CEAM003800

Operation & Maintenance Manual

avance® plus

WA450-3

WHEEL LOADER

SERIAL NUMBERS WA450-3MC - A31001 and up

FEB 1999

PRODUCT PUBLICATIONS INFORMATION

VARIOUS PRODUCT PARTS & SERVICE PUBLICATIONS ARE AVAILABLE TO ALL **KOMATSU** CONSTRUCTION EQUIPMENT OWNERS, INCLUDING OPERATION AND MAINTENANCE MANUALS, PARTS BOOKS AND SHOP MANUALS.

SPECIAL PUBLICATIONS SUCH AS SERVICE TOOL, AIR CONDITIONING, AND TURBOCHARGER SERVICE MANUALS ARE ALSO AVAILABLE AS WELL AS SELECTED OPERATION & SERVICE MANUALS IN FOREIGN LANGUAGES.

THE PUBLICATIONS LISTED BELOW ARE AVAILABLE FOR THIS PARTICULAR MACHINE(S).

DESCRIPTION	FORM NUMBER
PARTS BOOK - PAPER:	
Chassis and Engine	BEPB005600
PARTS BOOK - MICROFICHE:	
Chassis and Engine	BEPM005600
OPERATION AND MAINTENANCE MANUAL:	
Chassis and Engine	CEAM003700
SHOP MANUAL:	
Chassis	CEBM003500
Engine	CEBM000601
STANDARD MAN-HOUR GUIDE:	
Chassis	
Engine	N/A
SAFETY MANUAL	WLT70-1

PARTS AND SERVICE PUBLICATIONS CAN *ONLY* BE ACQUIRED BY AUTHORIZED KOMATSU DISTRIBUTORS, USING THE KOMATSU AMERICA INTERNATIONAL COMPANY PARTS INVENTORY PROCESSING SYSTEM (PIPS).

IF THE PIPS SYSTEM IS NOT AVAILABLE AT THE DISTRIBUTOR LOCATION, THEN THE FOLLOWING REQUISITION FOR TECHNICAL SERVICE PUBLICATIONS AND SERVICE FORMS CAN BE USED. FORM KDC91D IS SHOWN ON THE REVERSE SIDE OF THIS PAGE.

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IMPORTANT - TO ASSURE SHIPMENT OF THE CORRECT PUBLICATION(S), THE MODEL NUMBER AND MACHINE SERIAL NUMBER MUST BE SHOWN.

QTY.	PUBLICATION FORM NO.	PARTS BOOK ⬇ P-Paper M-Microfiche		PUBLICATION DESCRIPTION	MODEL NUMBER	SERIAL NUMBER

KDC91D 081696

CURRENT PRICES WILL BE CHARGED

INTRODUCTION

1. FOREWORD

This manual describes the procedures for the operation, handling,lubrication, maintenance, checking, and adjustment. The manual will help the operator and maintenance personnel realize peak performance through effective, economical and safe machine operation and maintenance.

Keep this manual handy and have all personnel read it periodically. If this manual becomes lost or illegible, request a replacement manual from your local distributor.

If you sell the machine, give this manual to the new owner.

Because of continual design changes in this machine, the changes may not be reflected in this manual. Consult your local distributor or Komatsu America International Company for the latest available information in this manual.

⚠ WARNING

Improper operation and maintenance of this machine can be hazardous and could result in serious injury or death.

Operators and maintenance personnel must read this manual thoroughly before operating or maintaining this machine.

This manual should be kept near the machine for reference and periodically reviewed by all personnel who come across it.

Some actions involved in the operation and maintenance can cause a serious accident, if they are not performed in the manner described in this manual.

The procedures and precautions given in this manual apply only to intended uses of the machine. If you use your machine for any unintended uses not specifically prohibited, you must be sure that it is safe for you and others. In no event should you or others engage in prohibited uses or actions described in this manual.

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

The description of safety is given in SAFETY INFORMATION on page 0-3 and in SAFETY from page 1-1.

2. SAFETY INFORMATION

Most accidents are caused by the failure to follow fundamental safety rules for the operation and maintenance of the machines. To avoid accidents, read and follow all precautions and warnings in this manual and on the machine before performing maintenance and machine operations.

To identify safety messages in this manual and on machine product graphics, the following signal words are used.

DANGER! - This word is used on safety messages and product graphics where there is a high probability of serious injury or death if the hazard is not avoided. These safety messages and product graphics usually describe precautions that must be taken to avoid the hazard. Failure to avoid this hazard may also result in serious damage to the machine.

WARNING! - This word is used on safety messages and product graphics where there is a potentially dangerous situation, which could result in serious injury or death if the hazard is not avoided. These safety messages and product graphics usually describe precautions that must be taken to avoid the hazard. Failure to avoid this hazard may also result in serious damage to the machine.

CAUTION! - This word is used on safety messages and product graphics for hazards, which could result in minor or moderate injury if the hazard is not avoided. These safety messages and product graphics might also use this word for hazards where the only result could be damage to the machine.

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

Safety precautions are described in SAFETY, which begins on page 1-1.

Komatsu America International Company cannot predict every circumstance that might involve a potential hazard in operation and maintenance. Therefore, the safety message 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, you must be sure that you and others can do such procedures and actions safely and without damaging the machine. If you are unsure about the safety of some procedures, contact your local distributor or Komatsu America International Company.

3. INTRODUCTION

3.1 INTENDED USE

This WHEEL LOADER is designed to be used mainly for the following work:

Digging

Leveling

Pushing

Loading

For details of the operating procedures, see 12.10 WORK POSSIBLE USING WHEEL LOADER on page 2-64.

3.2 FEATURES

Curved glass and improved sealing for reduced noise, low vibration cab, viscous mount.

Console and steering post with unencumbered foot area providing the same comfortable feeling as in an automobile.

Fully hydraulic brake system, which does not require draining water or concerns of rust and freezing.

Maintenance-free, wet-type disc parking brake (acts also as emergency brake).

Large capacity pump and 2-stage hydraulic system for reduced cycle time and increased productivity.

One-touch panel control and air conditioner with new refrigerant installed.

Full fender system installed to help prevent mud or water from splashing on or around the machine.

3.3 BREAKING IN A NEW MACHINE

Your machine has been thoroughly adjusted and tested before shipment. However, operating the machine under severe conditions at the beginning can adversely affect the performance and shorten the machine life. Be sure to break in the machine for the initial 100 hours (as indicated by the service meter).

During breaking in:

After starting, let the engine idle for 5 minutes to allow proper engine warm up prior to actual operation.

Avoid operation with heavy loads or at high speeds.

