

Operation & Maintenance Manual

GALEO

PC228US-3

PC228USLC-3

HYDRAULIC EXCAVATOR

SERIAL NUMBERS	PC228US-3	30001 and up
	PC228USLC-3	30001 and up

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July 2005

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 a hazard when performing operation and maintenance.



WARNING

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

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

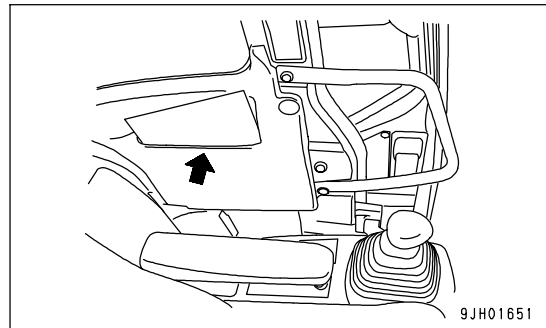
Keep this manual at the storage location for the Operation and Maintenance Manual given below so that all personnel involved in working on the machine can consult it periodically.

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

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

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

Storage location for the Operation and Maintenance Manual:
A magazine box provided on the left side of operator's seat



EMISSION CONTROL WARRANTY**EMISSION CONTROL WARRANTY STATEMENT (APPLIES TO CANADA ONLY)****1. Products Warranted**

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

2. Coverage

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

3. Limitations

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

KOMATSU IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This warranty, together with the express commercial warranties, are the sole warranties of Komatsu. **THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A 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-roulière. 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 DE L'EPA (ANNÉE DU MODÈLE) ET DE LA CALIFORNIE POUR LES MOTEURS LARGES NON-ROUTIERS À IGNITION PAR COMPRESSION. CE MOTEUR EST CERTIFIÉ POUR OPÉRER À ESSENCE DIESEL.

AVERTISSEMENT
 DES BLESSURES PEUVENT RÉSULTER 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			
EXHAUST EMISSION CONTROL SYSTEM		FIRING ORDER	1 - 5 - 3 - 6 - 2 - 4
ADV. LOAD OUTPUT	Kw (HP)	RPM	
VALVE LASH COLD (mm)	IN. EX.	FUEL RATE AT ADV.	mm ³ /STROKE
IDLE SPEED	RPM	FAMILY EMISSION LIMIT	
INITIAL INJECTION TIMING	DEG. BTDC	DATE OF MANUFACTURE	
KOMATSU LTD. MADE IN JAPAN			

MODÈLE DU MOTEUR

FAMILLE DU MOTEUR

SYSTÈME DE CONTRÔLE DES ÉMISSIONS D'ÉCHAPPEMENT

CHARGE DE SORTIE ADV.

PORTÉE DE VALVE À FROID (mm)

VITESSE STATIQUE

RÉGLAGE DE L'ALLUMAGE - INJECTION INITIALE

DEG. BTDC

NO. SÉRIE

DÉPLACEMENT

LITRES

SÉQUENCE DE MISE À FEU

mm³/BAITTEMENT

TAUX D'ESSENCE À ADV.

LIMITE D'ÉMISSION DE LA FAMILLE

DATE DE FABRICATION

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.

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

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

Example of safety message using signal word

 **WARNING**

When standing up from the operator's seat, always place the lock lever in the **LOCK** position.

If you accidentally touch the control levers when they are not locked, this may cause a serious injury or death.

Other signal words

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

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

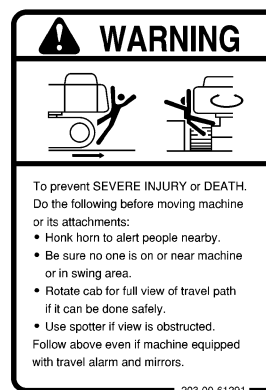
REMARKS This word is used for information that is useful to know.

- Safety labels

Safety labels are affixed to the machine to inform the operator or maintenance worker on the spot when carrying out operation or maintenance of the machine that may involve hazard.

This machine uses "Safety labels using words" and "Safety labels using pictograms" to indicate safety procedures.

Example of safety label using words



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))

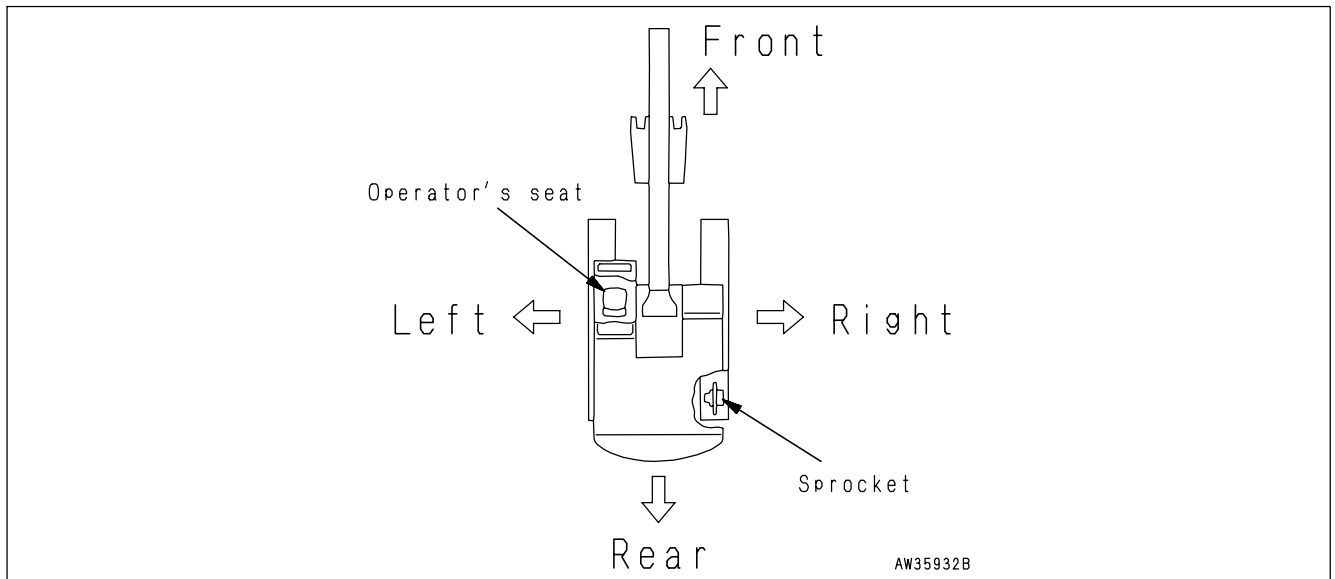
INTRODUCTION

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

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

See the section "RECOMMENDED APPLICATIONS (PAGE 3-109)" 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 seat when the operator's seat is facing the front and the sprocket is at the rear of the machine.

BREAKING-IN THE NEW MACHINE

NOTICE

Your Komatsu machine has been thoroughly adjusted and tested before shipment from the factory. However, operating the machine under full load before breaking the machine in can adversely affect the performance and shorten the machine life.

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

Make sure that you fully understand the content of this manual, and pay careful attention to the following points when breaking in the machine.

- Run the engine at idle for 15 seconds after starting it. During this time, do not operate the control levers or fuel control dial.
- Idle the engine for 5 minutes after starting it up.
- Avoid operation with heavy loads or at high speeds.
- Immediately after starting the engine, avoid sudden starts, sudden acceleration, unnecessary sudden stops, and sudden changes in direction.

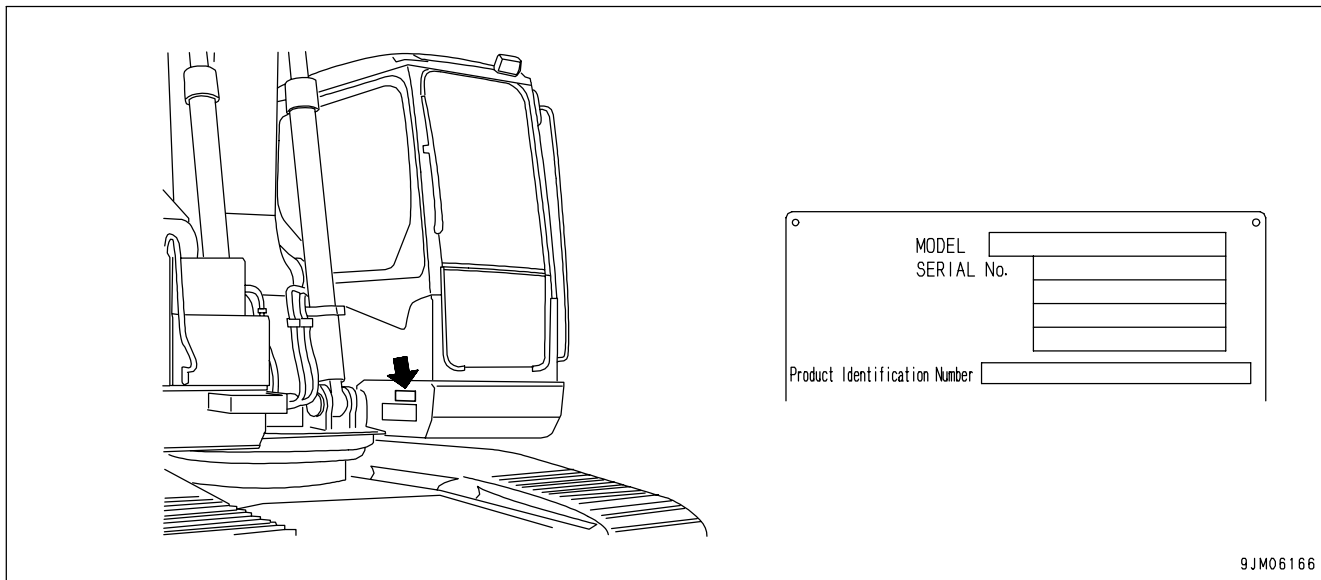
PRODUCT INFORMATION

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

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

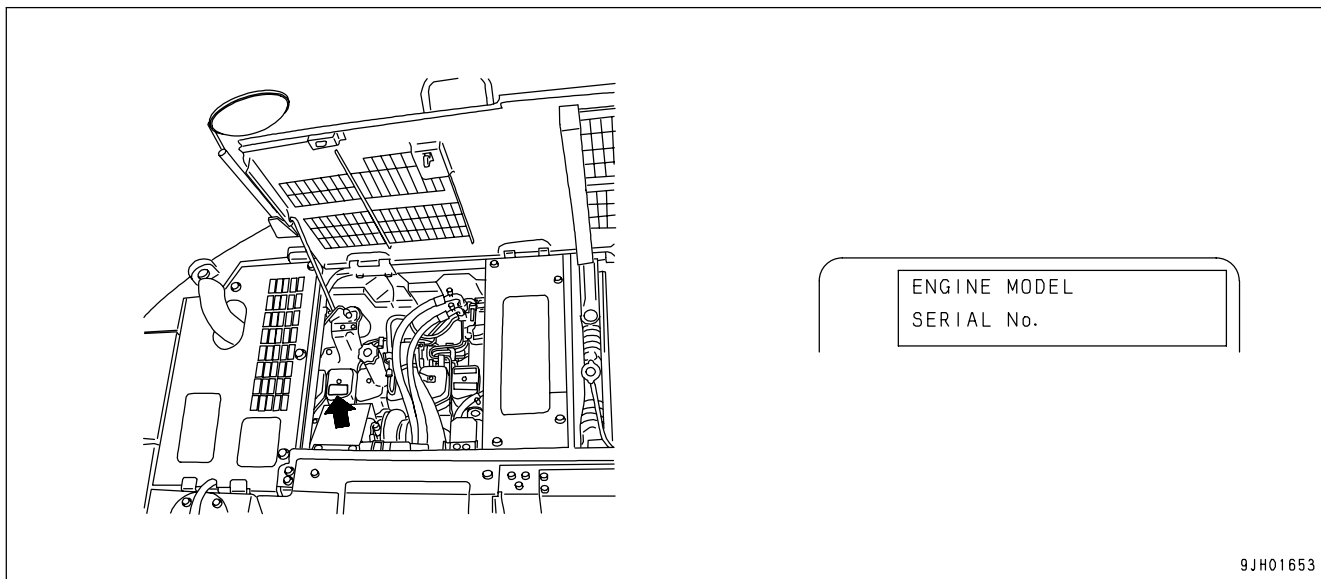
On the bottom right of the operator's cab

The design of the nameplate differs according to the territory.



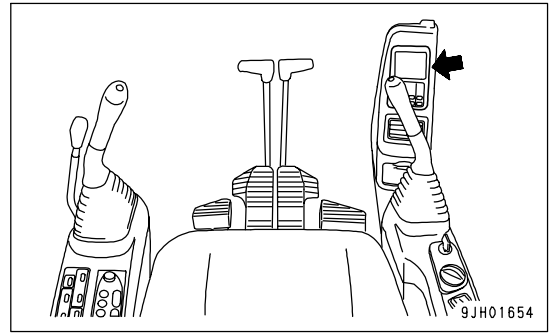
ENGINE SERIAL NUMBER PLATE AND ITS LOCATION

On the upper side of the engine cylinder head cover.



SERVICE METER LOCATION

On top of the machine monitor



YOUR MACHINE SERIAL NUMBERS AND DISTRIBUTOR

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

Service Personnel	
Phone/Fax	-----

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SAFETY

WARNING

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

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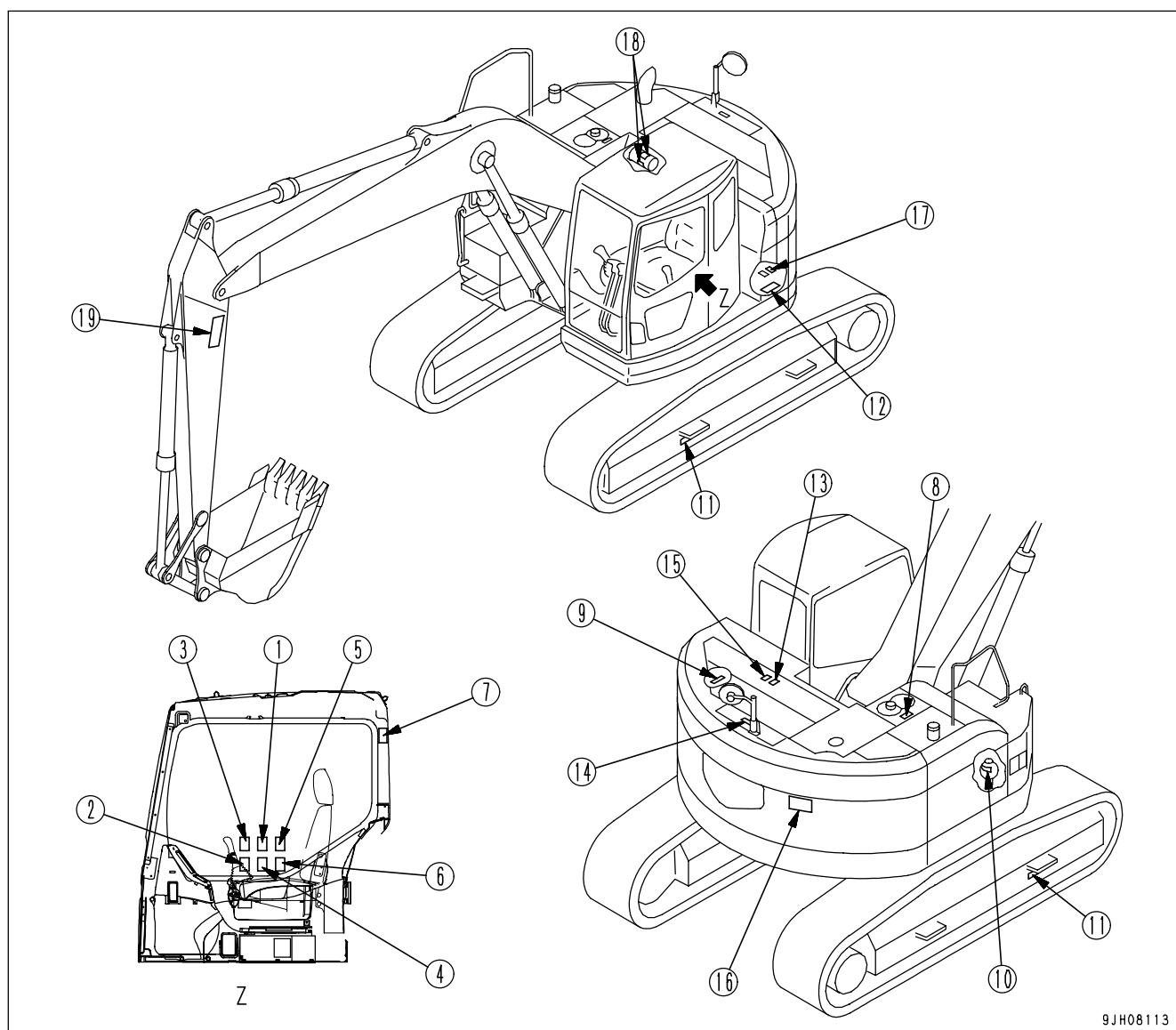
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SAFETY LABELS

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

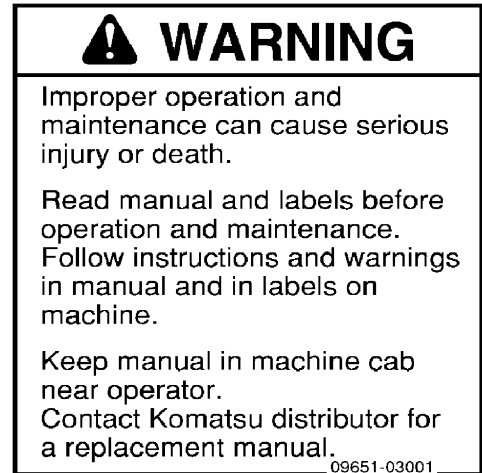
- Be sure that you fully understand the correct position and content of labels.
- To ensure that the content of labels can be read properly, be sure that they are in the correct place and always keep them clean. When cleaning them, do not use organic solvents or gasoline. These may cause the labels to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

LOCATION OF SAFETY LABELS

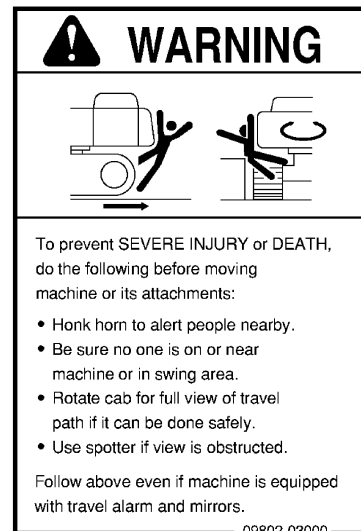


SAFETY LABELS

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



- (2) Caution before operating (09802-03000)




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



(4) Warnings for high voltage (09801-03001)

⚠ 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
SPECIAL HIGH VOLTAGE	66.000V	4m
	154.000V	5m
	187.000V	6m
	275.000V	7m
	500.000V	11m

09801-03001

(5) Caution when opening or closing front window (09839-03000)

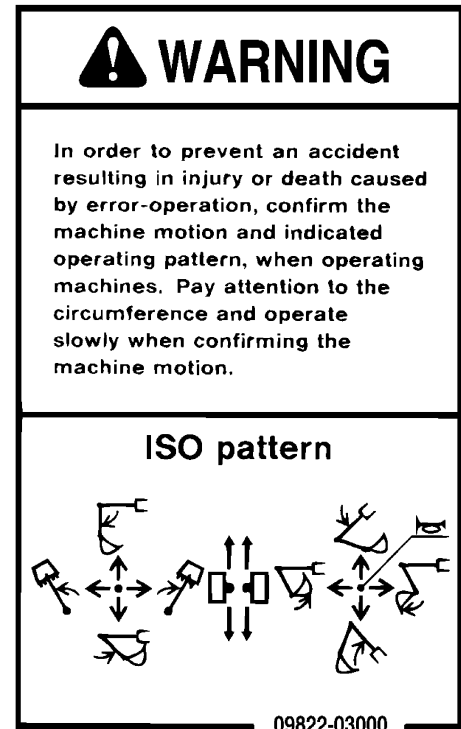
⚠ WARNING

To open or close the front or ceiling window, never stand up from the operator's seat before throwing the lock lever to the LOCK position.

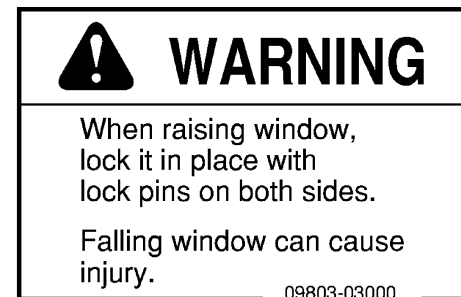
Inadvertently touching any of the working equipment control levers might cause the machine to start moving all of a sudden, probably resulting in a serious injury.

09839-03000

(6) Caution for operating patter (09822-03000)



(7) Caution when stowing front window (09803-03000)



(8) Caution for high-temperature hydraulic oil (09653-03001)



(9) Caution with high-temperature coolant (09668-03001)



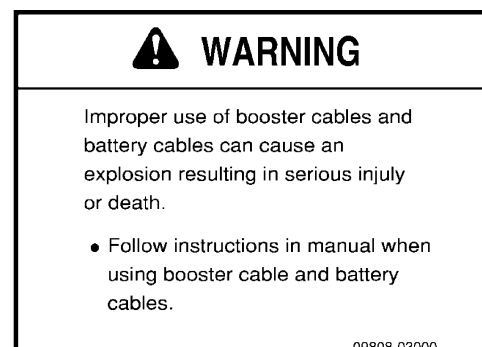
(10) Caution for handling accumulator (09659-53000)



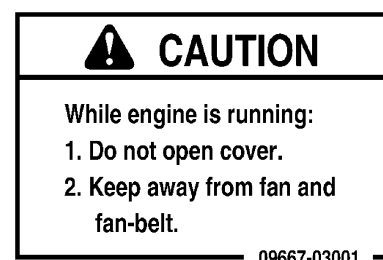
(11) Caution for check and adjust track tension (09657-03003)



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



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



(14) Warning against falling off the edge (09805-23000)



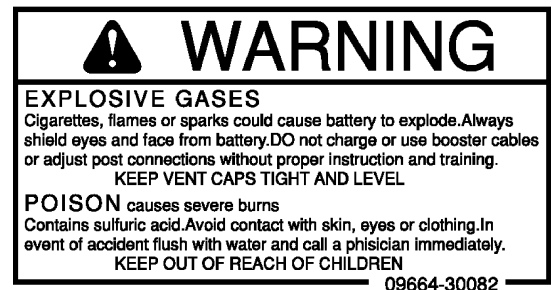
(15) Warning against falling (09805-13000)



(16) Keep off swing area (09133-23000)



(17) Warning when handling battery (09664-30082)



(18) Jump start prohibited (09842-A0481)
This safety label is fixed to the engine starting motor.



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.

(19) Beware of work equipment (09134-A1681)



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

Keep away from machine during operation.

SAFETY INFORMATION

SAFETY RULES

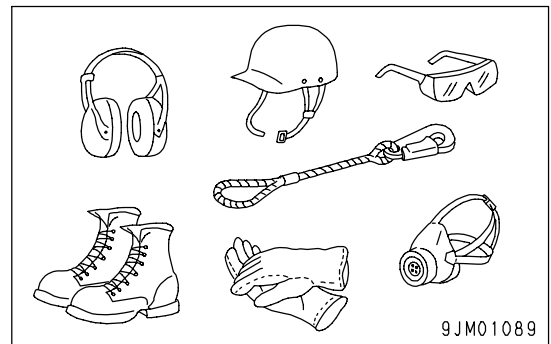
- Only trained and authorized personnel can operate and maintain the machine.
- Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
- If you are under the influence of alcohol or medication, your ability to safely operate or repair your machine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

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

WORKING WEAR AND PERSONAL PROTECTIVE ITEMS

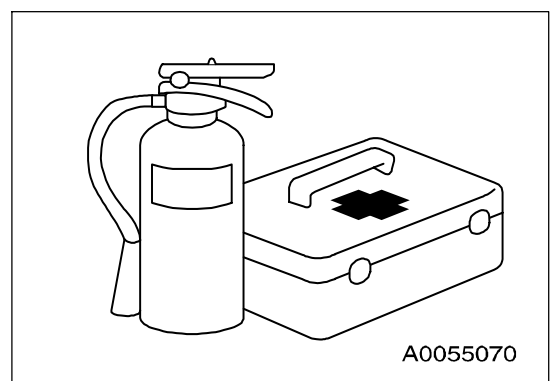
- Do not wear loose clothing and accessories. There is a hazard that they may catch on control levers or other protruding parts.
- If you have long hair and it hangs out from your hard hat, there is a hazard that it may get caught up in the machine, so tie your hair up and be careful not to let it get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

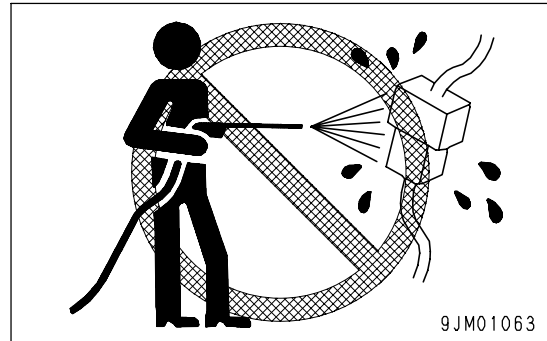


SAFETY EQUIPMENT

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

KEEP MACHINE CLEAN

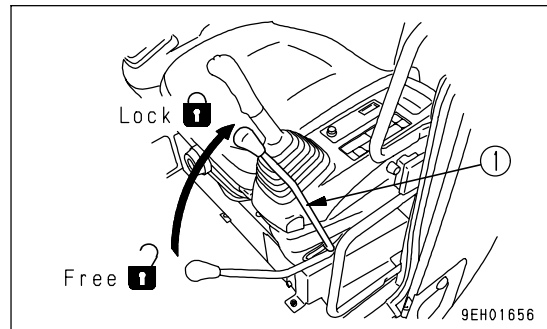
- If water gets into the electrical system, there is a hazard that it will cause malfunctions or misoperation. Do not use water or steam to wash the electrical system (sensors, connectors).
- If inspection and maintenance is carried out when the machine is still dirty with mud or oil, there is a hazard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

**KEEP OPERATOR'S COMPARTMENT CLEAN**

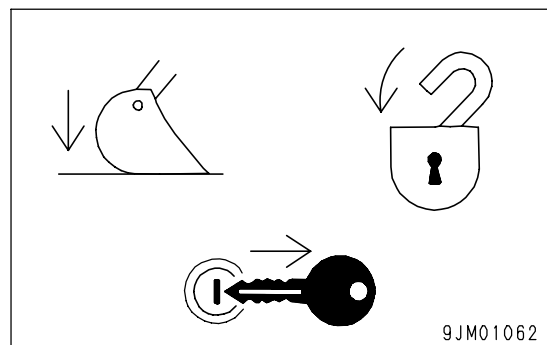
- When entering the operator's compartment, always remove all mud and oil from the soles of your shoes. If you operate the pedal with mud or oil affixed to your shoes, your foot may slip and this may cause a serious accident.
- Do not leave parts or tools lying around the operator's compartment.
- Do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

LEAVING OPERATOR'S SEAT WITH LOCK

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



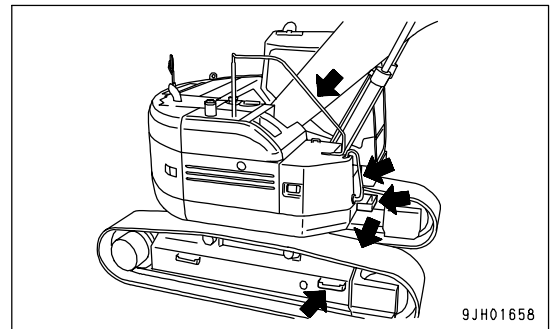
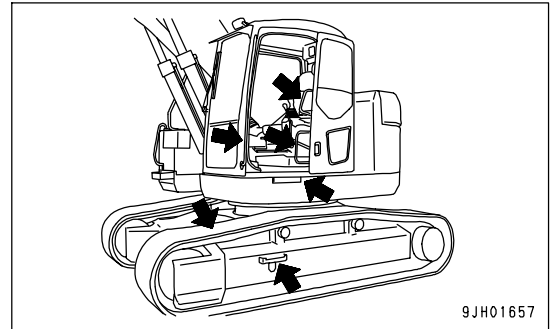
- When leaving the machine, always lower the work equipment completely to the ground, set lock lever (1) securely to the LOCK position, then stop the engine. Use the key to lock all the equipment. Always remove the key, take it with you, and keep it in the specified place.



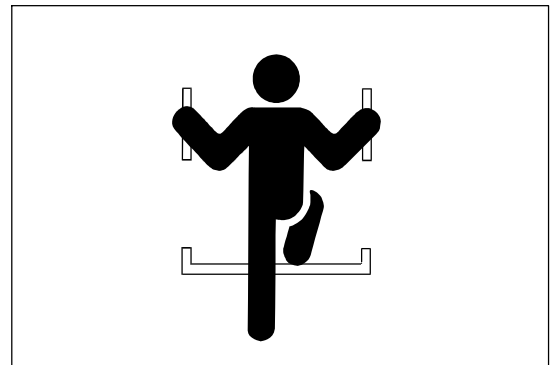
HANDRAILS AND STEPS

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, or lock lever when getting on or off the machine.
- Never climb on the engine hood or covers where there are no non-slip pads.
- Before getting on or off the machine, check the handrails and steps (including the track shoe). If there is any oil, grease, or mud on the handrails or steps (including the track shoe), wipe it off immediately. Always keep these parts clean. Repair any damage and tighten any loose bolts.
- Do not get on or off the machine while holding tools in your hand.



MOUNTING AND DISMOUNTING

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

NO PERSONS ON ATTACHMENTS

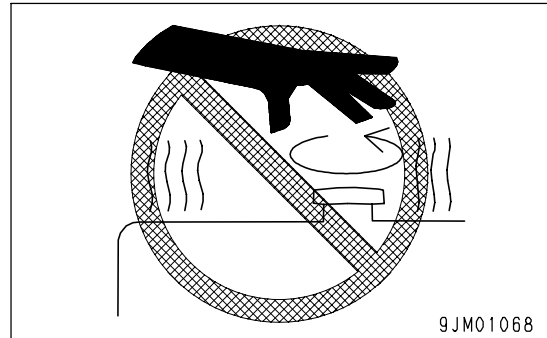
Never let anyone ride on the work equipment, or other attachments. There is a hazard of falling and suffering serious injury.

DO NOT GET CAUGHT IN ARTICULATED PORTION

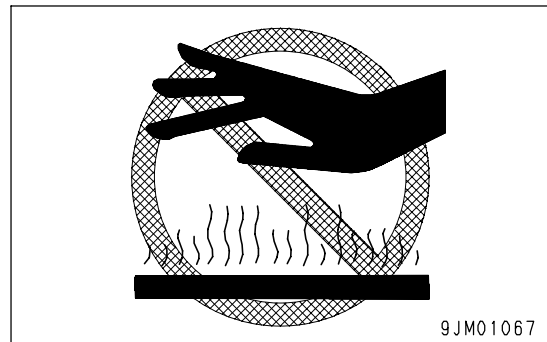
The clearance around the work equipment will change according to the movement of the link. If you get caught, this may lead to serious personal injury. Do not allow anyone to approach any rotating or telescoping part.

BURN PREVENTION**Hot coolant**

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

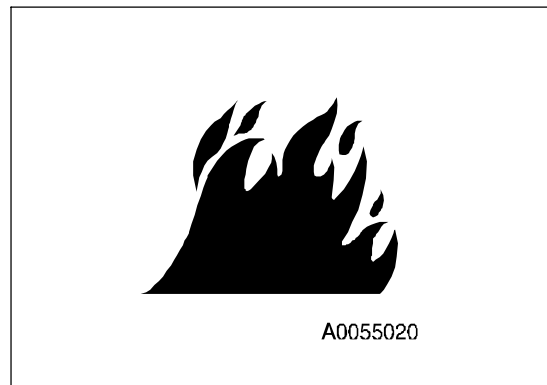
**Hot oil**

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

**FIRE PREVENTION AND EXPLOSION PREVENTION****• Fire caused by fuel or oil**

Fuel, oil, antifreeze, and window washer liquid are particularly flammable and can be hazardous. To prevent fire, always observe the following:

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

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

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

- **Fire coming from electric wiring**

Short circuits in the electrical system can cause fire.

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

- **Fire coming from hydraulic line**

Check that all the hose and tube clamps, guards, and cushions are securely fixed in position.

If they are loose, they may vibrate during operation and rub against other parts. This may lead to damage to the hoses, and cause high-pressure oil to spurt out, leading to fire damage or serious injury.

- **Explosion caused by lighting equipment**

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

ACTION IF FIRE OCCURS

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

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

WINDSHIELD WASHER FLUID

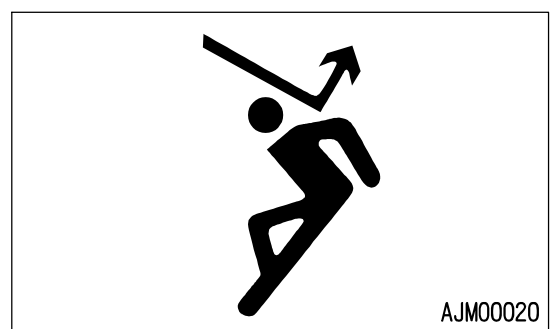
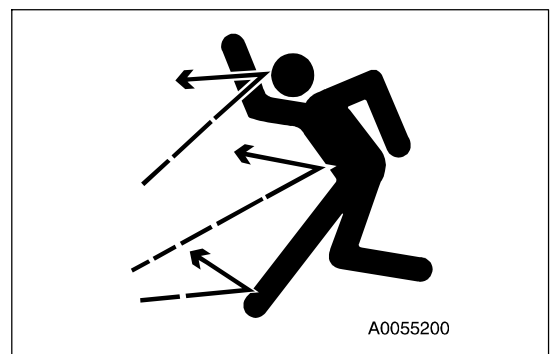
Use an ethyl alcohol base washer liquid.

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

FALLING OBJECTS, FLYING OBJECTS AND INTRUDING OBJECTS PREVENTION

On jobsites where there is a hazard that falling objects, flying objects, or intruding objects may hit or enter the operator's cab, consider the operating conditions and install the necessary guards to protect the operator.

- When carrying out demolition or breaker operations, install a front guard and use a laminated coating sheet on the front glass.
- When working in mines or quarries where there is a hazard of falling rock, install FOPS (Falling Objects Protective Structure) and a front guard, and use a laminated coating sheet on the front glass.
- When carrying out the above operations, always close the front window. In addition, always ensure that 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. Therefore contact your Komatsu distributor for advice.
- Any injuries, accidents, or product failures resulting from the use of unauthorized attachments or parts will not be the responsibility of Komatsu.
- When installing and using optional attachments, read the instruction manual for the attachment, and the general information related to attachments in this manual.

ATTACHMENT COMBINATIONS

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

CAB WINDOW GLASSES

- If the cab glass on the work equipment side is broken, there is a hazard that the work equipment may contact the operator's body directly. Stop operation immediately and replace the glass.
- The ceiling window is made of organic glass (polycarbonate), and as such it is apt to break easily when receiving damage on the surface, thereby deteriorating its protective characteristic. If there is a crack or damage caused by a fallen rock, or when any sign of them is noticed, replace it with a new window.

UNAUTHORIZED MODIFICATIONS

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

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

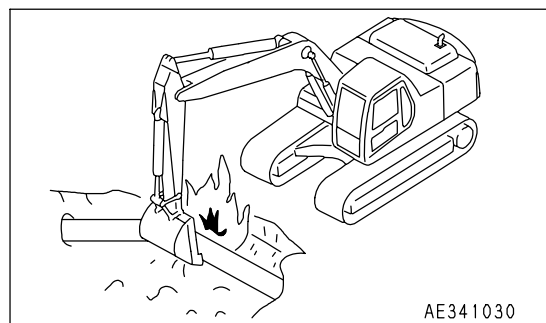
SAFETY AT JOBSITE

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

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

When working on public roads, position flagmen and erect barriers to ensure the safety of passing traffic and pedestrians.

- When traveling or operating in shallow water or on soft ground, check the shape and condition of the bedrock, and the depth and speed of flow of the water before starting operations.



WORKING ON LOOSE GROUND

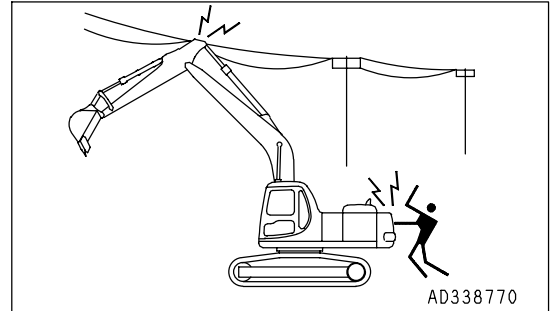
- Avoid traveling or operating your machine too close to the edge of cliffs, overhangs, and deep ditches. The ground may be weak in such areas. If the ground should collapse under the weight or vibration of the machine, there is a hazard that the machine may fall or tip over. Remember that the soil after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

- When working on embankments or near excavated ditches, there is a hazard that the weight and vibration of the machine will cause the soil to collapse. Before starting operations, take steps to ensure that the ground is safe and to prevent the machine from rolling over or falling.

DISTANCE TO HIGH VOLTAGE CABLES

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

- Before starting work near electric cables, inform the local power company of the work to be performed, and ask them to take the necessary action.



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

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

ENSURE GOOD VISIBILITY

- Check for any persons or obstacles in the area around the machine and check the conditions of the jobsite to ensure that operations and travel can be carried out safely. Always do as follows.
 - When working in dark places, turn on the working lamp and front lamps installed to the machine, and set up additional lighting in the work area if necessary.
 - Stop operations if the visibility is poor, such as in mist, snow, rain, or dust.

VENTILATION FOR ENCLOSED AREA

Exhaust fumes from the engine can kill.

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



SIGNALMAN'S SIGNAL AND SIGNS

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

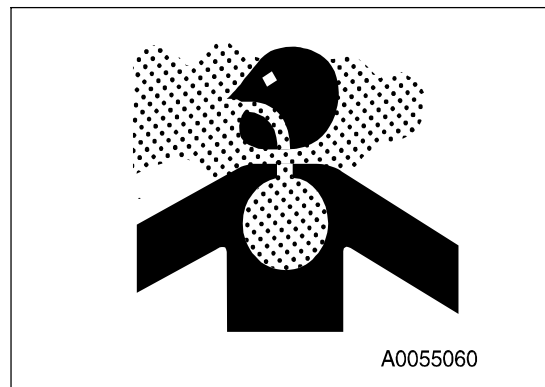
EMERGENCY EXIT FROM OPERATOR'S CAB

- If there is an emergency and the cab door does not open, use the hammer supplied with the machine to break the window glass, and use the window as an emergency exit.
For details, see "EMERGENCY ESCAPE HAMMER (PAGE 3-45)".
- To prevent injury from pieces of glass, remove all the broken glass from the window frame. Be careful also not to slip on the broken glass that has fallen to the ground.

ASBESTOS DUST HAZARD PREVENTION

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

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



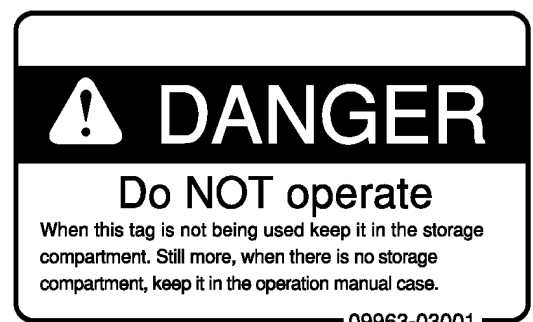
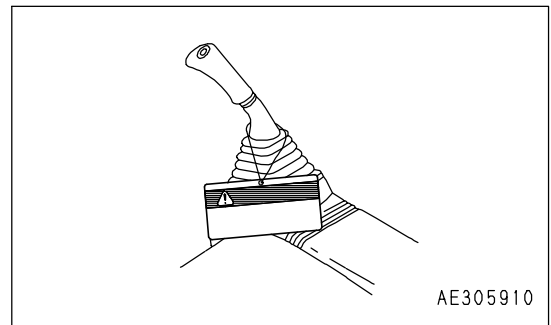
- Always observe the rules and regulations for the work site and environmental standards.

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

SAFETY MACHINE OPERATION

STARTING ENGINE

If there is a warning tag hanging from the work equipment control lever, do not start the engine or touch the levers .



CHECKS BEFORE STARTING ENGINE

Carry out the following checks before starting the engine at the beginning of the day's work.

- Remove all dirt from the surface of the window glass to ensure a good view.
- Remove all dirt from the surface of the lens of the front lamps and working lamps, and check that they light up correctly.
- Check the coolant level, fuel level, and oil level in engine oil pan, check for clogging of the air cleaner, and check for damage to the electric wiring.
- Adjust the operator's seat to a position where it is easy to carry out operations, and check that there is no damage or wear to the seat belt or mounting clamps.
- Check the operation of the instruments and gauges, check the angle of the mirror, and check that the control levers are all at the Neutral position.
- Before starting the engine, make sure that the lock lever is in 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 3-74)".
- Check that there are no persons or obstacles above, below, or in the area around the machine.

SAFETY RULES FOR STARTING ENGINE

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

STARTING ENGINE IN COLD WEATHER

- Carry out the warming-up operation thoroughly. If the machine is not thoroughly warmed up before the control levers are operated, the reaction of the machine will be slow, and this may lead to unexpected accidents.

- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source. There is a hazard that this will ignite the battery and cause the battery to explode. Before charging or starting the engine with a different power source, melt the battery electrolyte and check that there is no leakage of electrolyte before starting.

OPERATION

CHECKS BEFORE OPERATION

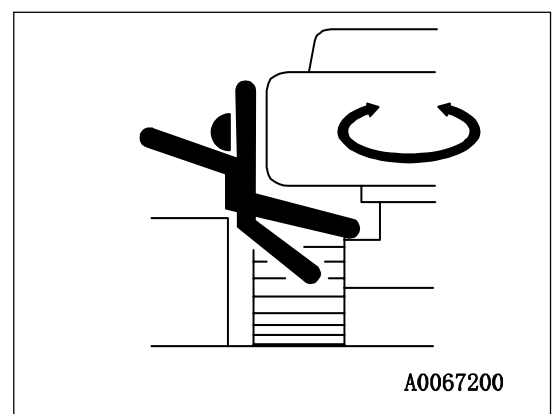
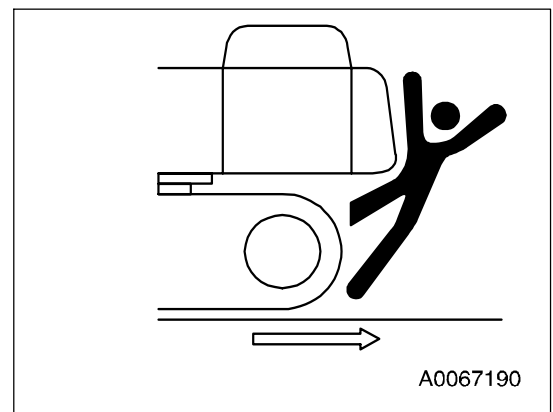
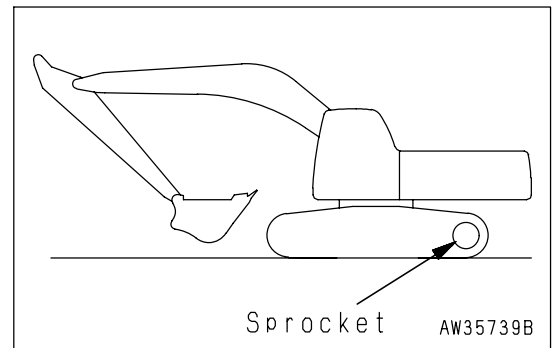
When carrying out the checks, move the machine to a wide area where there are no obstructions, and operate slowly. Do not allow anyone near the machine.

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

SAFETY RULES FOR CHANGING MACHINE DIRECTIONS

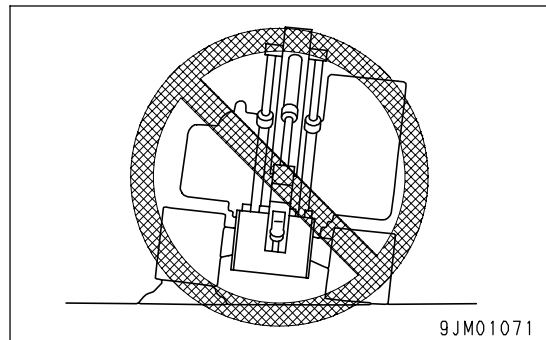
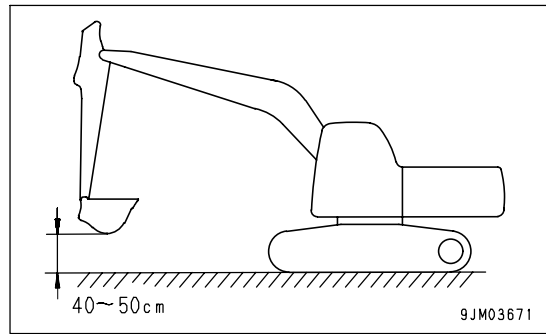
- Before traveling, position the upper structure so that the sprocket is at the rear of the operator's cab. If the sprocket is at the front of the operator's cab, the machine makes a movement reverse to the control lever movement (for example, forward becomes reverse, and left becomes right). Be careful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



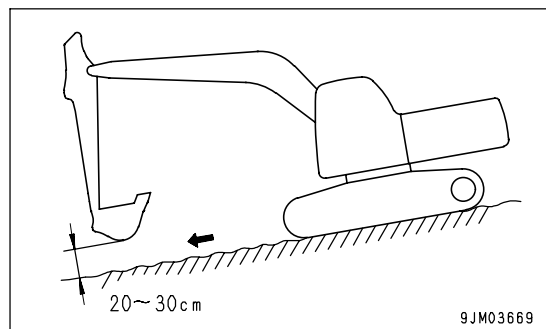
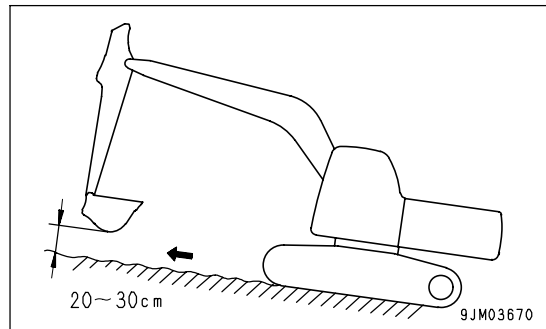
SAFETY RULES FOR TRAVELING

- When traveling on flat ground, keep the work equipment 40 to 50 cm (16 to 20 in) high above the ground.
- When traveling on rough ground, travel at low speed and do not operate the steering suddenly. There is danger that the machine may turn over. The work equipment may hit the ground surface and cause the machine to lose its balance, or may damage the machine or structures in the area.
- When traveling on rough ground or steep slopes, if the machine is equipped with auto-deceleration, always turn the auto-deceleration switch OFF (cancel).
- 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.

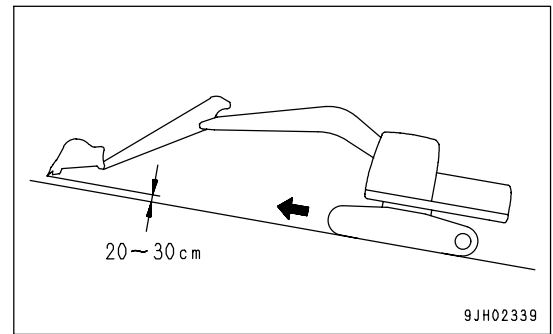
**TRAVELING ON SLOPES**

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

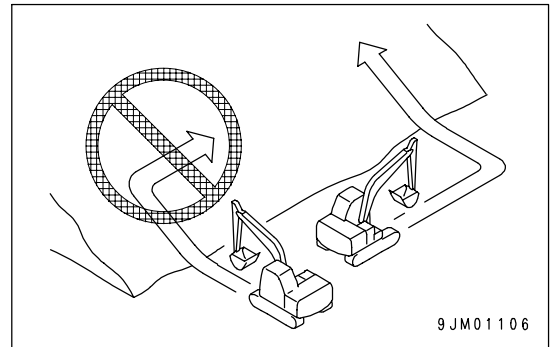
- Keep the work equipment approx. 20 to 30 cm (8 to 12 in) above the ground. In case of emergency, lower the work equipment to the ground immediately to help stop the machine.
- When travel up slopes, set the operator's cab facing uphill, when travel down slopes, set the operator's cab facing downhill. Always check the firmness of the ground under the front of the machine when traveling.



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

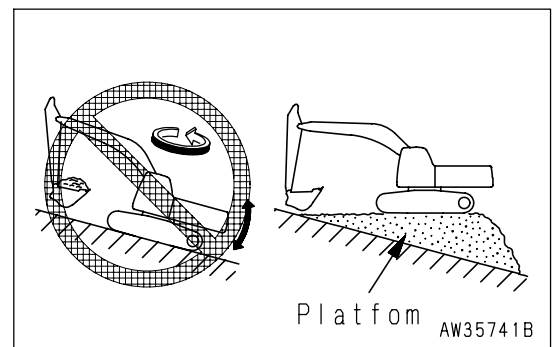


- Always travel straight up or down a slope. Traveling at an angle or across the slope is extremely dangerous.
- Do not turn on slopes or travel across slopes. Always go down to a flat place to change the position of the machine, then travel on to the slope again.
- Travel on grass, fallen leaves, or wet steel plates with low speed. Even with slight slopes there is a hazard that the machine may slip.
- If the engine stops when the machine is traveling on a slope, move the control levers immediately to the neutral position and start the engine again.



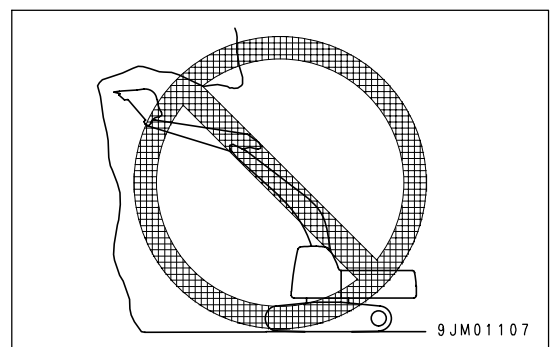
OPERATIONS ON SLOPES

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

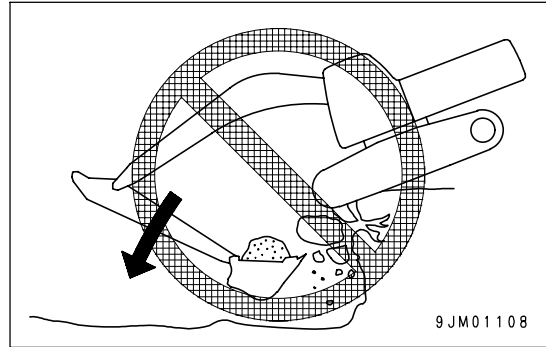


PROHIBITED OPERATIONS

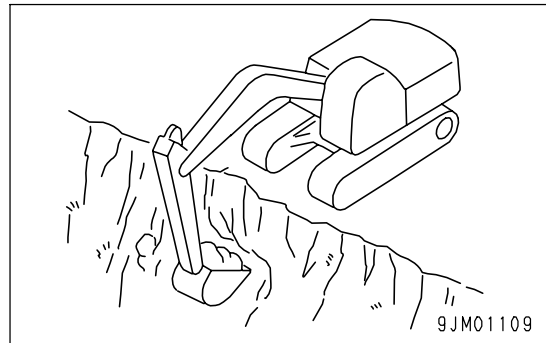
- Never dig the work face under an overhang. There is a hazard that rocks may fall or that the overhang may collapse and fall on top of the machine.



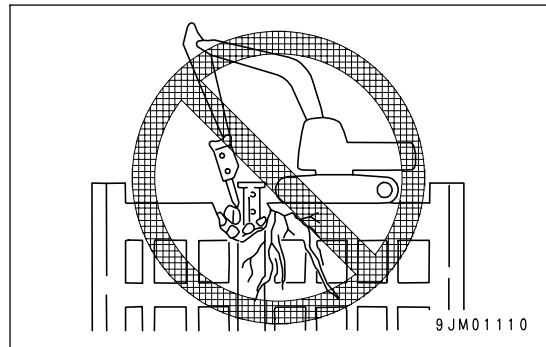
- Do not excavate too deeply under the front of the machine. The ground under the machine may collapse and cause the machine to fall.



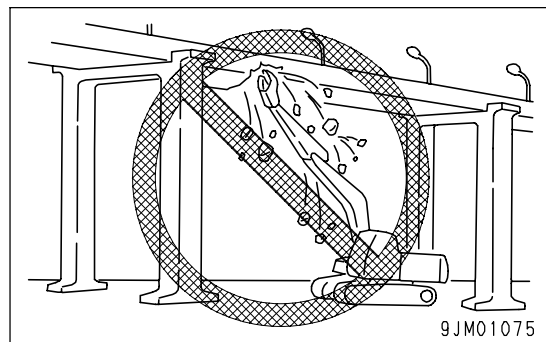
- To make it easier to escape if there is any problem, set the tracks at right angles to the road shoulder or cliff with the sprocket at the rear when carrying out operations.



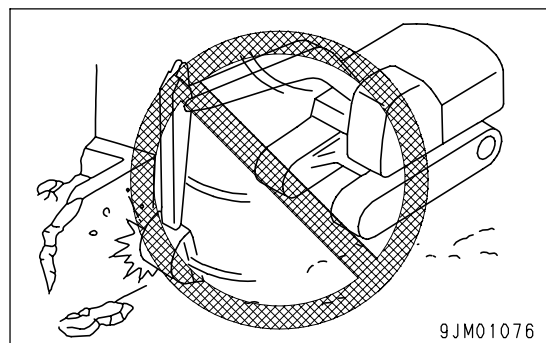
- Do not carry out demolition work under the machine. There is a hazard that the machine may become unstable and tip over.
- When working on or from the top of buildings or other structures, check the strength and the structure before starting operations. There is a hazard of the building collapsing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



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



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



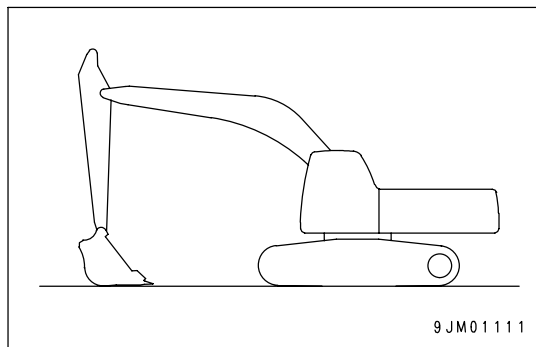
- When using a breaker or other heavy work equipment, there is a hazard of the machine losing its balance and tipping over. When operating on flat ground as well as on slopes.
 - Do not suddenly lower, swing, or stop the work equipment.
 - Do not suddenly extend or retract the boom cylinder. There is a hazard that impact will cause the machine to tip over.
- Do not pass the bucket over 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

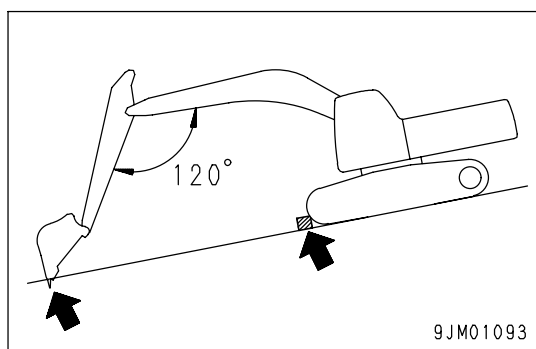
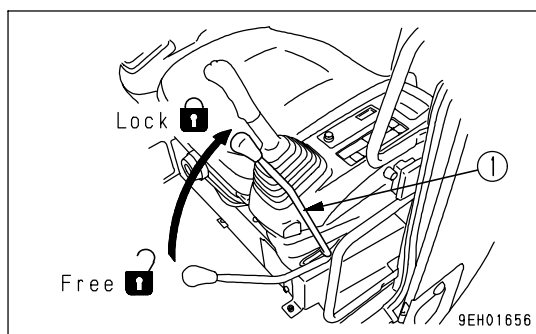
- Snow-covered or frozen surfaces are slippery, so be extremely careful when traveling or operating the machine, and do not operate the levers suddenly. Even a slight slope may cause the machine to slip, so be particularly careful when working on slopes.
- With frozen ground surfaces, the ground becomes 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 lock lever (1) to the LOCK position, then stop the engine.
- Always close the operator's cab door, and use the key to lock all the equipment in order to prevent any unauthorized person from moving the machine. Always remove the key, take it with you, and leave it in the specified place.
- If it is necessary to park the machine on a slope, always do as follows.
 - Set the bucket on the downhill side, then dig it into the ground.
 - Put blocks under the tracks to prevent the machine from moving.

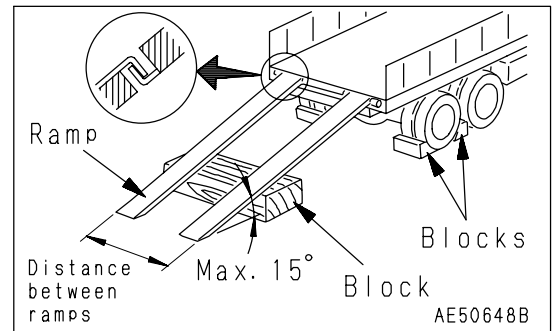


TRANSPORTATION

LOADING AND UNLOADING

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

- Perform loading and unloading on firm, level ground only. Maintain a safe distance from the edge of the road or cliff.
- Never use the work equipment to load or unload the machine. There is danger that the machine may fall or tip over.
- Always use ramps of adequate strength. Be sure that the ramps are wide, long, and thick enough to provide a safe loading slope. Take suitable steps to prevent the ramps from moving out of position or coming off.
- Be sure the ramp surface is clean and free of grease, oil, ice and loose materials. Remove dirt from machine-tracks. On a rainy day, in particular, be extremely careful since the ramp surface is slippery.
- If the machine is equipped with auto-deceleration, always turn the switch OFF (cancel) before starting the operation. If the machine is operated with the auto-deceleration switch ON (actuate), there is danger that the engine speed may suddenly increase, causing the machine to suddenly start and the travel speed to increase.
- Run the engine at low idle, 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.
- For machines equipped with a cab, always lock the door after boarding the machine. If this is not done, the door may suddenly open during transportation.
Refer to "TRANSPORTATION (PAGE 3-117)".



SHIPPING THE MACHINE

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

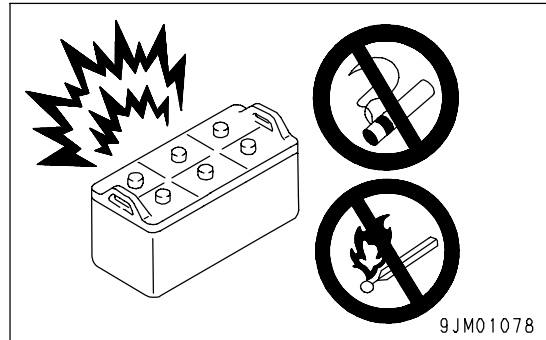
- The weight, transportation height, and overall length of the machine differ according to the work equipment, so be sure to confirm the dimensions.
- When passing over bridges or structures on private land, check first that the structure is strong enough to support the weight of the machine. When traveling on public roads, check first with the relevant authorities and follow their instructions.
- For details of the shipping procedure, see "TRANSPORTATION (PAGE 3-117)" in the OPERATION section.

BATTERY

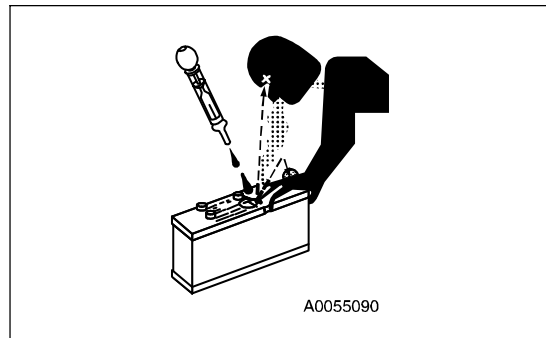
BATTERY HAZARD PREVENTION

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. Check the battery electrolyte level periodically and add distilled water to bring the electrolyte level to the UPPER LEVEL line.
- When working with batteries, always wear safety glasses and rubber gloves.
- Never smoke or use any flame near the battery.



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



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

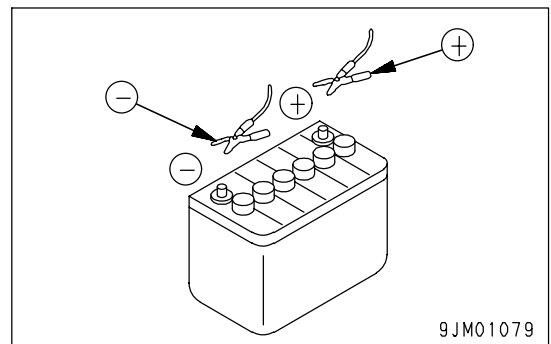
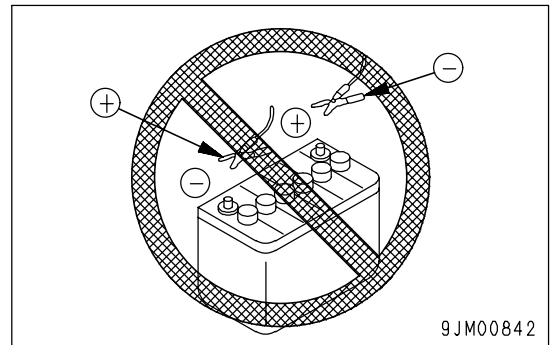
As there is a hazard that sparks will be generated, always do as follows.

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

STARTING ENGINE WITH BOOSTER CABLES

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

- When starting with a booster cable, carry out the starting operation with two workers (one worker sitting in the operator's seat and the other working with the battery).
- When starting from another machine, do not allow the two machines to touch.
- When connecting the booster cables, turn the starting switch OFF for both the normal machine and problem machine. There is a hazard that the machine will move when the power is connected.
- Be sure to connect the positive (+) cable first when installing the booster cables. Disconnect the negative (-) cable (ground side) first when removing them.
- When removing the booster cables, be careful not to let the booster cable clips touch each other or to let the clips touch the machine.
- Always wear safety goggles and rubber gloves when starting the engine with booster cables.
- When connecting a normal machine to a problem machine with booster cables, always use a normal machine with the same battery voltage as the problem machine.
- For details of the starting procedure when using booster cables, see "Starting Engine with Booster Cables (PAGE 3-137)" in the OPERATION section.



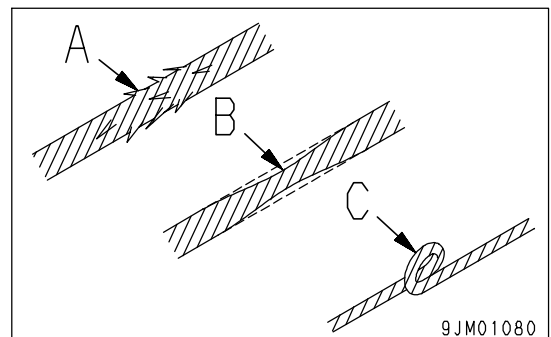
TOWING

SAFETY RULES FOR TOWING

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

For towing, see "TOWING THE MACHINE (PAGE 3-134)".

- Always check that the wire rope used for towing has ample strength for the weight of the machine being towed.
- Never use a wire rope which has cut strands (A), reduced diameter (B), or kinks (C). There is danger that the rope may break during the towing operation.

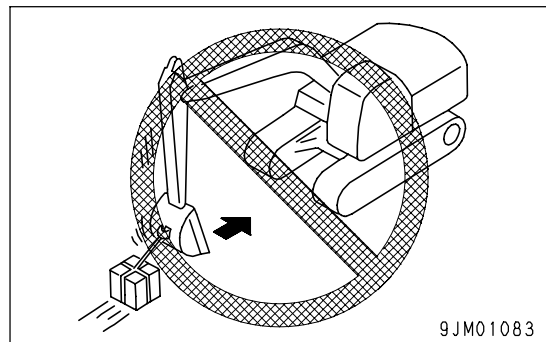
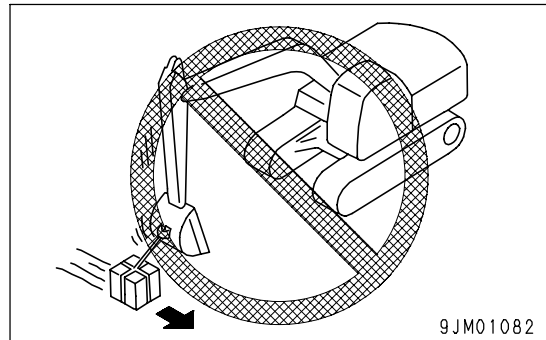


- Always wear leather gloves when handling wire rope.
- Never tow a machine on a slope.
- During the towing operation, never stand between the towing machine and the machine being towed.
- Operate the machine slowly and be careful not to apply any sudden load to the wire rope.

LIFTING OBJECTS WITH BUCKET

SAFETY RULES FOR LIFTING OBJECTS

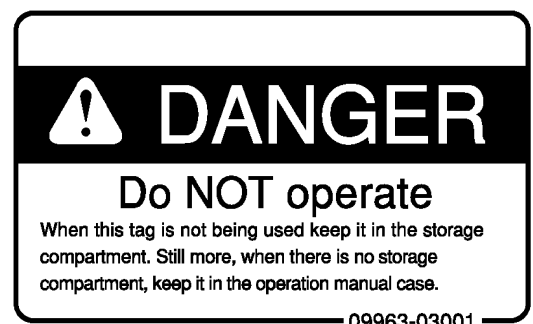
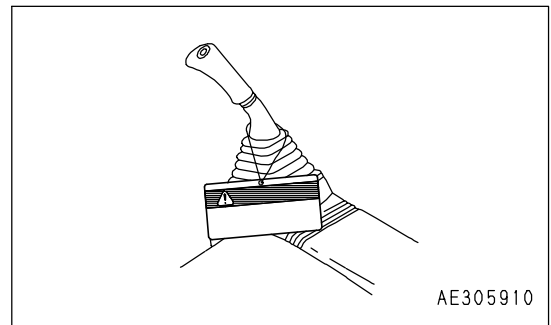
- Determine the signals to be used and place a signalman in position.
- To prevent the machine from tipping over or falling, carry out the operation on flat ground.
- To prevent the danger of contact with a raised load or the danger from a falling load, do not allow any worker inside the area.
- Do not exceed the specified lifting load.
For details of the maximum lifting load permitted for this machine, see "BUCKET WITH HOOK (PAGE 6-3)".
- Use wire rope that conforms to the specified standard.
- It is dangerous if the raised load hits any person or structure. When swinging or operating the work equipment, check carefully that the surrounding area is safe.
- Do not swing or operate the work equipment suddenly. There is danger that this may cause the load to sway and the machine to tip over.
- Do not leave the operator's seat when there is a raised load.
- Do not use the work equipment or swing to pull the load in any direction. There is danger that the hook may break and the load come off, causing the work equipment to move suddenly and cause personal injury.



SAFETY MAINTENANCE INFORMATION

WARNING TAG

- Always attach the "DO NOT OPERATE" warning tag to the work equipment control lever in the operator's cab to alert others that you are performing service or maintenance on the machine. Attach additional warning tags around the machine if necessary. Warning tag Part No. 09963-03001
Keep this warning tag in the tool box while it is not used. If there is no toolbox, 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

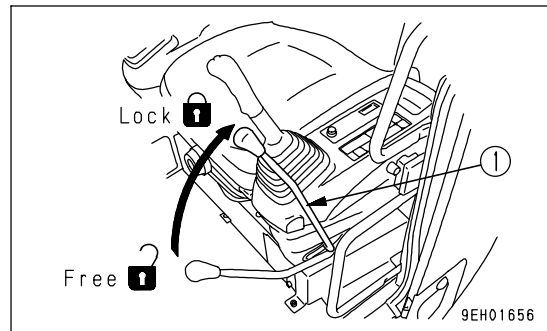
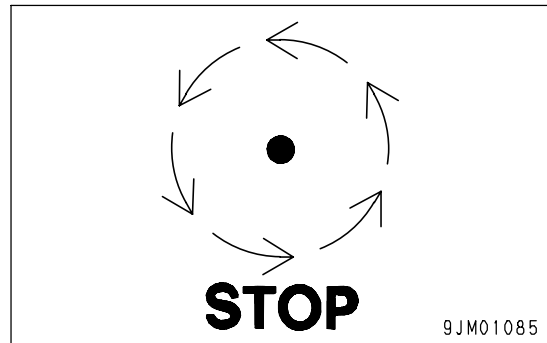
- Do not leave hammers or other tools lying around in the work place. Wipe up all grease, oil, or other substances that will cause you to slip. Always keep the work place clean and tidy to enable you to carry out operations safely. If the work place is not kept clean and tidy, there is the danger that you will trip, slip, or fall over and injure yourself.
- When cleaning the ceiling window which is made of organic glass (polycarbonate), use tap water and avoid use of organic solvents for cleaning. An organic solvent like benzene, toluene or methanol can invite a chemical reaction like dissolution and decomposition on the window glass, deteriorating polycarbonate in use.

APPOINT LEADER WHEN WORKING WITH OTHERS

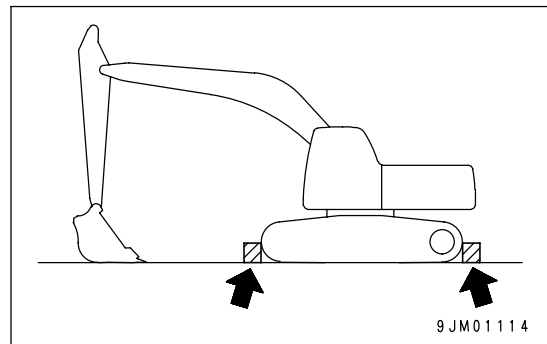
- When repairing the machine or when removing and installing the work equipment, appoint a leader and follow his instructions during the operation.

STOP ENGINE BEFORE CARRYING OUT MAINTENANCE

- Stop the machine on firm, level ground.
- Select a place where there is no hazard of falling rocks or landslides, or of flooding if the land is low.
- Lower the work equipment completely to the ground and stop the engine.
- Turn the starting switch to the ON position. Operate the work equipment control lever back and forth, left and right at the full stroke 2 to 3 times to eliminate the remaining internal pressure in the hydraulic circuit, and then push up lock lever (1) to the LOCK position (L).



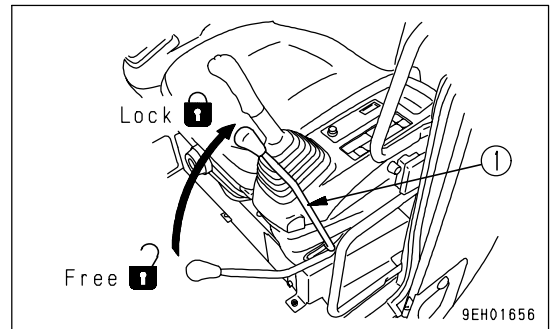
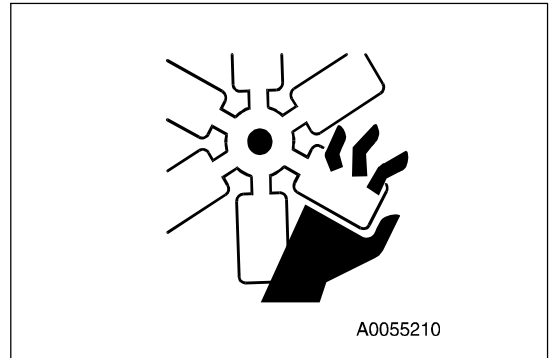
- Put blocks under the track to prevent the machine from moving.



TWO WORKERS FOR MAINTENANCE WHEN ENGINE IS RUNNING

To prevent 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.

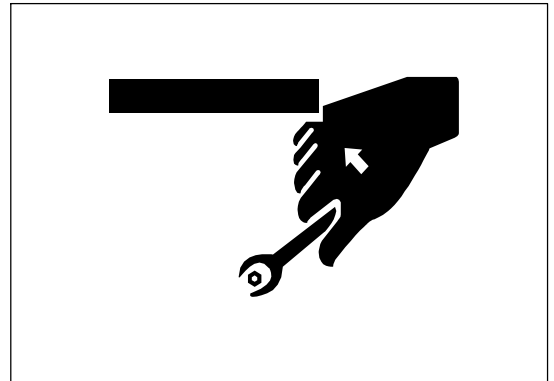
- One worker must always sit in the operator's seat and be ready to stop the engine at any time. All workers must maintain contact with the other workers.
- Set lock lever (1) to the LOCK position to prevent the work equipment from moving.
- When carrying out operations near the fan, fan belt, or other rotating parts, there is a hazard of being caught in the parts, so be careful not to come close.



- Do not touch any control levers. If any control lever must be operated, give a signal to the other workers to warn them to move to a safe place.
- Never drop or insert tools or other objects into the fan or fan belt. Parts may break or be sent flying.

PROPER TOOLS

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



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 lifted off the ground and the machine is supported only with the work equipment. If any of the control levers is touched by accident, or there is damage occurring to the hydraulic piping, the work equipment or the machine will suddenly drop. This is extremely dangerous. Never work under the work equipment or the machine.

**NOISE**

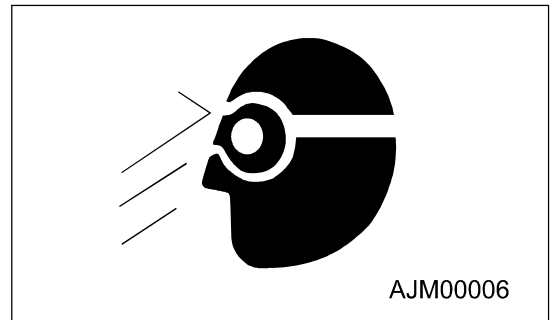
When carrying out maintenance of the engine and you are exposed to noise for long periods of time, wear ear covers or ear plugs while working.

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

WHEN USING HAMMER

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

- If hard metal parts such as pins, bucket teeth, cutting edges, or bearings are hit with a hammer, there is a hazard that pieces might be scattered and cause injury. Always wear safety goggles and gloves.
- When hitting pins or bucket teeth, there is a hazard that broken pieces might be sent flying and injure people in the surrounding area. Always check that there is no one in the surrounding area.
- There is a hazard that the pin hit with strong force may fly out and injure people in the surrounding area.

**WELDING WORKS**

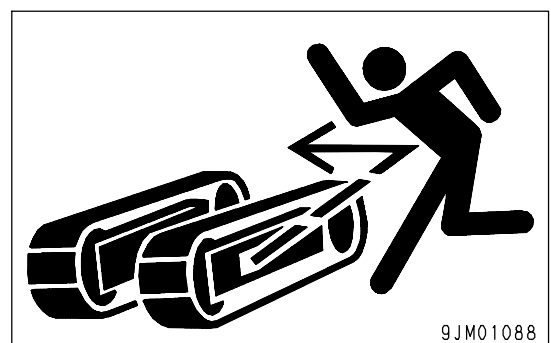
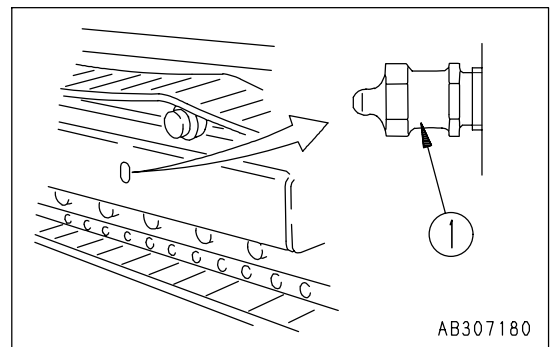
Welding operations must always be carried out by a qualified welder and in a place equipped with proper equipment. There is a hazard of gas, fire, or electrocution when carrying out welding, so never allow any unqualified personnel to carry out welding.

REMOVING BATTERY TERMINALS

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

SAFETY FIRST WHEN USING HIGH-PRESSURE GREASE TO ADJUST TRACK TENSION

- Grease is pumped into the track tension adjustment system under high pressure. If the specified procedure for maintenance is not followed when making adjustment, grease drain plug (1) may fly out and cause serious injury or property damage.
- When loosening grease drain plug (1) to loosen the track tension, never loosen it more than one turn. Loosen the grease drain plug slowly.
- Never put your face, hands, feet, or any other part of your body close to grease drain plug (1).

**DO NOT DISASSEMBLE RECOIL SPRINGS**

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

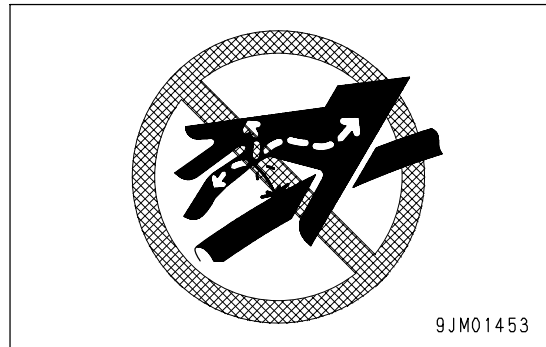
SAFETY RULES FOR HIGH-PRESSURE OIL

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

- For details of the method of releasing the pressure, see "METHOD FOR RELEASING INTERNAL PRESSURE IN HYDRAULIC CIRCUIT (PAGE 4-43)". If the circuit is still under pressure, do not carry out any inspection or replacement operation.
- If there is any leakage from the piping or hoses, the surrounding area will be wet, so check for cracks in the piping and hoses and for swelling in the hoses.

When carry out inspection, wear safety glasses and leather gloves.

- There is a hazard that high-pressure oil leaking from small holes may penetrate your skin or cause blindness if it contacts your eyes directly. If you are hit by a jet of high-pressure oil and suffer injury to your skin or eyes, wash the place with clean water, and consult a doctor immediately for medical attention.



SAFETY HANDLING HIGH-PRESSURE HOSES

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

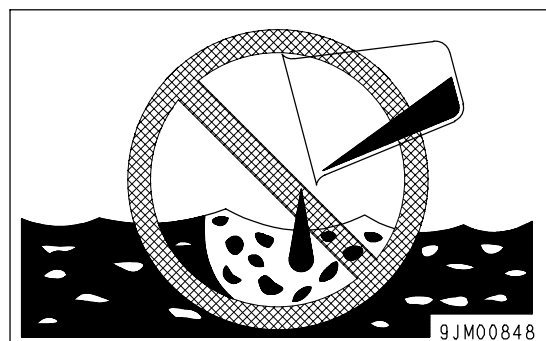
Replace the hose if any of the following problems are found.

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

WASTE MATERIALS

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

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



AIR CONDITIONER MAINTENANCE

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

COMPRESSED AIR

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

PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS

- 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 4-13)".

- The material of these components naturally changes over time, and repeated use causes deterioration, wear, and fatigue. As a result, there is a hazard that these components may fail and cause serious injury or death. It is difficult to judge the remaining life of these components from external inspection or the feeling when operating, so always replace them at the specified interval.
- Replace or repair safety-critical parts if any defect is found, even when they have not reached the time specified interval.

