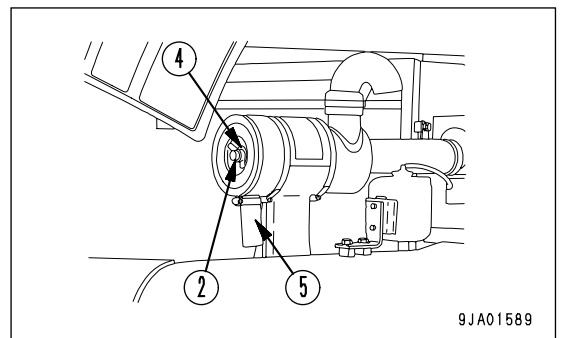
**When cleaning the element, do not hit it or beat it against something .**

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

**Wrap unused element and store them in a dry place.**

5. Install the cleaned element and fix it with the wing nut.
6. Replace seal washer (4) or wing nut (2) with new parts if they are broken.
7. Remove evacuator valve (5) and clean with compressed air.

After cleaning, install it.



8. Press the button of dust indicator 1 to return the red piston to its original position.

**Replacing inner element**

1. First remove wing nut (2) and the outer element, and then remove the inner element.
2. To prevent dust from getting in, use a clean cloth or tape to cover the air connector (outlet side).
3. Clean the air cleaner body interior, then remove the cover installed in Step 2.
4. Fit a new inner element to the connector and tighten it with nuts.  
Do not clean and reinstall a inner element.  
Tightening torque: 4.9 to 5.88 N•m(0.5 to 0.6 kgf•m, 3.6 to 4.3 lbft)
5. Set the outer element in position and secure it with the wing nut.
6. After replacing the element, press the button of dust indicator to return the red piston to its original position.

## Cooling System Coolant - Clean/Change

**⚠ WARNING**

- Immediately after the engine is stopped, the coolant is at a high temperature and the radiator is under high internal pressure.  
If the cap is removed to drain the coolant in this condition, there is a hazard of burns. Wait for the temperature to go down, then turn the cap slowly to release the pressure before removing it.
- Cleaning is carried out with the engine running. When standing up or leaving the operator's seat, set the safety lock lever to the LOCK position.
- For details of starting the engine, see "BEFORE STARTING ENGINE (PAGE 3-34)" and "STARTING ENGINE (PAGE 3-47)" 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 according to the table below.

Antifreeze coolant	Interval of cleaning inside of cooling system and changing antifreeze coolant
Komatsu supercoolant (AF-NAC)	Every two years or every 4000 hours whichever comes first
Permanent type antifreeze (All-season type, *)	Every year (autumn) or every 2000 hours whichever comes first

\*: Permanent type antifreeze shall meet the requirements of ASTM D3306-03.

Stop the machine on level ground when cleaning or changing the coolant.

The coolant has the important function of preventing corrosion as well as preventing freezing.

Even in the areas where freezing is not an issue, the use of antifreeze coolant is essential.

Komatsu machines are supplied with Komatsu Supercoolant (AF-NAC). Komatsu Supercoolant (AF-NAC) has excellent anticorrosion, antifreeze and cooling properties and can be used continuously for 2 years or 4000 hours.

Komatsu Supercoolant (AF-NAC) is strongly recommended wherever available.

To maintain the anticorrosion properties of Supercoolant (AF-NAC), always keep the density of Supercoolant between 30% and 68%.

When deciding the ratio of antifreeze to water, check the lowest temperature in the past, and decide from the mixing table given below.

It is actually better to estimate and temperature about 10°C (18°F) lower when deciding the mixing ratio.

The mixing ratio depends on the ambient temperature, but it should always be a minimum of 30% by volume (antifreeze/total amount of coolant × 100).

The freezing temperature of undiluted antifreeze is -15°C (5°F). Do not store undiluted antifreeze at a temperature of below -15°C (5°F).

Mixing rate of water and antifreeze

Min. atmospheric temperature	°C	-10	-15	-20	-25	-30
	°F	14	5	-4	-13	-22
Amount of antifreeze	liters	3.1	3.7	4.2	4.7	5.2
	US gal	0.82	0.98	1.11	1.24	1.37
Amount of water	liters	7.2	6.6	6.1	5.6	5.1
	US gal	1.90	1.74	1.61	1.48	1.35
Volume ratio	%	30	36	41	46	50

** WARNING**

**Antifreeze is flammable, so keep it away from flame.**

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

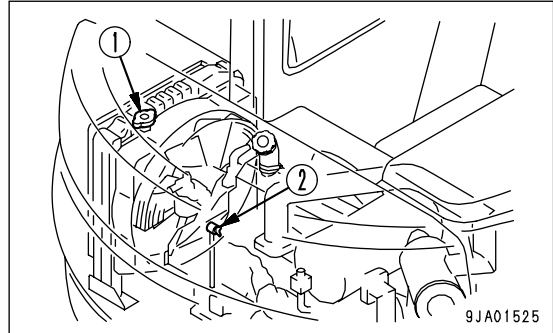
Use antifreeze and appropriate water for diluting (for details, see "Coolant and Water for Dilution (PAGE 4-6)")

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

Prepare a container whose capacity is larger than the specified coolant volume to catch drained coolant.

Prepare a hose to supply antifreeze coolant and water.

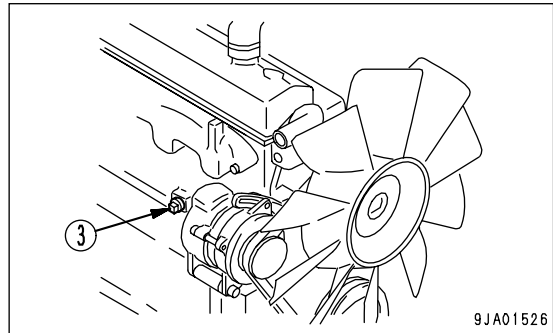
1. Stop the engine.
2. Open the engine hood.
3. Check that the coolant temperature has gone down enough to make it possible to touch the radiator cap surface by hand, then turn radiator cap (1) slowly until it contacts the stopper to release the pressure.
4. Following this, push radiator cap (1), turn it until it contacts the stopper, then remove it.



5. Remove the undercover, then set the container under drain valve (2) and drain plug (3) to catch the coolant mixture.

Open drain valve (2) at the bottom of the radiator and drain the coolant. Then open drain plug (3) in the cylinder block and drain the coolant.

6. After draining the coolant, close drain valve (2) and drain plug (3), and fill with city water. When the radiator is full, start the engine and run at low idling to raise the temperature to at least 90°C, then continue to run for approx. 10 minutes.



7. Stop the engine, open drain valve (2) and drain plug (3), and drain the water.

8. After draining the water, clean the radiator with detergent. For the cleaning method, follow the instruction of detergent.

9. Close drain valve (2), then wrap drain plug (3) with sealing tape and close it.

10. Install the undercover.

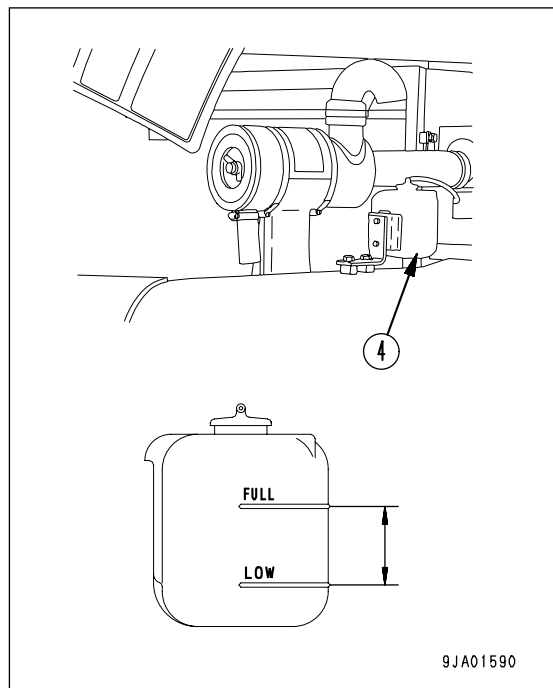
11. Add coolant mixed with antifreeze until it overflows from the water filler.

Decide the proportions of antifreeze and water according to the table for the mixing rate of water and antifreeze.

12. To remove air in the cooling system, run the engine for 5 minutes at low idle, then for 5 minutes at high idle. (While doing this, leave the radiator cap removed.)

13. Drain the coolant from sub-tank (4), clean the inside of the sub-tank, then add water until the coolant level is between the FULL and LOW marks.

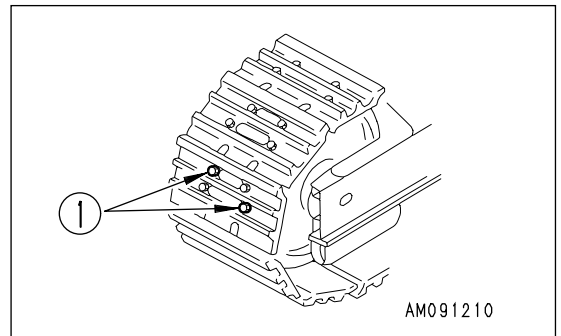
14. Stop the engine, wait for approx. 3 minutes, then add coolant until the coolant level is near the coolant filler port, and tighten the cap. Check the coolant level and add coolant if necessary.



## Track Shoe Bolts - Check/Tighten

(Machine equipped with steel shoes, road liners)

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



## Steel Track Shoe Bolts - Check/Tighten

1. First tighten to a tightening torque of  $118 \pm 19.6 \text{ N}\cdot\text{m}$  ( $12 \pm 2 \text{ kgf}\cdot\text{m}$ ,  $87 \pm 14.5 \text{ lbf}\cdot\text{ft}$ ) then check that the nut and shoe are in close contact with the link contact surface.
2. After checking, tighten the steel shoe a further  $90^\circ \pm 10^\circ$ .

## Road Liner Mounting Bolt - Check/Tighten

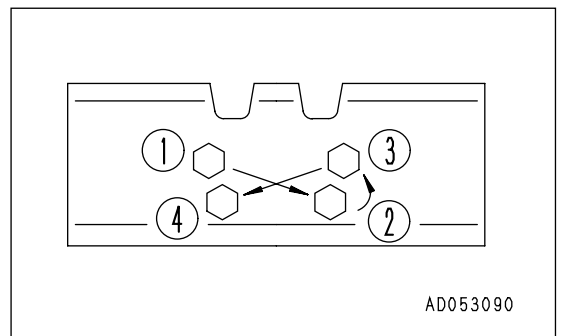
Tighten to a tightening torque of  $196 \pm 19.6 \text{ N}\cdot\text{m}$  ( $20 \pm 2 \text{ kgf}\cdot\text{m}$ ,  $144.7 \pm 14.5 \text{ lbf}\cdot\text{ft}$ ) then check that the nut and shoe are in close contact with the link contact surface.

## Tightening Order

(Machine equipped with steel shoes, road liners)

Tighten the bolts in the order shown in the diagram on the right.

After tightening, check that the nut and shoe are in close contact with the link mating surface.





## Track Tension - Check/Adjust

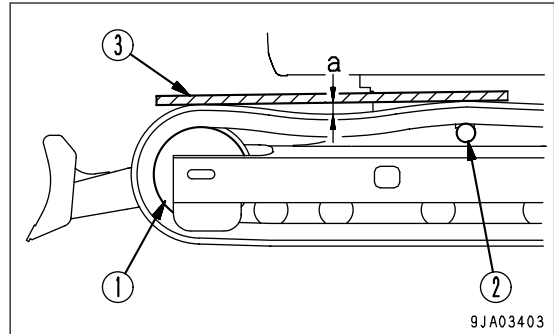
(Machine equipped with steel shoes, road liners)

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

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

### Checking

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



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

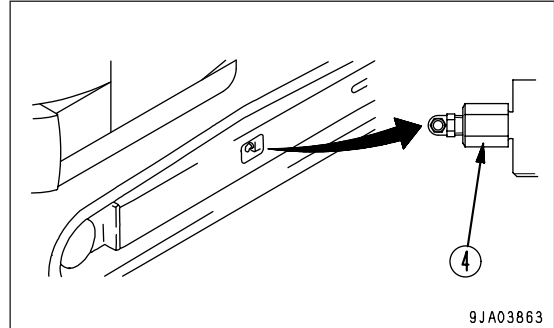
### Adjustment

#### **⚠ WARNING**

There is danger of plug (4) flying out under the high internal pressure of the grease. Never loosen plug (4) more than 1 turn.

Never loosen any part other than plug (4). Never put your face in the mounting direction of plug (4).

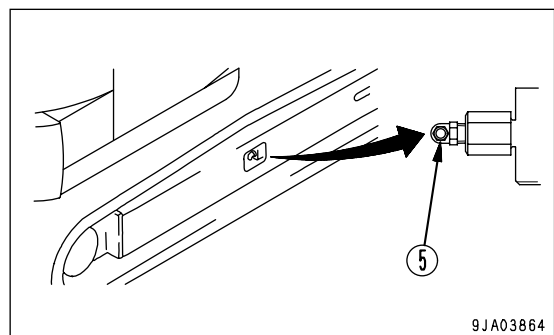
If the track tension cannot be loosened with the procedure given here, please contact your Komatsu distributor.



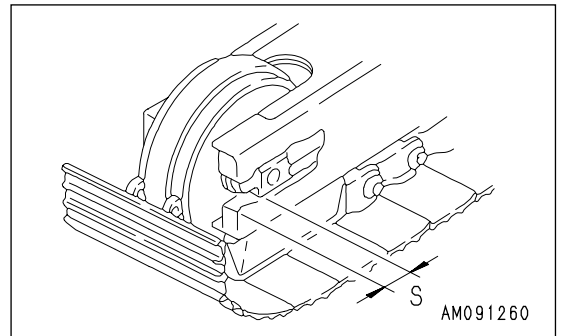
#### increasing track tension

Prepare a grease gun.

1. Pump in grease through grease fitting (5) with a grease pump.
2. To check that the track tension is correct, run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.
3. Check the track tension again, and if the tension is not correct, adjust it again.



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

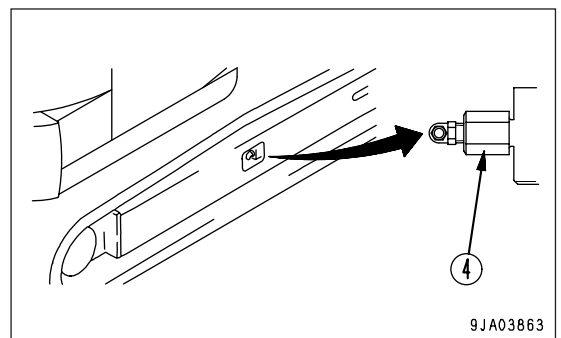


**Loosening track tension**

**⚠ WARNING**

**It is extremely dangerous to release the grease by any method except the procedure given below. If the track tension is not relieved by this procedure, please contact your Komatsu distributor for repairs.**

1. Loosen plug (4) gradually to release the grease.
2. When loosening plug (4), turn it a maximum of one turn.
3. If the grease does not come out smoothly, move the machine forwards and backwards a short distance.
4. Tighten plug (4).
5. To check that the track tension is correct, run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.
6. Check the track tension again, and if the tension is not correct, adjust it again.



## Rubber Shoes or Road Liners - Check

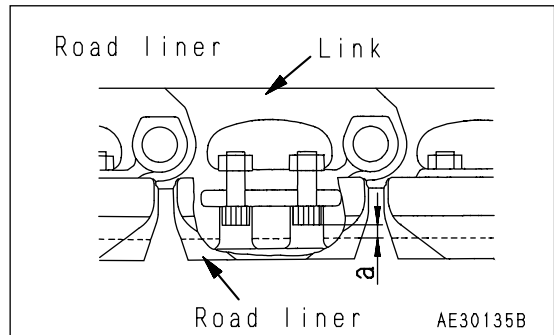
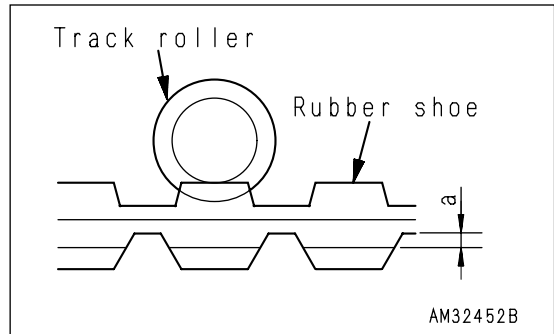
(Machine equipped with rubber shoes, road liner)

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

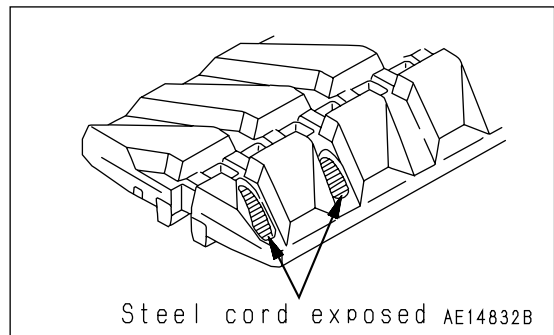
### Lug Height

- If lug height "a" is reduced by wear, the drawbar pull will drop.  
(Rubber shoes)

If "a" is less than 5 mm (0.2 in), replace with a new part.

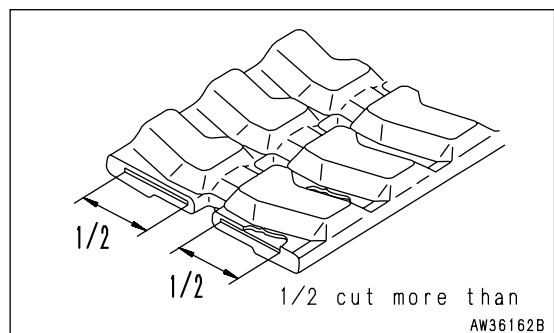


- If the lug is worn and the steel cord inside the shoe is exposed for two or more links, replace with a new part.  
(Rubber shoe specification)



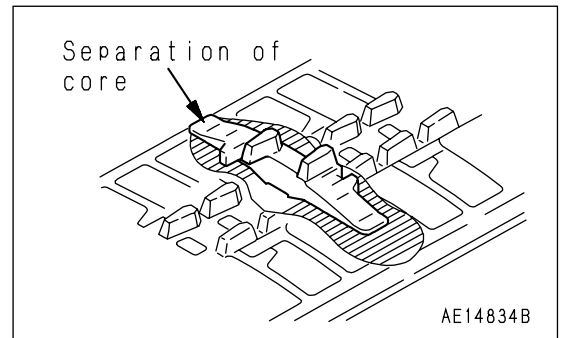
### Rubber Shoe Steel Code Cuts

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



### Rubber Shoe Core Separations

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



### Rubber Shoe Tension

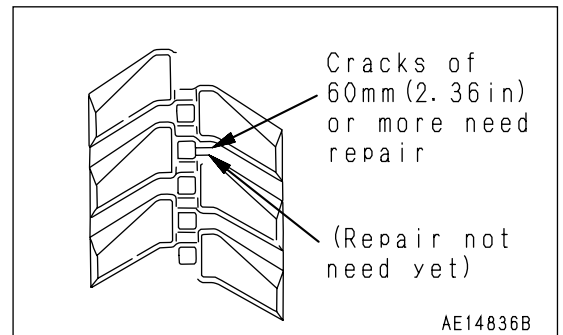
If the rubber shoe is still slack even when grease is pumped in, replace with a new part or replace the seal inside the cylinder.

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

### Rubber Shoe Cracks

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

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



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

## Rubber Shoe Tension - Check/Adjust

(Machine equipped with rubber shoes)

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

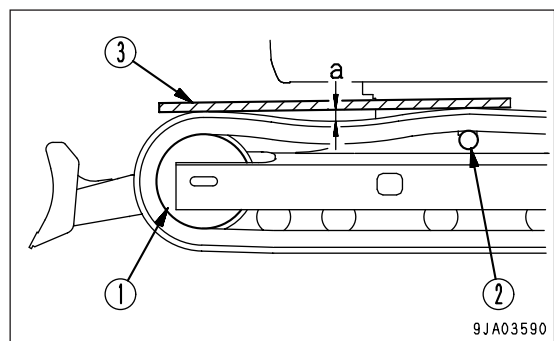
In particular, on new machines or after new tracks have been installed and the tension has been set to the specified value, the track tension will become loose in the first 5 to 30 hours when the machine has been used for a certain amount of repeated

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

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

### Checking

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



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

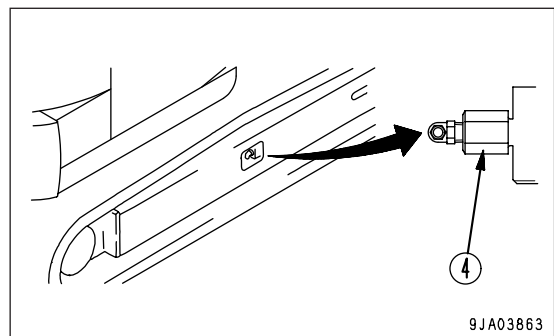
### Adjustment

#### **⚠ WARNING**

There is danger of plug (4) flying out under the high internal pressure of the grease. Never loosen plug (4) more than 1 turn.

Never loosen any part other than plug (4). Never put your face in the mounting direction of plug (4).

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



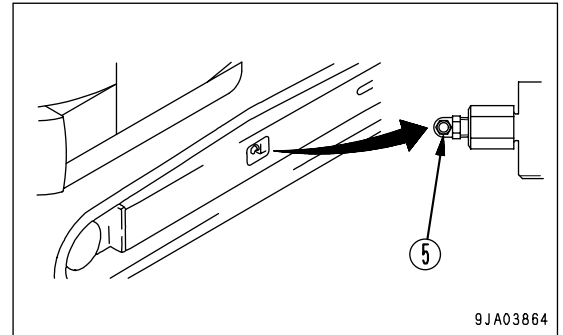
increasing track tension

#### NOTICE

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

Prepare a grease gun.

1. Pump in grease through grease fitting (5) with a grease pump.
2. To check that the track tension is correct, run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.
3. Check the track tension again, and if the tension is not correct, adjust it again.
4. If the tension is still low after supplied grease, the rubber shoe needs to be replaced or the seal in the cylinder needs to be replaced. Ask your Komatsu distributor for replacement.

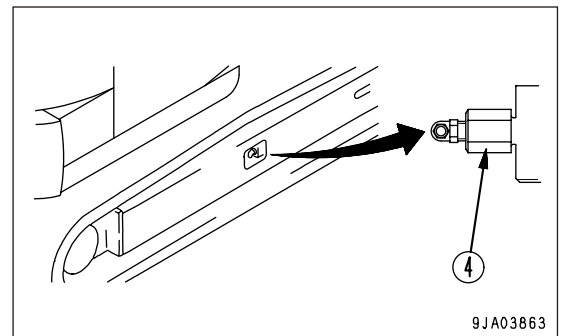


**Loosening track tension**

**⚠ WARNING**

**It is extremely dangerous to release the grease by any method except the procedure given below. If the track tension is not relieved by this procedure, please contact your Komatsu distributor.**

1. Loosen plug (4) gradually to release the grease.
2. When loosening plug (4), turn it a maximum of one turn.
3. If the grease does not come out smoothly, move the machine forwards and backwards a short distance.
4. Tighten plug (4).
5. To check that the track tension is correct, run the engine at low idling, move the machine forward a distance equal to the length of track on ground, then stop the machine.
6. Check the rubber shoe tension again, and if the tension is not correct, adjust it again.

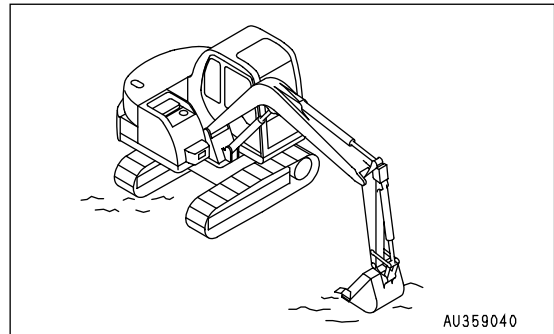


### Rubber Shoes Removal

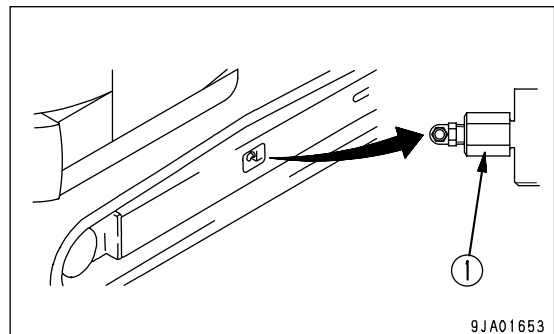
**⚠ WARNING**

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

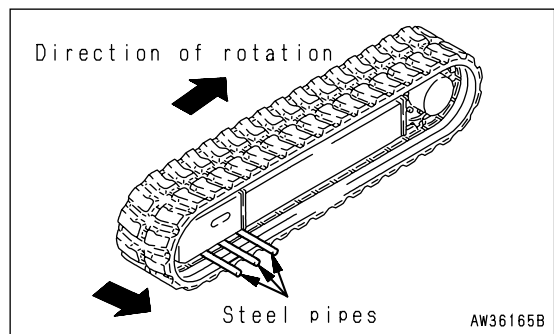
1. Raise the chassis with the boom and arm.  
When doing this, operate the levers slowly.



2. Loosen plug (1) gradually to release the grease.
3. Turn plug (1) a maximum of one turn.

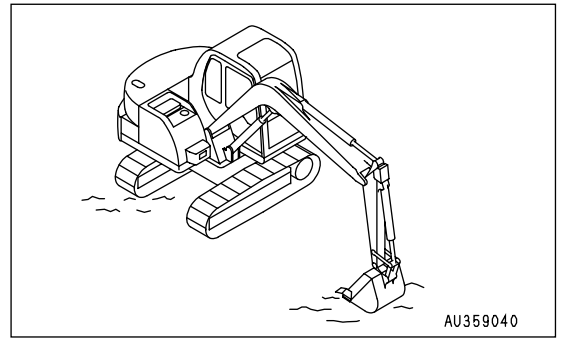


4. Fit the steel pipes inside the rubber shoe, rotate the sprocket in reverse, so that the steel pipes make the rubber shoe come up from the idler, then to the side to remove.