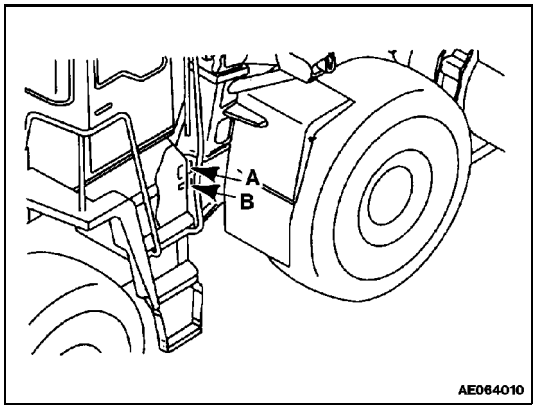
Avoid sudden starts or acceleration, unnecessarily abrupt stops and sharp steering except in cases of emergency.

The precautions given in this manual for operating, maintenance, and safety procedures are only those that apply when this product is used for the specified purpose. If the machine is used for a purpose that is not listed in this manual, Komatsu America International Company cannot bear any responsibility for safety. All consideration of safety in such operations is the responsibility of the user.

Operations that are prohibited in this manual must never be carried out under any circumstance.

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

4.1 MACHINE SERIAL NO. PLATE POSITION



4.1.1 POSITION OF PLATE (A)

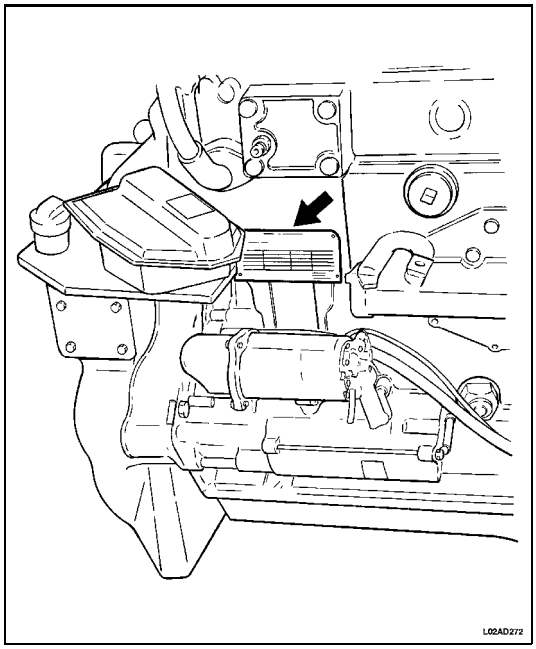
On the center right of the front frame.

4.1.2 POSITION OF STAMP (B)

This is stamped on the center of the front frame on the right hand side of the machine.

4.2 ENGINE SERIAL NO. PLATE POSITION

As viewed from the left-hand side of the machine.



4.3 TABLE TO ENTERSERIAL NO. DISTRIBUTOR

Machine P.I.N.:
Engine serial No.:
Distributor name: Address: Phone: Service personnel for your machine:

REMARKS

5. TABLE OF CONTENTS

SAFETY

WARNING

Read and follow all safety precautions. Failure to do so may result in serious injury or death.

This safety section also contains precautions for optional equipment and attachments.

6. GENERAL PRECAUTIONS

SAFETY RULES

ONLY trained and authorized personnel should be allowed to operate and service this machine.

Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.

The owner and/or operator must replace any and all safety and warning product graphics if they are defaced or removed from the machine.

Think before you act. Careful operators and service personnel are the best insurance against accidents.

Do not rush. Hurrying can lead to accidents. Haste, carelessness, and lack of training are the primary causes of equipment-related injuries.

The operator must be alert, physically fit and free from the influences of alcohol, drugs, and medications that might affect his eyesight, hearing, or reactions.

Safety must always be the operator's most important concern. He must refuse to operate when he knows it is unsafe and consult his supervisor when safety is in doubt.

When working with another operator or a person on work site traffic duty, be sure all personnel understand all hand signals that are to be used.

SAFETY FEATURES

Be sure all guards and covers are in their proper position. Be sure to replace them after servicing the machine. Have guards and covers repaired immediately, if damaged.
Proper position

Use safety features such as safety lock lever and seat belt properly.

A seat belt is required by OSHA in almost all applications. DO NOT operate this machine without a seat belt.

NEVER remove any safety features. ALWAYS keep them in good operating condition.

Safety lock lever
Seat belts

Improper use of safety features could result in serious bodily injury or death.

Be sure the machine has the correct equipment required by local rules and regulations.

UNAUTHORIZED MODIFICATION

Any modification made without authorization from Komatsu America International Company can create hazards.

Before making a modification, consult your local distributor. Komatsu America International Company will not be responsible for any injury or damage caused by any unauthorized modification.

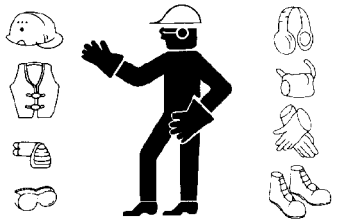
⚠ WARNING: For reasons of safety, always follow these safety precautions.

CLOTHING AND PERSONAL PROTECTIVE ITEMS

Avoid loose clothing and long hair, and jewlery. They can catch on controls or in moving parts and cause serious injury or death. Also, do not wear oily clothes because they are flammable.

Wear a hard hat, safety glasses, safety shoes, mask or gloves when operating or maintaining the machine. Always wear safety goggles, hard hat and heavy gloves if your job involves scattering metal chips or minute materials - this is particularly important when driving pins with a hammer and when cleaning the air filter element with compressed air.
Also check that there are no other personnel near the machine.

Check that all protective equipment functions properly before using the machine.



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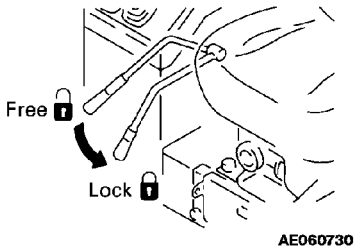
ALWAYS APPLY LOCK WHEN LEAVING OPERATOR'S SEAT

When standing up from the operator's seat, always place the safety lock lever securely in the LOCK position. If you accidentally touch the equipment levers when they are not locked, the machine or work equipment may move and cause serious injury or damage.

When leaving the machine, lower the work equipment completely to the ground, set the safety lock lever to the LOCK position, then stop the engine and use the key to lock all the equipment locks. Always take the key with you.

Work equipment posture
Locks



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MOUNTING AND DISMOUNTING

Climbing on the machine improperly can cause injury. NEVER jump on or off the machine. NEVER get on or off a moving machine.

When mounting or dismounting, always face the machine and use the handrails and steps.

Do not use the machine's controls or hoses as supports when climbing on or off the machine. Controls and hoses can move and do not provide solid support. Movement of the controls may cause unexpected machine movement and injury.

Ensure safety by always maintaining at least three-point contact of hands and feet with the handrails and steps.

Always remove any oil or mud from the handrails and steps. If they are damaged, repair them and tighten any loose hardware.