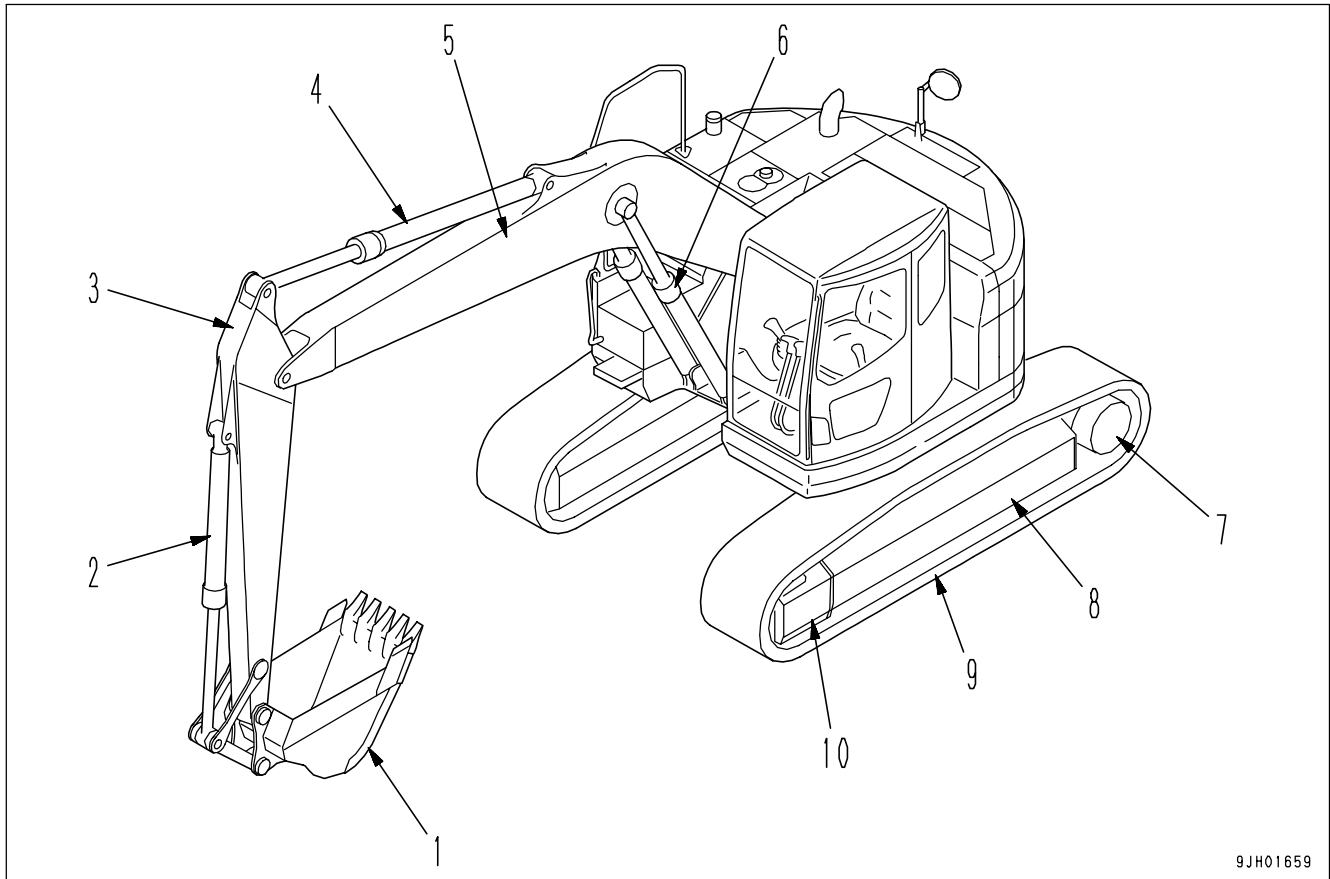
OPERATION

WARNING

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

MACHINE VIEW ILLUSTRATIONS

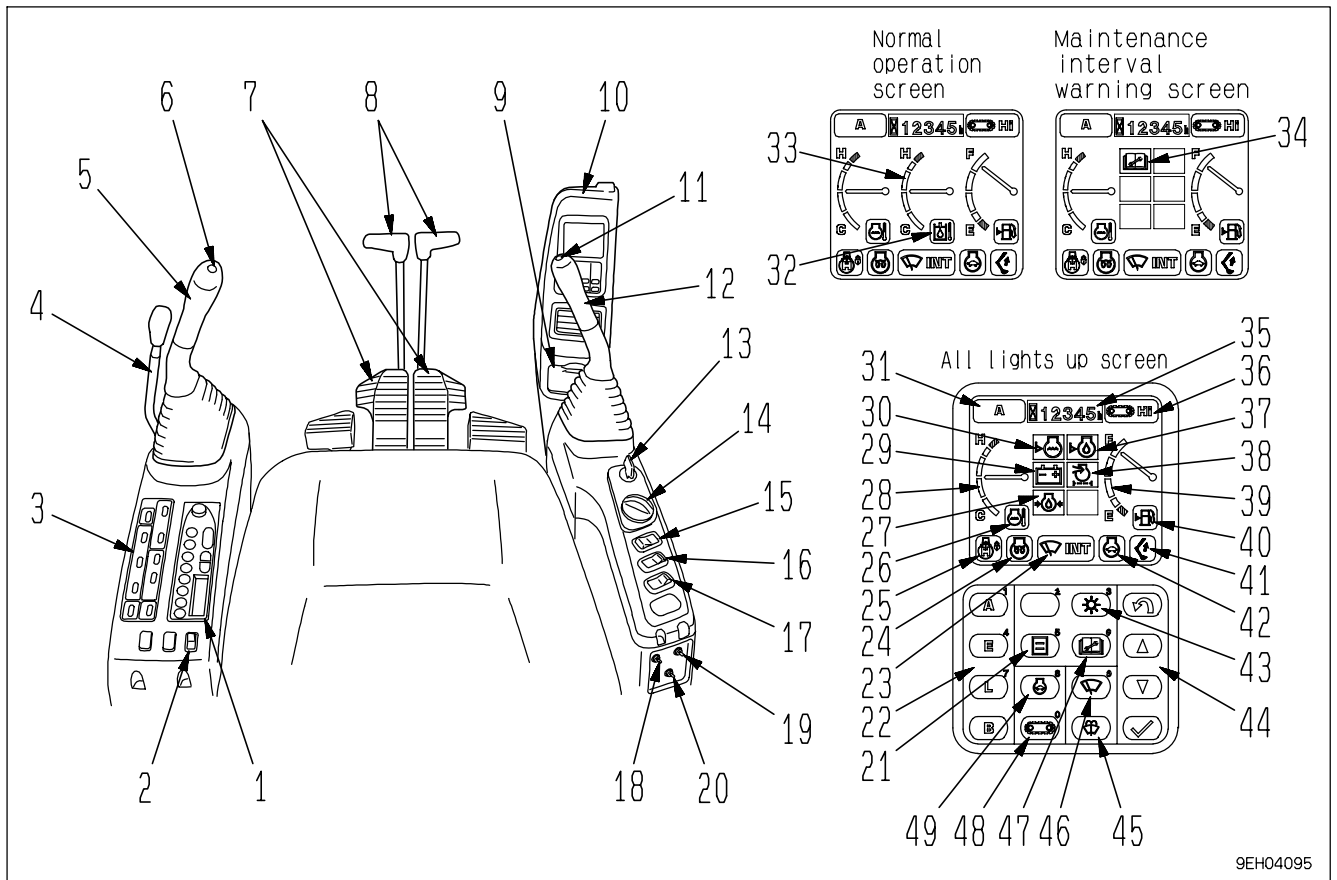
OVERALL MACHINE VIEW



9JH01659

- | | |
|---------------------|-------------------|
| (1) Bucket | (6) Boom cylinder |
| (2) Bucket cylinder | (7) sprocket |
| (3) Arm | (8) Track frame |
| (4) Arm cylinder | (9) Track shoe |
| (5) Boom | (10) Idler |

CONTROLS AND GAUGES



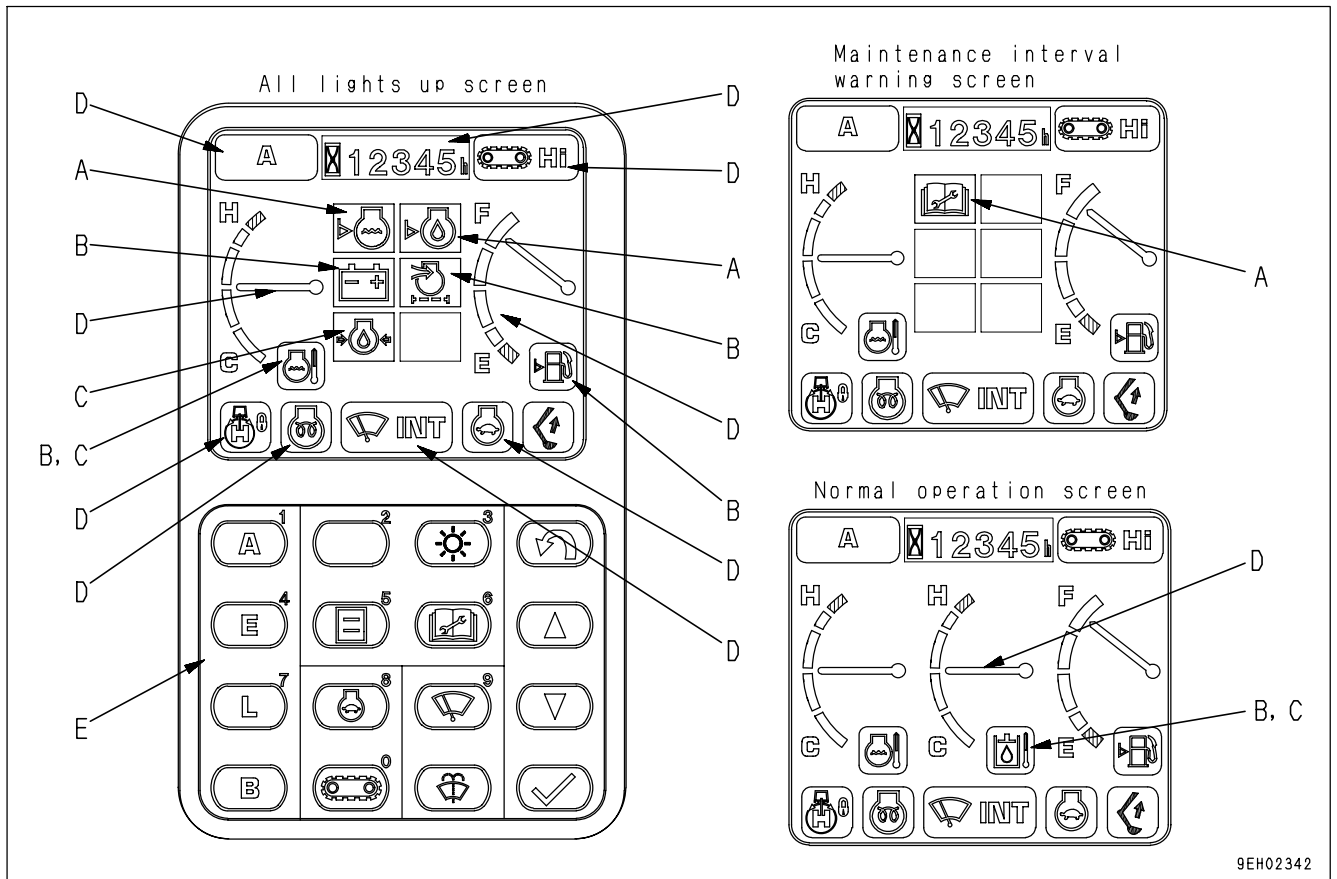
- (1) Car radio
- (2) Revolving warning lamp (if equipped)
- (3) Airconditioner control switch
- (4) Lock lever
- (5) Left work equipment control lever
- (6) Knob switch
- (7) Travel pedals
- (8) Travel levers
- (9) Cigarette lighter
- (10) Machine monitor
- (11) Horn switch
- (12) Right work equipment control lever
- (13) Starting switch
- (14) Fuel control dial
- (15) Lamp switch
- (16) Alarm buzzer stop switch
- (17) Swing lock switch
- (18) Emergency pump drive switch
- (19) Swing brake cancel switch
- (20) Emergency work equipment operation switch
- (21) Select switch
- (22) Working mode selector switch
- (23) Wiper monitor
- (24) Engine pre-heating monitor
- (25) Swing lock monitor
- (26) Engine coolant temperature monitor
- (27) Engine oil pressure monitor
- (28) Engine coolant temperature gauge
- (29) Charge monitor
- (30) Radiator water level monitor
- (31) Working mode monitor
- (32) Hydraulic oil temperature monitor
- (33) Hydraulic oil temperature gauge
- (34) Maintenance monitor
- (35) Service meter
- (36) Travel speed monitor
- (37) Engine oil level monitor
- (38) Air cleaner clogging monitor
- (39) Fuel gauge
- (40) Fuel level monitor
- (41) One touch power up monitor
- (42) Auto-deceleration monitor
- (43) Liquid crystal monitor adjustment switch
- (44) Input control switch
- (45) Window washer switch
- (46) Wiper switch
- (47) Maintenance switch
- (48) Travel speed selector switch
- (49) Auto-deceleration switch

DETAILED CONTROLS AND GAUGES

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

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

MONITORING SYSTEM



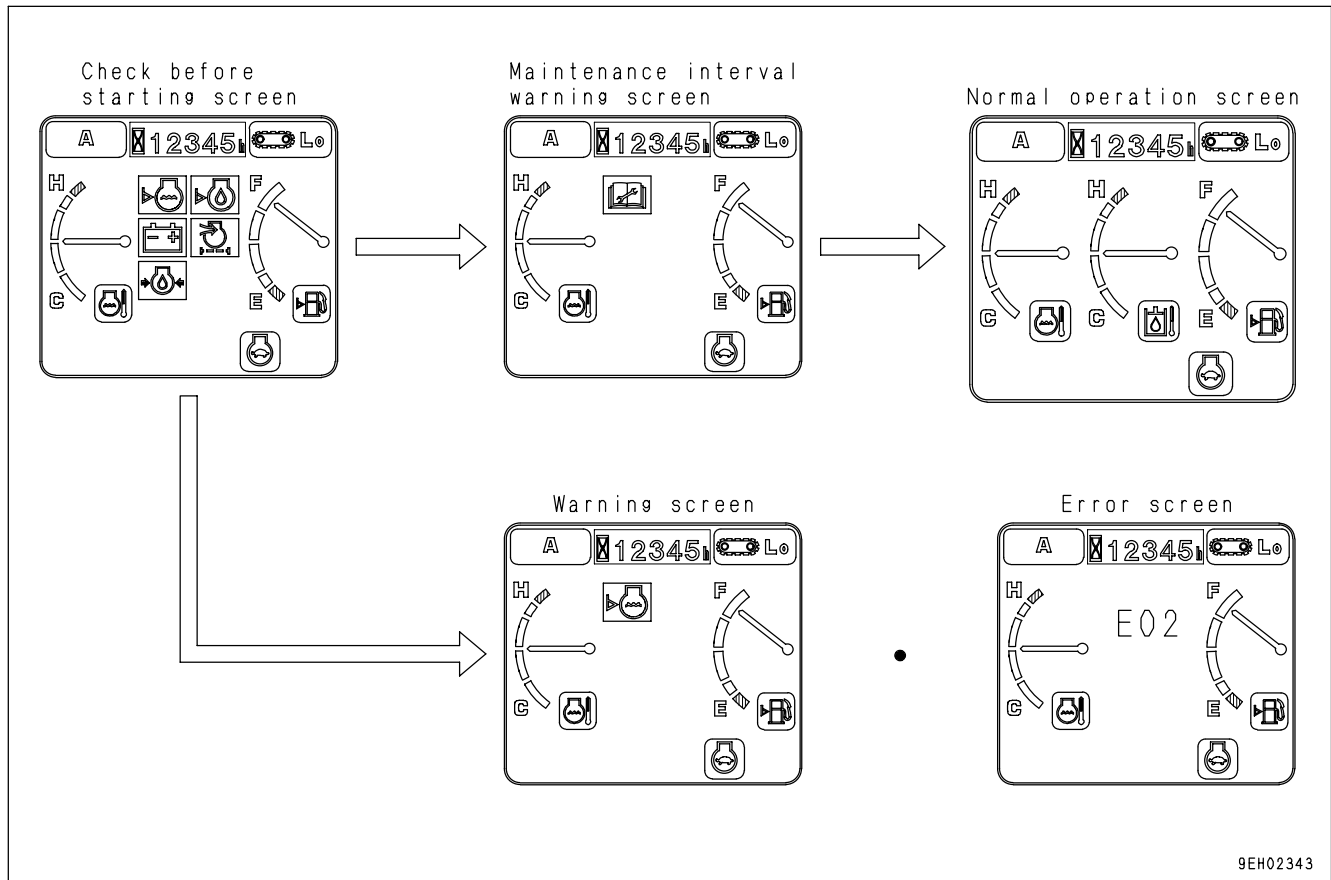
9EH02342

- A: Basic Check Monitors
- B: Caution Monitors
- C: Emergency Monitors

- D: Meter Display Portion, Pilot Display
- E: Monitor Switches Portion

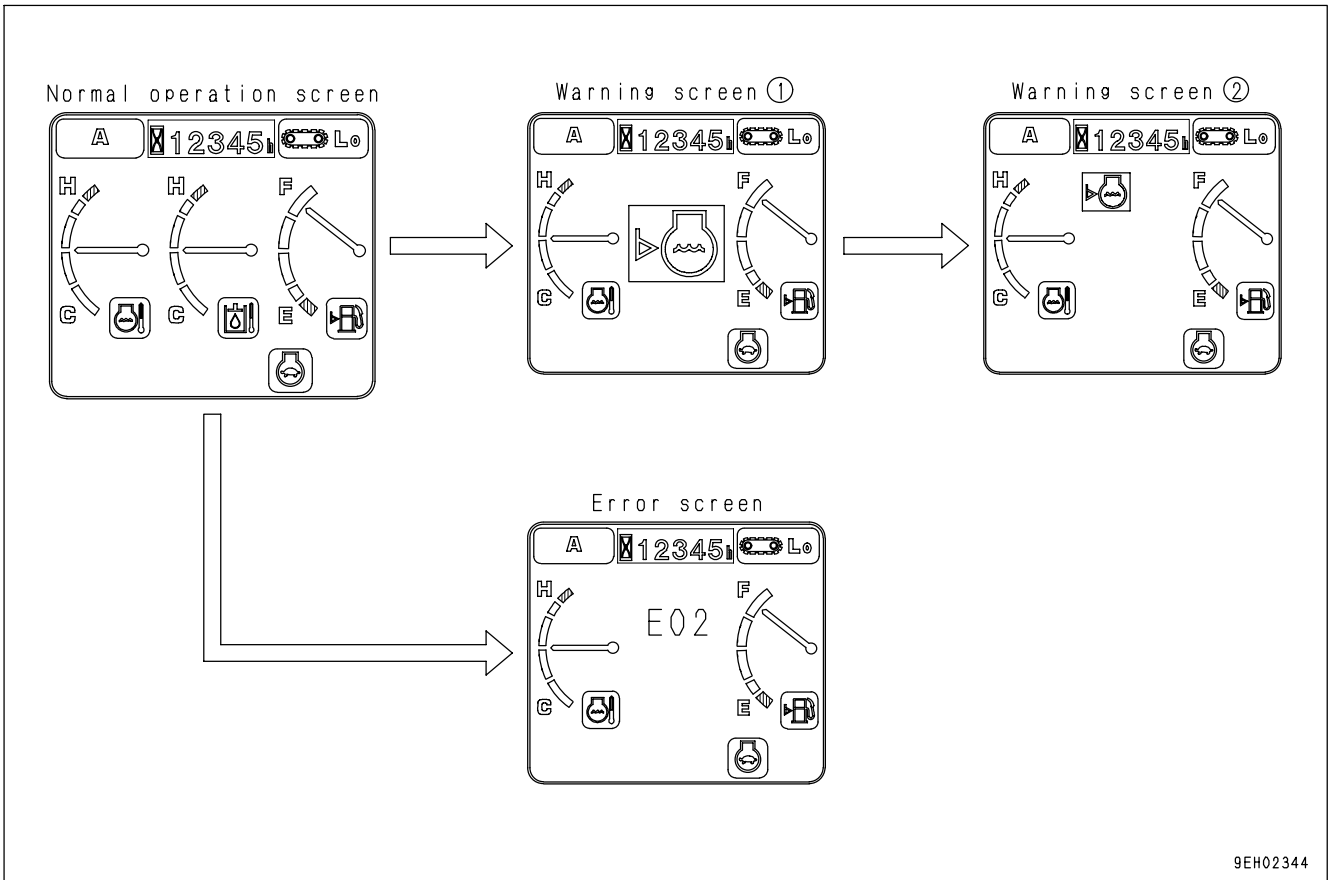
Basic Operation Of Machine Monitor

If There Is Abnormality When Starting Engine



- If there is any abnormality when starting the engine, the check before starting screen changes to the maintenance warning screen, warning screen, or an error screen.
- After displaying the check before starting screen for 2 seconds, the screen changes to the maintenance warning screen.
- After displaying the maintenance warning screen for 30 seconds, the screen returns to the normal screen.
- After displaying the check before starting screen for 2 seconds, the screen changes to the warning screen or error screen.

If Any Abnormality Occurs During Operation



9EH02344

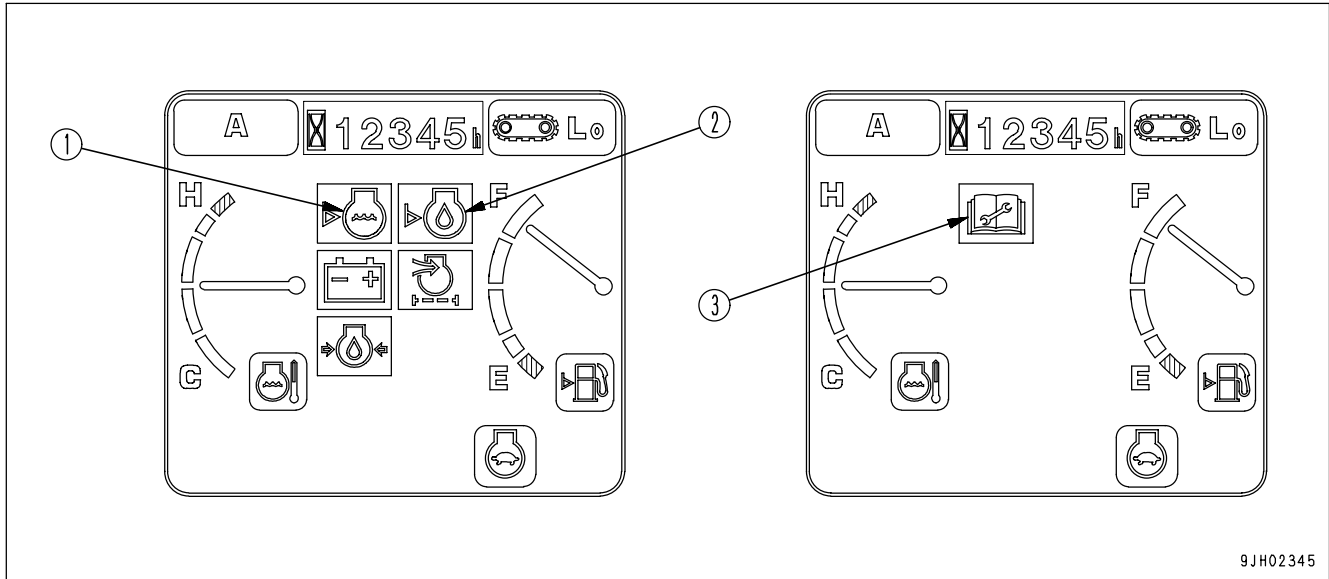
- If any abnormality occurs during operation, the normal operation screen changes to warning screen (1) or the error screen.
- After displaying warning screen (1) for 2 seconds, the screen automatically changes to warning screen (2).

Basic Check Monitors



These monitors DO NOT ensure that the machine is in good condition. When performing checks before starting (daily checks), do not simply rely on the monitors. Always dismount the machine and check each item directly.

Displays basic items among the check before starting items that must be checked before starting the engine. If there is any abnormality, monitor for the location of abnormality will light up.



9JH02345

A(1) Radiator coolant level monitor

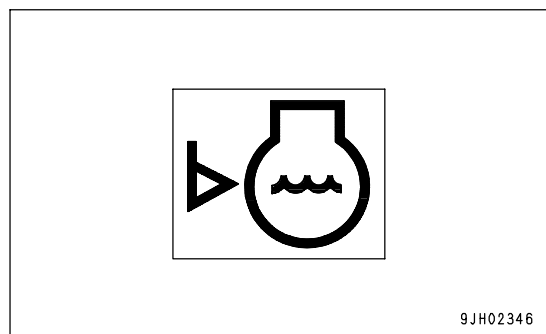
A(3) Maintenance interval monitor

A(2) Engine oil level monitor

Radiator Coolant Level Monitor

Monitor (1) warns the operator that there has been a drop in the radiator coolant level.

If the radiator coolant is low, the lamp lights up red, so check coolant level in the radiator and subtank, and add coolant.

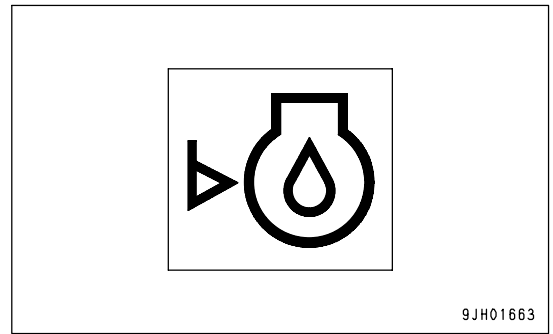


9JH02346

Engine Oil Level Monitor

Monitor (2) warns the operator that the oil level in the engine oil pan has dropped.

If oil level in the engine oil pan is low, the lamp lights up red, so check the oil level, and add oil.

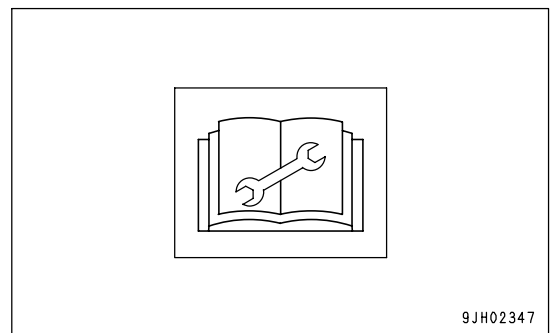
**Maintenance Interval Monitor**

Monitor (3) lights up to warn the operator that the set time has passed since maintenance was last performed.

This monitor screen goes out after 30 seconds and returns to the normal operation screen.

- For details of the method of checking the maintenance interval, see "Maintenance Switch (PAGE 3-22)" in the Detailed controls and gauges.

If it is desired to change the maintenance interval settings, have your Komatsu distributor change the interval settings.



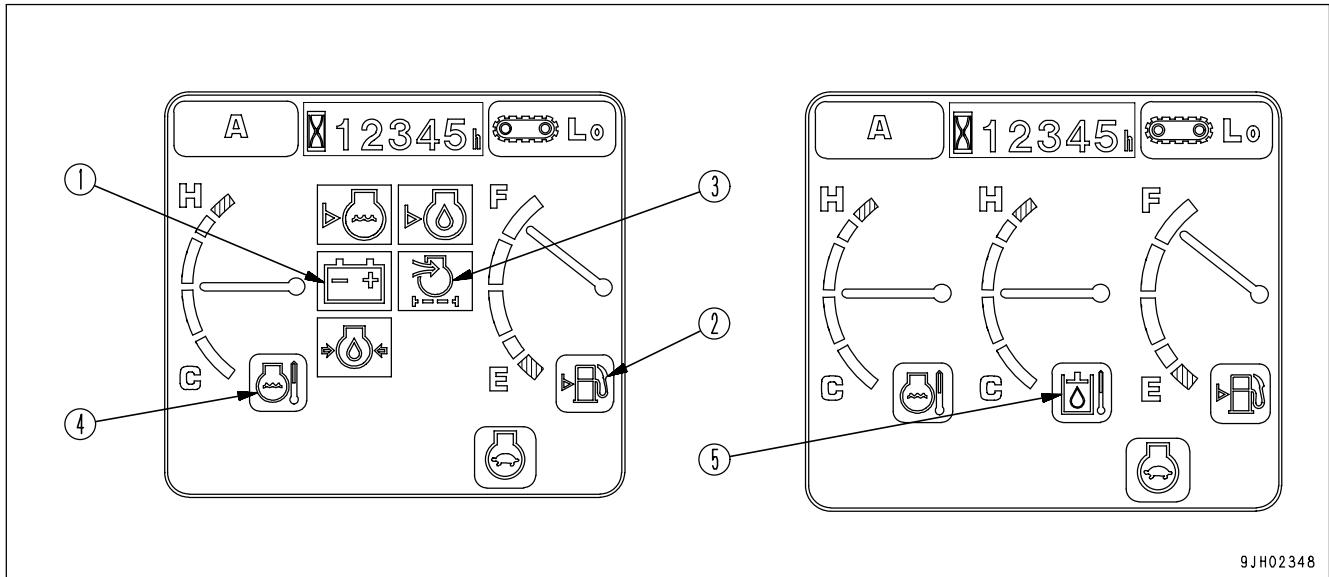
Caution Monitors



If the warning monitor lights up red, stop operations as soon as possible and perform inspection and maintenance of the applicable location. If the warning is ignored, it may lead to failure.

These are items that should be observed while the engine is running. If any abnormality occurs, the screen displays the item that needs immediate action.

If there is an abnormality, the monitor for the abnormal location lights up red.



- B(1) Charge level monitor
- B(2) Fuel level monitor
- B(3) Air cleaner clogging monitor

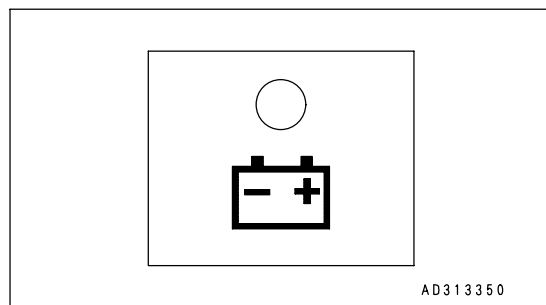
- B(4) Engine coolant temperature monitor
- B(5) Hydraulic oil temperature monitor

Charge Level Monitor

Monitor (1) warns the operator of a abnormality in the charging system while the engine is running.

If the battery is not being charged properly while the engine is running, monitor (1) lights up red.

If monitor lights up red, check the V-belt for looseness. If any abnormality is found, perform the necessary actions. For details, see "OTHER TROUBLE (PAGE 3-139)".



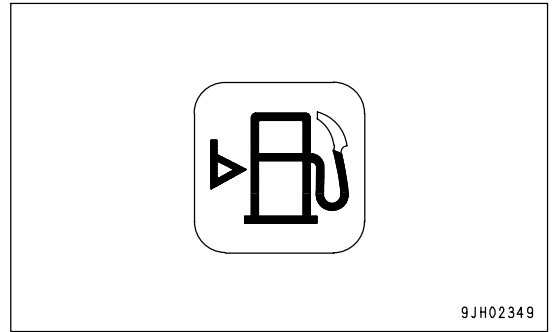
REMARK

- While the starting switch is ON, the lamp will remain lit and will go off when 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 and horn may sound momentarily, but this does not indicate any abnormality.

Fuel Level Monitor

Monitor (2) lights up to warn the operator the fuel level in the tank is low.

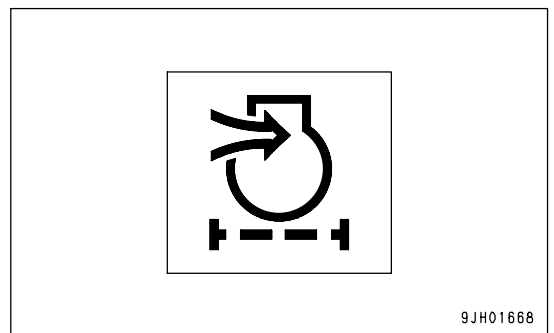
If the remaining amount of fuel goes down to 41 liters (10.83 US gal), the light changes from green to red, so add fuel as soon as possible.



Air Cleaner Clogging Monitor

Monitor (3) warns the operator of a clogged air cleaner.

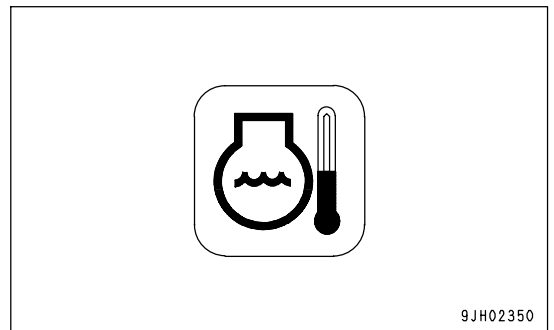
If the monitor lights up red, stop the engine, inspect and clean the air cleaner.



Engine coolant Temperature Monitor

If monitor (4) lights up white in low temperatures, perform warming-up operation. For details, see "Warming-up Operation (PAGE 3-83)".

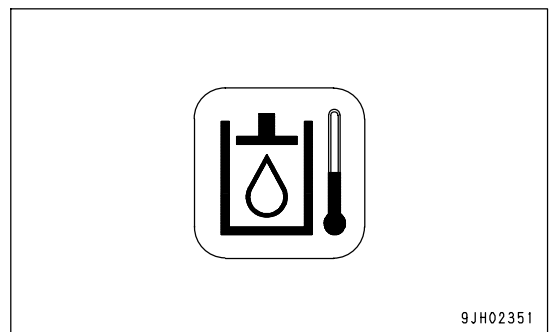
Continue warming-up operation until monitor (4) changes to green.



Hydraulic Oil Temperature Monitor

If monitor (5) lights up white in low temperatures, perform warming-up operation. For details, see "Warming-up Operation (PAGE 3-83)".

Continue warming-up operation until monitor (5) changes to green.

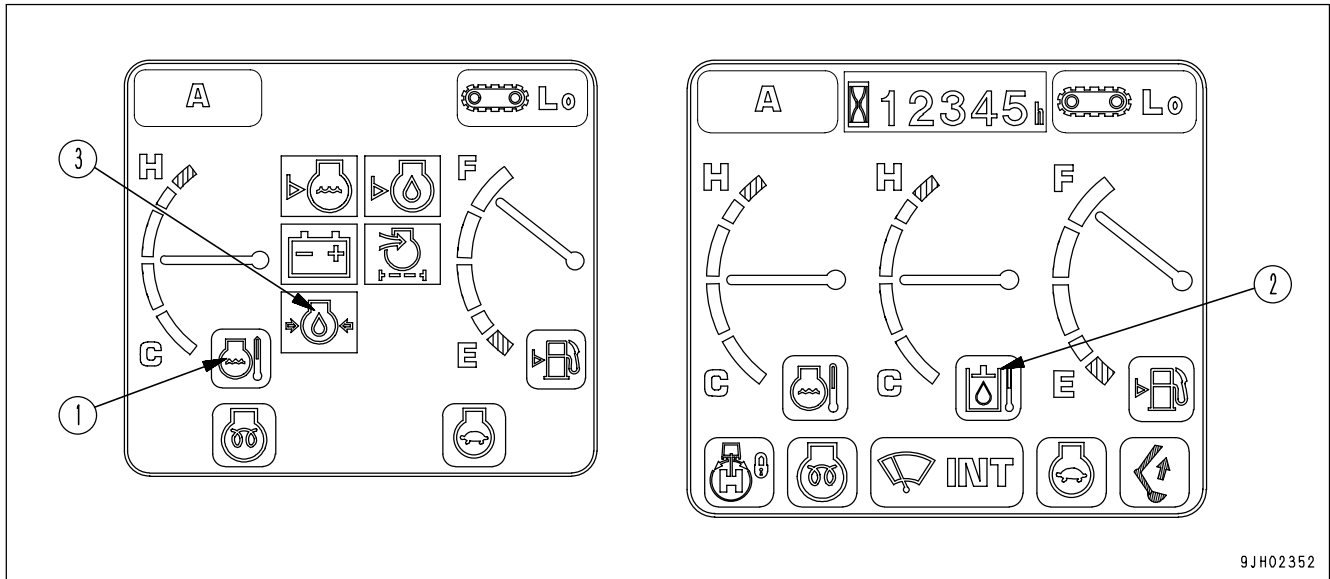


Emergency Monitors



If the monitor lights up red, stop the engine immediately or run at low idle, check applicable location, then perform necessary actions.

These items should be observed while the engine is running. If there is a problem, the monitor for the abnormal location lights up red and buzzer sounds, perform action immediately.



C(1) Engine coolant temperature monitor
C(2) Hydraulic oil temperature monitor

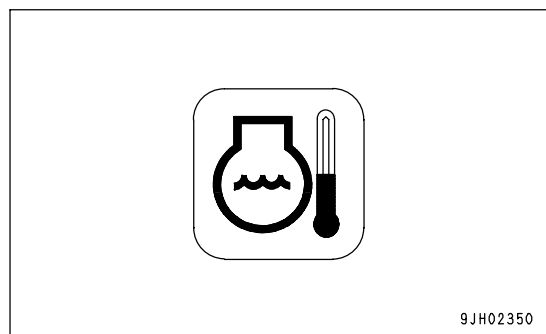
C(3) Engine oil pressure monitor

Engine Coolant Temperature Monitor

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

If engine coolant temperature becomes abnormally high, monitor lights up red, overheat prevention system is automatically actuated, and the engine speed goes down.

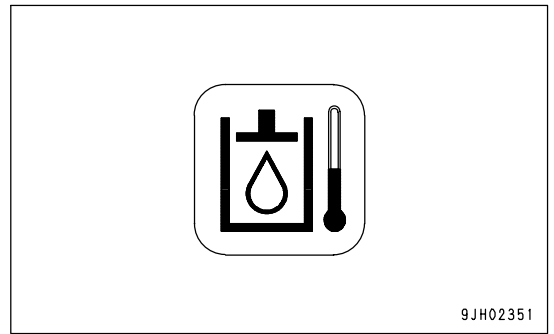
Stop operations and run engine at low idle until monitor (1) changes to green.



Hydraulic Oil Temperature Monitor

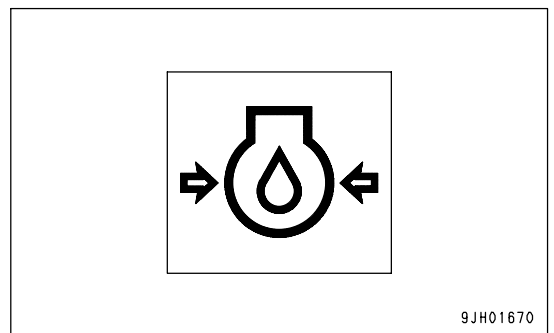
Monitor (2) warns operator that the hydraulic oil temperature has risen.

If monitor lights up red during operations, run engine at low idle or stop the engine and wait until the oil temperature goes down and monitor (2) changes to green.



Engine Oil Pressure Monitor

Monitor (3) lights up red if the engine lubrication oil pressure goes below normal level. If monitor lights up red, stop the engine immediately, check the lubrication system and level of oil in the engine oil pan.

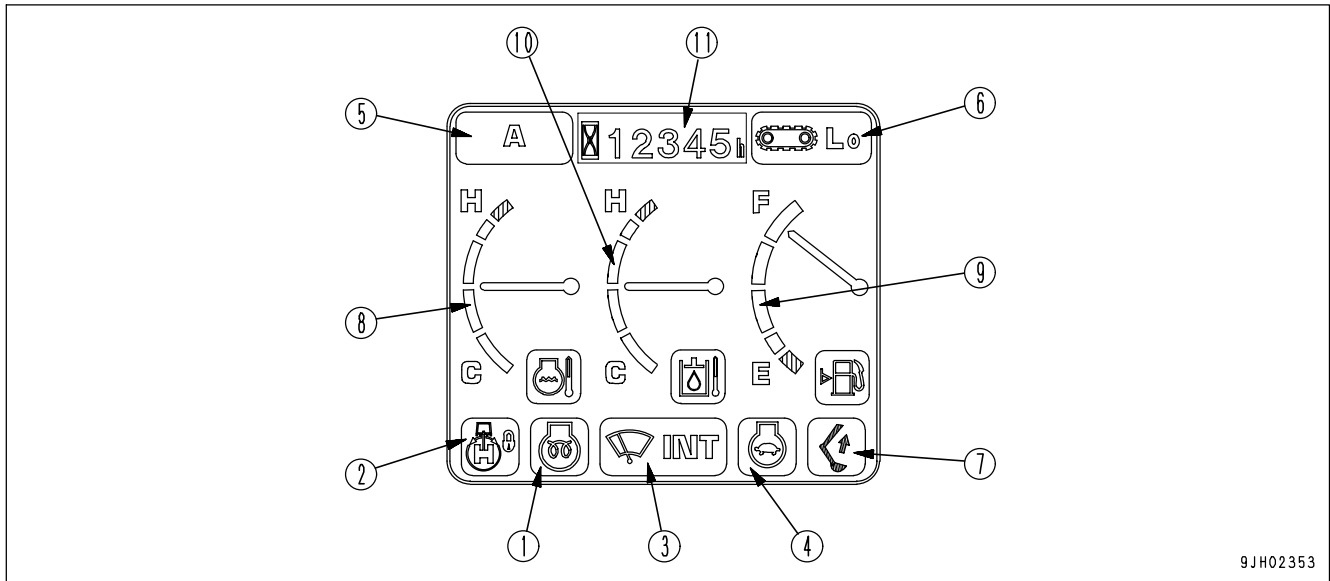


REMARK

Color when the monitor lights up for basic check items, caution items, and emergency stop items are as follows.

Type of monitor	Color when monitor lights up		
	When normal	When abnormal	At low temperature
Radiator coolant level monitor	OFF	Red	-
Engine oil level monitor	OFF	Red	-
Maintenance interval monitor	OFF	Red	-
Charge monitor	OFF	Red	-
Fuel level monitor	Green	Red	-
Air cleaner clogging monitor	OFF	Red	-
Engine coolant temperature monitor	Green	Red	White
Hydraulic oil temperature monitor	Green	Red	White
Engine oil pressure monitor	OFF	Red	-

Meter Display Portion



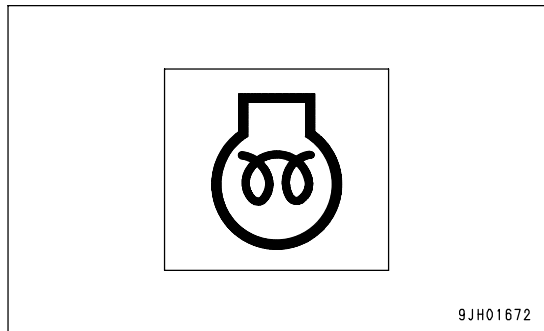
- D(1) Engine pre-heating monitor
- D(2) Swing lock monitor
- D(3) Wiper monitor
- D(4) Auto-deceleration monitor
- D(5) Working mode monitor
- D(6) Travel speed monitor
- D(7) One touch power up monitor
- D(8) Engine coolant temperature gauge
- D(9) Fuel Gauge
- D(10) Hydraulic oil temperature gauge
- D(11) Service meter

Pilot Display

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

Engine Pre-heating Monitor

Monitor lamp (1) indicates 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 the HEAT position and flashes after 30 seconds to show pre-heating is completed. (Monitor lamp will go off after 10 seconds.)



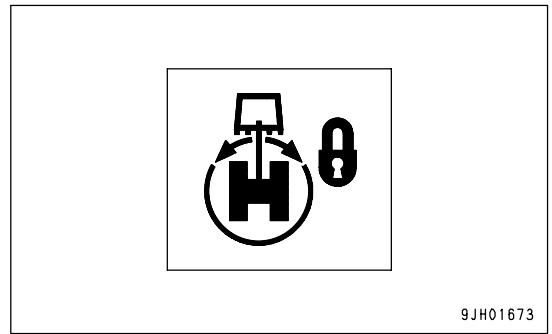
Swing Lock Monitor

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.

This monitor flashes when the swing holding brake release switch is turned on.



REMARK

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

Wiper Monitor

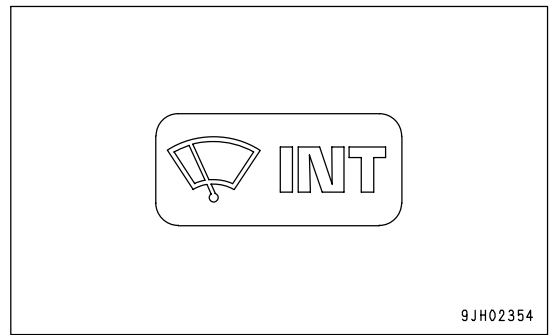
Monitor (3) indicates operating status of the wiper.

The monitor display when wiper switch is operated, as follows.

When ON lights up: Wiper moves continuously

When INT lights up: Wiper moves intermittently

OFF: Wiper stops



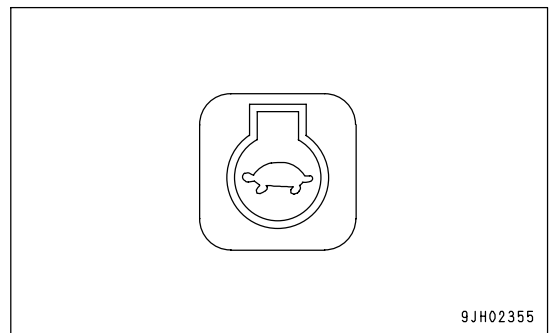
Auto-deceleration Monitor

Monitor (4) shows if the auto-deceleration is being actuated.

The monitor display when auto-deceleration switch is operated, as follows.

Auto-deceleration monitor ON: Auto-deceleration actuated

Auto-deceleration monitor OFF: Auto-deceleration canceled



Working Mode Monitor

Monitor (5) displays the set working mode.

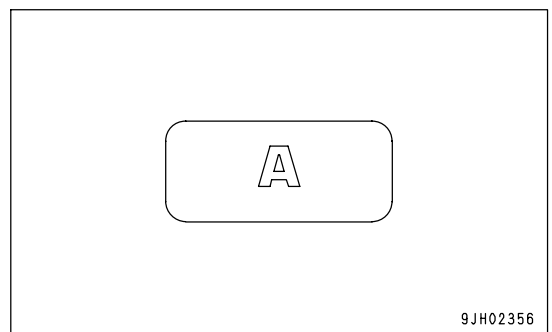
The monitor display when the working mode switch is operated is as follows.

A: A mode (for heavy-load operations)

E: E mode (for operations with emphasis on fuel economy)

L: L mode (for fine-control operations)

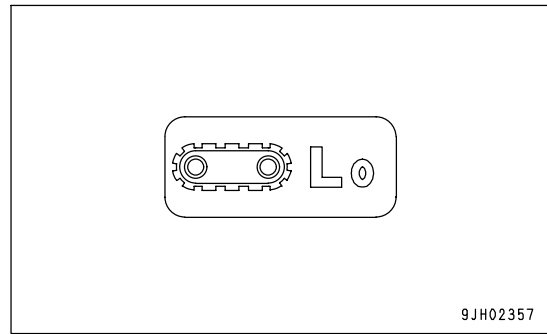
B: B mode (for breaker operations)



Travel Speed Monitor

Monitor (6) displays set mode for the travel speed.
 The monitor display when the travel speed selector switch is operated is as follows.

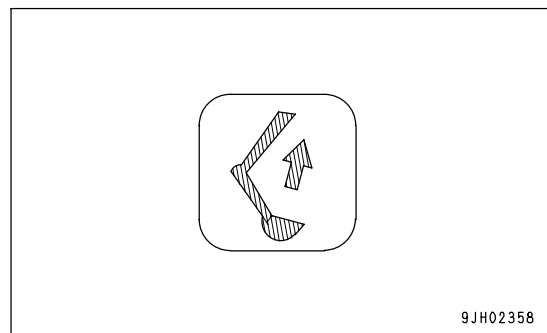
- Lo: Low speed
- Mi: Medium speed
- Hi: High speed



One touch power up monitor

Meter (7) shows if the power max function is being actuated.
 The monitor display when the knob switch on the left control lever is operated is as follows.

Monitor lights up: Digging power is increased while knob switch is kept pressed.



REMARK

The digging power is increased while the knob switch is being pressed only for working modes A and E. Note that even if the knob switch is kept pressed, the increase in power ends after 8.5 seconds.

Monitor goes out: Power max function stopped

Gauges and Meter

Engine Coolant Temperature Gauge

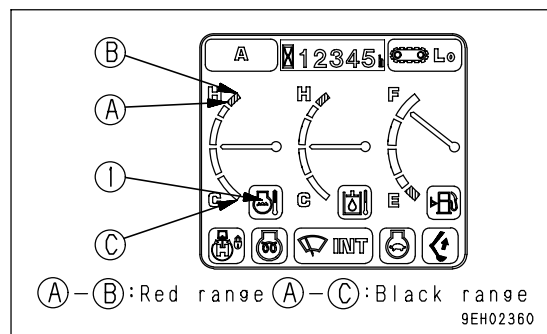
Gauge (8) indicates the engine coolant temperature.
 During normal operations, indicator should be in the black range (A) - (C). If indicator enters the red range (A) - (B) during operations, the overheat prevention system is actuated.

- The overheat prevention system acts as follows.
- Red range position (A): Engine water temperature monitor (1) lights up red
 - Red range position (B): Engine speed is reduced to low idle, engine water temperature monitor (1) lights up red, and alarm buzzer sounds at same time.

The overheat prevention system remains actuated until the indicator returns to the black range.

When the engine is started, if the indicator is at position (C), engine coolant temperature monitor (1) lights up white.

In this case, carry out the warming-up operation. For details, see "Warming-up Operation (PAGE 3-83)".



Fuel Gauge

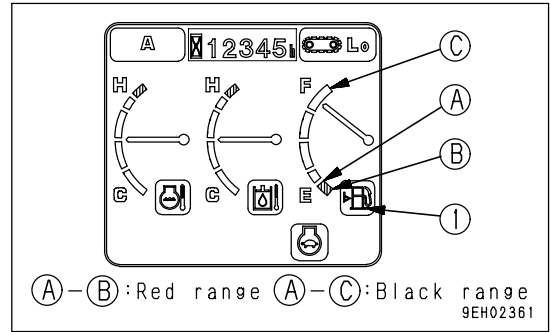
This meter (9) displays the level of the fuel in the fuel tank. During operations, the indicator should be in the black range.

If the indicator enters red range (A) during operations, there is less than 60 liters (15.85 US gal) of fuel remaining in the tank, so check and add fuel.

REMARK

If the indicator enters red range (B), there is less than 41 liters (10.83 US gal) of fuel remaining.

When the indicator is in the red range (A) to (B), fuel level monitor (1) lights up red.



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

Hydraulic Oil Temperature Gauge

Meter (10) displays the hydraulic oil temperature.

During operations, the indicator should be in the black range.

If the indicator enters red range (A) during operations, the hydraulic oil temperature has gone above 102°C (215.6°F).

Stop the engine or run it at low idle and wait for the hydraulic oil temperature to go down.

REMARK

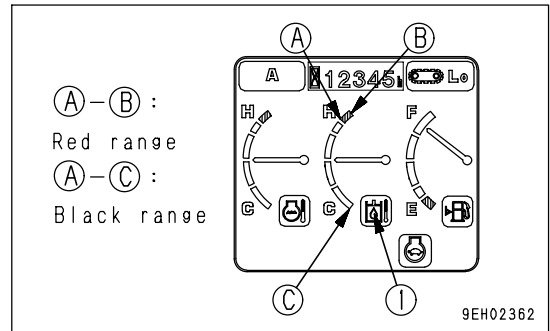
When the indicator is in the red range (A), the hydraulic oil temperature is as follows.

Red range position (A) : More than 102°C (215.6°F)

Red range position (B) : More than 105°C (221°F)

When the indicator is in the red range (A) to (B), hydraulic oil temperature monitor (1) lights up red.

If the indicator is at position (C) when the engine is started, the hydraulic oil temperature is more than 25°C (77°F), and hydraulic oil temperature monitor (1) lights up white. In this case, carry out the warming-up operation. For details, see "Warming-up Operation (PAGE 3-83)".

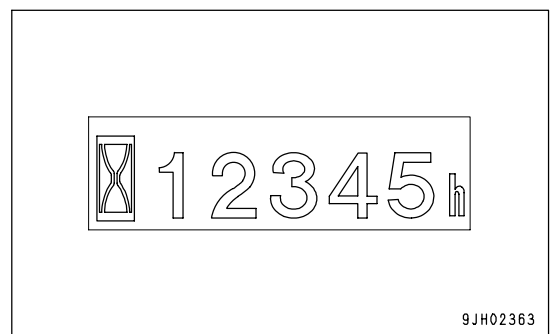


Service Meter

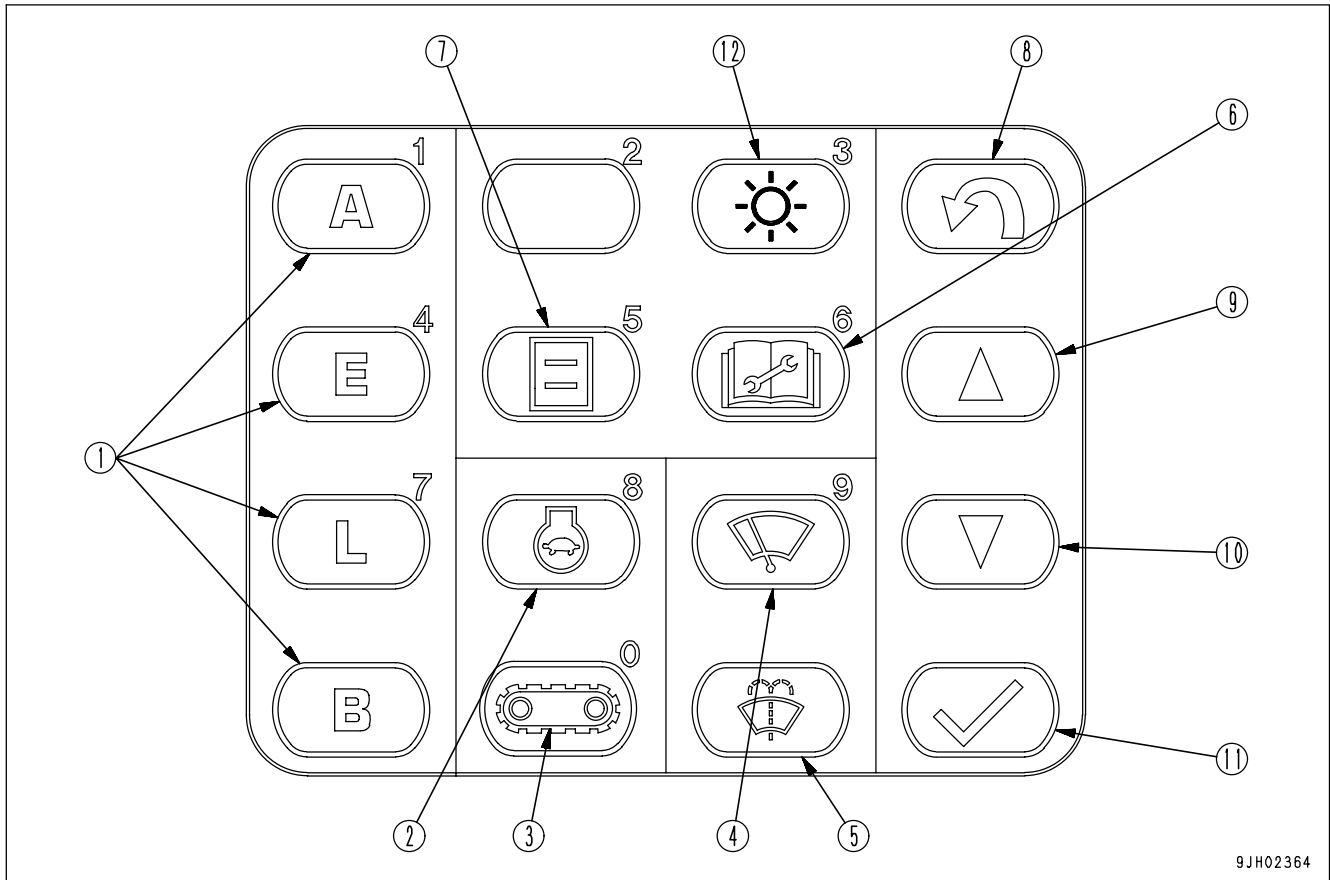
This monitor (11) displays the total time that the machine has been operated.

Use the time display to set the maintenance interval. When the starting switch is ON, the service meter advances even if the machine is not moving.

The service meter advances by 1 for every hour of operation, regardless of the engine speed.



Monitor Switches Portion



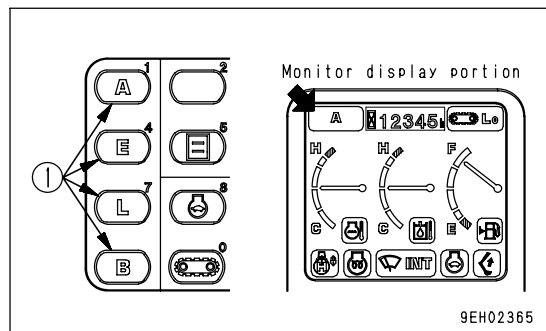
- E(1) Working mode selector switch (basic switch)
- E(2) Auto-deceleration switch (selection switch)
- E(3) Travel speed selector switch
- E(4) Wiper switch
- E(5) Window washer switch
- E(6) Maintenance switch
- E(7) Select switch
- E(8) Back switch
- E(9) Up switch
- E(10) Down switch
- E(11) Input confirmation switch
- E(12) Adjusting brightness and contrast

Working Mode Selector Switch (Basic Switch)

Switch (1) is used to set the power and movement of the work equipment.

Operations can easily be performed by selecting the mode to match the type of operation.

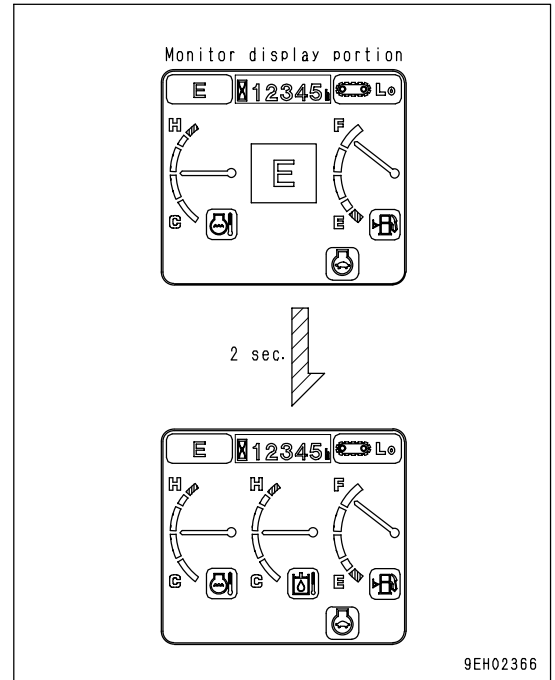
- A mode: For heavy-duty operations
- E mode: For operations prioritizing fuel consumption
- L mode: For fine-control operations
- B mode: For breaker operations



- When the engine is started, the working mode is set automatically to A mode. When the switch is pressed, it is possible to select the other modes. The monitor display on the monitor display portion changes for each mode.
- If it is desired to have the working mode set to start automatically in E, L, or B mode (default options setting), please contact your Komatsu distributor to change the setting.

REMARK

When the mode selector switch is pressed, the mode is displayed in the center of the monitor display, and the screen returns to the normal screen after 2 seconds. (The diagram on the right is an example of the display for the E mode.)



NOTICE

When using the breaker, do not use A mode. There is danger that the breaker may be damaged.

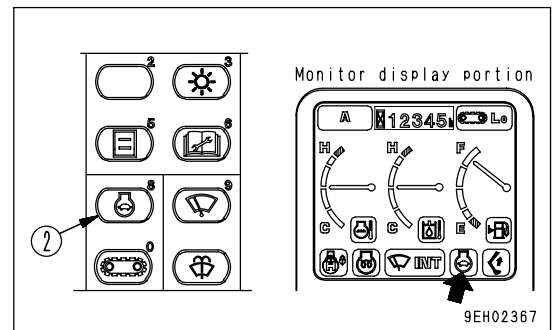
Auto-deceleration Switch (Selection Switch)

This switch (2) turns on the function to reduce fuel consumption and lowers the engine speed automatically when the work equipment control levers are at neutral.

Monitor display ON: Auto-deceleration actuated

Monitor display OFF: Auto-deceleration canceled

Each time that the switch is pressed, the auto-deceleration switches between actuated and canceled.



- Auto-deceleration function

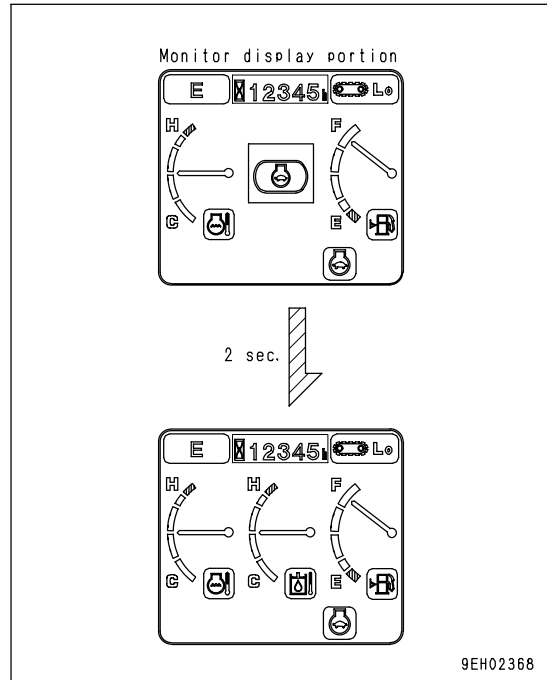
When the auto-deceleration function is ON, if the work equipment and travel levers are returned to the N position, the engine speed will drop after 4 seconds from the operating speed to idling speed.

This makes it possible to reduce fuel consumption.

If any lever is operated when the machine is in this condition, engine speed will return to the previous operating speed to make it possible to perform operations.

REMARK

When the auto-deceleration switch is pressed and the auto-deceleration is actuated, the mode is displayed in the center of the monitor display, and the screen returns to the normal screen after 2 seconds.



Travel Speed Selector Switch

WARNING

- When loading or unloading from a trailer, always travel at low speed (with travel speed selector switch (3) at the Lo position). Never operate travel speed selector switch (3) while loading or unloading.
- If the travel speed is switched between Hi and Lo when the machine is traveling, the machine may deviate to one side, even when traveling in a straight line. Stop the machine before switching the travel speed.

Switch (3) is used to set the travel speed to 3 stages.

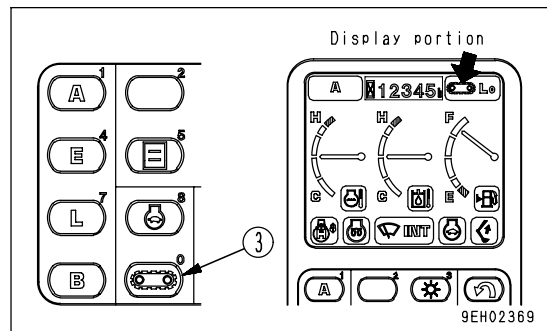
Lo lights up : Low-speed travel

Mi lights up : Medium-speed travel

Hi lights up : Hi-speed travel

When the engine is started, the speed is automatically set to Lo.

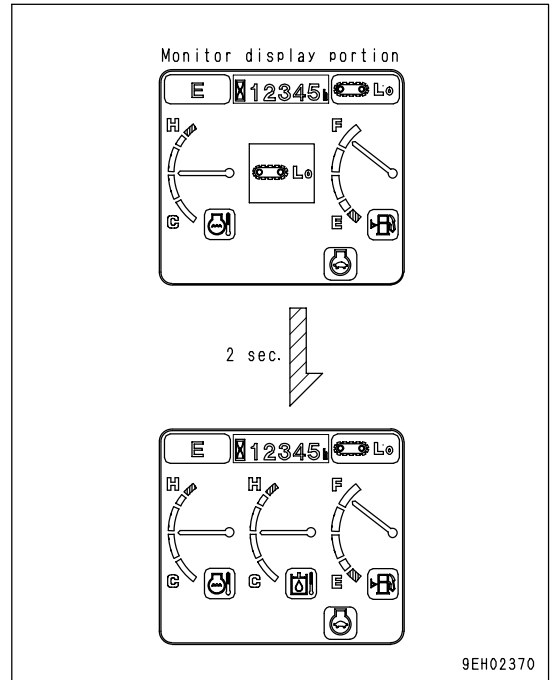
Each time that the switch is pressed, the display changes Lo → Mi → Hi → Lo in turn.



When traveling in high speed travel (Hi) or middle speed (Mi), the travel speed is automatically switched to low speed (Lo) to match the travel surface on soft ground or when traveling uphill where travel power is needed, so there is no need to operate the switch. The monitor display lamp remains lighted up at Hi (high speed travel) or Mi (middle speed travel).

REMARK

Each time that the travel speed selector switch is operated, the mode is displayed in the center of the monitor display, and the screen returns to the normal screen after 2 seconds.



Wiper Switch

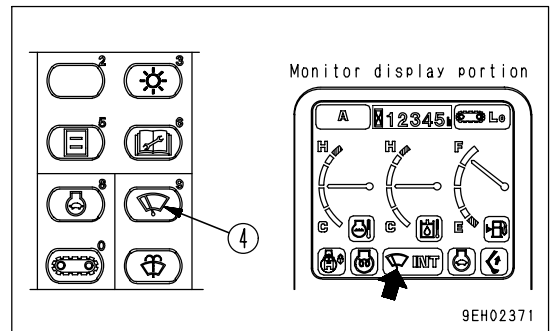
Switch (4) operates the wiper for the front glass.

Each time the switch is pressed, it changes ON → INT → stop (OFF).

Monitor display ON lighted up : Wiper moves continuously

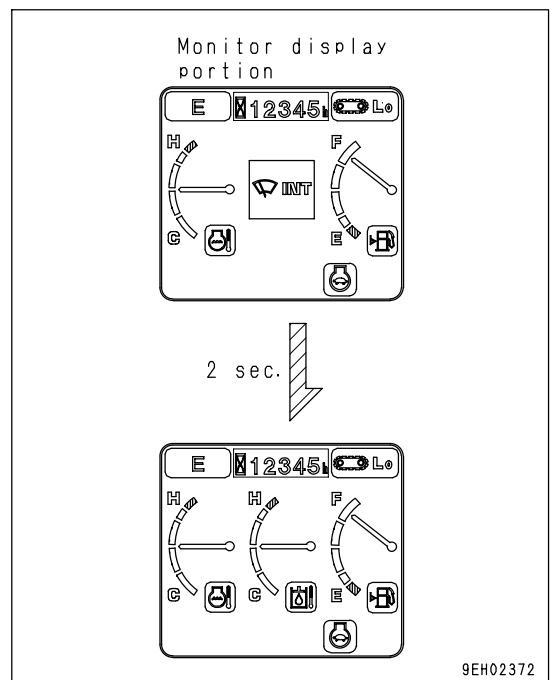
Monitor display INT lighted up : Wiper moves intermittently

Monitor display OFF : Wiper stops



REMARK

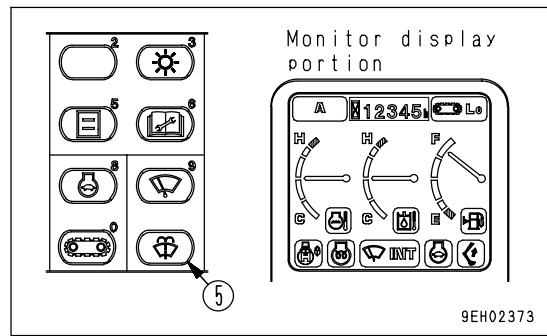
Each time that the wiper switch is operated, the mode is displayed in the center of the monitor display. The screen returns to the normal screen after 2 seconds.



Window Washer Switch

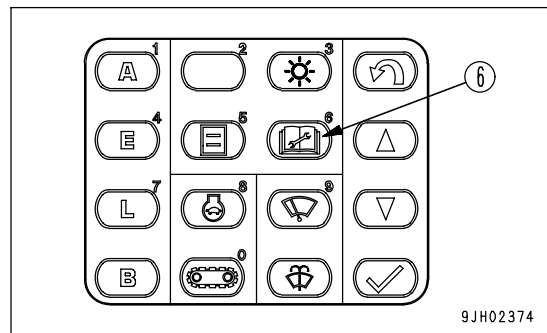
This switch (5) is kept continuously pressed, window washer fluid is sprayed out on the front glass. When the switch is released, the spray stops.

- If switch (5) is kept pressed when the wiper is stopped, the window washer fluid will spray out, and at the same time, the wiper will be actuated continuously. When switch (5) is released, the wiper will continue to operate for 2 cycles, then stop.
- If the wiper is moving intermittently and switch (5) is kept pressed continuously, window washer fluid will spray out, and at the same time, the wiper will be actuated continuously. When switch (5) is released, the wiper will continue to operate for 2 cycles, then return to intermittent operation.



Maintenance Switch

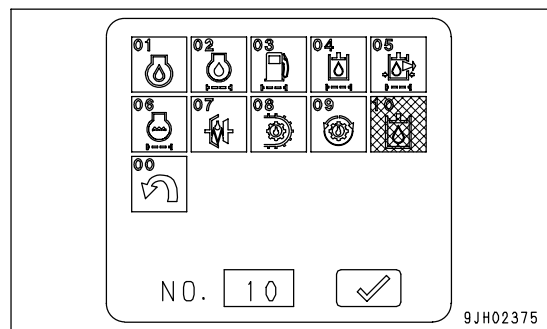
- Switch (6) is used to check the time remaining until maintenance.



- When switch (6) is pressed, screen on the monitor display changes to the maintenance screen, as shown in diagram on the right.

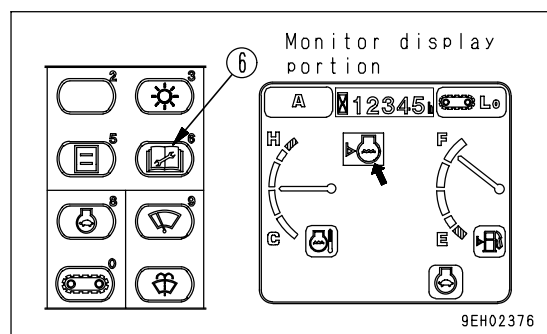
The time remaining until maintenance is indicated by the color of each monitor display. After confirming the maintenance time, perform the maintenance.

- White display: More than 30 hours remaining until maintenance
- Yellow display: Less than 30 hours remaining until maintenance
- Red display : Maintenance time has already passed



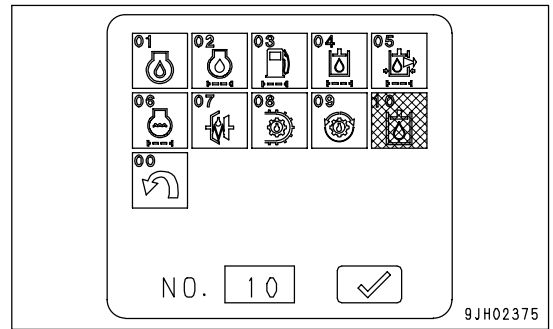
NOTICE

1. If the monitor display changes to the maintenance warning screen when the engine is started or when the machine is being operated, stop operations immediately. When this happens, the monitor corresponding to the maintenance warning screen will light up red.
2. Press switch (6) to display the maintenance screen and check that there is no abnormality in any other monitor.
3. If another monitor is lighted up red on the maintenance screen, carry out maintenance for that item also.



- Maintenance display items are as follows:

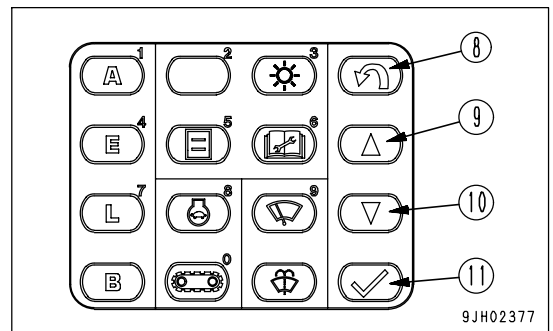
Monitor No.	Maintenance item	Default set screen (H)
01	Change engine oil	500
02	Change engine oil filter	500
03	Change fuel filter	500
04	Change hydraulic oil filter	1000
05	Change hydraulic tank breather	500
06	Change corrosion resistor (option for overseas)	1000
07	Check damper case oil level, add oil	1000
08	Change final drive case oil	2000
09	Change swing machinery case oil	1000
10	Change hydraulic oil	5000



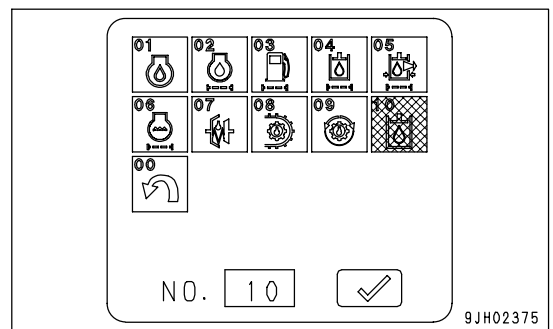
If it is desired to change settings for the maintenance interval, have your Komatsu distributor change the settings.

- The method of checking time remaining until maintenance is as follows:

1. Look at the maintenance screen, press up switch (9) or down switch (10) on the monitor switch portion, and select the item. (Color of the monitor for selected item is inverted to black.)



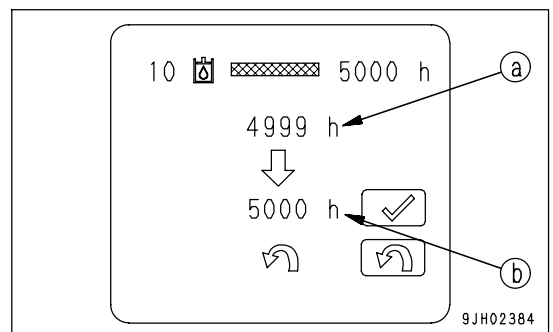
2. After selecting the monitor item, press input confirmation switch (11). Display screen will switch to the time remaining until maintenance. (Press back switch (8) to return to the previous screen.)



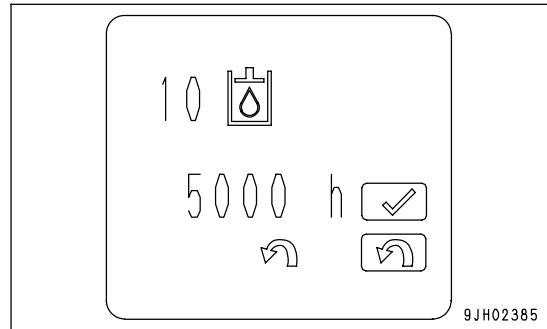
3. Check the time remaining until maintenance.
 - (a): Time remaining until maintenance
 - (b): Default setting for maintenance interval

When only checking the time remaining until maintenance, press back switch (8) twice.

The screen will return to the normal operation monitor screen. When canceling time remaining until maintenance and returning to the default time setting, press input confirmation switch (11). The screen will switch to the default setting screen.

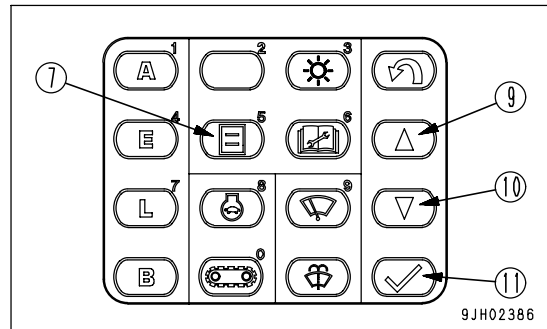


4. After checking the time on the default setting screen, press input confirmation switch (11).
The screen will return to the maintenance screen.
(Press back switch (8) to return to the previous screen.)

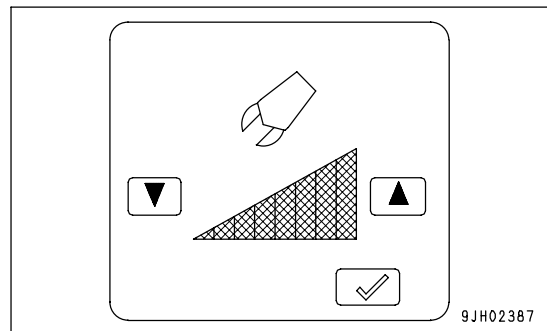


Select Switch

This switch (7) is used as a selector switch when setting the oil flow for each working mode (A, E, B mode).



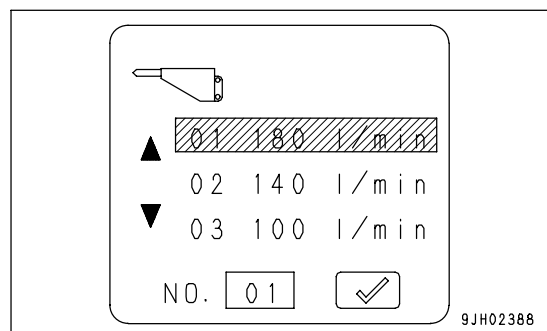
- When working mode is A or E
 - (1) Press select switch (7) and the normal screen on the monitor display changes to the flow setting screen shown in the diagram on the right.
 - (2) Press up switch (9) or down switch (10) to adjust to the desired flow.
Each segment on the scale is approx. 30 liters/min.
 - (3) After completing the flow setting, press input confirmation switch (11).
The monitor display will return to the normal screen.



REMARK

The flow can be adjusted only when it is possible to install an attachment. (if equipped)

- When working mode is B mode
 - (1) Press select switch (7) and the normal screen on the monitor display changes to the flow setting screen shown in the diagram on the right.
 - (2) Press up switch (9) or down switch (10) to adjust to the desired flow.
 - (3) After completing the flow setting, press input confirmation switch (11).



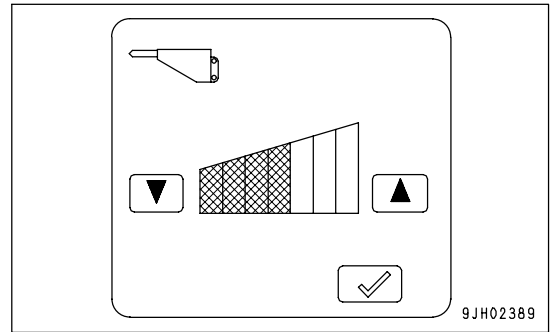
(4) With the operation in Step (3), the flow setting screen changes to the fine flow adjustment screen shown in the diagram on the right.

(5) Press up switch (9) or down switch (10) to adjust to the desired flow.

Each segment on the scale is approx. 10 liters/min.

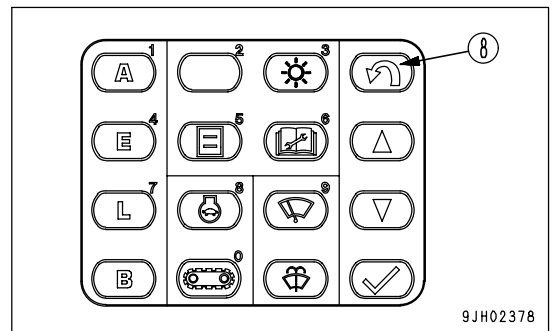
(6) After completing the flow setting, press input confirmation switch (11).

The monitor display will return to the normal screen.



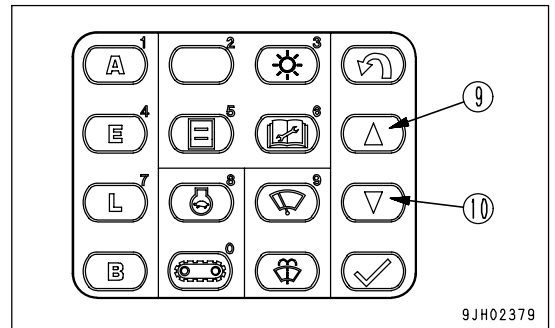
Back Switch

Press this switch (8) when in the maintenance mode, brightness/contrast adjustment mode, or select mode. The screen will return to the previous screen on the monitor display.



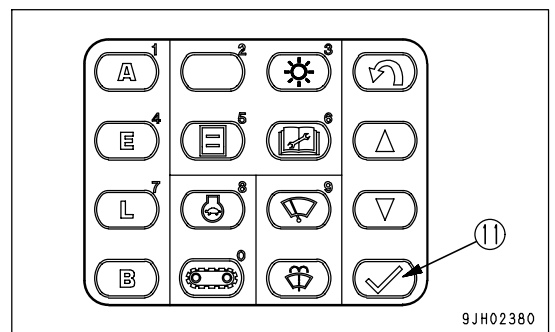
Up Switch, Down Switch

Press up switch (9) or down switch (10) when in the maintenance mode, brightness/contrast adjustment mode, or select mode to move the cursor on the monitor display (colors of selected monitor are inverted) up, down, left, or right.



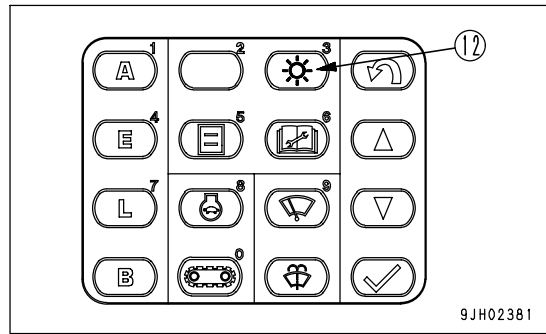
Input Confirmation Switch

Press this switch (11) to confirm the selected mode when in the maintenance mode, brightness/contrast adjustment mode, or select mode.