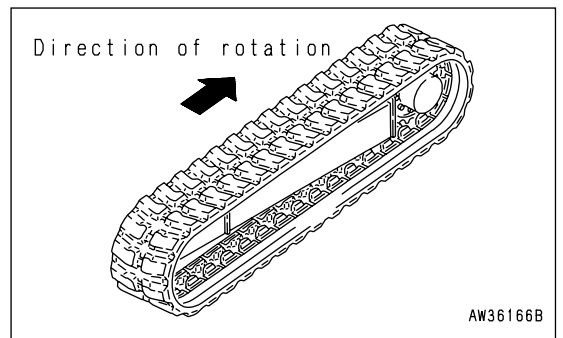


**Rubber Shoes Installation**

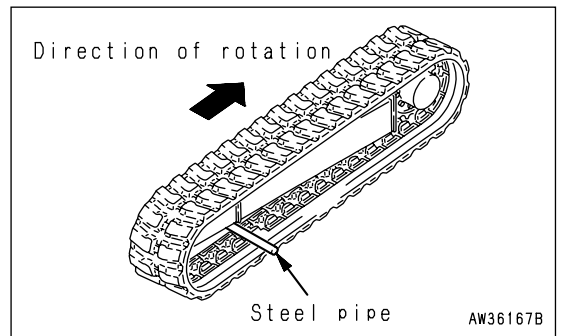
1. Raise the chassis with the boom and arm.  
When doing this, operate the levers slowly.



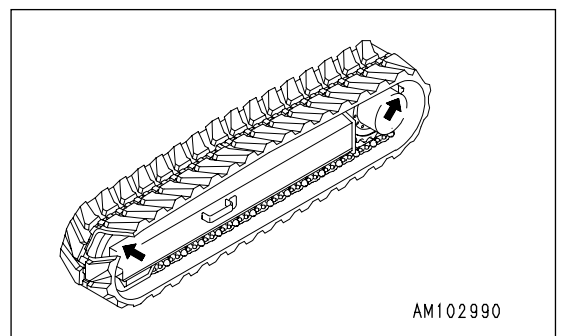
2. Mesh the rubber shoe with the sprocket and fit it over the idler.
3. Rotate the sprocket in reverse, then push in the rubber shoe and stop the rotation.



4. Mesh a steel pipe with the rubber shoe, then 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 "Track Tension - Check/Adjust (PAGE 4-28)".
7. Check that the track tension is correct and that the rubber shoe is correctly meshed on the sprocket and idler, then lower the machine to the ground.



## Road Liners - Replace

(Machine equipped with road liner)

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

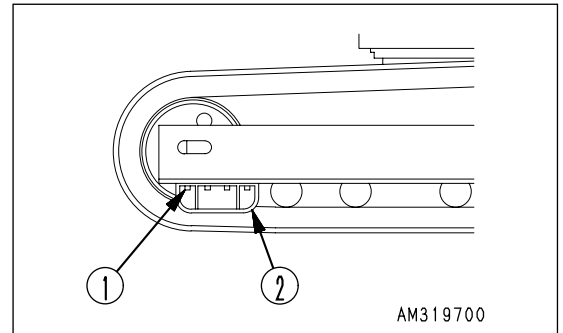
## Steel Shoes or Road Liners to Rubber Shoes - Change

### WARNING

When changing from the steel shoe or road liner to the rubber shoe, or when changing from the rubber shoe to the steel shoe or road liner, always contact your Komatsu distributor to have the replacement carried out.

### Changing from Steel Shoes or Road Liners to Rubber Shoes

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



### Changing from Rubber Shoes to Steel Shoes or Road Liners

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

## Electrical Intake Air Heater - Inspect

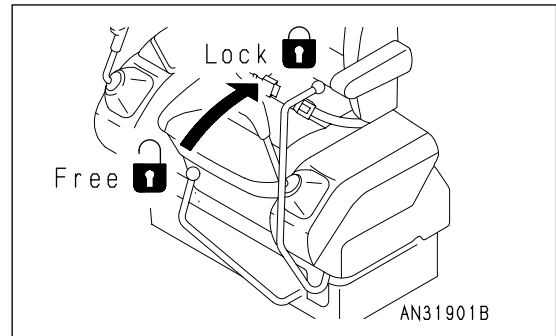
Before the start of the cold season (once a year), contact your Komatsu distributor to have the electrical intake air heater repaired or checked for dirt or disconnections.

## Bucket Teeth (Vertical Pin Type) - Replace

Replace the bucket teeth before the bucket teeth wear to a point where the adapter starts to wear.

### **⚠ 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.

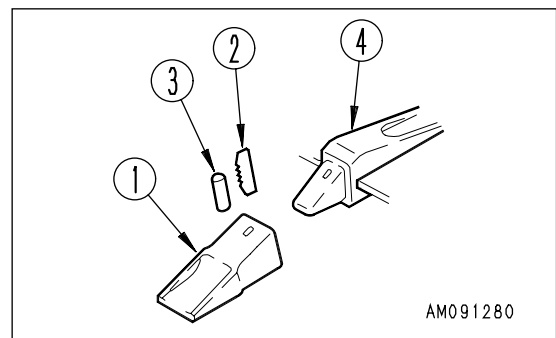
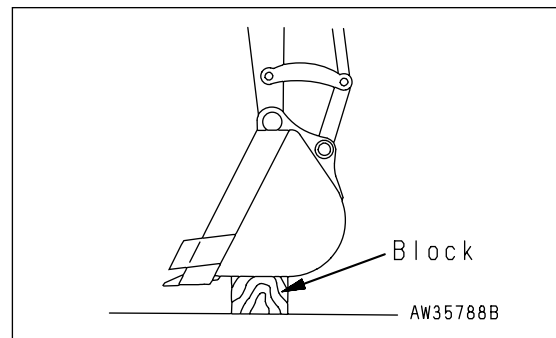


1. To make it possible to knock out the pin of tooth (1), set the bottom surface of the bucket on a block, check that the work equipment is in a stable condition, then set the safety lock lever to the LOCK position.

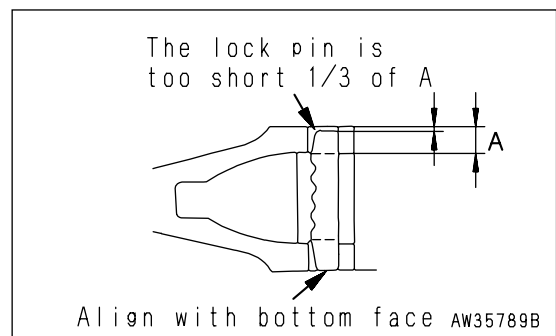
Set so that the bottom face of the bucket is horizontal.

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

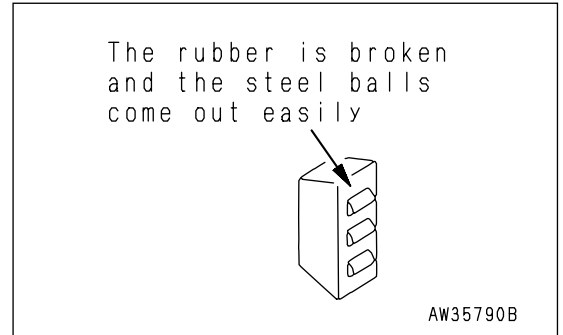
If lock pins and rubber pin locks with the following defects are used, the teeth may come off the bucket. Replace them with new ones.



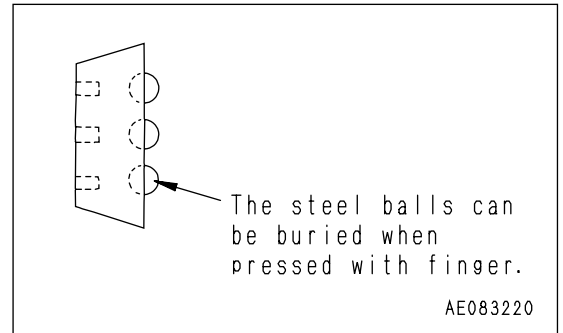
- The lock pin is too short.



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



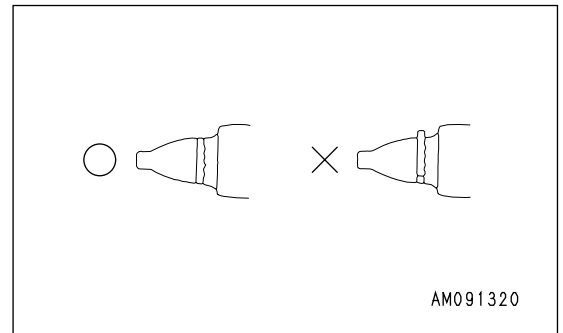
- The steel balls are buried when they are pressed by hand.



4. Clean the surface of adapter (4) and remove the soil with a knife.
5. Use your hand or a hammer to push rubber pin lock (3) into the hole of the adapter.

When doing this, be careful that the rubber pin lock does not fly out from the adapter surface.

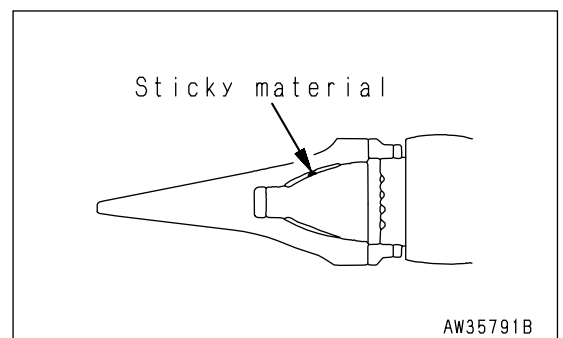
6. Clean the inside of teeth (1), then install it to adapter (4). If there is mud affixed to it or if there are protrusions, the teeth will not enter the adapter properly, and there will not be proper contact at the mating portion.



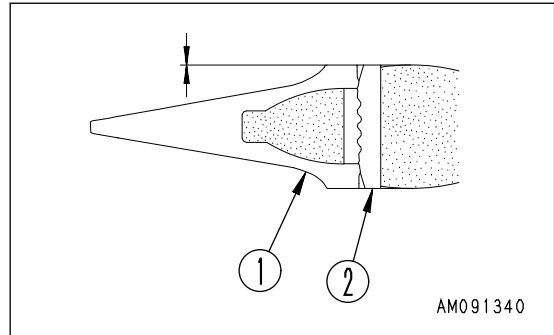
7. Fit teeth (1) to adapter (4), and confirm that when the pointer is pressed strongly, the rear face of the hole for the pin of the teeth (1) is at the same level as the rear face of the hole for the pin of the adapter.

If the rear face of the hole for the pin of teeth (1) is protruding to the front from the rear face of the pin hole for adapter (4), do not try to knock the pin in.

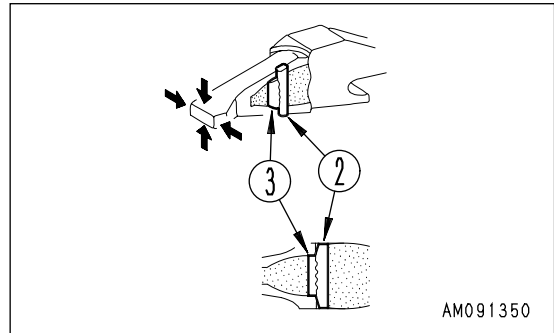
There is something preventing teeth (1) from entering adapter (4) fully, so remove the obstruction. When teeth (1) enters adapter (4) fully, knock in lock pin (2).



8. Insert lock pin (2) in the hole of the teeth and hit it until its top is the same level as the surface of teeth (1).



9. After replacing a bucket tooth, always check the following.
  - 1) After the lock pin has been knocked in completely, check that it is secured by the point and surface.
  - 2) Lightly hit lock pin (2) in the reverse direction from which it was hit in.
  - 3) Lightly hit the tip of the point from above and below, and hit its sides from right and left.
  - 4) Confirm that rubber pin lock (3) and lock pin (2) are set as shown in the figure.



The life of the teeth can be lengthened and the frequency of its replacement can be reduced by turning it upside down so that it will wear evenly.

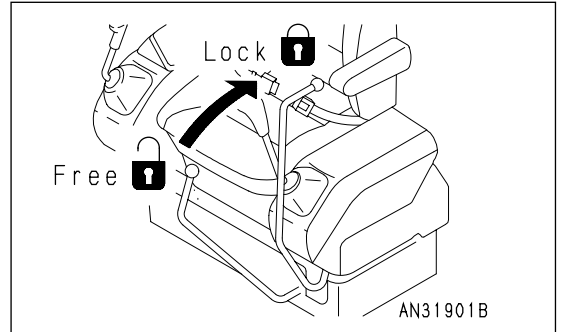
Replace the rubber pin lock and locking pin at the same time as replacing the teeth. This makes it possible to prevent the teeth from falling out.

## Bucket Teeth (Horizontal Pin Type) - Replace

Replace the teeth before the wear reaches the adapter.

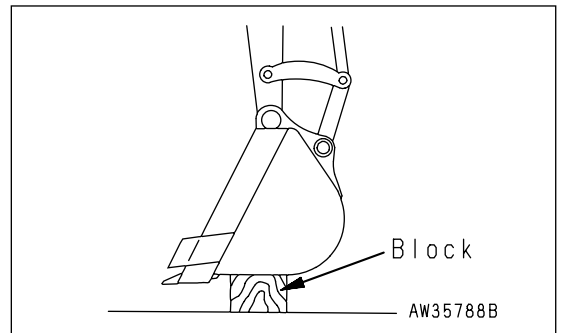
### WARNING

- 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.

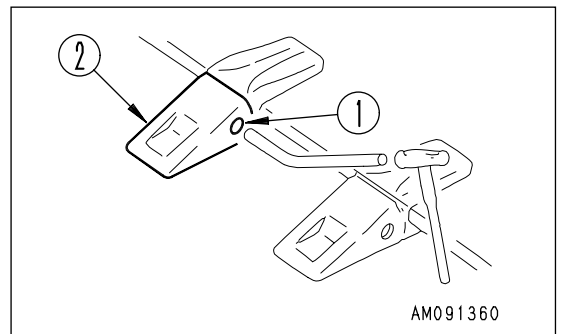


1. Set the bottom of the bucket on a block to make it possible to remove pin (1), check that the work equipment is stable, then set the safety lock lever to the LOCK position.

Set so that the bottom of the bucket is horizontal.



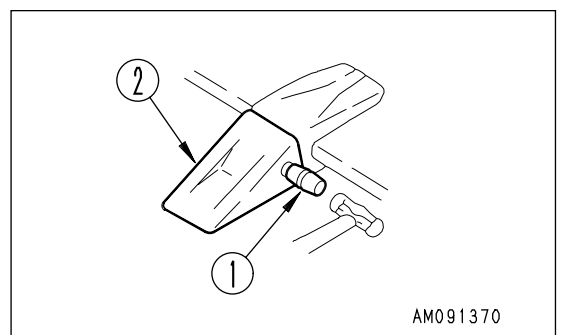
2. Place a bar on the pin head and strike the bar with a hammer to knock out pin (1). Remove tooth (2).



### REMARK

Use a round bar with a smaller diameter than that of the pin.

3. Clean the mounting face. Fit a new tooth (2) in the adapter, push in pin (1) partially by hand, then lock it with a hammer to install the tooth to the bucket.

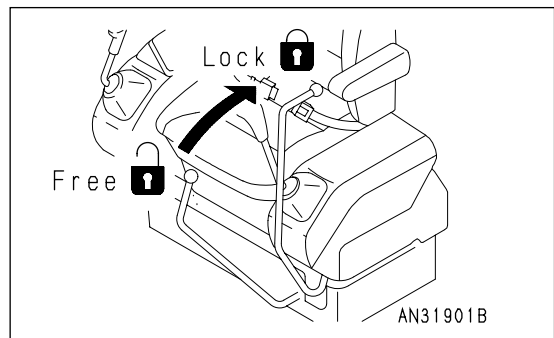


## Bucket Clearance - Adjust

**⚠ WARNING**

It is dangerous if the work equipment moves by mistake when the clearance is being adjusted.

Set the work equipment in a stable condition, then stop the engine and lock the safety lock lever securely.



1. Set the work equipment to the position shown in the diagram at right, stop the engine and set the lock lever to the locked position.

2. Shift O-ring (1) of the linkage and measure the amount of play "a".

Measurement is easier if you move the bucket to one side or the other so all the play can be measured in one place.

Use a gap (clearance) gauge for easy and accurate measurement.

3. Loosen 4 plate mounting bolts (2), and loosen plate (3).

The shim is a split type, so the operation can be carried out without removing the bolts.

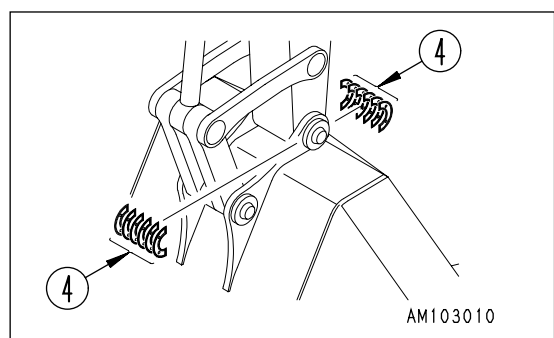
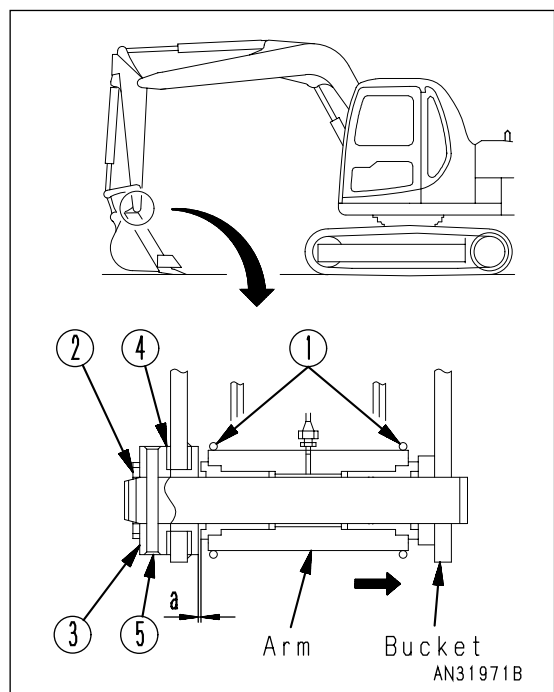
4. Remove shim (4) corresponding to the amount of play "a" measured above.

Two shims form one set. The thickness of shim (4) is 0.5 mm(0.02 in) for each shim.

If play "a" is smaller than the thickness of one shim, do not tighten bolt (2) to adjust.

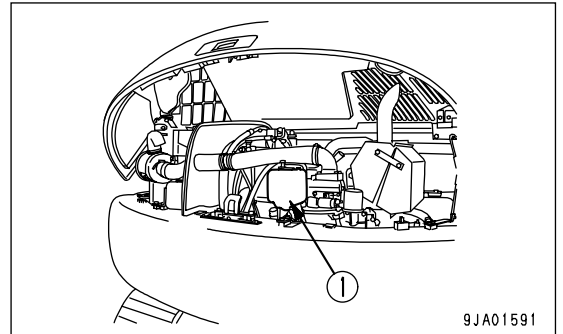
5. Tighten 4 bolts (2) .

If bolt (2) is stiff and cannot be tightened, it may be easier to remove ring plate (5) and tighten the bolts.



### Windshield Washer Fluid Level - Check/Add

If there is air in the window washer fluid, check the level of the fluid in window washer tank (1). Add automobile window washer fluid if necessary.



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

### Washer Fluid Dilution Ratio

The proportion differs according to the ambient temperature, so dilute the washer fluid with water to the following proportions before adding.

Area, season	Proportions	Freezing temperature
Normal	Washer fluid 1/3 : water 2/3	-10°C (14°F)
Winter in cold area	Washer fluid 1/2 : water 1/2	-20°C (-4°F)
Winter in extremely cold area	Pure washer fluid	-30°C (-22°F)

There are two types depending on the freezing temperature:

-10°C (14°F) (general use) and -30°C (-22°F) (cold area use), so select according to the area and season.

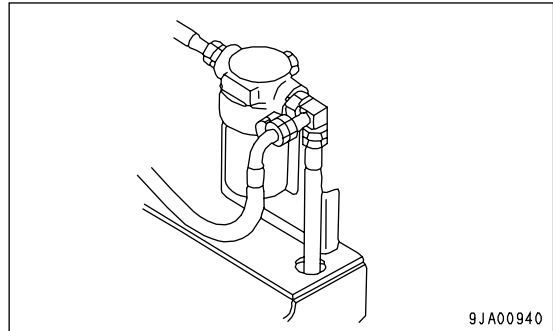


## Breaker Circuit Additional Oil Filter Element - Replace

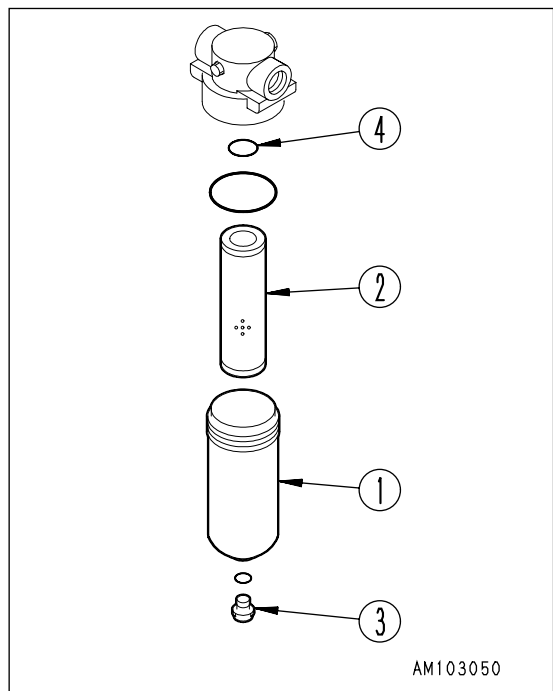
(If equipped)

### 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 engine breather.
- When using compressed air, there is a hazard that dirt may be blown up and cause serious injury. Always use safety glasses, dust mask, or other protective equipment.

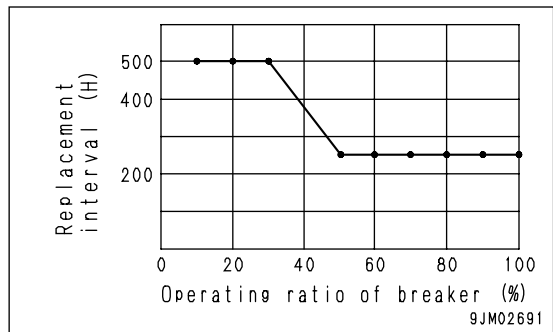


- Prepare a container to catch the oil.
  1. Place a container under the filter element to catch the oil.
  2. Turn filter case (1) to the left to remove it, then take out element (2).
  3. Remove plug (3) from filter case (1).
  4. Clean the removed parts, then install new element (2) and O-ring (4).
  5. When installing, bring the case into contact with the filter holder, then tighten a further 1/2 turns.



### NOTICE

When the breaker is used, replace the element every approx 250 hours (when operating ratio is more than 50%), referring to the chart at the right.



## Wash Washable Floor

### WARNING

- When setting the machine at an angle, use strong blocks to stabilize the machine and be extremely careful when carrying out the operation.
- If the control levers are touched by mistake, the work equipment or machine may suddenly move, and this may lead to a serious accident. Always set the safety lock lever securely to the LOCK position before standing up from the operator's seat.

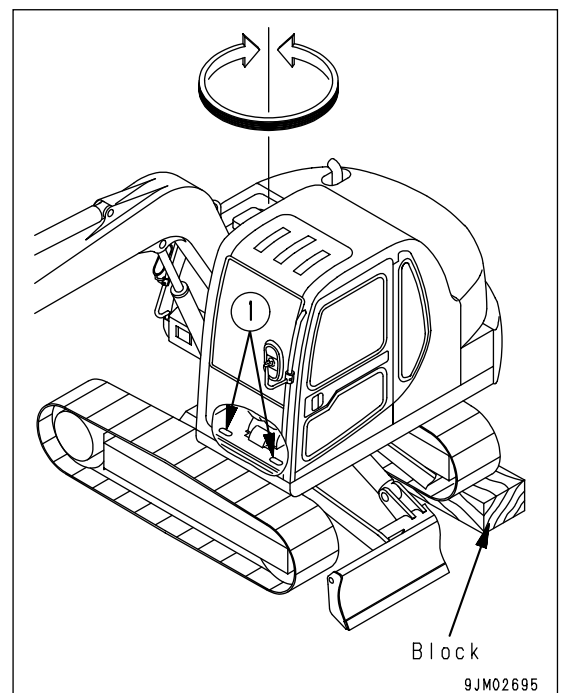
With the washable floor, it is possible to flush out the dirt on the cab floor directly with water.

### Method of washing

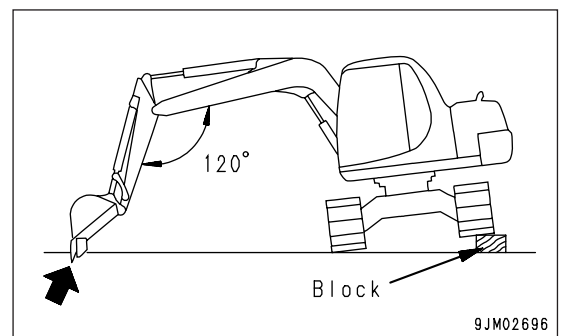
1. Set the machine at an angle.