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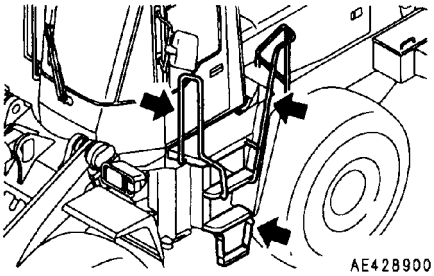

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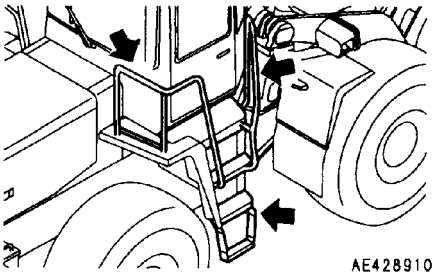

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FIRE PREVENTION FOR FUEL AND OIL

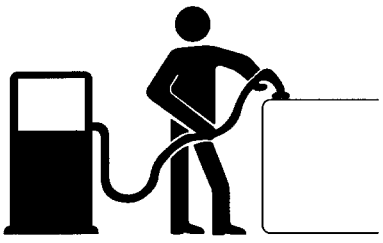
Fuel, oil, and antifreeze can be ignited by a flame. Fuel is particularly FLAMMABLE and can be HAZARDOUS. Keep any flame away from flammable fluids.

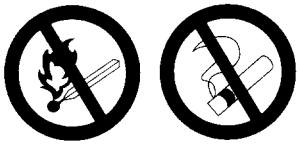
Stop the engine and do not smoke when refueling.

Tighten all fuel and oil caps securely.

Refueling and lubricating should be done in well ventilated areas.

Keep oil and fuel in the determined place and do not allow unauthorized persons to enter.

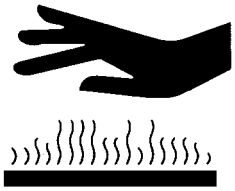




PRECAUTIONS WHEN HANDLING AT HIGH TEMPERATURES

Engine coolant, engine oil, and hydraulic oil can reach high temperatures, and are under pressure during operation. Attempting to remove the cap, drain the oil or water, or replace the filters may lead to serious burns. Stop the engine and wait for the temperature and pressure to subside, and follow the specified procedures when carrying out these operations.

To prevent hot water from spurting out:
1) Turn engine off.
2) Allow water to cool.
3) Slowly loosen cap to relieve pressure before removing.



To prevent hot oil from spurting out:
1) Turn engine off.
2) Allow oil to cool.
3) Slowly loosen cap to relieve pressure before removing.

ASBESTOS DUST HAZARD PREVENTION

Asbestos dust is HAZARDOUS to your health if inhaled.
If you handle materials containing asbestos fibers, follow the guidelines below:

NEVER use compressed air for cleaning.

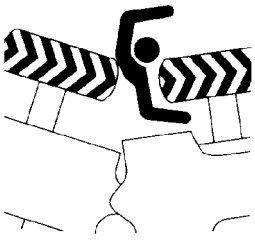
Use water for cleaning to keep down the dust.

Operate the machine with the wind to your back, whenever possible.

Use an approved respirator.

CRUSHING OR CUTTING PREVENTION

Keep hands, arm and all other parts of the body away from movable parts such as between the work equipment and cylinders, or between the machine and work equipment. If the work equipment is operated, the clearance will change and this may lead to serious damage or personal injury.



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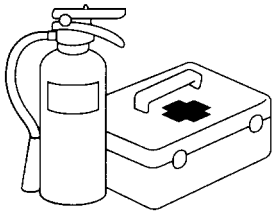
FIRE EXTINGUISHER AND FIRST AID KIT

Make sure fire extinguishers of the correct type are kept in good condition and convenient to the operators and other personnel. Make sure the appropriate personnel have been trained in their use.

Provide a first aid kit at the storage point.

Know what to do in the event of a fire.

Be sure you know the phone numbers of persons you should contact in case of an emergency.



PRECAUTIONS WHEN USING ROPS

Never operate the machine without a ROPS (ROLL OVER PROTECTIVE STRUCTURE) properly installed and in good condition.

The ROPS is installed to protect the operator if the machine should roll over. It is designed not only to support the load if the machine should roll over, but also to absorb the impact energy.

The ROPS fulfills all the regulations and standards for all countries, but if it is rebuilt without authorization or is damaged when the machine rolls over, its strength may suffer and it may be unable be able to fulfill its function properly. It can perform if it is repaired or modified in the specified way.

When modifying or repairing the ROPS, always contact your Komatsu America International Company distributor.

Even if the ROPS is installed, it cannot show its full effect if the operator does not fasten the seat belt properly. Always fasten the seat belt when operating.

PRECAUTIONS FOR ATTACHMENTS

When installing and using an optional attachment, read the instruction manual for the attachment and the information related to attachments in this manual.

Do not use attachments that are not authorized by your distributor or Komatsu America International Company. Use of unauthorized attachments could create a safety problem and adversely affect the proper operation and useful life of the machine.

Any injuries, accidents, product failures resulting from the use of unauthorized attachments will not be the responsibility of Komatsu America International Company.

PRECAUTIONS WHEN HANDLING ACCUMULATOR

If the travel damper switch is turned ON when the machine is traveling or when the work equipment is raised, the hydraulic accumulator in the travel damper will instantaneously be connected with the lift cylinder bottom circuit. Be careful when doing this, because the oil then will flow in or out in the direction to balance the oil pressure at the accumulator and lift cylinder bottom , so the work equipment will move.

When releasing the pressure or charging with gas for the work equipment circuit of machines equipped with an accumulator, be careful to follow the instructions given for handling the accumulator.

Method of releasing the pressure or charging with gas.

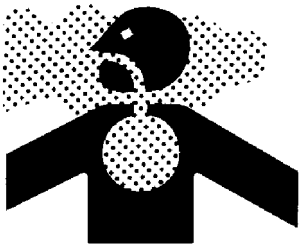
The accumulator is charged with high-pressure nitrogen gas, which is extremely dangerous, so heed the following advice and handle the accumulator carefully.

- Do not make any holes in the accumulator.
- Keep flames and heat away from the accumulator.
- Do not weld anything (such as bosses) to the accumulator.
- Gas must be released from an accumulator before it can be discarded; consult your Komatsu America International Distributor.

VENTILATION FOR ENCLOSED AREAS

Be sure to provide adequate ventilation to prevent gas poisoning. If it is necessary to start the engine, or handle fuel, flushing oil or paint within an enclosed or poorly ventilated area, open doors and windows.

Operate fans or similar devices to circulate air if opening doors and windows fails to provide sufficient ventilation.



PRECAUTIONS FOR MIRRORS, WINDOWS AND LIGHTS

Remove all dirt from the surface of the windows and lights to ensure good visibility.