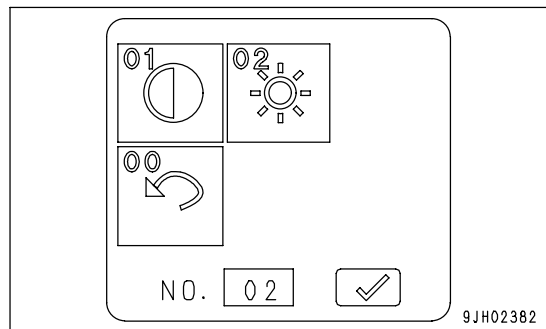
Liquid Crystal Monitor Adjustment Switch

Press switch (12) to adjust the brightness or contrast of the display monitor.



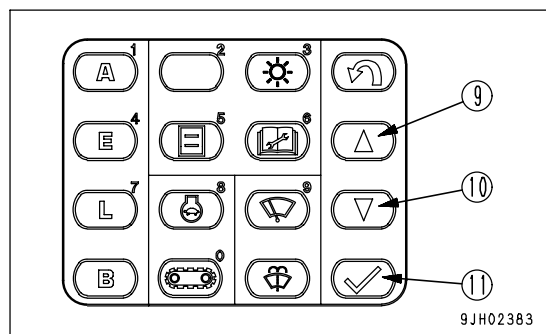
Adjusting brightness and contrast

1. When monitor adjustment switch (12) is pressed, the monitor display screen changes to the brightness/contrast screen shown in the diagram on the right.

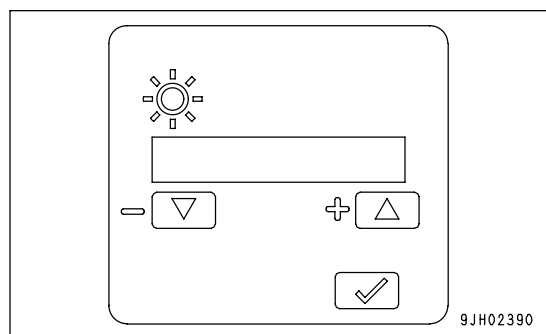


- Adjusting brightness

2. Use the brightness/contrast screen and press up switch (9) or down switch (10) to select brightness of the monitor. (The selected monitor is inverted to black.)

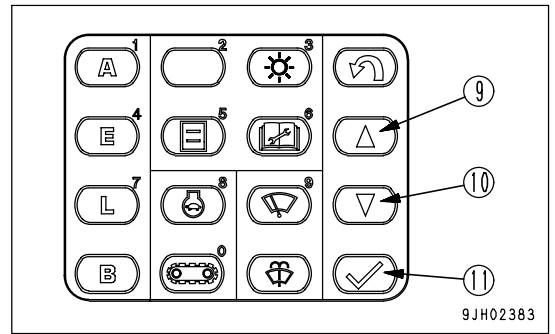


3. When the screen changes to the brightness adjustment screen, press up switch (9) or down switch (10) to adjust the brightness.
4. After completing adjustment of the brightness, press input confirmation switch (11).

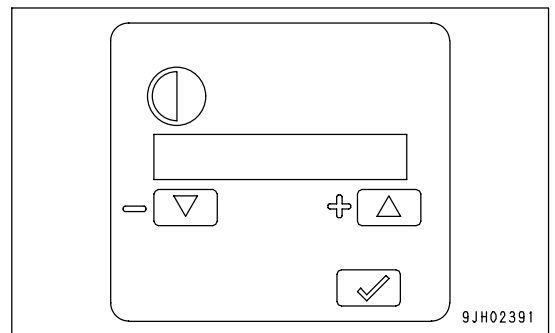


- Adjusting contrast

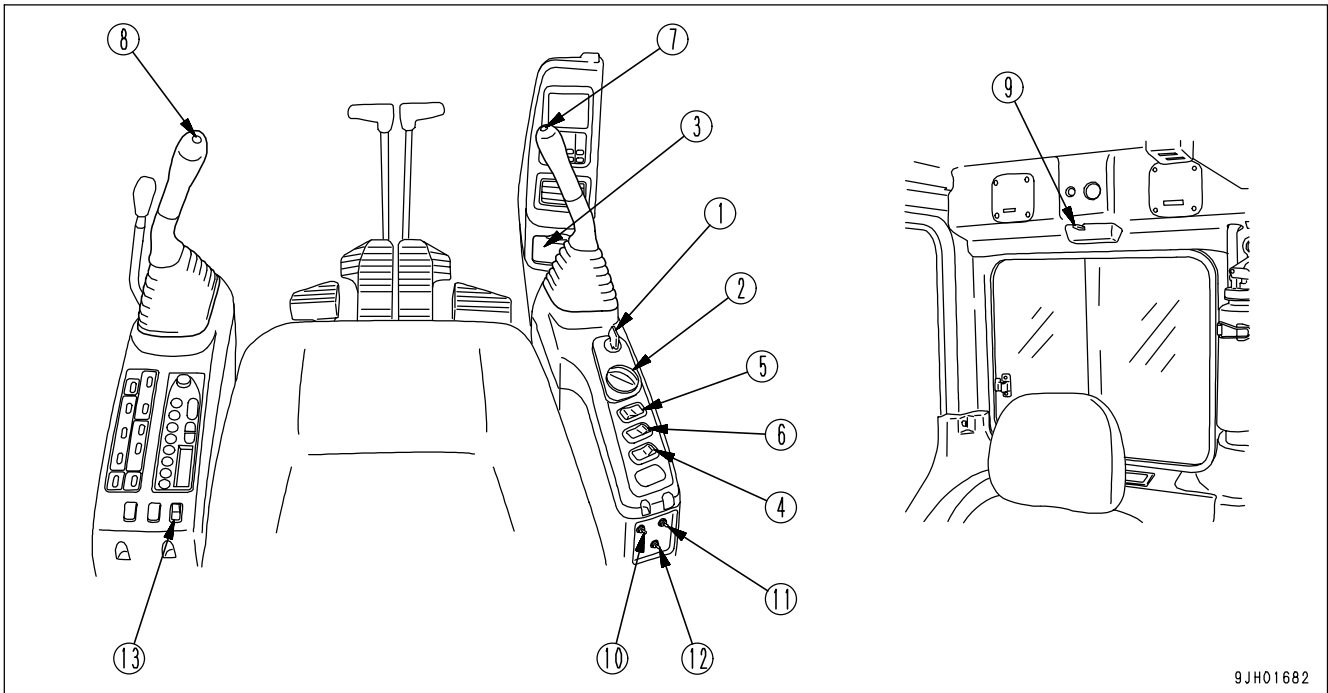
2. Use the brightness/contrast screen and press up switch (9) or down switch (10) to select the contrast monitor.
 (The selected monitor is inverted to black.)



3. When the screen changes to the contrast adjustment screen, press up switch (9) or down switch (10) to adjust the contrast.
 4. After completing adjustment of the contrast, press input confirmation switch (11).



SWITCHES



9JH01682

- (1) Starting switch
- (2) Fuel control dial
- (3) Cigarette lighter
- (4) Swing lock Switch
- (5) Lamp switch
- (6) Alarm buzzer stop switch
- (7) Horn switch
- (8) Knob switch
- (9) Room lamp switch
- (10) Pump drive emergency switch
- (11) Swing holding brake release switch
- (12) Emergency work equipment actuation switch
- (13) Rotating lamp switch (if Equipped)

Starting Switch

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

OFF position

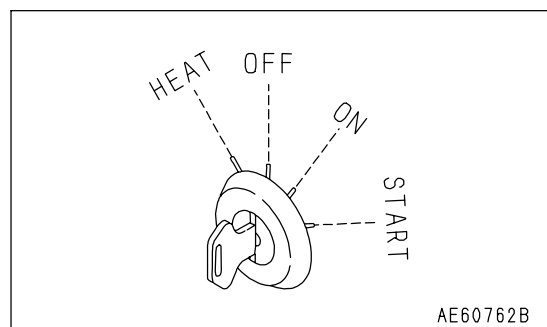
The key can be inserted or withdrawn. The switches for the electric system except the room lamp, are all turned off and the engine is stopped.

ON position

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

START position

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



AE60762B

HEAT position

When starting the engine in cold temperatures, set the key to this position. When the key is set to the HEAT position, the preheating monitor lights up. Keep the key at this position until the preheating monitor flashes.

When the preheating monitor flashes, release the key immediately.

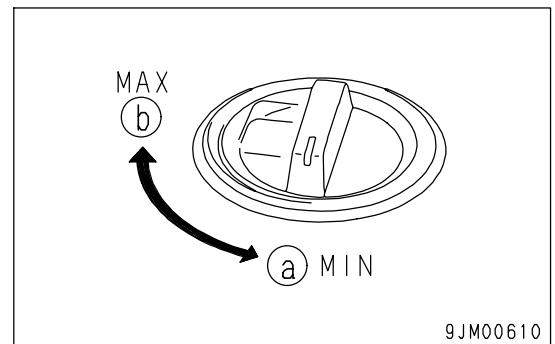
When the key is released, it will return automatically to the OFF position, so turn it immediately to the START position to start the engine.

Fuel Control Dial

Dial (2) adjusts the engine speed and output.

(a) Low idling (MIN): Turned fully to the left

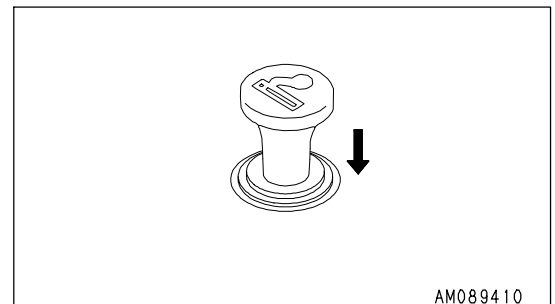
(b) Full speed (MAX): Turned fully to the right

**Cigarette Lighter**

This switch (3) is used to light cigarettes. To use, push the lighter in. After a few seconds it will spring back.

Pull out the lighter and light your cigarette.

By removing the cigarette lighter, the socket is available as a power source for the yellow flashing lamp. Max. current is 3.5 A (85 W).

**Swing Lock Switch****WARNING**

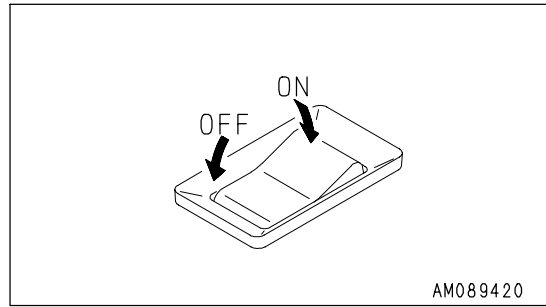
- When the machine is traveling under its own power, or when the swing is not being operated, always set the switch to the ON (ACTUATED) position.
- On a slope, the work equipment may swing to the down side with its own load even if the swing lock switch is located at the ON position. Be careful concerning this point.

This switch (4) 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.

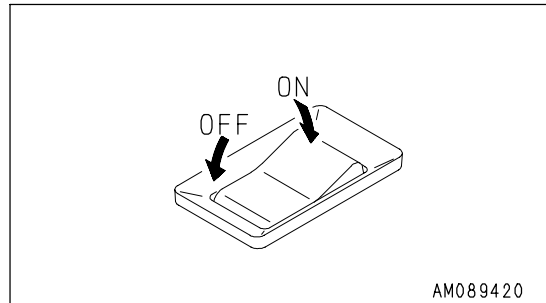
OFF position (canceled): The swing lock is applied only when all the control levers of the work equipment are at neutral; when any of the control levers is operated, it is cancelled.

The swing lock is actuated approx. 5 seconds after all the control levers are placed in the neutral position.



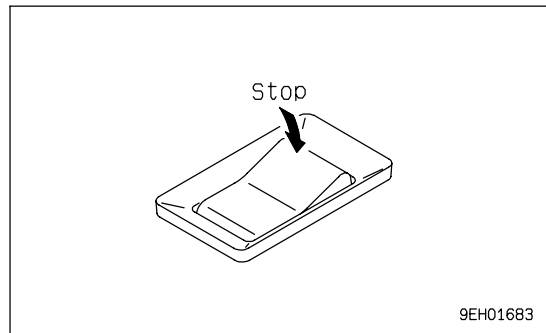
Lamp Switch

This switch (5) is used to light up the front lamps, working lamp, additional lamp at the top front of the cab, rear lamp, and monitor lighting.



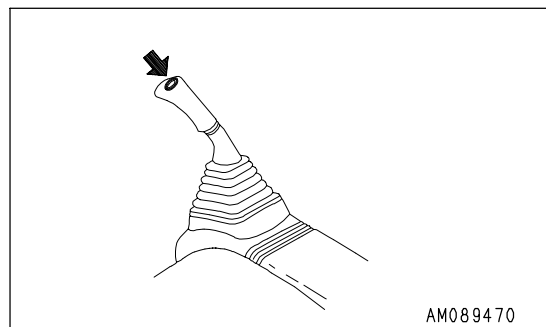
Alarm Buzzer Stop Switch

This switch (6) is used (when the engine is running) to stop the alarm buzzer when it has sounded to warn of a problem in a warning item.



Horn Switch

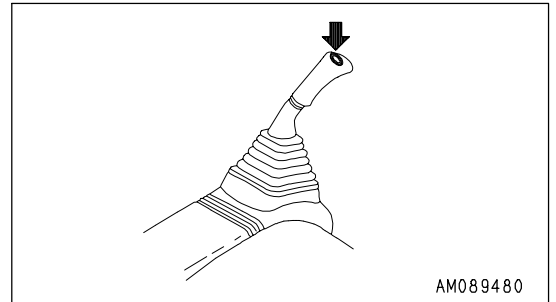
When the button (7) at the tip of the right work equipment control lever is pressed, the horn will sound.



Knob Switch

Knob switch (8) on the left work equipment control lever is used to actuate the power max and slowdown functions.

Press once (single click) and keep the switch pressed. The one-touch power max. Function is actuated for a maximum of 8.5 seconds at A and E mode.

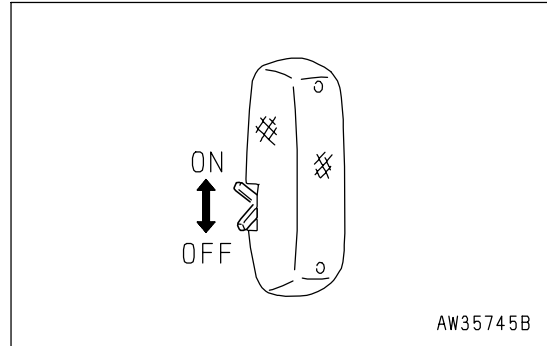


Room Lamp Switch

NOTICE

It is possible to turn on the interior cab room lamp even when starting switch is in the OFF position, do not forget to turn it off.

This switch (9) is used to light up the room lamp.
ON position: Lights up
OFF position: Goes out
It will also light up even when the engine is not running.



Emergency Pump Drive Switch

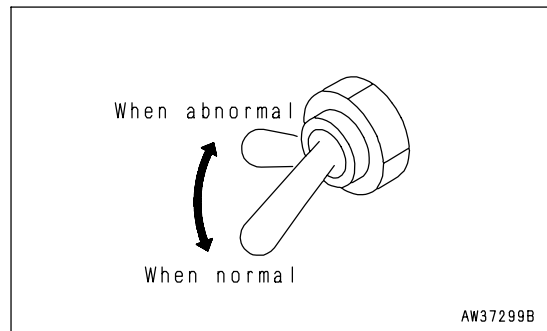
NOTICE

Emergency pump drive switch is provided to make it possible to perform work for a short time when there is a failure in the pump control system. It is necessary to repair the abnormal location as soon as possible.

This switch (10) is used to make it possible to carry out operations temporarily if any abnormality should occur in the pump control system (when the display shows E02).

When normal: Move switch down
When abnormal: Move switch up

If the display shows E02, move the switch up to make it possible to carry out work.



Swing Brake Cancel Switch

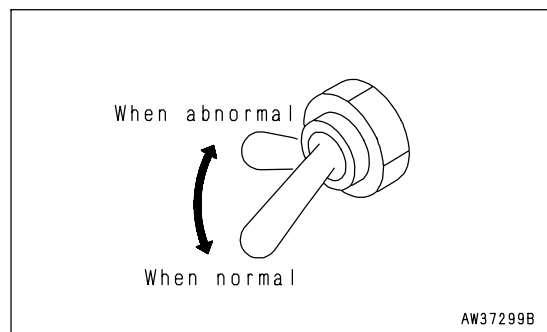
NOTICE

This switch makes it possible to perform swing operations for a short even when there is a problem in the swing brake electric system. DO NOT use this switch except in emergencies. Repair the problem as soon as possible.

This switch (11) is used to make it possible to carry out operations temporarily if any abnormality should occur in the swing brake system (when the display shows E03).

When normal: Move switch down
When abnormal: Move switch up

If the display shows E03, move the switch up to make it possible to carry out work.



Emergency Work Equipment Actuation Switch**WARNING**

Do not turn the emergency work equipment operation switch ON to carry out operations. The electric system is not actuated.

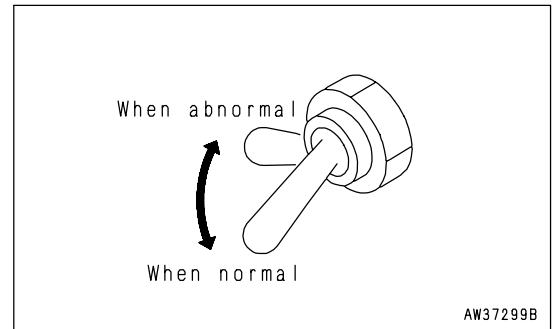
This switch (12) is used to make it possible to operate the work equipment if necessary if any abnormality should occur in the electrical system and the work equipment (boom) stops.

When normal: Move switch down

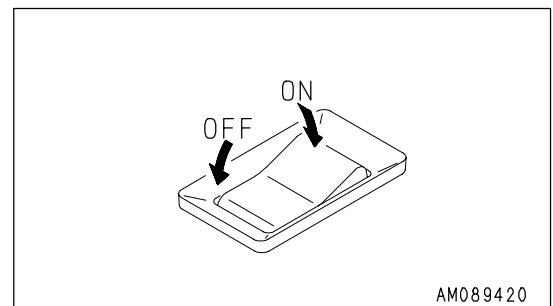
When abnormal: Move switch up

If the switch is at the abnormal position and it is released, it will automatically return to the Normal position.

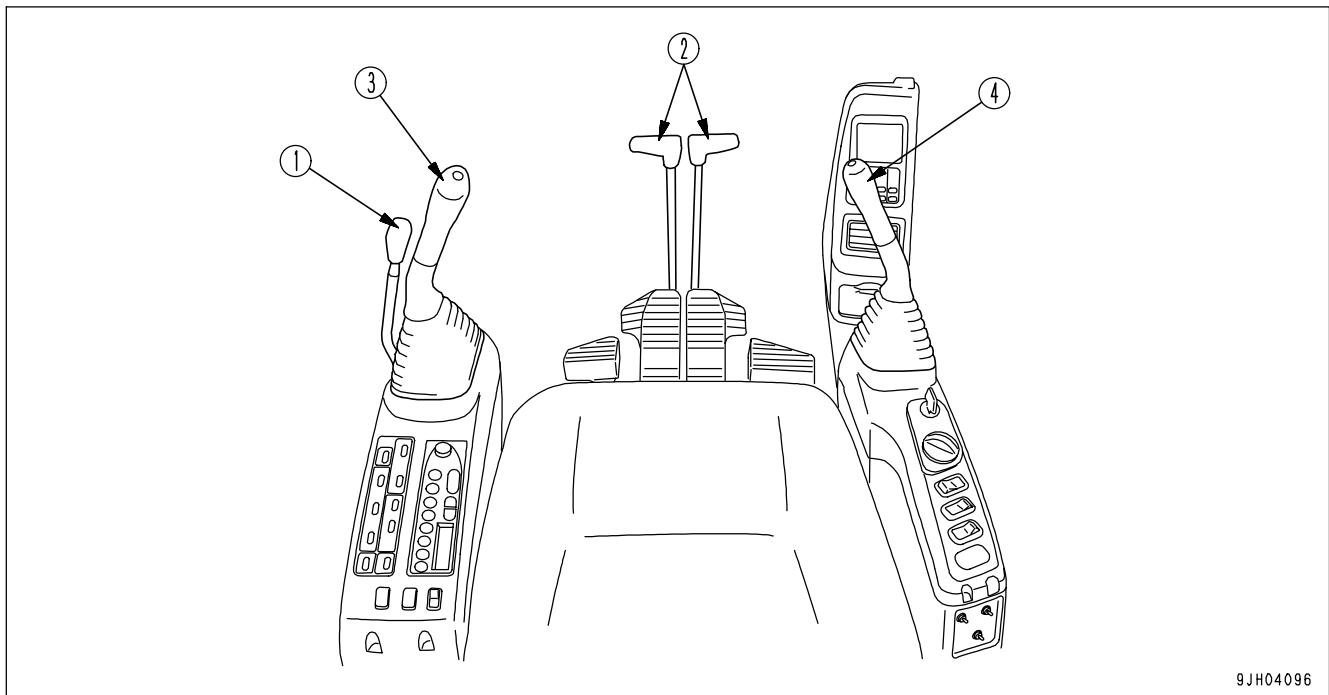
- If the display shows E06, move this switch (12) up or down to make it possible to carry out work.

**Rotating Lamp Switch (If Equipped)**

This switch (13) is used to light up the yellow rotating lamp on top of the cab.



CONTROL LEVERS AND PEDALS



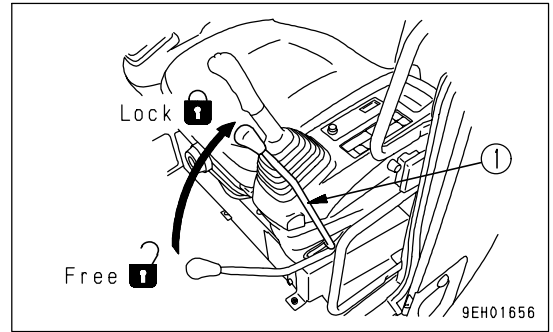
9JH04096

- | | |
|--|---|
| (1) Lock Lever | (3) Left Work Equipment Control Lever
(with auto-deceleration system) |
| (2) Travel Levers
(with a pedal and auto-deceleration system) | (4) Right Work Equipment Control Lever
(with auto-deceleration system) |

Lock Lever

**WARNING**

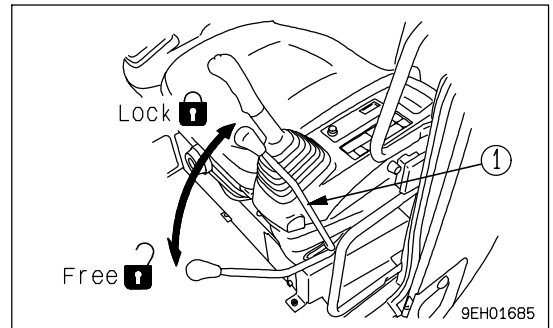
- When leaving the operator's compartment, set the lock lever securely to the LOCK position. If the lock lever is not at the LOCK position and the control levers are touched by mistake, it may lead to serious personal injury.
- Check that the condition of the lever is as shown in the diagram.
- When pulling the lock lever up, be careful not to touch the work equipment control lever.
When pushing the lock lever down, be careful not to touch the work equipment control lever.



This lever (1) locks the controls for the work equipment, swing, travel, and optional attachments.

Pull the lever up to apply the lock.

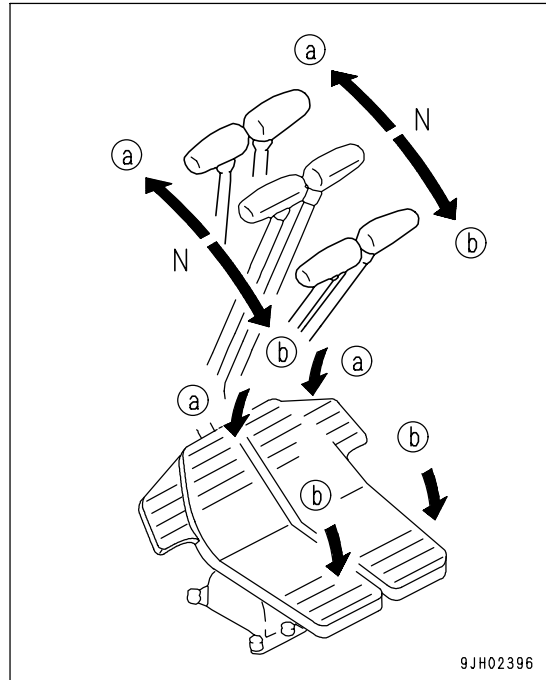
This lock lever is a hydraulic lock, so even if it is in the lock position, the work equipment control lever and travel lever will move, but the work equipment, travel motor, and swing motor will not work.



Travel Levers

WARNING

- Do not rest your foot on the pedal during operations. If the pedal is depressed by mistake, the machine may suddenly move and cause a serious accident. Be extremely careful when operating the pedal for travel or steering operations. When you are not using the pedal, do not rest your foot on it.
- If the track frame is facing the rear, the direction of travel operations will be reversed when the travel lever is operated. (The machine will travel forward when operated in reverse, and in reverse when operated forward; the left and right directions will also 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.)



Lever (2) is used to change the direction of travel between forward and reverse. () shows the pedal operation.

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

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

N (Neutral): The machine stops

REMARK

Machines equipped with travel alarm (If equipped)

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

Work Equipment Control Lever

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

Arm operation

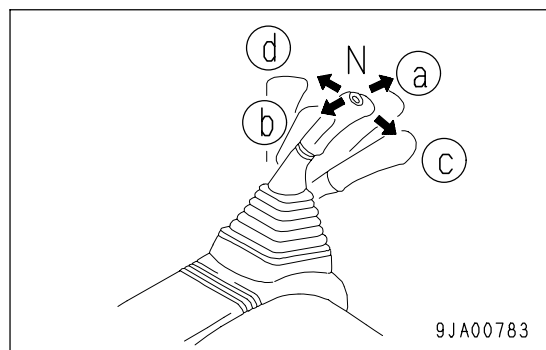
(a) Arm OUT

(b) Arm IN

Swing operation

(c) Swing to right

(d) Swing to left



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

Right work equipment control lever (4) is used to operate the boom and bucket.

Boom operation

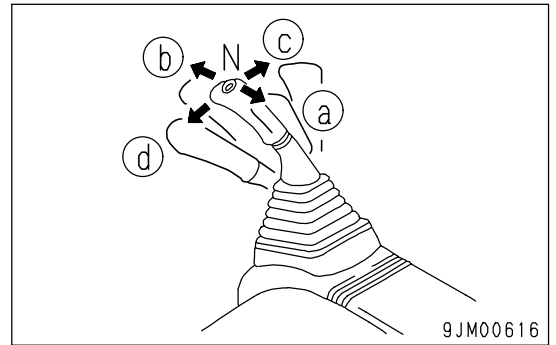
(a) RAISE

(b) LOWER

Bucket operation

(c) DUMP

(d) CURL



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

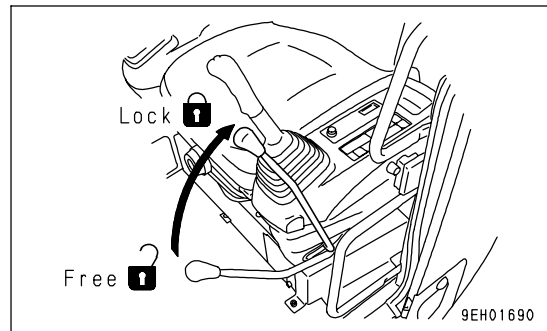
SUN ROOF

WARNING

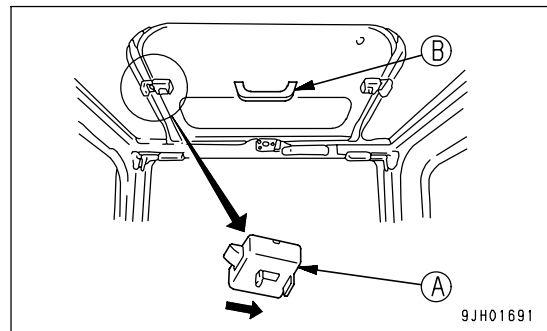
- When leaving the operator's compartment, set the lock lever securely to the LOCK position.
- If the control levers are not locked, and they are touched by mistake, this may lead to a serious accident.
- When opening or closing the roof hatch, carry out the operation on horizontal ground. If you open or close the hatch when the footing conditions are poor, there is danger that you may fall.

Opening

1. Set the lock lever securely to the LOCK position.



2. Release lock (A) provided on both side of the ceiling and check that it moves freely. Then push it up to open, holding handle (B).



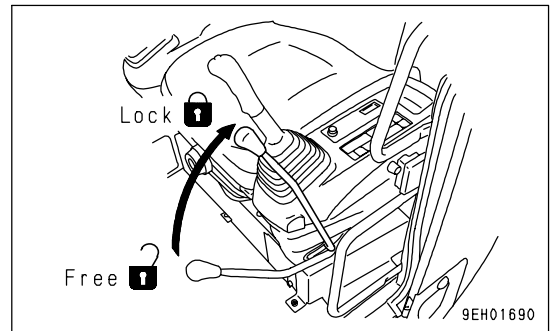
Closing

Pull the ceiling down, holding handle (B) and set locks (A). If the locks do not engage properly, open the ceiling once again and try to shut it.

WINDSHIELD

 **WARNING**

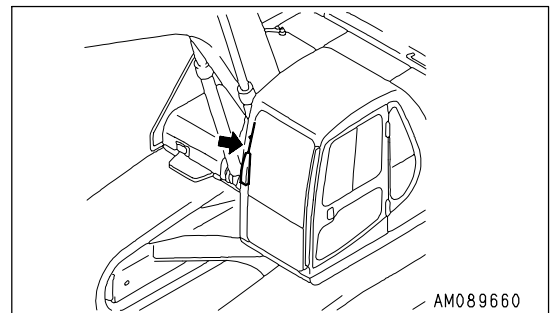
- When opening or closing the ceiling window, front window, bottom window, or door, always set the lock lever to the LOCK position. If the control levers are not locked and they are touched by accident, this may lead to a serious accident.
- When opening or closing the window at the front of the cab, stop the machine on horizontal ground, lower the work equipment completely to the ground, stop the engine, then carry out the operation.
- 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.
- When closing the front window, the window will move quicker under its own weight. Hold the grips securely with both hands when closing it.



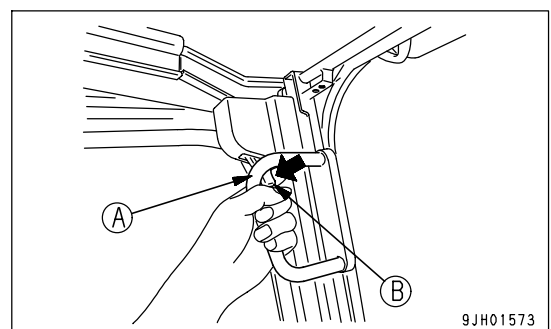
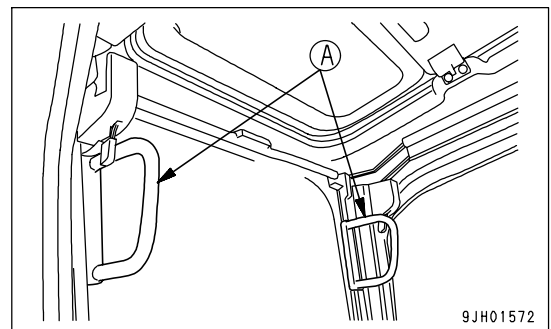
It is possible to stow (pull up) the front window in the roof of the operator's compartment.

Opening

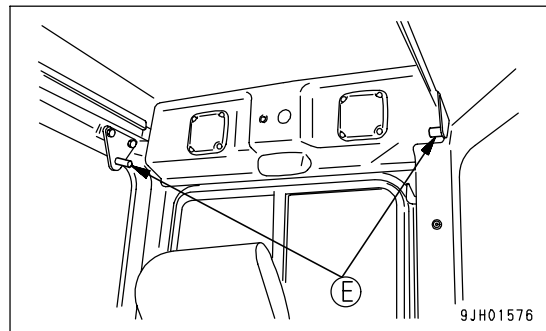
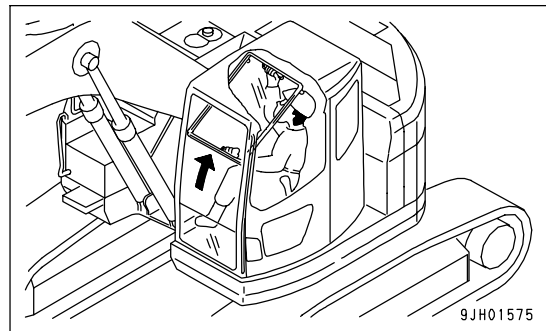
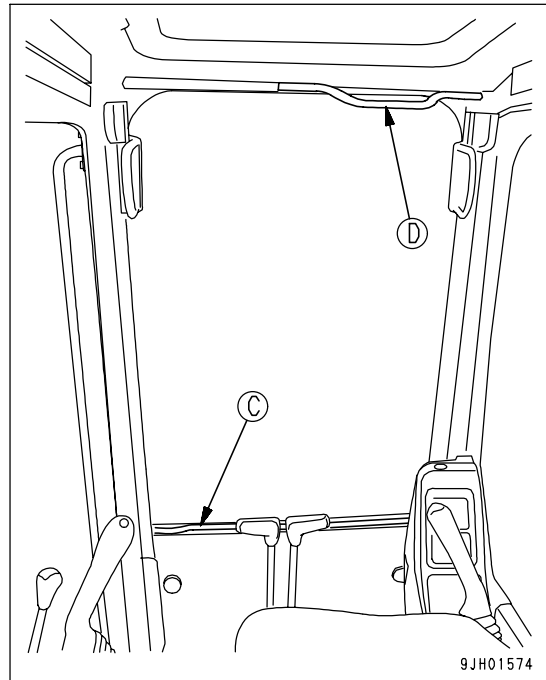
1. Stop the machine on level ground, lower the work equipment completely to the ground, then stop the engine.
2. Set the lock lever securely to the LOCK position.
3. Check that the wiper blade is stowed in the right stay.



4. Grip handles (A) at the top right and left of the front window, and pull lock lever (B) toward yourself to release the lock at the top of the front window. The top of the front window will come out.

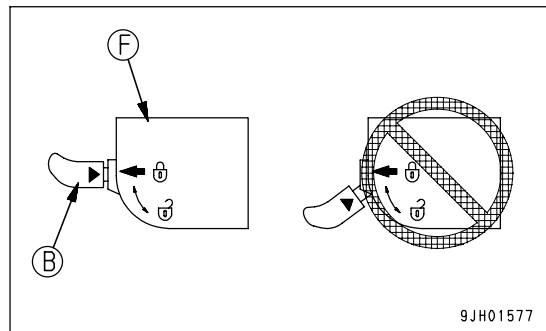


5. Hold lower knob (C) with your left hand from inside the operator's cab, and with your right hand, grip top knob (D), pull it up, and push it against lock catch (E) at the rear of the cab securely to lock the window.



6. Check that lock lever (B) is securely in the LOCK position.

- The lock is engaged if the arrow on lock case (F) matches the position of the arrow on lock lever (B). Check visually.
- If the arrow on lock case (F) does not match the position of the arrow on lock lever (B), the lock is not engaged. Repeat the operation in Step 5 to engage the lock.

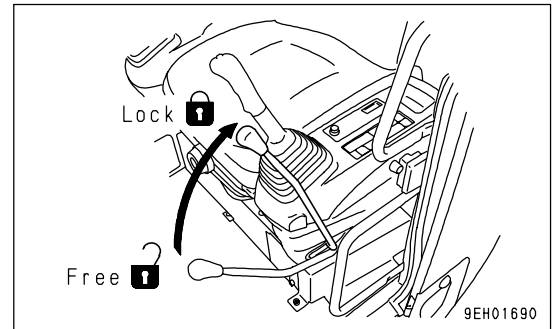


Closing

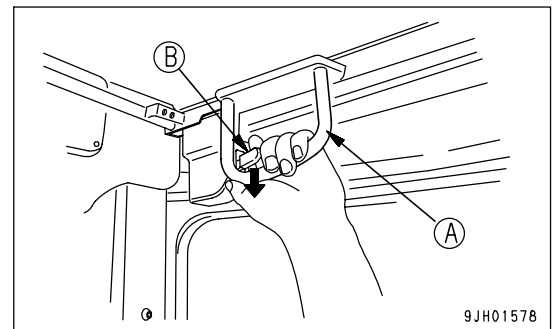
**WARNING**

When closing the window, lower it slowly and be careful not to get your hand caught.

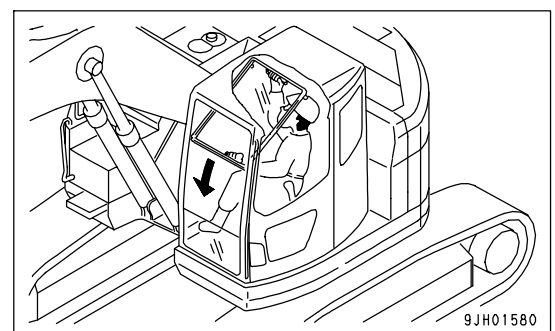
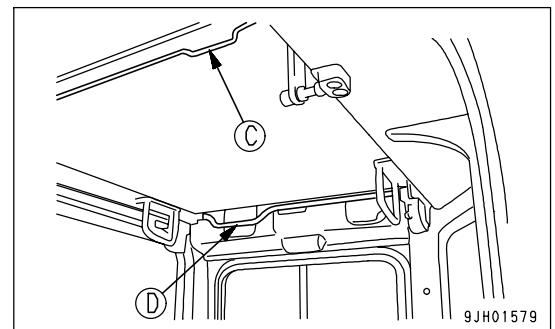
1. Stop the machine on level ground, lower the work equipment completely to the ground, then stop the engine.
2. Set the lock lever securely to the LOCK position.



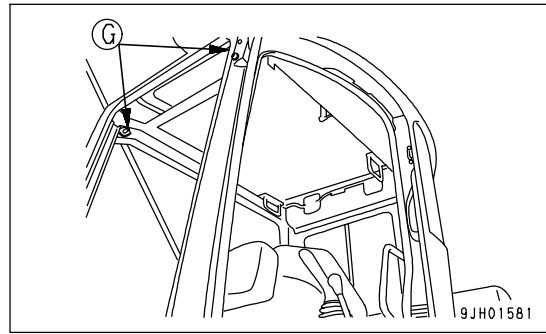
3. Grip left and right handles (A), and pull down lock lever (B) to release the lock.



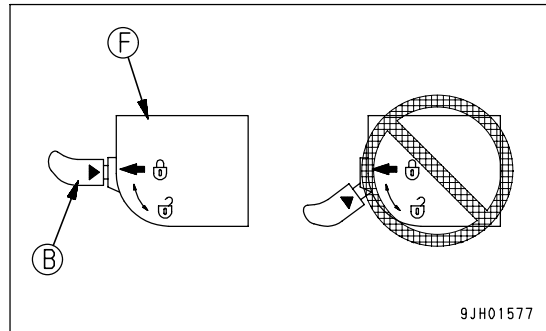
4. Grip handle (C) at the bottom of the front window with your left hand and handle (D) at the top with your right hand, push to the front, then lower slowly.



5. When the bottom of the window reaches the top of the bottom window, push the top of the window to the front to push it against left and right lock catches (G) and engage the lock.

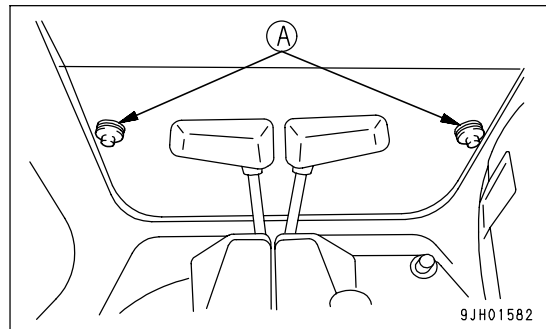


6. Check that lock lever (B) is securely at the LOCK position.
 - The lock is engaged if the arrow on lock case (F) matches the position of the arrow on lock lever (B). Check visually.
 - If the arrow on lock case (F) does not match the position of the arrow on lock lever (B), the lock is not engaged. Repeat the operation in Step 5 to engage the lock.

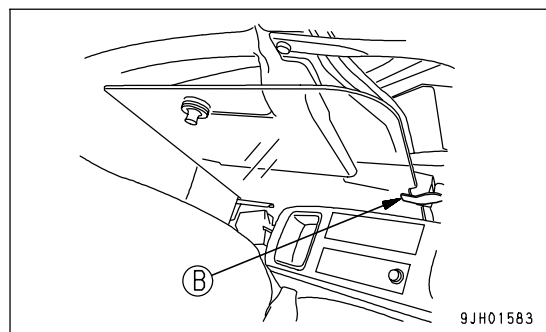


Removing Lower Windshield

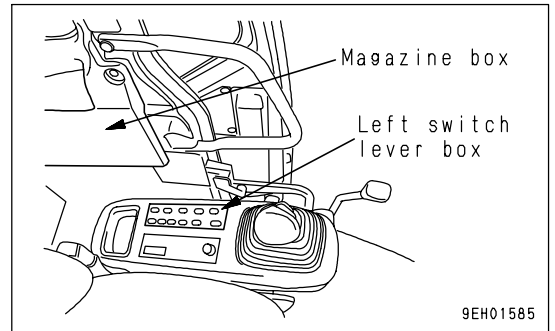
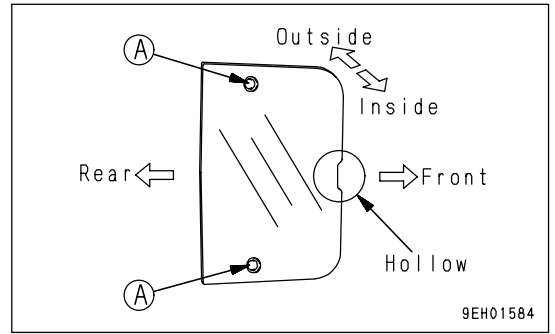
1. Open the front window, then hold grip (A), pull up, and remove the bottom window.



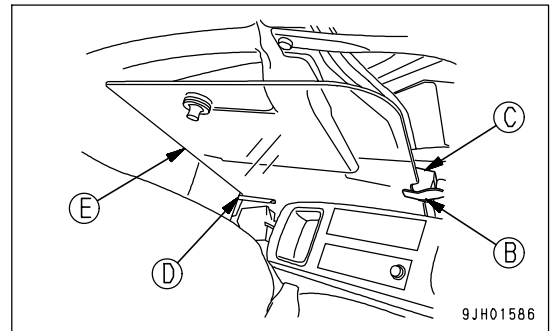
2. After removing the bottom window, stow it on the inside left of the operator's cab, then lock securely in position with lock lever (B). The procedure for stowing is as follows.



- 1) Set the hollow in the glass at the front face, set the protruding part of grip (A) on the inside, and insert between the left switch lever box and magazine box on the inside left of the operator's cab.

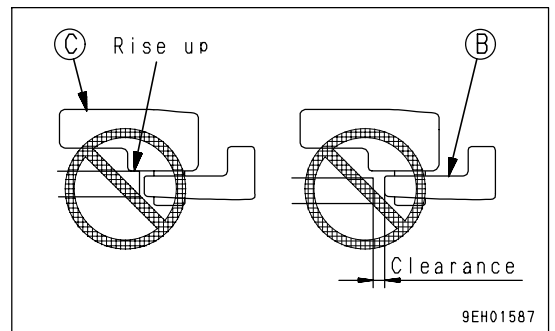


- 2) After inserting into groove (D) of the bottom frame rubber and rear frame rubber (A), push the bottom window against lock base (C).

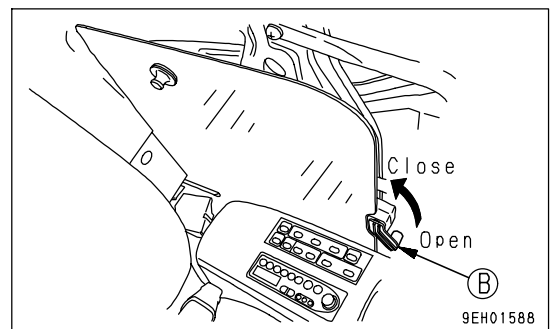


NOTICE

If the window rise up on lock base (C) or is not in contact with lock lever (B), and it is attempted to engage the lock by force, there is danger that the glass may break. Check before applying the lock.



- 3) Set lock lever (B) to the LOCK (CLOSED) position.



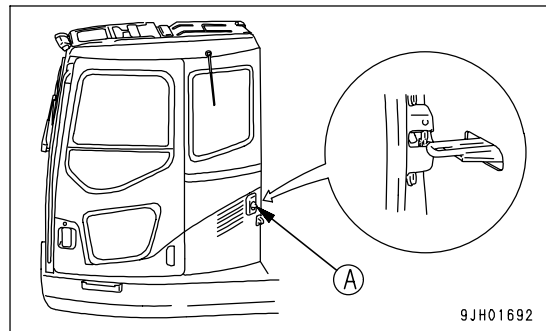
SLIDING DOOR

CAUTION

- When opening or closing the sliding door, select a suitable position for your left and right hands and be extremely careful not to get your fingers caught.
- Always check that the sliding door is locked at the open or closed position.
- Always stop the machine on level ground when opening or closing the door.
- If the door is opened or closed on a slope, the operating effort may suddenly change, so do not open or close the door on slopes.

- Door lock

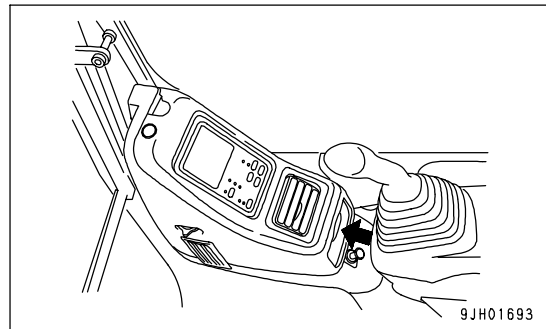
When closing the door, pull the handle back to remove lock (A) , then pull the door to the front.



9JH01692

ASHTRAY

An ashtray is provided at the right front of the operator's seat. Be sure to extinguish the cigarette, then close the lid.



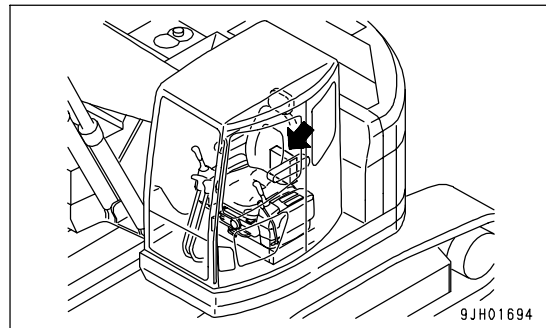
9JH01693

CONTROLLERS

NOTICE

- Do not let water, mud, or juice spill on the controller. This will cause failures.
- If any problem occurs in the controller, do not repair it by yourself. Please contact your Komatsu distributor for repairs.

A controller for the work equipment control, engine control, and pump control systems is installed.



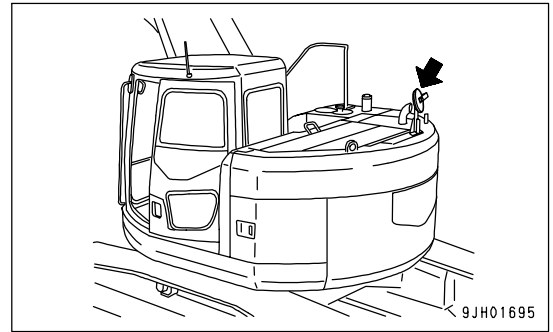
9JH01694

REAR UNDERVIEW MIRROR

NOTICE

Depending on the direction that the mirror is facing, it may extend outside the swing radius (approx. 100 mm (3.9 in)).

Sit in the operator's seat and adjust the mirror so that it is possible to see the right side of the counterweight.

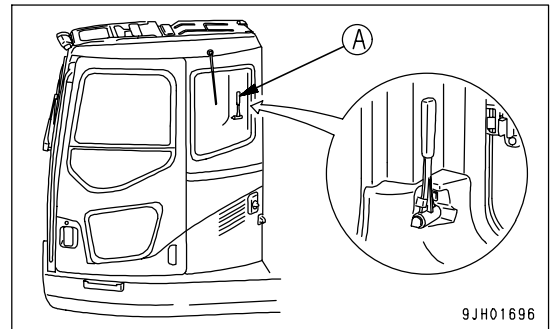


EMERGENCY ESCAPE HAMMER

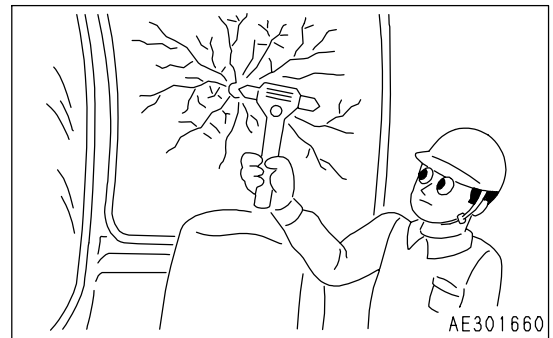
NOTICE

When escaping, remove the broken pieces of the glass from the sash so that you will not cut yourself with them. Take care not to slip on the broken and scattered pieces.

If it should become impossible to open the cab door for any reason, and it is necessary to make an emergency escape from the operator's compartment, use hammer (A) to escape.



To escape from the operator's cab, use hammer (A) to break the glass and escape through the window.

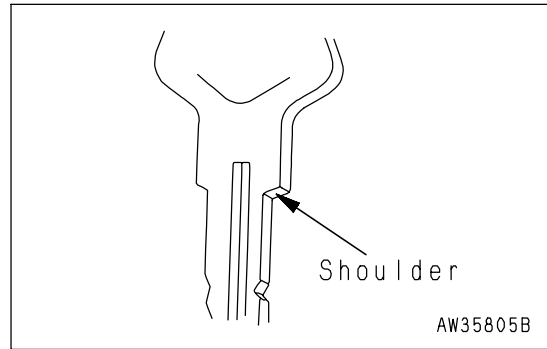


CAP WITH LOCK

Use the starting switch key to open and close the locks on the caps and covers.

For details of the locations of the caps and covers with locks, see "LOCKING (PAGE 3-116)".

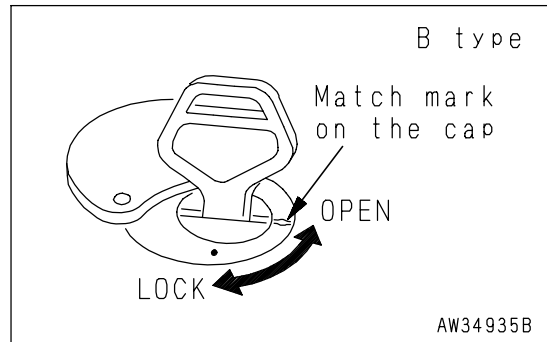
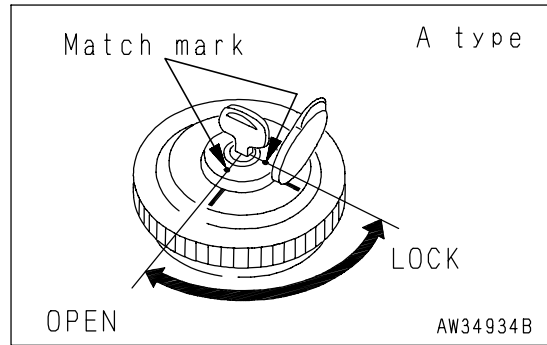
Insert the key as far as it will go to the shoulder. If the key is turned before it is inserted all the way, it may break.



Opening and Closing Caps with Lock

Opening the Cap

1. Insert the key into the key slot.
2. Turn the key clockwise (but, for the B type, turn counter-clockwise), align the key slot with the match mark on the cap, then open the cap.



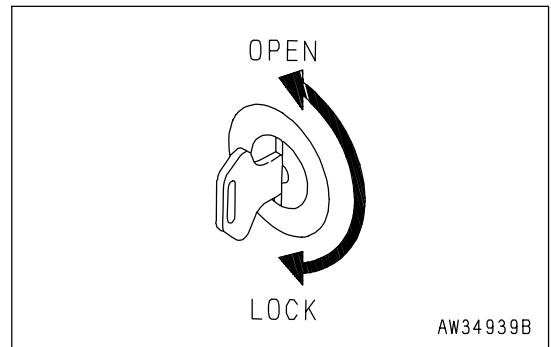
Locking the Cap

1. Turn the cap until tight, then insert the key into the key slot.
2. Turn the key counterclockwise (but, for the B type, turn clockwise) and take the key out.

Opening and Closing Cover with Lock

Opening the Cover (Locked Cover)

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

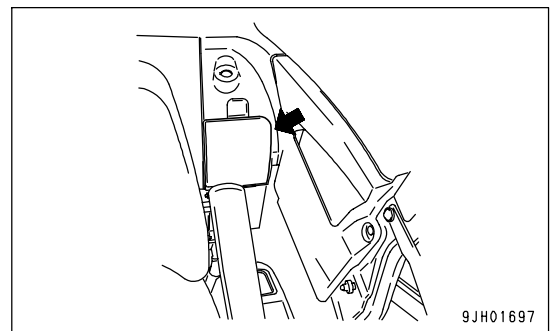


Locking the Cover

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

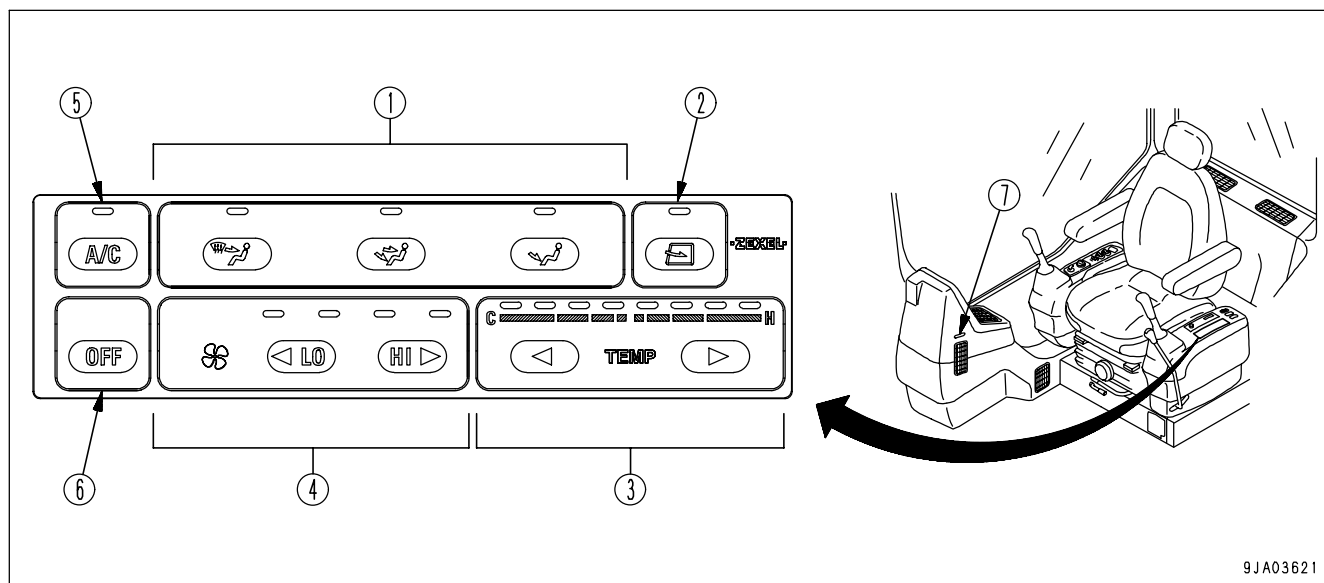
HOT AND COOL BOX

This is at the rear left of the operator's seat. It is interconnected with the air conditioner, it warms when the heater is being used and cools when the air conditioner is being used.



AIR CONDITIONER CONTROLS

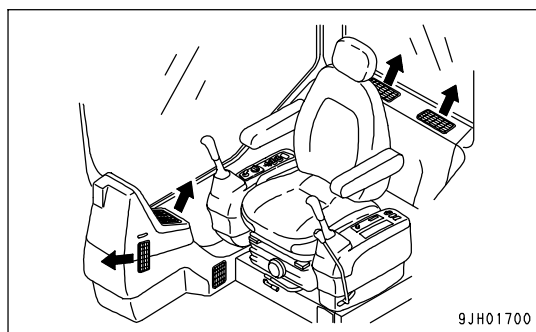
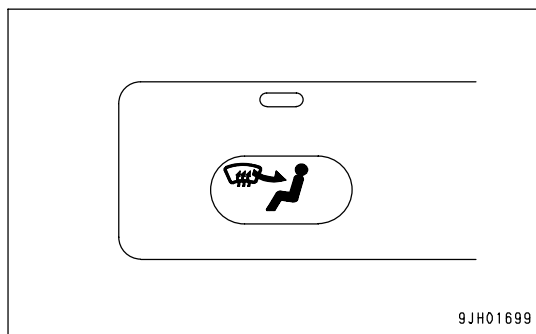
Air Conditioner Control Panel



- | | |
|---|------------------------------|
| (1) Vent selector switch | (5) Air conditioner switch |
| (2) Air circulation selector switch (external/internal) | (6) Off switch |
| (3) Temperature control switch | (7) Defroster selector lever |
| (4) Air flow selector switch | |

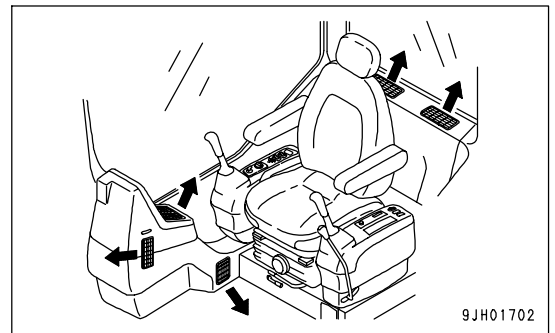
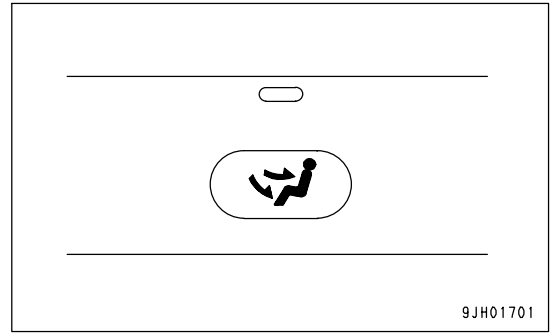
Vent Selector Switch (Air Flow to Upper Part of Body)

If this switch (1) is pressed, the air from the air conditioner is all directed to the face. This can be used to send a cool breeze to the face during hot weather.



Vent Selector Switch (Air Flow to Upper Part of Body and Foot)

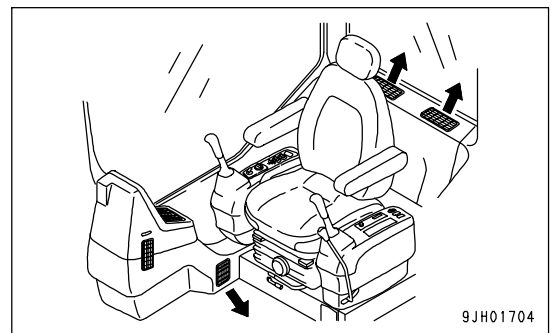
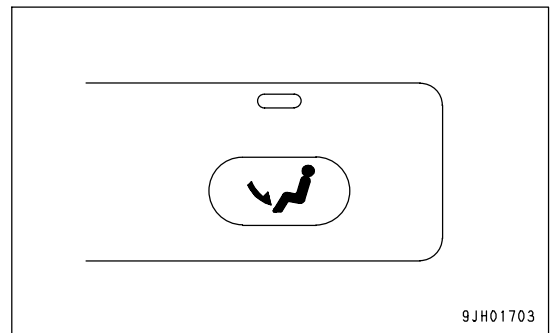
If this switch (1) is pressed, the air from the air conditioner is directed to the face and feet.



Vent Selector Switch (Air Flow to Foot)

If switch (1) is pressed, the air from the air conditioner is all directed to the feet.

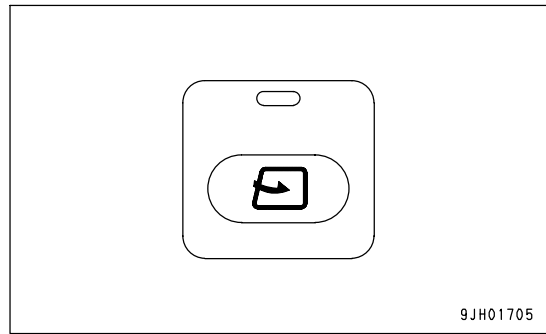
This can be used to send warm air to the feet during cold weather.



Air Circulation Selector Switch (External Air Circulation)

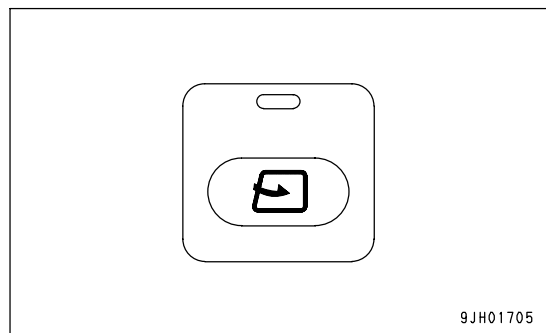
When switch (2) is pressed, fresh air is taken into the cab during heating or cooling.

This position is used to bring in clean fresh air into the cab or to remove the mist from the cab windows.



Air Circulation Selector Switch (Internal Air Circulation)

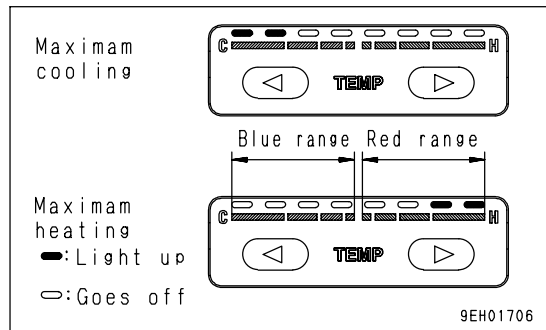
When switch (2) is pressed, the air inside the cab is recirculated and no fresh air is taken in from outside. This position is used when heating or cooling the cab quickly or when the outside air is dirty.



Temperature Control Switch (Cooling)

The more the indicator is in the blue range, the lower the temperature is the more the indicator is in the red range, the higher the temperature is.

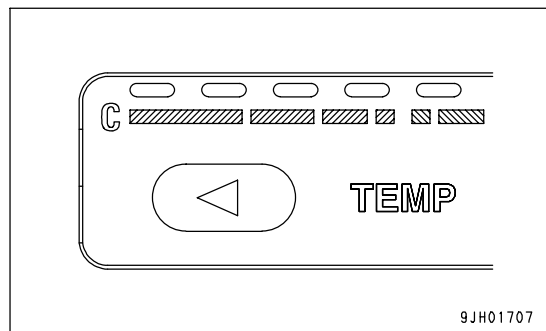
The indicator range is divided into 11 levels, but within each range the temperature changes sleeplessly.



Use switch (3) to reduce the temperature.

Press this switch to reduce the temperature of the air sent from the air conditioner.

The lower the temperature becomes, the further the indicator moves into the blue range.

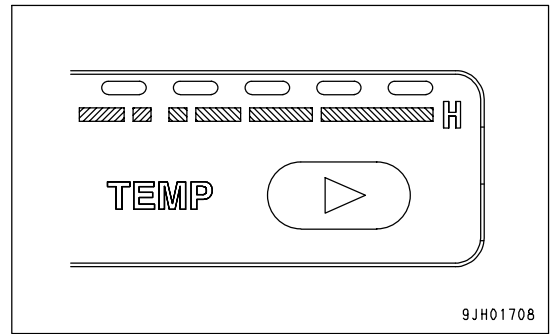


Temperature Control Switch (Heating)

Use switch (3) to increase the temperature.

Press this switch to increase the temperature of the air sent from the air conditioner.

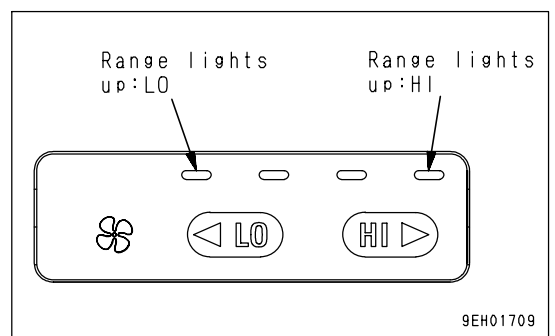
The higher the temperature becomes, the further the indicator moves into the red range.



Air Flow Selector Switch

The further it is moved into the LO range (rear of machine), the smaller the air flow becomes; the further it is moved into the HI range (front of machine), the greater the air flow becomes.

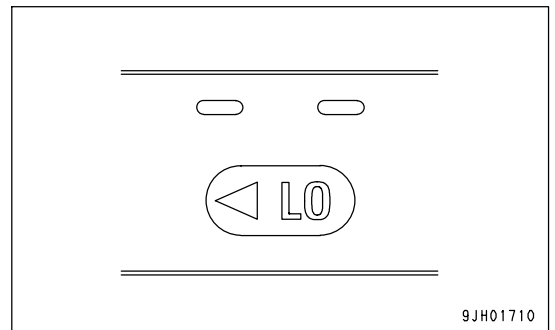
The range is divided into 4 levels.



Air Flow Selector Switch (Low)

Switch (4) is used to set the flow of air from the air conditioner to Low.

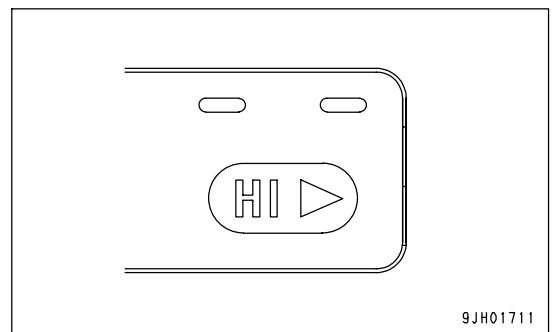
Press this switch to reduce the air flow. The further it is moved into the LO range (rear of machine), the smaller the air flow becomes.



Air Flow Selector Switch (High)

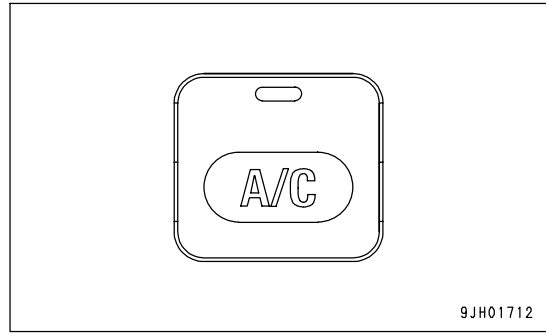
Switch (2) is used to set the flow of air from the air conditioner to High.

Press this switch to increase the air flow. The further it is moved into the HI range (front of machine), the greater the air flow becomes.



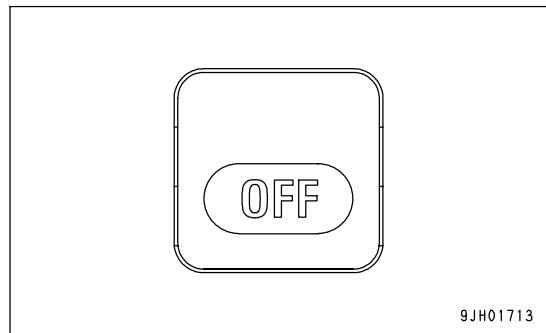
Air Conditioner Switch

Switch (5) is used to switch the air conditioner functions ON/OFF.



Off Switch

Switch (6) is used to stop operation of the fan.



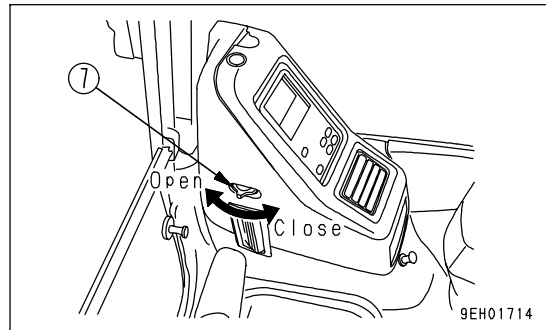
Defroster Selector Lever

Switch (7) is used to remove the mist from the front glass during cold or rainy weather.

Selector lever to front: To defroster (open)

Selector lever to rear: Closed

The defroster can be used when the vent selector switch is set to send air to the face or to the face and the feet.



Use Air Conditioner with Care

Ventilation

- If you smoke when the air conditioner is on, the smoke may start to hurt your eyes, so open the window and turn the lever to FRESH for a while to remove the smoke while continuing the cooling.

When running the air conditioner for a long time, turn the lever to the FRESH position once an hour to carry out ventilation and cooling.

Temperature Control

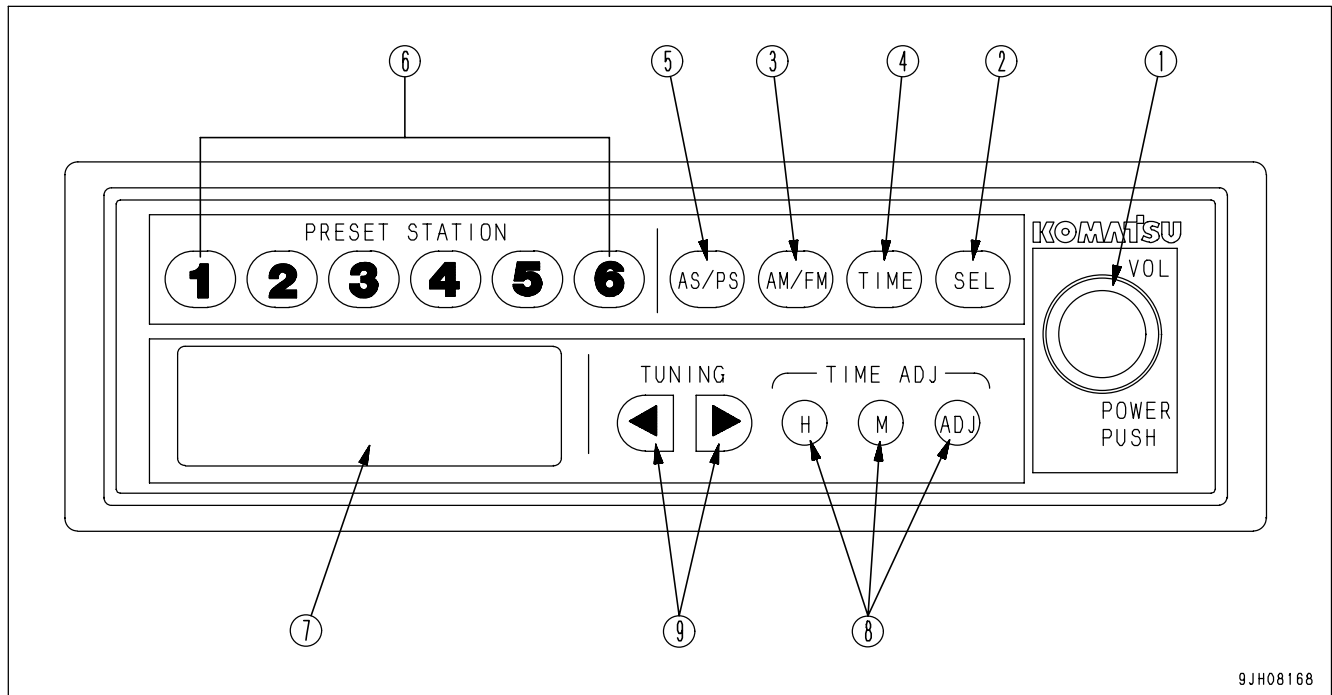
- When the air conditioner is on, set the temperature so that it feels slightly cool when entering the cab (5 to 6°C (41 to 42.8°F) lower than the outside temperature). This temperature difference is considered to be the most suitable for your health, so always be careful to adjust the temperature properly.

Air Conditioner Maintenance

When carrying out inspection of a machine equipped with an air conditioner, see the "MAINTENANCE SCHEDULE CHART (PAGE 4-14)" and carry out inspection according to the table.

RADIO

Control Panel



9JH08168

- | | |
|---|--|
| (1) Power switch, Volume control knob, Balance control knob | (5) AS/PS button |
| (2) SEL button | (6) Preset station buttons (1,2,3,4,5,6) |
| (3) FM/AM selection button | (7) Display |
| (4) Display selection button | (8) Time reset button |
| | (9) Tuning button |

Power switch, Volume control knob, Balance control knob

Press this knob (1) to turn the power for the radio on. The frequency is displayed on display (7). Press the knob again to turn the power off.

Turn the knob clockwise to increase the volume; press counterclockwise to reduce the volume. The range for the volume is VOL 0 - VOL 40.

SEL button

Each time this button (2) is pressed, the mode changes as follows: VOL (volume) → BAS (bass) → TRE (treble) → BAL (balance). The mode is displayed on display (7). For details of each mode, see "Controls of Radio (PAGE 3-56)".

FM/AM Selection Button (AM/FM)

Press this button (3) to select the desired band.

Each time the button is pressed, the band changes FM → AM → FM . . .

Display Selection Button (TIME)

On this machine, priority is given to the frequency display. When the frequency is being displayed, press button (4) and the display will show the present time for 5 seconds. After 5 seconds pass, the display returns automatically to the frequency display. If any button other than TIME ADJ (H, M, ADJ) is pressed within 5 seconds, the display returns to the frequency display. For details of the method of adjusting the time, see "Controls of Radio (PAGE 3-56)".

AS/PS button

This button (5) actuates the auto store and preset scan functions.

- Auto store
If this button is pressed for more than 2 seconds during radio reception, a search is made automatically of the 6 station settings to find an unused preset number, and that frequency is stored in the preset memory.
- Preset scan
If this button is pressed within 2 seconds, it is possible to select one of the already preset stations. Wait for 6 sec. after pressing the button and then press the button again to select the next preset station. If it is impossible to receive the preset frequency, the selection advances after 1 second to the next preset station.

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

If this button (6) has been used to decide which stations to preset, it is possible to select the desired station at a touch. It is possible to preset 6 stations each for both AM and FM.

For details of the method of presetting the stations, see "Controls of Radio (PAGE 3-56)".

Display

In this display (7), receiving band, frequency, preset No. and time are shown.

Time Reset Button

Use this button (8) when adjusting the time. For details of the method of adjusting the time, see "Controls of Radio (PAGE 3-56)".

H: Hour

M: Minute

ADJ: Sets to 00 minutes

Tuning Button (TUNING) Manual Tuning (MANUAL)

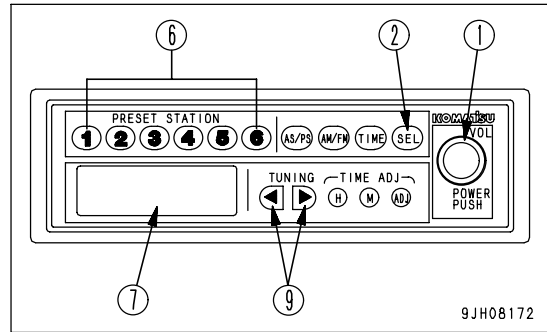
Use this button (9) to change the frequency.

For further details, see "Controls of Radio (PAGE 3-56)"

Controls of Radio

Preset Station Buttons

1. Press power switch (1) and display the frequency on display (7).
2. Use tuning button (9) to set to the desired frequency. There are two methods for tuning: auto tuning and manual tuning.
3. With the display (7) showing the desired frequency, keep the desired Preset button No pressed for at least 1.5 seconds. The reception sound will disappear, but when the presetting operation (saving to memory) is completed, the sound will appear again and the Preset No and frequency will be shown on the display to show that the presetting operation has been completed.



After completing the presetting, press Preset button (6) and release it within approx. 1.5 seconds. This will make it possible to receive the channel preset to that button. One channel each for AM and FM can be preset to each Preset button.

REMARK

It is also possible to save to the Preset button by using the auto store button.

Method of Setting with Preset Button

1. Press power switch (1) and display the frequency on display (7).
2. Use tuning button (9) to set to the desired frequency. There are two methods for tuning: auto tuning and manual tuning.

- Manual tuning

Press tuning button (9) until the frequency is displayed on display (7).

< button: Frequency moves down

> button: Frequency moves up

When the frequency reaches the top or bottom frequency, it automatically continues as follows: Top → Bottom, or Bottom → Top.

- Auto tuning

Press tuning button (9) for at least 3 seconds. When a station is picked up, the tuning automatically stops. To search for the next station, press the tuning button again for at least 3 seconds.

< button: Frequency moves down

> button: Frequency moves up

If this button is pressed during auto tuning, the auto tuning will be cancelled and the setting will return to the frequency in use before the button was pressed.

Method of Operating Mode

- (BAS) Bass adjustment button: When button (2) is pressed, BAS is displayed on display (7). If knob (1) is turned clockwise within 5 seconds, the bass sound is emphasized. If the knob is turned counterclockwise, the bass sound is reduced.
- (TRE) Treble adjustment button: When button (2) pressed, TRE is displayed on display (7). If knob (1) is turned clockwise within 5 seconds, the treble sound is emphasized. If the knob is turned counterclockwise, the treble sound is reduced.

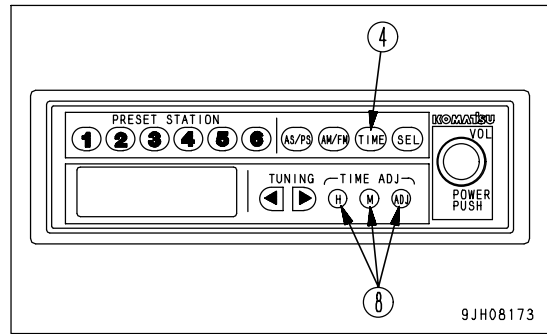
- (BAL) Balance adjustment button: When button (2) is pressed, BAL is displayed on display (7). If knob (1) is turned clockwise within 5 seconds, the sound from the right speaker is increased. If the knob is turned counterclockwise, the sound from the left speaker is increased. When it is set to BAL 0, the sound from the left and right speakers is balanced.

REMARK

With each mode, the display is returned automatically to its original setting after 5 seconds.

Setting Correct Time

1. Press display selector button (4) to display the time.
 After 5 seconds, the display will return to the frequency display and the time cannot be corrected. If this happens, press display selector button (4) again.
2. Press time adjustment button (8) to set to Hour or Minute.
 H button: Adjusts the hour (each time the button is pressed, the time advances by one hour)
 M button: Adjusts the minute (each time the button is pressed, the time advances by one minute)
 If the H or M button is kept pressed, the time will advance continuously until the button is released.
 ADJ button: When the ADJ button is pressed, the time is reset as follows.
 When display is 00 - 05 minutes, time is returned to 00 min. 00 sec. (No change in hour)
 When display is 55 - 59 minutes, time is advanced to 00 min. 00 sec. (Hour advances)
 When display is 06 - 54 minutes, time cannot be reset. (Time stays same)



Example

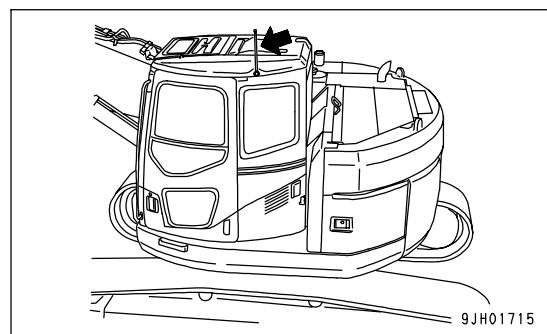
- 10:05 → 10:00
- 10:59 → 11:00
- 10:26 → 10:26

Use the H, M, and ADJ buttons to set to the correct time.

Antenna

NOTICE

Before transporting the machine or putting it inside a building, stored the antenna to prevent any interference.



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.