For details, see "Method of Setting Machine At Angle (PAGE 4-47)".

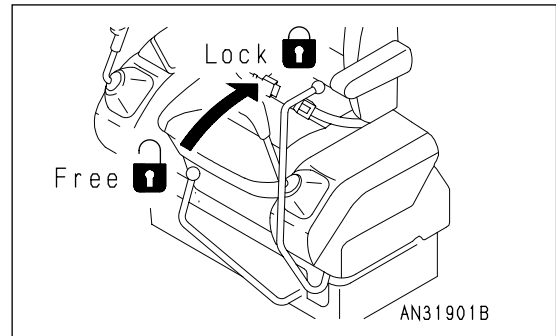
2. Swing the upper structure slowly so that water drain holes (1) in the cab floor are at a low position.



3. Lower the work equipment to the ground and set the machine in a stable condition.



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



5. Remove the floor mat.
6. Flush out the dirt on the floor directly with water through water drain hole (1).

**NOTICE**

- Be careful not to get water on the monitor and connectors inside the operator's compartment.
- Do not direct water above base (2) of the operator's seat.



7. After completing the washing operation, install the floor mat.

## Method of Setting Machine At Angle

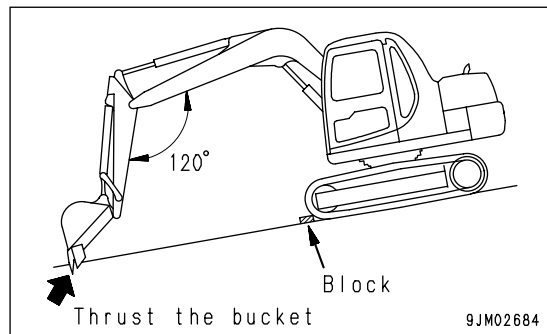
### Method Using Slope

**⚠ WARNING**

Select a firm flat place.

Always put blocks under the track to prevent the machine from moving, and dig the work equipment into the ground.

1. Stop the machine so that the work equipment is on the downhill side.
2. Put blocks under the track and dig the work equipment into the ground.



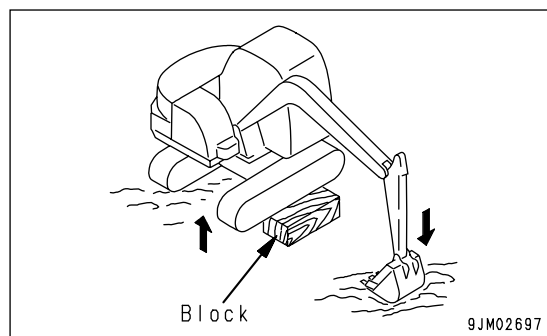
### Method Using Block

**⚠ WARNING**

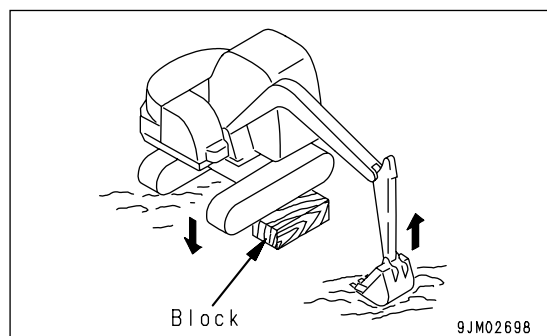
Select a firm flat place.

Put strong blocks under the undercarriage to stabilize the machine and be extremely careful when carrying out the operation.

1. Raise the chassis with the boom and arm.  
When doing this, operate the levers slowly.
2. Insert a block securely between the ground surface and the raised track and make sure that the machine is stable.



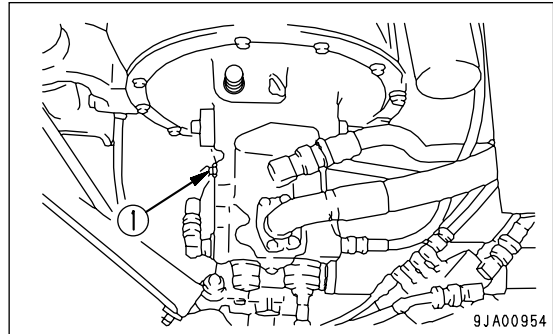
3. Raise the boom slowly and lower the machine.  
When doing this, check that the machine is always stable.



## Hydraulic System - Bleed Air

For details, see "STARTING ENGINE (PAGE 3-47)". If it is necessary to refer to the items for starting the engine, moving the machine off, steering, or stopping, see the OPERATION section.

1. Bleeding air from pump
  - 1) Loosen air bleed plug (1) installed to the drain port and check that oil oozes out (air bleeding is completed).
  - 2) After completion of the air bleeding operation, tighten the air bleed plug.



### NOTICE

**If the pump is run when the pump case is not full of oil, there will be abnormal generation of heat, and this will lead to premature failure of the pump.**

2. Bleeding air between pump and hydraulic tank
  - 1) Start the engine and maintain it at a mid-range speed (1650 rpm). For details, see "STARTING ENGINE (PAGE 3-47)".
  - 2) Operate the work equipment slowly for approx. 5 minutes to bleed the air.

### NOTICE

**If the engine is run at high speed without bleeding the air between the pump and hydraulic tank, there will be abnormal generation of heat, and this will lead to premature failure of the pump.**

3. Bleeding air from cylinders
  - 1) Run the engine at a mid-range speed (1650rpm) and extend and retract the cylinders 4 to 5 times to a point 100 mm(3.9in) from the end of the stroke. (Be careful not to operate to the end of the stroke.)
  - 2) Next, operate each cylinder 3 to 4 times to the end of its stroke.
  - 3) Finally, operate each cylinder 4 to 5 times to the end of its stroke to completely remove the air.

### NOTICE

**If the engine is run immediately 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.**

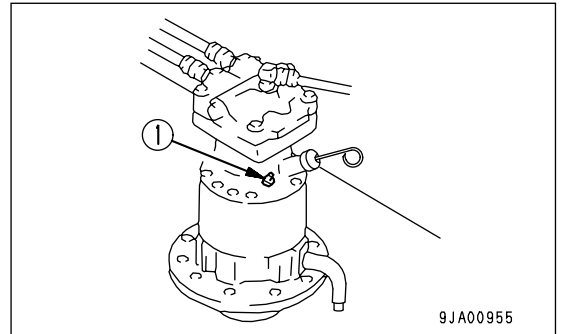
4. Bleeding air from swing motor  
(only after draining oil from swing motor case)

- 1) Run the engine at low idling, Loosen air bleeding plug (1) and check that oil oozes out from air bleeding plug (1).

**NOTICE**

**When doing this, do not operate the swing.**

- 2) If no oil oozes out, stop the engine, remove air bleeding plug (1), then fill the motor case with hydraulic oil.



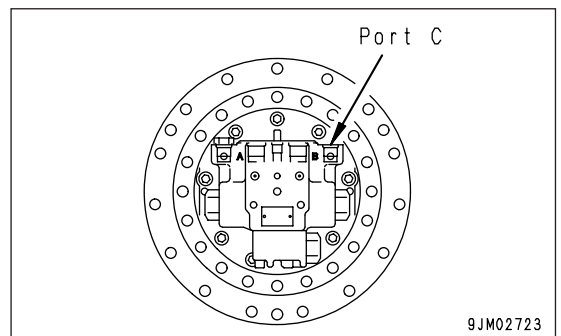
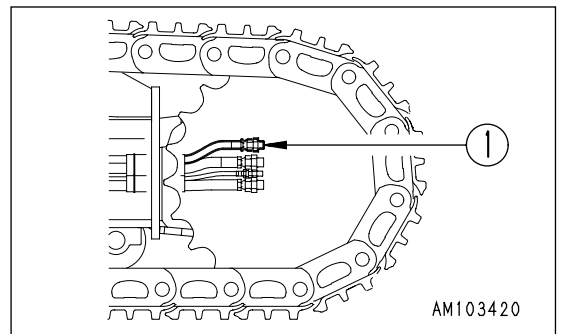
- 3) After completing the air bleed operation, tighten air bleeding plug (1).
- 4) Run the engine at low idling, and slowly swing the upper structure at least 2 times uniformly to the left and right.

**NOTICE**

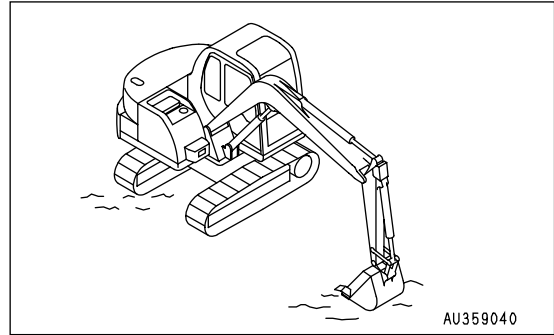
**If the air is not bled from the swing motor, the motor bearings may be damaged.**

5. Bleeding air from travel motor (only when oil inside travel motor case has been drained)

- 1) Run the engine at low idling, remove hose (1) from port C, then when the oil has flowed out, tighten it again.



- 2) Run the engine at low idling and swing the work equipment 90° to bring it to the side of the track.
- 3) Jack up the machine until the track is raised slightly from the ground. Rotate the track under no load for 2 minutes.  
Repeat this procedure on both the left and right sides, and rotate the track equally both forward and in reverse.



6. Bleeding air from attachment (when installed)

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

**NOTICE**

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

## CHECK BEFORE STARTING

For details of the following items, see "Checks Before Starting (PAGE 3-36)" in the OPERATION section.

- Cooling System Coolant Level - check/Add
- Engine Crankcase Oil Level - Check/Add
- Fuel Level - Check/Refill
- Hydraulic Oil Level - Check/Add
- Check Dust Indicator
- Electric Wiring - Inspect
- Check Function Of Horn
- Check For Water And Sediment In Water Separator, Drain Water



## EVERY 50 HOURS MAINTENANCE

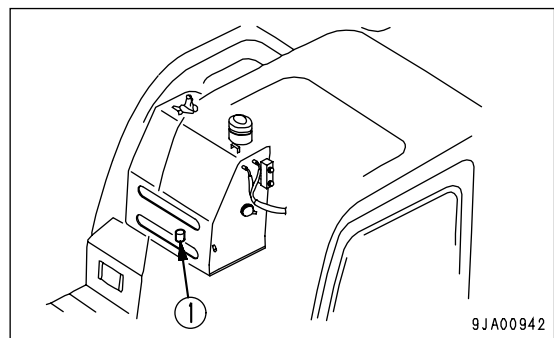
### Fuel Tank - Drain

#### NOTICE

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

Carry out this procedure before operating the machine.

1. Prepare a container to catch the fuel that is drained.
2. Open valve (1) at the bottom of the tank and drain the sediment and water that has accumulated at the bottom together with fuel. When doing this, be careful not to get fuel on yourself.
3. When only clean fuel comes out, close drain valve (1).

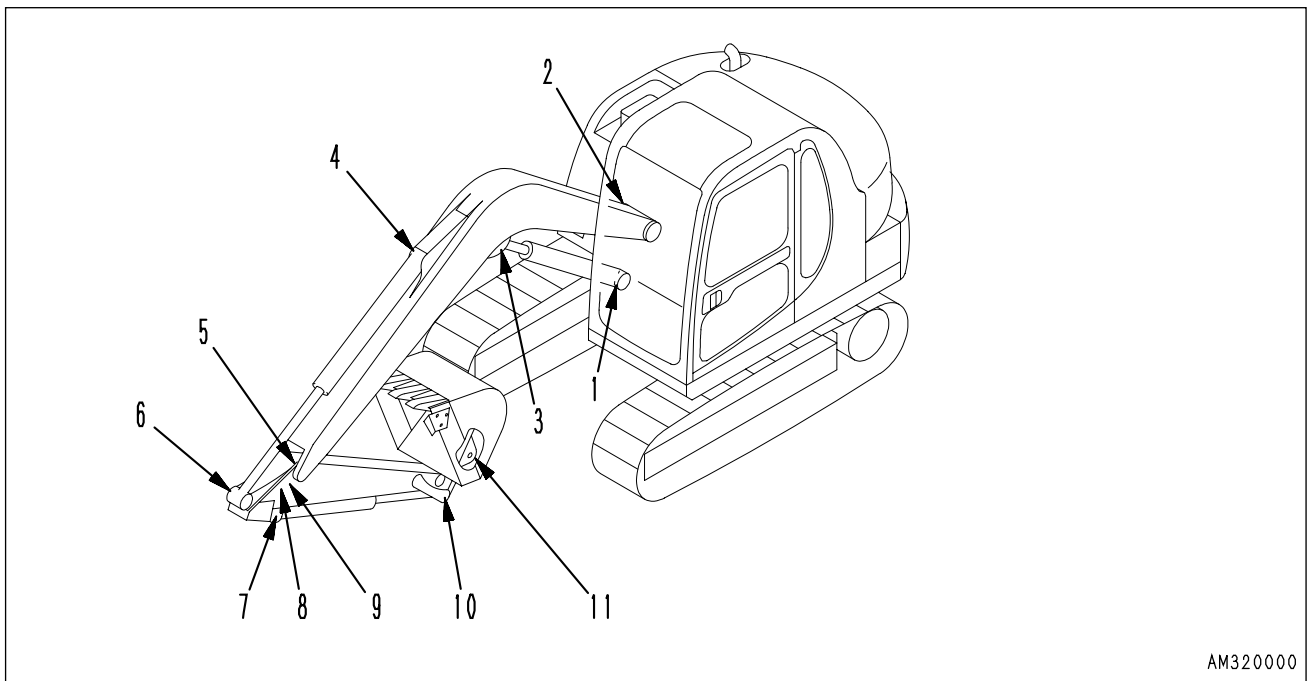


## EVERY 100 HOURS MAINTENANCE

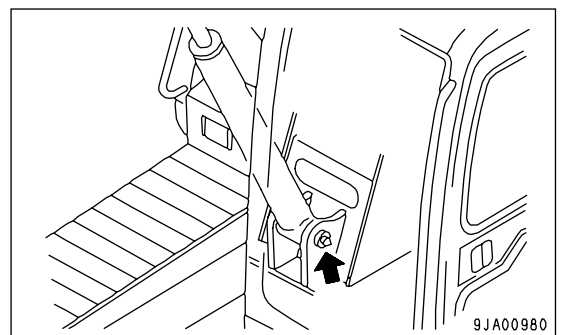
Maintenance for every 50 hours service should be carried out at the same time.

### Lubricating

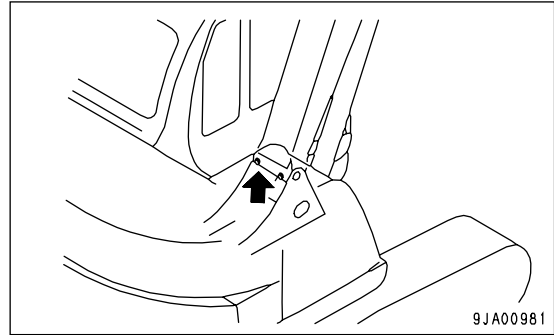
1. Set the work equipment in the greasing posture below, then lower the work equipment to the ground and stop the engine.
2. Using a grease pump, pump in grease through the grease fittings shown by arrows.
3. After greasing, wipe off any old grease that was pushed out.



(1) Boom cylinder foot pin (1 point)

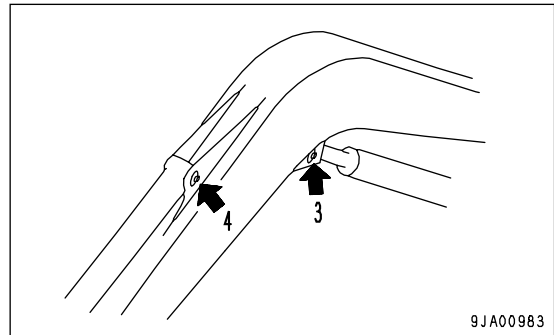


(2) Boom foot pin (2 points)



(3) Boom cylinder rod end (1 point)

(4) Arm cylinder foot pin (1 point)



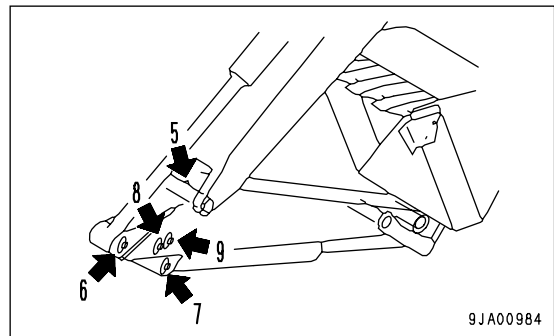
(5) Boom - Arm coupling pin (1 point)

(6) Arm cylinder rod end (1 point)

(7) Bucket cylinder foot pin (1 point)

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

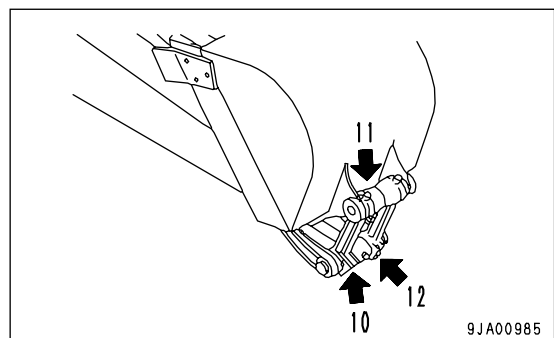
(9) Arm - Link coupling pin (1 point)



(10) Link coupling pin (2 points)

(11) Bucket - Link coupling pin (2 points)

(12) Bucket cylinder rod end (1 point)

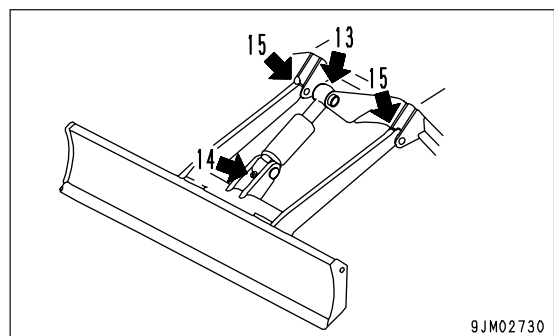


(Only machines with blade specification)

(13) Blade cylinder rod end (1 point)

(14) Blade cylinder foot pin (1 point)

(15) Blade foot pin (2 points)



## Swing Machinery Case Oil - Check/Add

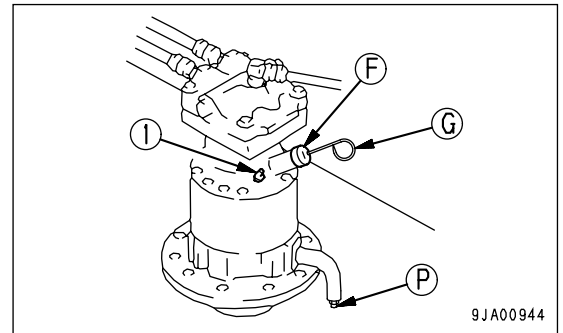
### WARNING

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. Remove dipstick (G) and wipe the oil from the dipstick with a cloth.
2. Insert dipstick (G) fully in the guide.
3. When dipstick (G) is pulled out, if the oil level is between the H and L marks of the gauge, oil level is proper.
4. If the oil does not reach the L mark on dipstick (G), add engine oil through dipstick insertion hole (F).

When refilling, remove bleeding plug (1).

5. If the oil level exceeds the H mark on the dipstick, loosen drain plug (P) to drain the excess oil.
6. After checking oil level or adding oil, insert the dipstick into the hole and install air bleeding plug (1).



## EVERY 250 HOURS MAINTENANCE

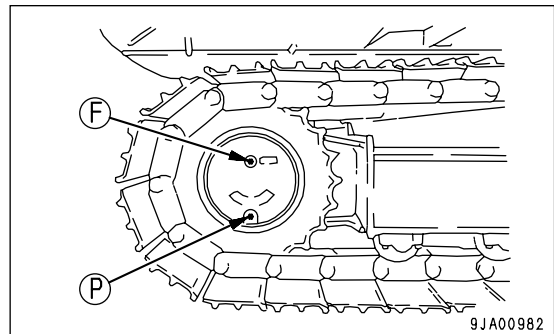
Maintenance for every 50 hours service should be carried out at the same time.

### Final Drive Case Oil Level - Check/Add

#### 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 (Width across flats: 8 mm (0.3 in)).
  1. Set so that plug (F) is at the top, with plug (F) and plug (P) perpendicular to the ground.
  2. Using a hexagonal wrench, remove plug (F) and check that the oil level is within a range from the bottom of the plug hole to a point 10 mm(0.4 in) below it.
  3. If the oil level is too low, install plug (F), operate the travel levers, and drive forward or in reverse to rotate the sprocket one turn. Then repeat Step 2 to check again.
  4. If the oil level is still too low, add engine oil through the hole in plug (F) until the oil overflows.
  5. After checking, install plug (F).



## Battery Electrolyte Level - Check

Carry out this check before operating the machine.

### WARNING

- Do not use the battery if the battery electrolyte level is below the LOWER LEVEL line. This will accelerate deterioration of the inside of the battery and reduce the service life of the battery. In addition, it may also cause an explosion.
- The battery generates flammable gas and there is danger of explosion, so do not bring fire or sparks near the battery.
- Battery electrolyte is dangerous. If it gets in your eyes or on your skin, wash it off with large amount of water and consult a doctor.
- When adding distilled water to the battery, do not allow the battery electrolyte to go above the UPPER LEVEL line. If the electrolyte level is too high, it may leak and cause damage to the paint surface or corrode other parts.

### NOTICE

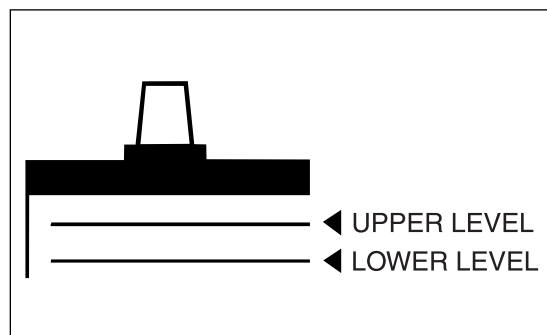
When adding distilled water in cold weather, add it before starting operations in the morning to prevent the electrolyte from freezing.

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

### When Checking Electrolyte Level from side of Battery

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

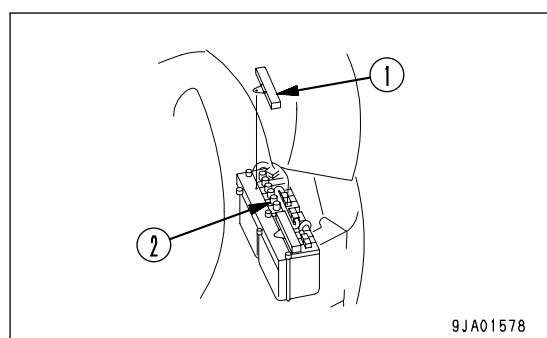
1. Open the battery room door and remove sheet (1) installed above the battery.
2. Use a wet cloth to clean the area around the electrolyte level lines and check that the electrolyte level is between the UPPER LEVEL (U.L) and LOWER LEVEL (L.L) lines. If the battery is wiped with a dry cloth, static electricity 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 (2) and add distilled water to the U.L line.
4. After adding distilled water, tighten cap (2) 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.

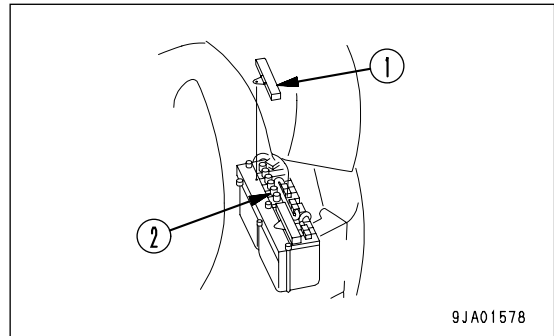


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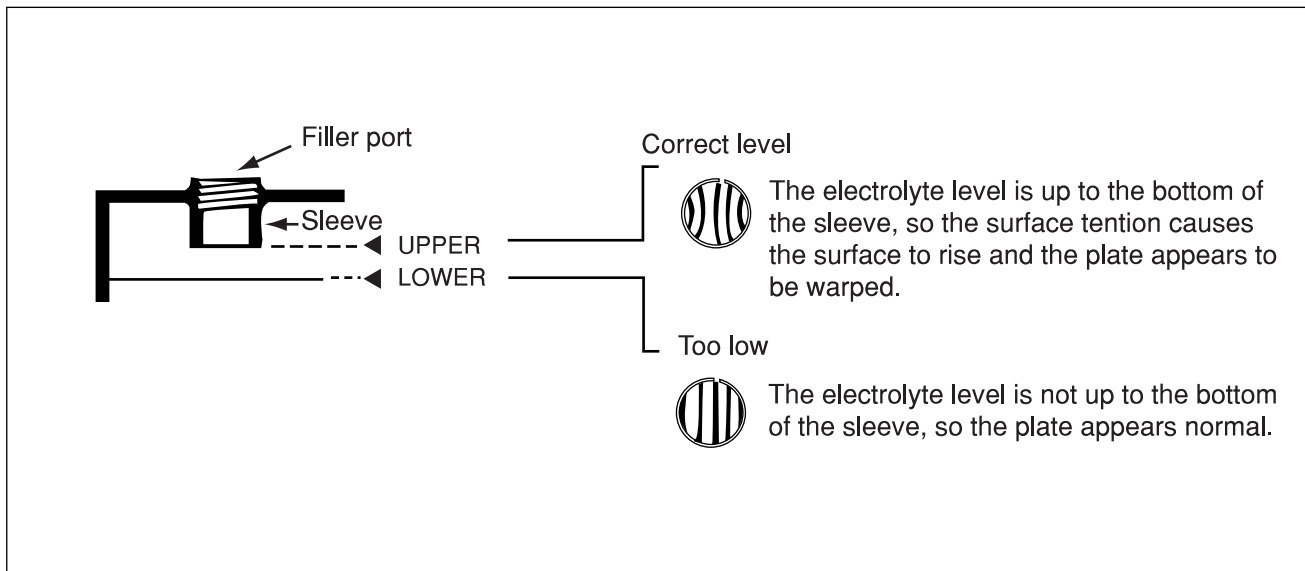
### When It is Impossible to Check Electrolyte Level from Side of Battery

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 battery room door and remove sheet (1) installed above the battery.
2. Remove cap (2) 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 (2) 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.