Adjust the side mirror so you can see clearly from the operator's seat, and always keep the surface of the mirror clean. Replace broken glass with a new replacement part(s).

Check that all head lamps and working lamps operate properly.

7. PRECAUTIONS DURING OPERATION

7.1 BEFORE STARTING ENGINE

CHECKS BEFORE STARTING ENGINE

Carry out the following checks before starting the engine at the beginning of the work shift.
Failure to carry out the checks may lead to serious injury or damage.

Completely remove all wood chips, leaves, grass, paper and other flammable materials accumulated in the engine compartment and near the battery. Check fuel, lubrication and hydraulic systems for leaks, and have leaks repaired. Clean up excess oil, fuel or other flammable fluids. Return all fuel containers to their proper storage place, remove all parts and tools from the operator's compartment, and remove dirt from the mirrors, handrails and steps.

Check points

Check the coolant level, fuel level, and oil level in the engine. Check for clogged air cleaner, and check for damage to the electric wiring.

Checks before starting

Adjust the operator's seat to a position where it is easy to carry out operations, and check for wear or damage to the seat belt and seat belt mounting equipment.

Adjusting operator's seat

Handling seat belt

Check that the gauges work properly, and check that the control levers are at the PARKING position.

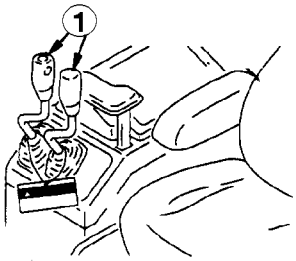
Method of checking operation of gauges

Remove all dirt from the surface of the window glass and lights to ensure good visibility.
Adjust the side mirror to a position that gives best view from the operator's seat, and clean the mirror surface. Replace broken mirror glass.
Check that the front lamps and working lamps operate properly. Repair broken lamps promptly.
Check that the safety lock is in the LOCK position before starting the engine.
Check that a fire extinguisher of the proper type is present and check the method of using it.
Do not operate the machine near fire or flame.

7.2 OPERATING MACHINE

WHEN STARTING ENGINE

Walk around your machine again just before mounting it, and check for people and objects that might be in the way.
Never start the engine if a warning tag has been attached to a control lever (1).
When starting the engine, sound the horn to alert nearby personnel.
Start and operate the machine only when seated.
An additional worker may ride in the machine only when sitting in a passenger seat. Do not allow anyone to ride on the machine body.



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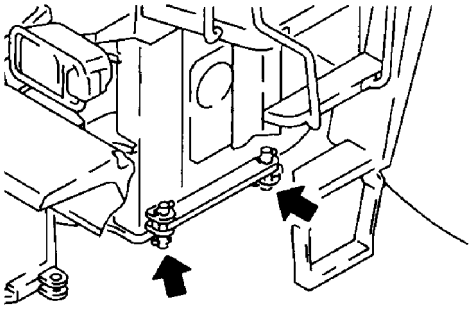
CHECKS AFTER STARTING ENGINE

Failure to carry out the checks properly after starting the engine will lead to delays in discovery of abnormalities, and this may lead to serious injury or damage to the machine.
When carrying out the checks, use a wide area where there are no obstructions. Do not allow anyone near the machine.

Check the operation of the gauges and equipment, and check the operation of the bucket, lift arm, brakes, travel system and steering system.
Listen for abnormality in the sound of the machine; check for vibration, heat, and/or smell; check gauges.
Check also that there is no leakage of air, oil or fuel.
If any abnormality is found, carry out repairs promptly.
If the machine is used when it is not in proper condition, it may lead to serious injury or damage to the machine.
Before traveling or starting operations, check that safety bar is securely locked in the FREE position.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PRECAUTIONS WHEN STARTING TO MOVE

Before starting to move, check again that there is no one in the surrounding area and that there are no obstacles.
When starting, sound the horn to alert nearby personnel.
Always operate the machine only when seated in the operator's seat.
Always fasten the seat belt.
Do not allow anyone to ride on the machine body.
Check that the backup alarm works properly.

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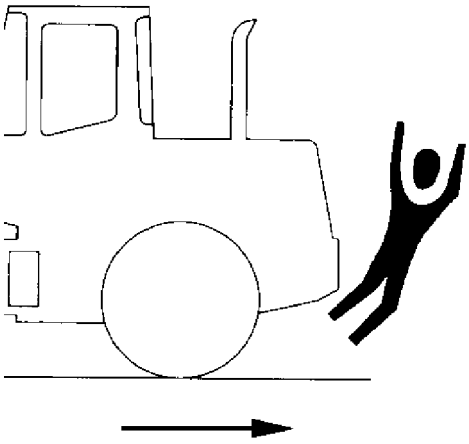
CHECK WHEN CHANGING DIRECTION

Be aware of the area surrounding the machine before moving the machine or its work equipment.

Sound the horn to warn people in the area.
Check that there is no one near the machine. Be particularly careful to check behind the machine. A clear view of this area is obscured by the engine cover.
When operating in the areas that may be hazardous or have poor visibility designate a person to direct work site traffic.
Ensure that no unauthorized person can come within the direction of turning or direction of travel. Always be sure to carry out these precautions even if the machine is equipped with mirrors and a backup alarm.



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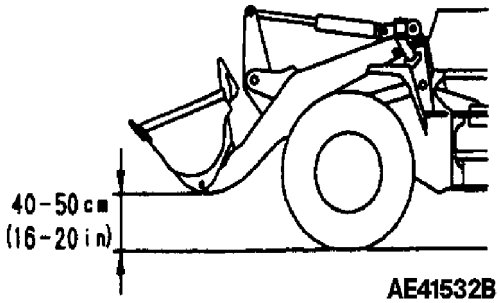
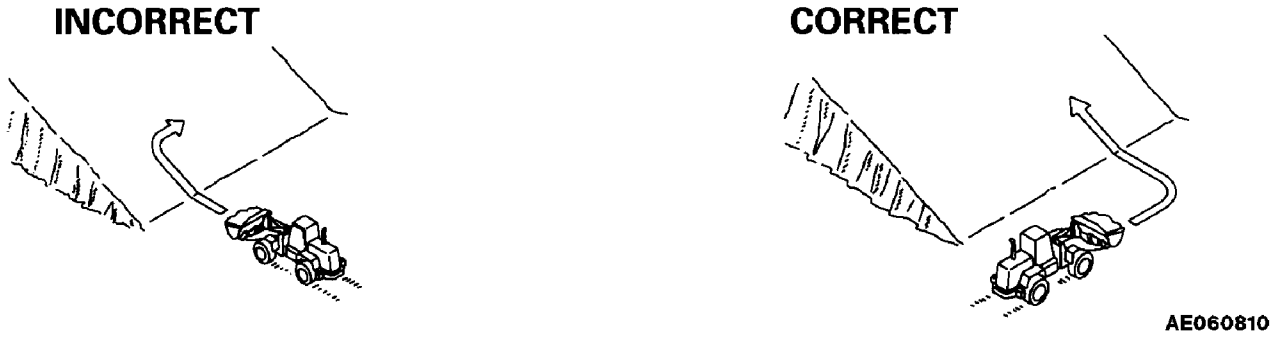
PRECAUTIONS WHEN TRAVELING