AUXILIARY ELECTRIC POWER

NOTICE

Do not use this as the power source for 12 V equipment.

Pull out the connector plug for taking out electric power from the rear side of the panel.

Maximum usable electric power is 85 W (24 V x 3.5 A).

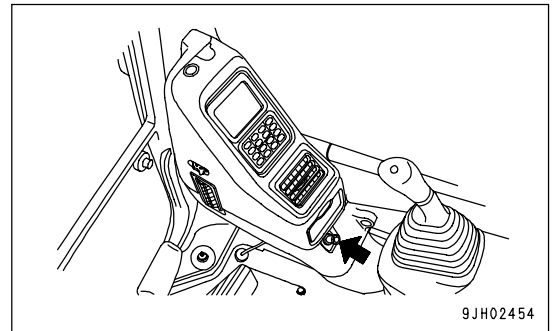
24V power source

NOTICE

Do not use this as the power source for 12 V equipment.

Pull out the connector plug for taking out electric power from the rear side of the panel.

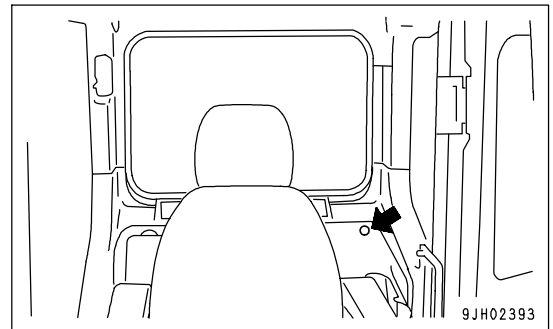
Maximum usable electric power is 85 W (24 V x 3.5 A).



12V power source

(if equipped)

This power source can be used up to a capacity of 60W (12V x 5A).



FUSE

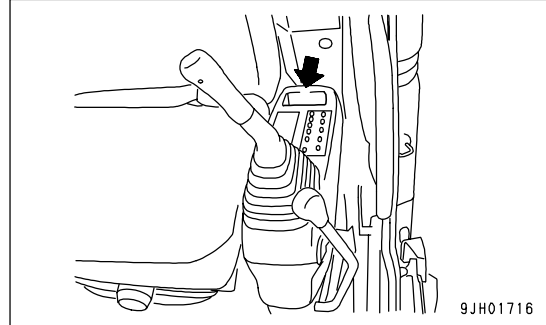
NOTICE

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

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

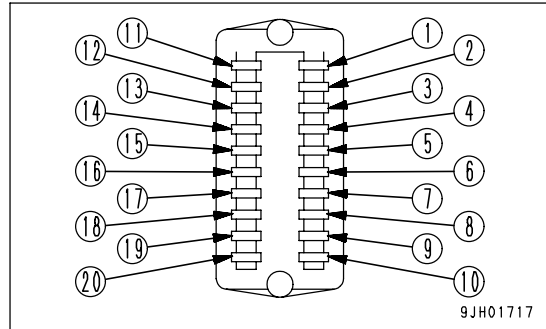
If the fuse becomes corroded, or white powder can be seen, or the fuse is loose in the fuse holder, replace the fuse.

Replace the fuse with another of the same capacity.



Fuse Capacities and Circuit Names

No.	Fuse capacity	Name of circuit
(1)	10A	Controller
(2)	20A	Electromagnetic valve
(3)	10A	PPC hydraulic lock solenoid
(4)	10A	Window washer, cigarette lighter
(5)	10A	Horn
(6)	10A	Spare
(7)	10A	Revolving lamp
(8)	10A	Optional lamp
(9)	10A	Radio, speaker, left knob switch
(10)	10A	Spare
(11)	25A	Air conditioner unit
(12)	20A	Monitor, wiper monitor
(13)	20A	Lamp, lamp relay
(14)	10A	Optional power source (1)
(15)	10A	Optional power source (2), travel alarm
(16)	10A	Radio backup, air conditioner servo
(17)	20A	Monitor (normal power source)
(18)	10A	Starting switch
(19)	10A	Room lamp
(20)	10A	Spare

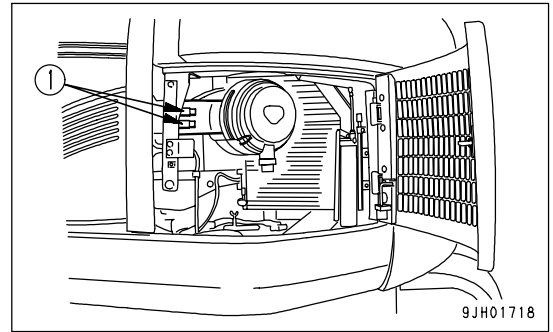


FUSIBLE LINK

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.

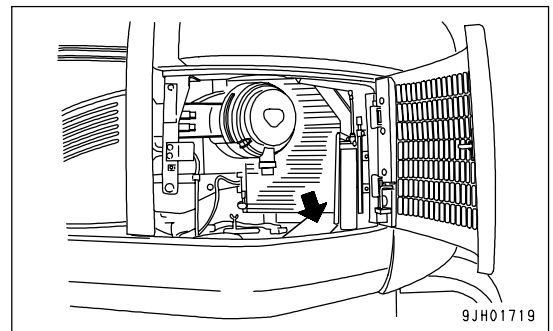
REMARK

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.



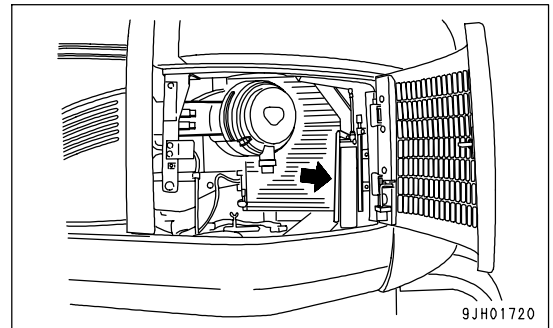
TOOL BOX

This is inside the cover at the rear left of the machine.
Keep the tools in the tool box.



GREASE GUN HOLDER

This is inside the cover at the rear left of the machine. It is next to the tool box. When the grease gun is not being used, insert it into the holder.



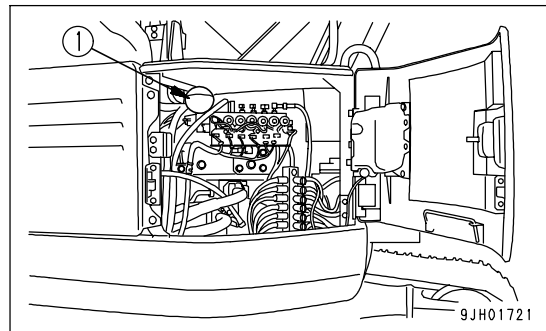
ACCUMULATOR

WARNING

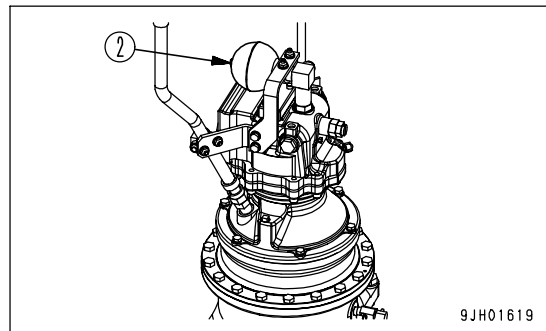
The accumulator is charged with high-pressure nitrogen gas, so mistaken operation may cause an explosion, which will lead to serious injury or damage. When handling the accumulator, always do as follows.

- The pressure in the control circuit cannot be completely removed. When removing the hydraulic equipment, do not stand in the direction that the oil spurts out when carrying out the operation.
Loosen the bolts slowly.
- Do not disassemble the accumulator.
- Do not bring it near flame or dispose of it in fire.
- Do not make holes in it or weld it.
- Do not hit it, roll it, or subject it to any impact.
- When disposing of the accumulator, the gas must be released. Please contact your Komatsu distributor to have this work carried out.

The machine is equipped with an accumulator (1) in the control circuit. The accumulator in the control circuit is a device to store pressure, and when this accumulator is installed, it is possible to operate the control circuit for a short time even after the engine is stopped. Therefore, it is possible to lower the work equipment under its own weight by operating the control lever in the direction to lower the work equipment.



Accumulator (2) is a device to store the pressure in the valve return circuit. It is installed to protect the valve return circuit when the work equipment is suddenly operated.



Releasing Hydraulic Pressure with Accumulator

1. Lower the work equipment to the ground.
2. Stop the engine.
3. Turn the key in the starting switch to the ON position.
4. Move lock lever to the free position. Move the work equipment control lever and attachment control pedal to full strokes back and forth, right and left to release pressure in the control circuit.
5. Set the lock lever to the LOCK position to lock the control levers and attachment control pedal. Note that the pressure is not completely removed, so when removing accumulator (1) in the control circuit and accumulator (2) in the valve return circuit, loosen the bolts slowly and do not stand in the direction where oil spurts out.

MACHINE OPERATIONS AND CONTROLS

BEFORE STARTING ENGINE

Walk-around Checks

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



WARNING

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

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

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

1. Check for damage, wear, play in work equipment, cylinders, linkage, hoses
Check for cracks, excessive wear, play in work equipment, cylinders, linkage, and hoses. If any problem is found, repair it.
2. Remove dirt and debris from around the engine, battery, and radiator.
Check for dirt accumulated around the engine and radiator. Also check for flammable material (dry leaves, twigs, etc.) around the battery, engine muffler, turbocharger, or other high temperature engine parts. If any dirt or flammable materials are found, remove them.
3. Check for coolant and oil leakage around the engine
Check for oil leakage from the engine and coolant leaks from the cooling system. If any problem is found, repair it.
4. Check for oil leakage from hydraulic equipment, hydraulic tank, hoses, and joints
Check for oil leakage. If any problem is found, repair the area where oil is leaking.
5. Check the undercarriage (track, sprocket, idler, guard) for damage, wear, loose bolts, or leakage of oil from rollers.
If any problem is found, repair it.
6. Check for problems in handrails, steps, loose bolts.
If any problem is found, repair it. Tighten any loose bolts.
7. Check for problems in gauges and monitor
Check that there is no problem in the gauges and monitor in the operator's cab. If any problem is found, replace the parts. Clean off any dirt on the surface.
8. Checking window for damage and displacement
Check the window for any damage or displacement. If it is found broken or displaced, repair it. In particular, repairs must be made immediately, once stopping the machine, if the window is broken or displaced during operation. Do not attempt to continue to operate the machine without repair.

9. Checking and cleaning rear view mirror

Check the rear view mirror for any abnormality, and replace it with new one, if it is damaged. Keep the mirror surface clean and adjust the angle so that the lower part of the machine at the rear (a portion whose view is blocked by the engine hood) can be seen from the operator's seat.

10. Seat belt and mounting clamps

Check for damage or wear to the seat belt and mounting clamps. If there is any damage, replace with new parts.

11. Check bucket with hook (if equipped) for damage.

Check for damage to the hook, guide, and hook mount. If any problem is found, contact your Komatsu distributor for repairs.

Checks Before Starting

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

Check Coolant Level, Add Coolant



WARNING

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

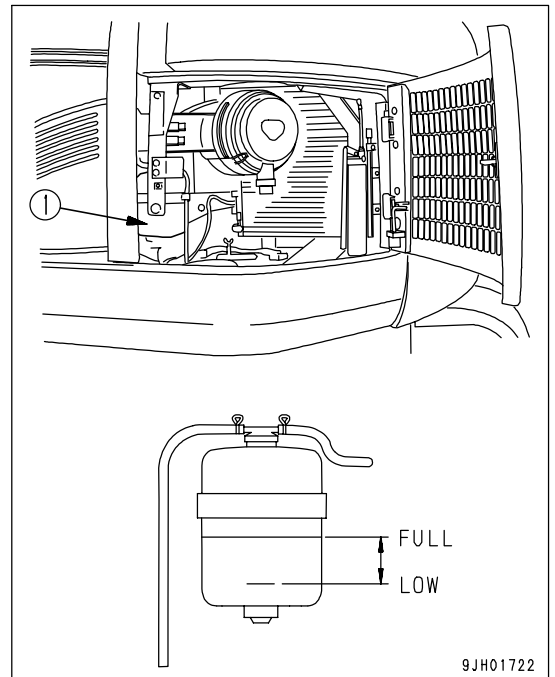
1. Open the rear cover (1) at the right side of the machine and check that the cooling water level is between the FULL and LOW marks on radiator reserve tank (1) (shown in the diagram on the right).

If the water level is low, add water through the water filler of reserve tank (1) to the FULL level.

2. After adding coolant, tighten the cap securely.

NOTICE

If the sub-tank is empty, there is probably leakage of water. After checking, repair any problem immediately. If no problem is found, check the level of the water in the radiator. If it is low, add water to the radiator, then add water to the sub-tank.



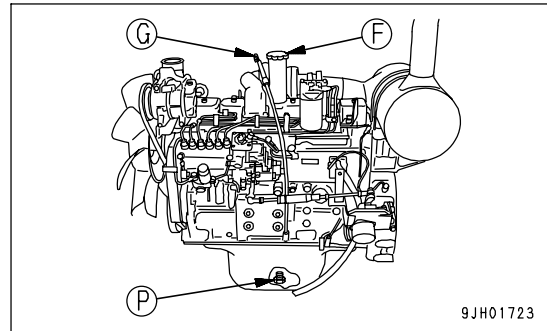
Check Oil Level in Engine Oil Pan, Add Oil



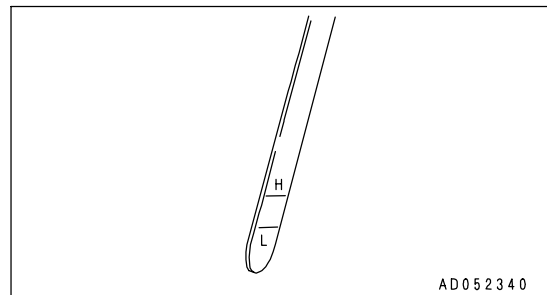
WARNING

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

1. Open the engine hood on the machine.
2. Remove dipstick (G), and wipe the oil off with a cloth.
3. Fully insert dipstick (G) into filler pipe (F), then remove it.



4. The oil level should be between the H and L marks on dipstick (G).
If the oil level is below the L mark, add engine oil through oil filler (F).
5. If the engine oil level is higher than the H mark, drain the excess through drain plug (P), and check the level again.
6. If oil level is correct, securely tighten the oil filler cap 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.

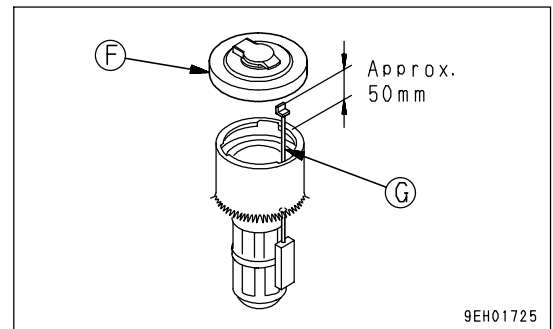
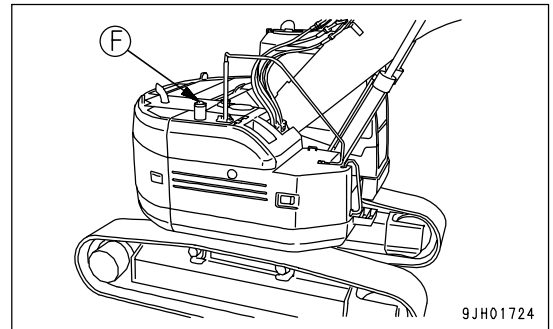
If the machine is at an angle, make it to a horizontal position before checking.

Check Fuel Level, Add Fuel

**WARNING**

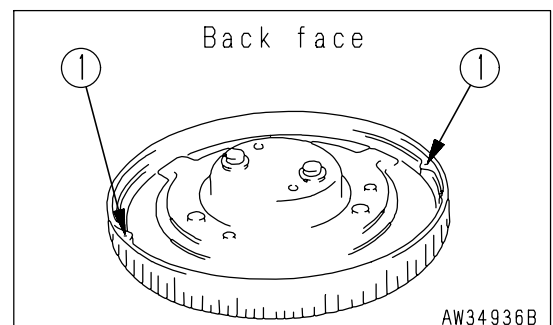
When adding fuel, never let the fuel overflow. This may cause a fire. If any fuel is spilled, wipe it up completely. Never bring flames near fuel because it is highly flammable and dangerous.

1. Open fuel filler cap (F) of the fuel tank.
2. When fuel filler cap (F) is opened, float gauge (G) moves up in accordance with the amount of fuel.
Check if the fuel tank is full. When checking, use float gauge (G) and also check visually.
3. If the fuel tank is not full, add fuel through the fuel filler until float gauge (G) rises to the maximum position.
Fuel tank capacity: 320 liters (84.48 US gal)
Position of tip of float gauge (G) when tank is full:
Approx. 50 mm (2 in) from top surface of fuel tank.
4. After adding fuel, push float gauge (G) straight down with fuel filler cap (F). Be careful not to get float gauge (G) caught in the tab of fuel filler cap (F), and tighten fuel filler cap (F) securely.

**REMARK**

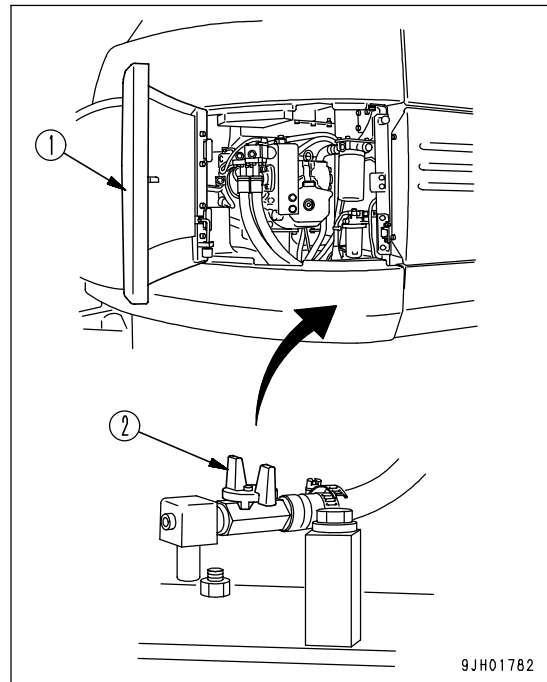
If breather hole (1) on the cap is clogged, the pressure in the tank will drop and fuel will not flow.

Clean the hole from time to time.



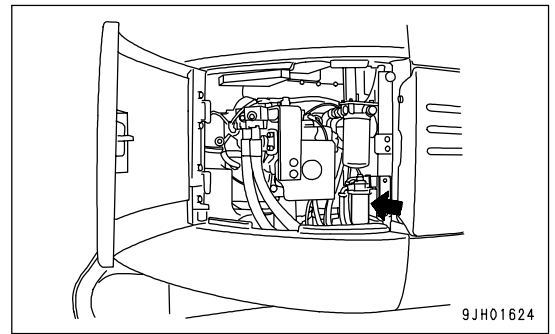
Drain Water And Sediment from Fuel Tank

1. Open the pump room door (1) at the rear right of the machine.
2. Put a container to catch the drained fuel under drain valve (2).
3. Open drain valve (2) at the rear of the fuel tank and drain the water and sediment accumulated at the bottom of the tank together with the fuel.
4. When only clean fuel comes out, close drain valve (2).
5. Close the pump room door (1) at the rear right of the machine.

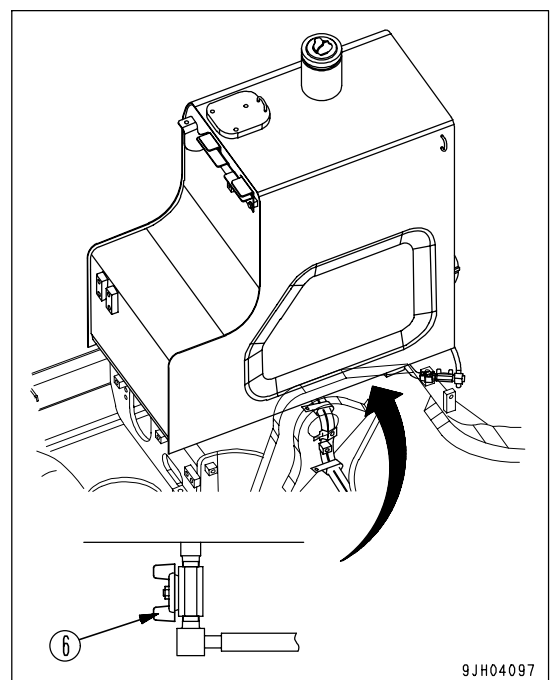
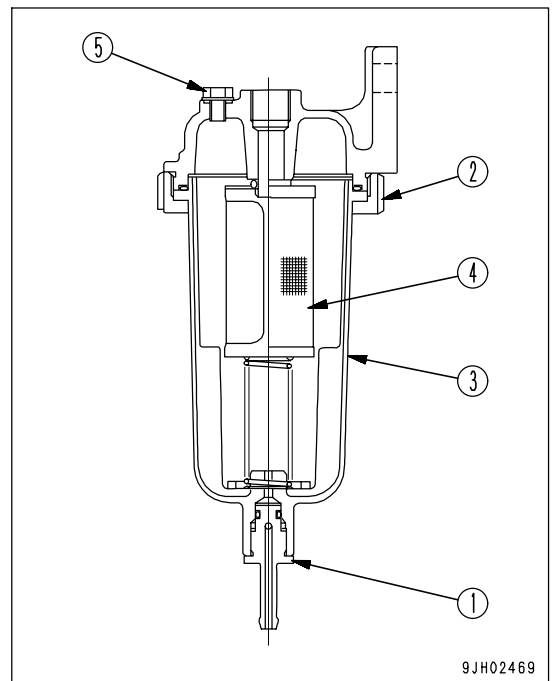


Check for Water and Sediment in Water Separator, Drain Water

1. Open the cover at the rear right of the machine.
2. Inspect the water separator, and check if the ring inside has risen to the marked line.
3. If the ring has risen to the marked line, carry out the procedure from Step 4.



4. Prepare a container to catch the drained fuel and set it under the water separator.
 5. Close fuel valve (6) at the bottom of the fuel tank.
 6. Remove air bleed plug (5) at the top of the water separator.
 7. Loosen drain valve (1) at the bottom of the water separator, and drain the water and sediment into the container.
 8. Loosen ring nut (2), then remove filter case (3).
 9. Remove element (4) from the separator base.
 10. Wash element (4) and filter case (3) in clean diesel oil.
 11. Check element (4) and replace it if it is damaged.
 12. When installing element (4), perform Steps 5 and 9 in the opposite order.
- Tightening torque of ring nut (2):
 $40 \pm 3 \text{ N}\cdot\text{m}$ ($4.1 \pm 0.3 \text{ kgf}\cdot\text{m}$, $29.7 \pm 2.2 \text{ lbf}\cdot\text{ft}$)
13. Loosen air bleed plug (5) then Fill filter case (3) with fuel. When the fuel comes out from air bleed plug (5), tighten air bleed plug (5).

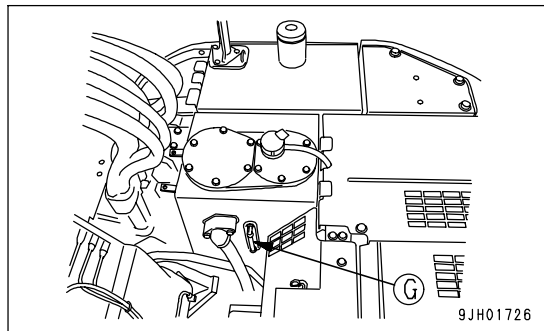
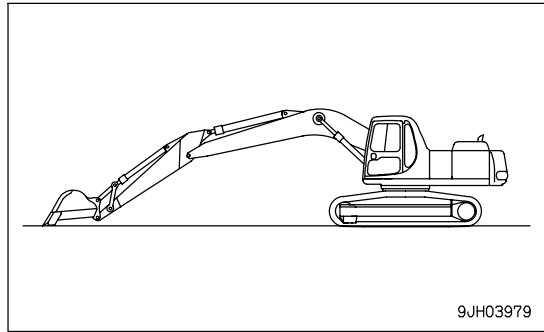


Check Oil Level in Hydraulic Tank, Add Oil

! WARNING

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

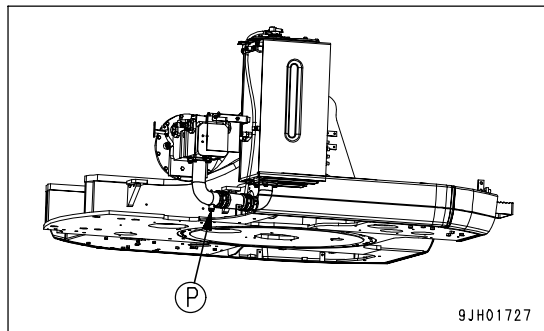
1. If the work equipment is not in the condition shown in the diagram on the right, start the engine, run the engine at low speed, retract the arm and bucket cylinder rods fully, then lower the boom, set the bucket teeth in contact with the ground, and stop the engine.
2. Turn the starting switch to the ON position.
3. Within 15 seconds after stopping the engine, move each control lever (for work equipment and travel) to the full stroke in all directions to release the internal pressure.
4. Check sight gauge (G) from the right window installed to the operator's compartment. 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).

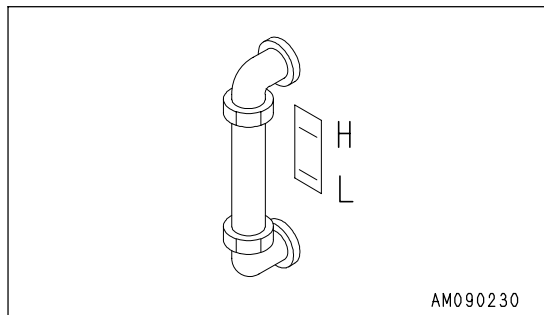
5. If the level is below the L mark, add oil through oil filler (F) at the top of the hydraulic tank.



REMARK

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

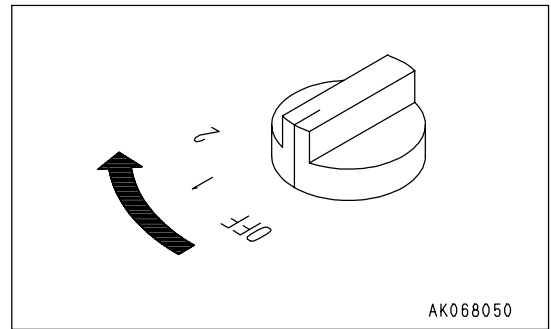
- Before starting operation: Between H and L levels (Oil temperature 10 to 30°C (50 to 86°F))
- Normal operation: around H level (Oil temperature 50 to 80°C (122 to 176°F))



Check Working Lamp Switch

Turn the lamp switch to the ON position and check that the working lamp light up.

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

**Check Electric Wiring****WARNING**

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

Check that there is no damage to the fuses; that fuses of the specified capacity are used; that there is no disconnection or trace of short-circuiting in the electric wiring and no damage to the covering. Check also that there is no loosened terminals. If any, tighten them.

Moreover, pay particular attention to the electric wiring when checking the battery, engine starting motor and alternator.

Be sure to check that there is no inflammable material accumulated around the battery. If present, remove it as soon as possible.

Check Function of Horn

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, contact your Komatsu distributor for repair.

Adjustment

Seat Adjustment



WARNING

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

- Always adjust the operator's seat before starting each operation or when the operators change shift.
- Adjust the operator's seat so control levers and switches can be operated freely and easily with the operator's back against the backrest.

(A) Fore-and-aft adjustment

Pull up lever (1). After the seat is set to the desired position, release the lever.

Adjustable distance: 100 mm (3.3 in) in 10 steps

(B) Adjusting reclining

REMARK

The seat can be reclined to a large angle when the seat is pushed fully forward, but the reclining angle is reduced when the seat is moved back, so when moving the seat to the rear, return the seat back to its original position.

Pull up lever (2) and set the backrest to a position that is comfortable for operation, then release the lever.

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

(C) Adjusting seat tilt

- Forward tilt

Push lever (3) down to adjust the angle of the front of the seat. (4 stages)

- To raise the angle at the front of the seat, keep the lever pushed down and apply your weight to the rear of the seat.
- To lower the angle at the front of the seat, keep the lever pushed down and apply your weight to the front of the seat.

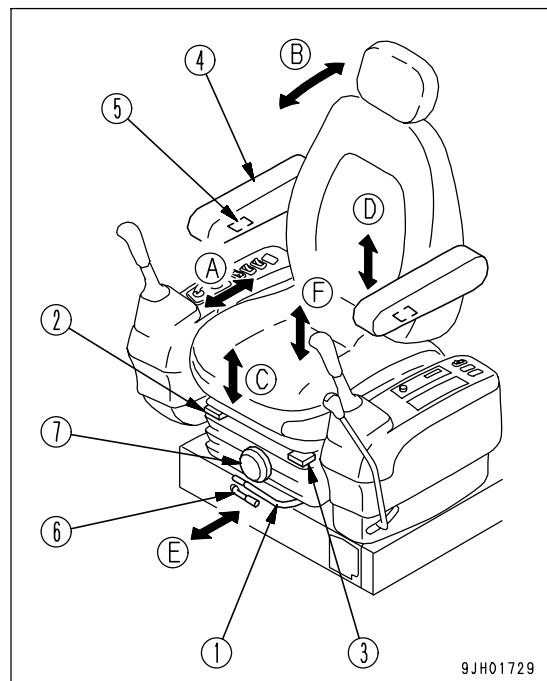
- Rear tilt

Pull lever (3) up to adjust the angle of the rear of the seat. (4 stages)

- To raise the angle at the rear of the seat, keep the lever(3) pulled up and stand up slightly to remove your weight from the seat.
- To lower the angle at the rear of the seat, keep the lever(3) pulled up and apply your weight to the rear of the seat.

Amount of tilt: Up 13°, down 13°

- Adjusting seat height



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It is possible to move the seat up or down by combining adjustments forward tilt and rear tilt.

After setting the forward tilt or rear tilt to the desired height, operate the opposite part to set the seat horizontal then secure in position.

Height adjustment: 60 mm (2.4 in)

(D) Adjusting armrest angle

Armrest (4) can be made to spring up by hand approx. 90°.

In addition, by turning the bottom (5) of the armrest by hand it is possible to make fine vertical adjustments of the armrest angle.

Armrest adjustment angle: 25°.

REMARK

- If the seat back is tipped to the front without raising the armrest(4), armrest will rise automatically.
- If the cable at the rear of armrest (4) is tense (when the seat back is tipped to the front), armrest (4) cannot be adjusted by turning bottom (5). When adjusting the angle of armrest (4), set the seat back to a position where it is easy to carry out operations, then adjust the armrest.

(E) Overall fore-and-aft adjustment of seat

Pull up lever(6), set to the desired position, then release the lever(6). In this case, the operator seat, left and right control levers, and lock lever all slide together.

Fore-and-aft adjustment: 120 mm (4.8 in)

(F) Adjusting suspension (if equipped)

Turn knob (7) to the right to make the suspension harder, or to the left to make the suspension softer. Adjust the reading of the dial to match the operator's weight and select the optimum suspension.

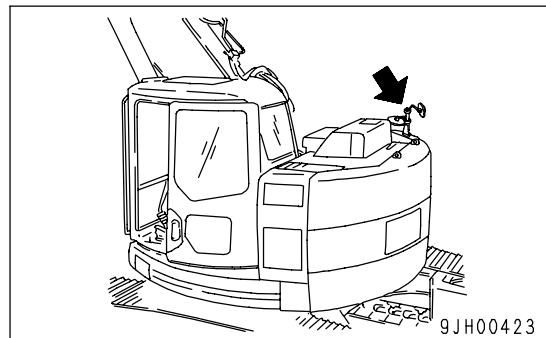
REMARK

To obtain the optimum adjustment, turn the knob so that the indicator of the weight display (kg) in the transparent portion of knob (7) is the same as the operator's weight.

Rearview Mirrors**NOTICE**

Depending on the direction that the mirror is facing, it may extend outside the swing radius (approx.100 mm (3.9 in)).

Sit in the operator's seat and adjust the mirror so that it is possible to see the right side of the counterweight.



Seat Belt



WARNING

- Before fitting the seat belt, check that there is no problem in the belt mount bracket or mounting belt. If it is worn or damaged, replace the seat belt.
- Even if no problem 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.
- Always wear the seat belt during operations.
- Fit the seat belt so that it is not twisted.

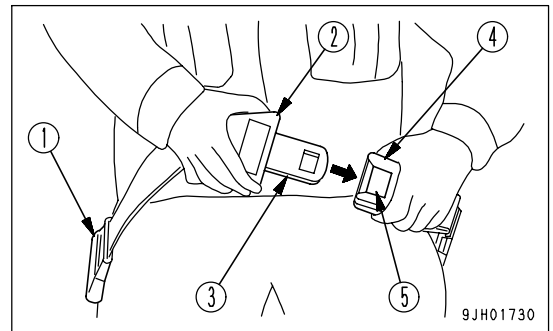
Fastening and Removing

This seat belt has a wind-in device, so it is not necessary to adjust the length.

Fastening Seat Belt

Hold grip (2) and pull the belt out from wind-in device (1), check that the belt is not twisted, then insert tongue (3) into buckle (4) securely.

When doing this, pull the belt lightly to check that it is properly locked.



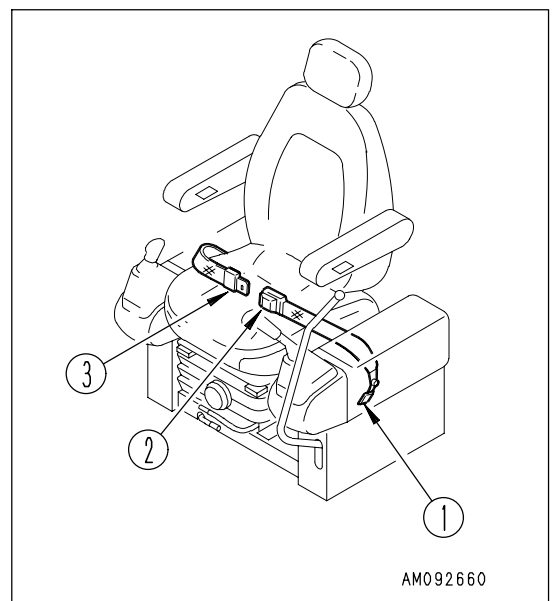
Removing Belt

Press button (5) in buckle (4), and remove tongue (3) from buckle (4).

The belt is automatically wound in, hold grip (2) and return the belt slowly to wind-in device (1).

REMARK

For machines with a suspension seat, adjust the position of the seat, then adjust tether belt (1). Install the tether belt so that it is tensed when no one is sitting in the seat. (Only machines equipped with suspension seat)



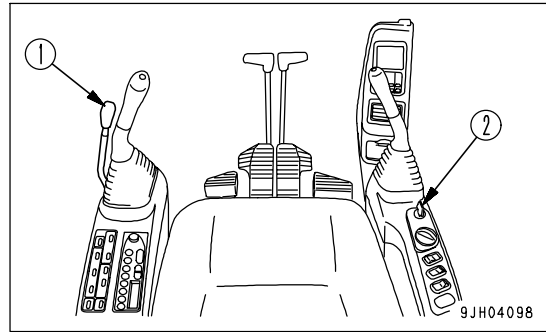
Operations Before Starting Engine



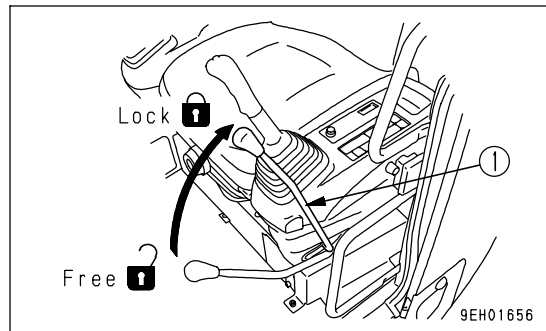
WARNING

- When starting the engine, check that the lock lever is securely at the LOCK position.

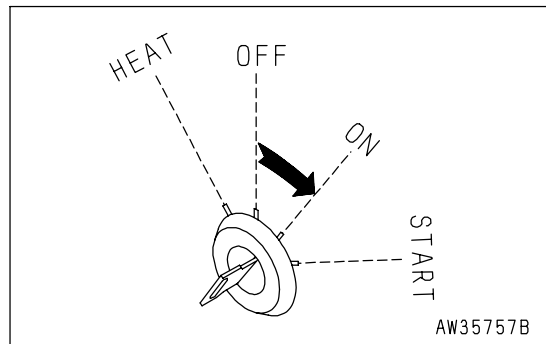
If the control levers are not locked and they are touched by accident when starting the engine, the work equipment may move unexpectedly, and this may lead to a serious accident.



1. Check that lock lever (1) is at the LOCK position.
2. Check the position of each lever.
Set the control lever to the neutral position.
When starting the engine, never touch the knob button.



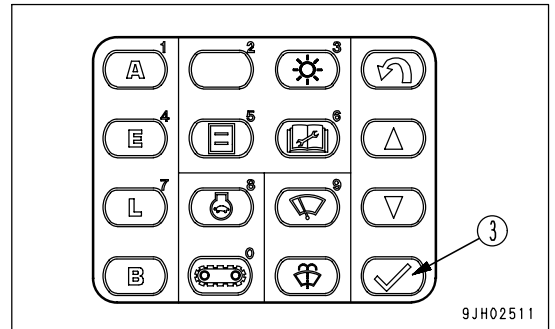
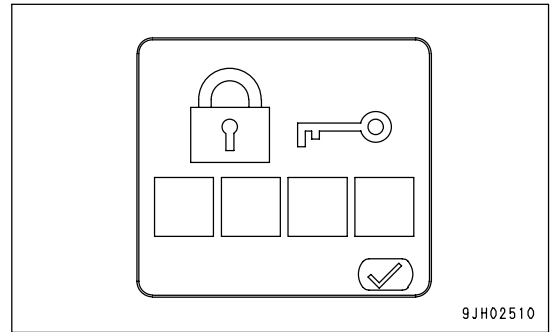
3. Insert the key in starting switch (2), turn the key to the ON position, then carry out the following checks.



- If a password has been set, the input display screen is shown on the monitor screen.
After inputting the password, press input confirmation switch (3).

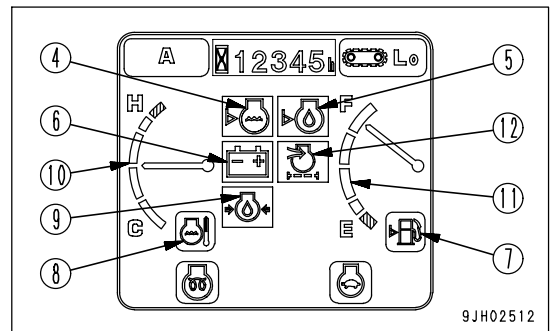
REMARK

For details of the method of setting, changing, or canceling the password, see "PROCEDURE FOR SETTING, CHANGING, OR CHANCELING PASSWORD".



1) The buzzer sounds for approx. 1 second, and the following monitors and meters light up for approx. 3 seconds.

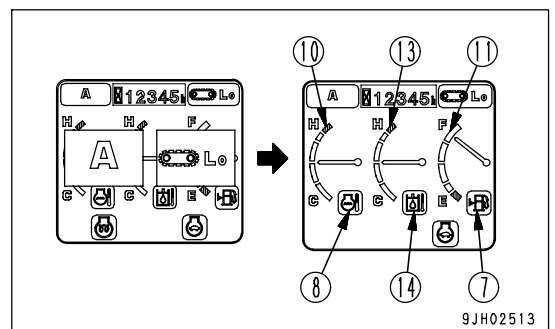
- Radiator coolant level monitor (4)
- Engine oil level monitor (5)
- Charge level monitor (6)
- Fuel level monitor (7)
- Engine coolant temperature monitor (8)
- Engine oil pressure monitor (9)
- Engine coolant temperature gauge (10)
- Fuel gauge (11)
- Air cleaner clogging monitor (12)



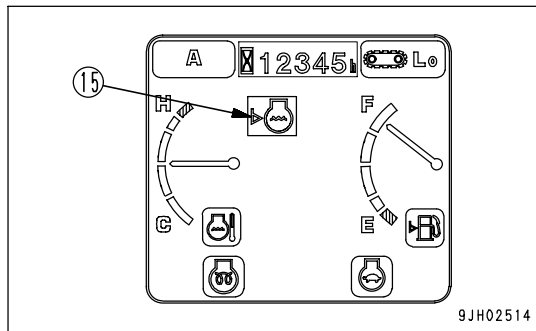
If the monitors do not light up or the buzzer does not sound, there is probably a failure in the monitor, so contact your Komatsu distributor for repairs.

2) After approx. 3 seconds, the screen switches to the working mode/travel speed display monitor. Then it switches to the normal screen.

- Fuel level monitor (7)
- Engine coolant temperature monitor (8)
- Engine coolant temperature gauge (10)
- Fuel gauge (11)
- Hydraulic oil temperature gauge (13)
- Hydraulic oil temperature monitor (14)

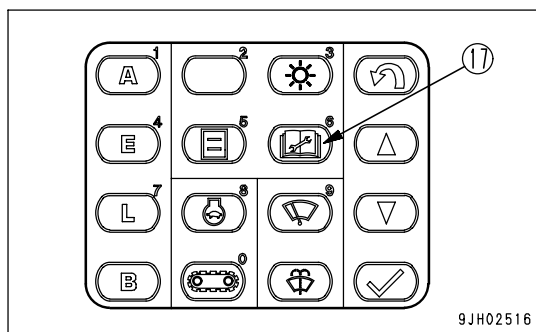
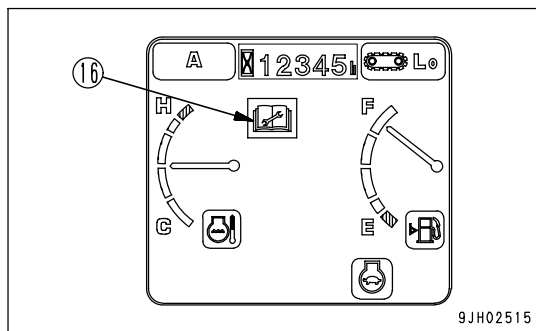


3) If the hydraulic oil temperature gauge goes out and caution lamp (15) stays lighted up red, perform inspection immediately for the item which is lighted up red.



4) If there are any items where the maintenance time has passed, maintenance interval monitor (16) lights up for 30 seconds. Press maintenance switch (17), check the item, then perform maintenance immediately.

For details of the method of checking the maintenance interval, see "Maintenance Switch (PAGE 3-22)" in the Detailed controls and gauges.



STARTING ENGINE

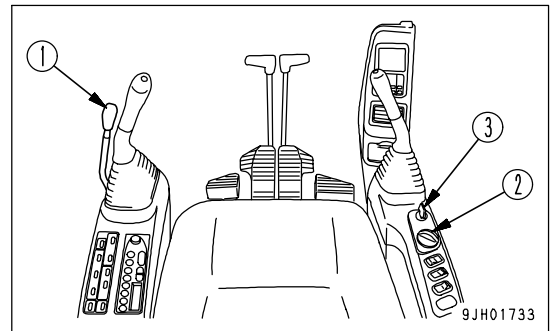
Normal Starting

WARNING

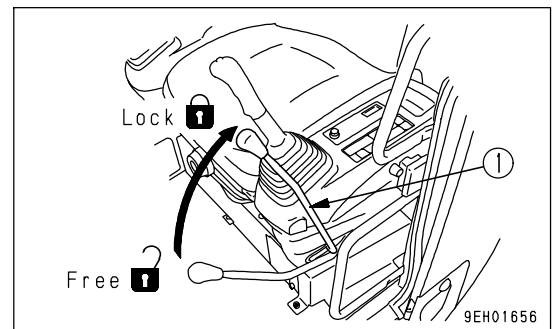
- Sit down in the operator's seat before starting the engine.
- Do not attempt to start the engine by short-circuiting the engine starting circuit. Such an act may cause serious bodily injury or fire.
- Check that there are no persons or obstacles in the surrounding area, then sound the horn and start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

NOTICE

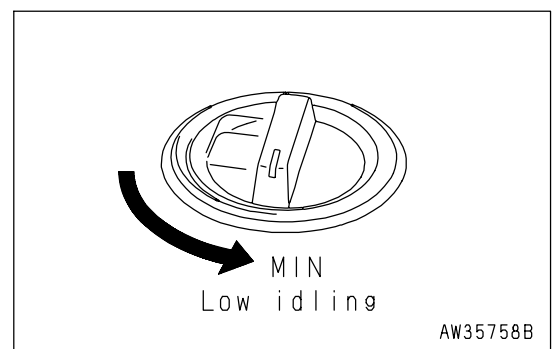
- Before starting the engine, check that the fuel control dial is at the low idle (MIN) position.
If the fuel control dial is at the FULL position, the engine will accelerate suddenly and cause damage to the engine parts.
- Do not crank the starting motor continuously for more than 20 seconds.
If the engine does not start, wait for at least 2 minutes before trying again.



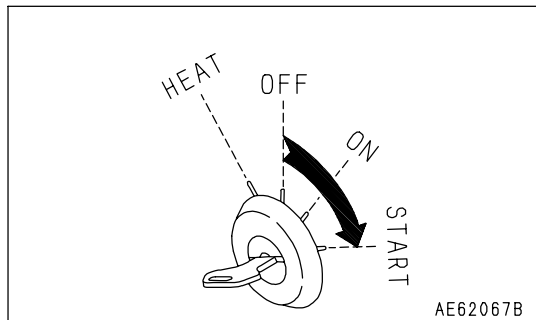
1. Check the lock lever (1) is at the LOCK position. If the lock lever is in the FREE position, the engine does not start.



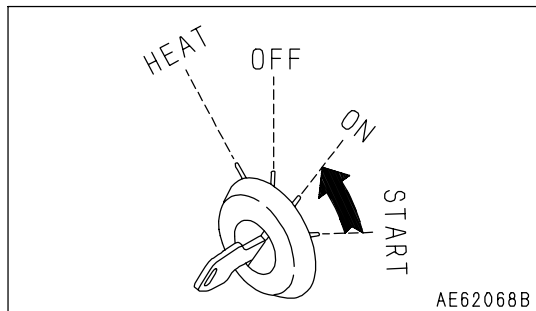
2. Set fuel control dial (2) at the low idle (MIN) position.
If it is at the high idle (MAX) position, always change it to the low idle (MIN) position.



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



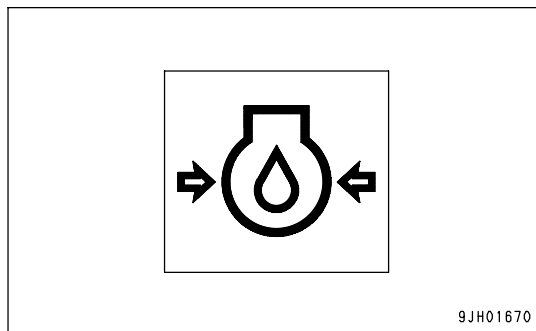
4. When the engine starts, release the key in starting switch (3). The key will return automatically to the ON position.



5. Even after the engine is started, do not touch the work equipment control levers and the travel pedals, while the engine hydraulic pressure monitor lamp is still lighted.

NOTICE

If the engine oil pressure monitor does not go out even after 4 to 5 seconds have passed, stop the engine immediately. Check the oil level, check for leakage of oil, and take the necessary action.



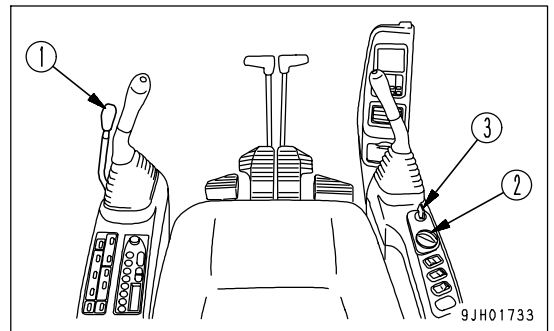
Starting Engine in Cold Weather

! 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.

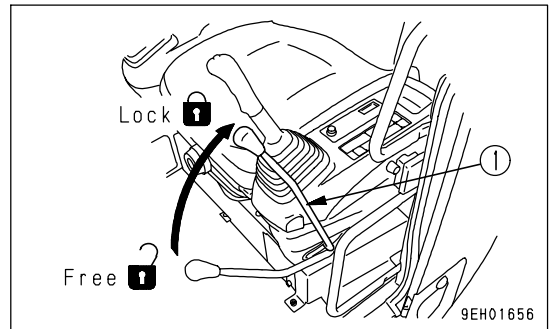
NOTICE

- Before starting the engine, check that fuel control dial (2) is at the low idle (MIN) position.
If the fuel control dial is at the FULL position, the engine will accelerate suddenly and cause damage to the engine parts, set it to an intermediate or low speed position.
- 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.

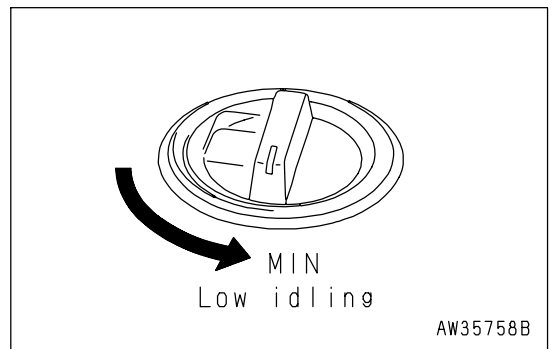


When starting in low temperatures, do as follows.

1. Check the lock lever (1) is at the LOCK position. If the lock lever is in the FREE position, the engine does not start.



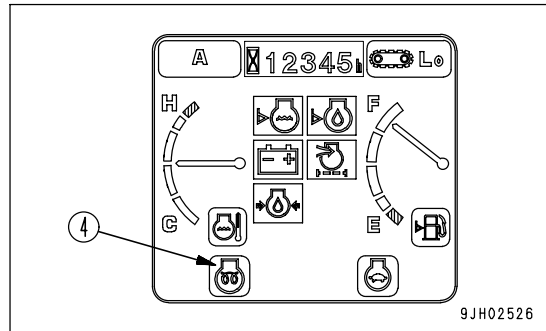
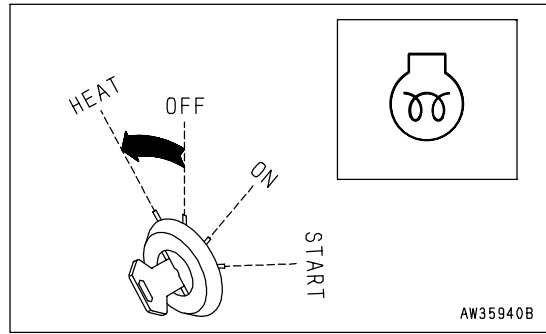
2. Set fuel control dial (2) at a low idle (MIN) position.
Do not set fuel control dial (2) at the high idle (MAX) position.



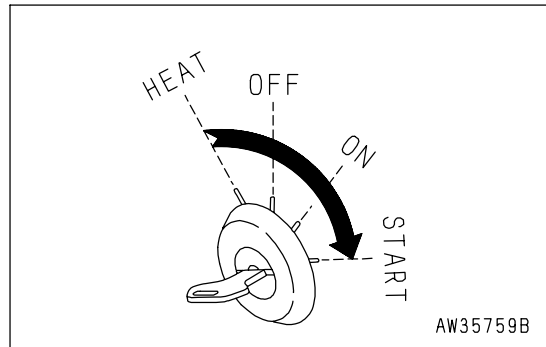
3. Hold the key in starting switch (3) at the HEAT position, and check that pre-heating monitor (4) lights up.
After about 18 seconds, pre-heating monitor (4) will go off to indicate that pre-heating is finished.

REMARK

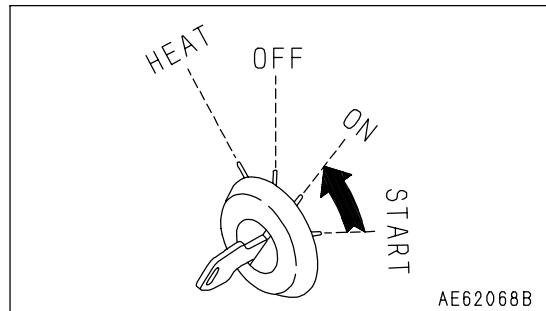
- The monitors and gauges will light up also when the key is turned to the HEAT position, but this is not a problem.
- If the temperature is low, the monitor screen may become dark or it may take time for the display to appear, but this is not a problem.



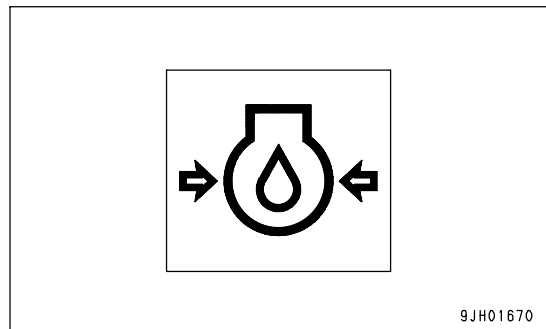
4. When preheating monitor (4) goes out, turn the key in starting switch (3) to the START position to start the engine.



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



6. After starting the engine, do not touch the work equipment control lever or travel pedal while the engine oil pressure monitor lamp is lighted up.



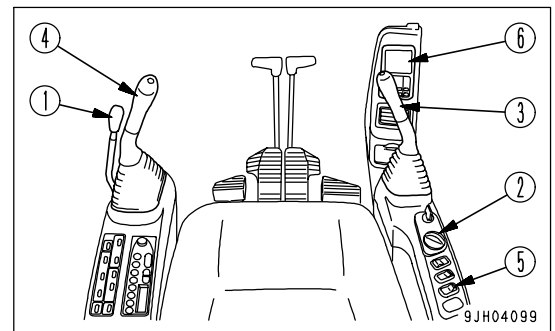
AFTER STARTING ENGINE

**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.

Warming-up Operation**NOTICE**

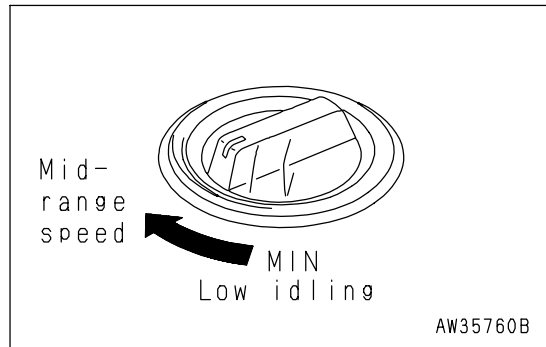
- When the hydraulic oil is at a low temperature, do not perform operations or move the levers suddenly. Always perform the warming-up operation. This will help extend the machine life.
Do not suddenly accelerate the engine before the warming-up operation is completed.
- Do not run the engine at low or high idle continuously for more than 20 minutes. This will cause oil leaks from the turbocharger oil supply piping. If it is necessary to run the engine at idle, apply a load from time to time or run the engine at a mid-range speed.

**REMARK**

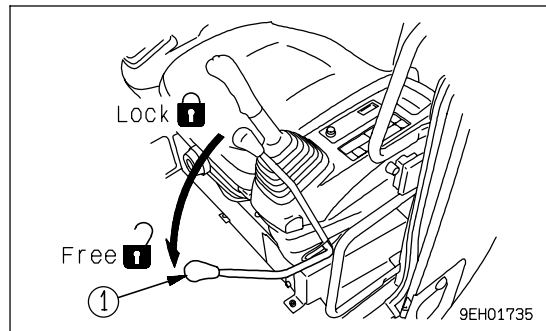
- If the engine coolant temperature is above 30°C (86°F), to protect the turbocharger, the engine speed does not rise for 2 seconds after starting, even if the fuel control dial is turned.
- If the hydraulic oil temperature is low, the hydraulic oil temperature monitor display will be white.

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

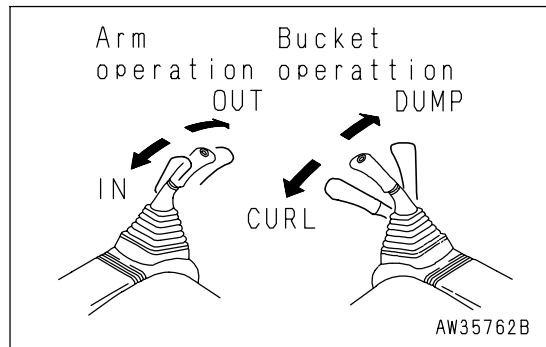
1. Set fuel control dial (2) to a point midway between low idling (MIN) and full throttle (MAX), and run the engine at a mid-range speed under no load until the engine water temperature monitor enters the green display.



2. Set lock lever (1) to the FREE position and raise the bucket from the ground.



3. Operate bucket control lever (3) and arm control lever (4) slowly to move the bucket cylinder and arm cylinder to the end of the stroke.
4. Operate the bucket for 30 seconds and the arm for 30 seconds in turn fully for 5 minutes.

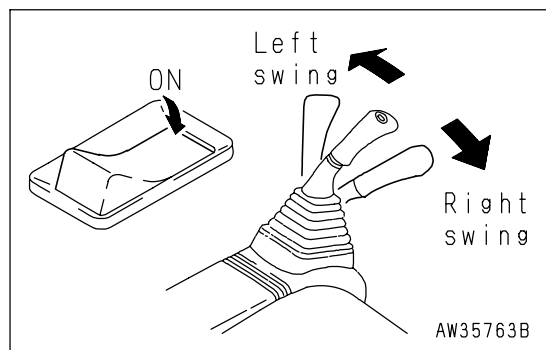


REMARK

If swing lock switch (5) is operated to the ON position, it is possible to raise the oil temperature faster.

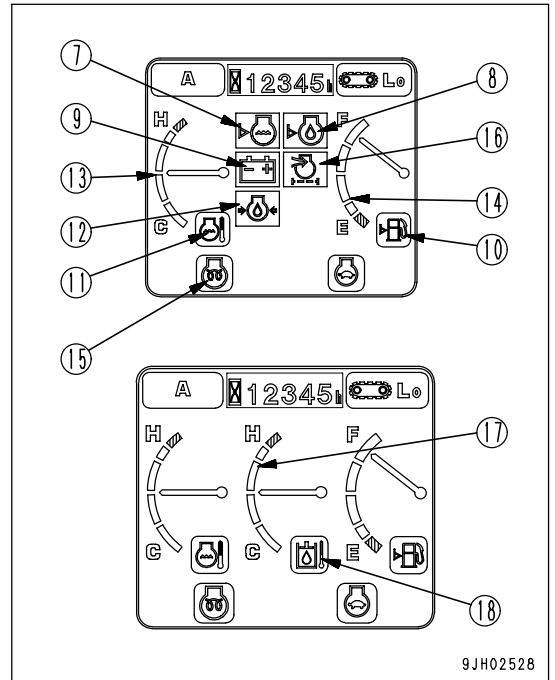
NOTICE

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



5. After performing the warming-up operation, check and be sure all the gauges on machine monitor (6) and the caution lamps are in the following conditions:

- Radiator coolant level monitor (7): OFF
- Engine oil level monitor (8): OFF
- Charge level monitor (9): OFF
- Fuel level monitor (10): Green display
- Engine coolant temperature monitor (11): Green display
- Engine oil pressure monitor (12): OFF
- Engine coolant temperature gauge (13): Indicator in black range
- Fuel gauge (14): Indicator in black range
- Engine pre-heating monitor (15): OFF
- Air cleaner clogging monitor (16): OFF
- Hydraulic oil temperature gauge (17): Indicator in black range
- Hydraulic oil temperature monitor (18): Green display

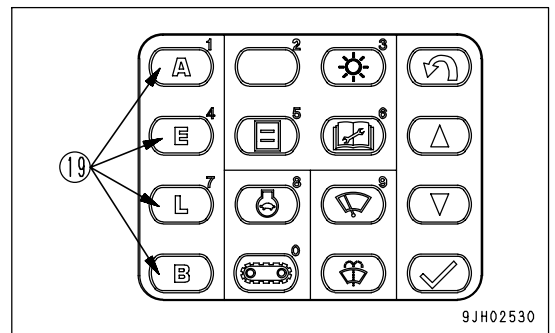


6. Check for abnormal exhaust gas color, noise, or vibration. If any problem is found, contact your Komatsu distributor.

7. If air cleaner clogging monitor (16) lights up, clean or replace the element immediately.

For details of the method of cleaning the element, see "CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT (PAGE 4-18)".

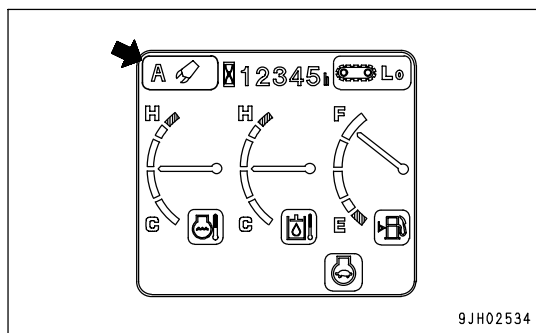
8. Use working mode selector switch (19) on machine monitor (6) to select the working mode to be used.



Working mode monitor display

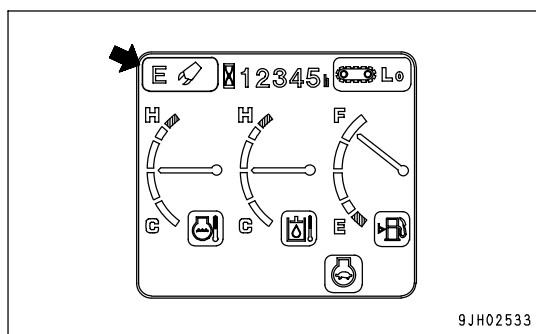
1) A mode

For heavy-load operations



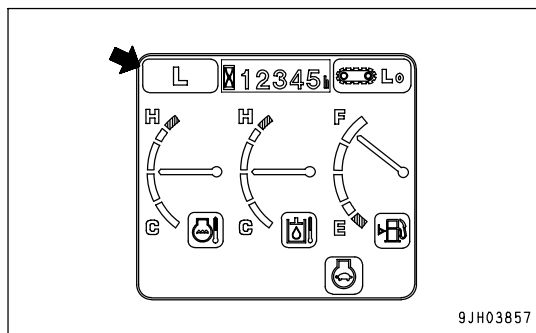
2) E mode

For operations with emphasis on fuel economy



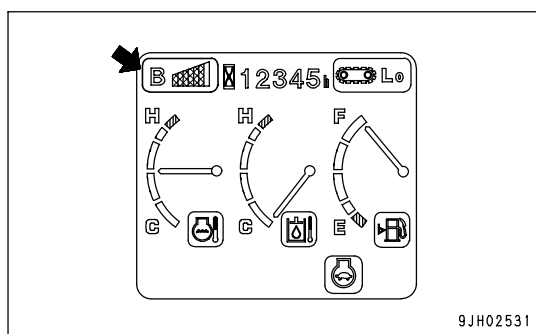
3) L mode

For fine-control operations



4) B mode

For breaker operations



In Cold Weather Areas

(AUTOMATIC WARMING-UP OPERATION)

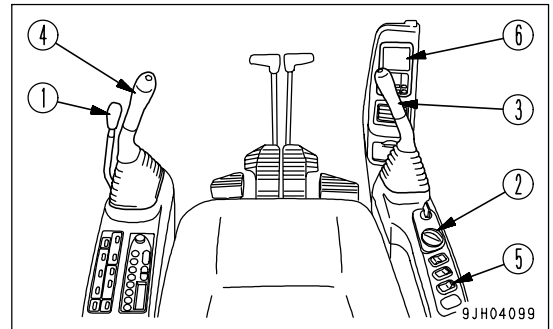
This machine is equipped with an automatic warming-up device.

When the engine is started, if the engine coolant temperature is low (below 30 °C (86 °F)), the warming-up operation is carried out automatically.

The automatic warming-up operation is canceled if the engine coolant temperature reaches the specified temperature (30 °C (86 °F)) or if the warming-up operation is continued for 10 minutes. If the engine coolant temperature or hydraulic oil temperature are low after the automatic warming-up operation, warm the engine up further as follows.

NOTICE

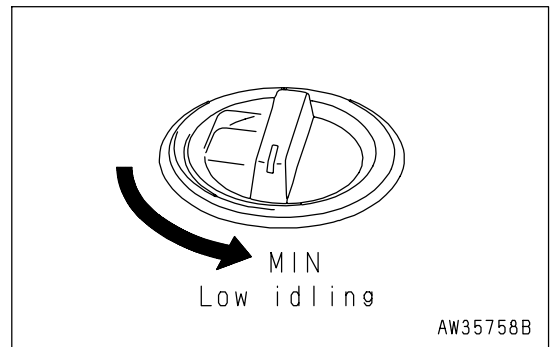
- Do not suddenly accelerate the engine before the warming-up operation is completed.
Do not run the engine at low or high idling continuously for more than 20 minutes. This will cause oil leaks from the turbocharger oil supply piping. If it is necessary to run the engine at idling, apply a load from time to time or run the engine at a mid-range speed.
- Never perform operations or operate the control levers when the hydraulic oil is still at low temperature. Always continue the warming-up operation until the hydraulic oil temperature monitor display is green. This will extend the service life of the machine.



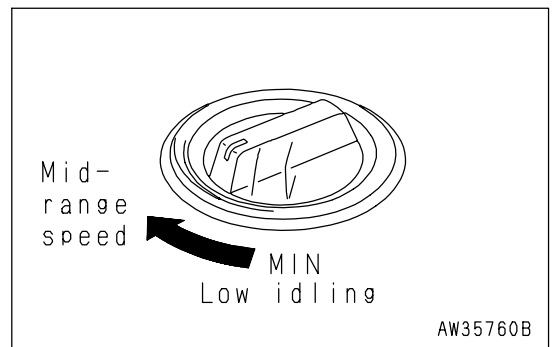
REMARK

If the hydraulic oil temperature is low, the hydraulic oil temperature monitor display will be white.

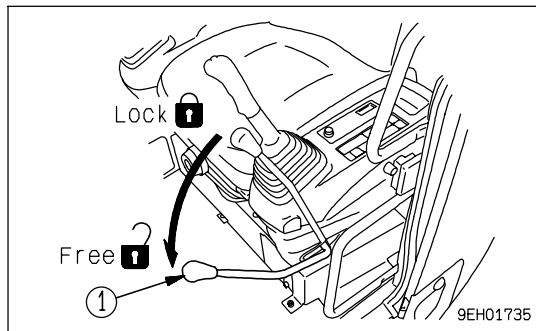
1. Turn fuel control dial (2) to the low idle (MIN) position and run the engine under no load until the engine coolant temperature monitor gives a green display.
2. To raise the hydraulic oil temperature quickly, use the operating mode switch on the machine monitor to set to A mode (heavy-duty operation mode).



3. Turn fuel control dial (2) to the medium speed position.



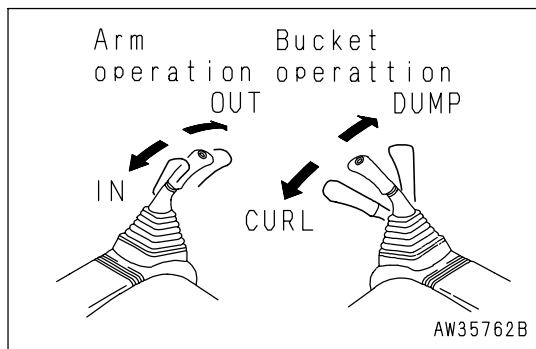
4. Set lock lever (1) to the FREE position and raise the bucket from the ground.



5. 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.
6. Operate the bucket for 30 seconds and the arm for 30 seconds in turn fully for 5 minutes.

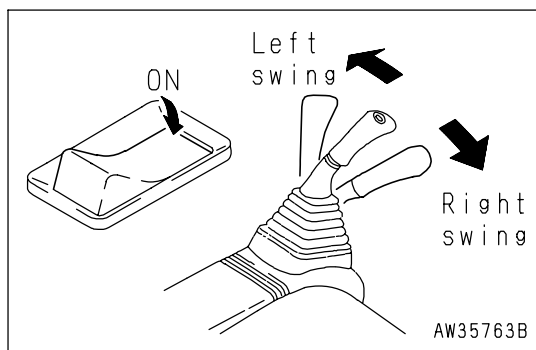
REMARK

If swing lock switch (5) is operated to the ON position, it is possible to raise the oil temperature faster.



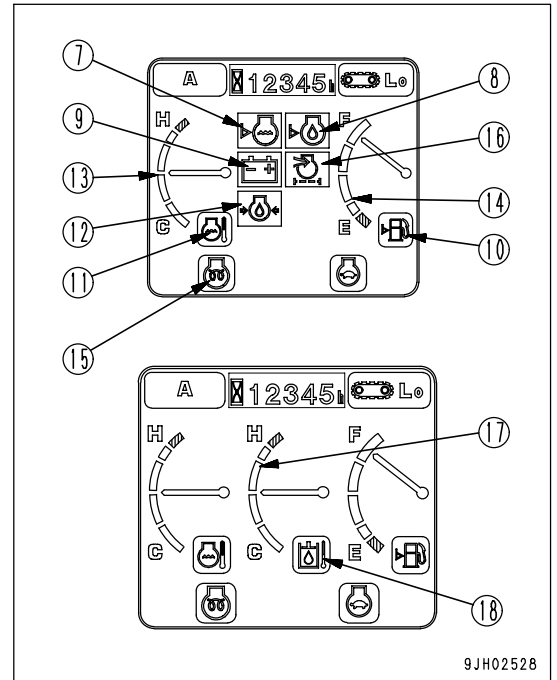
NOTICE

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



7. After performing the warming-up operation, check and be sure all the gauges on machine monitor (6) and the caution lamps are in the following conditions:

- Radiator coolant level monitor (7): OFF
- Engine oil level monitor (8): OFF
- Charge level monitor (9): OFF
- Fuel level monitor (10): Green display
- Engine coolant temperature monitor (11): Green display
- Engine oil pressure monitor (12): OFF
- Engine coolant temperature gauge (13): Indicator in black range
- Fuel gauge (14): Indicator in black range
- Engine pre-heating monitor (15): OFF
- Air cleaner clogging monitor (16): OFF
- Hydraulic oil temperature gauge (17): Indicator in black range
- Hydraulic oil temperature monitor (18): Green display



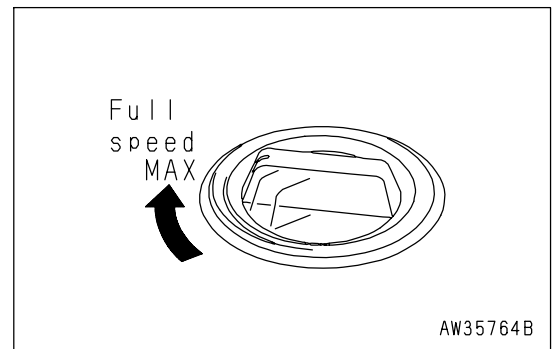
8. Check for abnormal exhaust gas color, noise, or vibration. If any problem is found, contact your Komatsu distributor.

9. If air cleaner clogging monitor (16) lights up, clean or replace the element immediately.
For details of the method of cleaning the element, see "CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT (PAGE 4-18)".

10. Turn fuel control dial (2) to the full speed (MAX) position and carry out the operation in Step 5. for 3 to 5 minutes.

11. Repeat the following operation 3 - 5 times and operate slowly.

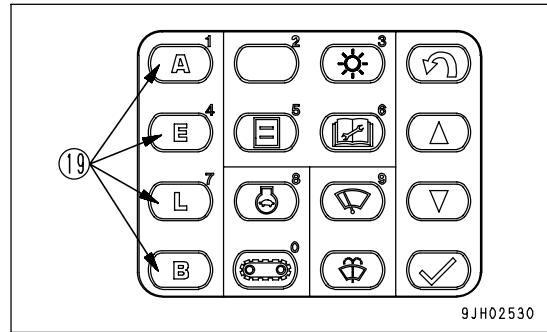
- Boom operation RAISE ↔ LOWER
- Arm operation IN ↔ OUT
- Bucket operation CURL ↔ DUMP
- Swing operation LEFT ↔ RIGHT
- Travel (Lo) operation FORWARD ↔ REVERSE



REMARK

If the above operation is not carried out, then may be a delay in response when starting or stopping the actuation of the travel, swing, or work equipment.

12. Use working mode selector switch (19) on machine monitor (6) to select the working mode to be used.

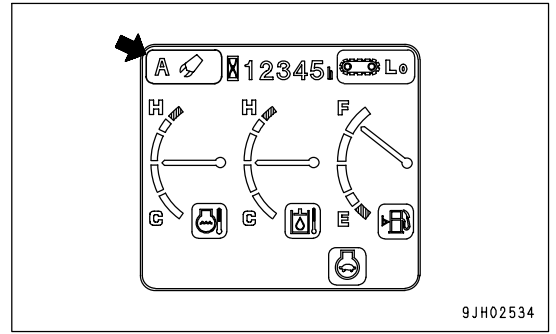


9JH02530

Working mode monitor display

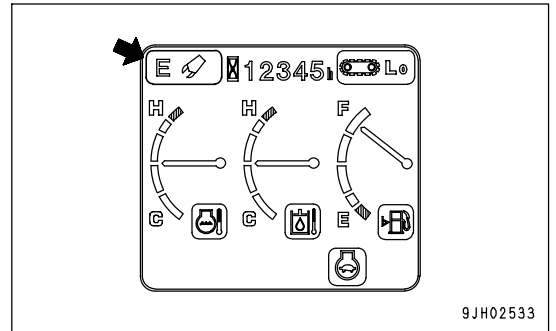
1) A mode

For heavy-load operations



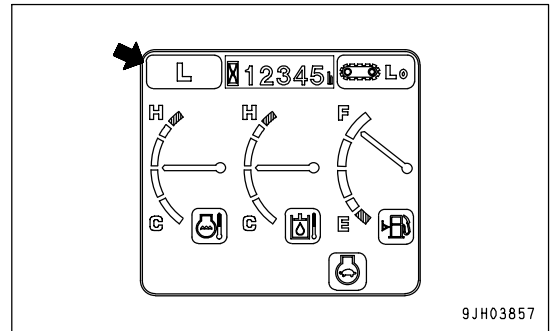
2) E mode

For operations with emphasis on fuel economy



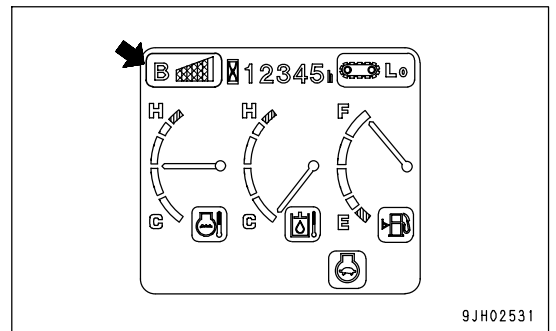
3) L mode

For fine-control operations



4) B mode

For breaker operations

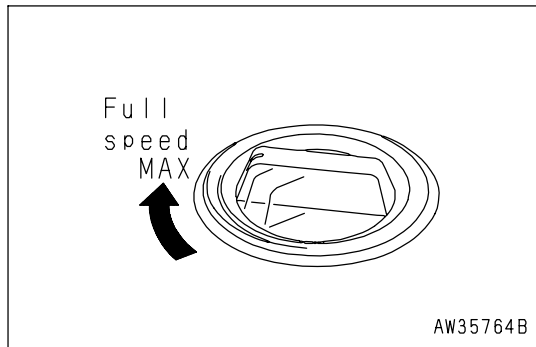


NOTICE

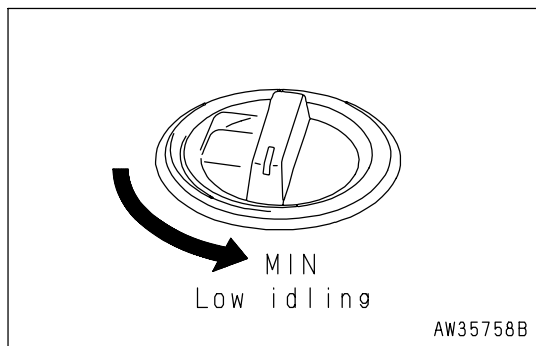
Canceling automatic warming-up operation

If it becomes necessary in an emergency to cancel the automatic warming-up operation or to lower the engine speed to low idle, do as follows.

- 1] Turn fuel control dial (2) to the full speed (MAX) position and hold it for 3 seconds.



- 2] When fuel control dial (2) is returned to the low idle (MIN) position, the engine speed will drop.

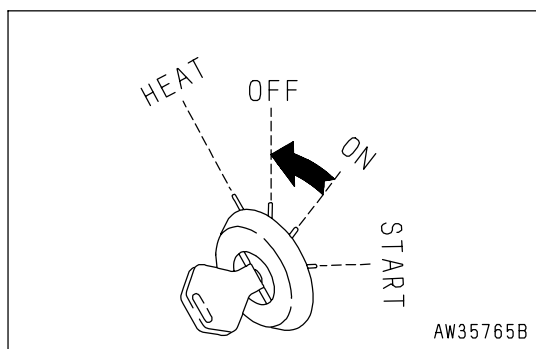
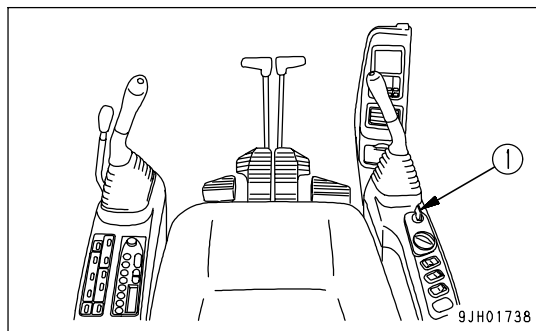


STOPPING THE ENGINE

NOTICE

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

1. Run the engine at low idle for about 5 minutes to cool down gradually.
2. Turn the key in starting switch (1) to the OFF position and stop the engine.
3. Remove the key from starting switch (1).

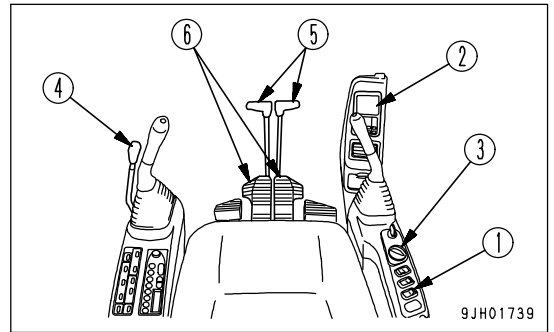


MACHINE OPERATION

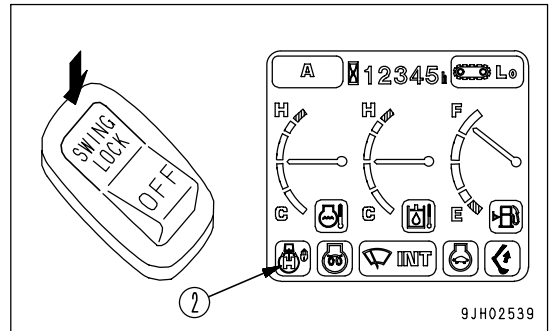
Preparations for Moving the Machine

WARNING

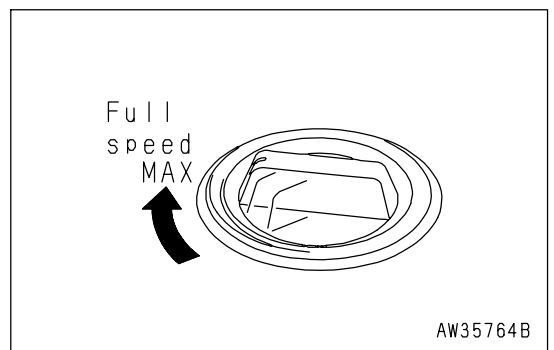
- Before operating the steering levers, check the direction of the track frame.
If the sprocket is at the front, the operation of the travel levers is reversed.
- When moving the machine, check that the area around the machine is safe, and always sound the horn before moving.
- Do not allow anyone in the area around the machine.
- Remove all obstacles from the travel path of the machine.
- The rear of the machine is a blind spot, be extremely careful when traveling in reverse.
- If the lever is moved inside the deceleration range, engine speed will rise suddenly. Operate the levers carefully.
- For machines equipped with a travel alarm, 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.