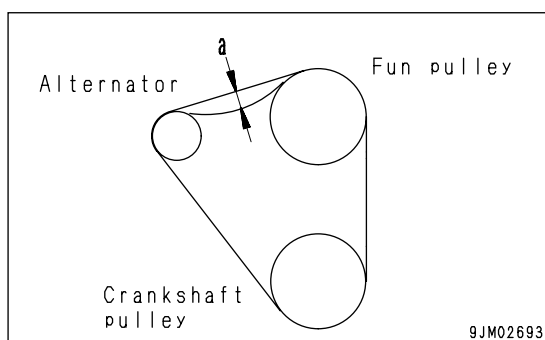
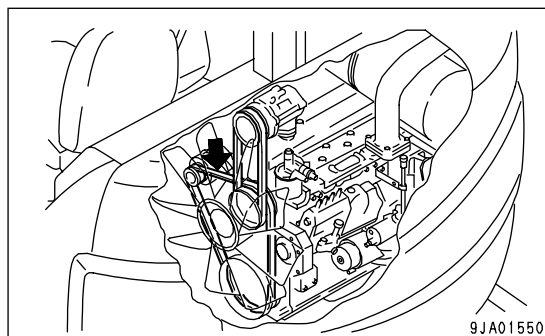
### When It is Possible to Use Indicator to Check Electrolyte Level

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

## Cooling Fan Belt Tension - Inspect/Adjust

### Inspection

The belt should deflect approx. 8 mm(0.3 in) when pressed with "a" finger force of approx. 58.8 N (6 kgf) at a point midway between the alternator pulley and fan pulley.





### Adjustment

For machines equipped with air conditioner, see "V-belt Tension - Inspect/Adjust (PAGE 6-14)".

Prepare the following.

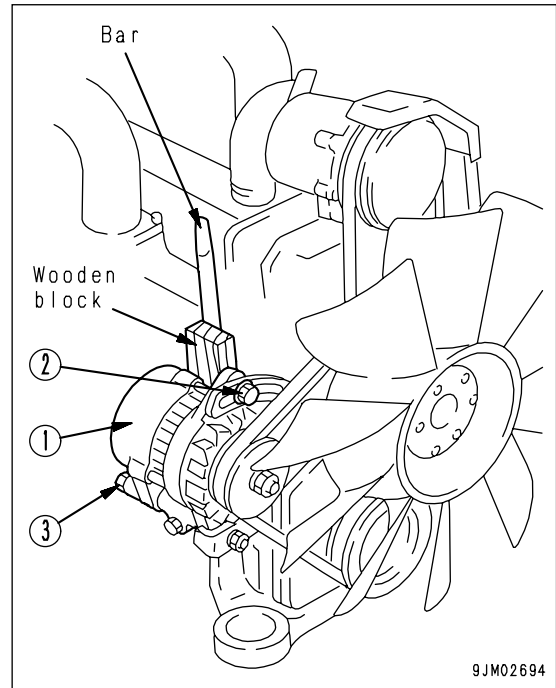
- Prepare a bar.
- Prepare a wooden block.

Adjust the fan belt tension.

1. 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 any damage to the alternator.
2. Loosen bolts (2) and (3).
3. Move alternator (1) so that the deflection of the belt is approx. 8 mm(0.3 in) (approx. 58.8 N (6 kgf)).
4. Tighten bolts (2) and (3) to fix alternator (1) in position.

#### NOTICE

- Check each pulley for damage, wear of the V-groove, and wear of the V-belt. In particular, be sure to check that the V-belt is not touching the bottom of the V-groove.
- If the belt is stretched and there is no allowance for adjustment, or if it is cut or cracked, please contact your Komatsu distributor for replacement.



## EVERY 500 HOURS MAINTENANCE

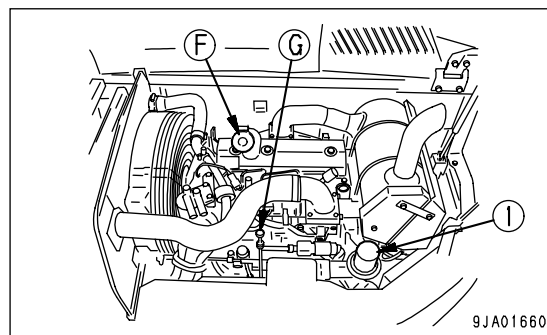
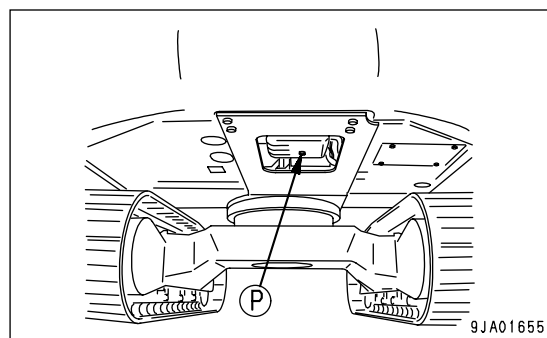
Maintenance for every 50, 100 and 250 hours service should be carried out at the same time.

### Change Oil In Engine Oil Pan, Replace Engine Oil Filter Cartridge

**⚠ WARNING**

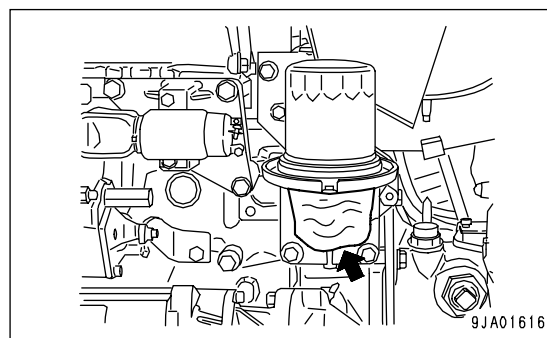
The parts and oil are at high temperature after the engine is stopped, and may cause serious burns. Wait for the temperature to go down before starting the operation.

- Container to catch drained oil: Min. 10.5 liters  
Refill amount: 10.5 liters (2.77 US gal)
- Prepare a 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, please contact your Komatsu distributor.
  4. Install drain plug (P).
  5. Open the engine hood, then using a filter wrench, turn filter cartridge (1) counterclockwise to remove it.



**REMARK**

Put a cloth in contact with the notched part of the oil container guide. This makes it possible to prevent the area around the filter holder from becoming dirty.



6. Clean the filter holder, then coat the thread and the packing portion of the new filter cartridge with clean engine oil (or coat thinly with grease), and install.

**NOTICE**

**Check that the old packing is not stuck to the filter holder.  
If there is any old packing, it will cause oil leakage.**

7. After bringing the packing surface into contact with the seal surface of the filter holder, tighten it a further 1/2 turns.
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 "Engine Crankcase Oil Level - Check/Add (PAGE 3-37)".

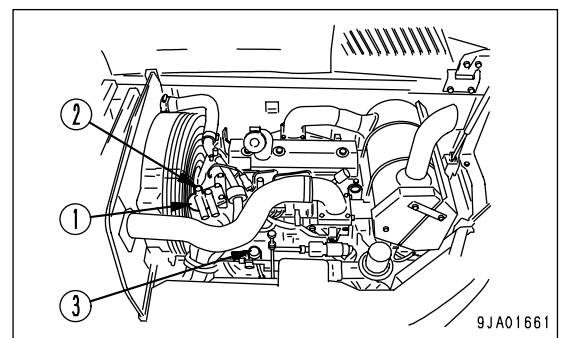
## Fuel Filter Cartridge - Replace

### WARNING

- The parts are at high temperature immediately after the engine has been operated. Wait for all parts to cool down before replacing the filter.
- Do not bring fire or sparks near the fuel.

Prepare a filter wrench and a container to catch the fuel.

1. Set the container to catch the fuel under the filter cartridge.
2. Using a filter wrench, turn filter cartridge (1) counterclockwise to remove it.
3. Clean the filter holder, fill a new filter cartridge with clean fuel, coat the packing surface with engine oil, then install it to the filter holder.
4. After bringing the packing surface into contact with the seal surface of the filter holder, tighten it a further 2/3 turns.



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

5. After replacing the fuel filter cartridge, bleed the air from the system.  
Bleed the air as follows.
6. Fill the fuel tank with fuel (to the position where the float is at the highest position).
7. After replacing filter cartridge (1), loosen air bleed plug (2).
8. Loosen the knob of feed pump (3), pump it up and down, and continue to make the fuel overflow until no more bubbles come out from joint bolt (2).
9. Tighten joint bolt (2).

Always use a genuine Komatsu filter cartridge.

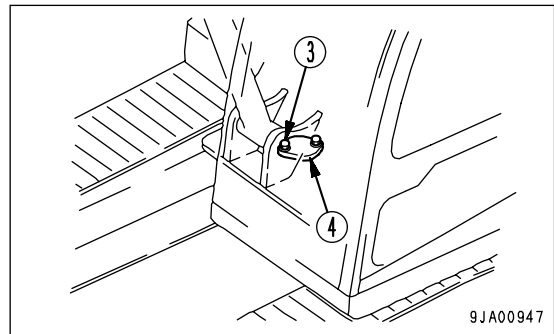
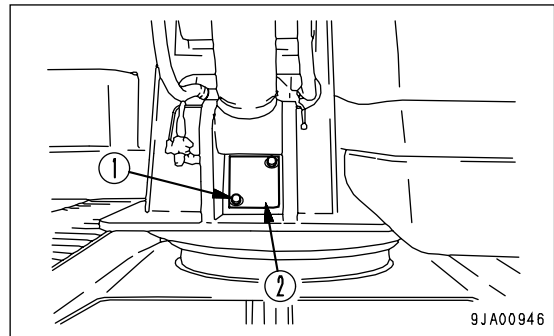
After replacing the filter cartridge, start the engine and check for any leakage of oil from the filter seal surface.

### REMARK

Use the same procedure to operate the feed pump and bleed the air if the machine runs out of fuel.

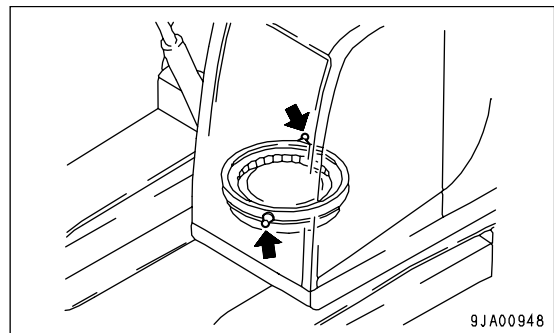
### Swing Pinion Gear Oil Level - Check/Add

- Prepare a scale.
1. Remove bolts (1) (2 bolts) on the front of the revolving frame and remove cover (2) .
  2. Remove bolts (3) (2 bolts) on the top of the revolving frame and remove cover (4) .
  3. Insert a scale into the grease and check that the height of the grease in the portion where the pinion passes is at least 20 mm (0.8 in). Add more grease if necessary.
  4. Check if the grease is milky white. If it is milky white, it is necessary to change the grease. Please contact your Komatsu distributor.
- The total amount of grease is 5 liters (4.5 kg)  
(1.3 US gal [9.9 lb]).
5. Install cover (4) with bolts (3) .
  6. Install cover (2) with bolts (1) .



### Swing Circle - Lubricate

1. Lower the work equipment to the ground.
2. Using a grease pump, pump in grease through the grease fittings shown by arrows.
3. After greasing, wipe off all the old grease that was pushed out.



## Clean And Inspect Radiator Fins, Oil Cooler Fins And Condenser Fins

(Machines Equipped With Air Conditioner)

### WARNING

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

### NOTICE

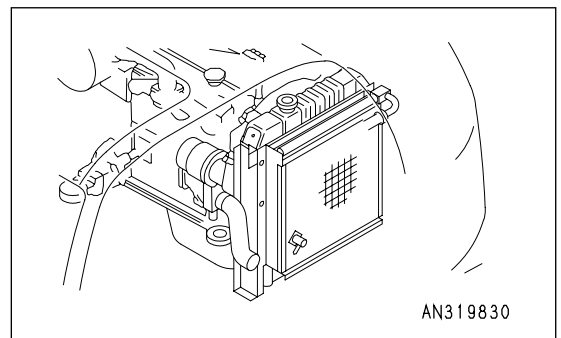
To prevent damage to the fins, apply compressed air from an appropriate distance. Damaged fins may cause water leakage or overheating. In a dusty site, check the fins daily, irrespective of the maintenance interval.

1. Open the engine hood.
2. Use compressed to blow off mud, dust, or leaves clogging the radiator fins and oil cooler fins. At the same time, clean the net in front of the oil cooler. On machines equipped with an air conditioner, clean the condenser fins also.

Steam or water can be used in place of compressed air.

3. Check the rubber hose. Replace with a new one if the hose is found to have cracks or to be hardened by ageing.

Further, check hose clamps for looseness.



## Hydraulic Oil Filter Element - Replace

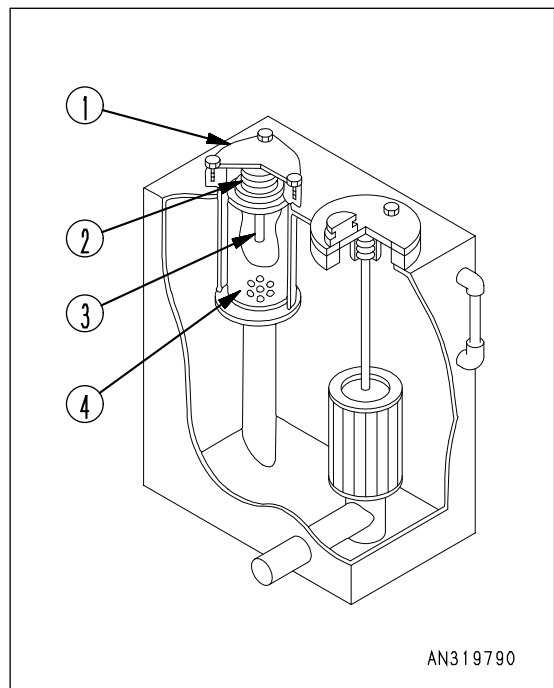
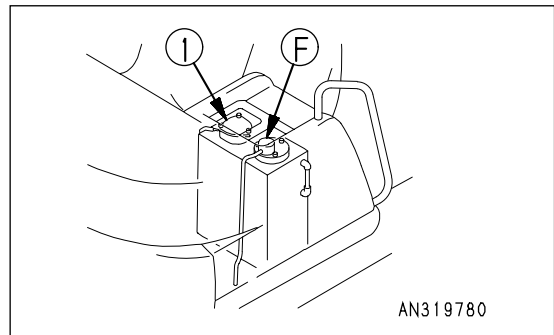
### WARNING

- 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 4-18)" when carrying out maintenance.

1. Remove the cover at the top of the hydraulic tank.
2. Remove the cap from oil filler (F), and release the internal pressure.
3. Loosen 3 bolts, then remove cover (1). When doing this, the cover may fly out under the force of spring (2), so hold the cover down when removing the bolts.
4. After removing spring (2) and valve (3), take out element (4).
5. Clean the removed parts in diesel oil.
6. Install the new element in the place where old element (4) was installed.  
  
Check the O-ring to be set between the hydraulic tank and cover (1). If it is damaged, replace the O-ring.
7. Set valve (3) and spring (2) on top of the element.
8. Set cover (1) in position, push it down by hand, and install the cover with the mounting bolts.
9. Install the oil filler cap, then install the cover at the top of the hydraulic tank.
10. To bleed the air, start the engine according to "STARTING ENGINE (PAGE 3-47)" and run the engine at low idling for 10 minutes.
11. Stop the engine.



### REMARK

Wait for at least 5 minutes after stopping the engine to eliminate bubbles in the oil inside the tank.

12. Check for oil leakage and wipe off any spilled oil.

## EVERY 1000 HOURS MAINTENANCE

Maintenance for every 50, 100, 250 and 500 hours service should be carried out at the same time.

### Swing Machinery Case Oil - Change

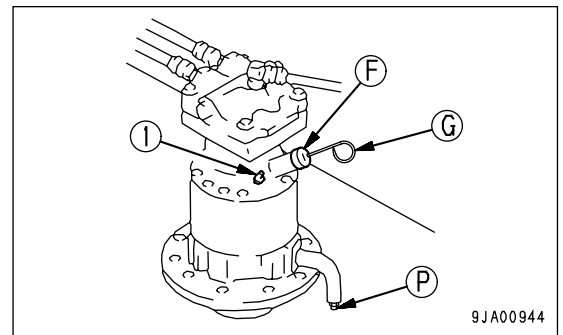
#### WARNING

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.

- Container to catch drained oil: Min. 1.5 liters
  - Refill amount: 1.5 liters (0.40 US gal)
1. Set an oil container under drain valve (P) at the bottom of the machine.
  2. Loosen drain valve (P) at the bottom of the machine and drain the oil, then tighten the drain valve again.

Tightening torque of drain plug : 44.1 to 93.2 N•m  
(4.5 to 9.5 kgf•m,  
32.5 to 68.7 lbft).

3. Remove dipstick (G) and air bleed plug (1), then add the specified amount of engine oil through filler port (F) of the dipstick guide.
4. After adding oil, install air bleed plug (1).
5. Wipe off the oil on the dipstick with a cloth.
6. Insert dipstick (G) fully into the dipstick guide, and then pull it out again.
7. The oil level should be between H and L marks on the dipstick (G). If the oil does not reach the L mark, add engine oil through oil filler port (F).
8. If the oil level is above the L mark, drain the excess engine oil from drain plug (P), then check the oil level again.



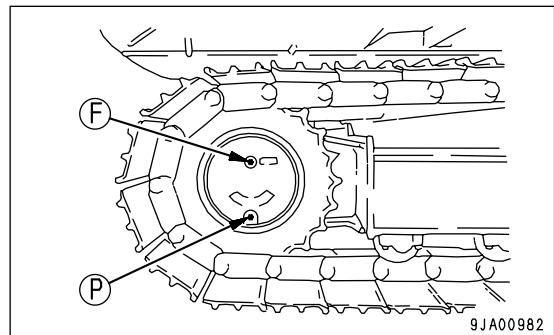


## Final Drive Case Oil - Change

### WARNING

- The oil is at high temperature after the engine is stopped. Wait for the temperature to go down before starting the operation.
- If there is pressure remaining inside the case, the oil or plug may fly out. Loosen the plug slowly to release the pressure.

- Container to catch drained oil: Min. 1.7 liters capacity
  - Refill capacity: 1.7 liters (0.45 US gal)
  - Hexagon wrench (Width across flats: 8 mm (0.3 in))
1. Set plug (F) at the top, with plug (F) and plug (P) perpendicular to the ground surface.
  2. Set a container under plug (P) to catch the oil.
  3. Remove plugs (P) and (F) with the hexagon wrench and drain the oil.
  4. Tighten plug (P).
  5. Add engine oil through the hole of plug (F).
  6. When the oil overflows from the hole of plug (F), install plug (F).



## EVERY 2000 HOURS MAINTENANCE

Maintenance for every 50, 100, 250, 500 and 1000 hours service should be carried out at the same time.

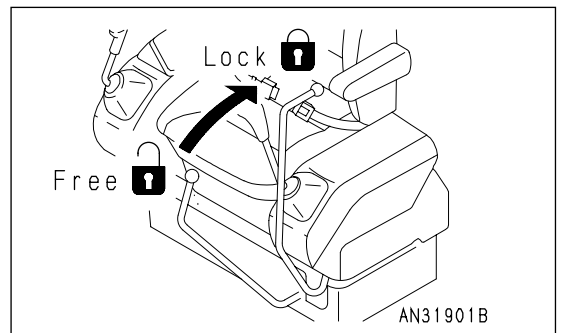
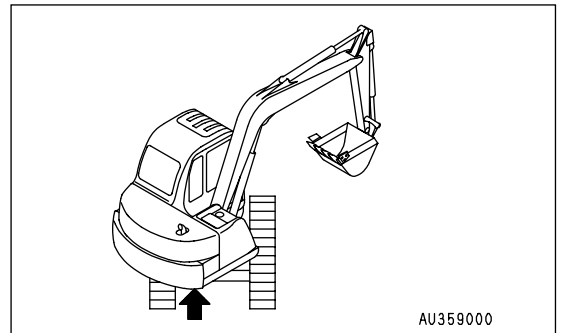
### PTO Gear Case Oil Level - Check/Add

**⚠ 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. Swing the upper structure so that the PTO gear case is midway between the left and right tracks.

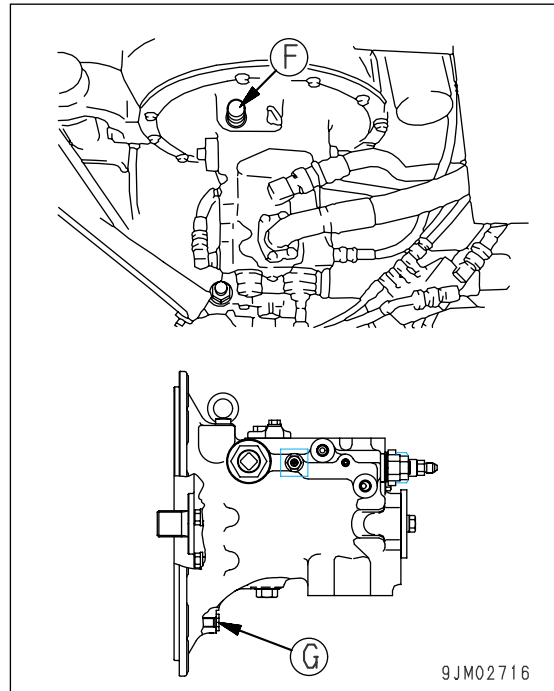
Stop the engine and set the safety lock lever to the LOCK position.



2. Remove the cover under the right side of the machine.
3. Remove plug (G) and check that the oil level is close to the bottom edge of the plug hole. If the oil level is low, remove breather (F), and add oil through the hole of breather (F) until it reaches the bottom of the hole of plug (G).
4. Check the O-ring installed to plug (G), and if it is damaged, replace the O-ring.
5. Install plug (G) and plug (F).

Tightening torque of plug (G): 14.7 to 19.6 N•m  
 (1.5 to 2.0 kgf•m, 10.9 to 14.5 lbft)

6. Install the cover.



### Alternator And Starting Motor - Inspect

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

If the engine is started frequently, have this inspection carried out every 1000 hours.

### Engine Valve Clearances - Inspect

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

## **EVERY 4000 HOURS MAINTENANCE**

Maintenance for every 50, 100, 250, 500, 1000 and 2000 hours service should be carried out at the same time.

### **Water Pump - Inspect**

Check that there is no play in the pulley, leakage of oil or water, or clogging of the drain hole. If any abnormality is found, please contact your Komatsu distributor for repairs or replacement.

## EVERY 5000 HOURS MAINTENANCE

Maintenance for every 50, 100, 250, 500 and 1000 hours service should be carried out at the same time.

### Change Oil In Hydraulic Tank, Clean Strainer

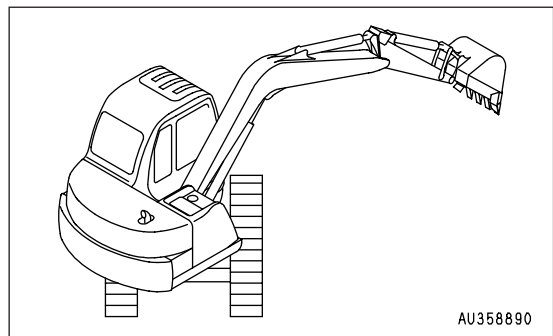
#### WARNING

- 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 changing 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.

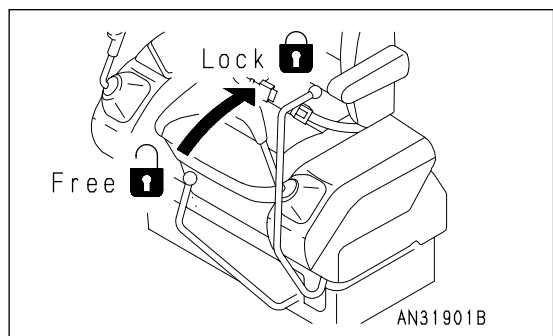
#### NOTICE

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 4-18)" when carrying out maintenance.

- Container to catch drained oil: min. 57 liters capacity
  - Refill, capacity: 57 liters (15.05 US gal)
  - Prepare a handle for the socket wrench set.
1. Swing the upper structure so that the drain plug under the hydraulic tank comes at the middle of the left or right track.
  2. Retract the arm and bucket cylinders to the end of the stroke, then lower the boom and put the teeth in contact with the ground.
  3. Lower the blade to the ground. (Only machines with blade specification)
  4. Lock the safety lock lever and stop the engine.



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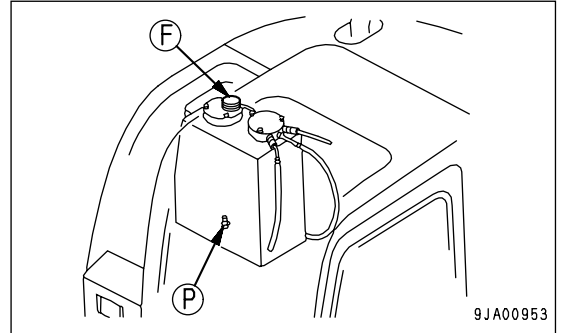


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5. Remove the cover over the hydraulic tank and remove the cap of oil filler (F).
6. Set the oil container under the drain plug under the machine. Using the handle, remove drain plug (P) and drain the oil. Check the O-ring installed to plug (P), and if it is damaged, replace the O-ring. After draining the oil, tighten drain plug (P).