Never turn the key to the OFF position in the starting switch when traveling.
It is dangerous if the engine stops when the machine is traveling, because the steering becomes heavy. If the engine stops, apply the brake immediately to stop the machine.
It is dangerous to look around excessively when operating. Concentrate on your work.
It is dangerous to drive too fast, or to start suddenly, stop suddenly, turn sharply or zig zag.
If you find any abnormality in the machine during operation (noise, vibration, smell, incorrect gauge readings, air leakage, oil leakage, etc.) move the machine immediately to a safe place and investigate the cause of the problem.
Set the work equipment to a height of 40-50 cm (16-20 in) from the ground level and travel on level ground
When traveling, do not operate the work equipment control levers. If the work equipment control levers have to be operated, stop the machine first, then operate the levers.
Do not operate the steering wheel suddenly. 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, travel at low speed, and avoid sudden changes in direction.
Avoid traveling over obstacles. IF the machine has to travel over an obstacle, keep the work equipment as close tot he ground as possible, and travel at low speed.
When traveling or carrying out operations, always keep your distance from other machines or structures to avoid collisions.
NEVER enter water in excess of the permissible water depth.**Permissible water depth PRECAUTIONS FOR OPERATION" on page 2-69.**
When passing over bridges or structures on private land, check first that the structure is strong enough to support the mass of the machine. When traveling on public roads, check first with the relevant authorities and follow their instructions.
Always obey the traffic regulations when traveling in public roads. This machine travels at a lower speed than automobiles, so keep to the side of the road and be careful to leave the center of the road free for other vehicles.
The tires can overheat and develop excess pressure if subjected to sustained high-speed use, for which they were not designed. Tires then may fail, causing loss of control.
If you must travel continuously consult Komatsu America International, or your distributor.



TRAVELING ON SLOPES

Traveling on a slope can allow the machine to tip over or slip to the side.
When traveling on slopes, keep the bucket approximately 20 - 30 cm (8-12 in.) above the ground. In case of emergency, quickly lower the bucket to the ground to help the machine stop.
Do not travel on grass, fallen leaves, or wet steel plates. With these slippery coverings, even slight slopes may cause the machine to slip to the side, so travel at low speed and be sure the machine travels only directly up or directly down the slope.
When traveling downhill, never shift gear or place the transmission at neutral. It is dangerous to coast without the braking force of the engine. Always place the transmission in a low gear before starting to travel downhill.
When traveling downhill, use the engine braking and travel slowly. If necessary, use engine braking along with the vehicle brake to control the travel speed.
If the engine stops with the machine on a slope immediately depress the brake pedal fully to apply the brakes. Then lower the bucket to the ground and apply the parking brake to hold the machine in position.
When traveling up or down hills with a loaded bucket, always travel with the bucket facing uphill (travel forward when going uphill; travel in reverse when going downhill).
Traveling on a slope with a loaded bucket alters the vehicle's balance, increasing the chance it can tip.

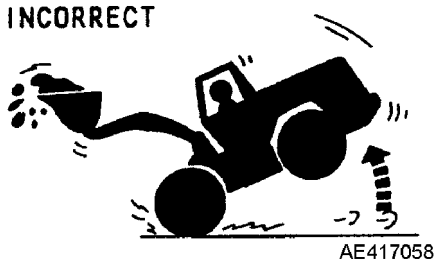


PROHIBITED OPERATIONS

To prevent the machine from turning over or the work equipment being damaged because of overload, always keep the load below the maximum specified for the machine. Never use the machine beyond its capacity.

PRECAUTIONS WHEN OPERATING

Be careful not to approach too close to the edge of cliffs. When making embankments or landfills, or when dropping soil over a cliff, dump one pile, then use the next pile to push the first pile.
The load suddenly becomes lighter when a load is pushed over a cliff or when the machine reaches the top of a slope. When this happens there is danger in that the travel speed may suddenly increase, so be sure to reduce the travel speed prior to the danger.
Use caution when the bucket is fully loaded, never start, turn, or stop the machine suddenly.
Use caution when handling unstable loads, such as round or cylindrical objects, or piled sheets. If the work equipment is raised high there is danger the load may fall on the operator's compartment and cause serious damage or injury. Avoid raising the work equipment too high or tipping the bucket back too much.
If the work equipment is suddenly lowered or suddenly stopped, the reaction may cause the machine to tip.



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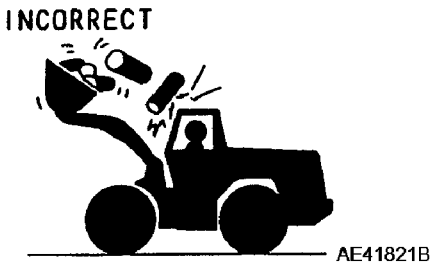

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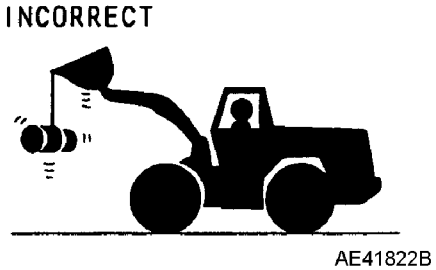
Use particular care when carrying a load.
Do not use the bucket or lift arm for crane work.
Carry out only work that is specified as the purpose of the machine. Carrying out other operations will cause breakdowns.
Specified operations **See "12.10 WORK POSSIBLE USING WHEEL LOADER" on page 2-64.**
Ensure good visibility:

When operating in dark areas, turn on the working lamps and front lamps. Install job site lighting when necessary.

Limit operations in fog, mist, snow or heavy rain, or other conditions where visibility is poor. If necessary, wait for the weather to clear so visibility is sufficient for work.

Avoid collisions:

Use care positioning the bucket, especially when operating in tunnels, under bridges, under electric wires or other places where height is limited.