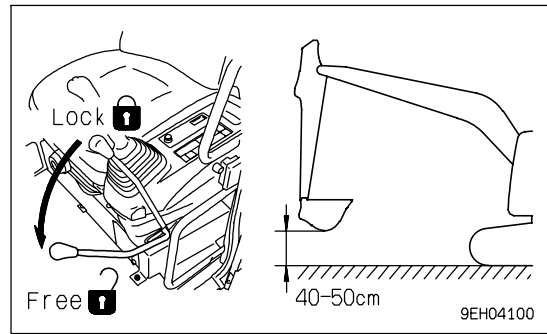


2. Turn fuel control dial (3) towards the full speed position to increase the engine speed.



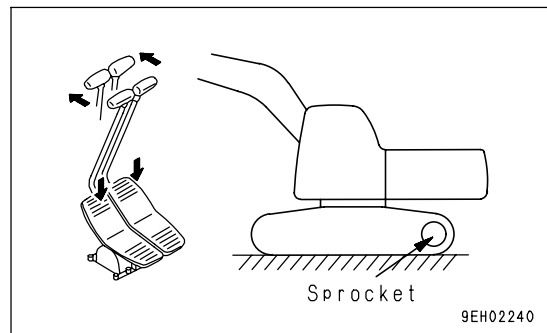
Moving Machine Forward

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

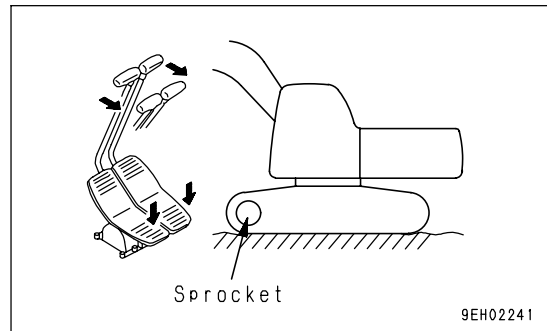


2. Operate the right and left travel levers (5), or the right or left travel pedals (6) as follows:

- When sprocket (A) is at the rear of the machine:
Slowly push the levers (5) forward, or slowly depress the front part of the pedals (6) to move the machine forward.



- When sprocket (A) is at the front of the machine:
Slowly pull the levers (5) backward, or slowly depress the rear part of the pedals (6) to move the machine forward.



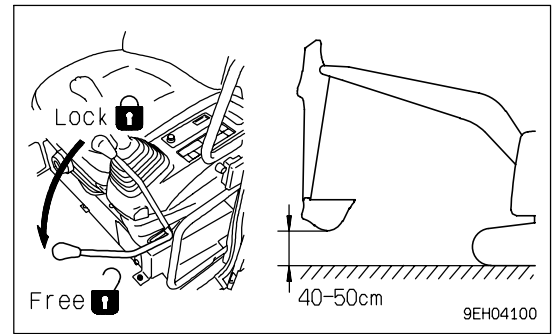
3. For machines equipped with a travel alarm (if equipped), check that the alarm sounds. If the alarm does not sound, please contact your Komatsu distributor for repair.

REMARK

In cold temperatures, if the machine travel speed is not normal, thoroughly perform the warming-up operation. In addition, if the undercarriage is clogged with mud and the machine travel speed is not normal, remove the soil and mud from the undercarriage.

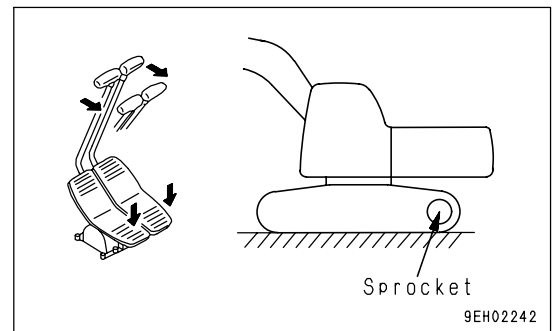
Moving Machine Backward

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

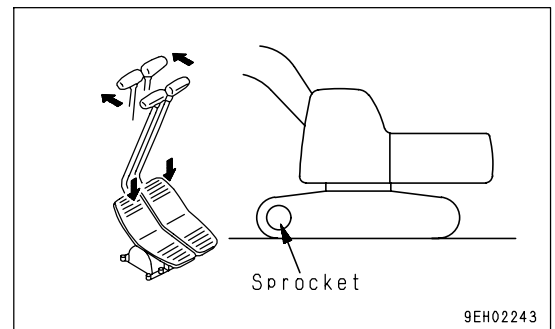


2. Operate the right and left travel levers (5), or the right or left travel pedals (6) as follows:

- When sprocket (A) is at the rear of the machine:
Slowly pull the levers (5) backward, or slowly depress the rear part of the pedals (6) to move the machine backward.



- When sprocket (A) is at the front of the machine:
Slowly push the levers (5) forward, or slowly depress the front part of the pedals (6) to move the machine backward.

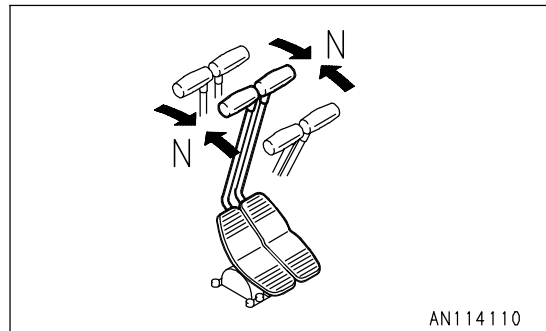
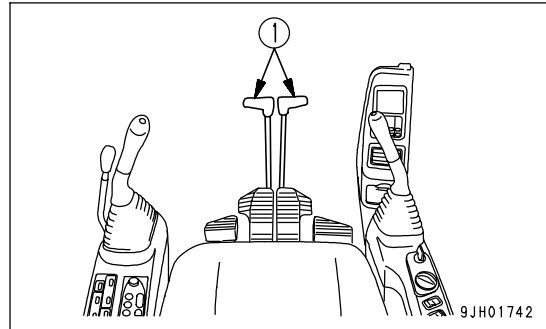


3. For machines equipped with a travel alarm (if equipped), check that the alarm sounds. If the alarm does not sound, please contact your Komatsu distributor for repair.

Stopping Machine

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

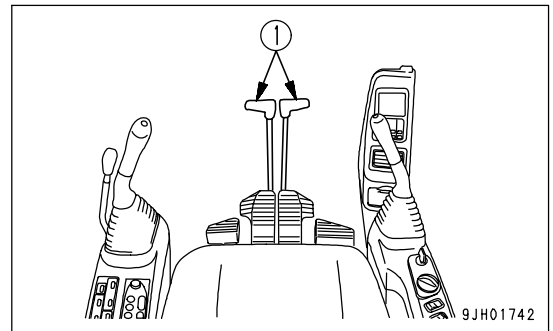
Steering



WARNING

Before operating the travel levers, check the direction of the track frame (the position of the sprocket). If the sprocket is at the rear, the machine moves in the reverse direction to the operation of the travel levers.

Use the travel levers to change direction.
 Avoid sudden changes of direction as much as possible.
 Especially when performing counter-rotation (spin turn), stop the machine before turning.
 Operate two travel levers (1) as follows.



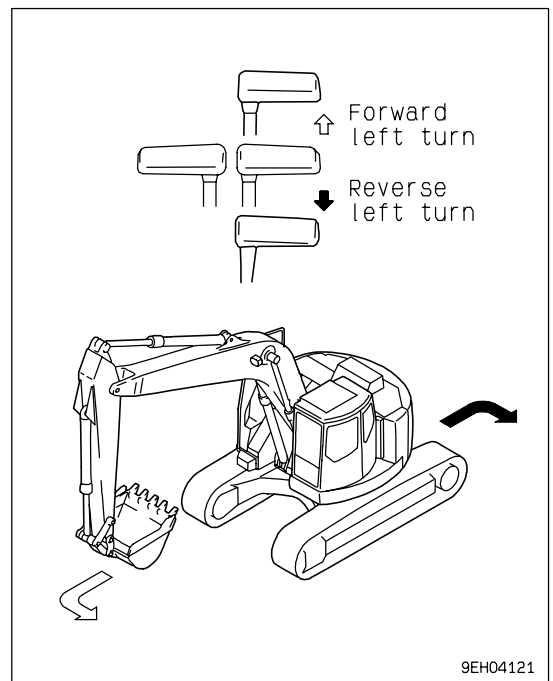
Steering the Machine when Stopped

When turning to the left:

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

REMARK

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



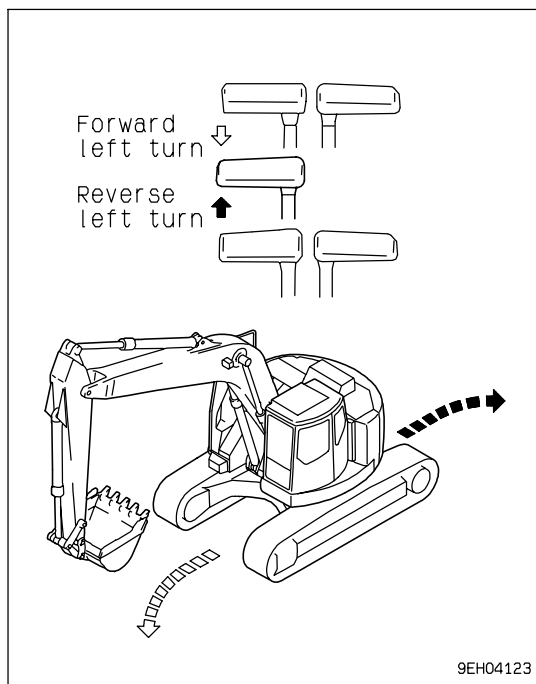
Changing Direction of the Machine

When turning to the left:

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

REMARK

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

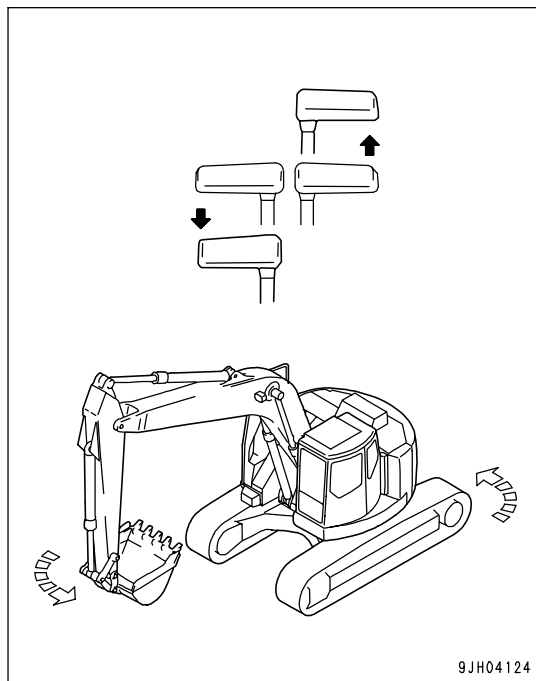


Counter-rotation Turn (Spin Turn)

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

REMARK

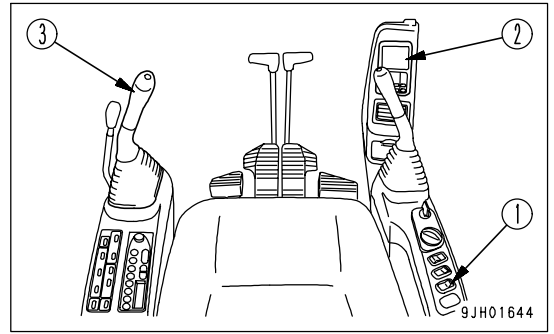
When using counter-rotation to turn right, pull the right travel lever back and push the left travel lever forward.



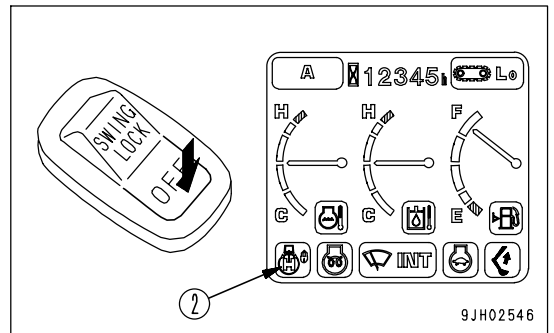
SWINGING

WARNING

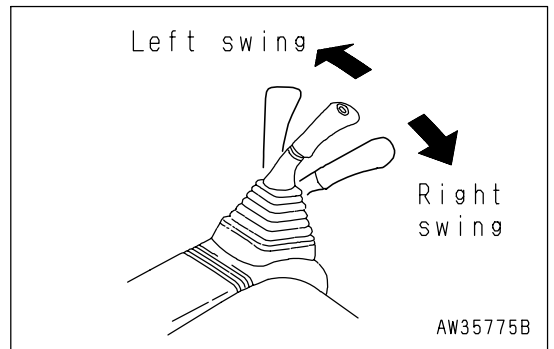
- The rear of the machine extends outside the track width. Check that the surrounding area is safe before swinging the upper structure.
- Operate the levers with care when the auto-decelerator is in use, because the engine speed sharply rises.



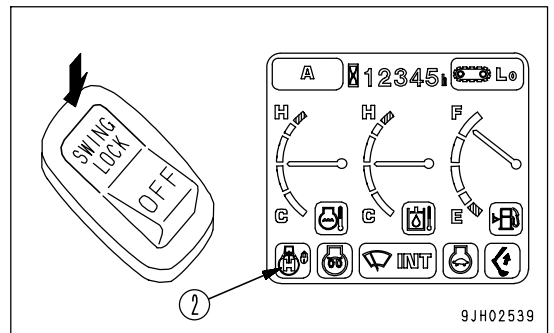
1. Before starting the swing operation, turn swing lock switch (1) OFF and check that swing lock monitor (2) has gone out.



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



3. When not using the swing, turn swing lock switch (1) ON. Check that swing lock monitor (2) lights up.



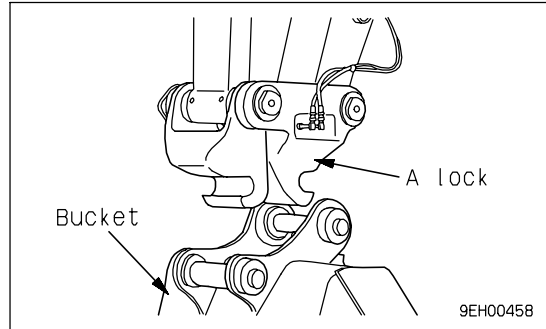
WORK EQUIPMENT CONTROLS AND OPERATIONS

WARNING

If the lever is operated when the auto-deceleration is being actuated, the engine speed will suddenly rise, so be careful when operating the lever.

WARNING

If an A lock (attachment) is installed and the bucket is brought in towards the cab, the bucket may hit the cab. Be careful when operating in this condition.



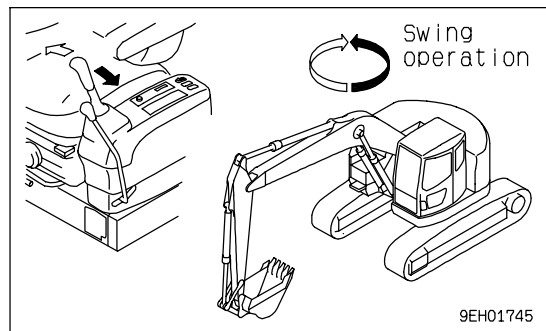
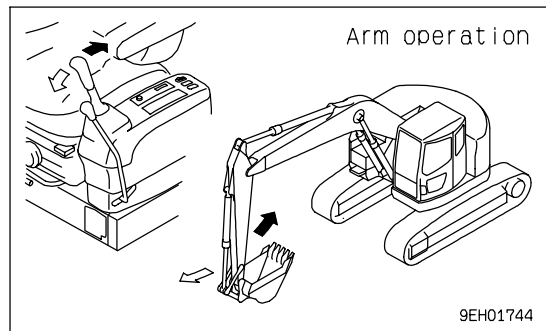
Use the control levers to operate the work equipment.

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

The work equipment is operated by the left and right work equipment control levers. The left work equipment control lever operates the arm and swing, and the right work equipment control lever operates the boom and bucket.

The movements of the lever and work equipment are as shown in the diagrams on the right. When the levers are released, they automatically return to the neutral position and the work equipment is held in place.

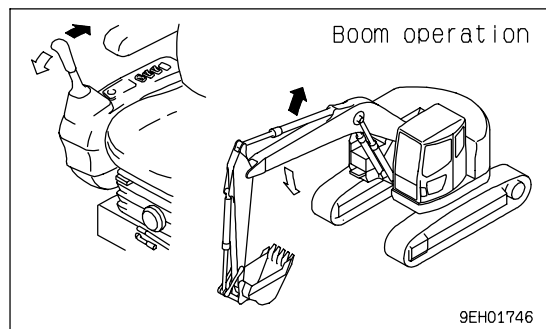
- If the work equipment control levers are returned to the neutral position when the machine is stopped, even if the fuel control dial is set to FULL, the auto-deceleration mechanism will act to reduce the engine speed to a mid-range speed.

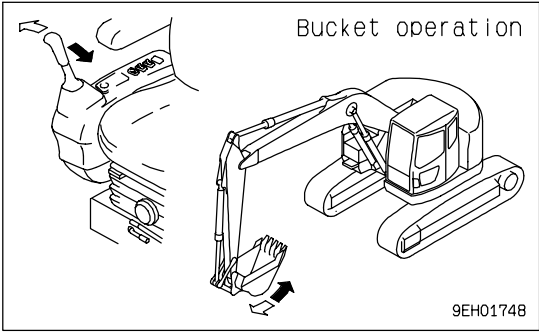


REMARK

With this machine, an accumulator is installed in the operating circuit, if less than 15 seconds has passed since the engine was stopped, when the starting switch is turned to the ON position even with the engine stopped, it is possible to operate the levers to lower work equipment to the ground.

In addition, this operation can also be used to release the remaining pressure in the hydraulic cylinder circuit or to lower the boom after the machine has been loaded onto a trailer.





WORKING MODE

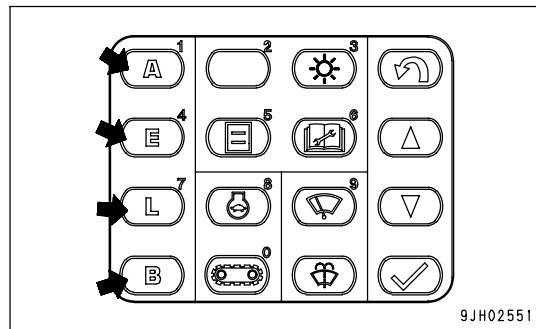
Working Mode

The mode selector switch can be used to switch the mode to match operating conditions and purpose, thereby enabling work to be performed efficiently.

Make effective use of each mode as follows.

When the starting switch is turned to the ON position, the working mode is set to A mode (digging).

Use the working mode switch to set the mode to the most efficient mode to match the type of work.



Working mode	Applicable operations
A mode	Normal digging, loading operations (Operations with emphasis on productivity)
E mode	Normal digging, loading operations (Operations with emphasis on fuel consumption)
L mode	When positioning work equipment exactly (fine-control operations)
B mode	Breaker operations

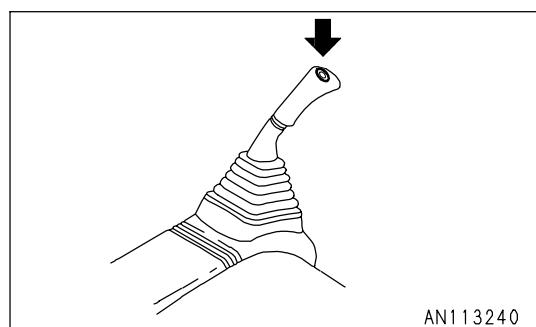
NOTICE

Do not use the heavy-duty operation mode for breaker operations. If breaker operations are carried out in the heavy-duty operation mode, there is a hazard that the hydraulic equipment may be damaged or broken.

Power Max and Shift Slowdown

The one-touch power max. Switch can be used during operations to increase the power. Make effective use of this function whenever necessary in combination with the working mode.

- Press the left knob switch and keep it pressed. The power is increased as long as the switch is being pressed. However, the increased power is automatically canceled after 8.5 seconds.
- This function is not actuated when the working mode is set to L mode or B mode.



PROHIBITED OPERATIONS

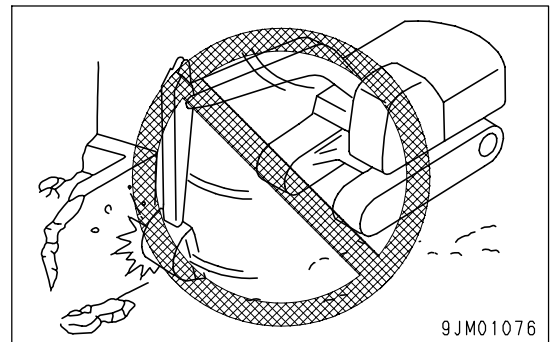


WARNING

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

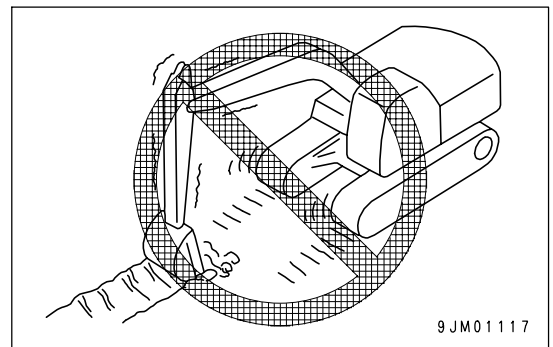
Operations Using Swing Force

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



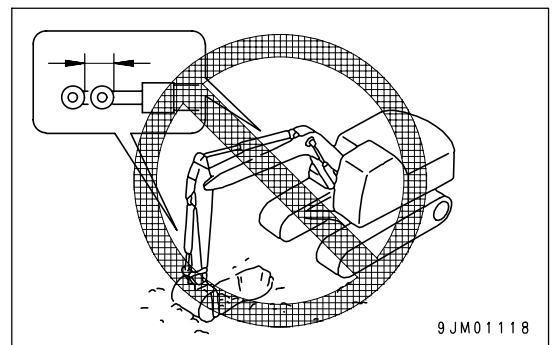
Operations Using Travel Force

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



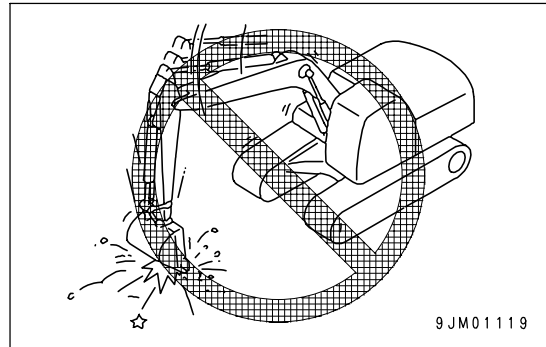
Prohibition of Operations Using Hydraulic Cylinders to Stroke Ends

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



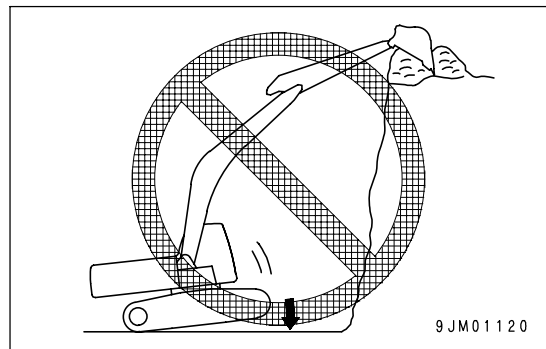
Operations Using Bucket Dropping Force

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 drastically reduce the life of the machine.



Operations Using Machine Dropping Force

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

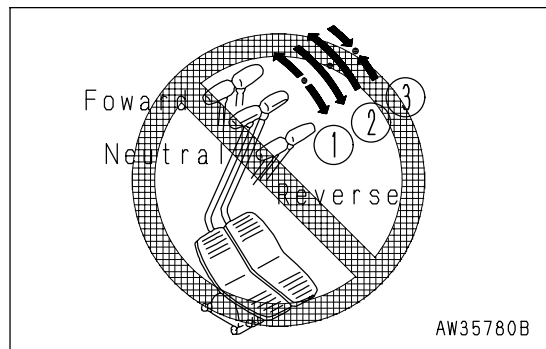


Digging Hard Rocky Ground

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

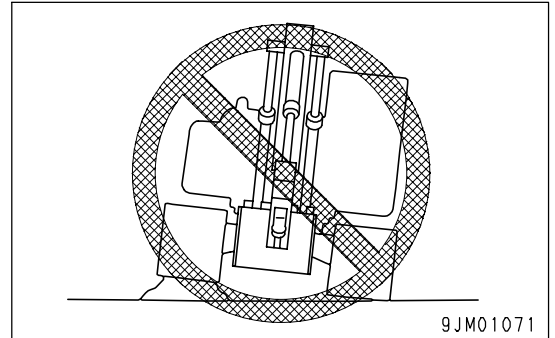


GENERAL OPERATION INFORMATION

Traveling

Traveling over boulders, tree stumps, or other obstacles will cause a big shock to the chassis (and in particular to the tracks), and this will cause damage to the machine. For this reason, always remove any obstacles or travel around them, or take other steps to avoid traveling over such obstacles as far as possible.

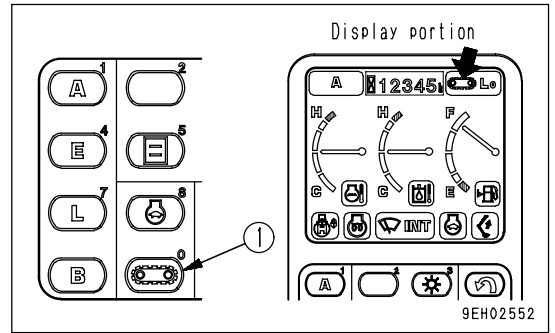
If there is no way to avoid traveling over an obstacle, reduce the travel speed, keep the work equipment close to the ground, and try to travel so that the center of the track passes over the obstacle.



High Speed Travel

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

- To switch the travel speed, press travel speed selector switch (1). The travel speed is displayed as Lo, Mi, or Hi on the monitor display.

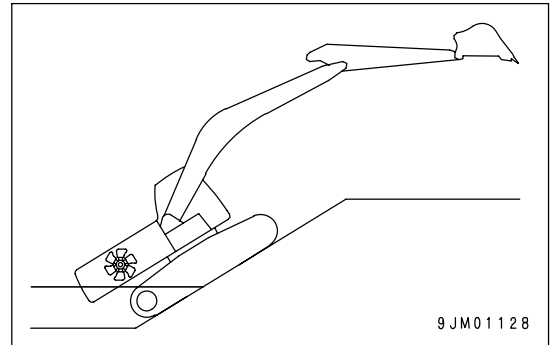


Permissible Water Depth

NOTICE

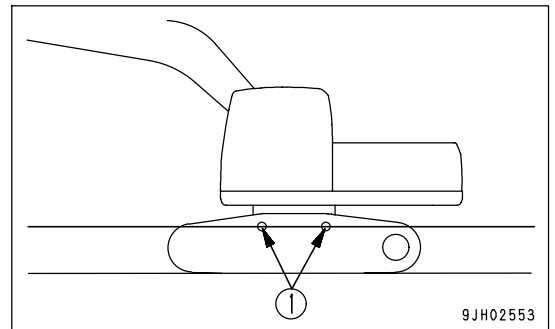
When driving the machine out of water, if the angle of the machine exceeds 15°, the rear of the upper structure will go under water, and water will be thrown up by the radiator fan. This may cause the fan to break.

Be extremely careful when driving the machine out of water.



Do not drive the machine in water deeper than the center of carrier roller (1).

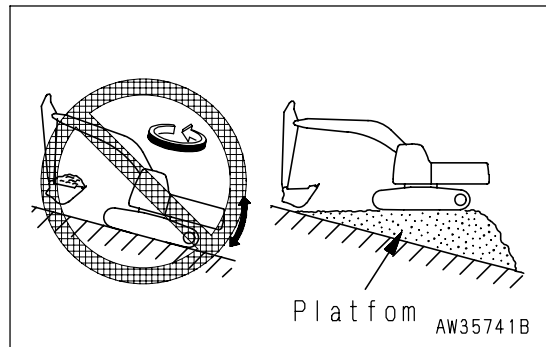
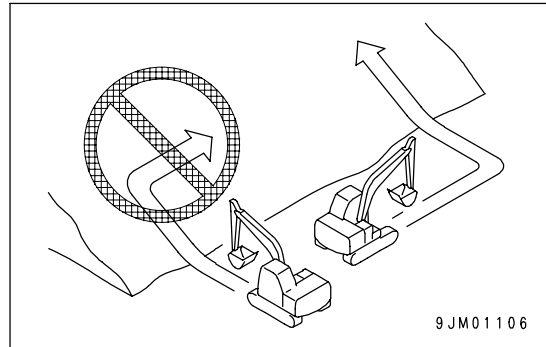
Supply grease to the parts which have been under water for a long time until the used grease is projected out of the bearings (around the bucket pin, in particular).



TRAVELING ON SLOPES

! WARNING

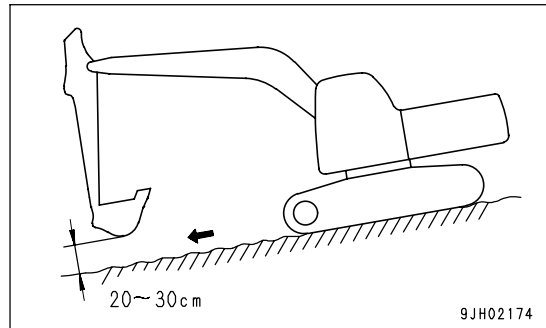
- Turning or operating the work equipment when working on slopes may cause the machine to lose its balance and turn over, so avoid such operations.
It is particularly dangerous to swing downhill when the bucket is loaded. If such operations have to be carried out, pile soil to make a platform on the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



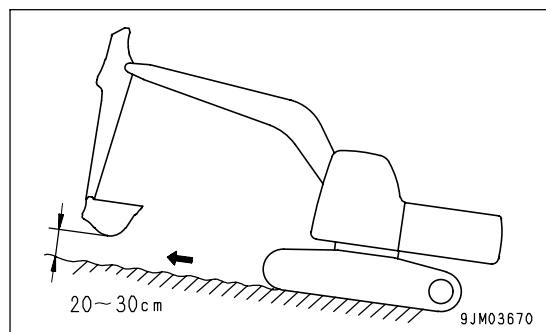
1. When traveling down steep hills, use the travel lever and fuel control dial to keep the travel speed low. When traveling down a steep hill of more than 15°, set the work equipment to the posture shown in the diagram on the right, and lower the engine speed.

REMARK

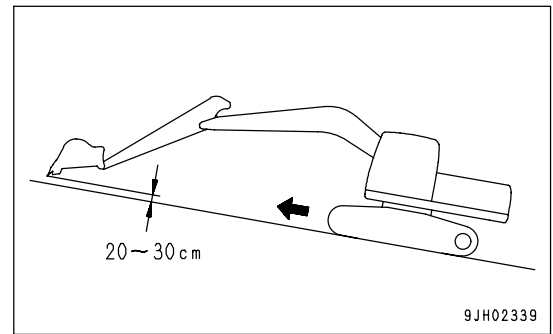
Travel down hills with the sprocket side down. If the machine travels down with the sprocket side up, the track tends to become loose, and that can cause skipping pitches.



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



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



Traveling Downhill

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

Engine Stopped on Slope

If the engine stops when traveling uphill, move the travel levers to the neutral position, lower the bucket to the ground, stop the machine, 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.
- Take good care when opening or closing the sliding door (the cab specification). There is the danger that it will likely gain momentum due to its own weight and open or shut suddenly.

ESCAPE FROM MUD

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

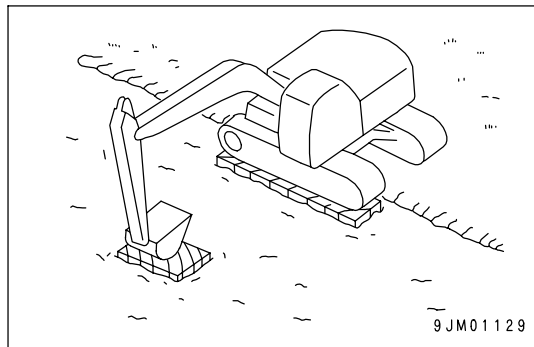
Track on One Side Stuck

NOTICE

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

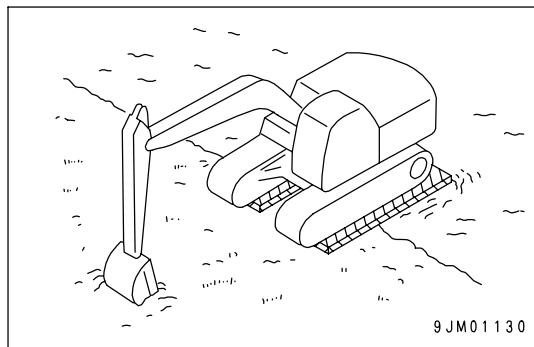
The same applies when using the bucket installed in the reverse direction.

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



Tracks on Both Sides Stuck

When the tracks on both sides are stuck in mud and they slip, making it impossible for the machine to move, lay boards or logs 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

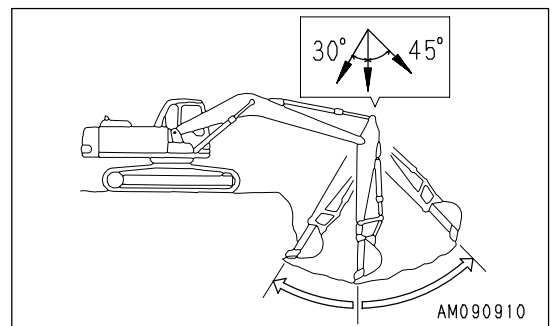
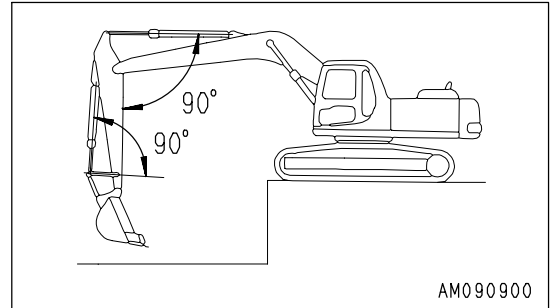
A backhoe is suitable for excavating areas that are lower than the machine.

When the condition of the machine is as shown in the diagram on the right (angle between [bucket cylinder and link] and [arm cylinder and arm] is 90°), the maximum excavation force is obtained from the pushing force of each cylinder.

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

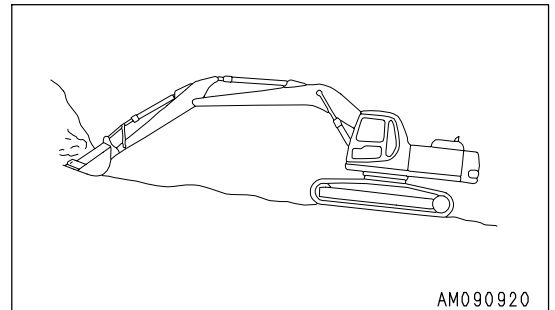
The range for excavating with the arm is from a 45° angle away from the machine to a 30° angle towards the machine.

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



Shovel Work

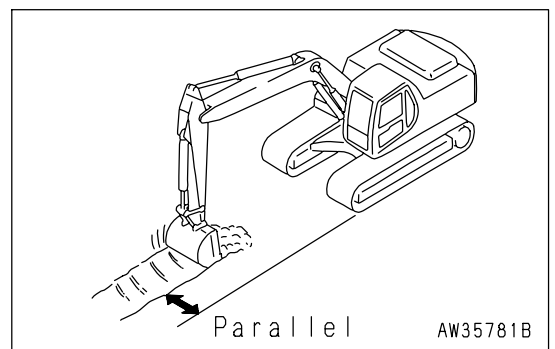
A shovel is suitable for excavating at a position higher than the machine. Shovel work is performed by attaching the bucket in the reverse direction.



Ditching Work

Ditching work can be performed efficiently by attaching a bucket which matches the digging operation and then setting the tracks parallel to the line of the ditch to be excavated.

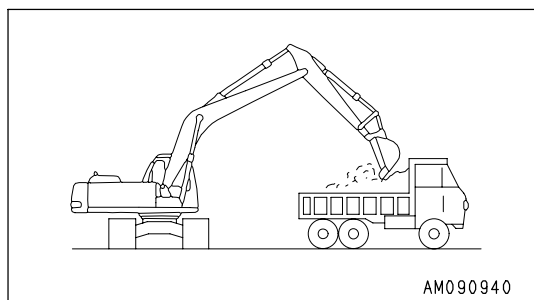
To excavate a wide ditch, first dig both sides and then finally remove the center portion.



Loading Work

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

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

Replacement

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

REMARK

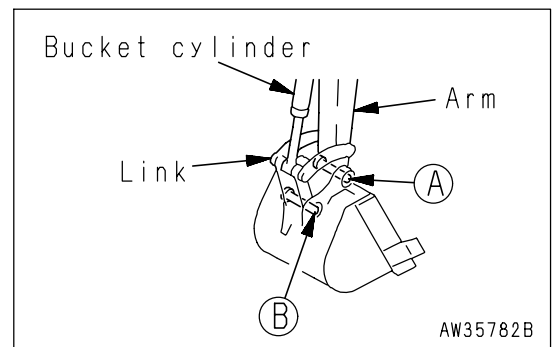
When removing the pins, place the bucket so that it is in light contact with the ground.

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

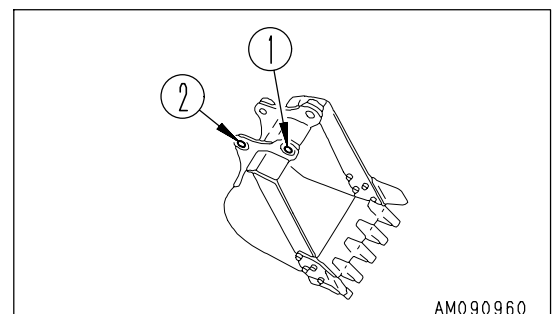
NOTICE

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, be careful not to damage them.

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



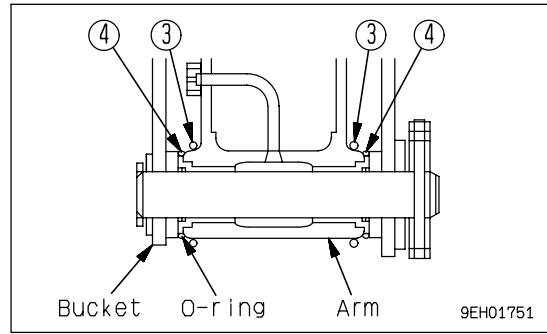
3. Align the arm with holes (1) of the replacement bucket and the link with holes (2), then insert grease-coated pins (A) and (B) into hole (1) and hole (2) respectively.



REMARK

- Install the bucket exactly in reverse order to dismantling.
- 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 (3) on the right. When knocking in the pins, move the O-ring down to the regular groove (4).

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



Inversion

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

REMARK

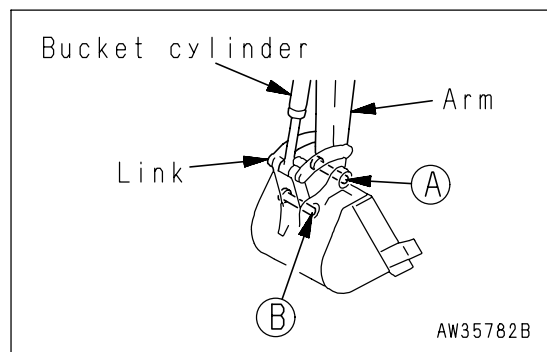
When removing the pins, place the bucket so that it is in light contact with the ground.

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

NOTICE

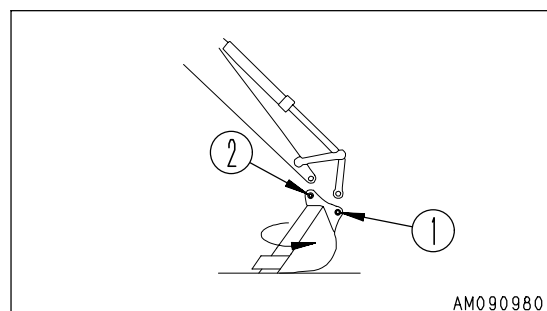
After removing the pins, make sure that mud or sand does not get on them. Dust seals are fitted at both ends of the bushings, be careful not to damage them.

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

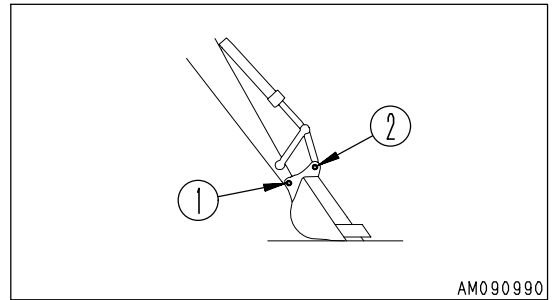


3. Install the bucket inversely.

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



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

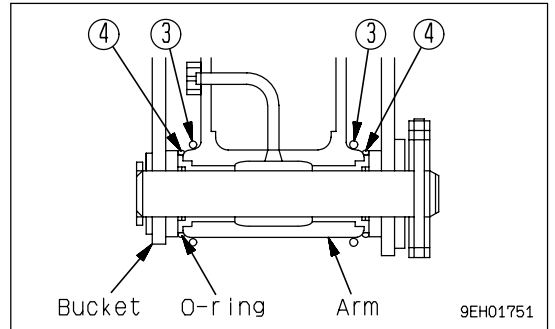


REMARK

Install the O-ring 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 (3) on the right. When knocking in the pins, move the O-ring down to the regular groove (4).

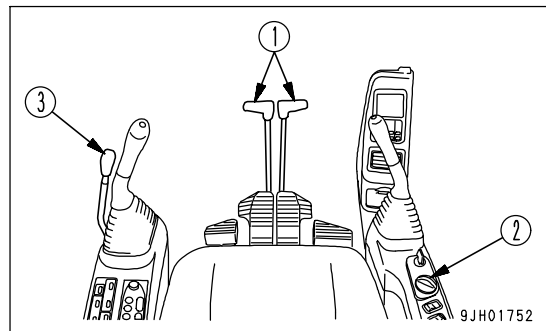
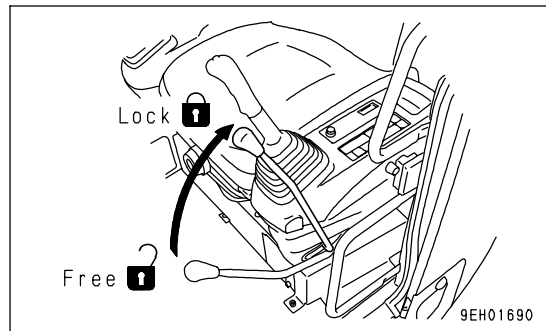
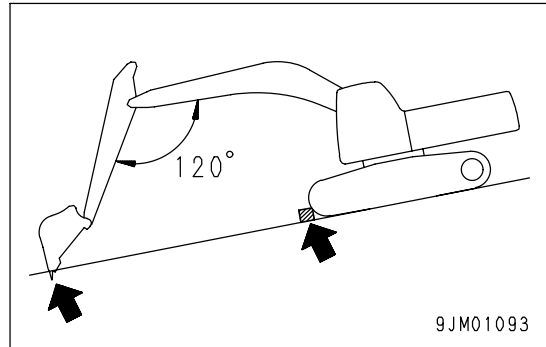
- Install the stopper bolts and nuts for each pin, then grease the pin.



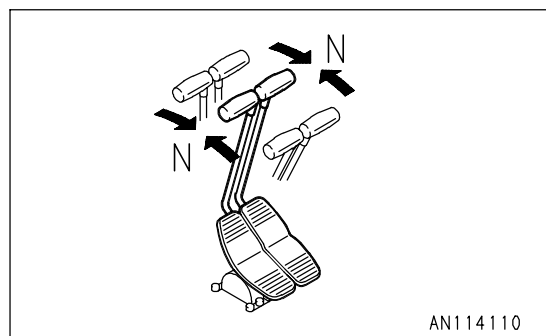
PARKING MACHINE

! WARNING

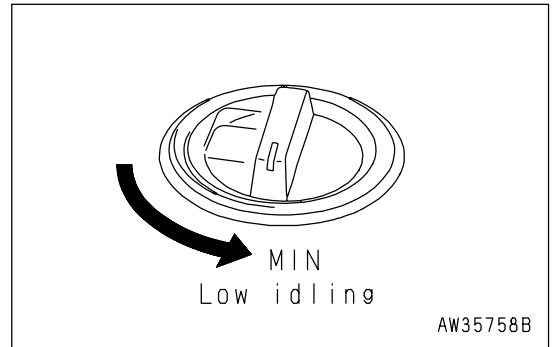
- Avoid stopping suddenly. Give yourself ample room when stopping.
- When stopping the machine, select flat hard ground and avoid dangerous places. If it is unavoidably necessary to park the machine on a slope, insert blocks underneath the track shoes. As an additional safety measure, thrust the bucket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



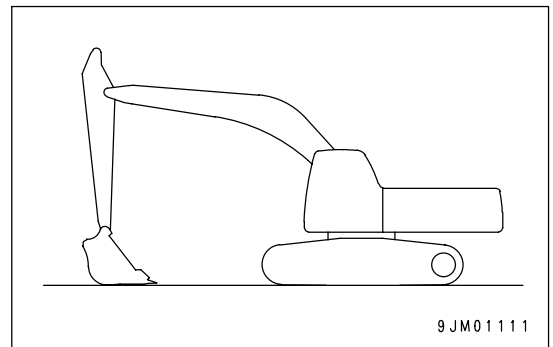
1. Put left and right travel levers (1) in the neutral position. The machine stops.



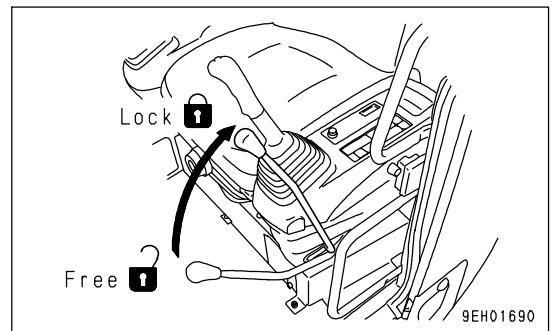
2. Turn fuel control dial (2) to lower the engine speed to low idle.



3. Lower the bucket horizontally until the bottom touches the ground.



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

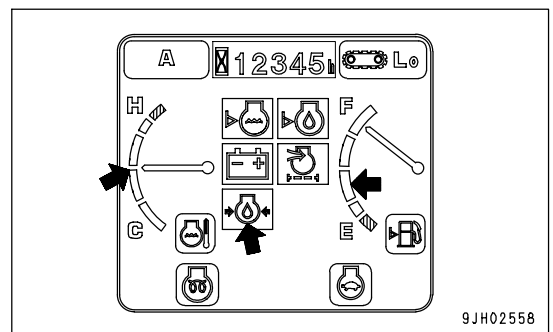


CHECK AFTER SHUT OFF ENGINE

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

REMARK

After stopping the engine, if the starting switch is turned within approx. 10 seconds to the ON or START position to start the engine again, the monitor display is not reset, and the screen before the starting switch was turned OFF is displayed.



MACHINE INSPECTION AFTER DAILY WORK

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

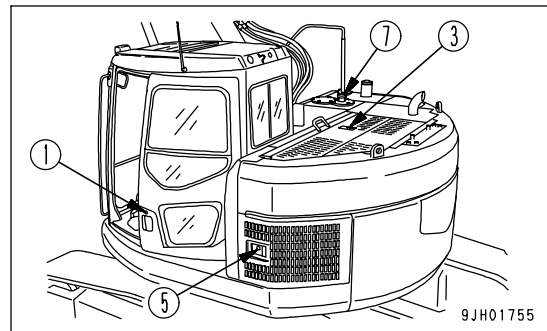
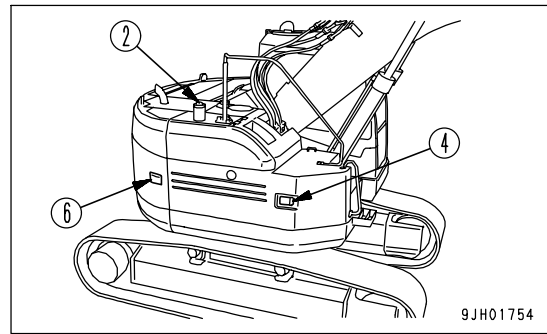
LOCKING

Always lock the following places.

- (1) Door of operator fs cab Always remember to close the window.
- (2) Fuel tank filler port
- (3) Engine hood
- (4) Cover at the front right
- (5) Cover at the rear Left of the machine
- (6) Cover at the rear right of the machine
- (7) Hydraulic tank filler port

REMARK

Use the starting switch key to lock and unlock all these places.



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.

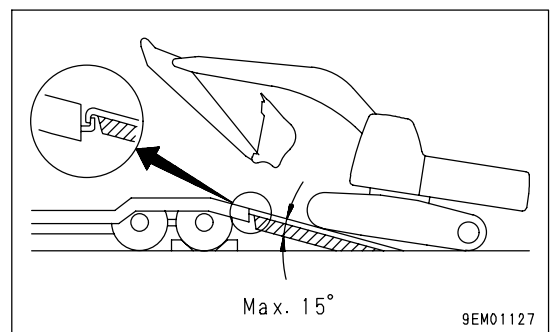
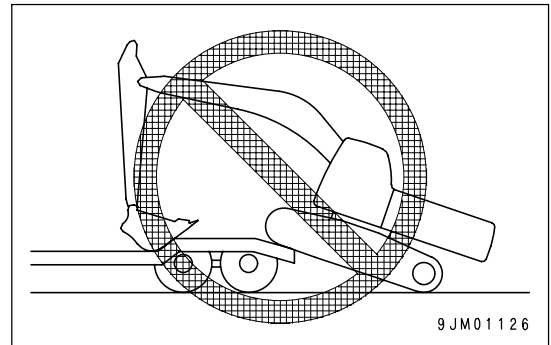
Select the trailer to match the weight and dimensions given in "SPECIFICATIONS (PAGE 5-2)".

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

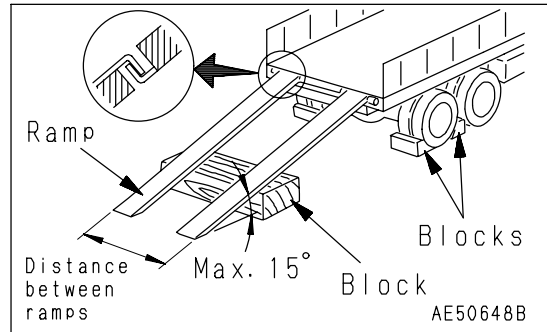
- Always turn the auto-deceleration switch OFF (cancel) during loading and unloading operations.
If the auto-deceleration switch is left ON, the machine may suddenly start moving.
- When loading or unloading the machine on a trailer, always travel at low speed. Do not operate the travel speed selector switch.
- Run the engine at low idling, set to low speed, and operate the machine slowly when loading or unloading.
- Do not carry out loading or unloading operations during the automatic warming-up operation.
If the automatic warming-up operation is canceled before completion, the travel speed may suddenly change.
- 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 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, grease, oil, or ice.
- Never correct your steering on the ramps. There is a hazard that the machine may turn over.
If necessary, drive off the ramps, correct the direction, then enter the ramps again.
- It is dangerous to use the work equipment for loading and unloading operations.
- 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 a hazard 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.



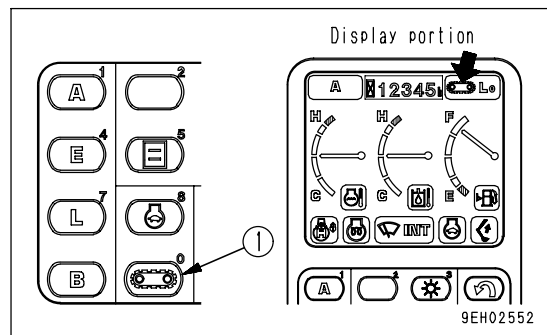
When loading or unloading, always use ramps or a platform. Proceed as follows.

Loading

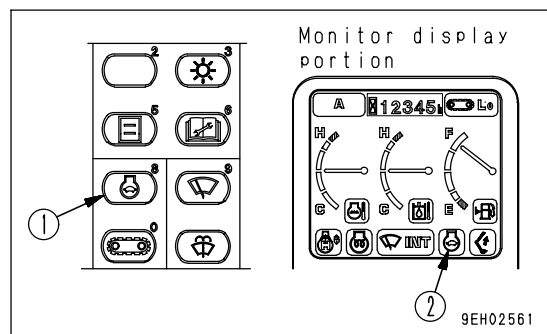
1. Load and unload on firm level ground only.
 Maintain a safe distance from the edge of a road.
2. Properly apply the brakes on the trailer and put blocks under the tires to ensure that the trailer does not move.
 Make the slope of the ramps a maximum of 15°.



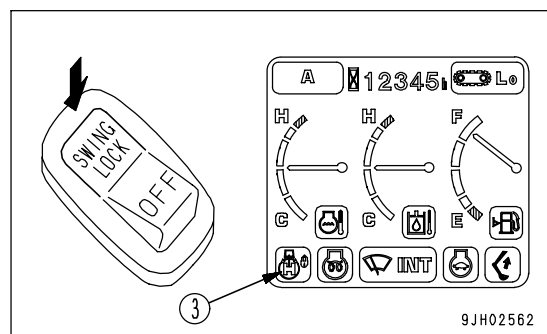
3. Set the travel speed selector switch to Lo (low speed travel).
 - To switch the travel speed, press travel speed selector switch (1). The travel speed is displayed as Lo, Mi, or Hi on the monitor display.



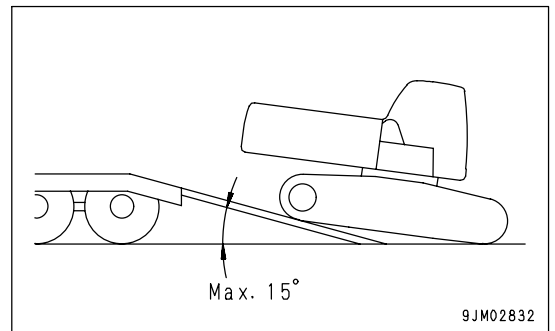
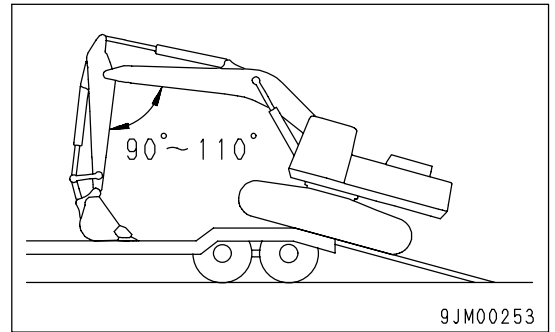
4. Turn auto-deceleration switch (1) OFF and operate the fuel control dial to set the engine speed to low idle.
 - Each time auto-deceleration switch (1) is pressed, it switches OFF → ON → OFF in turn.
 - When auto-deceleration switch (1) is turned OFF, display monitor (2) goes out.



5. Turn the swing lock switch ON to apply the swing lock.
 - When the swing lock switch is turned ON, display monitor (3) lights up.



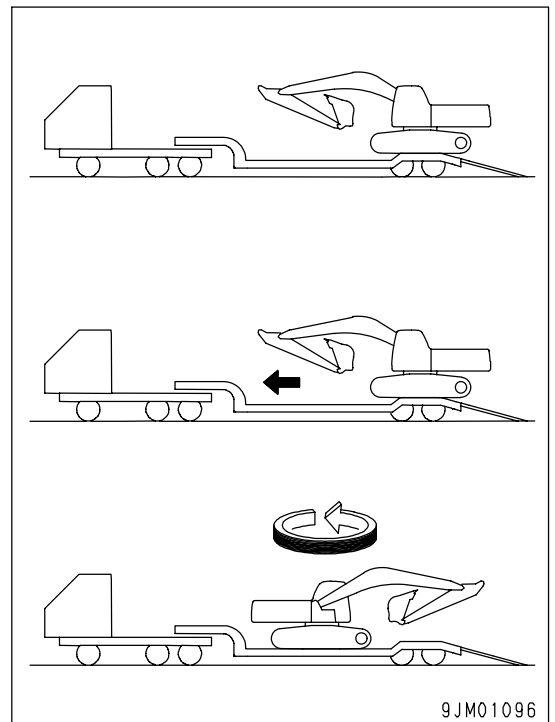
6. If the machine is equipped with work equipment, set the work equipment at the front, and travel forward to load it; if it has no work equipment, travel in reverse to load it. Follow instructions and signals of a conductor particularly when traveling in reverse.



7. Before moving onto the ramps, make sure that the machine is positioned in a straight line with the ramps and that the centerline of the machine matches that of the trailer. Align the direction of travel with the ramps and travel slowly. Lower the work equipment as far as possible without causing interference.

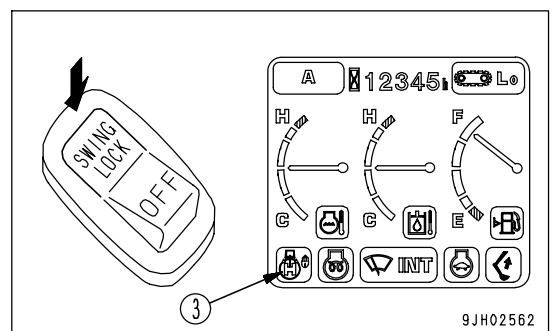
When on the ramps, operate only the travel lever. Do not operate any other lever.

8. When the machine travels over the rear wheels of the trailer, it becomes unstable, drive slowly and carefully. (Never operate the steering.)
9. At the moment the machine passes the rear wheels, it tilts forward, be careful not to let the work equipment hit the trailer body. Drive the machine forward to the specified position, then stop the machine.



10. Turn the swing lock switch OFF to release the swing lock, then swing the upper structure slowly 180°.
11. Stop the machine at the specified position on the trailer.

12. Turn the swing lock switch ON to lock the swing lock.
- When the swing lock switch is turned ON, display monitor (3) lights up.



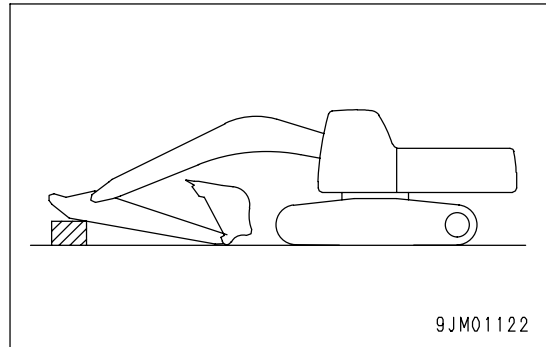
Securing Machine

NOTICE

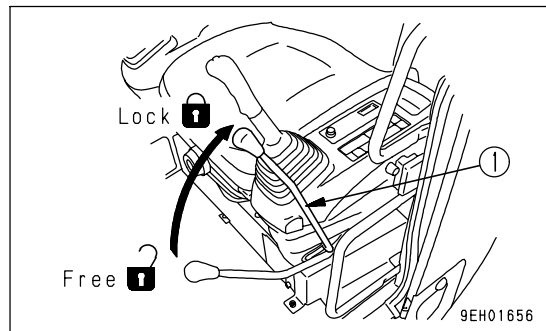
- Remove the mirrors.
- Tie the removed parts securely to the trailer.
- To prevent damage to the bucket cylinder during transportation, fit a wooden block at one end of the bucket cylinder to prevent it from touching the floor.

Load the machine onto a trailer as follows:

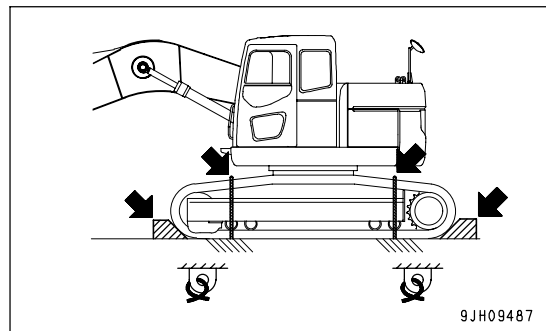
1. Extend the bucket and arm cylinders fully, then lower the boom slowly.



2. Lock all the control levers securely with the lock lever (1).
3. Stop the engine, then remove the key from the starting switch.
4. Lock the window glass, roof window, front window, operator's seat door, side cover, engine hood, and battery box cover securely.

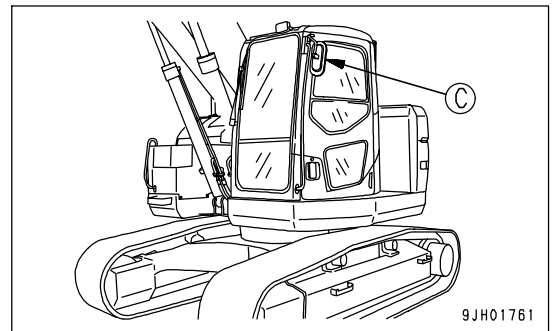
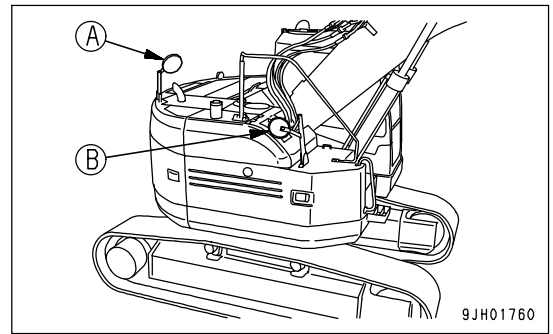


5. Place blocks under both ends of the tracks to prevent the machine from moving during transportation, and secure the machine with chains or wire rope of suitable strength. Be particularly careful to secure the machine in position so it does not slip to the side.



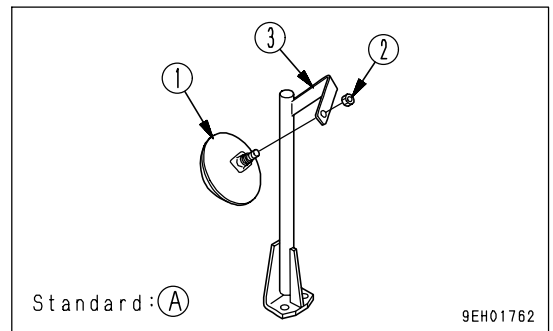
Rearview Mirrors

The mirrors are at the positions shown in the diagram on the right. If they are damaged, or are to be removed for shipment, or are to be installed again, use the following procedure.



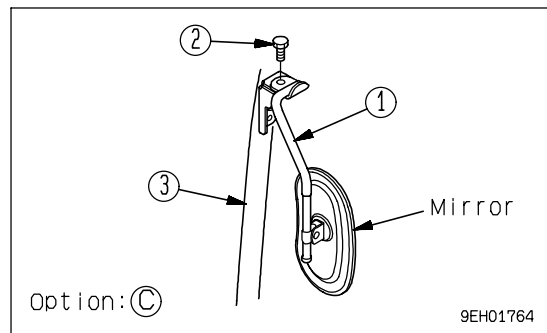
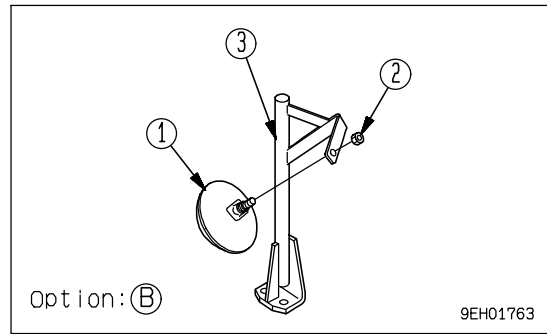
Removal

- For the mirrors at (A) and (B), loosen nut (2) of mirror (1), then remove mirror (1) from bar (3).
- For the mirror (C), leave the mirror installed to support (1), loosen mounting bolt (2) of support (1), then remove from stay (3).



Installation

- Install the mirror in the reverse order from removal.

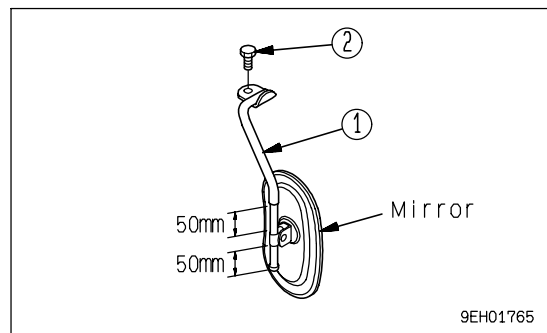


REMARK

When adjusting the mirror at (C), to adjust the angle, loosen bolt (2); to adjust the height, move the mirror mount on support (1) up or down within a range of 50 mm (2 in) in each direction.

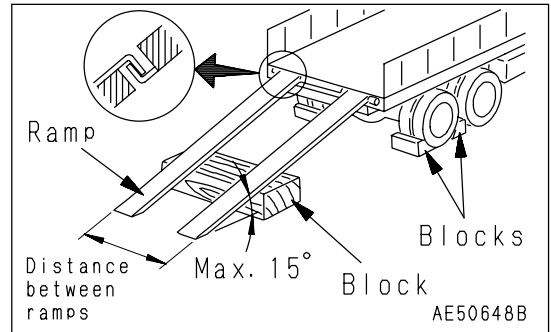
NOTICE

When installing the mirror at (C), it extends beyond the swing radius. Be extremely careful when carrying out swing operations.

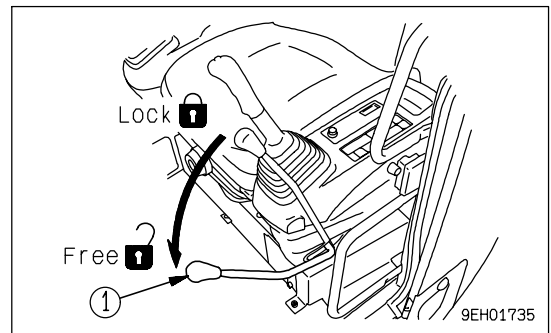


Unloading

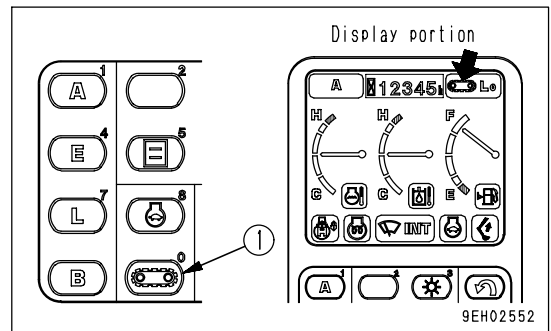
1. Load and unload on firm level ground only. Maintain a safe distance from the edge of a road.
2. Properly apply the brakes on the trailer and put blocks under the tires to ensure that the trailer does not move.
Make the slope of the ramps a maximum of 15°.
3. Remove the chains and wire ropes fastening the machine.
4. Start the engine.
Warm the engine up fully.



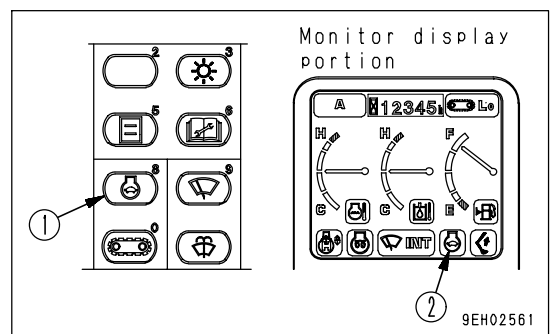
5. Set the lock lever to the FREE position.



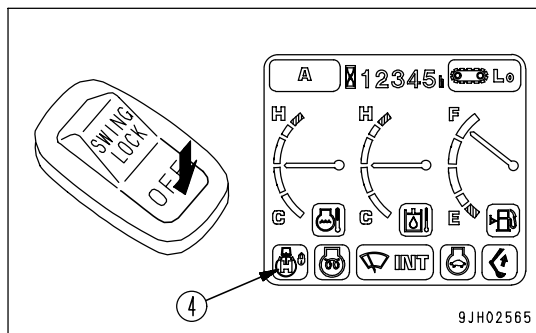
6. Set the travel speed selector switch to Lo (low speed travel).
 - To switch the travel speed, press travel speed selector switch (1). The travel speed is displayed as Lo, or Hi on the monitor display.



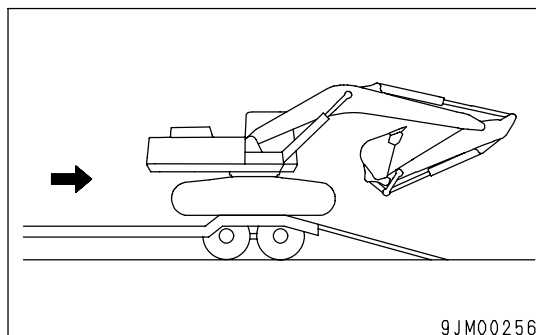
7. Turn auto-deceleration switch (1) OFF and operate the fuel control dial to set the engine speed to low idle.
 - Each time auto-deceleration switch (1) is pressed, it switches OFF → ON → OFF in turn.
 - When auto-deceleration switch (1) is turned OFF, display monitor (2) goes out.



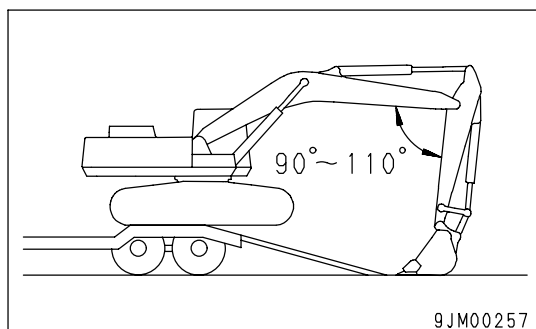
8. Turn the swing lock switch OFF to release the swing lock.
 - When the swing lock switch is turned OFF, display monitor (4) goes off.



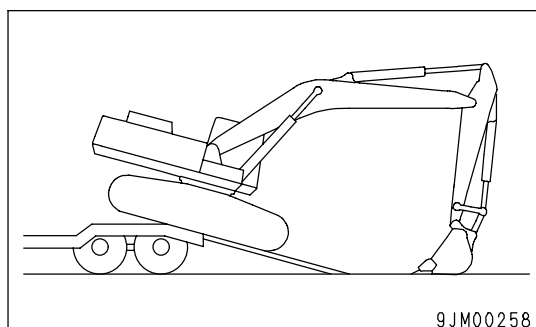
9. Raise the work equipment, pull in the arm under the boom, then move the machine slowly.
10. When the machine is horizontal on top of the rear wheels of the trailer, stop the machine.



11. When moving from the rear of the trailer on to the ramps, set the angle of the arm and boom to 90° to 110°, lower the bucket to the ground, then move the machine slowly.



12. When moving down the ramps, operate the boom and arm slowly to lower the machine carefully until it is completely off the ramps.



LIFTING MACHINE

**WARNING**

- The operator carrying out the lifting operation using a crane must be a properly qualified crane operator.
 - Never raise the machine with any worker on it.
 - Always make sure that the wire rope is of ample strength for the weight of this machine.
 - Never lift the machine with the upper structure swung to the side. Always set the upper structure parallel to the undercarriage before lifting.
 - When lifting, keep the machine horizontal.
 - Never go under the machine when it is raised.
 - Never try to lift the machine in any posture other than the posture given in the procedure below or using lifting equipment other than in the procedure below.
- There is a hazard that the machine may lose its balance.

NOTICE

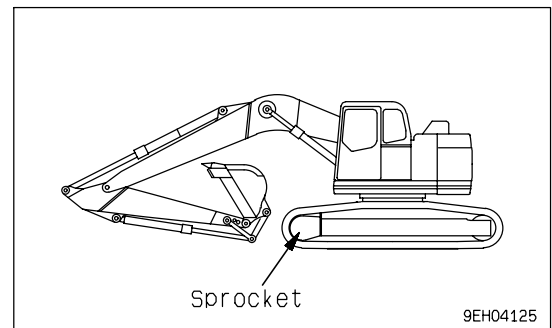
The lifting procedure applies to machines with standard specifications.

The method of lifting differs according to attachments and options actually installed on the machine. For the proper lifting procedures, contact your Komatsu distributor.

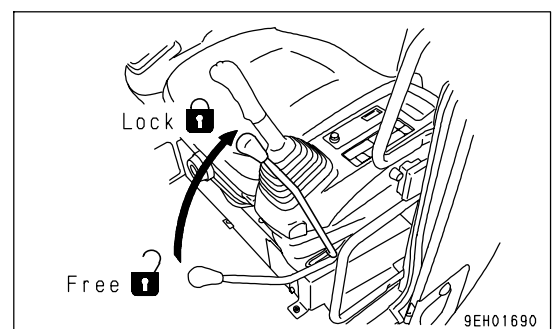
For details of the weight, see "SPECIFICATIONS (PAGE 5-2)".

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

1. Start the engine, 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.

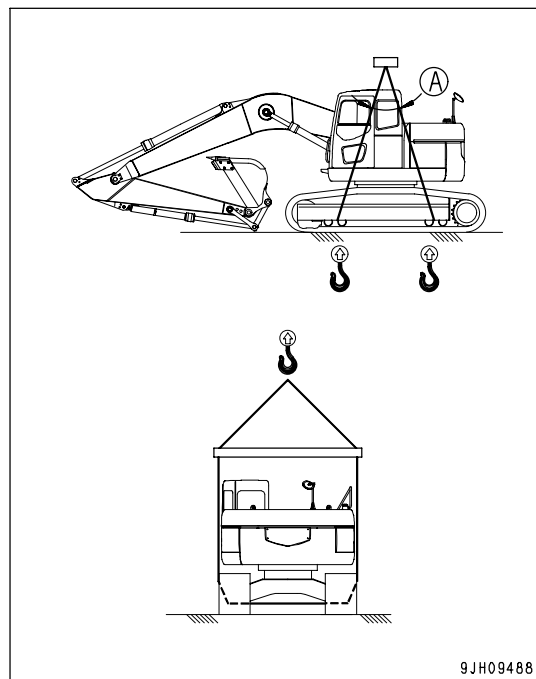


3. Set the lock lever securely to the LOCK position.



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. However, for machines equipped with a full roller guard for the track roller, pass the wire rope under the track.
6. Set the lifting angle (A) of the wire rope to 30° to 40° , then lift the machine slowly.
7. After the machine comes off the ground, check the hook condition and the lifting posture, and then lift slowly.



COLD WEATHER OPERATION

COLD WEATHER OPERATION INFORMATION

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

Fuel and Lubricants

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

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

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

For details of the antifreeze mixture when changing the coolant, see "CLEAN INSIDE OF COOLING SYSTEM (PAGE 4-24)".

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

Standard requirements for permanent antifreeze

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

REMARK

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

Battery

 **WARNING**

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

When the ambient temperature drops, the capacity of the battery will also drop. If the battery charge ratio is low, the battery electrolyte may freeze. Maintain the battery charge as close as possible to 100%. Insulate it against cold temperature to ensure the machine can be started easily the next morning.

REMARK

Measure the specific gravity and calculate the charging rate from the following conversion table.

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.

Monitor

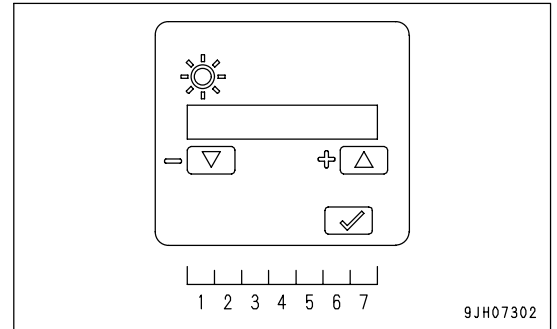
A feature of the liquid-crystal monitor is that the screen becomes dark and is difficult to read in cold weather (particularly with the starting switch ON).

In this case, adjust the brightness and contrast of the screen.

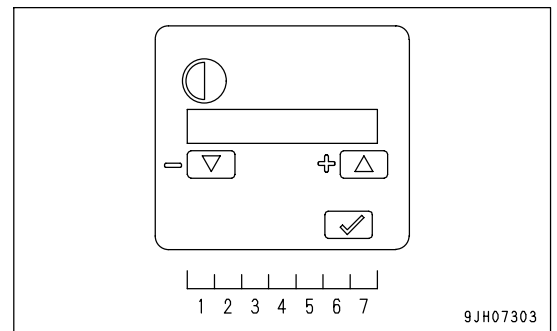
For details, see "Liquid Crystal Monitor Adjustment Switch (PAGE 3-26)".

If the screen is dark, increase the brightness and contrast (extend the scale in the + Δ direction) to make the screen brighter and easier to read.

Brightness



Contrast



Guideline for bar display for brightness and contrast in cold weather

Ambient temperature	Brightness	Contrast
-10°C (14°F)	7 (max)	5 - 4
-20°C (-4°F)	7	7 - 6

AFTER DAILY WORK COMPLETION



WARNING

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

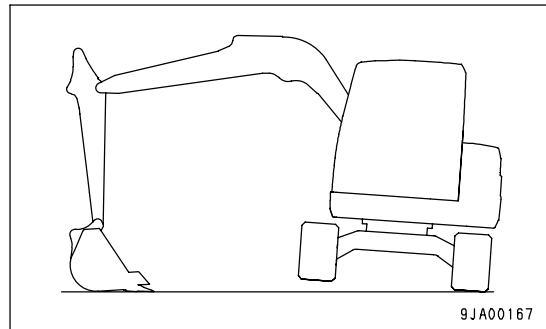
To prevent mud, water, or the undercarriage from freezing and making it impossible for the machine to move on the following morning, observe the following precautions.

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

If this is impossible, park the machine on boards.

The boards prevent the tracks from freezing to the ground, and allow the machine to be moved the next morning.

- Open the drain valve and drain 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 idle 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 the season changes and the weather becomes warmer, do as follows.

- Replace all fuel and oil with the specified fuel and oil.
For details, see "LUBRICANTS, FUEL AND COOLANT SPECIFICATIONS (PAGE 4-8)".
- If for any reason permanent antifreeze cannot be used, and an ethylene glycol base antifreeze (winter, one season type) is used instead, or if no antifreeze is used, drain the cooling system completely. Thoroughly flush out the cooling system and fill it with fresh coolant.

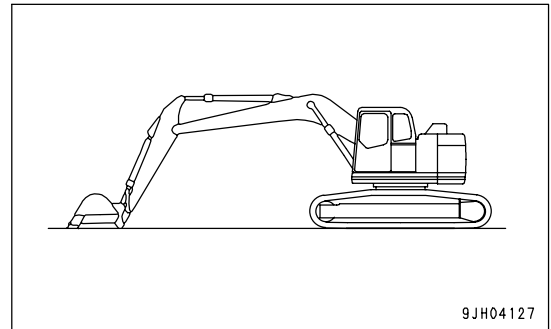
LONG TERM STORAGE

BEFORE STORAGE

NOTICE

To protect the hydraulic cylinder piston rod while in storage, keep the work equipment in the posture shown at right.

(This prevents rust from developing on the piston rod)



When putting the machine in storage for a long time, do as follows.

- Clean and wash all parts, then store the machine indoors. If the machine has to be stored outdoors, select level ground and cover the machine with canvas.
- 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 "Where no attachment is mounted" position.

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

AFTER STORAGE

NOTICE

If the machine has been stored without carrying out the monthly rust-prevention operation, consult your Komatsu distributor before using it.

When using the machine after long-term storage, do as follows before using it.

- Wipe off the grease from the hydraulic cylinder rods.
- Add oil and grease at all lubrication points.
- When the machine is stored for a long period, moisture in the air will mix with the oil. Check the oil before and after starting the engine. If there is water in the oil, change all the oil.

STARTING MACHINE AFTER LONG-TERM STORAGE

When starting the engine after the machine has been in storage for a long time, perform the automatic warming-up operation.

If the engine is started according to the starting procedure for cold weather, the warming-up operation is performed automatically.

(For details, see "Starting Engine in Cold Weather (PAGE 3-81)" and "In Cold Weather Areas (PAGE 3-87)".)