Tightening torque:  $68.6 \pm 9.81 \text{ N}\cdot\text{m}$   
 $(7 \pm 1 \text{ kgf}\cdot\text{m}, 50.6 \pm 7.2 \text{ lbft})$

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



7. Loosen 4 bolts, then remove cover (1).

When doing this, the cover may fly out under the force of spring(2), so push the cover down when removing the bolts.

8. Pull up the top of rod (3), and remove spring (2) and strainer (4).
9. Remove the dirt stuck to strainer (4), then wash it in clean diesel oil or flushing oil.

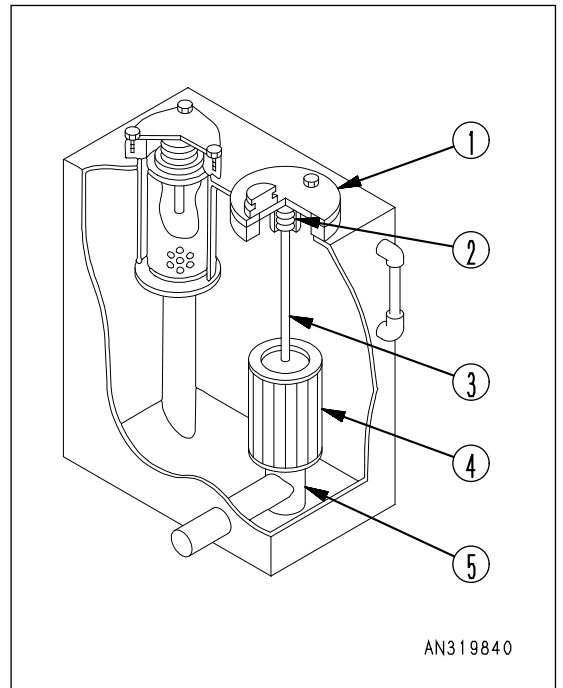
If strainer (4) is damaged, replace it with a new one.

10. Refit strainer (4) by inserting it into tank projecting part (5).
11. Install cover (1) with bolts.

Check the O-ring installed to cover (1), and if it is damaged, replace the O-ring.

12. 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.

For details of oil level check, see "Hydraulic Oil Level - Check/Add (PAGE 3-39)".

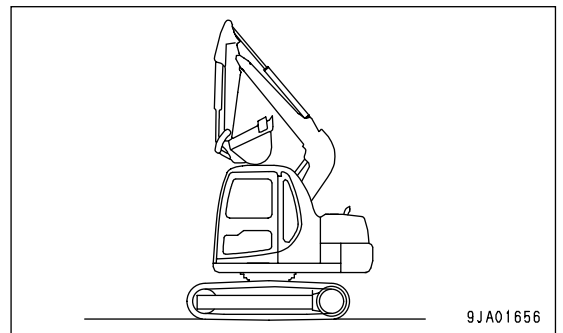


13. Extend the boom, arm, and bucket cylinder fully as shown in the diagram on the right, remove the oil filler cap, then install the cap and pressurize the inside of the tank.

**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.**

14. After replacing hydraulic oil and cleaning or replacing filter element and strainer, bleed air from the circuit.



For details of the method of bleeding the air, see "Hydraulic System - Bleed Air (PAGE 4-48)".

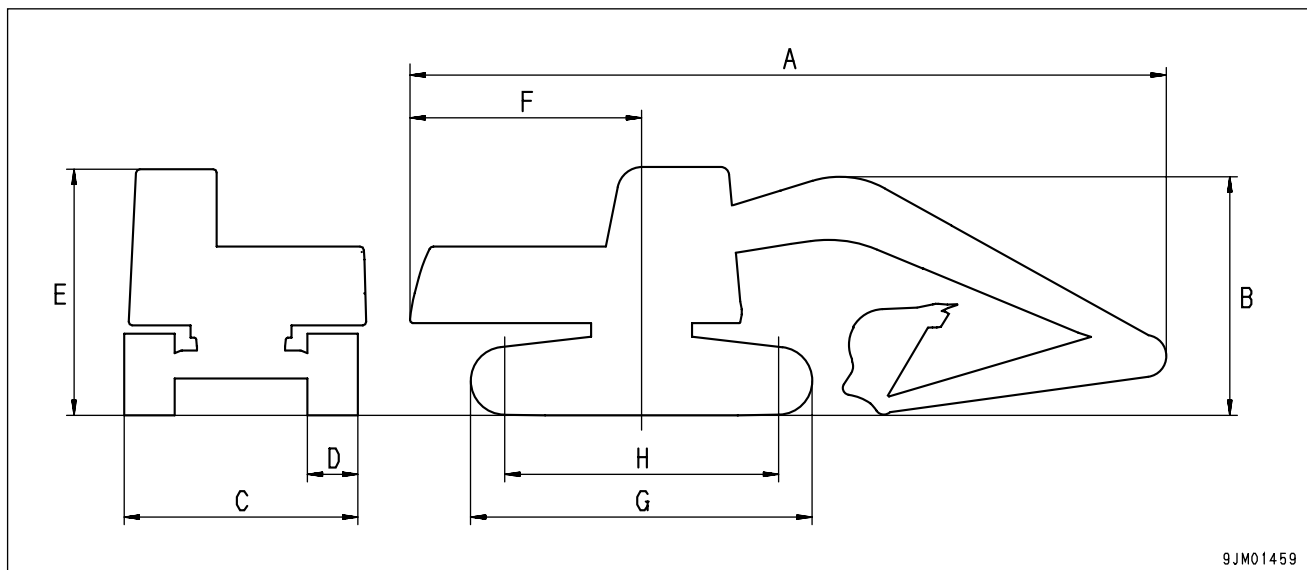
**MEMO**

# **SPECIFICATIONS**



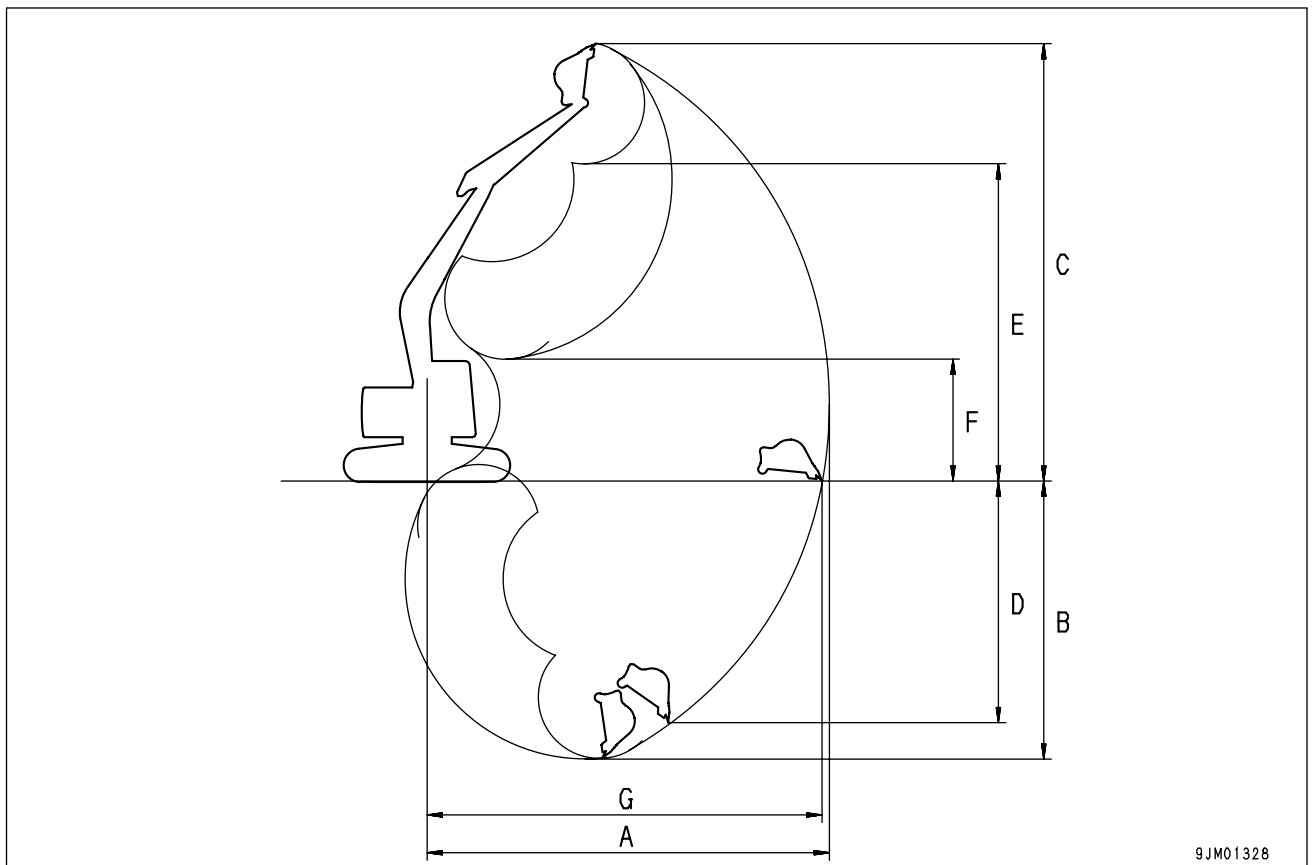
# SPECIFICATIONS

	Item	Unit	PC60-7 AVANCE	PC60-7 AVANCE long arm specified
	Operating weight	kg(lb)	6200(13,671)	6270(13,825)
	Operating weight (with blade specification)	kg(lb)	6800(14,994)	6800(14,994)
	Bucket capacity	m <sup>3</sup> (cu.yd)	0.25(0.32)	0.18(0.23)
	Name of engine	—	Komatsu 4D95LE-2 diesel engine	
	Engine horsepower	kW(HP)/rpm	29.79(40)/2100	29.79(40)/2100
A	Overall length	mm(ft in)	6080(19'11")	6080(19'11")
B	Overall height	mm(ft in)	2500(8'2")	2500(8'2")
C	Overall width	mm(ft in)	2150(7'1")	2150(7'1")
	Overall width (with blade specification)	mm(ft in)	2260(7'5")	2260(7'5")
D	Track width	mm(ft in)	450(1'6")	450(1'6")
E	Height of cab	mm(ft in)	2590(8'6")	2590(8'6")
F	Tail swing radius	mm(ft in)	1750(5'9")	1750(5'9")
G	Overall length of track	mm(ft in)	2760(9'1")	2760(9'1")
H	Length of track on ground	mm(ft in)	2130(6'12")	2130(6'12")
	Min. ground clearance	mm(ft in)	350(1'2")	350(1'2")
	Travel speed (Low/High)	km/h(MPH)	2.8(1.7)/4.5(2.8)	2.8(1.7)/4.5(2.8)
	Swing speed	rpm	12.0	12.0



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	Item	Unit	PC60-7 AVANCE	PC60-7 AVANCE long arm specified
A	Max. digging reach	mm (ft in)	6360(20'10")	6360(20'10")
B	Max. digging depth	mm (ft in)	4100(12'5")	4100(12'5")
C	Max. digging height	mm (ft in)	7150(23'5")	7150(23'5")
D	Max. vertical wall depth	mm (ft in)	3505(11'6")	3505(11'6")
E	Max. dumping height	mm (ft in)	5015(16'5")	5015(16'5")
F	Min. dumping height	mm (ft in)	2735(9')	2735(9')
G	Max. reach at ground level	mm (ft in)	6220(20'5")	6220(20'5")



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**MEMO**

# ATTACHMENTS AND OPTIONS

 **WARNING**

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

---

# ATTACHMENTS AND OPTIONS - GENERAL INFORMATION

## SAFETY FIRST

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

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

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

### WARNING

#### General precautions

- Attachments are powerful tools. To prevent serious injury or damage, use the attachment correctly.
- 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.

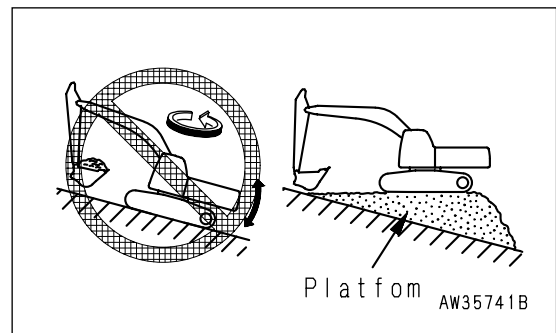
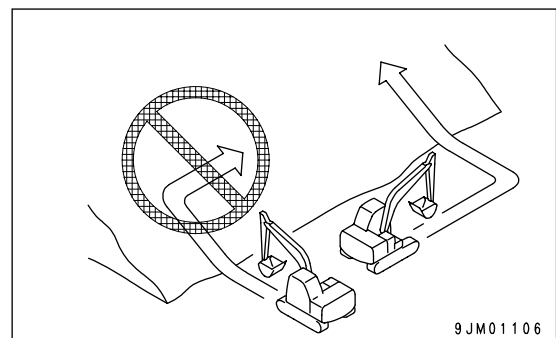
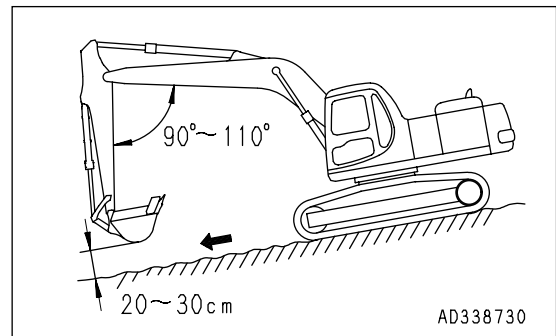
## ATTACHMENT INSTALLATION

### **⚠ 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.

- 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.



# BUCKET WITH HOOK

## HOOK CONDITION

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

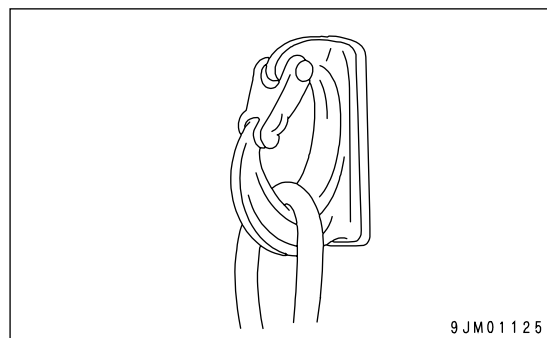
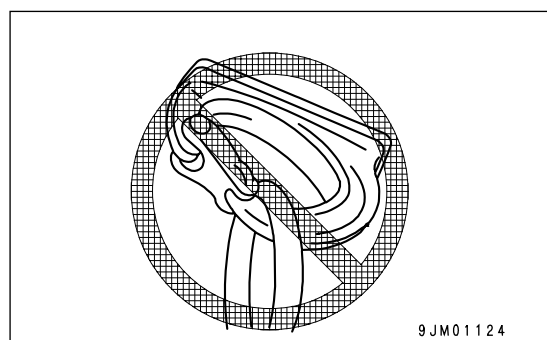
## PROHIBITED OPERATIONS

### Operations with Care

- When carrying out lifting operations, reduce the engine speed and 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.

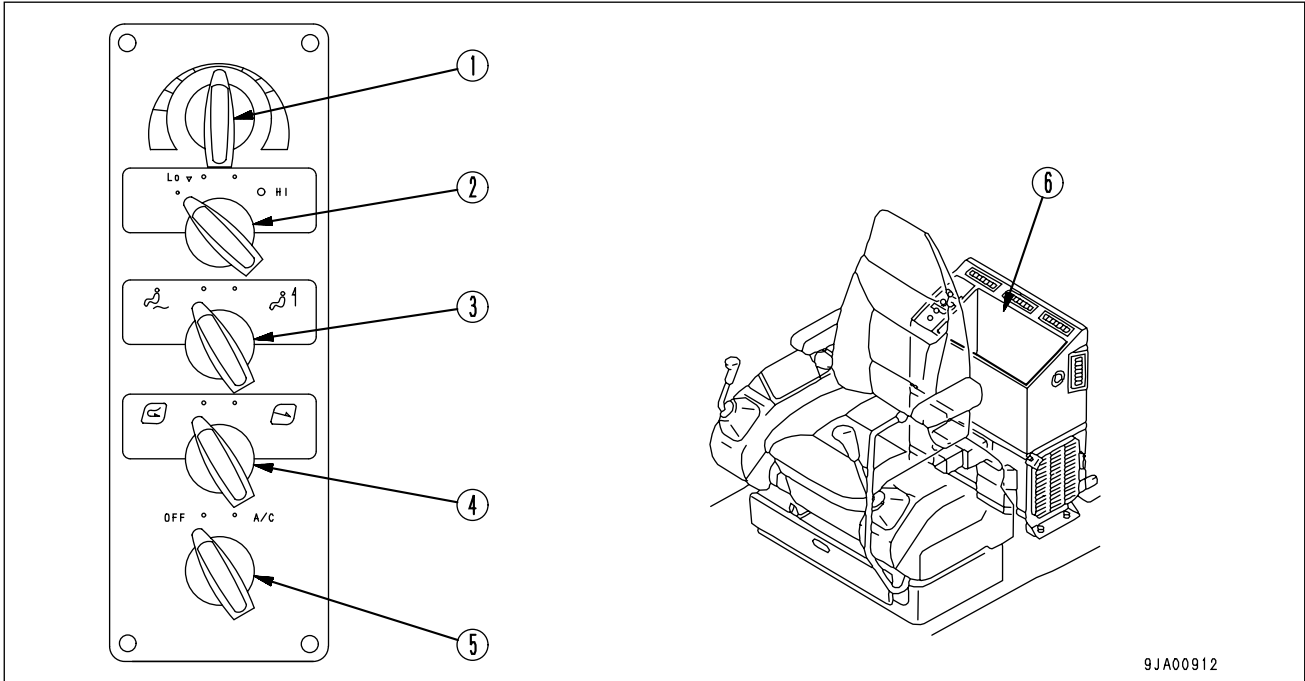


- If you are planning to install a hook, contact your Komatsu distributor.



# AIR CONDITIONER

## CONTROL PANEL



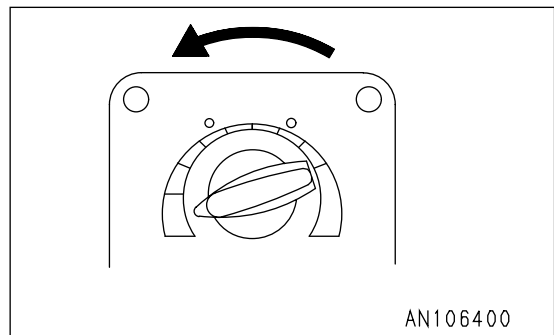
- (1) Temperature control switch
- (2) Air flow selector switch
- (3) Vent selector switch
- (4) RECIRC/FRESH selector switch
- (5) Air conditioner switch
- (6) Storage space

### Temperature Control Switch

This switch (1) is used to select the temperature from low temperature to high temperature.

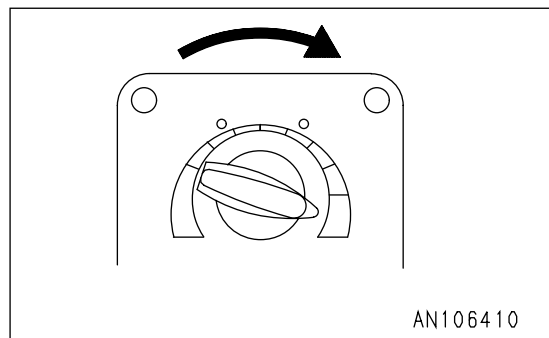
- To set to low temperature

Turn to the left to reduce the temperature; turn to the right to increase the temperature.



- To set to high temperature

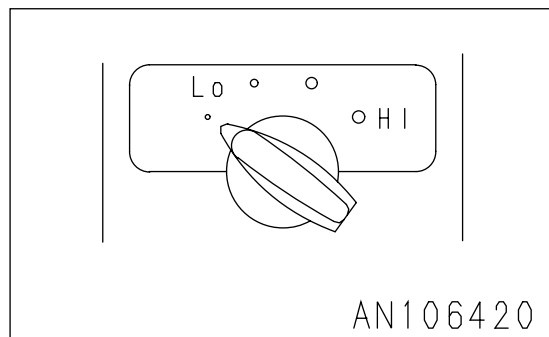
Turn to the left to reduce the temperature; turn to the right to increase the temperature.



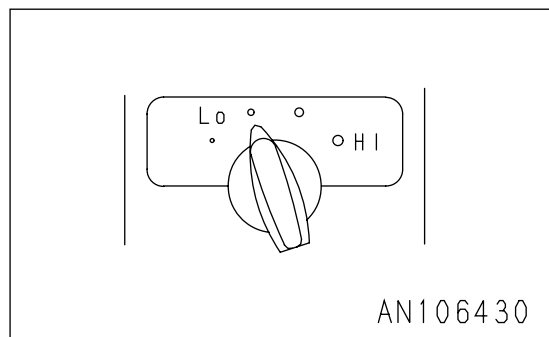
### Air Flow Selector Switch

This switch (2) can be used to select one of three levels for the air flow.

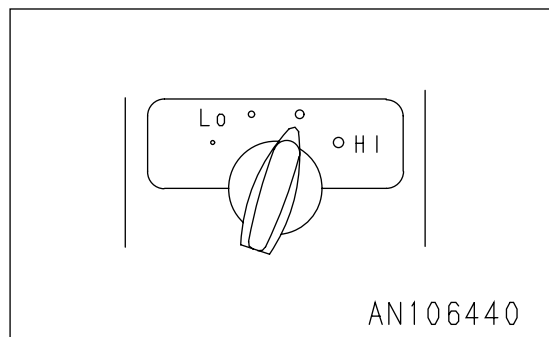
- To turn the air flow OFF



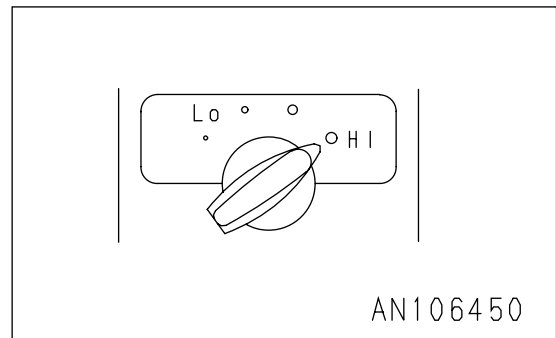
- To set the air flow to "Lo"



- To set the air flow to "Medium"



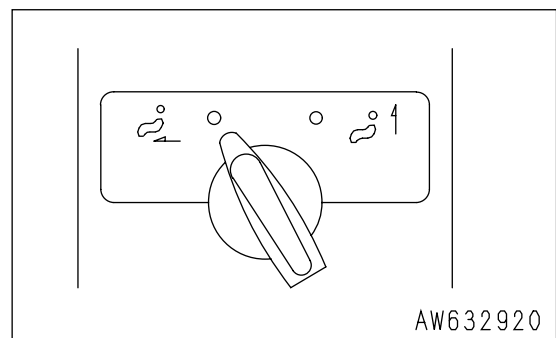
- To set the air flow to "Hi"



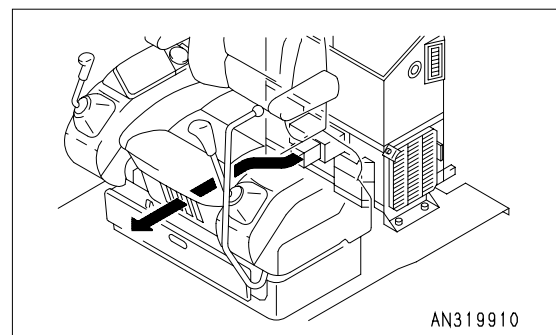
### Vent Selector Switch

This switch (3) is used to select the vent to match the purpose.

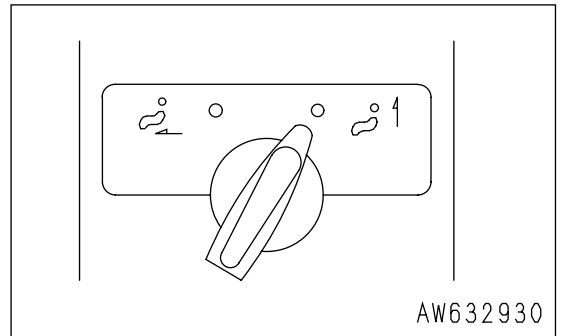
- To send the air to your feet



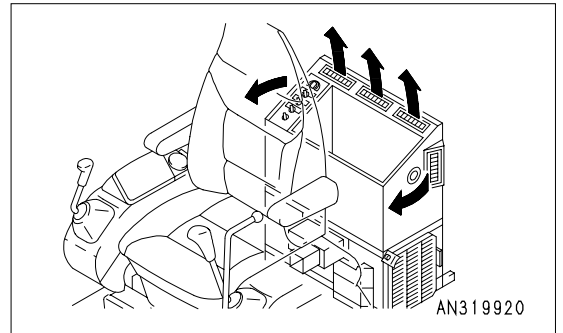
(Vent)



- To send the air flow to the upper part of your body



(Vent)

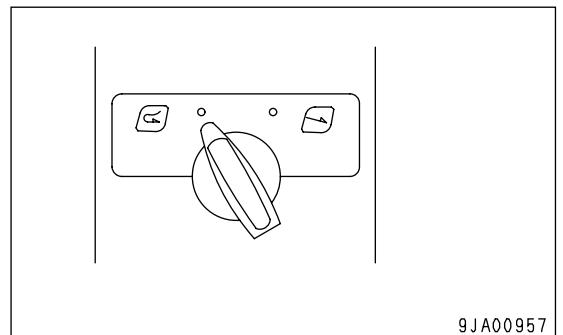


### Fresh/Recirculate Selection Switch

This switch (4) is used to select between recirculating the air and taking fresh air in from outside.