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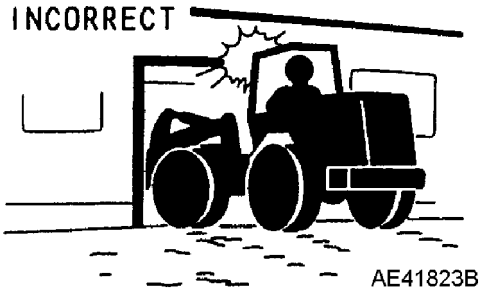

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DO NOT GO CLOSE TO HIGH-VOLTAGE CABLES

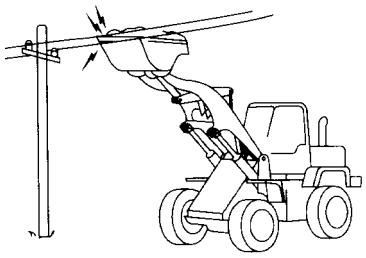
Going close to high-voltage cables can cause electrical shock. Always maintain the safe distance given below between the machine and the electric cable.
The following actions are effective in preventing accidents:
1) Wear shoes with rubber or leather soles.
2) Use a signalman to give a warning if the machine approaches too close to the electric cable.

If the work equipment should touch the electric cable, the operator should not leave the operator's compartment.

When carrying out operations near high voltage cables, do not let anyone come close to the machine.

Check with the electric utility company about the voltage of the cables before starting operations.

Voltage	Min. safety distance	
6.6 kV	3 m	10 ft
33.0 kV	4 m	14 ft
66.0 kV	5 m	17 ft
154.0 kV	8 m	27 ft
275.0 kV	10 m	33 ft



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ENSURE GOOD VISIBILITY

When working in dark places, install working lamps and head lamps, and set up lighting in the work area if necessary.
Stop operations if the visibility is poor, such as in mist, snow, or rain, and wait for the weather to improve to a condition that allows the operation to be carried out safely.

OPERATE CAREFULLY ON SNOW

When working on snow or icy roads, even a slight slope may cause the machine to slip to the side, so always travel at low speed and avoid sudden starting, stopping, or turning.
After a heavy snowfall, the road shoulder and objects placed beside the road are buried in the snow and cannot be seen, so always carry out snow-clearing operations carefully.
When traveling on snow-covered roads, always install tire chains.
When traveling on snow-covered slopes, never use the brakes to stop the machine suddenly. Lower the bucket to the ground to stop the machine.
The load may change greatly, according to the type of snow, reduce the load and be careful not to let the machine slip.

DO NOT HIT WORK EQUIPMENT

When working in places where there are height limits, such as in tunnels, under bridges, under electric cables, or in garages, be extremely careful not to hit the work equipment.

METHOD OF USING BRAKES

Do not put your foot on the brake pedal unless necessary.
Do not depress the brake pedal repeatedly unless necessary
When traveling downhill, use the engine as a brake, and always use the right brake pedal.
Note for machines with boosters: when the engine stops, the brake pedal effort becomes 3.5 times heavier.

WORKING ON LOOSE GROUND

Do not operate the machine on soft ground. It is difficult to extract the machine after it gets stuck.
Avoid operating your machine too close to the edge of cliffs, overhangs, and deep ditches. If these areas collapse, your machine could fall or tip over and result in serious injury or death. Remember that the soil after heavy rain, earthquake, or blasting is weakened in these areas.
Earth laid on the ground and the soil near ditches are loose. They can collapse under the weight or vibration of your machine.
Install the HEAD GUARD (FOPS, or Fallen Object Protective Structure) if working in areas where there is danger of falling rocks and dirt.
When operating in places where there is danger of falling rocks or danger of the machine turning over, always install ROPS and seat belt.

PARKING THE MACHINE

Park on level ground where danger of falling rocks, flooding and/or landslides is minimal. If the machine must be parked on a slope, block the wheels to prevent the machine from moving. Then dig the work equipment into the ground.

When parking on public roads, provide fences and signs, such as flags or lights, so the machine can be seen clearly. Park the machine so it doesn't obstruct traffic.

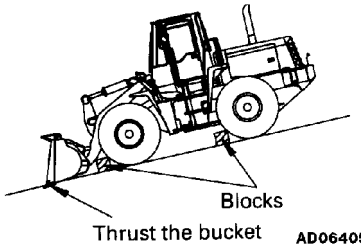
Parking procedure . See "12.13 PARKING THE MACHINE" on page 2-73.

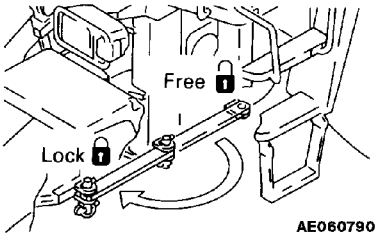
When leaving the machine, lower the work equipment completely to the ground, set the safety lock lever to the LOCK position, then stop the engine and use the key to lock all the equipment.

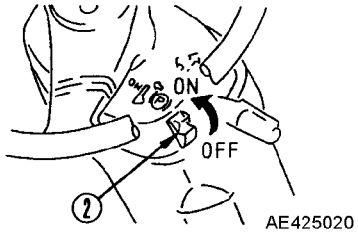
Always take the key with you.

Work equipment posture . See "12.13 PARKING THE MACHINE" on page 2-73.

Places to lock. See "12.17 LOCKING "on page 2-75.

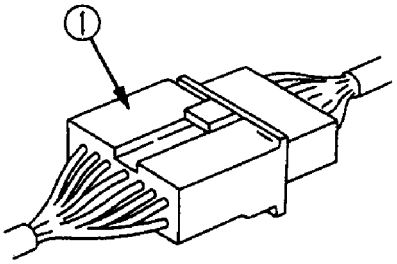






PRECAUTIONS IN COLD AREAS

After completing operations, remove all water, snow or mud from the wiring harness connectors and/or sensors. Cover these parts.
If the water freezes, it will cause malfunctions when the machine is used, which may lead to accidents.
Warm up the machine thoroughly. If the machine is not thoroughly warmed up, control lever operation and machine reaction will be slow, leading to accidents.
Operate the control levers to relieve the hydraulic pressure (raise to above the set pressure for the hydraulic circuit and release the oil to the hydraulic tank) to warm up the oil in the hydraulic circuit. This ensures good response from the machine and prevents malfunctions.
Do not charge the battery or start the engine with a different power source, if the machine's battery electrolyte is frozen. There is danger that this will ignite the battery.
Before charging the battery or starting the engine with a different power source, make sure the battery electrolyte has thawed. Check for leakage of electrolyte before starting.
Battery charge rate



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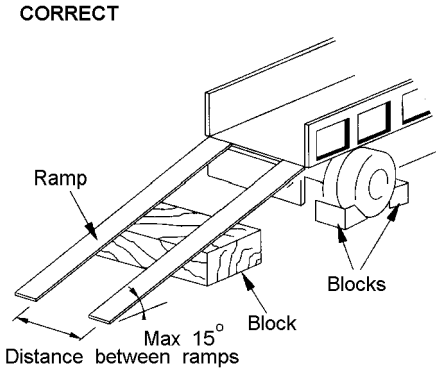
7.3 TRANSPORTATION

LOADING AND UNLOADING

Loading and unloading the machine always involves potential hazards. EXTREME CAUTION SHOULD BE USED.
When loading or unloading the machine, run the engine at low idling and travel at low speed.
Perform loading and unloading on firm, level ground only. Maintain a safe distance from the edge of road.
ALWAYS block the wheels of the hauling vehicle and support both ramps with blocks before loading and unloading.
ALWAYS use ramps of adequate strength. Be sure the ramps are wide and long enough to provide a safe loading slope.
Be sure that the ramps are securely positioned and fastened, and that the two sides are at the same level.
Be sure the ramp surface is clean and free of grease, oil, ice and loose materials. Remove dirt from the machine tires.
Drive straight. NEVER correct steering on ramps. If necessary, drive away from the ramps and climb again.
After loading, block the machine tires and secure the machine with tie-downs.