TROUBLES AND ACTIONS

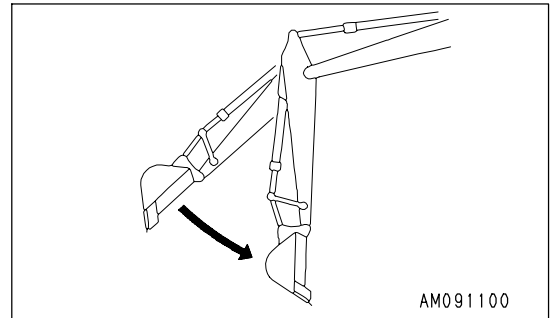
RUNNING OUT OF FUEL

When starting after running out of fuel, fill with fuel and bleed the air from the fuel system before starting. For details on bleeding the air, see "REPLACE FUEL FILTER CARTRIDGE (PAGE 4-55)".

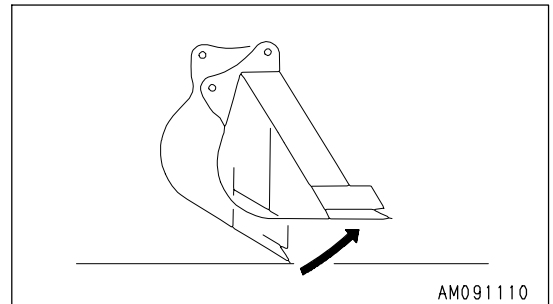
PHENOMENA THAT ARE NOT FAILURES

Note that the following phenomena are not failures:

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



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



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

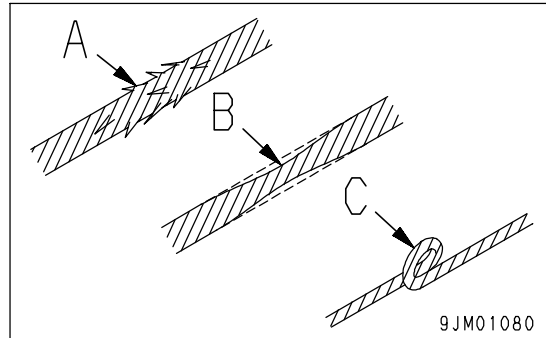
TOWING THE MACHINE



WARNING

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.

- Always check that the wire rope used for towing has ample strength for the weight of the machine being towed.
- Never use a wire rope which has cut strands (A), reduced diameter (B), or kinks (C). There is danger that the rope may break during the towing operation.
- Always wear leather gloves when handling wire rope.
- Never tow a machine on a slope.
- During the towing operation, never stand between the towing machine and the machine being towed.
- Operate the machine slowly and be careful not to apply any sudden load to the wire rope.

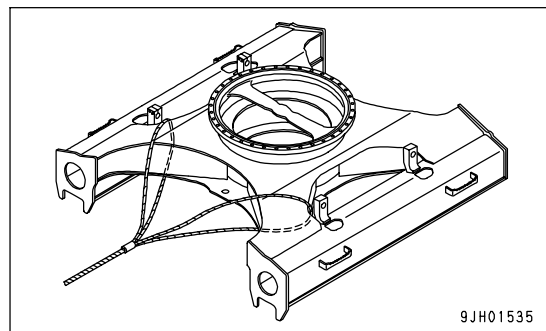
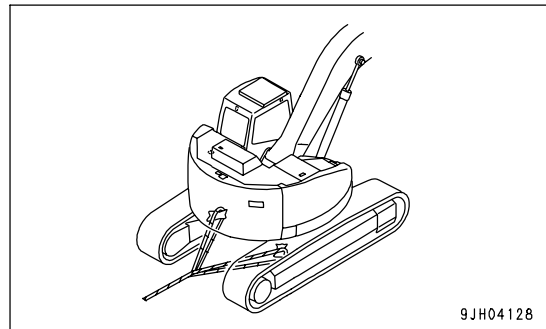


NOTICE

The maximum towing capacity for this machine is 157,000 N (16,100 kgf). Always carry out towing operations within the maximum towing capacity.

- 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.
- Hold the wire rope level and direct it straight to the track frame.
- When towing a machine, travel at a speed of less than 1 km/h for a distance of only a few meters to a place that is suitable for carrying out repairs.

This is for use only in emergencies.



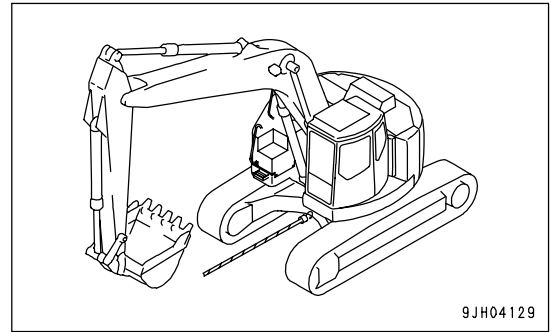
LIGHTWEIGHT TOWING HOLE

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.

There is a hole in the track frame to fit the shackle when towing light objects.

Permissible towing load:
Max. 108000 N (11,000 kgf)



SEVERE JOB CONDITION

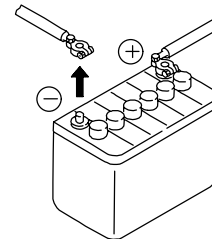
- When carrying out digging operations in water, if the work equipment mounting pin goes into the water, carry out greasing every time the operation is carried out.
- For heavy-duty operations and deep digging, carry out greasing of the work equipment mounting pins every time before operation.
After greasing, operate the boom, arm and bucket several times, then grease again.

DISCHARGED BATTERY

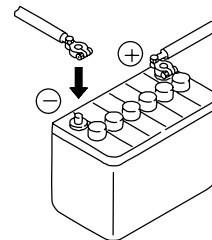
WARNING

- It is dangerous to charge a battery when mounted on a machine. Make sure that it is dismantled before charging.
- When checking or handling the battery, stop the engine and turn the starting switch key to the OFF position.
- The battery generates hydrogen gas, 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 sulfuric acid, and it will attack your clothes and skin. If it gets on your clothes or on your skin, immediately wash it off with a large amount of water. If it gets in your eyes, wash it out with fresh water and consult a doctor.
- When handling batteries, always wear protective goggles and rubber gloves.
- When removing the battery, first disconnect the cable from the ground (normally the negative (-) terminal). When installing, install the positive (+) terminal first.
If a tool touches the positive terminal and the chassis, there is danger that it will cause a spark, so be extremely careful.
- If the terminals are loose, there is danger that the defective contact may generate sparks that will cause an explosion.
- When removing or installing the terminals, check which is the positive (+) terminal and which is the negative (-) terminal.

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



When installing, connect the cable to the positive ⊕ terminal first.



9EA00023

Battery Removal and Installation

NOTICE

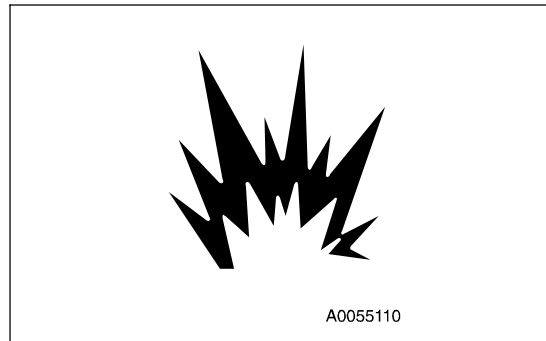
After securing the battery, check that it does not move. If it moves, tighten it again securely.

- Before removing the battery, remove the ground cable (normally connected to the negative (-) terminal).
If any tool touches between the positive terminal and the chassis, there is a hazard of sparks being generated.
- When installing the battery, connect the ground cable last.
- When replacing the battery, fix the battery securely with the battery mount clamp.
Tightening torque of mounting bolts
For standard battery: 29.4 -39.2 N·m {3 - 4 kgf·m}
For large capacity battery: 1.47 - 1.96 N·m {0.15 - 0.21 kgf·m}
When replacing the battery, secure it with battery fitting.

Battery Charges

When charging the battery, if the battery is not handled correctly, there is a hazard that the battery may explode. Always follow the instructions of "DISCHARGED BATTERY (PAGE 3-135)" and the instruction manual accompanying the charger, and do as follows.

- Set the voltage of the charger to match the voltage of the battery to be charged. If the correct voltage is not selected, the charger may overheat and cause an explosion.
- Connect the positive (+) charger clip of the charger to the positive (+) terminal of the battery, then connect the negative (-) charger clip of the charger to the negative (-) terminal of the battery. Be sure to attach the clips securely.
- Set the charging current to 1/10 of the value of the rated battery capacity; when carrying out rapid charging, set it to less than the rated battery capacity.
If the charger current is too high, the electrolyte will leak or dry up, and this may cause the battery to catch fire and explode.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source. There is a danger that this will ignite the battery electrolyte and cause the battery to explode.
- Do not use or charge the battery if the battery electrolyte level is below the LOWER LEVEL line. This may cause an explosion. Check the battery electrolyte level periodically and add distilled water to bring the electrolyte level to the UPPER LEVEL line.



Starting Engine with Booster Cables

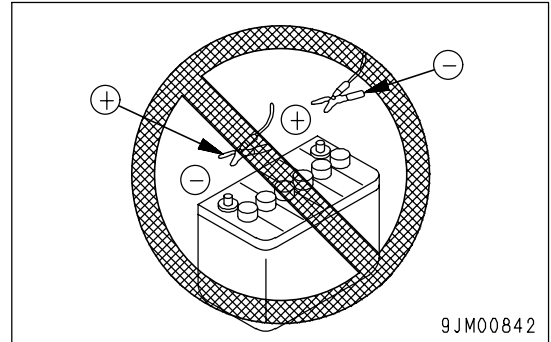
When starting the engine with a booster cable, do as follows:

Connecting and Disconnecting Booster Cables



WARNING

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



NOTICE

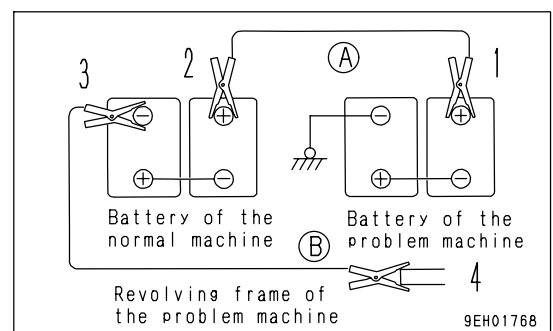
- The starting system for this machine uses 24 V. For the normal machine, also use a 24V battery.
- The size of the booster cable and clip should be suitable for the battery size.
- The battery of the normal machine must be the same capacity as that of the engine to be started.
- Check the cables and clips for damage or corrosion.
- Make sure that the cables and clips are firmly connected.
- Check that the 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 in the OFF position.

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

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



Starting the Engine



WARNING

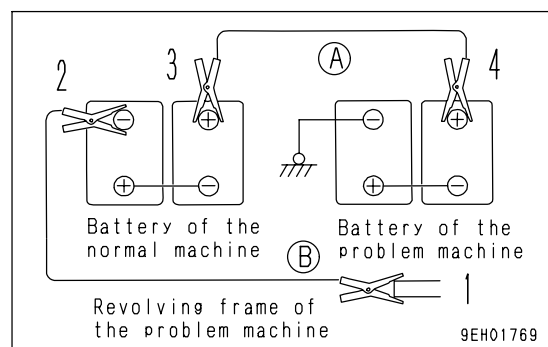
Always check that the lock lever is set to the LOCK position, regardless of whether the machine is working normally or has failed. Check also that all the control levers are in the neutral position.

1. Make sure the clips are firmly connected to the battery terminals.
2. Start engine of the normal machine and run it at high idle speed.
3. Turn the starting switch of the problem machine to the START position and start the engine.
If the engine doesn't start at first, try again after 2 minutes or so.

Booster Cable Disconnection

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

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



OTHER TROUBLE

Electrical System

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

Problem	Main causes	Remedy
Lamp does not glow brightly even when the engine runs at high speed	• Defective wiring, deterioration of battery	(• Check, repair loose terminals, disconnections and replace battery)
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	(• Check, repair) (• Replace) • Charge
Pinion of starting motor keeps going and out	• Insufficient battery charge • Defective safety relay (direct starting motor)	• Charge (• Replace)
Starting motor turns engine sluggishly	• Insufficient battery charge • Defective starting motor	• Charge (• Replace)
Starting motor disengages before engine starts	• Defective wiring, defective ring gear pinion • Insufficient battery charge	(• Check, repair) • Charge
Pre-heating monitor does not light	• Defective wiring • Defective heater relay • Defective monitor	(• Check, repair) (• Replace) (• Replace)
Oil pressure monitor does not light up when engine is stopped (starting switch at ON position)	• Defective monitor • Defective caution lamp switch	(• Replace) (• Replace)
Outside of electrical heater is not warm when touched by hand	• Defective wiring • Disconnection in electric heater • Defective operation of heater relay switch	(• Check, repair) (• Replace) (• Replace)

Chassis

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

Problem	Main causes	Remedy
Speed of travel, swing, boom, arm, bucket is slow	• Lack of hydraulic oil	• Add oil to specified level, see CHECK BEFORE STARTING
Pump generates abnormal noise (sucking in air)	• Clogged element in hydraulic tank strainer, lack of oil	• Clean, see EVERY 2000 HOURS SERVICE
Excessive rise in hydraulic oil temperature	• Loose fan belt • Dirty oil cooler • Lack of hydraulic oil	• Adjust fan belt tension, EVERY 1000 HOURS SERVICE • Clean, see EVERY 500 HOURS SERVICE • Add oil to specified level, see CHECK BEFORE STARTING
Track comes off	• Track too loose	• Adjust track tension, see WHEN REQUIRED
Abnormal wear of sprocket		
Bucket rises slowly, does not rise	• Lack of hydraulic oil	• Add oil to specified level, CHECK BEFORE STARTING
Does not swing	• Swing lock switch still applied	• Turn swing lock switch OFF

Engine

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

Problem	Main causes	Remedy
Engine oil pressure monitor lights up	<ul style="list-style-type: none"> • Engine oil pan oil level is low (sucking in air) • Clogged oil filter cartridge • Defective tightening of oil pipe, pipe joint, oil leakage from damaged point • Defective engine oil pressure sensor • Defective monitor 	<ul style="list-style-type: none"> • Add oil to specified level, see CHECK BEFORE STARTING • Replace cartridge, see EVERY 500 HOURS SERVICE (• Check, repair) (• Replace sensor) (• Replace monitor)
Steam spurts out from top of radiator (pressure valve)	<ul style="list-style-type: none"> • Coolant level low, leakage of water • Loose fan belt • Dirt or scale accumulated in cooling system 	<ul style="list-style-type: none"> • Check, add coolant, repair, see CHECK BEFORE STARTING • Check fan belt tension, adjust, replace • Change coolant, flush inside of cooling system, see WHEN REQUIRED
Radiator coolant level monitor lights up	<ul style="list-style-type: none"> • Clogged radiator fins or damaged fins • Defective thermostat • Loose radiator filler cap (high-altitude operations) • Defective water level sensor • Defective monitor 	<ul style="list-style-type: none"> • Clean or repair, see EVERY 500 HOURS SERVICE (• Replace thermostat) • Tighten cap or replace packing (• Replace sensor) (• Replace monitor)
Engine does not start when starting motor is turned	<ul style="list-style-type: none"> • Lack of fuel • Air in fuel system • Defective fuel injection pump or defective nozzle • Starting motor cranks engine sluggishly • Engine pre-heating monitor does not light up • Defective compression • Defective valve clearance 	<ul style="list-style-type: none"> • Add fuel, see CHECK BEFORE STARTING • Repair place where air is sucked in, see EVERY 500 HOURS SERVICE (• Replace pump or nozzle) • See ELECTRICAL SYSTEM • See ELECTRICAL SYSTEM (• Adjust valve clearance)
Exhaust gas is white or blue	<ul style="list-style-type: none"> • Too much oil in oil pan • Improper fuel 	<ul style="list-style-type: none"> • Set oil to specified level, see CHECK BEFORE STARTING • Change to specified fuel
Exhaust gas occasionally turns black	<ul style="list-style-type: none"> • Clogged air cleaner element • Defective nozzle • Defective compression • Defective turbocharger 	<ul style="list-style-type: none"> • Clean or replace, see WHEN REQUIRED (• Replace nozzle) (• See defective compression above) • Clean or replace turbocharger
Combustion noise occasionally make breathing sound	<ul style="list-style-type: none"> • Defective nozzle 	<ul style="list-style-type: none"> (• Replace nozzle)

Problem	Main causes	Remedy
Abnormal noise generated (combustion or mechanical)	<ul style="list-style-type: none">• Low-grade fuel being used• Overheating • Damage inside muffler• Excessive valve clearance	<ul style="list-style-type: none">• Change to specified fuel• Refer to "Radiator coolant level monitor lights up" as above• Replace muffler(• Adjust valve clearance)

Electronic Control System

If an error code appears on the machine monitor display (normally displays TIME), follow the countermeasure table as shown below in the self-diagnosis.

Machine Monitoring System

Monitor display	Error mode	Countermeasure
E02	pump control system error	If the emergency pump drive switch is set to the ON position, operation can be carried out. However, immediately have the pump control system inspected by your Komatsu distributor. (*)
E03	Swing brake system error	Turn the swing prolix switch ON to cancel the brake. When applying the swing brake, operate the swing lock switch manually. Depending on the cause of the failure, it may be impossible to release the brake. In any case, have the system inspected immediately by your Komatsu distributor. (*)
E05	Governor system error	Governor will not execute the control function. Manually operate the governor-lever. To fix the governor lever at the full stroke position, use the retaining bolt holes on bracket. In this case, immediately have the governor system inspected by your Komatsu distributor.
E06	Electrical system error	If the emergency work equipment actuation switch is turned ON, the work equipment (boom) can be raised, but have the machine inspected immediately.
CALL	Error indicating that operation cannot be continued	Place the machine in a safe posture, then have it inspected immediately by your Komatsu distributor.
In the case where the monitor will not display error codes and work equipment operation and swing operation cannot be carried out.		Have the machine inspected immediately by your Komatsu distributor.

(*): For details of handling the emergency pump drive switch, swing holding brake cancel switch, and emergency work equipment actuation switch, "SWITCHES (PAGE 3-28)".

Point of Contact to Telephone when Error Occurs

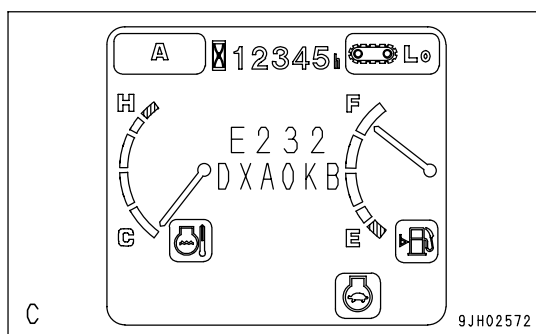
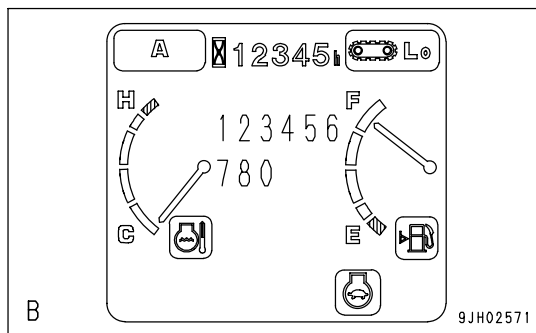
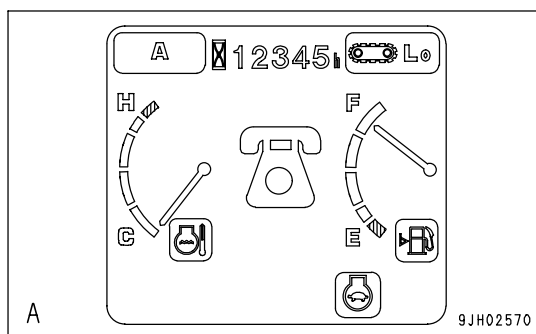
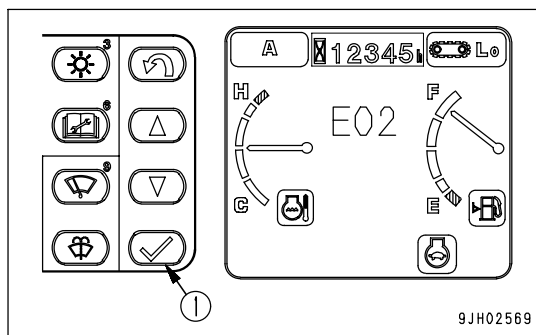
If an error screen is displayed on the monitor, the screen changes as follows each time input confirmation switch (1) is pressed.

Error screen -> screen A -> screen B -> screen C -> error screen
Check the point of contact telephone number on screen B.

REMARK

If the point of contact telephone number has not been registered, screen B is not displayed.

If it is necessary to register the point of contact telephone number, ask your Komatsu distributor to register it.



MAINTENANCE

WARNING

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

MAINTENANCE INFORMATION

Do not perform 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 performed.

Komatsu Genuine Replacement Parts

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

Komatsu Genuine Lubricants

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

Windshield Washer Fluid

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

Fresh and Clean Lubricants

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

Check Drained Oil and Used Filter

After oil is changed or filters are replaced, check the old oil and filters for metal particles and foreign materials. If large quantity 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 200 V continuously.
- Connect grounding cable within 1 m (3.3 ft) of the area to be welded. If grounding cable is connected near instruments, connectors, etc., the instruments may malfunction.
- If a seal or bearing happens to come between the part being welded and grounding point, change the grounding point to avoid such parts.
- Do not use the area around the work equipment pins or the hydraulic cylinders as the grounding point.

Do not Drop Things Inside Machine

- When opening inspection windows or the oil filler port of the tank to carry out inspection, be careful not to drop nuts, bolts, or tools inside the machine.
If such things are dropped inside the machine, it may cause damage and/or malfunction of the machine, and will lead to failure. If you drop anything inside the machine, always remove it immediately.
- Do not put unnecessary things in your pockets. Carry only things which are necessary for inspection.

Dusty Jobsite

When working at dusty worksites, do as follows:

- Inspect the air cleaner clogging monitor frequently to see if the air cleaner is clogged.
Clean the air cleaner element at a shorter interval than specified.
- Clean the radiator core frequently to avoid clogging.
- Clean and replace the fuel filter frequently.
- Clean electrical components, especially the starting motor and alternator, to avoid accumulation of dust.
- When inspecting or changing the oil, move the machine to a place that is free of dust to prevent dirt from getting into the oil.

Avoid Mixing Lubricants

If a different brand or grade of oil has to be added, drain the old oil and replace all the oil with the new brand or grade of oil. Never mix different brand or grade of oil.

Locking the Inspection Covers

Lock inspection cover securely into position with the lock bar. If inspection or maintenance is performed with inspection cover not locked in position, there is a danger that it may be suddenly blow shut by the wind and cause injury to the worker.

Hydraulic System - Air Bleeding

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 "BLEEDING AIR FROM HYDRAULIC SYSTEM (PAGE 4-41)".

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 or bend them into loops with a small radius.
This will cause damage to the hose and drastically reduce its service life.

Checks After Inspection and Maintenance Works

If you forget to perform the checks after inspection and maintenance, unexpected problems may occur, and this may lead to serious injury or property damage. Always do the following:

- Checks after operation (with engine stopped)
 - Have any inspection and maintenance points been forgotten?
 - Have all inspection and maintenance items been performed correctly?
 - Have any tools or parts been dropped inside the machine? It is particularly dangerous if parts are dropped inside the machine and get caught in the lever linkage mechanism.
 - Are there any leakage of coolant or oil? Have all nuts and bolts been tightened?
- Checks when operating engine
 - For details of the checks when operating the engine, see "TWO WORKERS FOR MAINTENANCE WHEN ENGINE IS RUNNING (PAGE 2-33)" and pay careful attention to safety.
 - Are the inspection and maintenance items working properly?
 - Is there any leakage of fuel or oil when the engine speed is raised?

OUTLINE OF SERVICE

HANDLING OIL, FUEL, COOLANT, AND PERFORMING OIL CLINIC

Oil

- Even if oil is not dirty, always change the oil at the specified interval.
Oil is used in the engine and work equipment under extremely severe conditions (high temperature, high pressure), and it deteriorates with use.
- Always use oil that matches the grade and temperature for use given in the Operation and Maintenance Manual.
- Never mix oils of different grades or brands.
- Oil corresponds to blood in the human body, so always be careful when handling it to prevent any impurities (water, metal particles, dirt, etc.) from getting in.
Take particular care not to let any impurities get in when adding oil.
The majority of problems with machines are caused by the entry of such impurities.
- Always add the specified amount of oil.
Having too much oil or too little oil are both causes of problems.
- When changing the oil, always replace the related filters at the same time.
- If the oil in the work equipment is not clear, there is probably water or air getting into the circuit. In such cases, please contact your Komatsu distributor.
- We recommend you have an analysis made of the oil periodically to check the condition of the machine. For those who wish to use this service, please contact your Komatsu distributor.

Fuel

- The fuel pump is a precision instrument, and if fuel containing water or dirt is used, it cannot work properly.
- Be extremely careful not to let impurities get in when storing or adding fuel.
- Always use the fuel specified in the Operation and Maintenance Manual.
Fuel may congeal, depending on the temperature, when it is used (particularly in low temperature below -15°C (5°F)). It is necessary to change to the fuel that is suitable for the temperature.
- To prevent the moisture in the air from condensing and forming water inside the fuel tank, always fill the fuel tank after completing the day's work.
- Before starting the engine, or when 10 minutes have passed after adding fuel, drain the sediment and water from the fuel tank.
- If the engine runs out of fuel, or if the filters have been replaced, it is necessary to bleed the air from the circuit.
- If there is any foreign material in the fuel tank, wash the tank and fuel system.

Cooling System Coolant

- If the coolant level is low, it will cause overheating, and will also cause problems with corrosion due to air entering the coolant.
- River water contains large amount of calcium and other impurities, so if it is used, scale will stick to the engine and radiator, and this will cause defective heat exchange and overheating.
- Do not use water that is not suitable for drinking.
- Antifreeze is also effective in preventing corrosion on the parts of the engine cooling system. It may be continuously used for two years or 4000 hours of operation, therefore it may be used throughout the year.
- When using anti-freeze, always observe the precautions given in the Operation and Maintenance Manual.
Anti-freeze is flammable, so be extremely careful not to expose it to flame or fire.
The proper mixing proportion of the antifreeze depends on the ambient temperature. For the mixing proportion, see "CLEAN INSIDE OF COOLING SYSTEM (PAGE 4-24)".

Grease

- Grease is used to prevent seizure and noises at the joints.

- The nipples not included in the MAINTENANCE section are nipples used when overhauling, so they do not need grease.
If any part becomes stiff or generates noise after being used for a long time, grease it.
- Always wipe off all of the old grease that is pushed out when greasing.
Be particularly careful to wipe off the old grease in places where sand or dirt sticking in the grease would cause wear of the rotating parts.

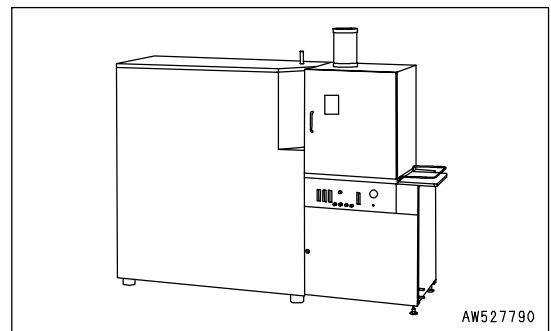
Carrying Out KOWA (Komatsu Oil Wear Analysis)

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

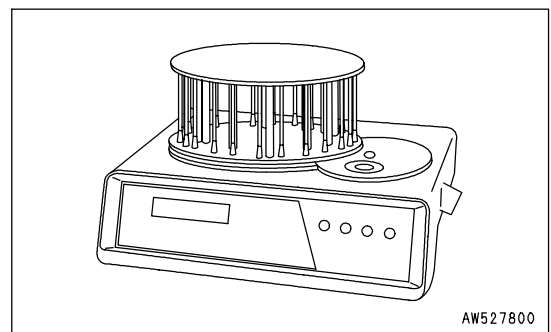
We strongly recommend you to use this service. The oil analysis is carried out at actual cost, so the cost is low, and the results of the analysis are reported together with recommendations which will reduce repair costs and machine downtime.

KOWA Analysis Items

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



- Measurement of quantity of particles
This uses a particle quantifier index measurement machine to measure the quantity of iron particles of 5μ 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.
 - Perform sampling at regular fixed intervals.
 - Do not perform sampling on rainy or windy days when water or dust can get into the oil.

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

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 attached to the old filter. If any metal particles are found, contact your Komatsu distributor.
- Do not open packs of spare filters until just before they are to be used.
- Always use Komatsu genuine filters.

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, 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

Replace wear parts such as the filter element or air cleaner element at the time of periodic maintenance or before they reach the wear limit. The wear parts should be replaced correctly in order to ensure more economic use of the machine. When replacing parts, always use Komatsu genuine parts.

As a result of our continuous efforts to improve product quality, the part number may change, so inform your Komatsu distributor of the machine serial number and check for the latest part number when ordering parts.

WEAR PARTS LIST

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

Item	Part No.	Part Name	Q'ty	Replacement frequency
Engine oil filter	6735-51-5141	Cartridge	1	Every 500 hours service
Fuel filter	6732-71-6111	Cartridge	1	
Hydraulic tank breather	20Y-60-21470	Element	1	
Hydraulic oil filter	207-60-71180 (07000-15160)	Element (O-ring)	1 (1)	Every 1000 hours service
Air cleaner	600-185-3100	Element assembly	1	-
Additional filter for breaker (if equipped)	20Y-970-1820 (07000-12115)	Element	1	-
		(O-ring)	1	-
Electric heater	6732-11-4810	Gasket	2	-
Bucket	205-70-74272 (205-70-74281) (205-70-74291)	Vertical pin type Tooth (Pin) (Lock)	5 (5) (5)	-
	205-70-19570 (09244-02496)	Horizontal pin type Tooth (Pin)	5 (5)	
	205-70-74180 205-70-74190 (176-32-11210) (01803-02430)	Cutter (left) Cutter (right) (Bolt) (Nut)	1 1 (8) (8)	

The above parts may differ depending on the machine's serial number, so when you ask your Komatsu distributor for any of those parts, inform them of the serial number of your machine.

LUBRICANTS, FUEL AND COOLANT SPECIFICATIONS

PROPER SELECTION

RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE										
		-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						SAE30					
					SAE10W							
		SAE10W-30										
		SAE15W-40										
Swing machinery case Final drive case PTO gear case							SAE30					
							SAE30					
							SAE10W-30					
Hydraulic system							SAE30					
							SAE10W-30					
							SAE15W-40					
Fuel tank	Diesel fuel						ASTM D975 No. 2					
		*1										
Greasing system	Grease	NLGI No. 2										
Cooling system	Water	Add antifreeze										

*1: ASTM D975 No. 1

		Engine oil pan	Swing machinery case	Final drive case (each)	Damper case	Hydraulic system	Cooling system	Fuel tank
Specified capacity	Liters	26.3	6.6	5.4	0.75	185	22.4	320
	US gal	6.95	1.74	1.43	0.20	48.88	5.92	84.54
Refill capacity	Liters	24	6.6	5.4	-	126	-	-
	US gal	6.34	1.74	1.43	-	33.29	-	-

REMARK

- When fuel sulphur content is less than 0.5%, change oil in the oil pan according to the periodic maintenance hours described in this manual.
Change oil according to the following table if fuel sulfur content is above 0.5%.
- When starting the engine with an atmospheric temperature of lower than 0°C (32°F), be sure to use engine oil of SAE10W, SAE10W-30 and SAE15W-40, even though the atmospheric temperature goes up to 10°C (50° F) more or less during the day.
- Use API classification CD as engine oil and if API classification CC, reduce the engine oil change interval to half.
- There is no problem if single grade oil is mixed with multigrade oil (SAE10W-30, 15W-40), but be sure to add single grade oil that matches the temperature range in the table.
- We recommend Komatsu genuine oil which has been specifically formulated and approved for use in engine and hydraulic work equipment applications.

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

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

ASTM: American Society of Testing and Material

SAE: Society of Automotive Engineers

API: American Petroleum Institute

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

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

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

TIGHTENING TORQUE SPECIFICATIONS

TIGHTENING TORQUE LIST

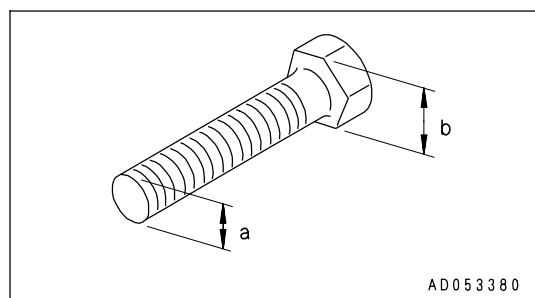


If nuts, bolts, or other parts are not tightened to the specified torque, it will cause looseness or damage to the tightened parts, and this will cause failure of the machine or problems with operation.

Always pay careful attention when tightening parts.

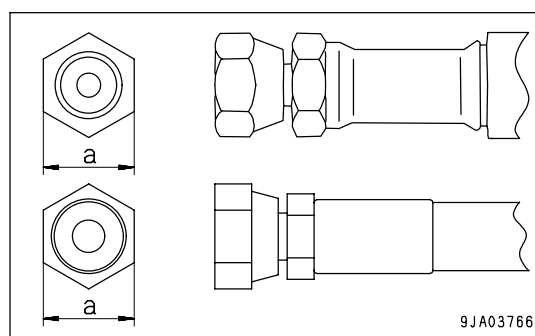
Unless otherwise specified, tighten the metric nuts and bolts to the torque shown in the table below. If it is necessary to replace any nut or bolt, always use a Komatsu genuine part of the same size as the part that was replaced.

Thread diameter of bolt (a)(mm)	Width across flats (b)(mm)	Tightening torque					
		Target value			Service limit		
		N·m	kgf·m	lbft	N·m	kgf·m	lbft
6	10	13.2	1.35	9.8	11.8-14.7	1.2-1.5	8.7-10.8
8	13	31	3.2	23.1	27-34	2.8-3.5	20.3-25.3
10	17	66	6.7	48.5	59-74	6.0-7.5	43.4-54.2
12	19	113	11.5	83.2	98-123	10.0-12.5	72.3-90.4
14	22	172	17.5	126.6	153-190	15.5-19.5	112.1-141
16	24	260	26.5	191.7	235-285	23.5-29.5	170.0-213.4
18	27	360	37	267.6	320-400	33.0-41.0	238.7-296.6
20	30	510	52.3	378.3	455-565	46.5-58.0	336.3-419.5
22	32	688	70.3	508.5	610-765	62.5-78.0	452.1-564.2
24	36	883	90	651	785-980	80.0-100.0	578.6-723.3
27	41	1295	132.5	958.4	1150-1440	118.0-147.0	853.5-1063.3
30	46	1720	175.0	1265.8	1520-1910	155.0-195.0	1121.1-1410.4
33	50	2210	225.0	1627.4	1960-2450	200.0-250.0	1446.6-1808.3
36	55	2750	280.0	2025.2	2450-3040	250.0-310.0	1808.3-2242.2
39	60	3280	335.0	2423.1	2890-3630	295.0-370.0	2133.7-2676.2



- Apply the following table for Hydraulic Hose.
- The torques marked * indicate the tightening torques for the hoses at the top of the swivel joint.

Hose nominal number	Width across flat a(mm)	Tightening torque					
		Target valve			Service limit		
		N·m	kgf·m	lbft	N·m	kgf·m	lbft
02	19	44	4.5	32.5	35-63	3.5-6.5	25.3-47.0
03	22	74	7.5	54.2	54-93	5.5-9.5	39.8-68.7
	24	78	8.0	57.9	59-98	6.0-10.0	43.4-72.3
04	27	103	10.5	75.9	84-132	8.5-13.5	61.5-97.6
05	32	157	16.0	115.7	128-186	13.0-19.0	94.0-137.4
06	36	216	22.0	159.1	177-245	18.0-25.0	130.2-180.8



SAFETY CRITICAL PARTS

For using the machine safely for an extended period of time, you are required to periodically replace the safety (critical and fire prevention) related parts listed in the table of important parts on the following page.

Material quality of these parts can change as time passes and they are likely to wear out or deteriorate. However, it is difficult to determine the extent of wear or deterioration at the time of periodic maintenance. Hence, it is required to replace them with new ones regardless of their condition after a certain period of usage. This is important to ensure that these parts maintain their full performance at all times.

Furthermore, should anything abnormal be found on any of these parts, replace it with a new one even if the periodic replacement time for the part has not yet arrived.

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

Also perform the following checks with hydraulic hoses which need to be replaced periodically. Tighten all loose clamps and replace defective hoses, as required.

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

Have your Komatsu distributor replace the critical parts.

SAFETY CRITICAL PARTS LIST

No.	Safety critical parts for periodic replacement	Q'ty	Replacement interval
1	Fuel hose (Fuel tank - Water separator)	1	Every 2 years or 4000 hours, whichever comes sooner
2	Fuel return hose (Water separator - Fuel pump)	1	
3	Fuel return hose (Fuel injection pump - Fuel tank)	2	
4	Fuel return hose (Connector - Fuel tank)	1	
5	Turbocharger lubricating oil hose	1	
6	Pump outlet hose (Pump - Control valve)	2	
7	Work equipment hose (Boom cylinder inlet)	4	
8	Work equipment hose (Bucket cylinder line - Boom foot section)	2	
9	Work equipment hose (Bucket cylinder inlet)	2	
10	Work equipment hose (Arm cylinder line - Boom foot section)	2	
11	Work equipment hose (Arm cylinder inlet)	2	
12	Additional attachment line hose (Boom foot section)	2	
13	Additional attachment line hose (Boom top section)	2	
14	Swing line hose (Swing motor inlet)	2	
15	Main suction hose	1	
16	Heater hose	2	
17	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 4-16)" to confirm the correct maintenance schedule when carrying out maintenance.

MAINTENANCE SCHEDULE CHART

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

REPLACE FUEL FILTER CARTRIDGE	4- 55
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INITIAL 1000 HOURS MAINTENANCE (ONLY AFTER THE FIRST 1000 HOURS)

CHECK ENGINE VALVE CLEARANCE, ADJUST	4- 69
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WHEN REQUIRED

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REPLACE BUCKET TEETH (HORIZONTAL PIN TYPE)	4- 33
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CHECK AND ADJUST AIR CONDITIONER	4- 36
WASHING WASHABLE FLOOR	4- 38
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EVERY 250 HOURS MAINTENANCE

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CHECK OIL LEVEL IN FINAL DRIVE CASE, ADD OIL	4- 51
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CHECK AIR CONDITIONER COMPRESSOR BELT TENSION, ADJUST	4- 54

EVERY 500 HOURS MAINTENANCE

REPLACE FUEL FILTER CARTRIDGE	4- 55
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CLEAN FRESH/RECIRC AIR FILTER OF AIR CONDITIONER (IF EQUIPPED)	4- 58
REPLACE BREATHER ELEMENT IN HYDRAULIC TANK	4- 60

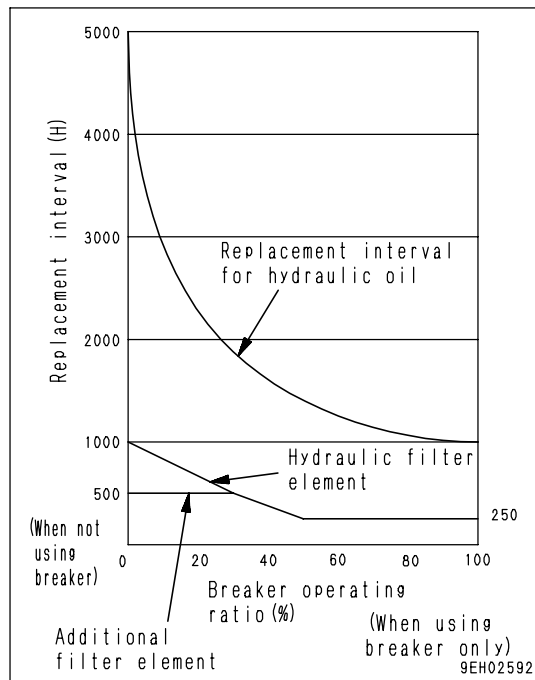
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EVERY 5000 HOURS MAINTENANCE	
CHANGE OIL IN HYDRAULIC TANK -----	4- 72

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.

REPLACE HYDRAULIC OIL FILTER ELEMENT

- On new machines, replace the element after the first 100 to 150 hours, then carry out further replacement of the element according to the table on the right.



CHANGE OIL IN HYDRAULIC TANK

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

REPLACE ADDITIONAL FILTER ELEMENT FOR BREAKER

- 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.

- Replace fuel filter cartridge
- Check engine valve clearance, adjust

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

For details of the method of replacing or maintaining, see EVERY 500 HOURS, EVERY 1000 HOURS and EVERY 2000 HOURS SERVICE.

INITIAL 1000 HOURS MAINTENANCE (ONLY AFTER THE FIRST 1000 HOURS)

Carry out the following maintenance only after the first 1000 hours of operation on new machines.

- Check engine valve clearance, adjust

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 2000 HOURS SERVICE.

WHEN REQUIRED

CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT

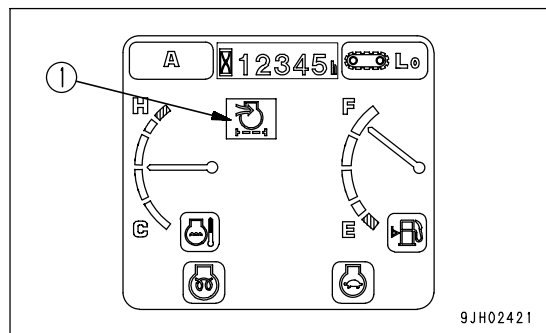
WARNING

- When using compressed air, there is danger of dirt flying and causing personal injury. Always wear protective glasses, dust mask, or other protective equipment.
- When removing the outer element from the air cleaner body, it is dangerous to pull it out by force. When working in high places or where the foothold is poor, be careful not to fall because of the reaction when pulling out the outer element.

Checking

If air cleaner clogging monitor (1) on the monitor panel lights up, check and clean the air cleaner element and air cleaner suction port.

If operations are carried out in places where there are a large amounts of dirt or dry leaves, check and clean the air cleaner suction port periodically.



Replacing

- Replacing element, O-ring
 - If one year has passed since installing the element or if air cleaner clogging monitor (1) on the monitor panel flashes immediately after the element is cleaned, replace the outer element, inner element, and O-ring.
- Replacing evacuator valve
 - Replace it if it is damaged or the rubber is markedly deformed.

NOTICE

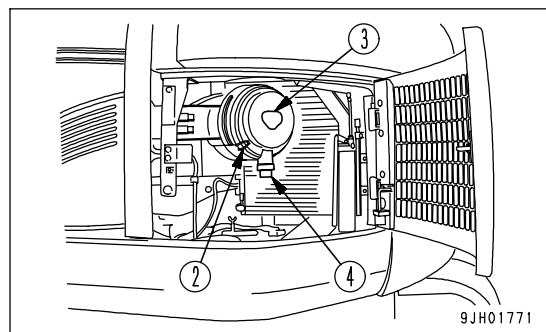
- Do not clean the air cleaner element until the air cleaner clogging monitor on the monitor panel flashes. If the element is cleaned frequently before the clogging monitor flashes, the air cleaner will not be able to display its performance fully, and the cleaning efficiency will also go down. In addition, during the cleaning operation, more dirt stuck to the element will fall inside the inner element.
- If inspection, cleaning, or maintenance is carried out with the engine running, dirt will enter the engine and cause damage to the engine. Always stop the engine before carrying out these operations.

Cleaning or Replacing Outer Element

1. Open a door located at the rear left side of the machine, release hooks (2) at 3 locations and then detach cover (3).

NOTICE

Before and after cleaning the element, do not leave or keep it in direct sunlight.

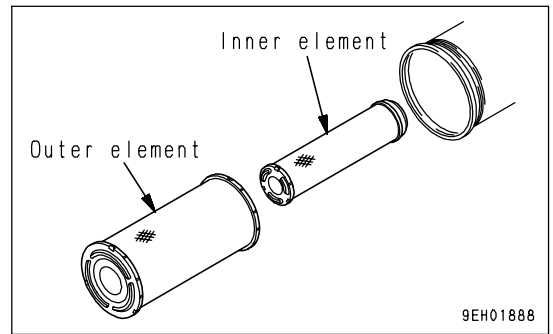


2. Hold the outer element, rock it lightly up and down and to the left and right, and rotate the element to the left and right to pull it out.

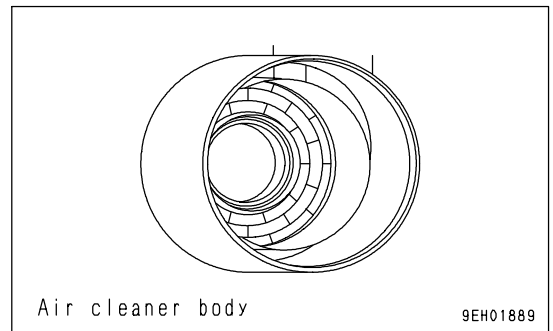
NOTICE

- Never remove the inner element. It will allow dirt to enter and cause failure of the engine.
- Do not use a screwdriver or any other tool.

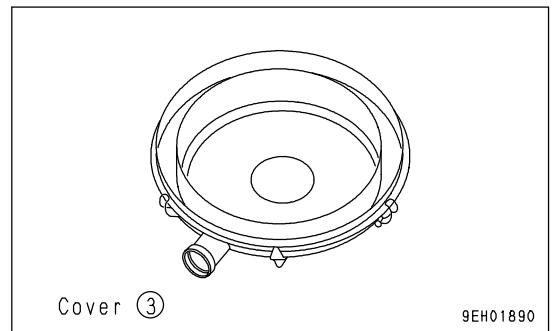
3. After removing the outer element, cover the air connector inside the air cleaner body with a clean cloth or tape to prevent dirt or dust from entering.



4. Wipe off or brush off the dirt stuck to cover (3) and the inside of the air cleaner body.

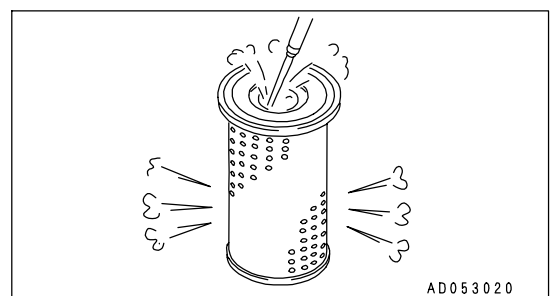
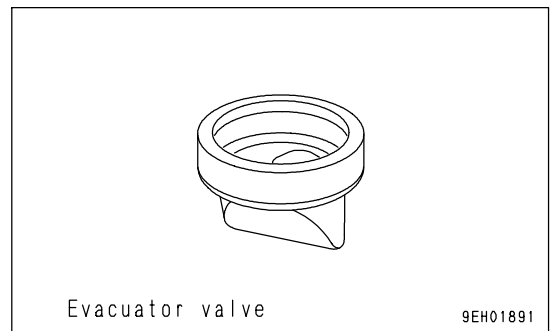


5. Remove any dirt or dust that is accumulated to evacuator valve (4) installed to cover (3).

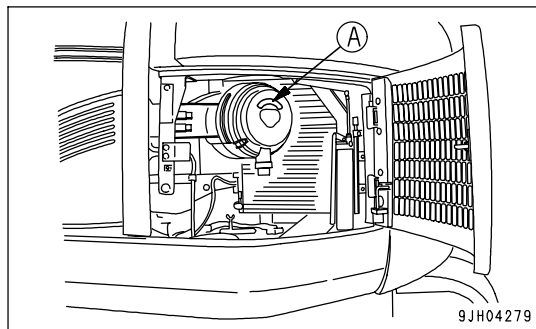


6. Direct dry compressed air (less than 0.69 MPa (7 kgf/cm², 99.4 PSI)) to the outer element from inside along its folds, then direct it from outside along its folds and again from inside.

- 1) Remove one seal from the element whenever the element has been cleaned.
- 2) Replace the outer element which has been cleaned 6 times repeatedly or used throughout a year. Replace the inner element at the same time.



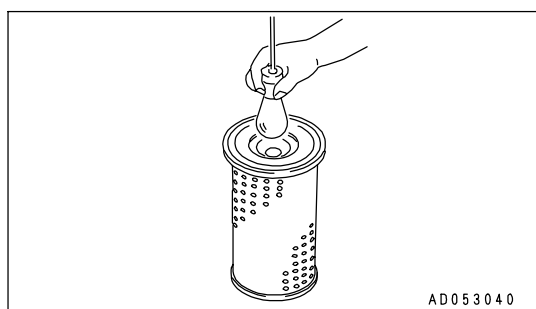
- 3) Replace both inner and outer elements when the monitor (1) lights up soon after installing the cleaned outer element even though it has not been cleaned 6 times.
- 4) When replacing the element, stick on seal (A) packed in the same box as the element. Stick the seal in the position shown in the diagram on the right.



- 7. Remove the cloth or tape cover installed in Step 3.
- 8. If small holes or thinner parts are found on the element when it is checked by shining a light through it after cleaning, replace the element.

NOTICE

- When cleaning the element, do not hit or beat it against anything.
- Do not use an element whose folds or gasket or seal are damaged.



Install Air Cleaner Element

NOTICE

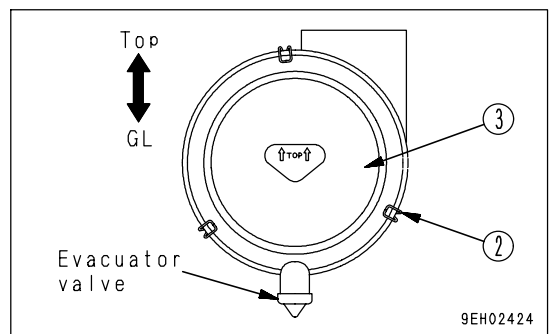
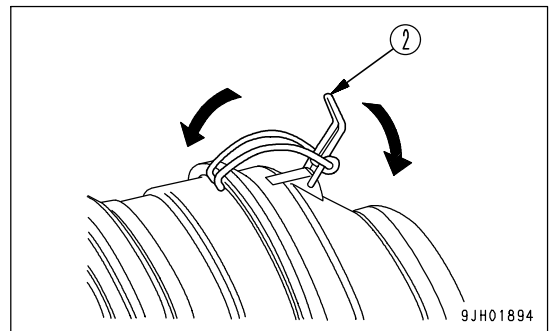
- Do not use any damaged gasket or seal or element with damaged pleats.
- Cleaning the element or O-ring after one year has passed and using them again will cause problems. Always replace them with new parts.
- The seal portion on imitation parts lacks precision, and allows the entry of dust, which leads to damage of the engine. Do not use such imitation parts.
- Do not run the engine with the inner element removed. It will cause damage to the engine.

1. Check that there is no dirt or oil stuck to the seal portion of the new element or cleaned element. Wipe off any dirt or oil.
2. When the outer element has been removed, check that the inner element has not come out of position and is not at an angle. If inner element is at an angle, insert your hand and push it in straight.
3. Push the outer element in straight with your hand when installing it to the air cleaner body.
If the element is held and rocked lightly up and down and to the left and right while pushing it in, the element can be inserted easily.

NOTICE

When inserting the element, if the rubber at the tip is swollen or the outer element is not pushed in straight, and cover (3) is assembled by force to hook (2), there is danger that the hook and air cleaner body may be damaged, so be careful when assembling.

4. Install cover (3) as follows.
 - 1) Align cover (3) with the element.
 - 2) Hook the tip of hook (2) to the protruding part of the air cleaner body and lock it in position.
 - 3) When locking hooks (2) in position, apply the hooks in turn on opposite sides (top, bottom, left, right) in the same way as when tightening bolts.
 - 4) Always install cover (3) so that the evacuator is facing the ground.
 - 5) When cover (3) is installed, check that the clearance between the air cleaner body and cover (3) is not too large. If it is too large, install again.



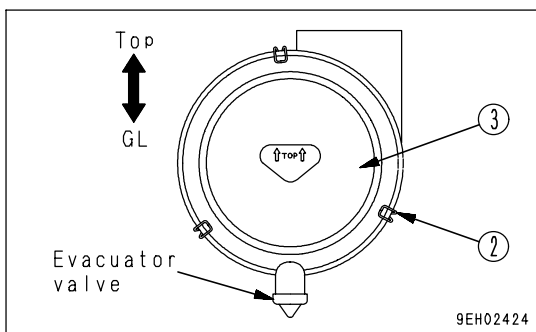
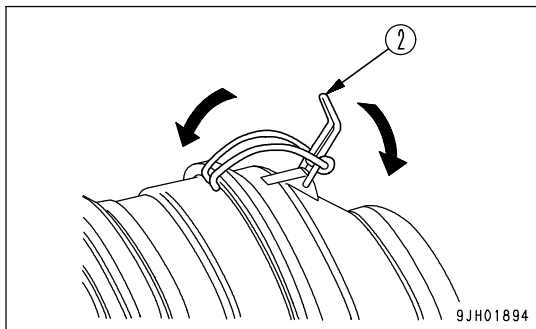
Replacing Inner Element

1. First remove the outer element, and then remove the inner element.
2. Cover the air connector side (outlet side) with a clean cloth or tape.
3. Clean the air cleaner body interior, then remove the cover from the air intake port in Step 2.
4. Install a new inner element to the connector, then tighten the nut.

NOTICE

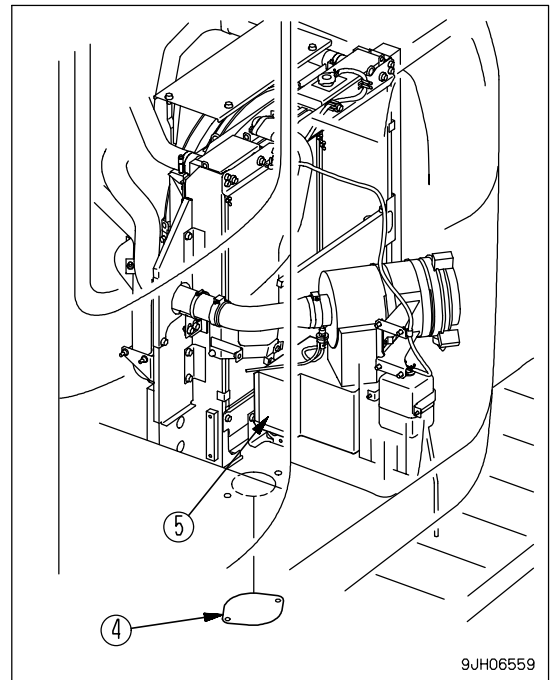
The inner element must not be used again even after cleaning. When replacing the outer element, replace the inner element at the same time.

5. Set the outer element in position, then lock cover (3) with hooks (2).



Check and Clean of Air Cleaner Inlet

1. Remove cover (4) under the chassis.
2. Insert your hand through the inspection port and remove all dirt and dry leaves stuck to net (5) at the air cleaner suction port.
3. Insert your hand through the inspection port and remove all accumulated dirt and dry leaves that can be reached.
4. Blow net (5) and the surrounding area with compressed air to remove all fine dust.
5. Install cover (4).



CLEAN INSIDE OF COOLING SYSTEM



- 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 lock lever to the LOCK position.
- For details of starting the engine, see "BEFORE STARTING ENGINE (PAGE 3-63)" and "STARTING ENGINE (PAGE 3-79)" in the OPERATION section.
- There is danger of touching the fan if the undercover is left removed.
Never enter behind the machine when the engine is running.

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

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

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

Use a permanent type of antifreeze.

If, for some reason, it is impossible to use permanent type antifreeze, use an antifreeze containing ethylene glycol. Super Coolant (AF-ACL) has an anti-corrosion effect as well as an antifreeze effect.

The ratio of antifreeze to water depends on the ambient temperature, but to obtain the corrosion resistance effect, a minimum ratio of 30% by volume is necessary.

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

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

Mixing rate of water and antifreeze

Min. atmospheric temperature	°C	Above -10	-15	-20	-25	-30
	°F	Above 14	5	-4	-13	-22
Amount of antifreeze	Liters	7.4	8.7	9.7	10.8	11.7
	US gal	1.96	2.30	2.56	2.85	3.09
Amount of water	Liters	15.0	13.7	12.7	11.6	10.7
	US gal	3.96	3.62	3.36	3.07	2.83
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 city water for the coolant.

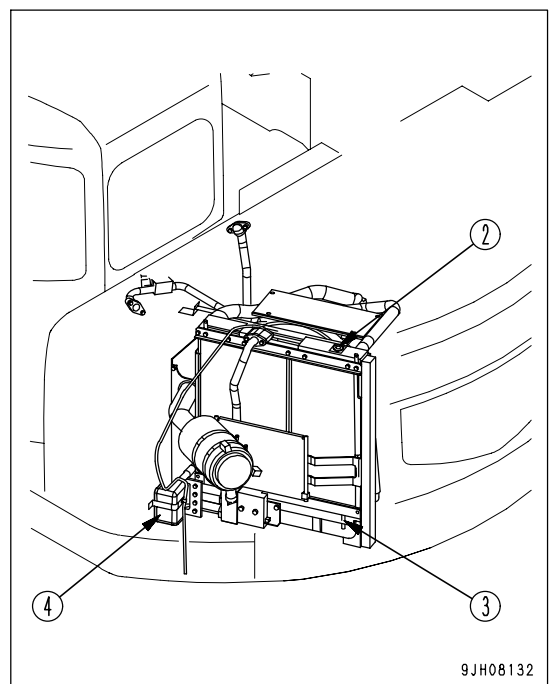
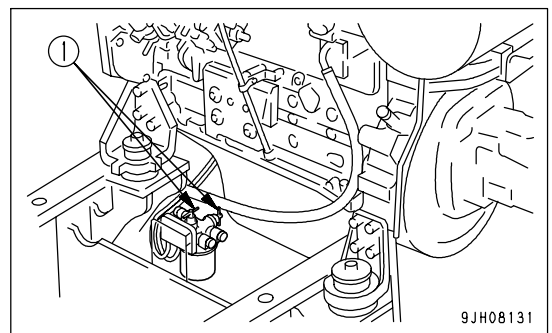
If river water, well water or other such water supply must be used, contact your Komatsu distributor.

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

Prepare a container having capacity of at least 22.4 liters (5.92 US gal) to receive the antifreeze solution.

- Prepare a water inlet hose.

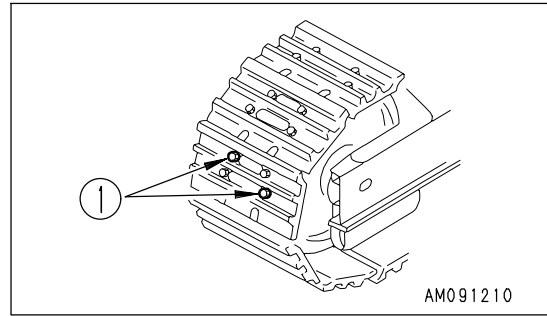
1. Stop the engine, then tighten 2 valves (1) of the corrosion resistor.
(Machines equipped with corrosion resistor)
2. Turn radiator cap (2) slowly and remove it.
3. Remove the undercover, then set the container under drain valve (3) to catch the coolant mixture.
Open drain valve (3) at the bottom of the radiator and drain the coolant.
4. After drain the water, close drain valve (3) and drain plug, and add water. When the radiator is full, start the engine and run at low idling. Raise the water temperature to above 90°C (194° F) and run for approx. 10 minutes.
5. Stop the engine, then open drain valve (3) and remove the drain plug to drain the water.
6. After draining the water, clean the radiator with detergent.
For the cleaning method, follow the instruction of detergent.
7. Close drain valve (3).
8. Install the undercover.
9. Replace the corrosion resistor, and open valve (1).
For details of the method for replacing the corrosion resistor cartridge, see "REPLACE CORROSION RESISTOR CARTRIDGE (PAGE 4-67)".
10. Add water through the water filler up to the filler port.
11. 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.)



12. Drain the cooling water from sub-tank (4) and clean the inside of the sub-tank, then supply cooling water to the middle level between the Full and LOW marks.
13. Stop the engine and tighten the cap. Check the coolant level, and add water if the level is low.

CHECK AND TIGHTEN TRACK SHOE BOLTS

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

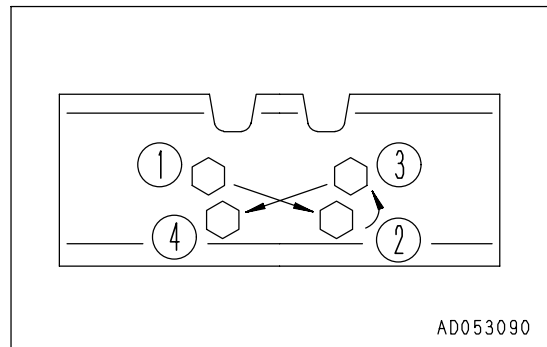


Tightening

1. Triple grouser shoe, swamp shoe, flat shoe and rubber pad shoe
 - 1) First tighten the shoe bolts to the tightening torque of 490 ± 49 N·m (50 ± 5 kgf·m, 361.7 ± 36.2 lbft) and confirm that nuts are in close contact with contact surface of track link.
 - 2) After checking, further tighten to the tightening torque of $120^\circ \pm 10^\circ$.
2. Road liner
 - 1) Tighten the shoe bolts to the tightening torque of 549 ± 58.8 N·m (56 ± 6 kgf·m, 405 ± 43.4 lbft) and confirm that nuts are in close contact with contact surface of track link.

Order for Tightening

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



CHECK AND ADJUST TRACK TENSION



WARNING

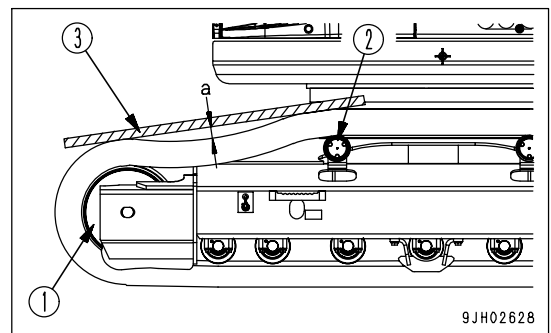
- For details of starting the engine and operating the work equipment, see "BEFORE STARTING ENGINE (PAGE 3-63)", "STARTING ENGINE (PAGE 3-79)", "AFTER STARTING ENGINE (PAGE 3-83)", and "WORK EQUIPMENT CONTROLS AND OPERATIONS (PAGE 3-100)" in the OPERATION section.

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 idle, then move the machine forward for a distance equal to the track length on ground, and slowly stop the machine.
2. Put on the track shoe straight wooden bar (3) which stretches from idler (1) to upper carrier roller (2).
3. Measure the maximum deflection between bottom surface of the wooden bar and top surface of the track shoe. Deflection "a" should be 10 - 30 mm (0.4 - 1.2 in).

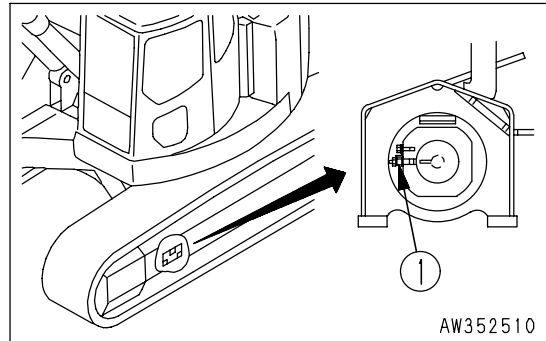


Adjustment

WARNING

Grease inside the adjusting mechanism is under high pressure. Grease coming from plug (1) under pressure can penetrate the body, causing injury or death. For this reason, do not loosen plug (1) more than one turn. Do not loosen any part other than plug (1). Furthermore, do not bring your face in front of the plug (1).

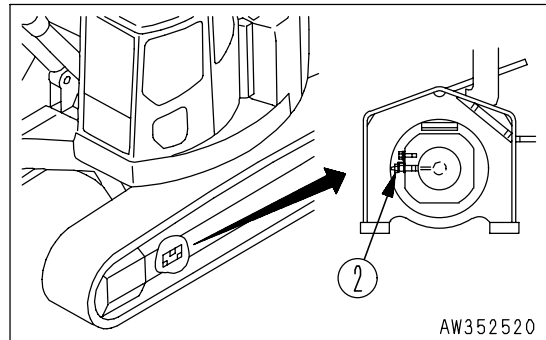
If track tension is not relieved by this procedure, contact your Komatsu distributor for repairs.



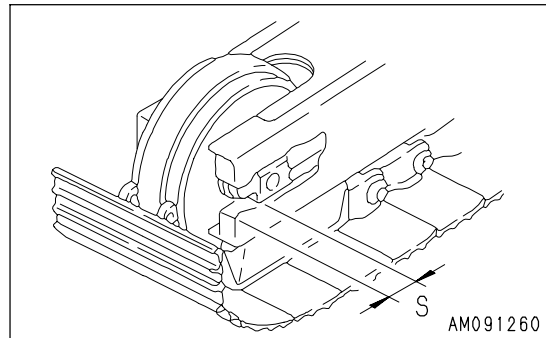
Increasing Track Tension

Prepare a grease pump.

1. Pump in grease through grease fitting (2) with a grease gun.
2. To check if the tension is correct, run the engine at low idle, move the machine slowly forward (by an amount 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.

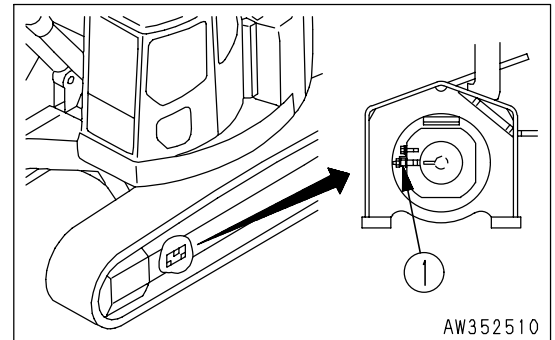


Loosening Track Tension

**WARNING**

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

1. Loosen plug (1) gradually to release the grease.
2. When loosening plug (1), turn it a maximum of one turn.
3. If the grease does not come out smoothly, move the machine forwards and backwards a short distance.
4. Tighten plug (1).
5. To check if the tension is correct, run the engine at low idle, move the machine slowly forward (by an amount 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.

**CHECK ELECTRICAL INTAKE AIR HEATER**

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

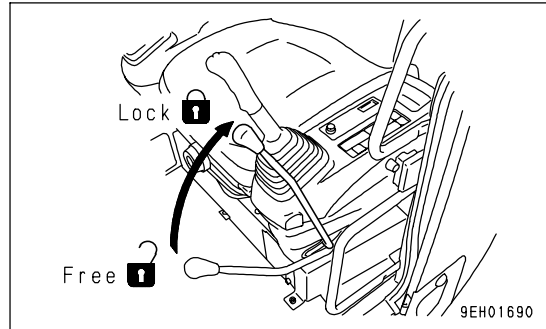
REPLACE BUCKET TEETH (VERTICAL PIN TYPE)

Replace the bucket teeth before the adapter starts to wear.

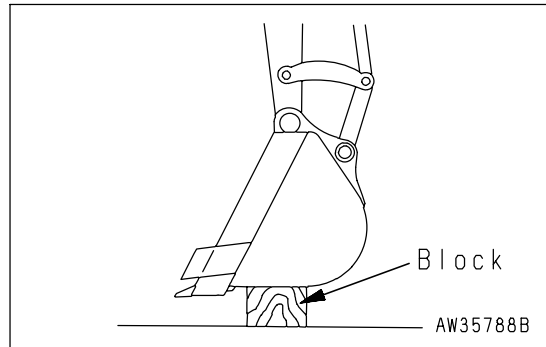


WARNING

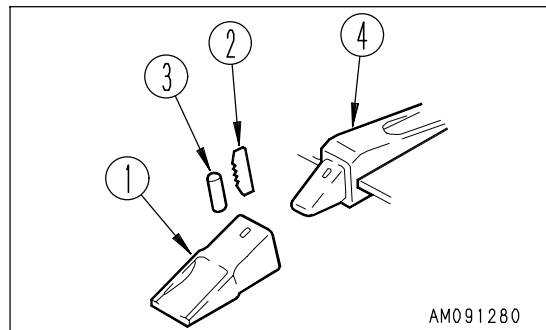
- It is dangerous if the work equipment moves by mistake when the teeth are being replaced.
Set the work equipment in a stable condition, then stop the engine and set the lock lever securely to the LOCK position.
- The pins can be knocked out only with strong force, so there is a hazard that the pin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



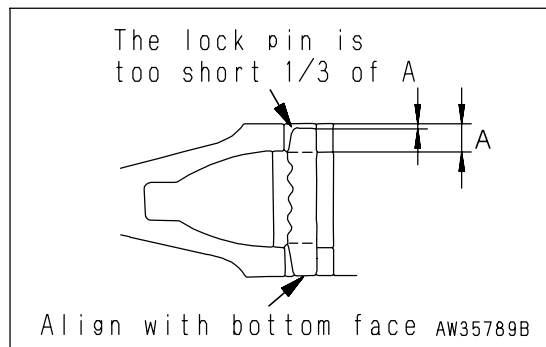
1. Place a block under the bucket bottom to make it possible to knock the pin of tooth (1) out with a hammer, and set so that the bottom of the bucket is horizontal.



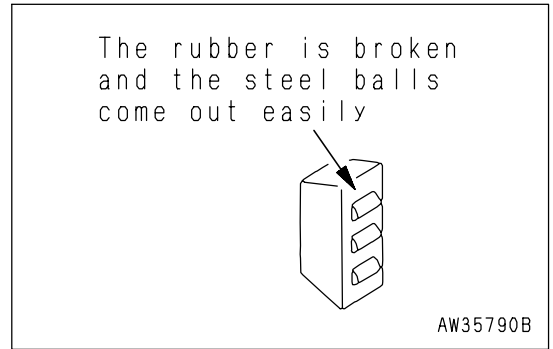
2. Use a hammer and drift to knock out lock pin (2). (If the drift is set against rubber pin lock (3) when it is hit, the rubber pin lock may break. Set it against the back of the pin.)
3. After removing lock pin (2) and rubber pin lock (3), check them. If lock pins and rubber pin locks with the following defects are used, the teeth may come off the bucket. Replace them with new ones.



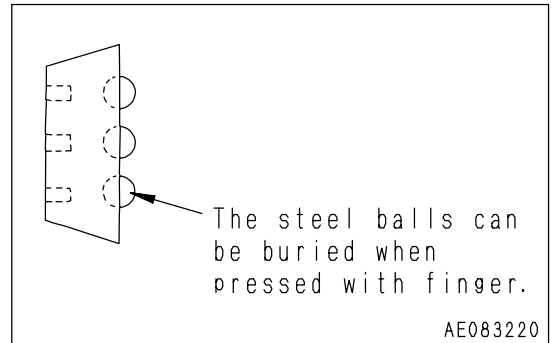
- The lock pin is too short.



- 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.

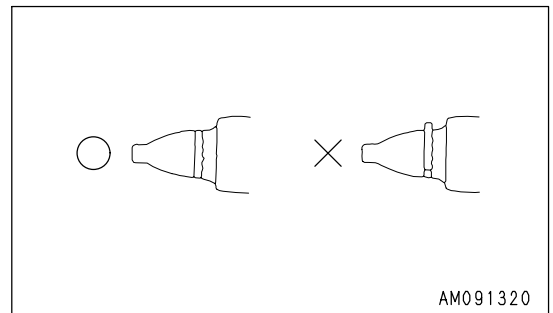


4. Clean the surface of adapter (4) and remove the soil with a knife.

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.

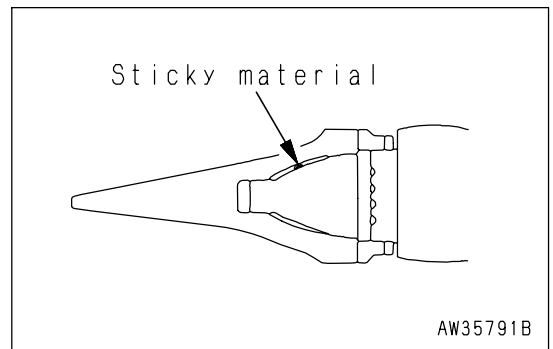
6. Clean the inside of teeth (1), then install it to adapter (4). If there is mud affixed to it or if there are protrusions, the teeth will not enter the adapter properly, and there will not be proper contact at the mating portion.



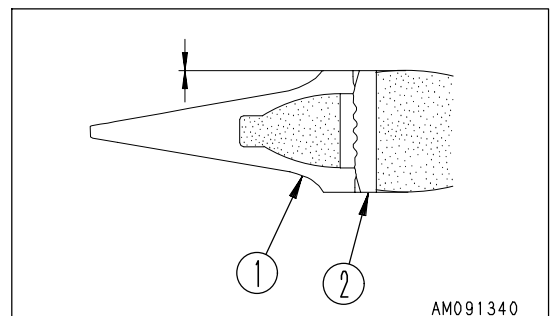
7. Fit tooth (1) to adapter (4), and confirm that when the pointer is pressed strongly, the rear face of the hole for the pin of the teeth is at the same level as the rear face of the hole for the pin of the adapter.

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

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



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

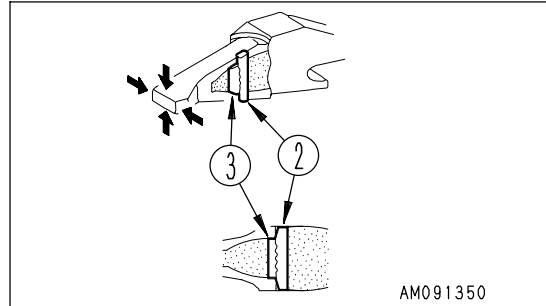


9. After replacing a bucket tooth, always check the following.

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

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

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

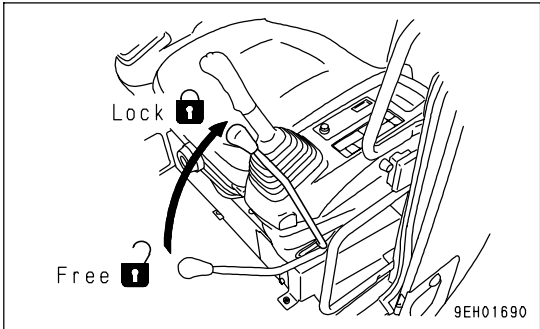


REPLACE BUCKET TEETH (HORIZONTAL PIN TYPE)

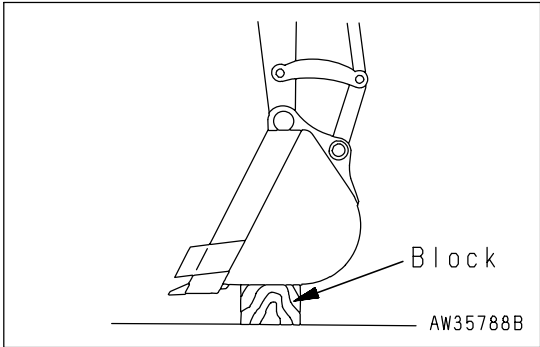
Replace the teeth before the wear reaches the adapter.

WARNING

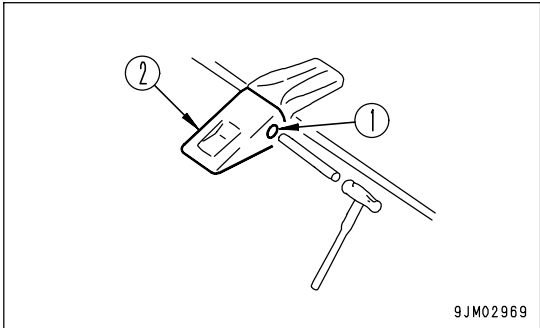
- It is dangerous if the work equipment moves by mistake when the teeth are being replaced.
Set the work equipment in a stable condition, then stop the engine and set the lock lever securely to the LOCK position.
- The pins can be knocked out only with strong force, so there is a hazard that the pin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



1. Place a block under the bucket bottom so that the pin (1) of tooth (2) can be knocked out with a hammer. Set so that the bottom face of the bucket is horizontal.



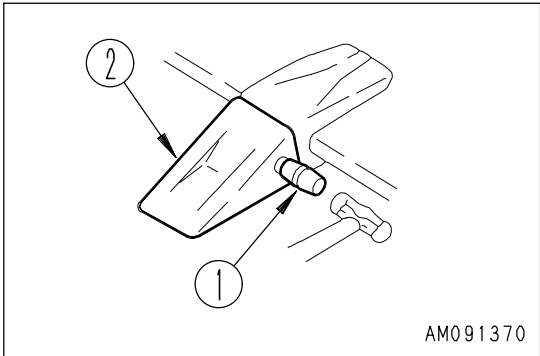
2. Place a bar on the head of pin (1), hit the bar with a hammer to knock out the pin, then remove tooth (2).



REMARK

If it cannot be removed by this method, for safety reasons, always contact your Komatsu distributor to have the replacement carried out.

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.



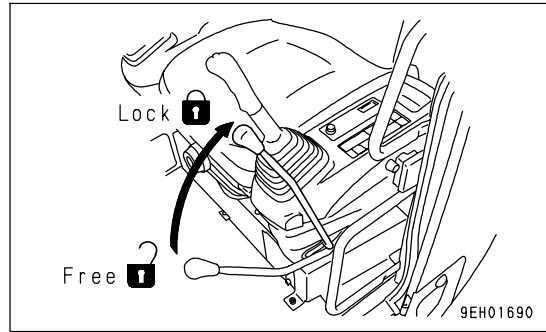
ADJUST BUCKET CLEARANCE



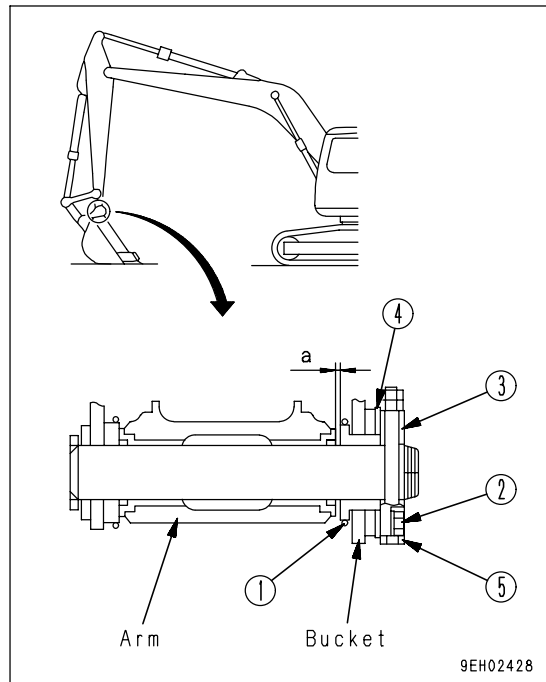
WARNING

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

Set the work equipment on the ground in a stable condition, then stop the engine and lock the lock lever without fail.



1. Set the work equipment to the position shown in the diagram on the right, then stop the engine and set the lock lever to the LOCK position.
2. Shift O-ring (1) and measure the amount of play "a".
Measurement is easier if you move the bucket to one side so that all the play can be measured at one place (the left side in the diagram).
Use a 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.



[Example]

In the case of play of 3 mm (0.118 in), remove two 1.0 mm (0.039 in) shims and one 0.5 mm (0.020 in) shim. Play becomes 0.5 mm (0.020 in). For shim (4), two types of 1.0 mm (0.039 in) and 0.5 mm (0.020 in) are used.

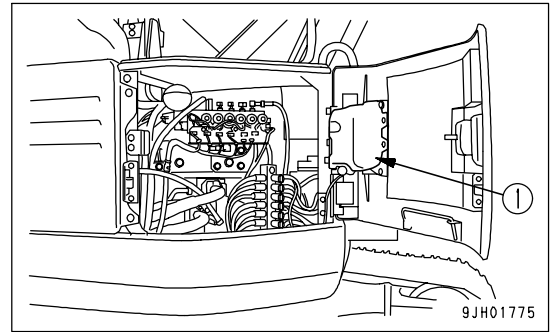
When play "a" is smaller than one shim, do not carry out any maintenance.

5. Tighten the four bolts (2).
If the bolts (2) are too stiff to tighten, pull out pin stopper bolt (5) for easier tightening.

CHECK WINDOW WASHER FLUID LEVEL, ADD FLUID

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.