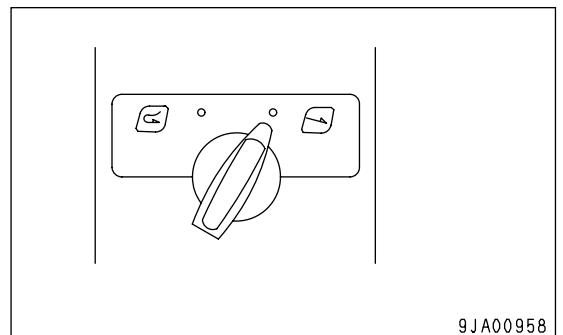
- Recirculating air

Use this position to cool the inside of the operator's cab quickly or when the outside air is dirty.



- Taking in fresh air

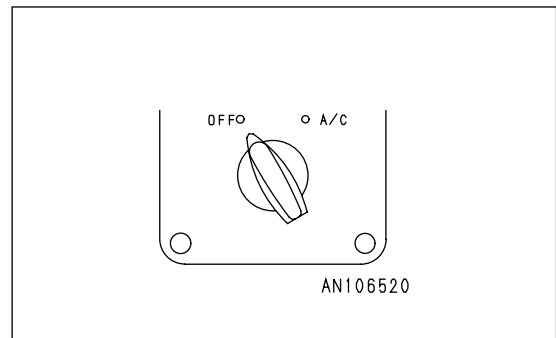
Use this position when taking in fresh air or when demisting.



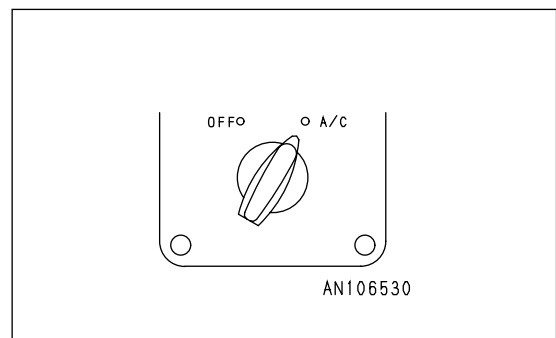
## Air Conditioner Switch

This switch (5) is used to turn the air conditioner ON/OFF.

- To stop the air conditioner



- To operate the air conditioner



## Box

Storage space (6) can be used for keeping the Operation and Maintenance Manual.

## AIR CONDITIONER CONTROLS

### Cooling

- If you are smoking when using the cooling your eyes may sting, so in such cases carry out ventilation to clear the smoke from the operator's cab.
- When the air conditioner is used for long periods, carry out ventilation once every hour.

### Cooling with Care

- It is considered suitable for health reasons to set the cooling temperature so that it feels slightly cool when entering the cab (difference from outside temperature: 5 to 6°C(41 to 42.8°F)).

## AIR CONDITIONER MAINTENANCE

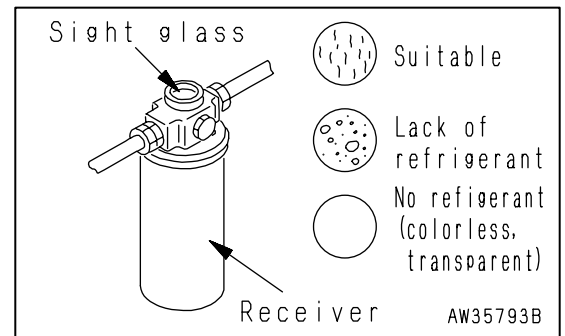
### WARNING

If the refrigerant used in the cooler gets into your eyes or on your hands, it may cause loss of sight or frostbite. Do not touch the refrigerant. Never loosen any part of the refrigerant circuit.

Do not bring any flame close to any point where the refrigerant gas is leaking.

If there is a lack of refrigerant (gas), the cooling performance will be poor. When operating the cooler at high speed with the engine at full throttle, use the receiver sight glass (inspection window) to check the condition of the refrigerant gas (Freon R134a) flowing in the refrigerant circuit.

- No bubbles in refrigerant flow: Suitable
- Some bubbles in flow (bubbles pass continuously): Lack of refrigerant
- Colorless, transparent: No refrigerant



### REMARK

When there are bubbles, the refrigerant gas level is low, so contact your refrigerant dealer to have refrigerant added.

If the air conditioner is run with the refrigerant gas level low, it will cause damage to the compressor.

If there is mud or dirt stuck to the condenser fins, there will be a big drop in the cooling efficiency of the condenser.

This will cause a drop in the performance of the cooler, so wash off all mud and dirt stuck to the fins. If the fins are crushed, repair them with a screwdriver.

In the off-season also, operate the compressor at low speed for several minutes once a month to supply lubricant to each component of the compressor.

(Run the engine at low speed and turn the cooler temperature regulator knob fully to the left.)

When the ambient temperature is low, if the compressor is suddenly run at high speed, it will cause failure of the compressor. The compressor is set so that if the ambient temperature is 2.0 to 6.5°C (35.6 to 43.7°F), it will not run even if the cooler switch is turned ON.

## When Required

### Refrigerant ( Gas) Level - Check

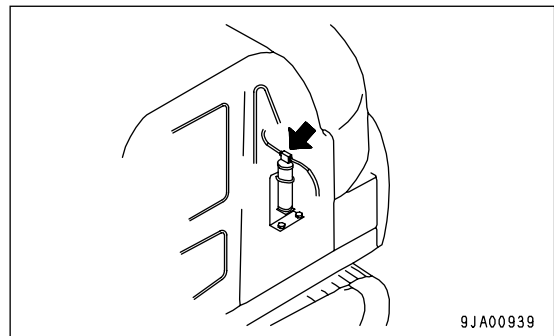
**⚠ WARNING**

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Do not bring any flame close to any point where the refrigerant gas is leaking.

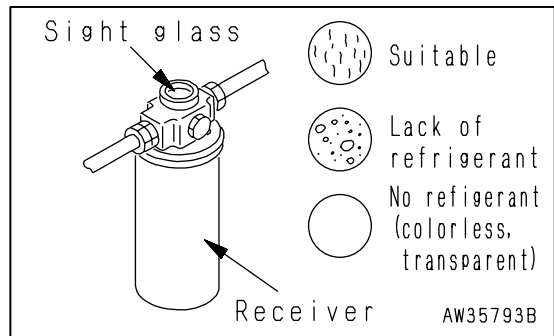
If there is a lack of refrigerant (gas), the cooling performance will be poor. When operating the cooler at high speed with the engine at full throttle, use the receiver sight glass (inspection window) to check the condition of the refrigerant gas (Freon R134a) flowing in the refrigerant circuit.

- No bubbles in refrigerant flow: Suitable
- Some bubbles in flow (bubbles pass continuously): Lack of refrigerant
- Colorless, transparent: No refrigerant



**REMARK**

When there are bubbles, the refrigerant gas level is low, so contact your refrigerant dealer to have refrigerant added. If the air conditioner is run with the refrigerant gas level low, it will cause damage to the compressor.



### Off Season Checks

Even during the off-season, run the compressor at low speed for 3 to 5 minutes once a month to prevent the loss of the oil film at the lubricated parts of the compressor.

### Inspection and Maintenance Items

Inspection and maintenance items	Content of inspection and maintenance	Maintenance interval guideline
Refrigerant (gas)	Filling quantity	Twice a year; spring and autumn
Condenser	Clogging of fin	Every 500 hours
Compressor	Operating condition	Every 4000 hours
V-belt	Damage and tension	Every 250 hours
Blower motor and fan	Operating condition (Check for abnormal sound)	When required
Control mechanism	Operating condition (Check for normal function)	When required
Piping at connection	Installation condition, looseness of tightening portion, connecting portions, gas leakage, damage	When required



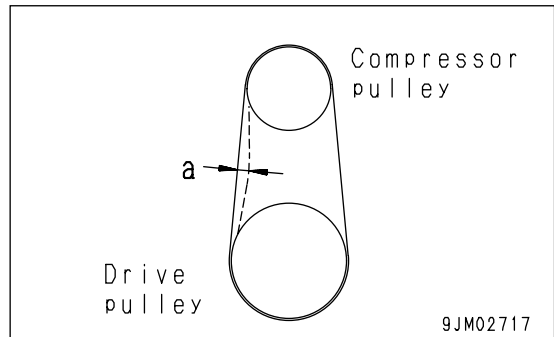
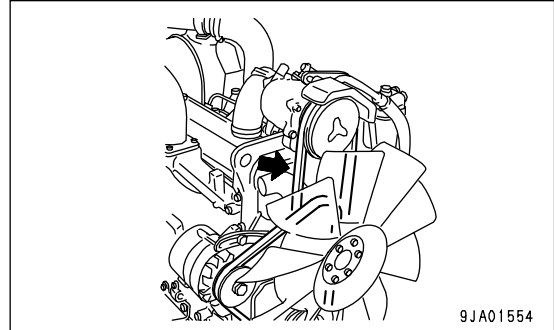
## Every 250 Hours Maintenance

### V-belt Tension - Inspect/Adjust

#### Inspection

Check compressor belt

Press the belt at "a" point midway between the drive pulley and compressor pulley with a finger force of approx. 58.8 N (approx. 6 kgf) and check that deflection a is 10 to 12 mm(0.4 to 0.5 in).



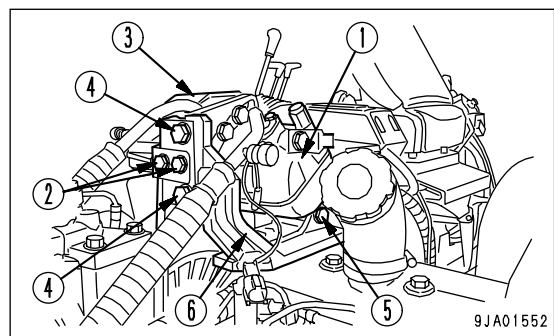
#### Adjustment

- Prepare a bar.
- Prepare a wooden block.

#### Adjusting fan belt

Remove compressor (1).

1. Remove bolts (2), then remove cover (3).
2. Remove bolts (4) and (5), then disconnect the compressor from bracket (6).
3. With the compressor hoses still attached to the compressor, move to a place where it is easy to adjust the fan belt tension.

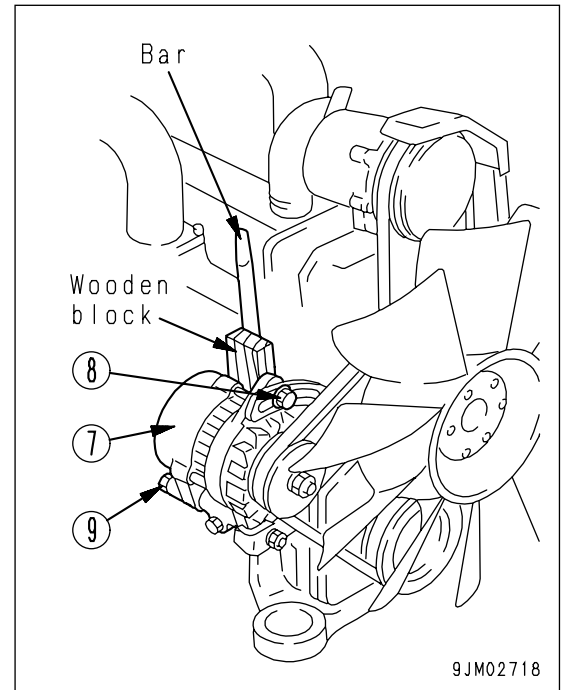


Adjust the fan belt tension.

4. Insert the bar between alternator (7) and the cylinder block to hold alternator (7) in position. When fixing the alternator in position, put a wooden block between the bar and alternator (7) to prevent damage to alternator (7).
5. Loosen bolts (8) and (9).
6. Move alternator (7) with the bar so that the deflection of the belt is approx. 8 mm(0.3in) with a finger force of approx. 58.8 N (6 kgf).
7. Tighten bolts (8) and (9) to secure alternator (7) in position

#### NOTICE

- Check each pulley for damage, wear of the V-groove, and wear of the V-belt. In particular, be sure to check that the V-belt is not touching the bottom of the V-groove.
- If the belt is stretched and there is no allowance for adjustment, or if it is cut or cracked, please contact your Komatsu distributor for replacement.



Install compressor (1).

8. Secure compressor (1) to bracket (6) with bolts (4) and (5).

Tightening torque

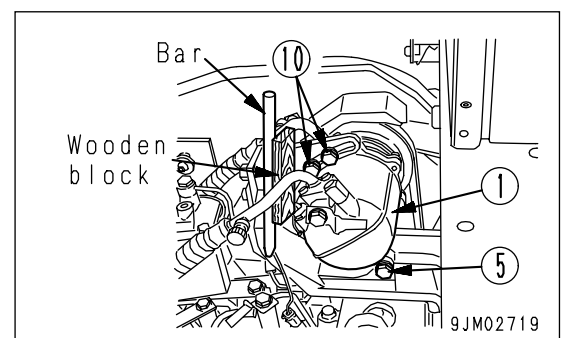
Bolt (4): 59 to 64 N•m (6 to 7.5 kgf•m, 43.4 to 54.2 lbft)

Tighten bolt (5) temporarily, then tighten it to the specified torque after adjusting the belt.

9. Secure cover (3) with bolt (2).
10. After installing the compressor, adjust the tension of the compressor belt (next procedure).

Adjusting compressor belt

11. Insert the bar between compressor (1) and the bracket block to hold compressor (1) in position. When fixing the compressor in position, put a wooden block between the bar and compressor (1) to prevent damage to compressor (1).
12. Loosen bolts (5) and (10).
13. Move compressor (1) with the bar so that the deflection of the belt is approx. 10 to 12 mm(0.4 to 0.5 in) with a finger force of approx. 58.8 N (6 kgf).



14. Tighten bolts (10) and (5) to secure compressor (1) in position. Tightening torque: 36 to 51 N•m (3.7 to 5.2 kgf•m, 26.8 to 37.6 lbft)
15. 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.
16. If the belt is elongated and there is no more allowance for adjustment, or if the belt is cut or cracked, replace the belt.
17. After the V-belt has been replaced, operate for 1 hour, then adjust again.

## Every 500 Hours Maintenance

### Air Conditioner Air Filter - Clean

**⚠ WARNING**

If compressed air is used, there is danger that dirt may fly and cause personal injury.

Always wear safety glasses, dust mask, and other protective equipment.

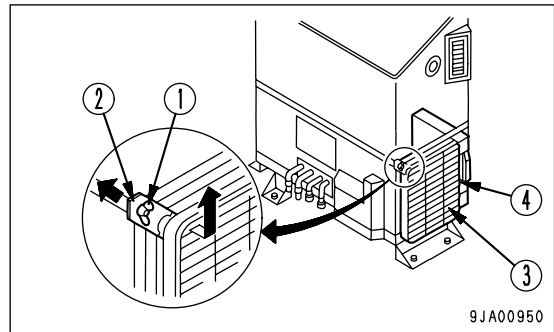
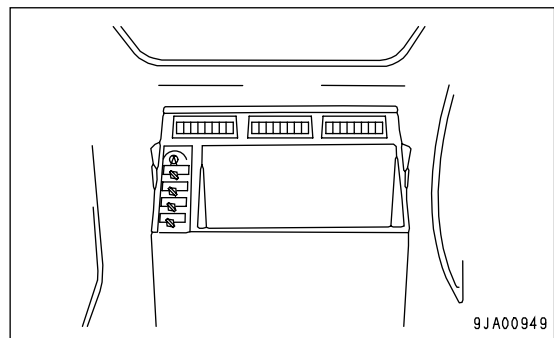
**NOTICE**

As a guideline, the filters should be cleaned every 500 hours, but on dusty jobsites, clean the filters more frequently.

1. Loosen wing bolt (1), move stopper (2) to the side, then pull up RECIRC filter (3) and remove it. Pull FRESH filter (4) to the side (left side of the machine) to remove it.
2. Blow filters (3) and (4) with compressed air to clean them. If there is oil stuck to the filter or the filter is extremely dirty, wash it in water with a neutral agent. After washing, dry the filter thoroughly before using it again.

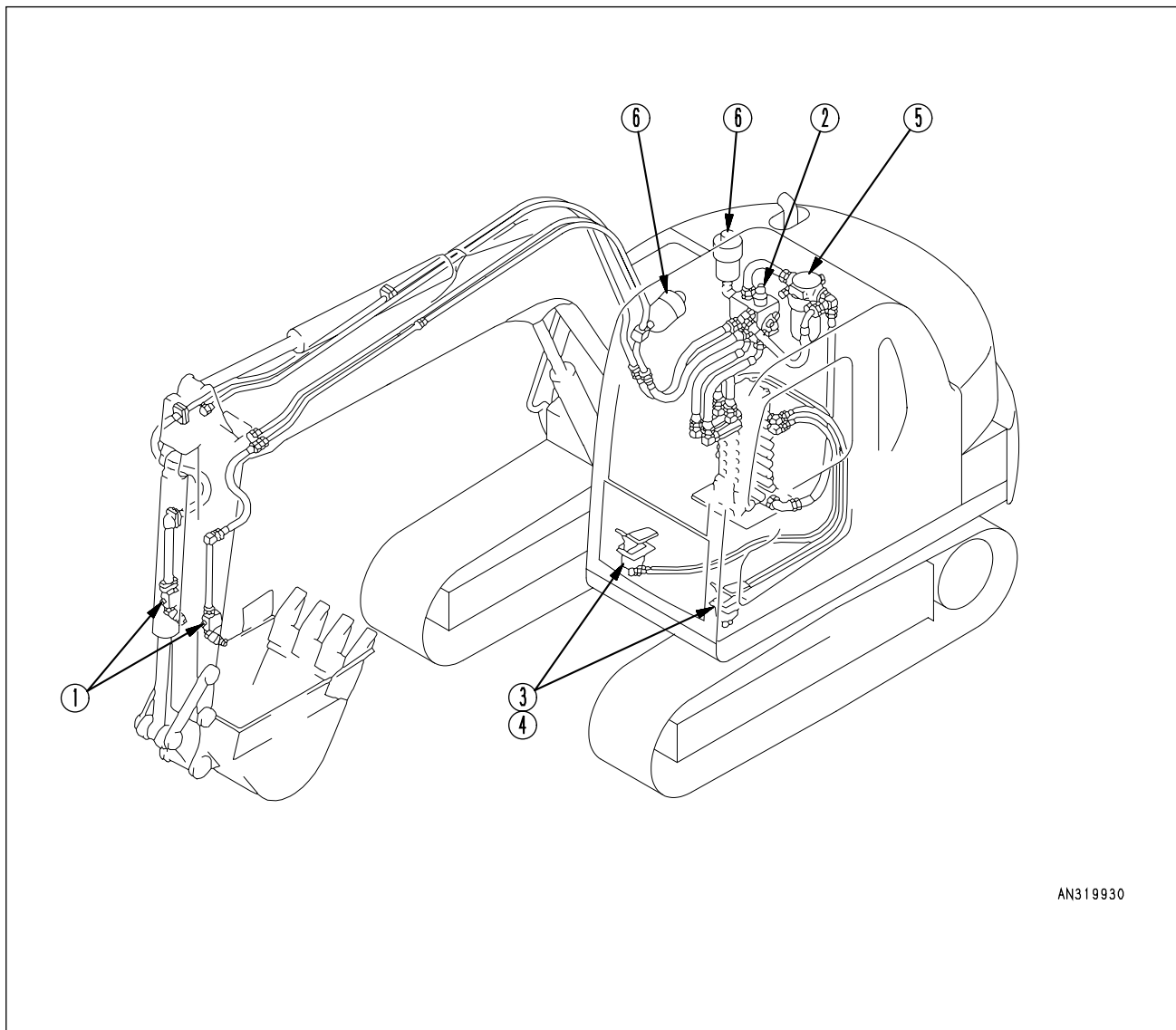
If the dirt clogging the filter cannot be removed by compressed air or washing in water, replace the filter with a new part.

If the dirt clogging the filter cannot be removed by blowing it with air or washing it in water, replace the filter with a new part.



# MACHINE READY FOR ATTACHMENT

## LOCATIONS



- (1) Stop Valve
- (2) Selector Valve
- (3) Attachment Control Pedal

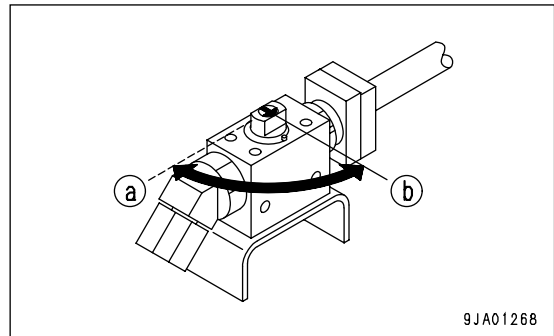
- (4) Lock Pin
- (5) Breaker Circuit Additional Oil Filter
- (6) Accumulator (For Attachment Circuit)

### Stop Valve

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

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

When removing or installing attachments, set this valve to the LOCK position.

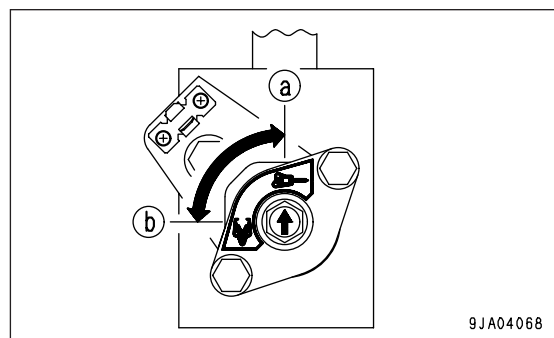


9JA01268

### Selector Valve

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

- Position (a) : When breaker is used
- Position (b) : When general attachment is used (crusher, etc.)



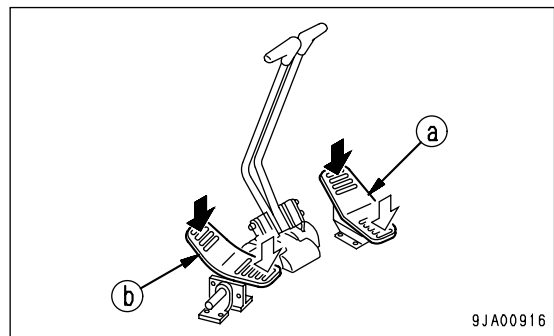
9JA04068

### Attachment Control Pedal

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

- (a) Pedal for one line attachment
- (b) Pedal for two line attachment(If equipped)

The breaker is operated with right pedal (1) .



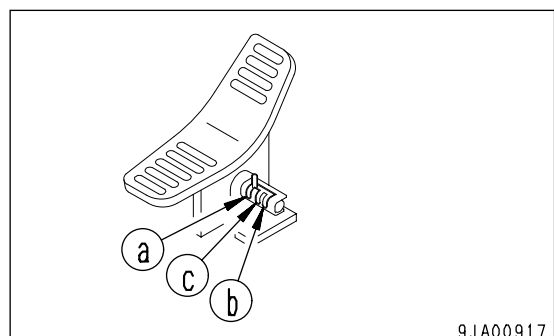
9JA00916

### Lock Pin

This pin(4) is used to lock the control pedal.

- Position (a) : LOCK
- Position (b) : FREE (when carrying out work with large oil flow)
- Position (c) : FREE (when carrying out work with small oil flow)

Always keep the pedal locked except when operating the attachments.

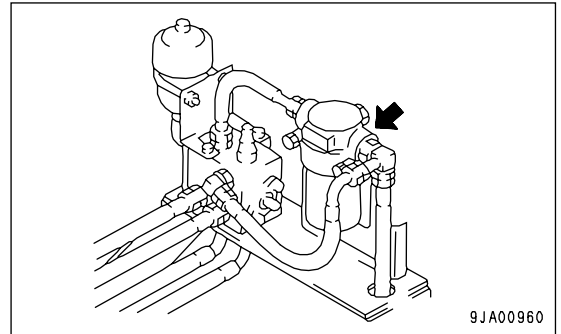


9JA00917

## Breaker Circuit Additional Oil Filter

This filter(5) is used to prevent deterioration of the hydraulic oil when using the breaker.

The oil flows through this only when the selector valve is at the breaker position.



## Accumulator (For Attachment Circuit)

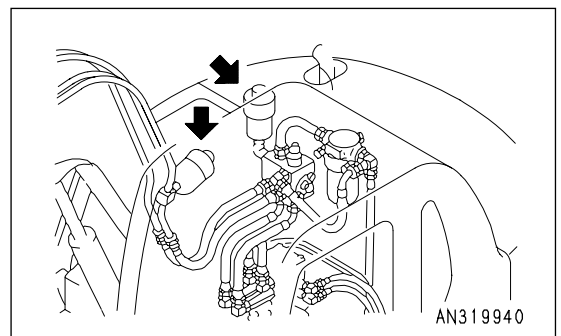
This accumulator(6) is installed to protect the oil cooler when using the breaker.

If the accumulator may be needed for use with an attachment, consult with the attachment manufacturer.

### **WARNING**

The accumulator is charged with high-pressure nitrogen gas, and it is extremely dangerous if it is handled mistakenly.

For details of handling, see "ACCUMULATOR (PAGE 6-25)".