Loading and unloading
Tie-downs



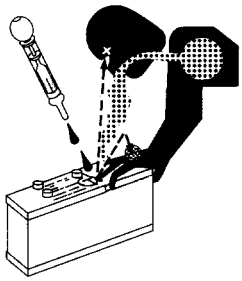
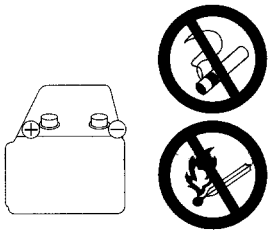
SHIPPING

When shipping the machine on a hauling vehicle, obey all state and local laws governing the weight, width, and length of a load. Also obey all applicable traffic regulations.
Determine the shipping route while taking into account the width, height and weight of the load.
Height, width, load of machine
Before passing over bridges or structures on private land, first check that the structures will support the mass of the machine. When traveling on public roads, check with the relevant authorities for instructions.
The machine can be dismantled for transportation; consult your Komatsu distributor for assistance.

7.4 BATTERY

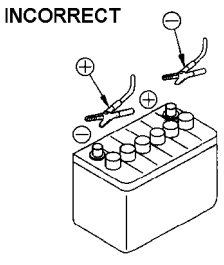
BATTERY HAZARD PREVENTION

Battery electrolyte contains sulfuric acid and can quickly burn the skin and eat holes in clothing. If you spil acid on yourself, immediately flush the area with water.
Battery acid could cause blindness if splashed into the eyes. If acid gets into the eyes, flush them immediately with large quantities of water and see a doctor at once.
If you accidentally drink acid, drink a large quantity of water or milk, beaten egg or vegetable oil. Call a doctor or poison prevention center immediately.
When working with batteries, ALWAYS wear safety glasses or goggles.
Batteries generate hydrogen gas. Hydrogen gas is very EXPLOSIVE, and is easily ignited with a small spark or flame.
Before working with batteries, stop the engine and turn the starting switch to the OFF position.
Avoid short-circuiting the battery terminals through accidental contact with metallic objects, such as tools, across the terminals.
When removing or installing, check which is the positive (+) terminal and negative (-) terminal.
Tighten the battery cap securely.
Tighten the battery terminals securely. Loosened terminals can generate sparks and lead to an explosion.


STARTING WITH BOOSTER CABLES

Mistakes in connecting booster cables can cause a fire:
Use two workers (one in the operator's seat).
ALWAYS wear safety glasses or goggles when starting the machine with booster cables.
When starting from another machine, do not allow the two machines to touch.
Be sure to connect the positive (+) cable first when installing the booster cables. Disconnect the ground or negative (-) cable first when removing them.
If any tool touches between the positive (+) terminal and the chassis, it will cause sparks. This is dangerous, so be sure to work carefully.
Connect the batteries in parallel: positive to positive and negative to negative.
When connecting the ground cable to the frame of the machine to be started, be sure to connect it as far as possible from the battery.
Starting with booster cables on page 2-90.



CHARGING BATTERY

The battery can explode if handled incorrectly during charging. Be sure to heed the following and check safety information supplied by the battery charger manufacturer.

Remove the battery caps to disperse hydrogen gas and charge in a well-ventilated area.

Set the voltage of the charge to match the voltage of the battery to be charged. If mismatched, the charger may overheat and catch fire.

Connect the positive (+) charging clip of the charger to the positive (+) terminal of the battery, then connect the negative (-) charging clip to the negative (-) terminal of the battery. Be sure to tighten both terminals securely.

If the battery charge is less than 1/10 of the rated charge, and high speed charging is carried out, set to a value below the rated capacity of the battery.

If there is an excessive flow of charging current, the battery electrolyte may overflow and evaporate, catch fire, or explode.

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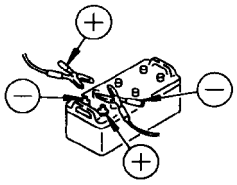
INCORRECT



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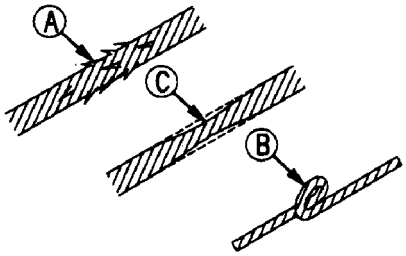
7.5 TOWING

WHEN TOWING

Towing incorrectly may lead to serious personal injury or damage.
Make sure all workers involved with the towing agree on signals before starting.
If the problem machine's engine will not start or has a failure in its brake system, contact your Komatsu distributor for repairs.
Keep personnel away from the machines, especially the area between the towed and towing machines.
When using another machine to tow this machine, use a wire rope with ample strength for the weight of this machine.
NEVER tow a machine on a slope.
Wear heavy leather gloves when handling wire rope. Do not use a kinked or frayed wire rope.
Do not straddle the towing cable or wire rope.
When connecting up a towing machine, do not let anyone enter the area between the towing machine and the equipment being towed.
Set the towing machine and the towing connection of the equipment being towed in a straight line when connecting it.
Place pieces of wood between the wire ropes and body to protect them from wear or damage.
Towing method



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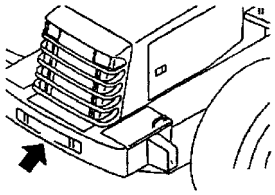
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8. PRECAUTIONS FOR MAINTENANCE

8.1 BEFORE CARRYING OUT MAINTENANCE

NOTIFICATION OF FAILURE

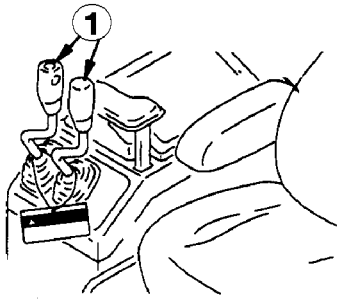
Carrying out maintenance not described in the Komatsu operation and maintenance manual my lead to unexpected failures. Contact your Komatsu distributor for repairs.

WARNING TAG

If others start the engine or operate the controls while you are performing service or lubrication, you could suffer serious injury or death.