Mixture Ratio of Pure Washer Fluid and Water

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

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

There are two types depending on the freezing temperature:

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

CHECK AND MAINTENANCE AIR CONDITIONER

Check Level of Refrigerant (gas)

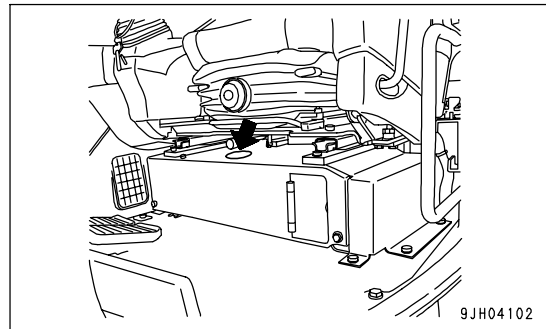


WARNING

If the refrigerant used in the air conditioner gets into your eyes or on your hands, it may cause loss of sight or frostbite. Do not touch the refrigerant. Never loosen any part of the refrigerant circuit. Do not bring any flame close to any point where the refrigerant gas is leaking.

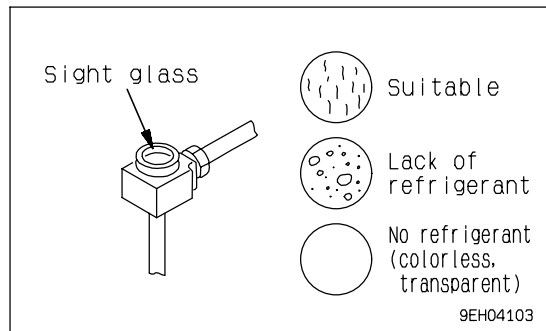
If there is a lack of refrigerant (Freon 134a), the cooling performance will be poor.

When operating the cooler at high speed, there should be no bubbles in the sight glass (inspection window) mounted on the condenser unit receiver.



9JH04102

- No bubbles in refrigerant flow: Suitable
- Some bubbles in flow
(bubbles pass continuously): Lack of refrigerant
- Colorless, transparent: No refrigerant



9EH04103

REMARK

When there are bubbles, the refrigerant gas level is low, so contact your Komatsu distributors to have refrigerant added. If the air conditioner is run with the refrigerant gas level low, it will cause damage to the compressor.

Inspection During Off Season

Even during the off-season, operate the air conditioner for 3 to 5 minutes once a month to maintain the oil film at all parts of the compressor.

Inspection and Maintenance Items

Check, maintenance items	Content of check, maintenance	Guideline for maintenance interval
Refrigerant (gas)	Charge amount	Twice a year (spring, autumn)
Condenser	Clogged fins	Every 500 hours
Compressor	Operating condition	Every 4000 hours
V-belt	Damage, tension	Every 250 hours
Blower motor, fan	Operating condition (does it when required make abnormal noise?)	When required
Control mechanism	Operating condition (does it function normally?)	When required
Piping mounts	Mounting condition, looseness at tightening or connecting portions, leakage of gas, damage	When required

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 lock lever securely to the LOCK position before standing up from the operator's seat.

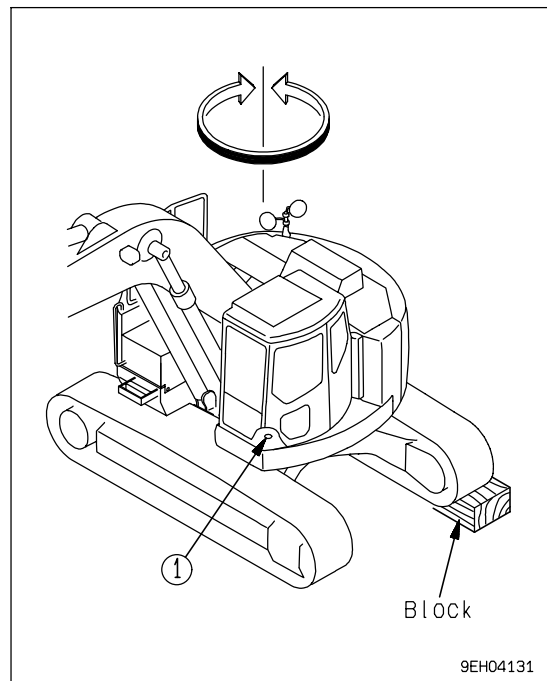
NOTICE

- During the operation, be careful not to get water on the air conditioner filter, connectors, and monitor inside the operator's cab.
- When washing the inside of the operator's cab, do not use high-pressure water.

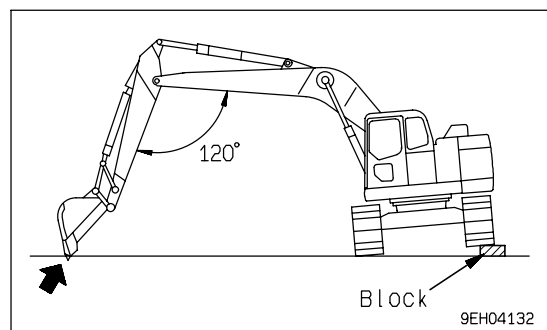
With the washable floor, it is possible to flush out the dirt on the cab floor directly with water.

Method of Washing

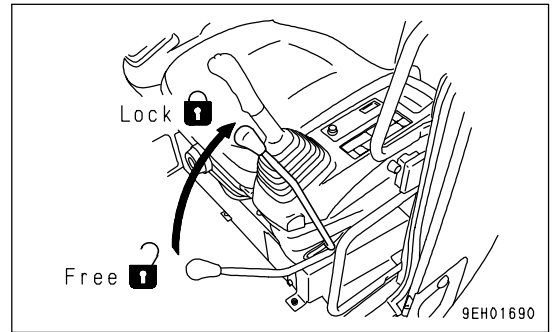
1. Set the machine at an angle.
2. Swing the upper structure slowly so that water drain holes (1) in the cab floor are at a low position.



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



4. Set the lock lever to the LOCK position and stop the engine.
5. Remove the floor mat.
6. Flush out the dirt on the floor directly with water through water drain port (1).
7. After completing the washing operation, install the floor mat.



Method of Setting Machine at Angle

Method Using Slope

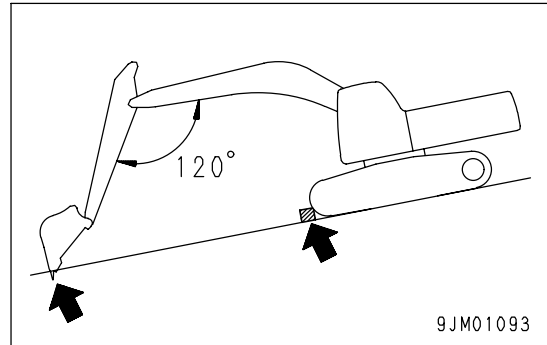


WARNING

Select a solid and smooth slope.

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

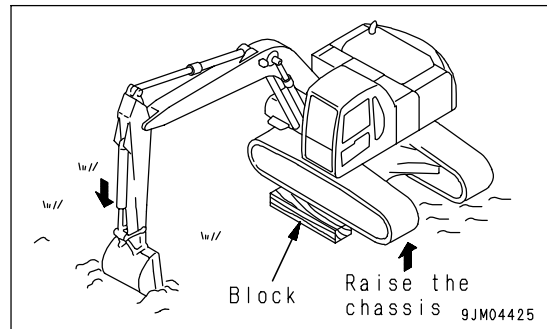


WARNING

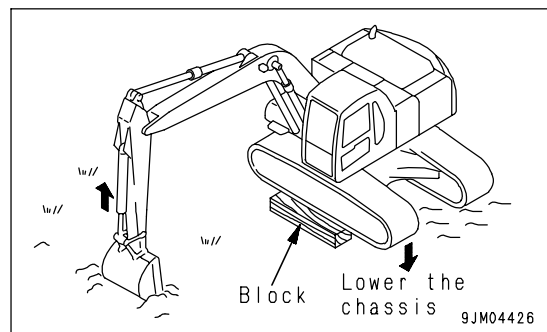
Select a firm flat place.

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.

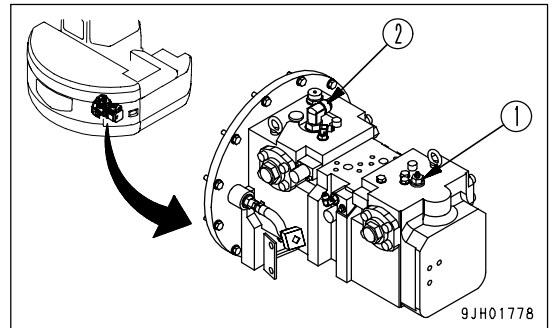


BLEEDING AIR FROM HYDRAULIC SYSTEM

For details, see "STARTING ENGINE (PAGE 3-79)". 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) and check that oil oozes out from the air bleeder.
- 2) If no oil oozes out, remove the drain hose from the pump case, and add hydraulic oil through drain port (2) to fill the pump case.
Oil will come out when the drain hose is removed, so secure the hose mouthpiece at a position higher than the level of the oil in the hydraulic tank.
- 3) After completing the air bleed operation, tighten air bleed plug (1) and install the drain hose.



NOTICE

If the drain hose is installed first, oil will spurt out from plug hole (1).

If the pump is operated without filling the pump case with hydraulic oil, abnormal heat will be generated and this may cause an unexpected damage to the pump.

2. Starting engine

Start the engine, referring to "STARTING ENGINE (PAGE 3-79)".

Run the engine at low idle for 10 minutes after starting, then start operations.

3. Bleeding air from cylinders

- 1) Run the engine at low idle, and extend and retract each cylinder 4 to 5 times, taking care that a cylinder is not moved to the end of its stroke. (Stop the cylinder approx. 100 mm (3.9 in) short of its stroke end)
- 2) Next, operate each cylinder 3 to 4 times to the end of its stroke.
- 3) 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 at high speed immediately after startup or a cylinder is pushed up to its stroke end, air taken inside the cylinder may cause damage to the piston packing.

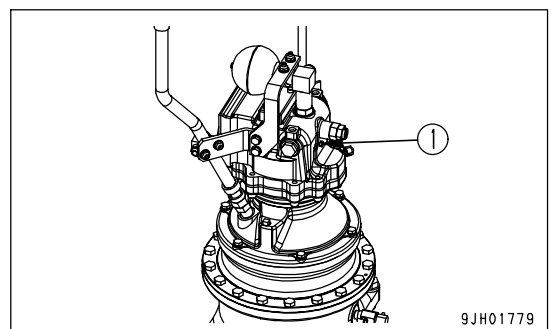
4. Bleeding air from swing motor

- 1) Run the engine at low idle, 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 idle, and slowly swing the upper structure at least 2 times uniformly to the left and right.

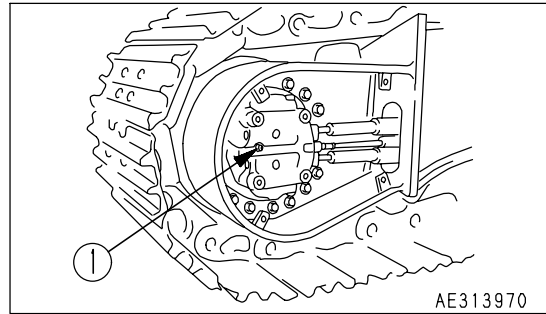
NOTICE

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

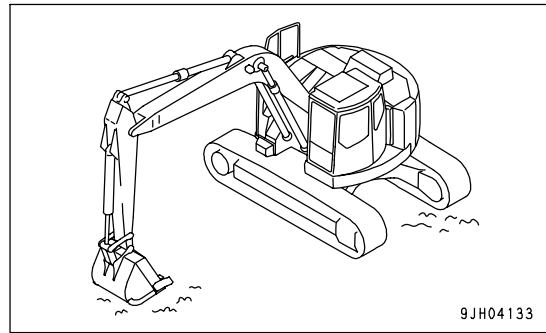
5. Bleeding air from travel motor

(Bleed the air only when the oil inside the travel motor case has been drained.)

- 1) Run the engine at low idling, loosen air bleeder (1), and check that oil flows out.



- 2) Run the engine at low idle 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. When rotating under no load, move uniformly in forward and reverse.



6. Bleeding air from attachment (when installed)

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

NOTICE

- If a specific attachment supplied by a subcontractor has its own instructions for air bleeding, carry out air bleeding following such instructions.
- After completing air bleeding, stop the engine. Wait for more than five minutes before starting a work. Air bubbles will be purged from the oil in the hydraulic oil tank this way.
- Check for oil leakage and wipe off any spilled oil.
- Check the hydraulic oil level after air bleeding, and refill with oil if not sufficient.

METHOD FOR RELEASING INTERNAL PRESSURE IN HYDRAULIC CIRCUIT

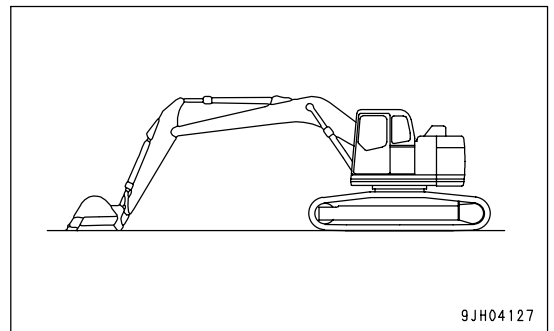
! WARNING

- The hydraulic system is always under internal pressure, so when inspecting or replacing the piping or hoses, always release the pressure in the circuit before starting. If the pressure is not released, high pressure oil may spurt out and cause serious personal injury.
- 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.
- When the oil filler cap is removed, oil may spurt out, so turn the cap slowly to release the pressure before removing the cap.

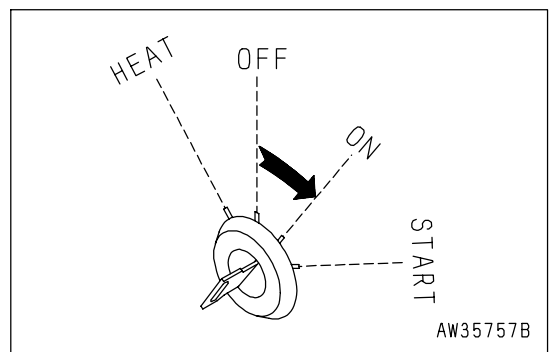
! CAUTION

When the engine starting switch is at the OFF position, power is not supplied to the control valve (PPC valve). Hence the residual pressure in the hydraulic circuit cannot be released, even if the work equipment control lever is moved to the full stroke. Be sure to turn the engine starting switch ON, when releasing the residual pressure in the hydraulic circuit.

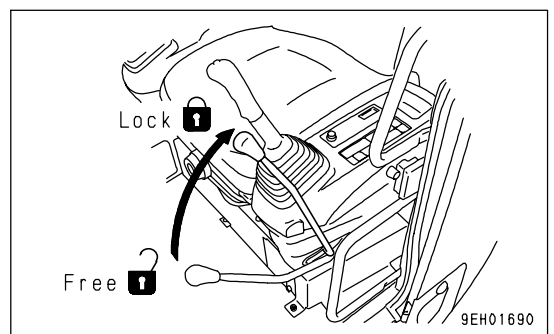
1. Set the machine on the flat and firm ground, and then stop the engine.



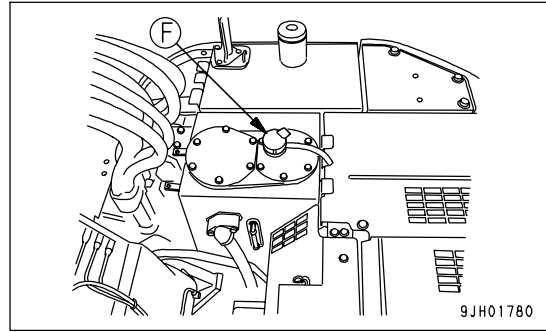
2. Turn the starting switch to the ON position.



3. Within 15 seconds after stopping the engine, turn the starting switch to the ON position, and operate the control levers (work equipment, travel) fully in each direction to release the internal pressure.



4. Loosen oil filler cap (F) at the top of the hydraulic tank slowly to release the internal pressure.



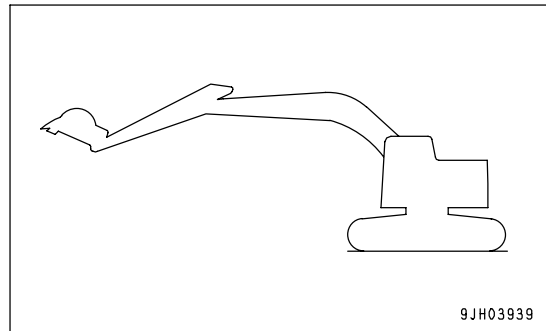
CHECK NITROGEN GAS CHARGE PRESSURE IN ACCUMULATOR (control circuit)

NOTICE

If the nitrogen gas charge pressure in the accumulator is low and operations are continued, it will become impossible to release the remaining pressure inside the hydraulic circuit if a failure occurs on the machine.

Check the nitrogen gas charge pressure as follows.

1. Set the work equipment to maximum reach as shown in the diagram on the right.



2. Stop the engine and carry out the LOWER operation for the boom.
3. Check that the tip of the bucket drops at least 1 m (3 ft).

If the tip of the bucket drops less than 1 m (3 ft), the charge pressure inside the accumulator is low, so contact your Komatsu distributor.

CHECK BEFORE STARTING

For details of the following items, see "Checks Before Starting (PAGE 3-65)" in the OPERATION section.

- Check coolant level, add coolant
- Check oil level in engine oil pan, add oil
- Check fuel level, add fuel
- Drain water and sediment from fuel tank
- Check for water and sediment in water separator, drain water
- Check oil level in hydraulic tank, add oil
- Check working Lamp switch
- Check electric wiring
- Check function of horn

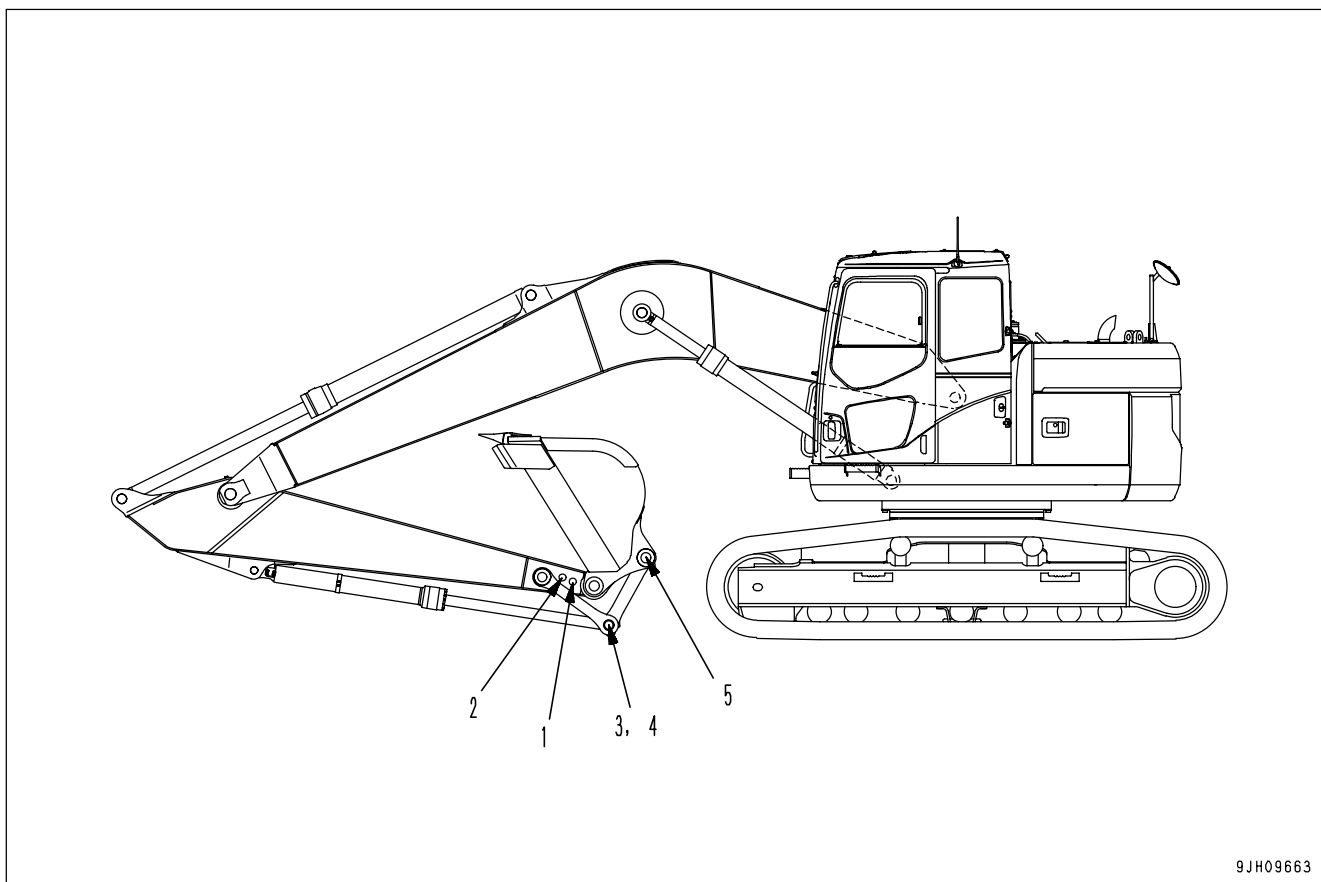
EVERY 100 HOURS MAINTENANCE

LUBRICATING

NOTICE

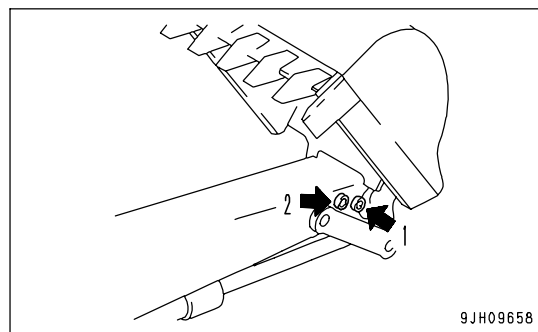
- If any abnormal noise is generated from any greasing point, carry out greasing regardless of the greasing interval.
- Carry out greasing every 10 hours for the first 50 hours on a new machine.
- After the machine was subjected to jobs in the water, be sure to grease the wet pins.

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.



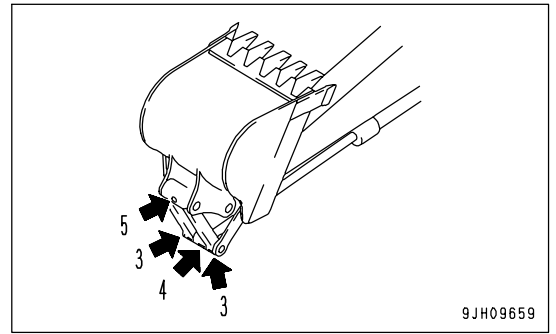
9JH09663

- (1) Arm - Bucket coupling pin (1 places)
- (2) Arm - Link coupling pin (1 places)



9JH09658

- (3) Link coupling pin (2 places)
- (4) Bucket cylinder rod end (1 places)
- (5) Bucket - Link coupling pin (1 places)



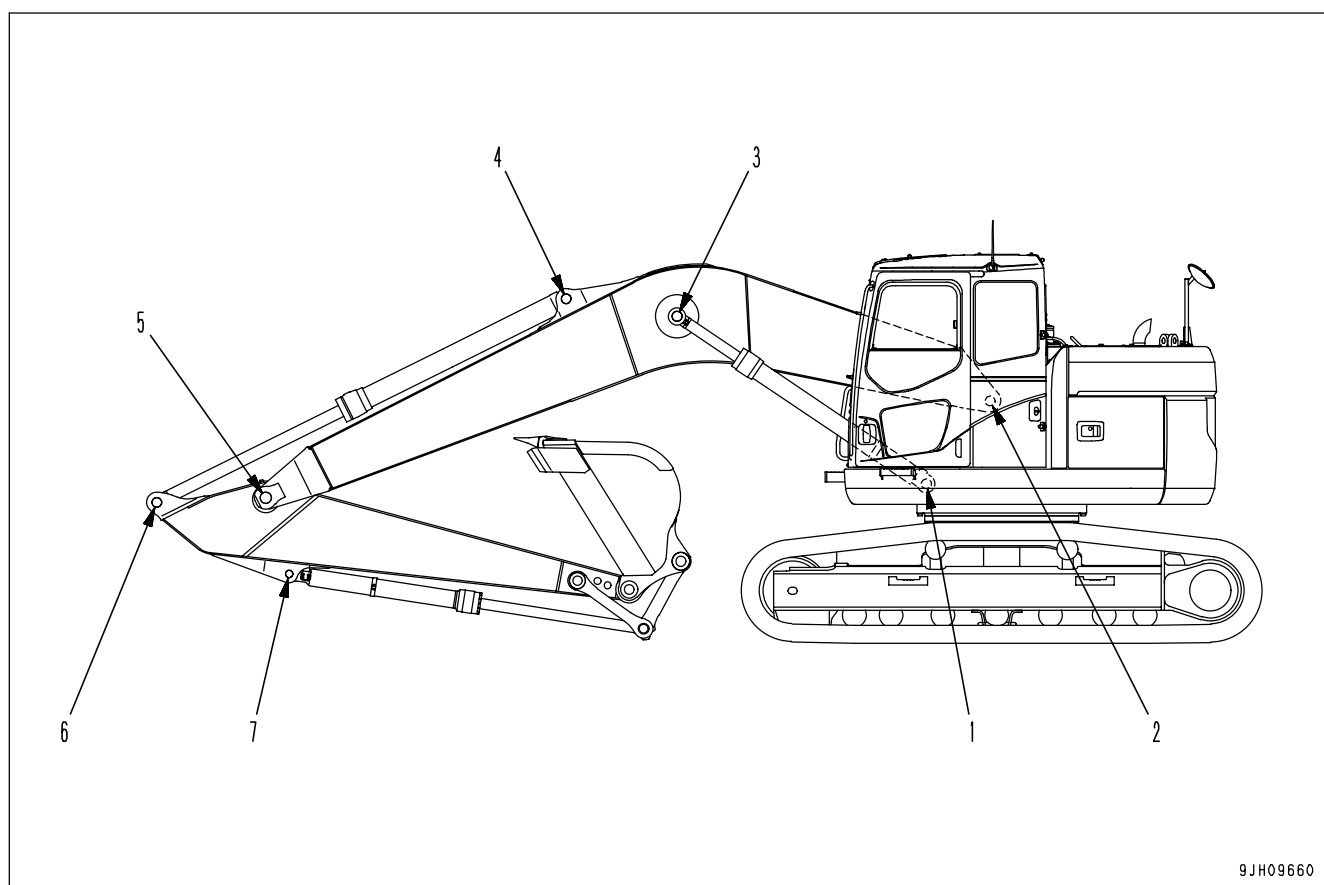
EVERY 250 HOURS MAINTENANCE

LUBRICATING

NOTICE

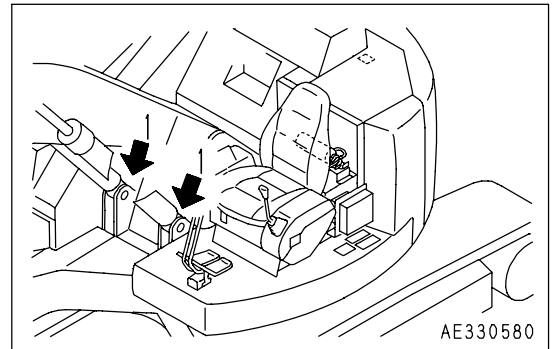
- If any abnormal noise is generated from any greasing point, carry out greasing regardless of the greasing interval.
- Carry out greasing every 10 hours for the first 50 hours on a new machine.
- After the machine was subjected to jobs in the water, be sure to grease the wet pins.

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.
4. After greasing, move the boom up and down several times and then grease the first boom foot pin at two places again.

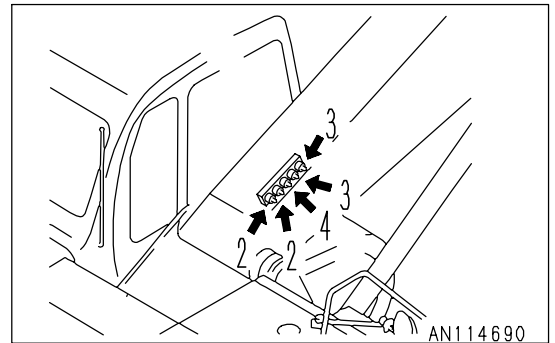


9JH09660

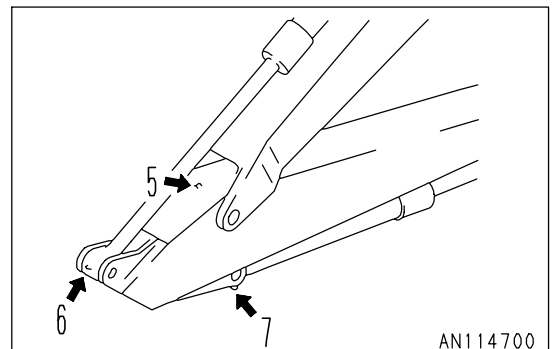
(1) Boom cylinder foot pin (2 places)



- (2) Boom foot pin (2 places)
- (3) Boom cylinder rod end pin (2 places)
- (4) Arm cylinder foot pin (1 place)



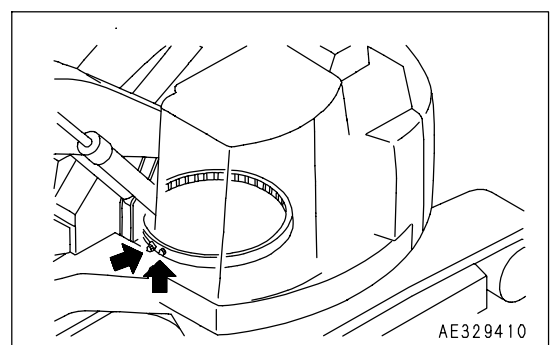
- (5) Boom - Arm coupling pin (1 place)
- (6) Arm cylinder rod end (1 place)
- (7) Bucket cylinder foot pin (1 place)



LUBRICATE SWING CIRCLE

(2 places)

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 any old grease that was pushed out.

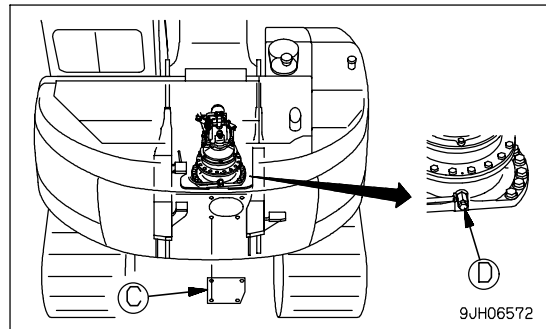
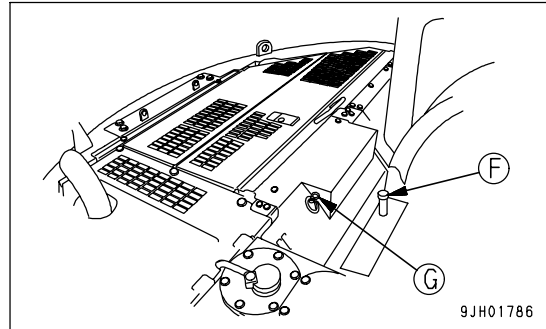


CHECK OIL LEVEL IN SWING MACHINERY CASE, ADD OIL

! WARNING

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

1. Remove dipstick (G) and wipe the oil from the dipstick with a cloth.
2. Fully insert dipstick (G) into the filler pipe.
3. Remove dipstick (G) and check the marks on the gauge. The oil level is correct if the top of the oil on the dipstick is between the H and L marks.
4. If the oil level is below the L mark, remove the cap from oil filler port (F) and add engine oil.
5. If the oil level is above the H mark, remove cover (C) under the chassis. Then loosen drain valve (D) through the inspection port and drain the excess oil.
6. After adding oil and checking the oil level, insert dipstick (G) and tighten the cap of oil filler port (F). If cover (C) was removed, install cover (C).



CHECK OIL LEVEL IN FINAL DRIVE CASE, ADD OIL

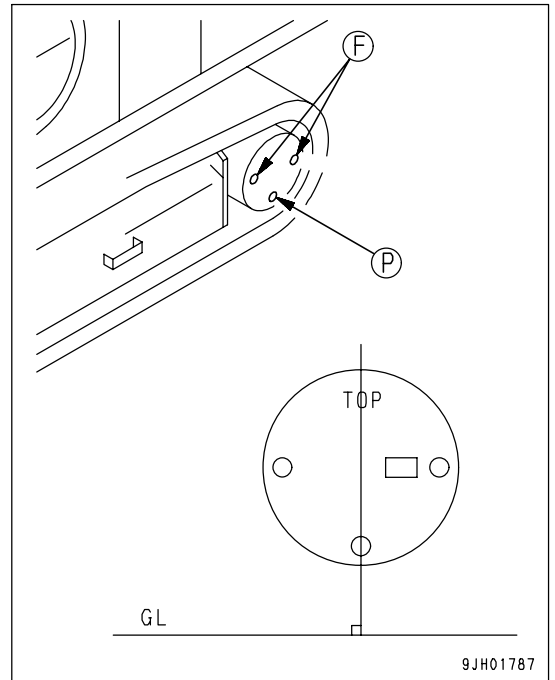
! WARNING

- The parts and oil are at high temperature immediately after the engine is stopped, and may cause serious burns. Wait for the temperature to go down before starting the operation.
- 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 handle.
 1. Set the TOP mark at the top, with the UP mark and plug (P) perpendicular to the ground surface.
 2. Remove plug (F) using the handle. When the oil level reaches a point 10 mm (0.4 in) below the bottom of the plug hole, the correct amount of oil has been added.
 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 low, add engine oil through plug hole (F) until the oil overflows from plug hole (F).
 5. After checking, install plug (F).

REMARK

There are two plugs (F). Add oil through the one easier to fill oil and through which no internal gears are to be seen.



9JH01787

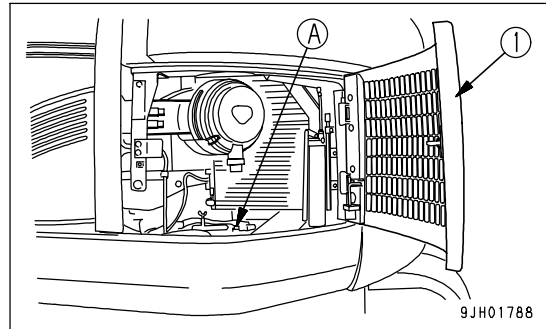
CHECK LEVEL OF BATTERY ELECTROLYTE

WARNING

- To avoid gas explosions, do not bring fire or sparks near the battery.
- Battery electrolyte is dangerous. If it gets in your eyes or on your skin, wash it off with large amounts of water, and consult a doctor immediately.

Perform this check before operating the machine.

1. Open cover (1) at the rear left side of the machine. The batteries are installed at (A) part.

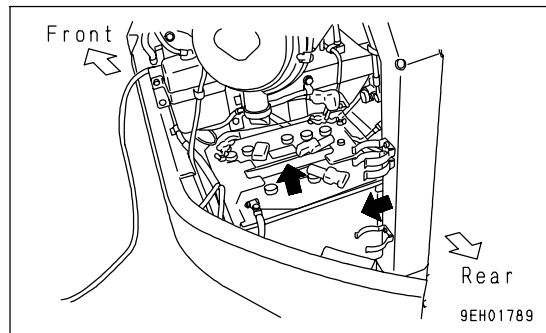


When Checking Electrolyte Level from Side of Battery

1. Standard Battery

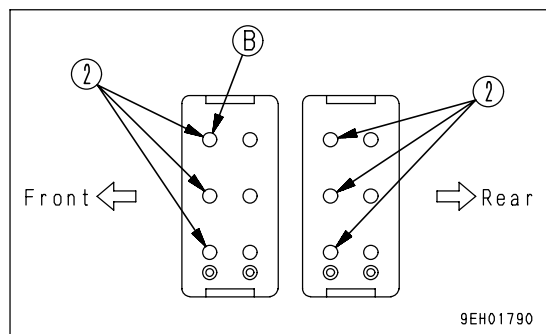
- Check the electrolyte level from the side of the battery. Add distilled water to UPPER LEVEL (U.L), if the level does not reach U.L.

Do not add distilled water above U. L. Otherwise it might cause electrolyte leakage or fire.



2. Large Capacity Battery

- For the rear cell, check the electrolyte level from the side of the battery, and add distilled water up to the U.L level, if the level does not reach U.L.
- For the front cell, remove any of caps (2), check the electrolyte level from above, and add distilled water up to the U.L level, if the level does not reach U.L.



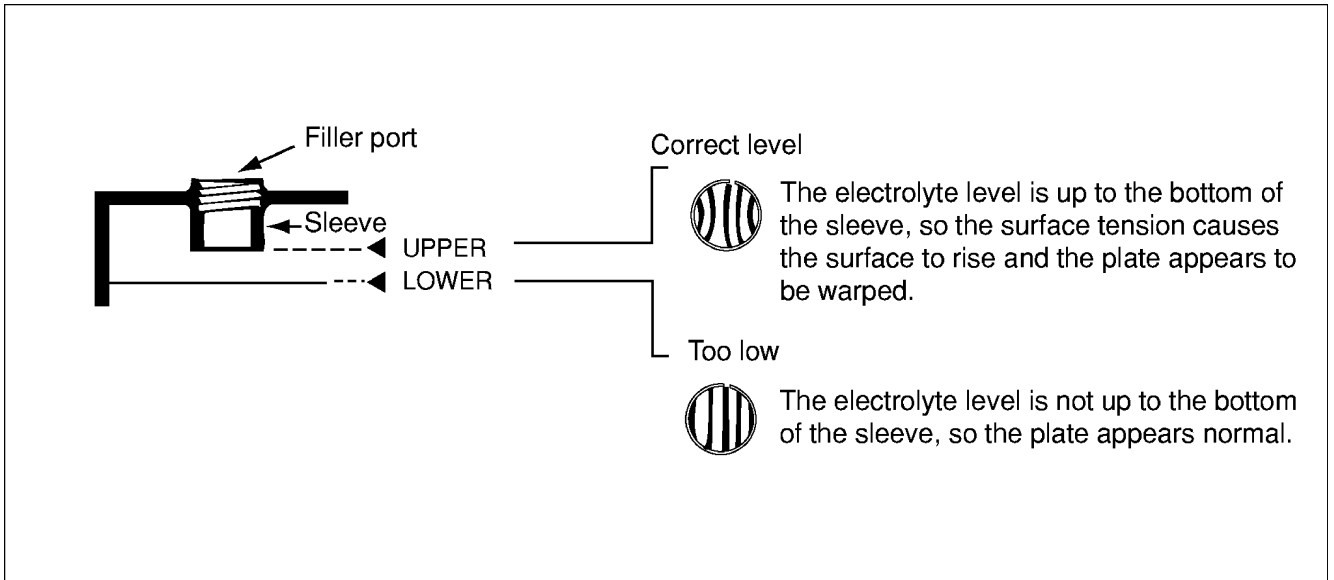
- Only with cap (B), however, use the attached mirror to check the level, as it is difficult to determine it.

Do not add distilled water above U.L. Otherwise it might cause electrolyte leakage or fire.

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

Check the line for the battery electrolyte level as follows.

1. To judge the position of the electrolyte level, remove cap (1), look through the filler port, and check if the electrolyte level reaches the sleeve.



NOTICE

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

2. Clean the air breather in the battery cap, then tighten cap (1) securely. Keep the top of the battery clean and with a damp cloth.

When adding distilled water, wait until starting operations next morning in order to prevent the electrolyte from freezing.

REMARK

If water is added to above the bottom tip of the sleeve, use a pipette to remove electrolyte. Neutralize the removed electrolyte with sodium bicarbonate, then flush it away with a large amount of water. If necessary, contact your Komatsu distributor or your battery maker.

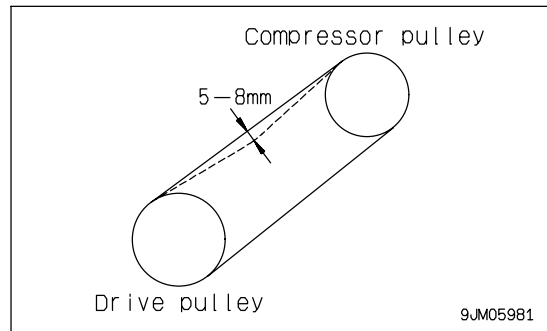
When it is Possible to Use Indicator to Check Electrolyte Level

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

CHECK AIR CONDITIONER COMPRESSOR BELT TENSION, ADJUST

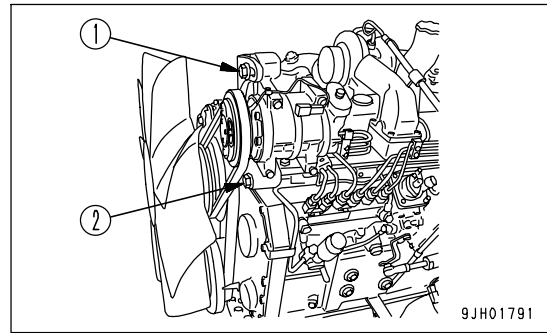
Checking

Press the belt at a point midway between the drive pulley and compressor pulley with a finger force of approx. 58.8 N (6 kgf) and check that the deflection is 5 to 8 mm (0.20 in to 0.31 in).

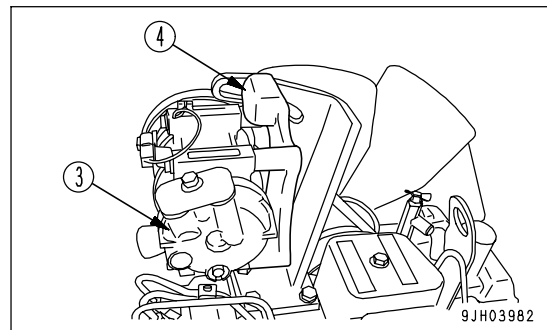


Adjustment

1. Loosen bolts (1) and (2).
 - Bracket (4) holds the compressor in place. When bolts (1) and (2) are loosened, bracket (4) moves with the securing position of bolt (2) as a fulcrum.



2. Loosen bolt (1) and bolts (2), then move compressor (3) to adjust.
3. When the position of the compressor is determined, tighten bolts (1) and (2) to hold it in position.



4. Check for damage to the pulleys, and wear of the V-groove and V-belt. Be particularly careful to check that the V-belt is not in contact with the bottom of the V-groove.
5. If the belt has elongated and there is no more allowance for adjustment, or if the belt is cut or cracked, replace the belt.
6. After replacing the V-belt, operate for one hour, then adjust again.

EVERY 500 HOURS MAINTENANCE

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

REPLACE FUEL FILTER CARTRIDGE



WARNING

- The engine is at high temperature immediately after the machine has been operated. Wait for the engine 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 on remove it.
3. Clean the filter holder. Fill a new filter cartridge with clean fuel. Coat the packing surface with engine oil. Then install the new cartridge into the filter holder.
4. When installing, screw in cartridge until seal comes in contact with sealing surface, then tighten approx. an additional 1/2 turn.

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

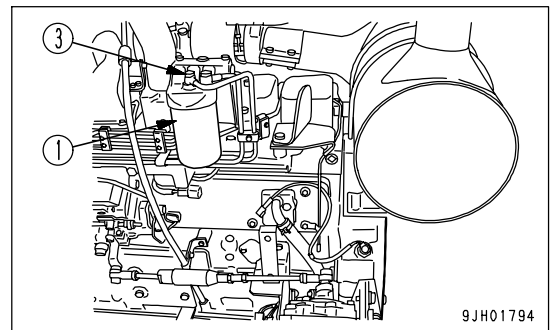
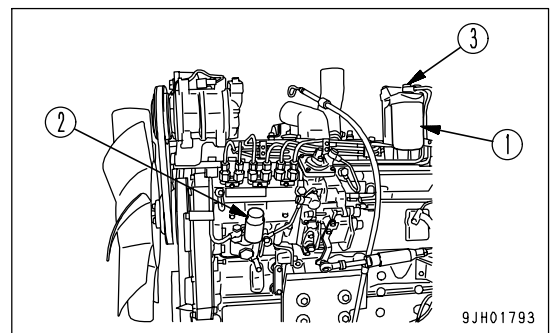
5. After replacing the fuel filter cartridge, bleed the air from the system.

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 (3).
8. Loosen the knob of feed pump (2), pump it up and down, and continue to make the fuel overflow until no more bubbles come out from air bleed plug (3). Then tighten the knob of feed pump (2).
9. Tighten air bleed pug (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.

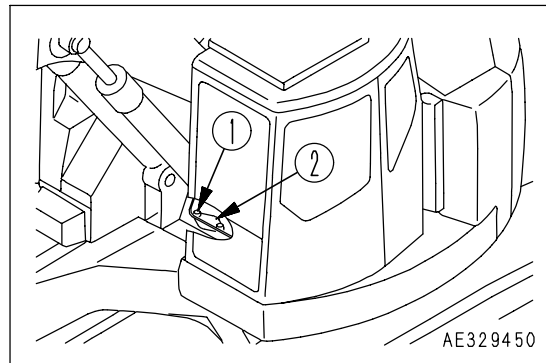


REMARK

Use the feed pump to bleed air from the fuel system, when the machine has run out of fuel, too.

CHECK SWING PINION GREASE LEVEL, ADD GREASE

- Prepare a scale.
- 1. Remove bolts (1) (2 bolts) on the top of the revolving frame and remove cover (2).
- 2. Insert a scale into the grease and check that the height of the grease in the portion where the pinion passes is at least 14 mm (0.6 in).
Add more grease if necessary.
- 3. 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: 14.5 liters (3.83 US gal)

4. Install cover (2) with bolts (1).

CLEAN AND INSPECT RADIATOR FINS, OIL COOLER FINS, CONDENSER FINS AND AFTER COOLER FINS



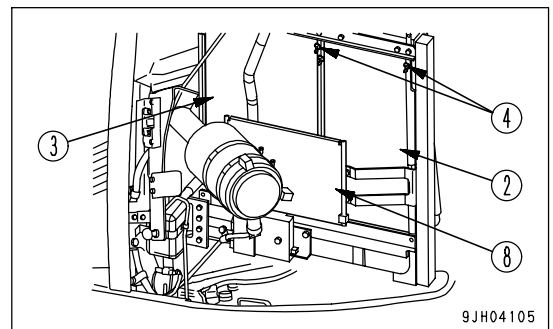
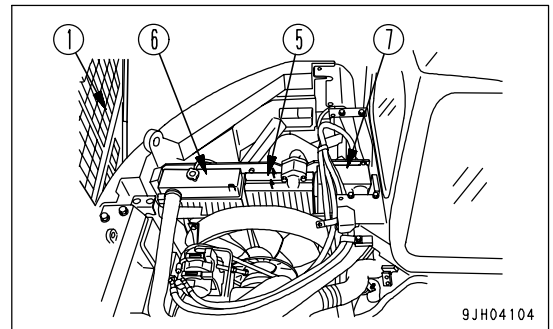
WARNING

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

NOTICE

When using compressed air for cleaning, blow it keeping some distance to avoid damaging the fins. Damage on the fins can cause water leakage and overheating. In a dusty job site, check the fins every day, regardless of the maintenance interval.

1. Open engine hood (1).
2. Loosen screw (3) and pull up net (2), (3).
3. Clean net (2).
4. Inspect the front and rear of oil cooler fins (5), radiator fins (6), after-cooler fins (7) and condenser fins (8) for dirt, dust, dry leaves, etc. Blow them away with compressed air, if any. Steam or water may be used instead of compressed air.
5. Check the rubber hose. Replace with a new one, if the hose is found to have cracks or to be hardened by aging. Further, check the hose cramps for looseness.
6. Remove cover of the under cover and dispose of the dirt, dust, dry leaves, etc. fallen on it.
7. Push in cleaned net (2), (3) back to the original place and secure it with screw (3).



CLEAN AIR CONDITIONER FRESH/RECIRC FILTERS



WARNING

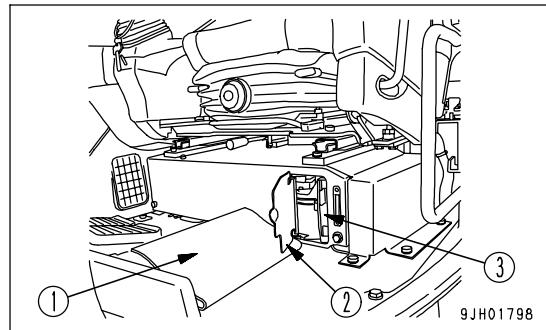
If compressed air is used, there is danger that dirt may fly and cause personal injury.
Always wear protective glasses, dust mask, and other protective equipment.

NOTICE

- The guide for cleaning the filter is 500 hours, but if the machine is used on an extremely dusty jobsite, reduce the maintenance interval and clean the filter more frequently.
- When washing the floor, be careful not to get water on the air conditioner system.

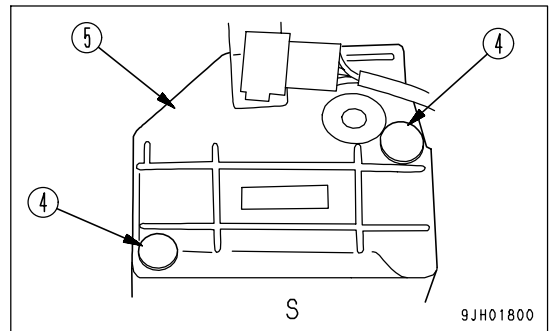
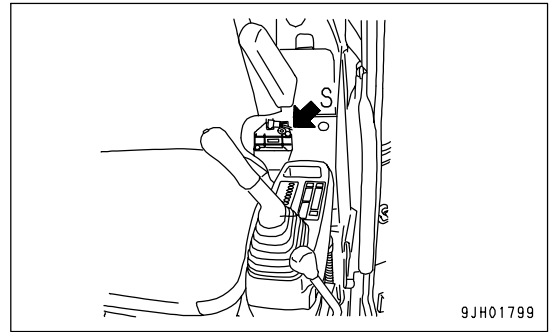
Cleaning Reticulated Air Filter

1. Roll up floor mat (1) on the front left part of the floor in the operator's cab, and open cover (2).
2. Take out internal filter (3).
3. Clean the filter (3) with compressed air. If there is oil on the filter, or if the filter (3) is extremely dirty, wash it in a neutral agent. After rinsing it in water, dry it thoroughly before using it again.
 - If the clogging of the filter cannot be removed by blowing with air or washing in water, replace the filter with a new part.
4. Install cleaned filter (3), close cover (2) and spread floor mat (1) flat.

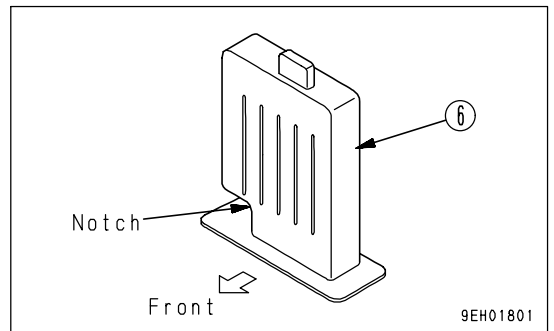


Cleaning Fresh Air Filter

1. Pull up pop-up rivet (4) of the air intake duct at the left rear of the operator's seat. Cover (5) will be released automatically.
2. Pull up external filter (6).
3. Clean external filter (6) by blowing it with compressed air. If there is oil stuck to the filter or it is extremely dirty, wash it in a neutral agent. After washing, dry it thoroughly before using it again.
4. Install cleaned filter (6) and then fix cover (5).



- Insert filter (6), paying attention to the top and bottom sides.

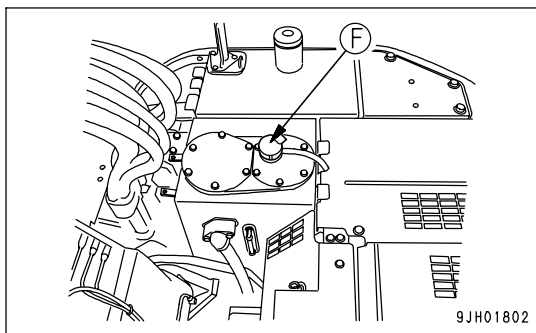


REPLACE BREATHER ELEMENT IN HYDRAULIC TANK

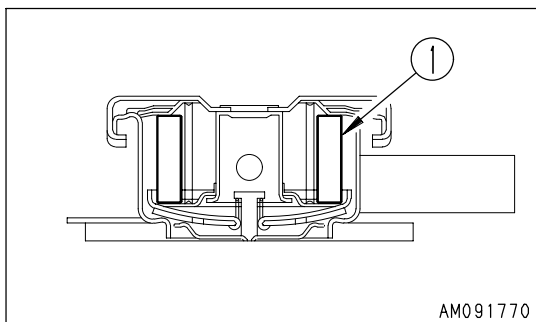
! WARNING

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

1. Remove the cap of oil filler (F) at the top of the hydraulic tank.



2. Replace element (1) inside the cap.

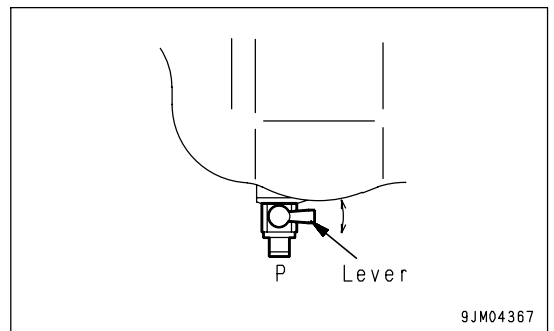
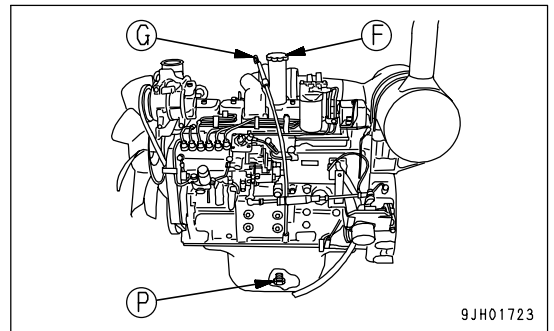


CHANGE OIL IN ENGINE OIL PAN, REPLACE ENGINE OIL FILTER CARTRIDGE

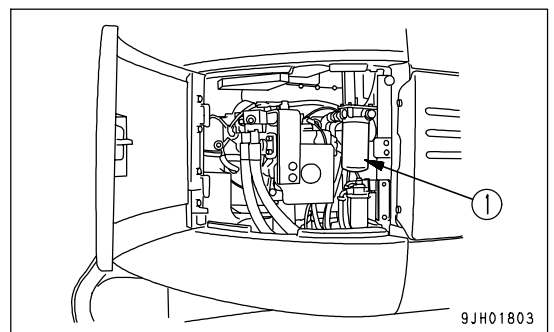
⚠ WARNING

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

- Refill capacity of oil pan: 24 liters (6.34 US gal)
 - Filter wrench
1. Remove the inspection cover of the undercover directly under drain plug (P) under the machine, then place a container to catch the oil.
 2. To prevent getting oil on yourself, lower the lever of drain valve (P) slowly, drain the oil, then raise the lever to close the valve.



3. Open the cover at the rear right, then use a filter wrench to turn filter cartridge (1) to the left to remove it.

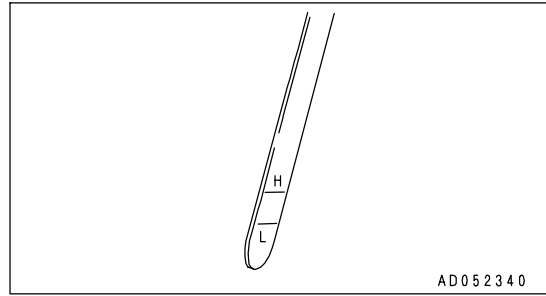


4. Clean the filter holder, fill the new filter cartridge with clean engine oil, coat the thread and packing surface of the new filter cartridge with clean engine oil (or coat it thinly with grease), then install it to the filter holder.

REMARK

Check that there is no old packing stuck to the filter holder. If there is any old packing stuck to the filter, it will cause leakage of oil.

5. When installing, tighten until the packing surface contacts the seal surface of the filter holder, then tighten it a further 3/4 to 1 turn.
6. After replacing the filter cartridge, open the engine hood and add engine oil through oil filler (F) to between the H and L marks on dipstick (G).
7. Run the engine at idle for a short time, then stop the engine, and check that the oil level is between the H and L marks on the dipstick. For details, see "Check Oil Level in Engine Oil Pan, Add Oil (PAGE 3-66)".



EVERY 1000 HOURS MAINTENANCE

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

REPLACE HYDRAULIC OIL FILTER ELEMENT



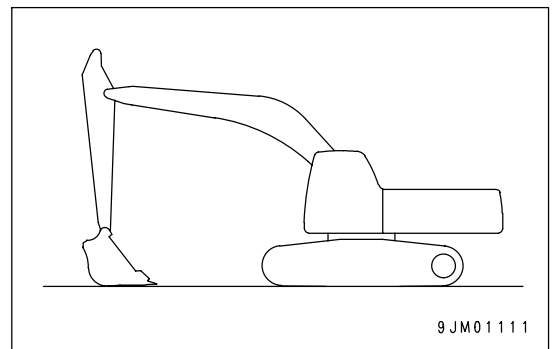
WARNING

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

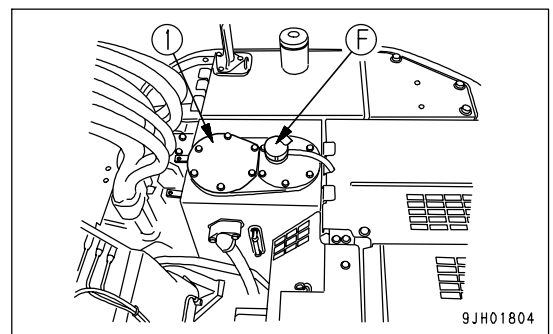
NOTICE

If the machine is equipped with a hydraulic breaker, the hydraulic oil will deteriorate much faster than during normal bucket operations. For details, see "MAINTENANCE INTERVAL FOR HYDRAULIC BREAKER (PAGE 4-16)" when carrying out maintenance.

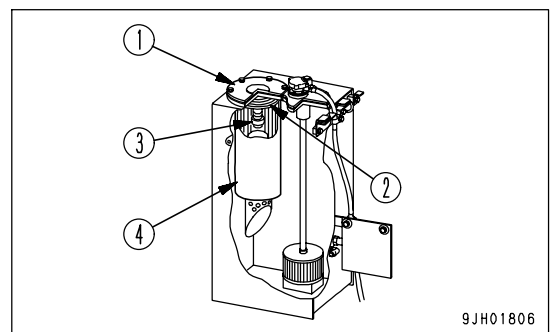
1. Set the work equipment on the hard and flat ground in the maintenance posture as shown in the figure, then lower it to the ground and stop the engine.



2. Remove the cap from oil filler (F), and release the internal pressure.
3. Loosen 6 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).
 - Inspect the bottom of the filter case for dirt, and remove it, if any. Take good care then not to let fall the dirt into the hydraulic tank.



5. Clean the removed parts in diesel oil.
6. Install the new element in the place where old element (4) was installed.
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 mousing bolts.
9. Screw in the oil filler cap and install the cover.
10. To bleed the air, start the engine according to "STARTING ENGINE (PAGE 3-79)" and run the engine at low idle 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.

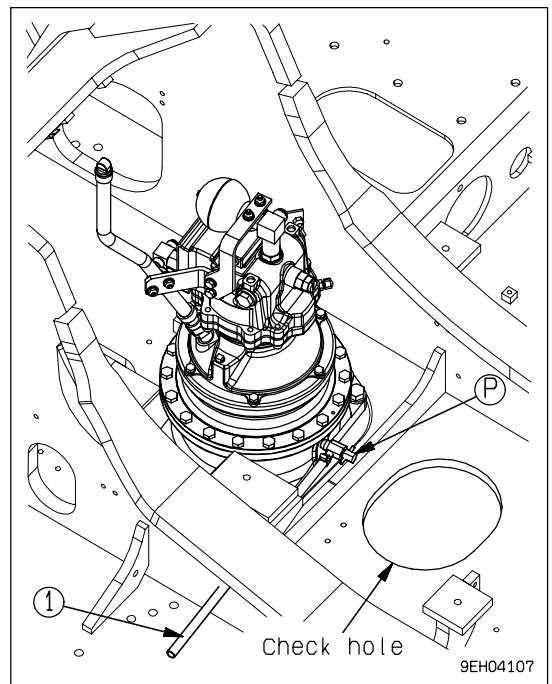
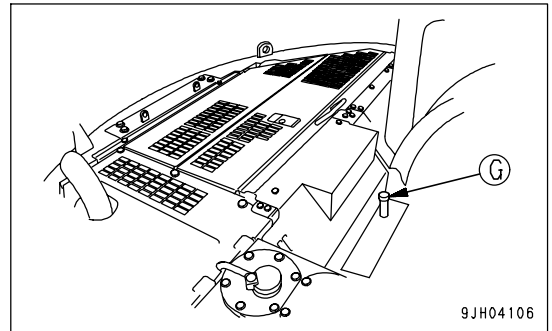
12. Check for oil leakage and wipe off any spilled oil.

CHANGE OIL IN SWING MACHINERY CASE

WARNING

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

- Refill capacity: 6.6 liters (1.74 US gal)
- 1. Set a container under drain valve (P) under the machine body to catch the oil.
- 2. Loosen drain valve (P) under the body, drain the oil, then tighten the drain valve again.
- 3. Remove the gauge of oil filler (G), then add the specified amount of engine oil through oil filler
- 4. Pull out dipstick (G) and wipe off oil on the dipstick with cloth.
- 5. Fully insert dipstick (G) into filler pipe (F), then remove it.
- 6. When the oil level is between the H and L marks, on dipstick (G), it is normal. If the oil does not reach the L mark, add more oil through oil filler (F).
- 7. If the oil is above the H mark, drain the excess engine oil from drain valve (P), and check the oil level again.
 - When draining the excess engine oil, pull out hose (1) from the check hole and then open the drain valve.



CHECK OIL LEVEL IN DAMPER CASE, ADD OIL**WARNING**

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

NOTICE

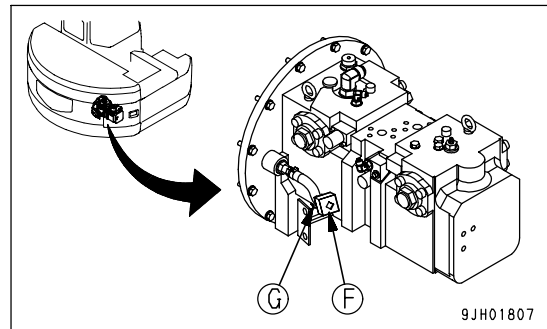
Park the machine on flat ground and stop the engine. After waiting for more than 30 minutes after stopping the engine, check the oil level.

1. Open the cover on the right side of the machine.
2. Remove plug (G) and check the oil level. If the oil level is near the bottom of the plug hole, the oil amount is at a proper level. If found short, remove plug (F) and replenish oil through plug (F) filler port up to the bottom of plug (G) hole.

NOTICE

If excess oil is supplied, drain it to the specified amount to avoid overheating.

3. Install plugs (G) and (F).
4. Close the cover.

**CHECK ALL TIGHTENING PARTS OF TURBOCHARGER**

Contact your Komatsu distributor to have the tightening portions checked.

CHECK PLAY TURBOCHARGER ROTOR

Contact your Komatsu distributor to have the rotor play checked.

REPLACE CORROSION RESISTOR CARTRIDGE

(If equipped)



WARNING

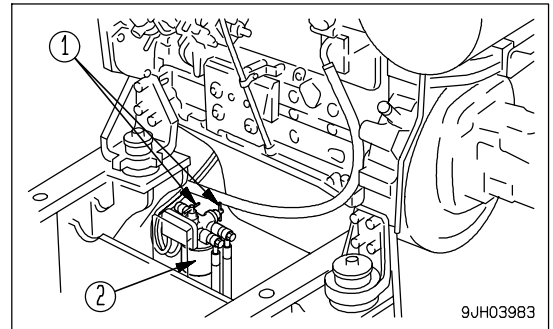
Parts and oil are at high temperature immediately after the engine is stopped and may cause serious burns. Wait for the oil temperature to go down before performing this operation.

1. Screw in valve (1) at the top of the corrosion resistor.
2. Using a filter wrench, turn cartridge (2) to the left to remove it.
3. Install a new filter cartridge after coating engine oil on its sealing face.

In the installation, turn the cartridge by two-thirds of one turn after the packing surface comes to contact with the sealing face of the cartridge stand.

A genuine Komatsu filter cartridge is recommended for use.

4. Open valve (1).
5. Run the engine and check that there is no leakage of water from the seal surface.



CHECK FAN BELT TENSION AND REPLACE FAN BELT

Special tools are required for inspection and replacement of the fan belt. Contact your Komatsu distributors for inspection and replacement.

REMARK

An installed auto fan belt tension adjuster, "Auto Tensional Fan Belt", dispenses with the belt deflection adjustment.

CHECK NITROGEN GAS CHARGE PRESSURE IN ACCUMULATOR (for breaker)

(If equipped)

A special tool is needed for inspecting and charging with nitrogen gas.
Have your Komatsu distributor inspect and charge the accumulator.

EVERY 2000 HOURS MAINTENANCE

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

CHANGE OIL IN FINAL DRIVE CASE



WARNING

- The parts and oil are at high temperature immediately 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.

- Refill capacity (each): 5.4 liters (1.43 US gal)
- Prepare a handle.
 1. Set the final drive the way TOP mark comes to the top.
 2. Set a container under plug (P) to catch the oil.
 3. Remove plugs (P) and (F) with the handle and drain the oil.

REMARK

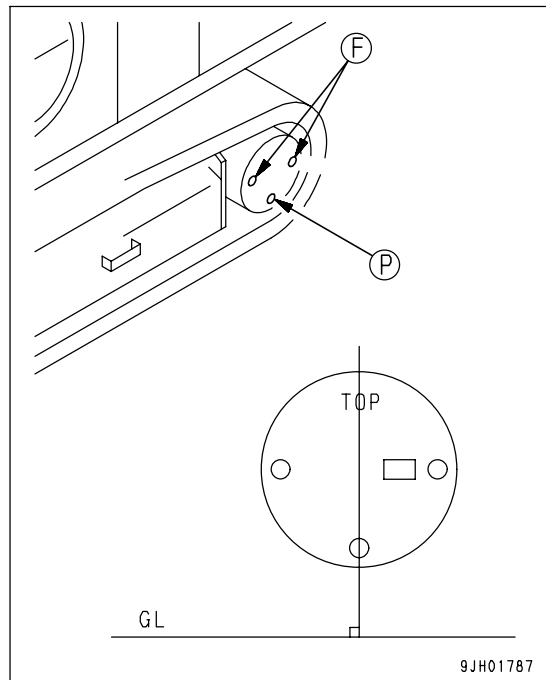
Check the O-rings in the plugs for damage. If necessary, replace with new ones.

4. Tighten plug (P).
5. Add oil through the hole of plug (F).
6. When oil begins to overflow from the plug (F) hole, install plug (F).

Tightening torque of plugs (P) and (F):
 $68.6 \pm 9.8 \text{ N}\cdot\text{m}$ ($7 \pm 1 \text{ kgf}\cdot\text{m}$, $50.6 \pm 7.2 \text{ lbft}$)

REMARK

There are two plugs (F). Add oil through the one easier to fill oil and through which no internal gears are to be seen.



CLEAN HYDRAULIC TANK STRAINER



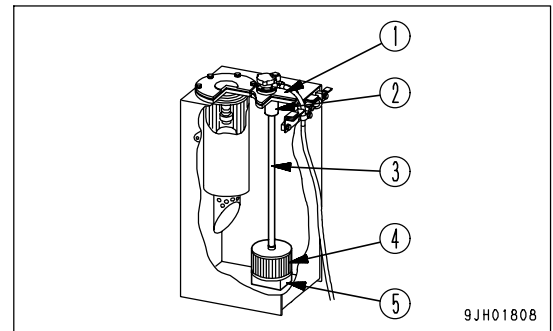
WARNING

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

1. Loosen 6 bolts, then remove cover (1).

When doing this, the cover (1) may fly out under the force of spring (2), so push the cover down when removing the bolts.

2. Hold the top of rod (3) and pull up to remove spring (2) and strainer (4).
3. Remove any 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 part.
4. When installing, insert strainer (4) into protruding part (5) of the tank, and assemble.
5. Install cover (1) with bolts.



CLEAN, CHECK TURBOCHARGER

Contact your Komatsu distributor for cleaning and inspection.

CHECK ALTERNATOR, STARTING MOTOR

The brushes may be worn or the bearing may have run out of grease, contact your Komatsu distributor for inspection and repairs.

If the engine is started frequently, have this inspection carried out every 1000 hours.

CHECK ENGINE VALVE CLEARANCE, ADJUST

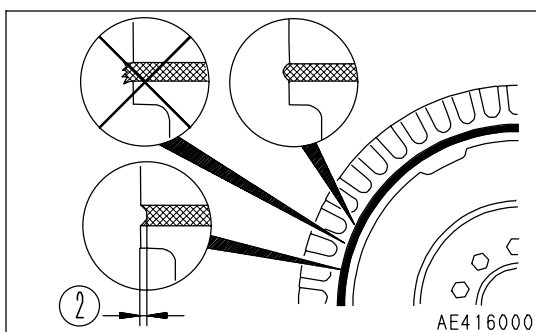
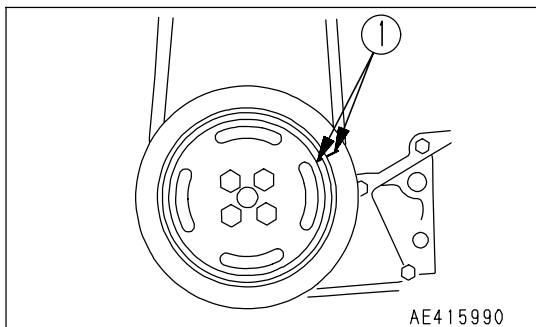
Special tools are needed for inspection and maintenance, please contact your Komatsu distributor.

CHECK VIBRATION DAMPER

For the check and replacement of the vibration damper, special tools are required. Contact Komatsu Ltd. or its distributor in the territory for the replacement. It has to be replaced with a new one in the following cases.

Mating mark (1) is notched both on the damper hub and on the inertia member of the vibration damper to show any misalignment between the two.

If this misalignment exceeds 1.6 mm (0.063in), or if there is any dent found on the damper metal surface deeper than 3.2 mm (0.1in), then (2) the vibration damper must be replaced.



EVERY 4000 HOURS MAINTENANCE

Maintenance for every 100, 250, 500, 1000 and 2000 hours service should be carried out at the same time.

CHECK WATER PUMP

Check that there is no play in the pulley, leakage of oil or water, or clogging of the drain hole. If any problem is found, please contact your Komatsu distributor for repairs or replacement.

EVERY 5000 HOURS MAINTENANCE

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

CHANGE OIL IN HYDRAULIC TANK



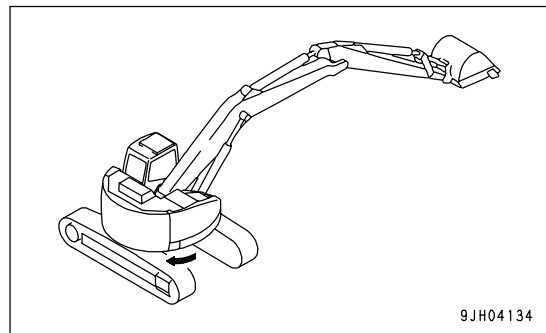
WARNING

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

NOTICE

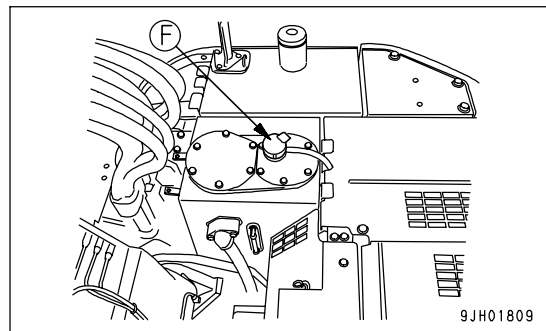
If the machine is equipped with a hydraulic breaker, the hydraulic oil will deteriorate much faster than during normal bucket operations. For details, see "MAINTENANCE INTERVAL FOR HYDRAULIC BREAKER (PAGE 4-16)" when carrying out maintenance.

- Refill capacity: 126 liters (33.29 US gal)
 - Prepare a handle (for the socket wrench).
1. Swing the upper structure so that drain plug at the lower part of the suction tube comes to the middle of the left or right track.
 2. Retract the arm and bucket cylinders, then lower the boom and put the teeth in contact with the ground.
 3. Set the lock lever to the LOCK position and stop the engine.



9JH04134

4. Remove the cap of oil filler (F) at the top of the hydraulic tank.



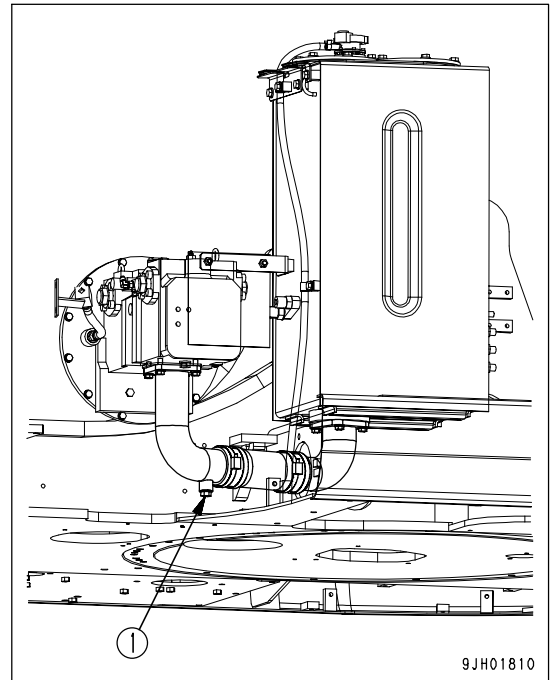
9JH01809

5. Set a container direct under the drain plug located on the machine's underside to catch oil that is drained. Remove drain plug (1) and drain the oil. Check an O-ring installed to Plug (1), and if it has a scratch or damage, replace it with new one. After draining the oil, tighten drain plug (1).

- The specified tightening torque is $68.6 \pm 9.81 \text{ N}\cdot\text{m}$ ($7 \pm 1 \text{ kgf}\cdot\text{m}$, $50.6 \pm 7.2 \text{ lbft}$)
- Take care not to get oil on yourself when you remove drain plug (P).

6. Add the replacement amount of oil through oil filler (F). Check that the oil level is between the H and L lines on the sight gauge (G).

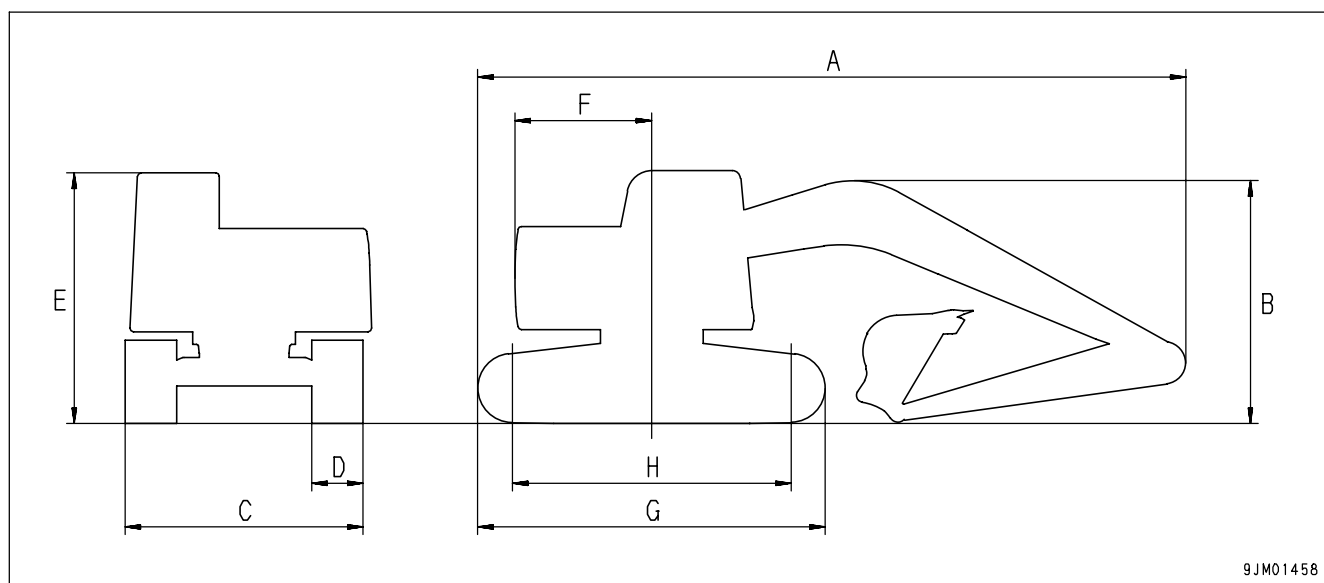
For details of oil level check, see "Check Oil Level in Hydraulic Tank, Add Oil (PAGE 3-70)".



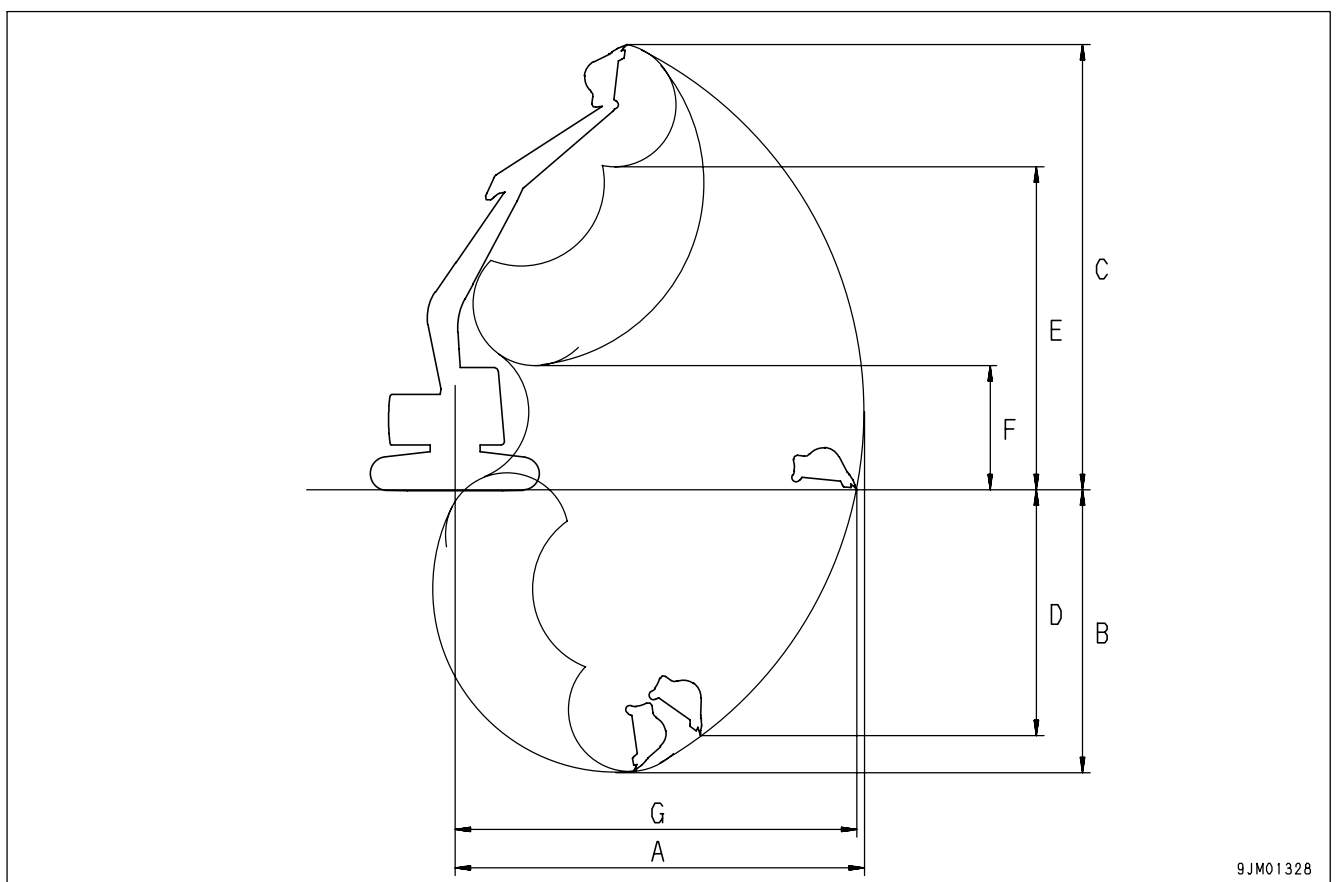
SPECIFICATIONS

SPECIFICATIONS

Item	Unit	PC228US-3	PC228USLC-3
Operating weight	kg (lb)	21,555	22,755
Bucket capacity	m ³ (cu.yd)	0.8 (1.05)	0.8 (1.05)
Name of engine	-	KOMATSU SAA6D102E diesel engine	
Engine horsepower	kW(HP)/rpm	107(143)/1,950	107(143)/1,950
A Overall length	mm (ft in)	8,700 (28' 7")	8,890 (29' 2")
B Overall height	mm (ft in)	3,035 (9' 11")	3,035 (9' 11")
C Overall width	mm (ft in)	2,980 (9' 9")	2,980 (9' 9")
D Track width	mm (ft in)	600 (1' 12")	700 (2' 4")
E Height of cab	mm (ft in)	3,035 (9' 11")	3,035 (9' 11")
F Radius of upper structure	mm (ft in)	1,680 (5' 6")	1,680 (5' 6")
G Length of track	mm (ft in)	4,080 (13' 5")	4,450 (14' 7")
H Tumbler center distance	mm (ft in)	3,270 (10' 9")	3,640 (11' 11")
Min. ground clearance	mm (ft in)	440 (1' 5")	440 (1' 5")
Travel speed (Low/High)	km/h (MPH)	3.0/5.5 (1.9/5.5)	3.0/5.5 (1.9/5.5)
Swing speed	rpm	11.0	11.0



	Working ranges	Unit	PC228US-3	PC228USLC-3
A	Max. digging reach	mm (ft in)	9,875 (32' 5")	
B	Max. digging depth	mm (ft in)	6,620 (21' 9")	
C	Max. digging height	mm (ft in)	10,700 (35' 1")	
D	Max. vertical wall depth	mm (ft in)	5,980 (19' 7")	
E	Max. dumping height	mm (ft in)	7,825 (25' 8")	
F	Min. dumping height	mm (ft in)	2,940 (9' 8")	
G	Max. reach at ground level	mm (ft in)	9,700 (3' 10")	



ATTACHMENTS, OPTIONS

 **WARNING**

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

GENERAL PRECAUTIONS FOR SAFETY

When installing attachments or options to the machine, it is necessary to pay attention to safety. Please obey the following precautions strictly when selecting, installing, or using attachments or options.