# HYDRAULIC CIRCUIT

## Hydraulic Circuit Connection

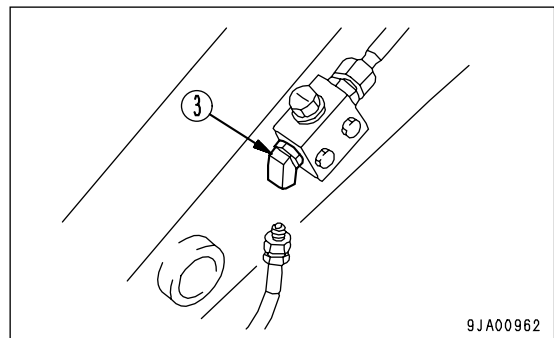
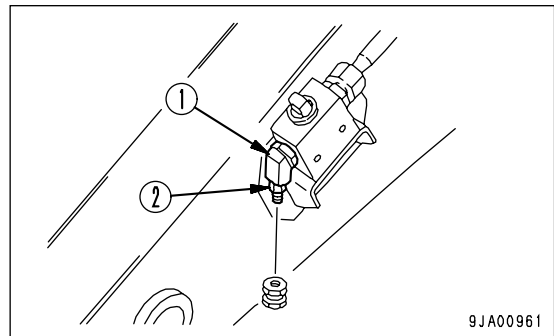
When connecting the attachment, connect the hydraulic circuit as follows.

### One Line Attachment

1. Check that the stop valve is locked, then remove plug (1) .Be careful not to lose or damage any parts that are removed.
2. Connect the attachment piping supplied by the attachment manufacturer.

Depending on the piping for the attachment, it may be necessary to remove nipple (2) .

The dimensions for nipple 2 and elbow 3 for the attachment at the stop valve end are as shown in the diagram on the right; for details of the dimensions at the attachment end, please consult the attachment manufacturer.

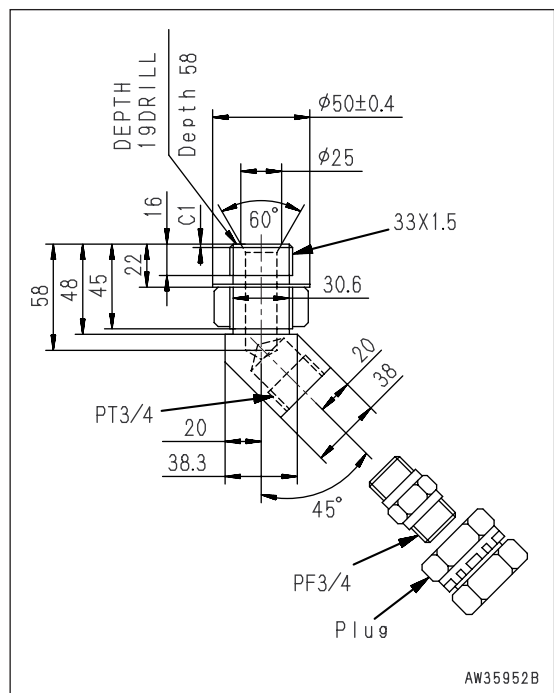


3. After connecting the piping, bleed the air from the circuit.
  - 1) Start the engine and run it at low idling for 10 minutes. For details, see "STARTING ENGINE (PAGE 3-47)". Then carry out the following operation.
  - 2) Run the engine at low idling until the air in the attachment circuit is completely removed, then operate the attachment pedal repeatedly (approx. 10 times) to bleed the air.

**NOTICE**

**If the attachment maker specifies an air bleeding procedure for the attachment itself, follow the specified procedure to bleed the air.**

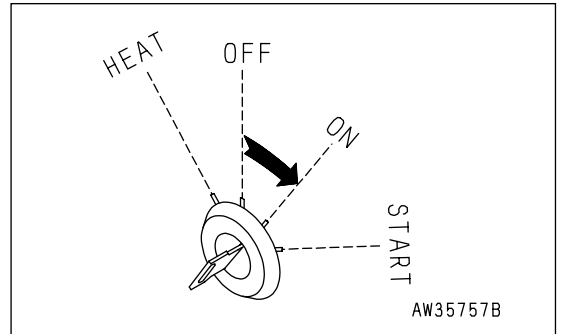
- 3) After completing the bleeding of the air, stop the engine, and wait for at least 5 minutes before starting operations. This will release the bubbles in the oil inside the tank.
- 4) Check that there is no oil leakage, and wipe off any oil that has been spilled.



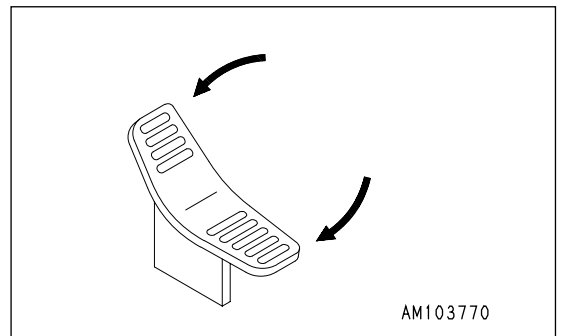
**Two Line Attachment**

When connecting the attachment, connect the circuit as follows.

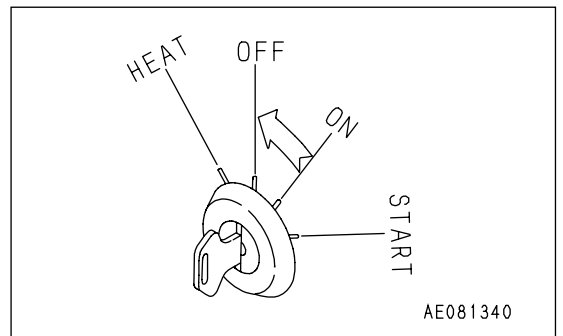
1. Bleed the air from the attachment circuit as follows.
  - 1) Lower the work equipment to the ground.
  - 2) After stopping the engine, turn the starting switch to the ON position.



- 3) Operate the left pedal to the end of its travel approx. 10 times to release the pressure in the circuit. Note that this does not completely release the pressure, so when connecting the piping, loosen the connections slowly and do not stand in the direction where the oil spurs out.

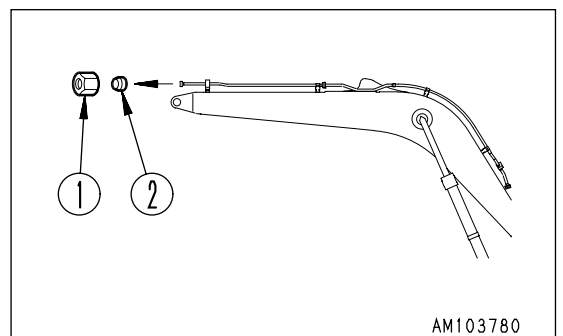


- 4) Turn the starting switch to the OFF position, and place the safety lock lever and lock pin in the LOCK position.



2. Remove nut (1) and plug (2) from the tip of the tube.

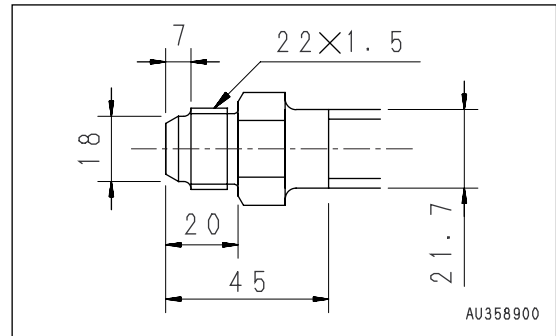
Be careful not to lose or damage any part that is removed.





3. Connect the piping for the attachment provided by the attachment maker.

The dimensions for the tube end are as shown in the diagram on the right, but consult the attachment maker when deciding the dimensions at the attachment end.



4. After connecting the piping, bleed the air from the circuit.

## ATTACHMENT OPERATIONS

### WARNING

Do not put your foot on the pedal except when operating the pedal. 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.

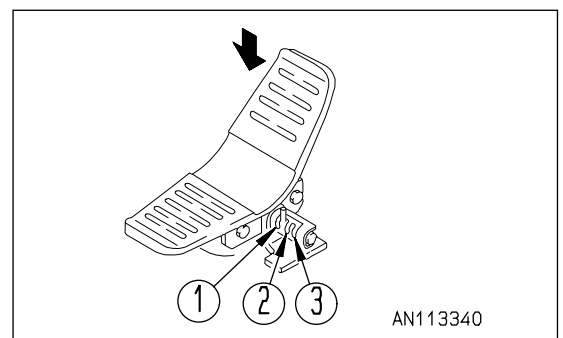
Operate the attachment as follows.

### When Using Breaker

#### NOTICE

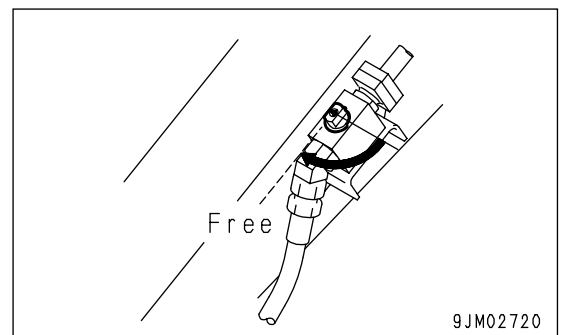
If breaker operations are carried out with lock pin (1) at full stroke position (3), there is danger that the hydraulic equipment may be damaged or overheat. Never operate the breaker with the lock pin in this position.

Set the lock pin to position (2) (half stroke), then depress the right pedal in the direction of the arrow to operate the breaker.

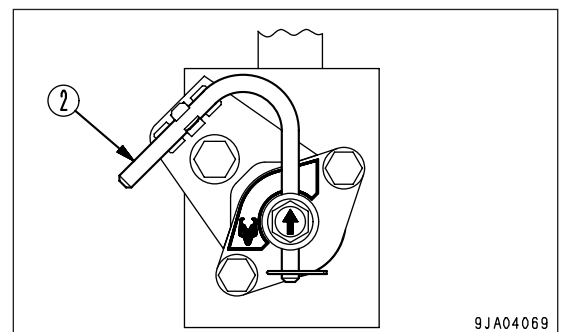


Precautions when using

- Check that the stopper valve is in the FREE position.



- Check that the selector valve is in the position for using the breaker.
- Check that stopper bar (2) of the selector is installed to the breaker position.

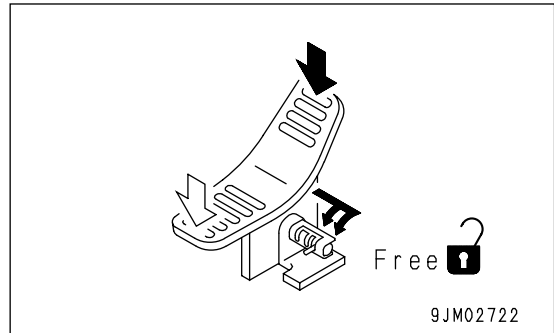


- Consult with the attachment maker to decide whether it is necessary to install an accumulator for the attachment circuit.
- For details of other precautions when handling the breaker, read and use correctly the instruction manual provided by the breaker manufacturer.

- When using the breaker, the hydraulic oil deteriorates more rapidly than for normal operations, so change the hydraulic oil and replace the element at a shorter interval.  
For details, see "MAINTENANCE INTERVAL FOR HYDRAULIC BREAKER (PAGE 4-18)".

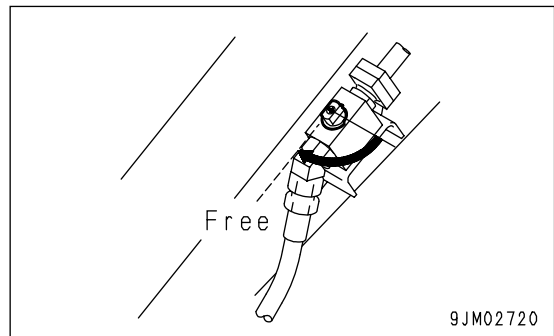
### When Using General Attachment Such As Crusher

When the lock pin is set at the FREE position and the front or rear of the pedal is depressed, the attachment is actuated.

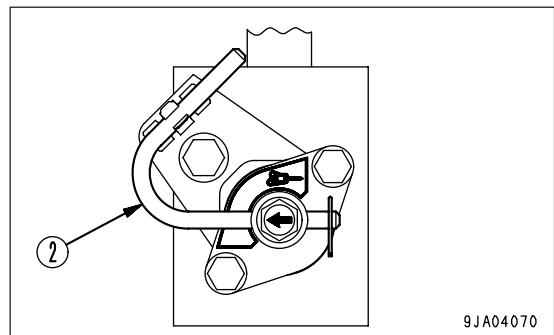


#### Precautions when using

- Check that the stopper valve is in the FREE position.



- Check that the selector valve is in the position for using the general attachment such as crusher.
- Check that stopper bar (2) of the selector is installed to the breaker position.



- For details of other precautions when handling the breaker, read and use correctly the instruction manual provided by the breaker manufacturer.

## ACCUMULATOR

### WARNING

On machines equipped with an accumulator, for a short time after the engine is stopped, if the work equipment control lever is moved to the LOWER position, the work equipment will move down under its own weight.

After stopping the engine, always place the safety lock lever in the LOCK position and lock the attachment control pedal with the lock pin.

The accumulator is filled with high-pressure nitrogen gas, and it is extremely dangerous if it is handled in the wrong way.

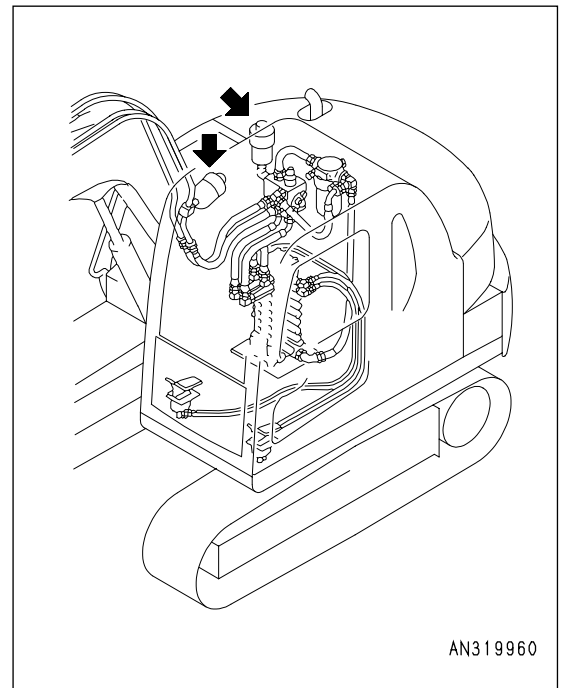
Always observe the following precautions.

- Never make any hole in the accumulator or expose it to flame or fire.
- Do not weld any boss to the accumulator.
- When disposing of the accumulator, it is necessary to release the gas from the accumulator, so please contact your Komatsu distributor.

This machine is equipped with the accumulator in the control circuit.

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

The accumulator is installed to the position shown in the diagram on the right.



## Hydraulic System - Pressure Release

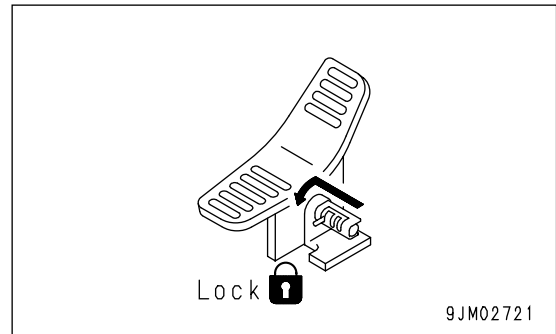
1. Place the work equipment on the ground. Close the crusher attachment jaws, etc.
2. Stop the engine.
3. Move the safety lock lever to the free position. Move the work equipment control lever and the attachment control pedal to full stroke back and forth, right and left so as to release the pressure in the control circuit.
4. Start the engine again, run it for 2 to 6 seconds, then stop the engine and repeat Step 3.
5. Repeat the operation in Step 4 until no hissing sound of hydraulic pressure can be heard. (Approx. 2 to 3 times)
6. Set the safety lock lever to the LOCK position, and lock the work equipment levers and attachment control pedal. Note that the pressure cannot be completely released, so if the accumulator in the control circuit is removed, loosen the screws slowly, and do not stand in the direction where the oil spurts out.

## LONG TERM STORAGE

If the equipment is not to be used for a long time, do as follows.

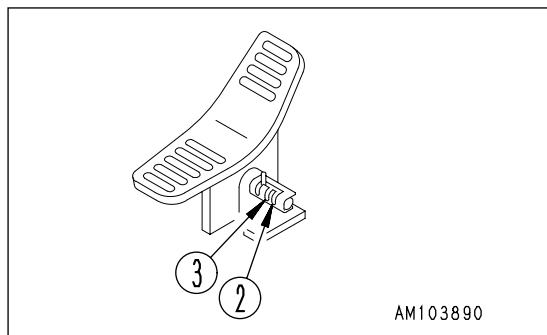
- Set the stop valve in the LOCK condition.
- Install a plug to the valve.  
Install a plug to the stop valve.
- Set the selector valve to the position for general attachments such as the crusher.
- Set the lock pin at the LOCK position.

If there is no breaker or general attachment installed, operating the pedal may cause overheating and other problems.



# SPECIFICATIONS

Hydraulic specifications



- Oil flow

Position of lock pin	Breaker or crusher	2-actuator attachment	
	Right pedal	Right pedal	Left pedal
(2)	—	65 liters /min (17.2 US gal/min)	120 liters /min (31.7 US gal/min)
(3)	65 liters /min (17.2 US gal/min)	—	65 liters /min (17.2 US gal/min)

- Cracking pressure of safety valve

When using breaker: 1720 MPa (175 kgf/cm<sup>2</sup>, 2490 PSI)

When using other attachment: 24.50 MPa (250 kgf/cm<sup>2</sup>, 3550 PSI)

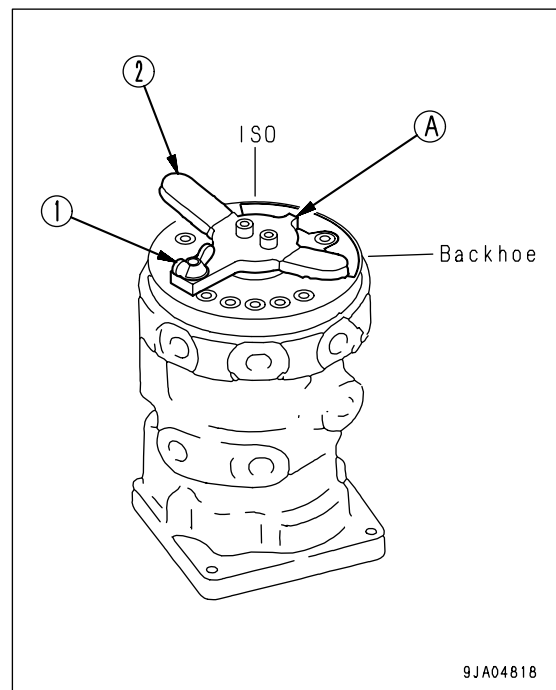
# CHANGING MACHINE CONTROLL PATTERN (IF PATTERN CHANGE VALVE EQUIPPED)

## WARNING

- When changing the operating pattern of the machine, set the machine in the parking posture, stop the engine, check that the safety lock lever is at the LOCK position, then change the operating pattern.
- To prevent personal injury caused by mistaken operation, test operate the machine and check that the display on the operating pattern card is the same as the movement of the machine.  
If it is not the same, replace the operating pattern card immediately with the card that matches the operating pattern.
- When checking the movement of the machine, check carefully that the surrounding area is safe, and operate slowly.

## CONTROL PATTERN CHANGE PROCEDURE

1. After setting the machine in the parking posture, set the safety lock lever to the LOCK position, then stop the engine.
2. Open the engine hood. The pattern selector valve is at the side of the oil cooler at the rear left of the machine.
3. Follow the steps explained below, when switching the patterns.
  - 1) Loosen wing nut (1).
  - 2) Turn lever (2) so that portion (A) of the lever is aligned with the control pattern marked on the top surface of the valve.
  - 3) After the switching, tighten wing nut (1).

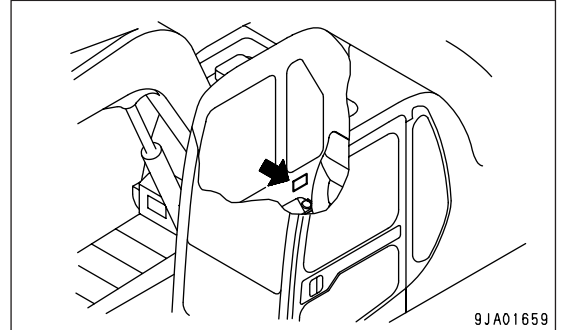


4. Change to an operating pattern card (insert it in the holder) that matches the selected operating pattern.
5. Start the engine, set the safety lock lever to the FREE position, operate the work equipment levers slowly, and check that the operating pattern has changed.

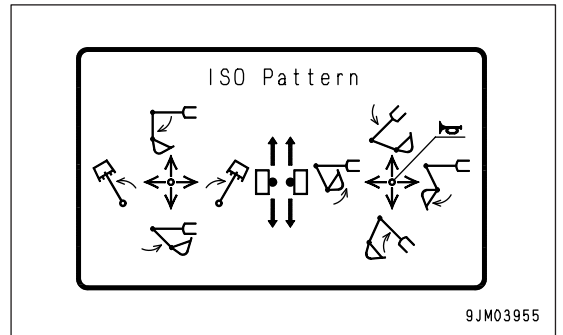
# MACHINE CONTROL PATTERNS

**⚠ WARNING**

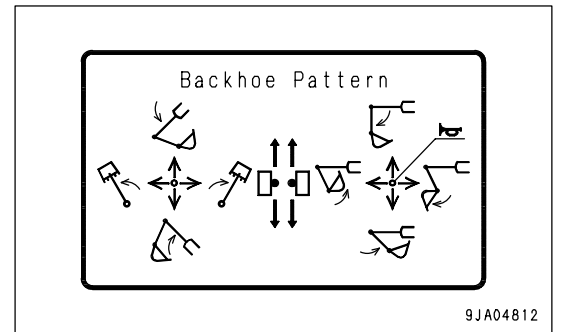
After changing the operating pattern, always change the operating pattern card in the operator's compartment.



- ISO pattern



- Backhoe pattern





# ATTACHMENT GUIDE

## ATTACHMENT COMBINATIONS

This table lists the combination of attachments which can be installed to the standard arm, short arm and long arm.

○ : Can be used

△ : Can be used only for light duty work

× : Cannot be used

### NOTICE

- When the long arm is equipped, if the bucket is pulled in to the machine body, the arm interferes with the body. Operate the long arm carefully.
- When the boom is fully lowered during oblique digging, the boom interferes with the undercarriage. Operate the boom carefully.

### Categories of use

For general digging: Digging or loading sand, gravel, clay etc.

For light duty digging: Digging or loading dry, uncaked earth and sand, mud etc.

For loading work: Loading dry, loose earth and sand

Name	Tooth mounting pin	Model	Capacity		Outside width		Use	Standard arm	Long arm
		PC60	SAE m <sup>3</sup> (cu.yd)	CECE m <sup>3</sup> (cu.yd)	Bucket body mm(in)	Side cutter mm(in)			
Narrow bucket	Bucket	OPT.	0.09 (0.10)	0.08 (0.10)	350(14")	450(18")	Narrow digging	○	×
Narrow bucket	Vertical	OPT.	0.13 (0.14)	0.11 (0.14)	450(18")	550(22")	Narrow digging	○	○
Narrow bucket	Vertical	OPT.	0.20 (0.23)	0.18 (0.23)	550(22")	650(26")	Narrow digging	○	○
Standard bucket	Vertical	Standard	0.28 (0.32)	0.25 (0.32)	650(26")	750(30")	General digging	○	△
	Horizontal	OPT.							
Strengthened bucket	Vertical	OPT.	0.28 (0.32)	0.25 (0.32)	650(26")	750(30")	Heavy duty digging	○	△
	Horizontal	OPT.							
Light duty bucket	Vertical	OPT.	0.36 (0.41)	0.32 (0.41)	725(29")	825(33")	Loading	△	×

## SELECTION OF TRACK SHOES

Select the most suitable track shoe to match the operating conditions.

### METHOD OF SELECTING SHOES

Check the category from the uses in the table below, then select the shoes from the table below that.

- Category of use B and C are the wide shoe, so there are limits on the use. Check the precautions for use, examine the conditions of use thoroughly, and use the optimum shoes for the situation.
- When selecting the shoe width, choose the narrowest shoes possible to bring the machine within the range where there is no problem regarding the machine flotation and ground contact pressure. If wider shoes than necessary are used, the load on the track shoe will increase, so this may cause problems such as bending of the shoe, cracking of the link, damage of the pin, and looseness of the shoe bolts.

Category	Use	Precautions when using
A	Rocky ground, riverbeds, normal soil	<ul style="list-style-type: none"> <li>● On rough ground with large obstacles such as boulders or fallen trees, travel at low speed (LOW).</li> </ul>
B	Normal soil, soft ground	<ul style="list-style-type: none"> <li>● These shoes cannot be used on rough ground where there are large obstacles such as boulders or fallen trees.</li> <li>● Travel at high speed (HIGH) only on flat ground. If it is impossible to avoid going over obstacles, travel slowly in low speed (LOW).</li> </ul>
C	Extremely soft ground (swamp)	<ul style="list-style-type: none"> <li>● In the case of A and B, use only in places where the machine sinks and it is impossible to travel.</li> <li>● These shoes cannot be used on rough ground where there are large obstacles such as boulders or fallen trees.</li> <li>● Travel at high speed (HIGH) only on flat ground. If it is impossible to avoid going over obstacles, travel slowly in low speed (LOW).</li> </ul>
D	Paved road surfaces	<ul style="list-style-type: none"> <li>● Be careful when using flat shoes on slopes. They have low gradeability.</li> </ul>
E	Paved road surfaces	<ul style="list-style-type: none"> <li>● To protect the rubber shoes and road liner, always follow the precautions in Section "RUBBER SHOES AND ROAD LINERS (PAGE 3-79)".</li> </ul>

	Specifications	Category
Standard	450mm Triple	A
Option	500mm Triple	B
Option	600mm Triple	B
Option	700mm Swamp shoes	C
Option	450mm Road Liner	E

# AUTOMATIC GREASING SYSTEM

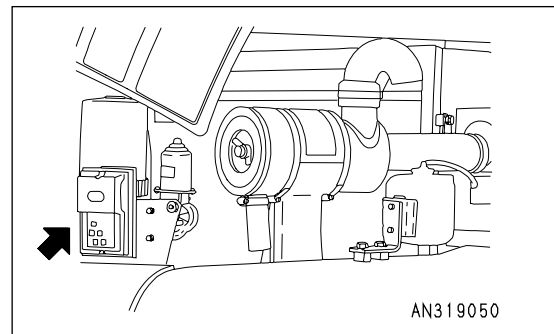
## CONTROLLER

### ⚠ WARNING

- If any abnormality occurs in the controller, do not repair it yourself. See "OTHER TROUBLE (PAGE 3-106)", and report the content when contacting your Komatsu distributor for repairs.
- When operating the controller, consult first with your Komatsu distributor.  
This is on the left side inside the engine room.  
This controller is used to control the automatic greasing system.