PRECAUTIONS WHEN SELECTING

- Please consult your Komatsu distributor before installing attachments or options to the machine. Depending on the type of attachment or option, it may be necessary to install a front guard, overhead guard, or other safety structure to the machine. There may also be problems of the attachment or option hitting the operator's cab.
- Install only attachments or options authorized by Komatsu. Komatsu cannot accept any responsibility for any accident, damage, or failure caused by the use of attachments or options not authorized by Komatsu.

READ THE INSTRUCTION MANUAL THOROUGHLY

- Before installing or using any attachment or option, make sure that you thoroughly read and understand the instruction manuals for the machine and the attachment or option.
- If you lose the instruction manual or it is damaged, always obtain a new copy from the attachment manufacturer or your Komatsu distributor.

PRECAUTIONS WHEN REMOVING OR INSTALLING

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

- Carry out the removal and installation operation on a flat, firm ground surface.
- When the operation is carried out by two or more workers, choose the leader and follow his instructions.
- Use a crane when handling heavy objects (more than 25 kg (55 lb)). (The crane must be operated by a qualified operator.)
- Never go under a load raised by the crane.
- Do not carry out operations with the load kept raised by the crane. Always use a stand to prevent the load from falling.
- When removing a heavy part, consider the balance after it is removed. To prevent the machine from tipping over, set a support in position if necessary before removing the part.
- Before installing or after removing the attachment or option, set it in a stable condition to prevent it from falling over.
- For details of the removal or installation operation, please consult your Komatsu distributor.

PRECAUTIONS WHEN USING

When long or heavy work equipment is installed, remember the following precautions. Before starting operations, move the machine to a safe place and carry out a test operation to make sure that you fully understand the movement, center of gravity, and working range of the machine.

- Do not swing the work equipment if the machine is at an angle. If the work equipment is swung with the machine at an angle, there is danger that the machine will tip over.
- Always maintain a safe distance from obstacles in the surrounding area when operating. If long work equipment is installed, the working range becomes larger.
- If heavy work equipment is installed, pay careful attention to the following precautions.
 - The swing overrun (the distance the work equipment moves before completely stopping after the swing brake is applied) will be greater. There is danger of hitting objects if the swing overrun is miscalculated, so allow extra space to the swing position when swinging.
 - The hydraulic drift of the work equipment (the amount of the work equipment moves down under its own weight when it is stopped in a raised position) also becomes greater. Do not stop the work equipment in a raised position; always lower it to the ground.
 - Do not swing, lower, or stop the work equipment suddenly. There is danger that the machine may tip over.
 - Do not suddenly extend or retract the boom cylinder. The shock may cause the machine to tip over.

BUCKET WITH HOOK

HOOK CONDITION

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

OPERATIONS WITH CARE

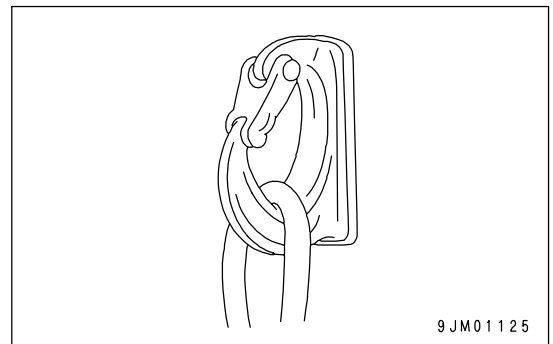
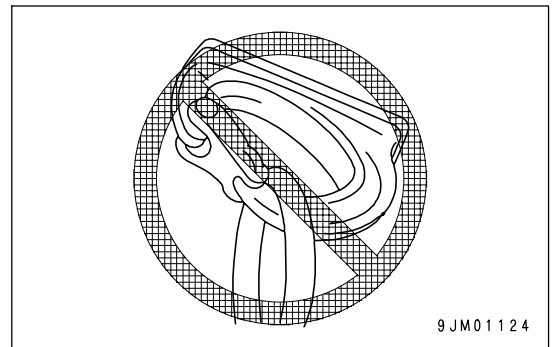
PROHIBITED OPERATIONS

Operations with Care

- When carrying out lifting operations, reduce the engine speed and use the lifting operation mode.
- Depending on the operating posture, there is danger that the wire or ring may come off the hook. To prevent this, pay careful attention to the angle of the hook.
- Never travel the machine while lifting a load.
- If the bucket with hook is turned and used for operations, it will hit the arm during dumping operations, be careful when using it.
- Do not exceed the following loads when carrying out lifting operations.

When standard arm is installed: 990 kg (2,183 lb)

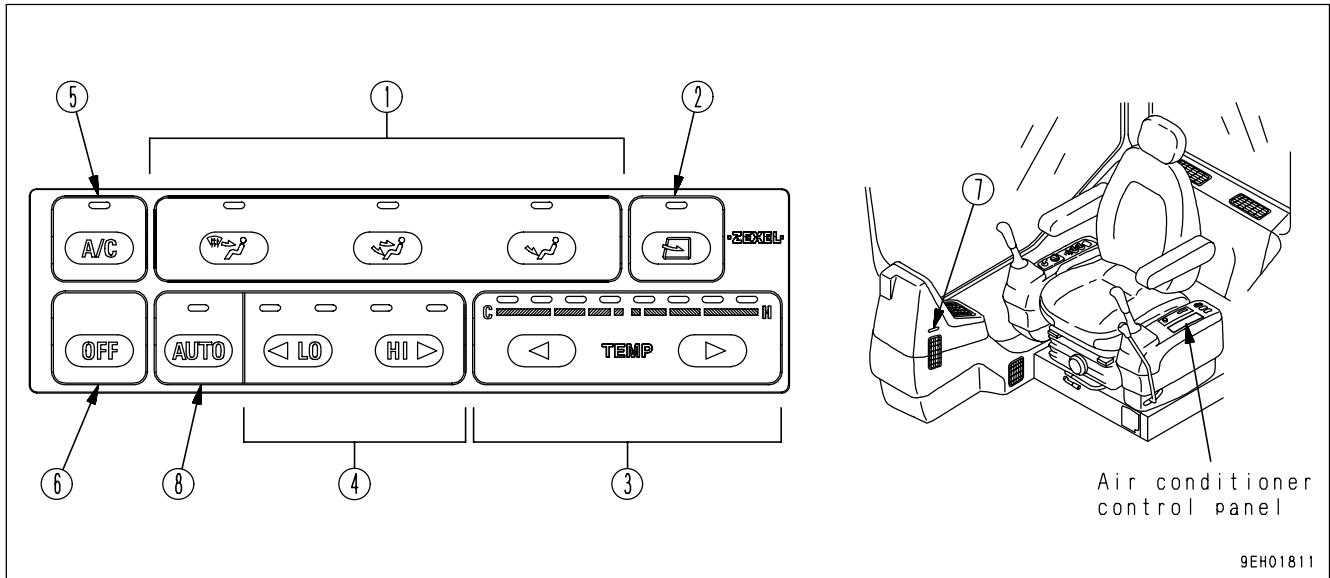
- If you are planning to newly install a hook, contact your Komatsu distributor.



AIR CONDITIONER

(Auto air conditioner)

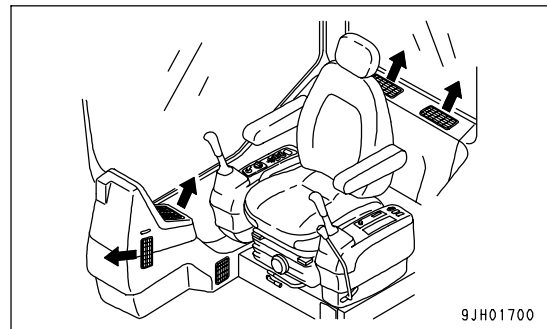
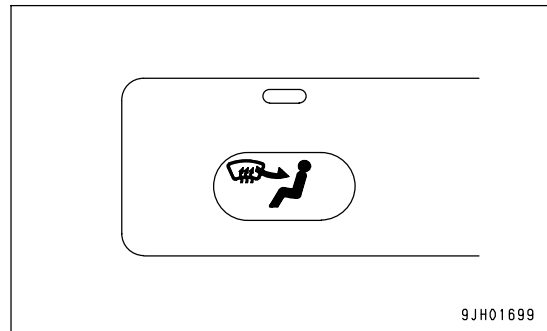
AIR CONDITIONER CONTROL PANEL



- | | |
|-------------------------------------|---------------------------------|
| (1) Vent selector switch | (5) Air conditioner switch |
| (2) Air circulation selector switch | (6) Off switch |
| (3) Temperature control switch | (7) Defroster selector lever |
| (4) Air flow selector switch | (8) Auto air conditioner switch |

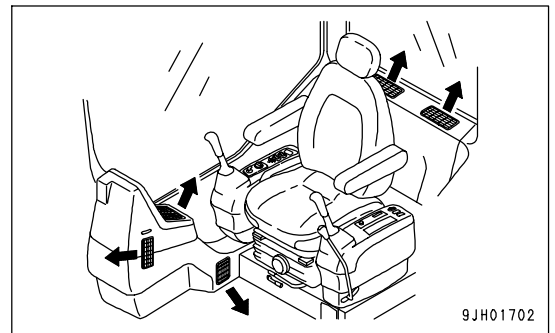
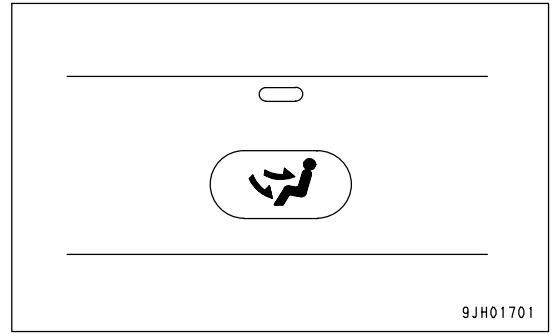
Vent Selector Switch (Air Flow to Upper Part of Body)

If this switch (1) is pressed, the air from the air conditioner is all directed to the face. This can be used to send a cool breeze to the face during hot weather.



Vent Selector Switch (Air Flow to Upper Part of Body and Foot)

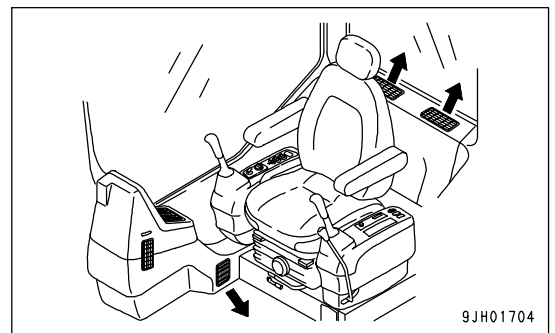
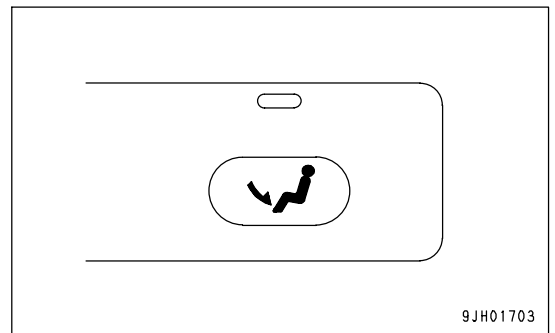
If this switch (1) is pressed, the air from the air conditioner is directed to the face and feet.



Vent Selector Switch (Air Flow to Foot)

If switch (1) is pressed, the air from the air conditioner is all directed to the feet.

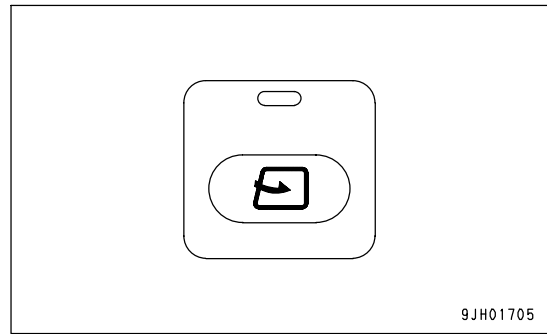
This can be used to send warm air to the feet during cold weather.



Air Circulation Selector Switch (External Air Circulation)

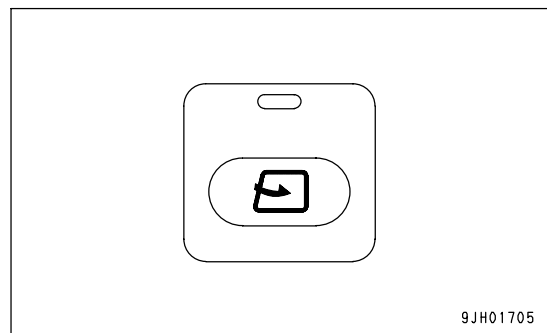
When switch (2) is pressed, fresh air is taken into the cab during heating or cooling.

This position is used to bring in clean fresh air into the cab or to remove the mist from the cab windows.



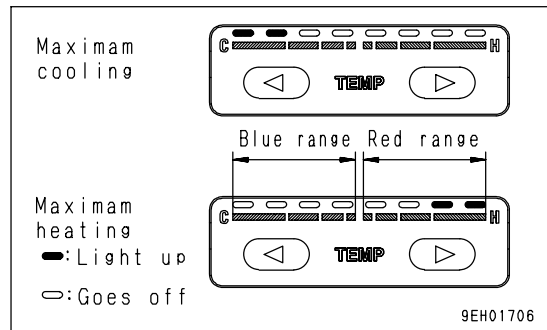
Air Circulation Selector Switch (Internal Air Circulation)

When switch (2) is pressed, the air inside the cab is recirculated and no fresh air is taken in from outside. This position is used when heating or cooling the cab quickly or when the outside air is dirty.



Temperature Control Switch (Cooling)

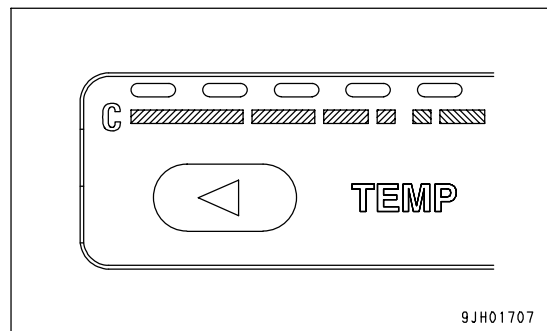
The closer to the "C" mark the lighting-up is in the range, the lower the room temperature is. Conversely the closer to the "H" mark the lighting-up is in the range, the higher the room temperature is. The indicator range is divided into 11 levels, but within each range the temperature changes steplessly.



Use switch (3) to reduce the temperature.

Press this switch to reduce the temperature of the air sent from the air conditioner.

The more times the switch is pressed, the lower the temperature becomes, as the indicator light moves to the "C".

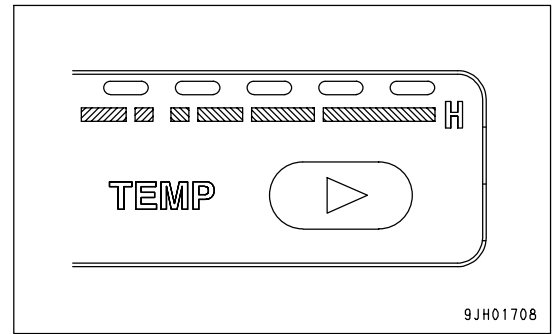


Temperature Control Switch (Heating)

Use switch (3) to increase the temperature.

Press this switch to increase the temperature of the air sent from the air conditioner.

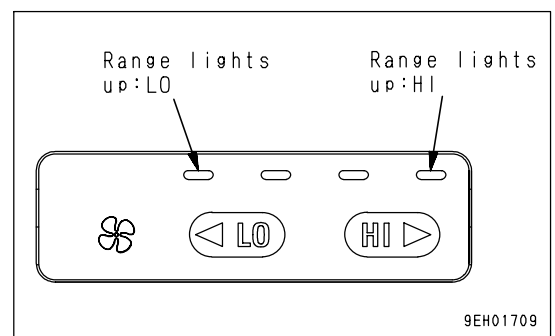
The more times the switch is pressed, higher the temperature becomes, as the indicator light moves to the "H".



Air Flow Selector Switch

The further it is moved into the LO range (rear of machine), the smaller the air flow becomes; the further it is moved into the HI range (front of machine), the greater the air flow becomes.

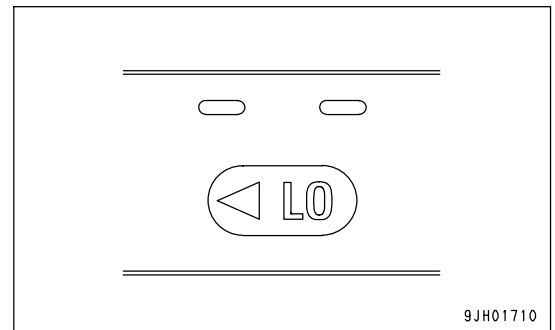
The range is divided into 4 levels.



Air Flow Selector Switch (Low)

Switch (4) is used to set the flow of air from the air conditioner to Low.

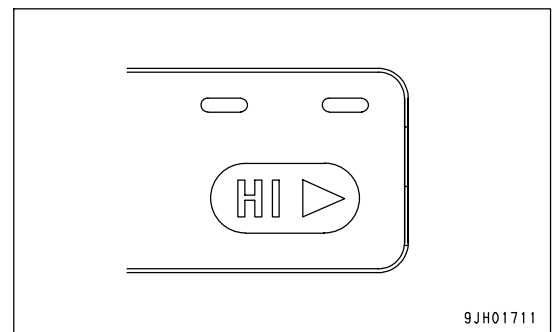
Press this switch to reduce the air flow. The further it is moved into the LO range (rear of machine), the smaller the air flow becomes.



Air Flow Selector Switch (High)

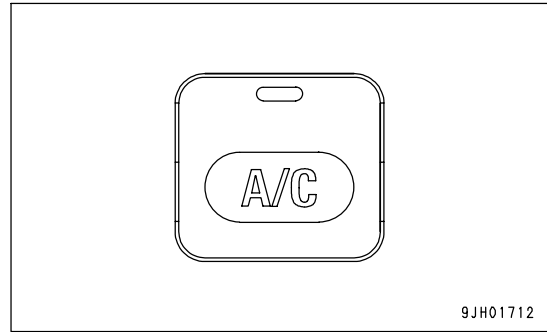
Switch (2) is used to set the flow of air from the air conditioner to High.

Press this switch to increase the air flow. The further it is moved into the HI range (front of machine), the greater the air flow becomes.

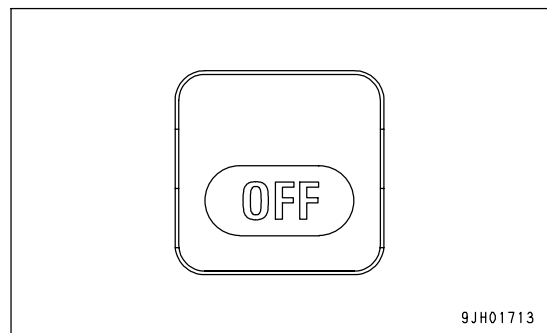


Air Conditioner Switch

Switch (5) is used to switch the air conditioner functions ON/OFF.

**Off Switch**

Switch (6) is used to stop operation of the fan.



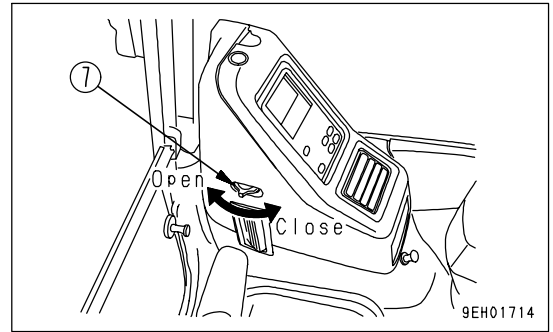
Defroster Selector Lever

Switch (7) is used to remove the mist from the front glass during cold or rainy weather.

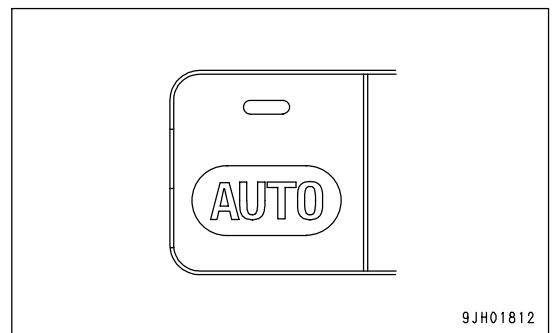
Selector lever to front: To defroster (open)

Selector lever to rear: Closed

The defroster can be used when the vent selector switch is set to send air to the face or to the face and the feet.

**Auto Air Conditioner Switch**

This switch (8) is used to automatically maintain the air temperature set by temperature control switch (3).

**AIR CONDITIONER CONTROLS****Cooling**

- If you smoke when the air conditioner is on, the smoke may start to hurt your eyes, so open the window and turn the lever to FRESH for a while to remove the smoke while continuing the cooling.

When running the air conditioner for a long time, turn the lever to the FRESH position once an hour to carry out ventilation and cooling.

Cooling with Care

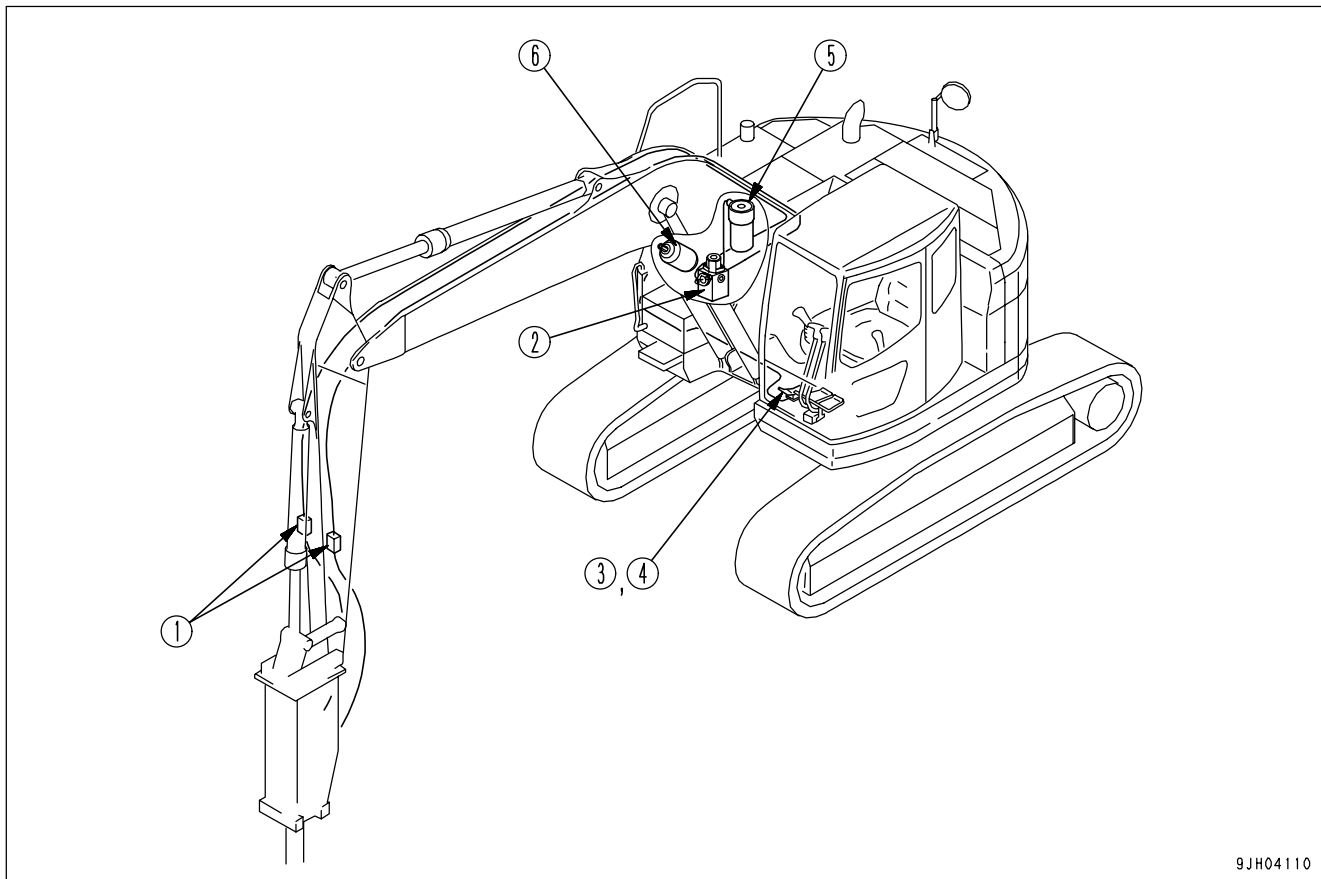
- It is considered suitable for health reasons to set the cooling temperature so that it feels slightly cool when entering the cab (difference from outside temperature: 5 to 6°C (41 to 42.8°F)).

AIR CONDITIONER MAINTENANCE

When carrying out inspection of a machine equipped with an air conditioner, see the "MAINTENANCE SCHEDULE CHART (PAGE 4-14)" and carry out inspection according to the table.

MACHINE READY FOR ATTACHMENT

LOCATIONS



9JH04110

- | | |
|------------------------------|---|
| (1) Stop valve | (4) Lock pin |
| (2) Selector valve | (5) Breaker circuit additional oil filter |
| (3) Attachment control pedal | (6) Accumulator |

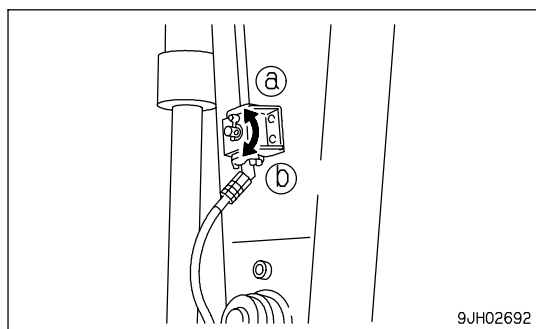
Stop Valve

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.



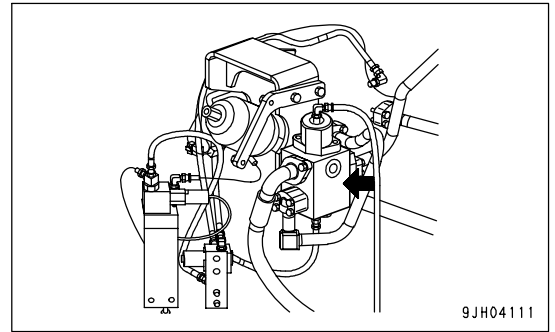
9JH02692

Selector Valve

This valve (2) switches the flow of hydraulic oil. It is automatically switched according to the selected working mode. It is necessary to switch the working mode to match the attachment that is installed. For details of switching the working mode, see "HYDRAULIC CIRCUIT (PAGE 6-14)".

NOTICE

If a service circuit from the attachment maker has been added, the return circuit may not switch automatically.



9JH04111

Attachment Control Pedal



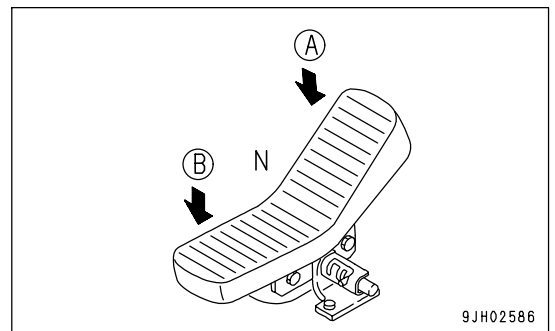
WARNING

Do not carry out operations with your foot on the pedal. If the pedal is depressed by mistake, the attachment may suddenly move and cause a serious accident. Lock the pedal with the lock pin when you are not operating the attachment.

This pedal (3) is used to control the attachment. When the front, center (neutral), and rear of the pedal are depressed, the movement of the attachment is as follows.

Hydraulic breaker

- Front of pedal (A): Actuated
- Center of pedal N: Stopped
- Rear of pedal (B): Stopped



9JH02586

Regarding other attachments, hold a meeting with the attachment maker at the time of installation to confirm the operation of the pedal and attachment before using it.

REMARK

This pedal cover (3) differs in thickness at both ends. It can be stalled facing in either direction, so install it according to your own preference.

Lock Pin

This pin (4) locks the control pedal.

Position (a): Locked

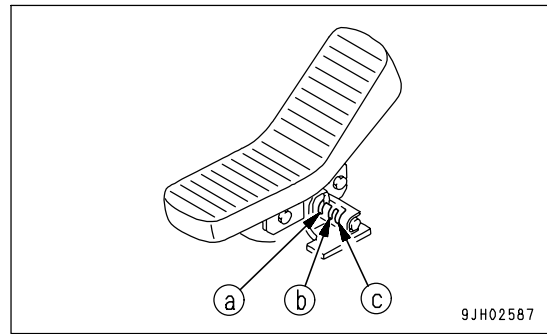
Position (b): Only front of pedal can be operated to full position
(rear is locked)

Position (c): Both front and rear of pedal can be operated to
full position

- When using a breaker, select B mode on the monitor and set the lock pin to position (b).

When not using the attachment, set the lock pin to position (a).

- When using a Crasher, select A or E mode on the monitor and set the lock pin to position (c).

**NOTICE**

When using a breaker, if the lock pin is set to position (c) and the rear portion (B) of the pedal is depressed, it will cause defective operation or breakage of the breaker, so always set the lock pin to position (b) when using the breaker.

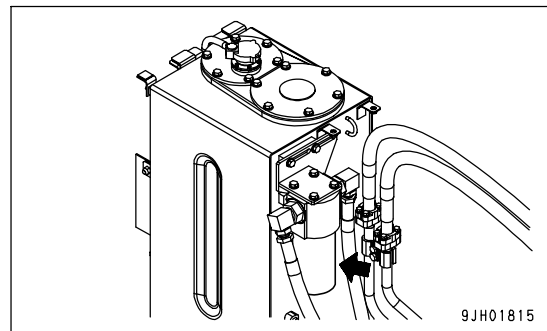
Breaker Circuit Additional Oil Filter

This filter (5) prevents deterioration of the hydraulic oil when using a breaker.

Oil only flows when B mode is selected on the monitor.

NOTICE

Always install an additional filter in the return circuit on machines equipped with a hydraulic breaker.

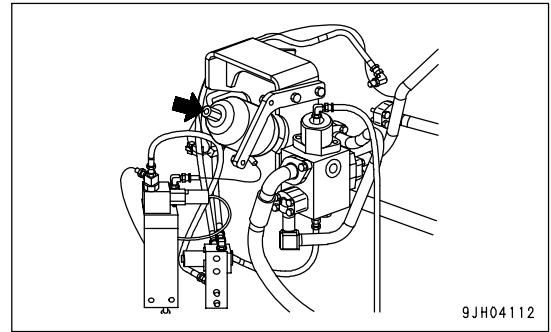


Accumulator

WARNING

The accumulator is charged with high-pressure nitrogen gas, improper operation may cause an explosion which could lead to serious injury or damage. When handling the accumulator, always do as follows:

- Pressure in the control circuit cannot be completely removed. When removing the hydraulic equipment, do not stand in the direction that oil spurts out when performing the operation.
- Loosen the bolts slowly.
- Do not disassemble the accumulator.
- Do not bring it near flame or dispose of it in fire.
- Do not make holes in it or weld it.
- Do not hit it, roll it, or subject it to any impact.
- When disposing of the accumulator, the gas must be released. Contact your Komatsu distributor for proper disposal.



This accumulator (6) is installed to reduce the peak pressure in the hydraulic circuit when a breaker is used. Normally, do not touch it.

NOTICE

- For machines equipped with a breaker, when connecting to the breaker piping, it is necessary to install the accumulator specified by the breaker manufacturer for that breaker model. If the breaker is operated without an accumulator being installed, the life of the machine will be reduced. Please contact your Komatsu distributor if you have questions about the applicable breaker.
- If the nitrogen gas charge pressure inside the accumulator goes down, it will become impossible to release the remaining pressure inside the hydraulic circuit after the engine is stopped. In addition, if operations are continued when the nitrogen gas charge pressure is low, it will lead to failure of the hydraulic circuit or the machine. Check the nitrogen charge pressure periodically.

For details, see "CHECK NITROGEN GAS CHARGE PRESSURE IN ACCUMULATOR (control circuit) (PAGE 4-44)" and "CHECK NITROGEN GAS CHARGE PRESSURE IN ACCUMULATOR (for breaker) (PAGE 4-67)".

HYDRAULIC CIRCUIT

NOTICE

- When a breaker is installed, it is necessary for the return circuit to return directly to the return filter, so always use B mode. Do not use any other mode.
- The standard set pressure of the service valve safety valve is set as follows when the machine is shipped from the factory.
When B mode is selected: 20.6 MPa (210 kgf/cm², 2982 PSI)
When A or E mode is selected: 27.4 MPa (280 kgf/cm², 3976 PSI)
Depending on the attachment, it may be necessary to adjust the pressure. In this case, please ask your Komatsu distributor to carry out the adjustment.

Switching Hydraulic Circuit

- Depending on the type of attachment, set the working mode on the monitor as follows.
- The set pressure of the service valve safety valve and the hydraulic circuit switch is according to the working mode selected.

Attachment	Working mode	Hydraulic circuit	Set pressure of service safety valve
Breaker or other attachment with one-way circuit	B mode	Return circuit automatically switched so that it does not pass through control valve	When shipped from factory: 20.6 MPa (210 kgf/cm ² , 2980 PSI)
Crusher or other attachment with two-way circuit	A mode or E mode	Return circuit automatically switched so that it passes through control valve	When shipped from factory: 27.4 MPa (280kgf/cm ² , 3980 PSI)

Adjusting Oil Flow

Depending on the attachment, it is necessary to change the oil flow in the service circuit. For details of setting the oil flow, see "ATTACHMENT OPERATIONS (PAGE 6-20)".

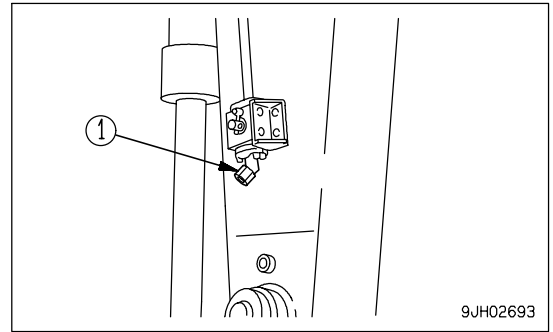
Switching Between Breaker and General Attachment

- When a possible attachment (if equipped) is installed and B mode is selected:
 - 1) The circuit becomes a circuit for breaker operation (1-way circuit).
 - 2) The hydraulic oil flowing in the breaker circuit flows to the additional filter for the breaker.
 - 3) The relief valve is set to a lower pressure.
When shipped from factory: 20.6 MPa (210 kgf/cm², 2980 PSI)
 - 4) It is possible to adjust the maximum flow with the select mode.
- When a possible attachment (if equipped) is installed and A mode or E mode is selected:
 - 1) The circuit becomes a circuit for crusher operation (2-way circuit).
 - 2) The hydraulic oil flowing in the crusher circuit does not flow to the additional filter for the breaker.
 - 3) The relief valve is set to a higher pressure.
When shipped from factory: 27.4 MPa (280 kgf/cm², 3980 PSI)
 - 4) It is possible to adjust the maximum flow with the select mode.

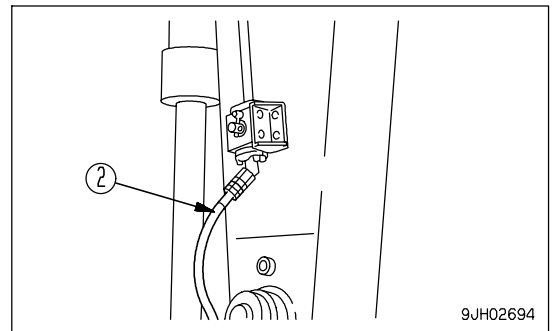
Hydraulic Circuit Connection

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

1. Remove blind plug (1) at the end of the stop valve piping.
(Two spots on the left and right)
Be careful not to lose or damage any part that has been removed.

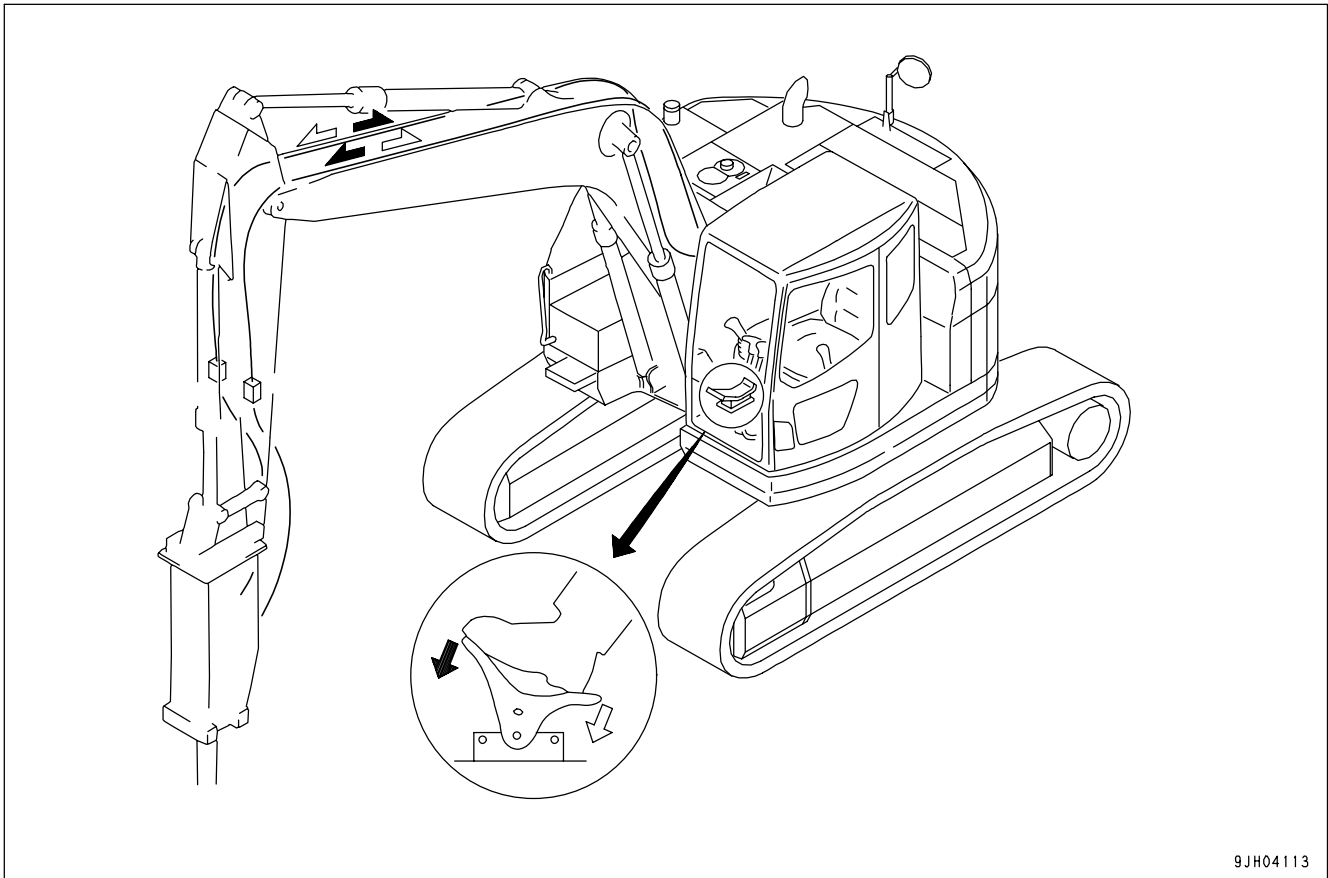


2. Connect attachment piping (2) provided by the attachment maker to the part from which the plug was removed Step 1.
For the mouthpiece size and accumulator add-on, the action to take differs according to the attachment manufacturer,
so please consult your Komatsu distributor.



Oil Flow Path

The direction of operation of the pedal and the path of the oil flow is as shown in the diagram below.



When the front of the pedal is depressed, oil flows to the piping on the left side of the work equipment; when the rear of the pedal is depressed, oil flows to the piping on the right side of the work equipment. (When a breaker is installed, only the front of the pedal can be used.)

Replace Additional Breaker Filter Element

(If equipped)



WARNING

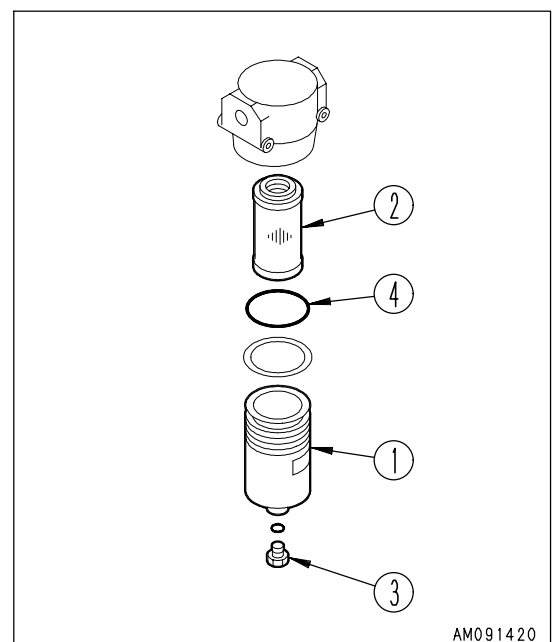
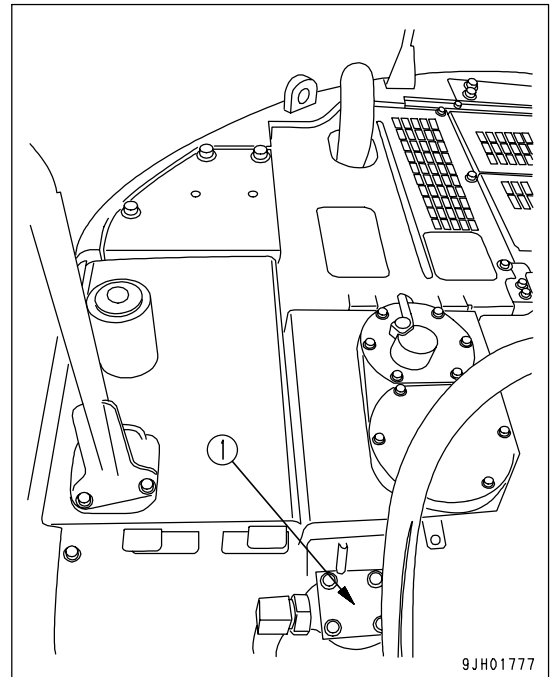
Immediately after operating the engine, all parts still retain high temperature. Never replace the filter in such condition.

Replace it only after each part has sufficiently cooled.

- 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

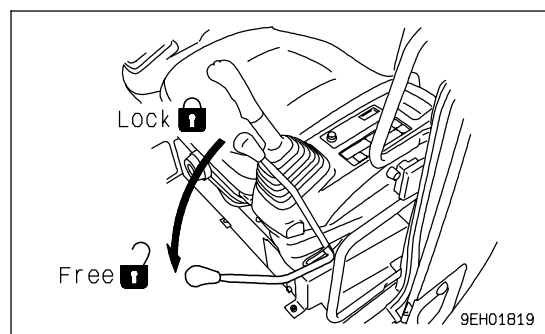
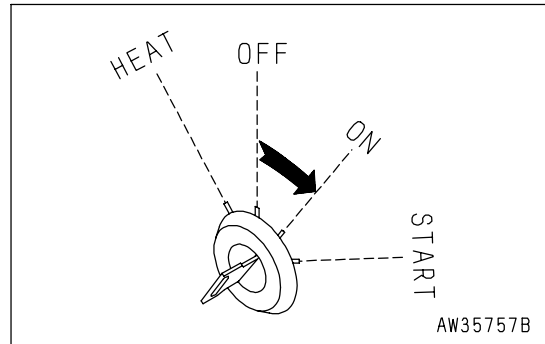
For details of the replacement interval for the element, "MAINTENANCE INTERVAL FOR HYDRAULIC BREAKER (PAGE 4-16)".



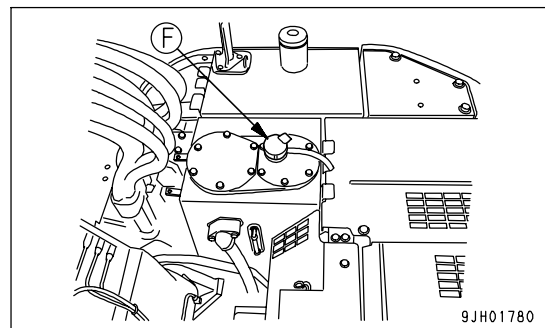
ATTACHMENT REMOVAL AND INSTALLATION

Attachment Removal

1. Lower the attachment to the ground and stop the engine.
2. Turn the starting switch to ON position and push down the lock lever to FREE position.
3. Operate each work equipment control lever and the attachment control pedal back and forth, left and right at full stroke 2 to 3 times to eliminate the internal pressure in the hydraulic circuit.

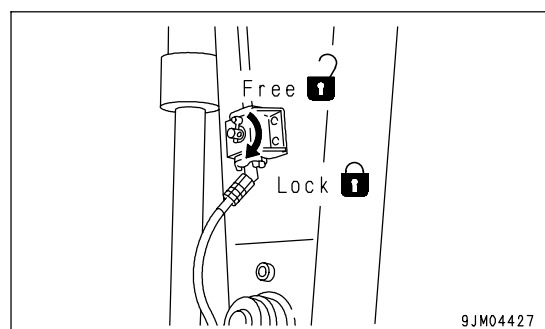


4. Loosen slowly oil filler cap (F) on top of the hydraulic tank to eliminate the internal pressure in the hydraulic circuit.



5. After checking that the oil temperature is low, turn the rotor of the stop valves installed to the inlet and outlet piping at the side of the arm to the OFF position.
6. Remove the hoses on the attachment side. Install the plugs to the two outlets.

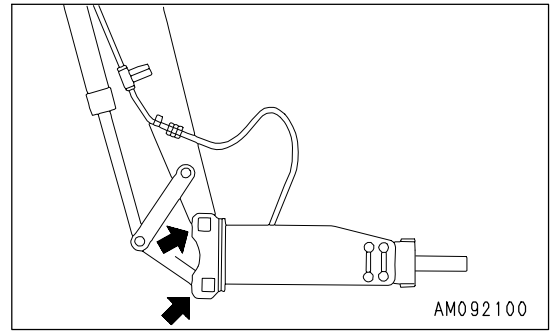
The plugs are used to prevent the attachment from incorrect operation caused by mixing in of foreign matter. After the plugs are correctly installed, store the attachment.



7. Pull out the mounting pins (2 places), remove the attachment, then install the bucket.

For details of the procedure for installing the bucket, see "BUCKET REPLACEMENT AND INVERSION (PAGE 3-111)".

8. After installing the bucket, check the oil level in the hydraulic tank.

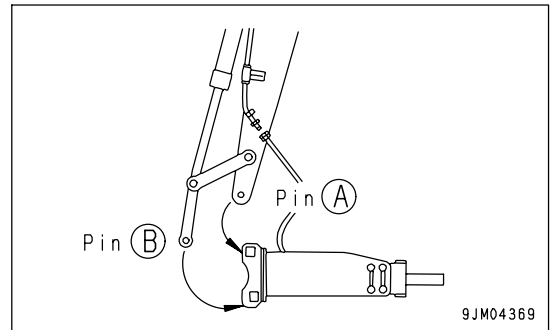


Attachment Installation

1. Remove the bucket.

For bucket dismounting procedure, see "BUCKET REPLACEMENT AND INVERSION (PAGE 3-111)".

2. Place the attachment in a horizontal position, then install to the arm with pin (A) and then pin (B).



3. After confirming low oil temperature, remove the plug from the outlet and inlet port respectively.

Take care that no dust, mud etc. adheres to the hose mousepiece portions.

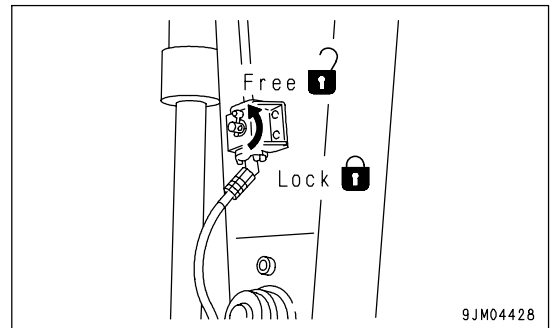
If O-ring is damaged, replace it with a new one.

4. Connect the hose at the attachment side.

When doing this, check the direction of flow of the oil and be careful not to make any mistake.

5. Turn the rotor of the stop valves installed to the inlet and outlet piping at the side of the arm to the FREE position.

6. After installing the attachment, check the oil level in the hydraulic tank.



ATTACHMENT OPERATIONS

WARNING

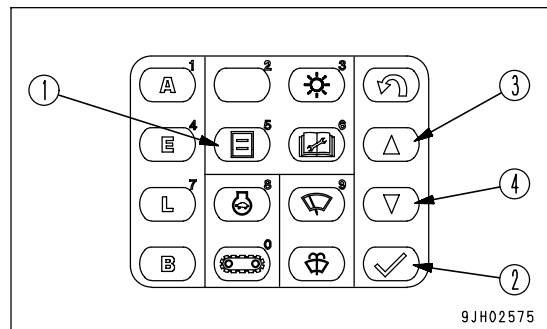
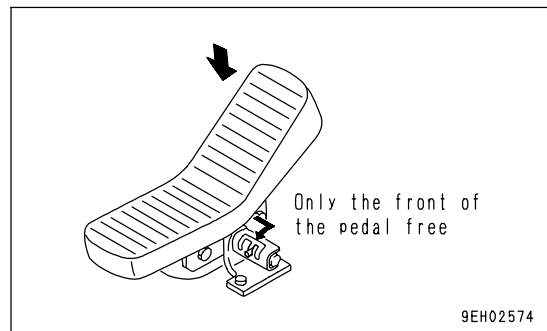
- Do not rest the foot on the pedal and depress it, when the auto deceleration switch is in ON position. The engine speed rises all of sudden and the attachment will move suddenly and cause serious damage or injury.
- Do not put your foot on the pedal except when operating the pedal. If rest your foot is 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

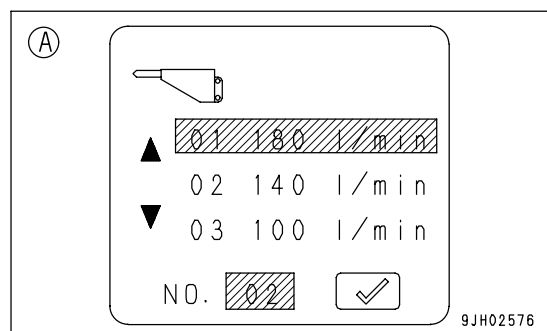
When the B mode control switch is ON and the lock pin position makes only the front of the pedal free, if the front of the pedal is depressed, the breaker is actuated.

1. Set the working mode to B mode.
2. When select switch (1) on the monitor is pressed, the screen changes to screen (A). Select a suitable oil flow for the breaker from among 180 liters/min, 140 liters/min, and 100 liters/min, then press input confirmation switch (2).
3. The monitor screen changes to screen (B), so if it is necessary to make fine adjustment, press up switch (3) or down switch (4) to move the bar graph showing the oil flow up or down, then press input confirmation switch (2).
 - It is possible to change the oil flow in segments of approx. 10 liters/min.
 - If fine adjustment is not necessary, simply press-input confirmation switch (2).
 - The default setting is 180 liters/min.
 - Even if the starting switch is turned OFF, the set oil flow when the engine is next started will be the value set by the above procedure.

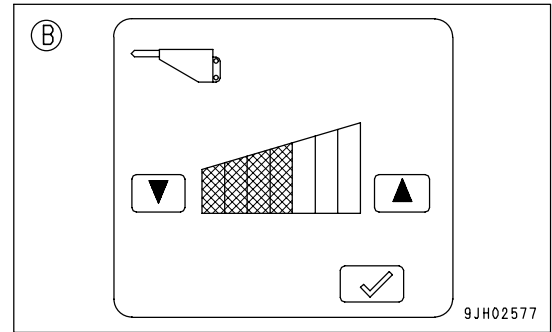


Precautions when using

- Check that the stop valve is at the FREE position.
- Check that the working mode is B mode.
For details of the path of the oil, see "HYDRAULIC CIRCUIT (PAGE 6-14)".
- When considering whether it is necessary to install an accumulator for the attachment circuit, contact the attachment manufacturer and then decide.
- For other precautions when handling the breaker, follow the instruction manual from the breaker manufacturer and use the breaker correctly.



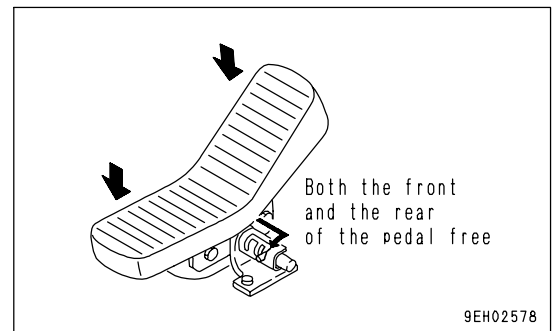
- The deterioration of the hydraulic oil when using the breaker is much faster than for normal operations, so reduce the maintenance interval for the hydraulic oil and element. For details, see "MAINTENANCE INTERVAL FOR HYDRAULIC BREAKER (PAGE 4-16)".



When Using General Attachment Such as Crusher

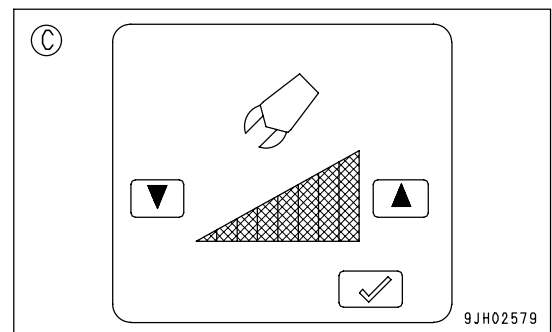
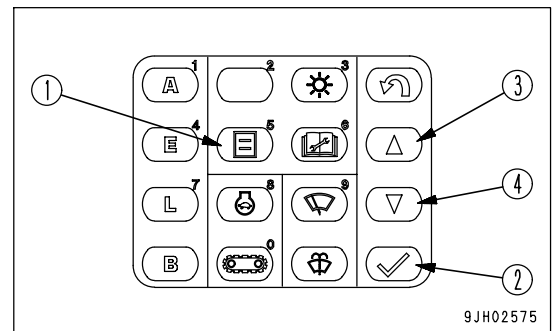
When the A mode or E mode control switch is ON and the lock pin position makes both the front and the rear of the pedal free, if the front or rear of the pedal is depressed, the attachment is actuated.

- Set the working mode to A mode or E mode.
- When select switch (1) on the monitor is pressed, the screen changes to screen (C), so press up switch (3) or down switch (4) to move the bar graph showing the oil flow up or down, then press input confirmation switch (2).
 - The default setting is the full flow (approx. 430 liters/min).
 - Even if the starting switch is turned OFF, the set oil flow when the engine is next started will be the value set by the above procedure.



Precautions when using

- Check that the stop valve is at the FREE position.
- Check that the working mode is E mode. For details of the path of the oil, see "HYDRAULIC CIRCUIT (PAGE 6-14)".
- For other precautions when handling the attachment, follow the instruction manual from the attachment manufacturer and use the attachment correctly.



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 the plug and O-rings to the valves.
- 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

- Max. merging oil flow 214 x 2 liters / min
- Safety valve of service valve relief setting pressure 27.47 MPa (280 kgf/cm², 3980 PSI)(except B mode)
- Safety valve of service valve cracking pressure 24.53 MPa(250 kgf/cm², 3550 PSI)(except B mode)
- Safety valve of service valve relief setting pressure 20.59 MPa (210 kgf/cm², 2980 PSI)(B mode)
- Safety valve of service valve cracking pressure 17.20 MPa(175 kgf/cm², 2490 PSI)(B mode)

In addition, valves with a safety valve relief set pressure of 24.53 MPa (250 kgf/cm², 3550 PSI) and relief valve cracking pressure of 20.11MPa (205 kgf/cm², 2911 PSI) are also available so please contact your Komatsu distributor.

ATTACHMENT GUIDE

ATTACHMENT COMBINATIONS

This table lists the combination of attachments which can be installed to the long arm (standard), short arm and extension arm.

○: Can be used

△: Can be used only for light duty work

×: Cannot be used

NOTICE

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

*:Equipped with side cutter

Name of bucket	Capacity (m ³)		Outside width (mm (ft in))	Use	Standard arm (2.6m)
	SAE	cu.yd			
*Narrow bucket	0.5	0.65	750 (2' 6")	Narrow digging	○
*Narrow bucket	0.6	0.78	970 (3' 2")	Narrow digging	○
*Standard bucket	0.8	1.05	1,150 (3' 9")	General digging	○
*Light duty bucket	0.9	1.18	1,200 (3' 11")	Light digging	△
Light duty bucket	1.0	1.31	1,330 (4' 4")	Loading	△
Slope finishing bucket	0.4	0.52	-	For trimming of a slope and rolling compaction	○

TRACK SHOES SELECTION

Select the most suitable track shoe to match the operating conditions.

Selection

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 shoe will increase, 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	Rockyground, riverbeds, normal soil	<ul style="list-style-type: none"> • On rough ground with large obstacles such as boulders or fallen trees, travel at low speed.
B	Normal soil, soft ground	<ul style="list-style-type: none"> • These shoes cannot be used on rough ground where there are large obstacles such as boulders or fallen trees. • Travel at Hi or Mi speed only on flat ground, and if it is impossible to avoid going over obstacles, shift down and travel at half speed in Lo.
C	Extremely soft ground (swampy ground)	<ul style="list-style-type: none"> • Use the shoes only in places where the machine sinks and it is impossible to use A or B shoes. • These shoes cannot be used on rough ground where there are large obstacles such as boulders or fallen trees. • Travel at Hi or Mi speed only on flat ground, and if it is impossible to avoid going over obstacles, shift down and travel at half speed in Lo.
D	Paved road	<ul style="list-style-type: none"> • Take note of low gradeability due to the flat shoes and exercise a due care.
E	Paved road	<ul style="list-style-type: none"> • Be sure to follow the instructions set forth in the "HANDLING OF RUBBER PAD SHOE AND ROAD LINER(6-26 PAGE)" section for the protection of the rubber pad shoes.

	PC228US-3		PC228USLC-3	
	Specifications	Category	Specifications	Category
Standard	600mm Triple	A	700mm Triple	B
Option	600mm Road Liner (Rubber pat type)	E	600mm Road Liner (Rubber pat type)	E
Option	610mm Flat	D	610mm Flat	D
Option	700mm Triple	B	600mm Triple	A
Option	800mm Triple	C	800mm Triple	C
Option	860mm Swamp	C	860mm Swamp	C

BUCKET TEETH SELECTION

Depending on the working conditions, there is danger that an adapter and teeth may break, so select from the vertical pin and horizontal pin teeth to give teeth that are suitable for the purpose.

While the standard teeth of both vertical and horizontal pin types may be used widely, the following kinds of teeth are recommended depending on the working conditions.

Teeth Selection

Vertical Pin Type Tooth

General digging: Digging and loading normal soil, such as sand, gravel, clay, etc.

Light-duty digging: digging and loading dry and loose sandy soil, or muddy soil.

Loading: loading of dry and loose earth.

Horizontal Pin Type Tooth

Heavy-duty digging: Digging and hammering work on hard soil, soil with rocks, scraping or other heavy-duty work

- The heavy-duty bucket is of a horizontal pin type and as such, use it for heavy duty-digging.

Long-life Tooth

- Jobsites where long wear life is demanded, such as when loading hard rocks.
- Jobsites where no penetration is needed, such as when working with crushed rocks after blasting or ripping.
- Jobsites where heavy-duty operations are carried out, such as hitting or pulling up rocks with the tips of the teeth.

Self-sharpening Tooth

- Jobsites demanding penetration such as digging and loading sandy or clayey soil.

Selection Guide for Horizontal or Vertical Pin Type Tooth

		Applicable Work Site			
		Rock	Crushed stone	Clayey soil, Decompressed weathered granite	Sand
Work Contents	→Heavy	Digging with hammering work	Horizontal pin type teeth		Vertical pin type teeth
	←Light	Scraping down	Horizontal pin type teeth		Vertical pin type teeth
		General excavation	Vertical pin type teeth		
		Loading	Vertical pin type teeth		

HANDLING OF RUBBER PAD SHOE AND ROAD LINER

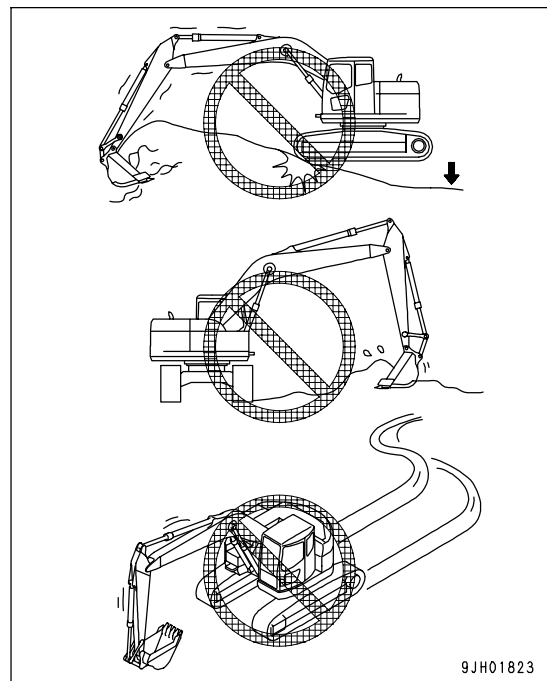
Be sure to observe the following instructions, when using a machine equipped with rubber pad shoes or Road Liner.

Working Environment

- Use a machine equipped with rubber pad shoes or Road Liner mainly for jobs on the paved roads. If used otherwise, breakage or chipping will occur on the rubber and the service life will be considerably reduced. Particularly the following jobsites must be avoided.
 - Jobsite strewn with crushed concrete or on sand
 - Jobsite with protruding edged objects like steel bar, glass and the like
 - Jobsite on rocky terrain or in a river with many rocks A ride over a concrete road shoulder or above all the tip of sheet piles driven into the ground must be avoided.
- Be careful of machine skidding on the road covered with water, ice, snow or gravel. Pay special attention when unloading a machine from a truck.
- Use a machine equipped with rubber pad shoes or Road Liner in the ambient temperature range of -25°C to 65 °C due to the properties of rubber.

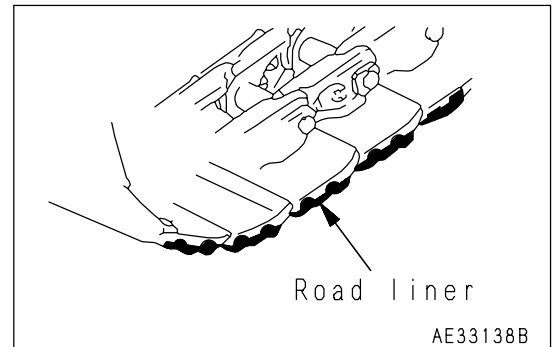
Working Conditions

- A job using the undercarriage as a fulcrum, side digging job, digging job on a slope and a job requiring frequent steering, as shown in the picture, cause an excessive load on the rubber and there is danger that it may be damaged.
- Durability of rubber pad shoes may not be covered with warranty, if a special work equipment is mounted.



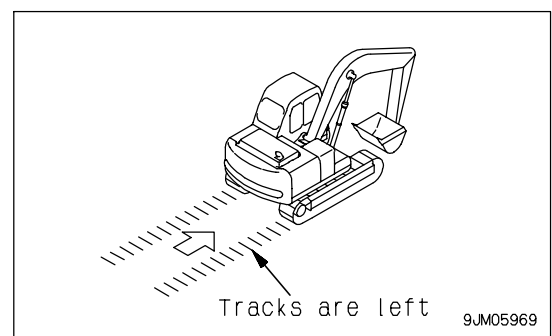
Storage, Protection

- Take care that no oil or grease sticks to the rubber. If it does, wipe it off immediately.
- Install rubber pad shoes and Road Liner corresponding to the number of the links. If there is any missing pad or liner, the rubber will be greatly deformed and damaged.
- If rubber pad shoes or Road Liner has to be stored for a long period, keep it indoors to avoid direct sunlight and rain.



Extent of Damage to Rubber

- When traveling on a concrete pavement, rubber may stick to the road surface, leaving a dark track behind. It is the time for replacement.



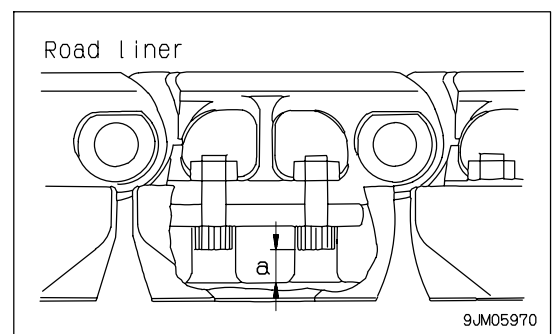
- The rubber is still usable, even if it does not look in good shape with part of the rubber chipped or cuts developed on the surface, so long as damage has not developed all over the shoe or it does not damage a road surface.

Check Road Liner

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

Height of Lug

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



Replace Road Liner

- When all the road liners of the machine need to be replaced, ask your Komatsu distributor to replace them.
- When replacing only part of the road liner, use the special road liner removal tool. Please order the tool from your Komatsu distributor.

RECOMMENDED ATTACHMENT OPERATIONS

Below described are instructions which must be followed without fail when doing the work using a hydraulic excavator equipped with an attachment.

NOTICE

Select the attachment most suited to the machine body.

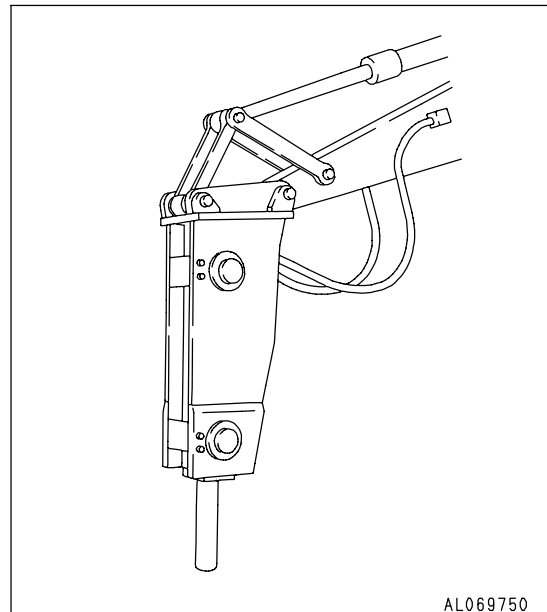
- The machine models to which attachments can be mounted vary. For selection of attachment and machine model, consult your Komatsu distributor.

HYDRAULIC BREAKER

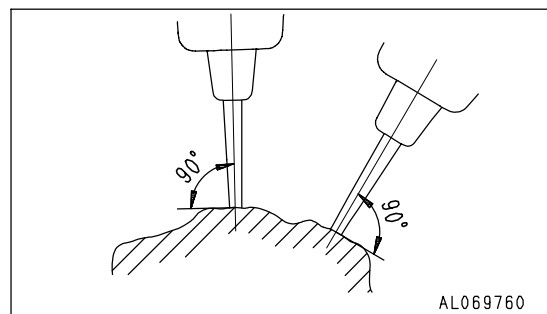
Main Applications

- Crushed rock
- Demolition work
- Road construction

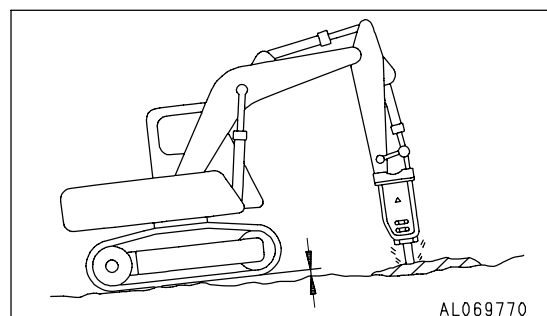
This attachment can be used for a wide range of applications including demolition of buildings, breaking up road surfaces or slag, tunnel work, rock crushing and breaking operations in quarries.



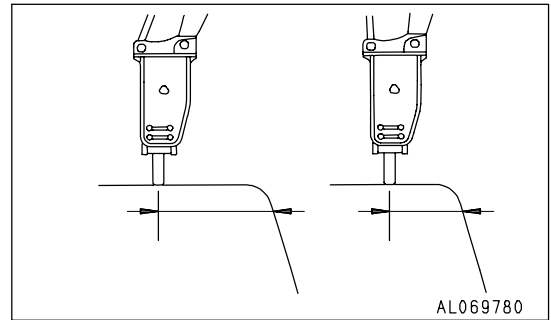
Keep the chisel pushed perpendicularly against the impact surface when carrying out breaking operations.



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

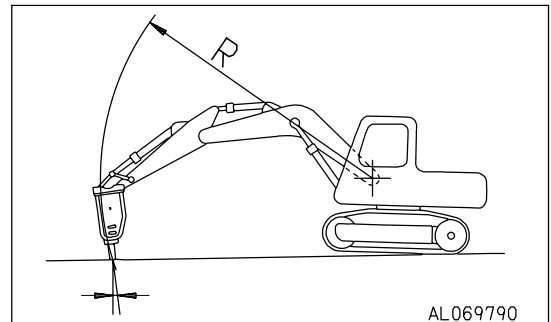


When applying continuous impact to the same impact surface, if the chisel does not penetrate or break the surface within 1 minute, change the point of impact and carry out breaking operations closer to the edge.



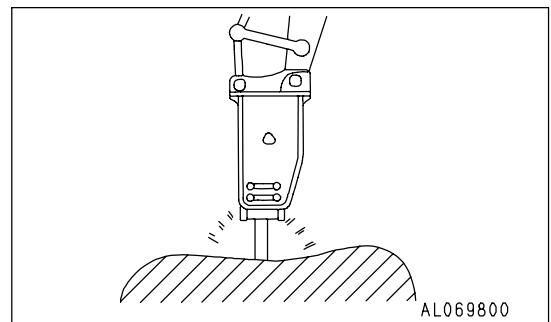
AL069780

The direction of penetration of the chisel and the direction of the breaker body will gradually move out of line with each other, always adjust the bucket cylinder to keep them aligned.



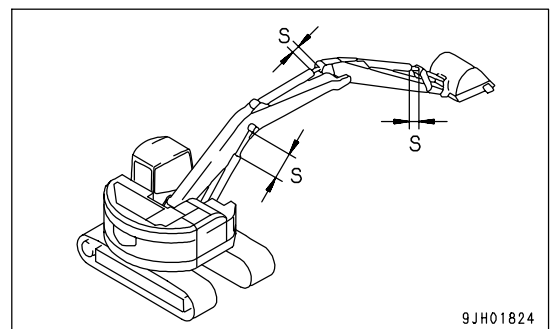
AL069790

Always keep the chisel pressed against the impact surface properly to prevent using the impact force when there is no resistance.



AL069800

Do not operate the cylinder to the end of its stroke. Stop approx. 50 mm from the end. If the cylinder is operated to the end of its stroke, there will be a heavy load applied to the machine and this will markedly reduce the service life of the machine.



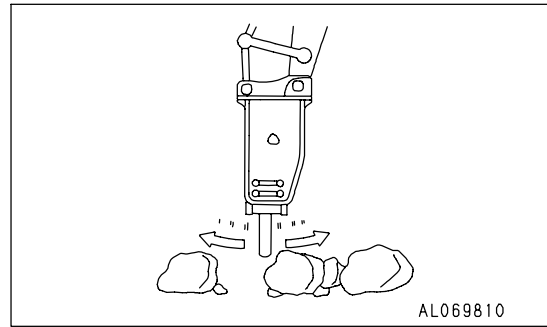
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Prohibited Works

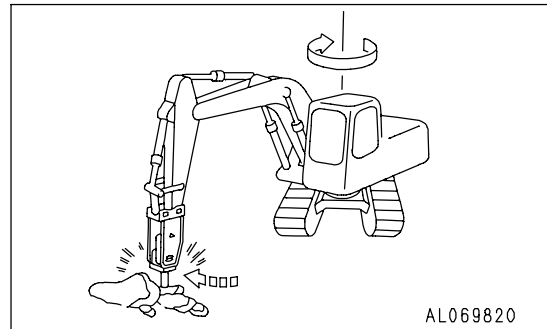
To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

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

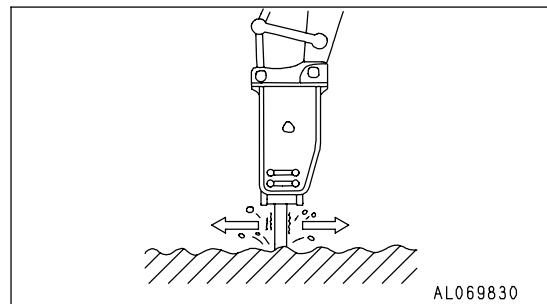
Using the mount to gather in pieces of rock



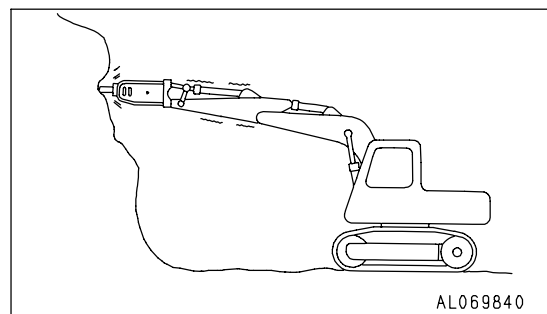
Operations using the swing force



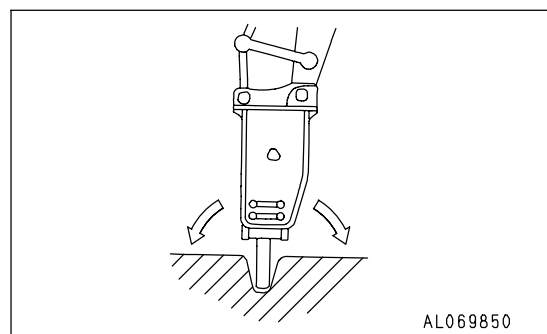
Moving the chisel while carrying out impacting operations



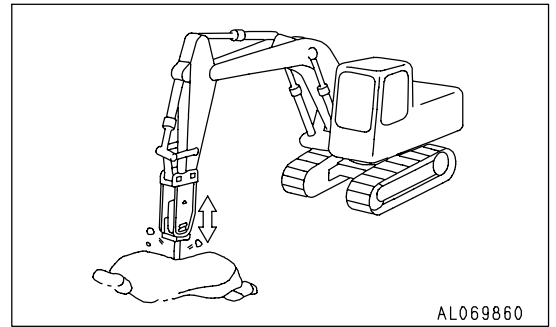
Holding the chisel horizontal or pointed up when carrying out impacting operations



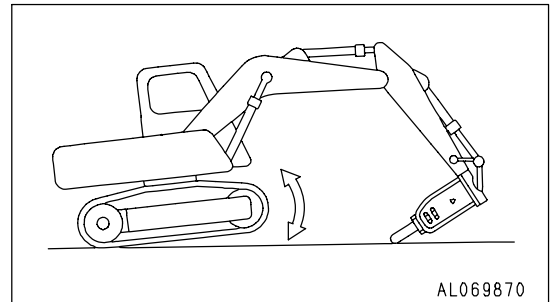
Twisting the chisel when it has penetrated the rock



Pecking operations

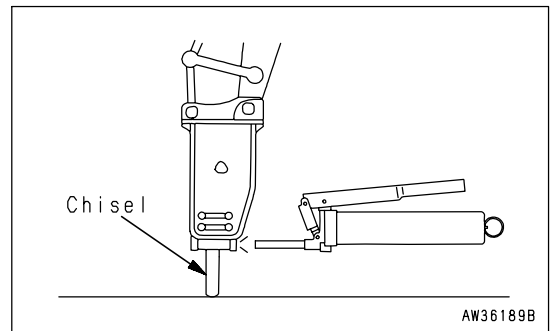


Extending the bucket cylinder fully and thrusting to raise the machine off the ground



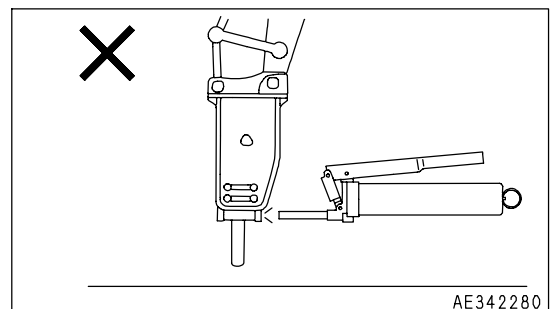
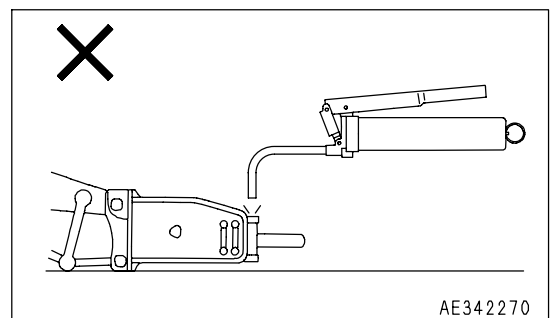
Greasing

Supply grease in the correct position.



NOTICE

If the breaker is greased in an improper posture, it is filled with more grease than necessary. As a result, soil and sand will enter the hydraulic circuit and can damage the hydraulic components, while the breaker is in use. Therefore, be sure to grease the breaker, holding it in the right posture.



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PC228US-3, PC228USLC-3 GALEO HYDRAULIC EXCAVATOR

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