This is on the left side inside the engine room.

This controller is used to control the automatic greasing system.



## Setting Greasing Interval

If the work equipment is used for long periods under particularly severe conditions or in riverbed work where a large amount of grease flows out, the greasing interval should be reduced. In such cases, if it is desired to carry out greasing more frequently than the interval set when the machine was shipped from the factory, it is possible to change the set value of the controller as follows to reduce the greasing interval.

The greasing interval is set at 5 hours when the machine is shipped from the factory.

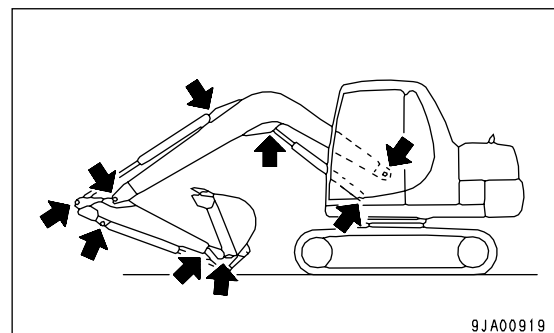
Remember that if the greasing interval is reduced, the length of time that the grease cartridge can be used is also reduced. Furthermore, if the greasing interval is reduced, there will be an increase in the amount of grease dripping from the end face of the work equipment pins and this may make the machine dirty or contaminate the surrounding area.

### REMARK

If the greasing controller or greasing pump should be damaged and stop working, greasing can still be carried out with a grease gun through the fitting of the divider valves (3 points).

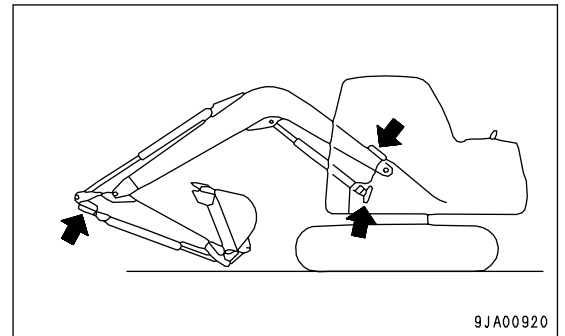
- The greasing locations for the automatic greasing controller are the places shown in the diagram on the right.
  - Bucket-link connecting pin (2 places)
  - Link connecting pin (2 places)
  - Bucket cylinder rod end (1 place)

Use a grease gun to grease the following places every 100 hours.



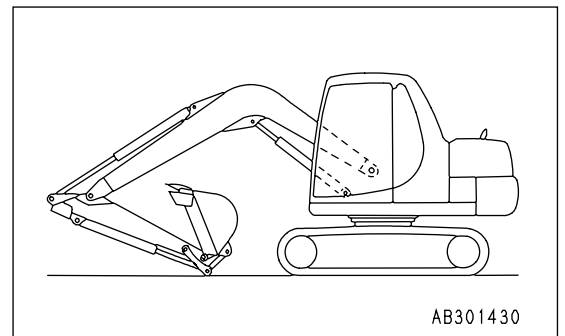
- When replacing or turning the bucket, or when replacing pins, bushings, or links at the connecting pin portions, the piping must be filled with grease when carrying out the first greasing. For this reason, it is necessary to add grease manually through the divider valve.

Use a grease gun to carry out greasing manually through the nipples of the three divider valves (total: 10 points).

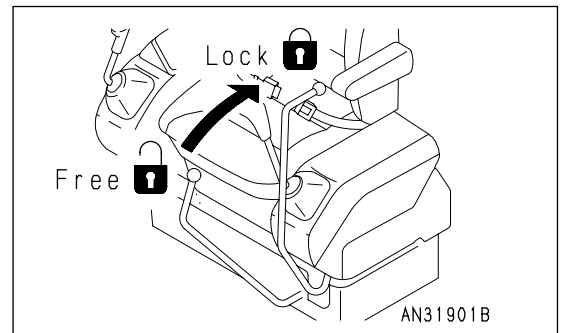


**Method of Setting (Changing) Greasing Interval**

1. Move the machine to a safe place, lower the work equipment to the ground, then stop the engine.

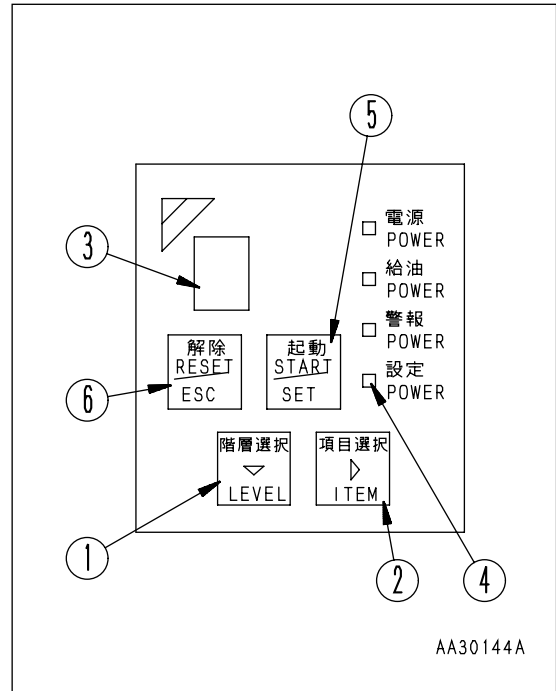


2. Set the safety lock to the LOCK position, then turn the starting switch to the ON position. (Do not start the engine.)



3. Select the code number for the desired greasing interval (time) "a" from the automatic greasing setting code table.
4. Press controller panel switch (1) and switch (2) at the same time.
  - "a" flashes on the display of LED (3) and setting lamp (4) flashes.
  - If the display of LED (3) is "b" or "c", press switch (2) until the display of LED (3) becomes "a".
5. When the display of LED (3) becomes "a", press switch (1).
  - "a" and the code number for the present setting are displayed in turn by LED (3).
6. When the code number for the selected greasing interval is displayed, press switch (2).
  - When switch (2) is pressed, the code number goes up in turn.
7. Press switch (5).
8. Press switch (6) two times.
  - A small dot "." flashes on the display of LED (3).

This completes the setting.



**REMARK**

To check the setting visually, repeat the above Steps 4 and 5, and if there is no mistake in the setting, press switch (6) two times to make the small dot "." flash on the display of LED (3).

Automatic greasing setting code table

Setting item											
No.	Code No.	0	1	2	3	4	5	6	7	8	9
a	Greasing interval (time)	—	1	1.5	2	3	4	5	6	8	—
b	Pressure hold time (minutes)	—	—	—	—	—	—	15	—	—	—
c	—	∞	—	—	—	—	—	—	—	—	—

Note 1: Do not use the values marked "-" for the code number.

Note 2: When the machine is shipped from the factory, the code number for the controller is set at a = 6, b = 6, c = 0. Do not change the settings for b or c. If the settings for b or c are changed, an abnormality display may appear during operations and the automatic greasing may not be carried out.

## CHECK BEFORE STARTING

### Grease Cartridge Grease Amount - Check/Replace

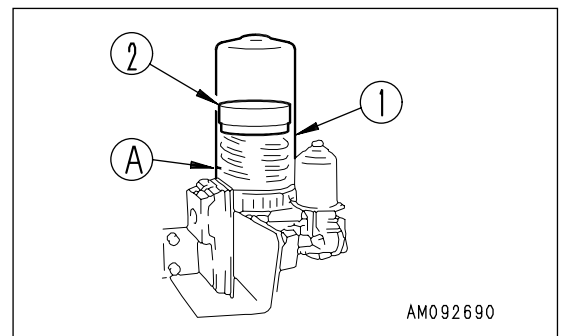
#### WARNING

The tank has a built-in compressed spring, so be careful when installing or removing tank cover (1).

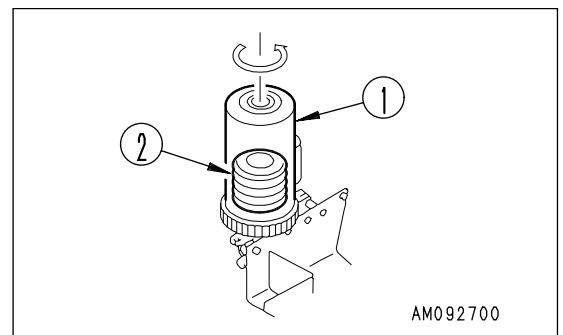
#### NOTICE

When changing the grease cartridge from the standard type to the cold area type, or from the cold area type to the standard type, please contact your Komatsu distributor.

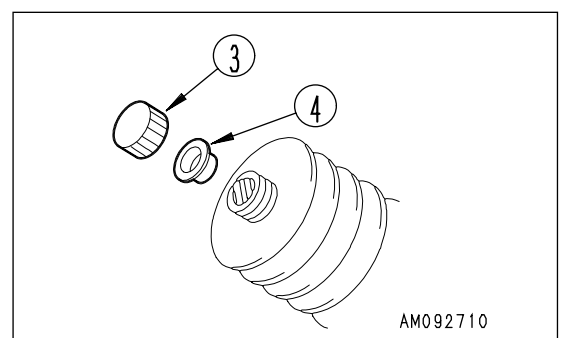
1. Open the engine hood and check the height of grease cartridge (2) inside tank cover (1).
2. If the height of grease cartridge (2) is lower than mark (A) on tank cover (1), replace grease cartridge (2) with a new part.



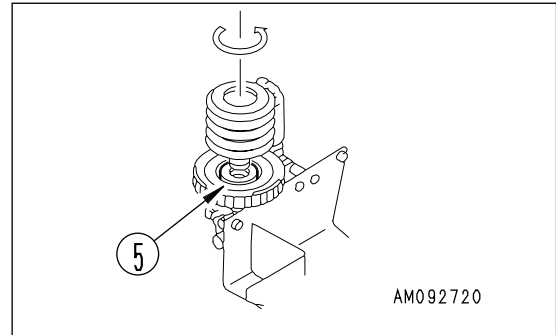
3. Turn tank cover (1) to the left to remove it.
4. Turn empty grease cartridge (2) to the left to remove it.



5. Remove cap (3) and plug (4) from the new grease cartridge.



6. Press the grease cartridge slightly so that grease comes out from the mouth, then screw the cartridge (approx. 5 turns) securely into suction port mouthpiece (5).
7. Tighten tank cover (1)(approx. 1/3 turns) securely until the lock is engaged.



Select the grease from the following table according to the ambient temperature.

Greasing point	Type of lubricant	AMBIENT TEMPERATURE								
		-22 -30	-4 -20	14 -10	32 0	50 10	68 20	86 30	122° 40°C	
Cartridge for auto- matic greasing Inside grease piping	Grease	SAE10WCD (*1)								
		SAE5W-20CD (*1)						(*2)		

\*1:

There are two types of automatic greasing cartridges available: the standard type (NLGI No. 2) and the cold area type (NLGI No. 0).

When changing the automatic greasing cartridge from the standard type to the cold area type, or from the cold area type to the standard type, please contact your Komatsu distributor.

Unless otherwise specified, a standard cartridge (NLGI No. 2) is installed when the machine is shipped from the factory.

The part numbers are as follows.

Standard cartridge: 20Y-70-25480

Cold area cartridge: 20Y-70-25490

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

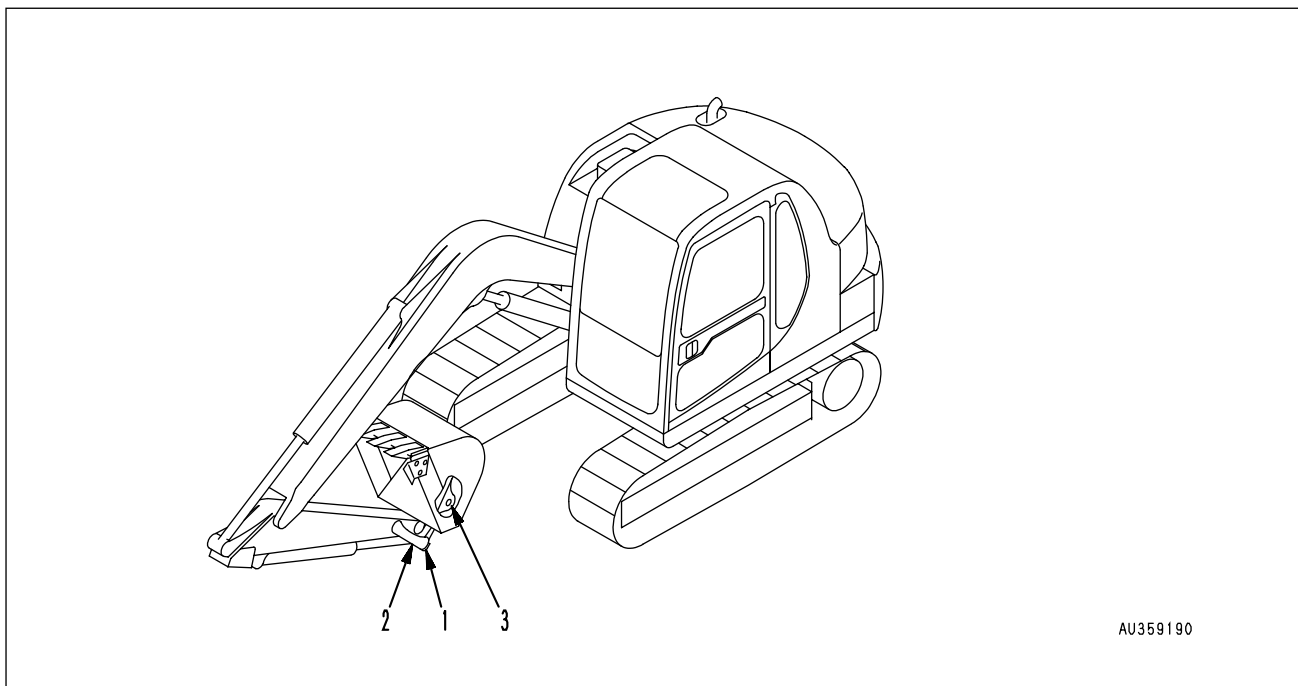
\*2:

If the cold area type grease (NLGI No. 0) is used in warm areas, some grease will drip from the ends of the work equipment pins, but there is no problem in the lubricating performance.

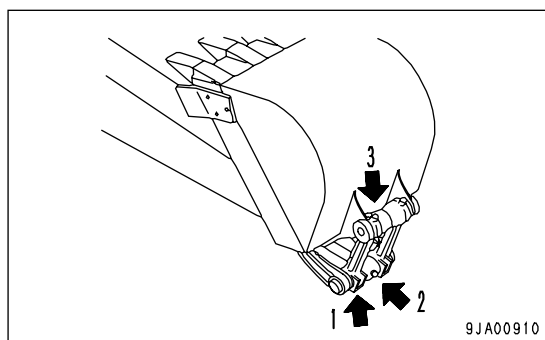
## Every 100 Hours Service

### Greasing

1. Set to the greasing posture shown below, 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) Link connecting pin (2 places)
- (2) Bucket cylinder rod end (1 place)
- (3) Bucket-link connecting pin (2 places)





# 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.

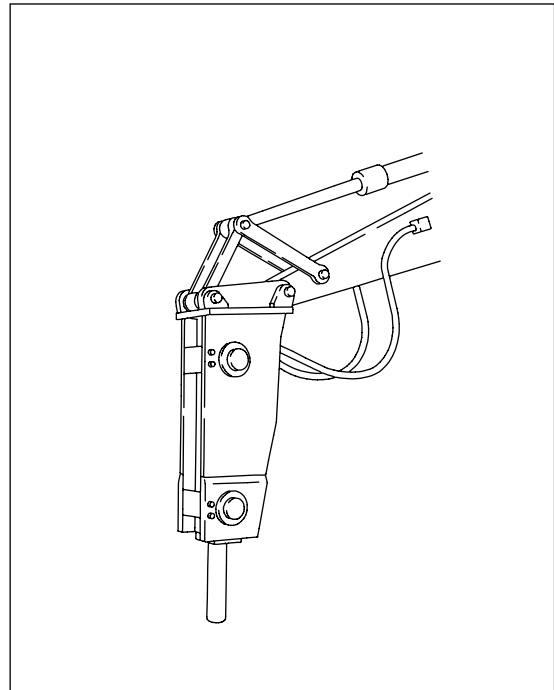
- The machine models to which attachments can be mounted vary. For selection of attachment and machine model, consult your Komatsu distributor.

## HYDRAULIC BREAKER

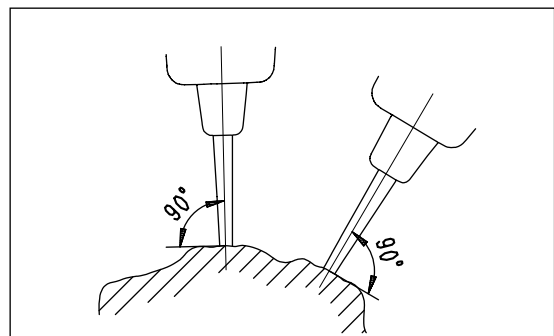
### Main Applications

- Crushed rock
- Demolition work
- Road construction

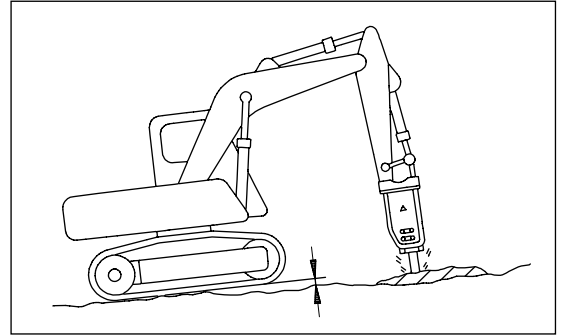
This attachment can be used for a wide range of work including demolition of buildings, breaking up of road surfaces, tunnel work, breaking up slag, rock crushing, and breaking operations in quarries.



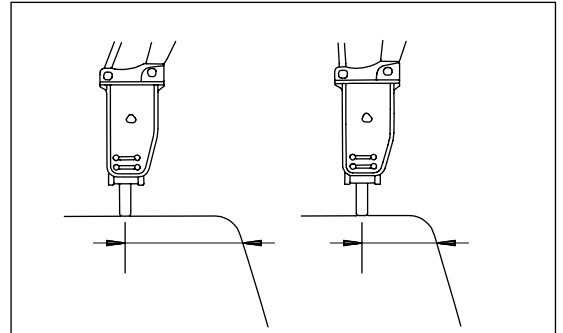
Keep the chisel pushed perpendicularly against the impact surface when carrying out breaking operations.



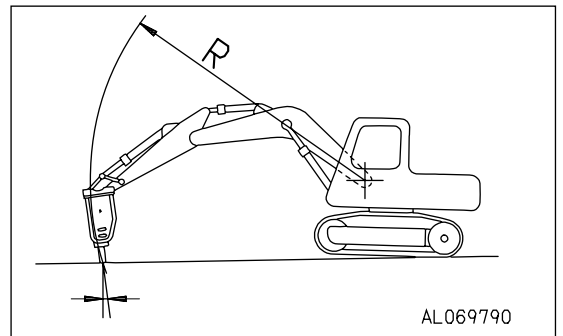
When applying impact, push the chisel against the impact surface and operate so that the chassis rises approx. 5 cm (2 in) off the ground. Do not let the machine come further off the ground than this amount.



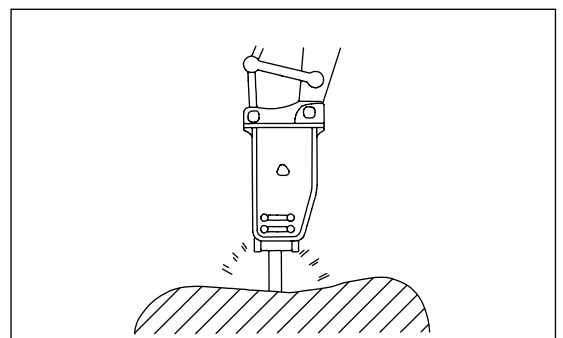
When applying continuous impact to the same impact surface, if the chisel does not penetrate or break the surface within 1 minute, change the point of impact and carry out breaking operations closer to the edge.



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.

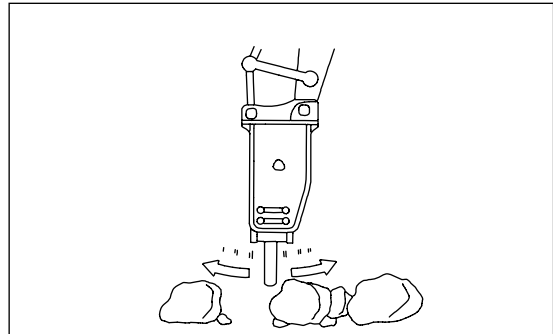


### Prohibited Works

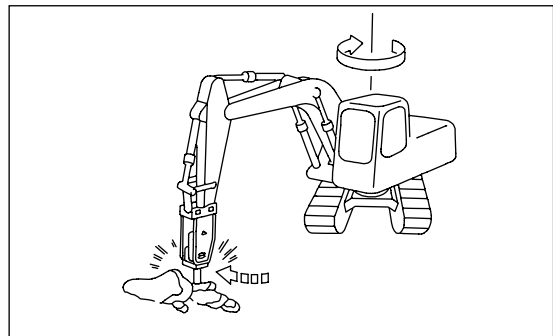
To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

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

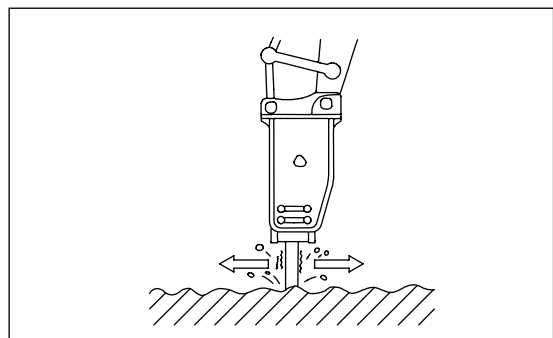
Using the mount to gather in pieces of rock



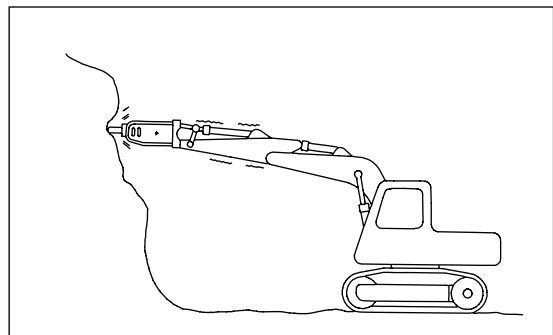
Operations using the swing force



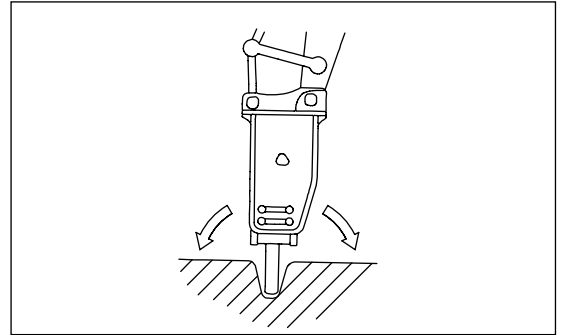
Moving the chisel while carrying out impacting operations



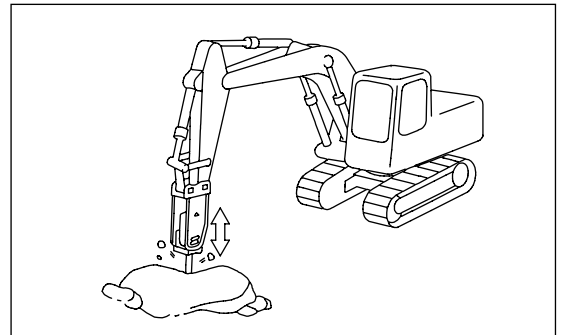
Applying impact horizontally or in upward direction



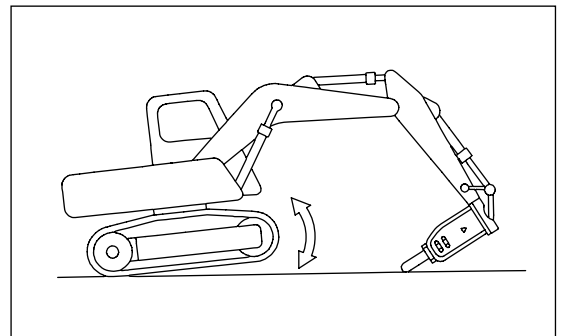
Twisting the chisel when it has penetrated the rock



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



**MEMO**

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# MEMO



**PC60-7 HYDRAULIC EXCAVATOR**

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