ALWAYS attach the WARNING TAG to the control lever in the operator's cab to alert others that you are working on the machine. Attach additional warning tags around the machine, if necessary.

These tags are available from your distributor. (Part No. 09963-03000)



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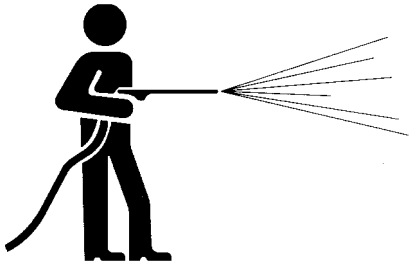
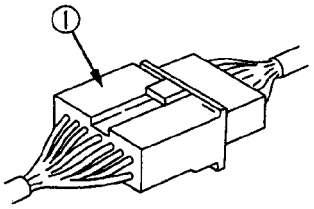
CLEAN BEFORE INSPECTION AND MAINTENANCE

Clean the machine before inspection and maintenance so that
- Procedures can be carried out safely without entry by dirt into the machine.
- Problem areas are less likely to be obscured by mud and debris.
- Chances of personal injury from falls or flying debris are lessened.

When washing the machine
- Wear non-slip shoes to maintain your footing on wet surfaces.
- Wear protective clothing, especially when cleaning with steam or high pressure water. Steam can cause burns.
- Water under pressure can cause injury.
- Do not spray water directly on the electrical system (sensors, connectors, etc.)(1). Water in the electrical system may cause defective operation and malfunctions.





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KEEP WORK PLACE CLEAN AND TIDY

Do not leave hammers or other tools lying around in the work place. Wipe up all grease, oil and other substances. Always keep the work place clean and tidy to allow safe operations, minimize tripping, slipping and falls.

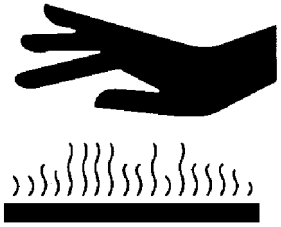
APPOINT LEADER WHEN WORKING IN GROUPS

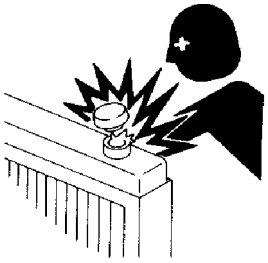
When repairing the machine or when removing and installing work equipment, appoint a leader to coordinate activities. Misunderstandings between workers can cause accidents.

RADIATOR COOLANT LEVEL

When inspecting the radiator coolant level, stop the engine and allow the temperature to subside. Check the coolant level in the sub-tank. Under normal conditions, do not open the radiator cap.
If there is no sub-tank, or if the radiator must be removed:

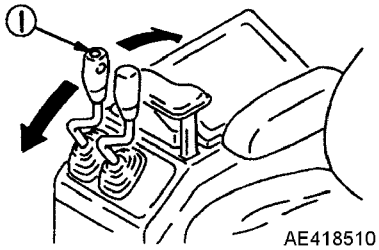
Wait for the radiator temperature to go down before checking the coolant level.
Be careful not to actually touch the radiator or engine; place a hand near the engine or radiator to check the air temperature.
Release the internal pressure before loosening the radiator cap, and remove the radiator cap slowly.
When adding coolant and/or additives, add it to the sub-tank.





STOP THE ENGINE BEFORE CARRYING OUT INSPECTION AND MAINTENANCE

Always stop the machine on firm flat ground and stop the engine before performing the inspection and maintenance.
If it is necessary to run the engine when carrying out maintenance, such as when cleaning the inside of the radiator, place the safety lock lever in the LOCK position and carry out the operation with two workers.
One worker should sit in the operator's seat so that he can stop the engine immediately if necessary. He should also be extremely careful not to touch any lever by mistake. Touch the levers only when they have to be operated.
The worker carrying out the maintenance should be extremely careful not to touch or get caught in any moving parts.



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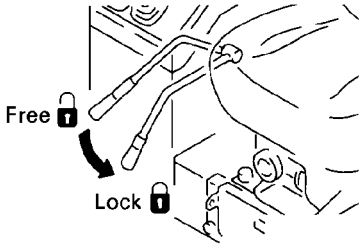

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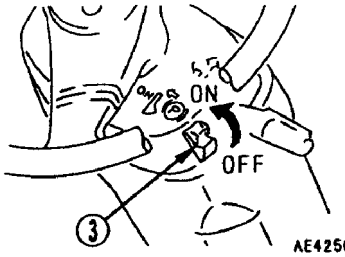

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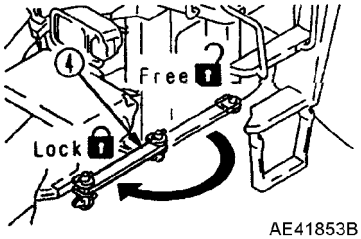

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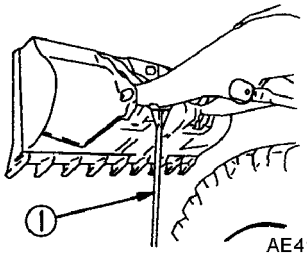
WORK EQUIPMENT SUPPORT

When carrying out inspection and maintenance with the bucket raised, fit stand (1) securely under the lift arm to prevent the work equipment from descending.
Place work equipment control lever (2) at HOLD, and set safety lock lever (3) to the LOCK position.



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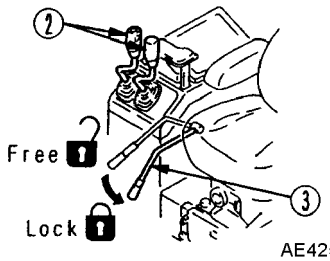

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PROPER TOOLS

Use only tools suited to the task. Using damaged, low quality, faulty, or makeshift tools could cause personal injury.

Tools

PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS

Replace the following safety-related and fire-related components periodically:

Fuel system: Fuel hose, spilling hose, and fuel tube cap

Hydraulic system: Pump outlet hose, and front and rear pump branch hoses

Replace these components periodically with new ones, regardless of whether or not they appear to be defective. These components deteriorate over time.

Replace or repair any such components if any defect is found, even though they have not reached the time specified.

Special skills and/or equipment may be required, so contact your Komatsu distributor.

Replacement of safety critical components

CRITICAL PARTS" on page 3-19.

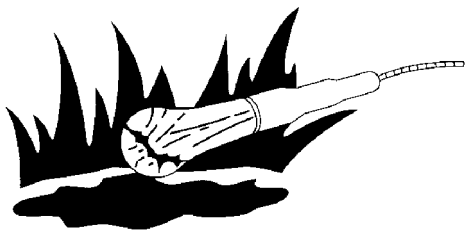
USE OF LIGHTING

Use lighting with anti-explosion specifications, especially when checking fuel, oil, battery electrolyte, window washer fluid or other flammable materials. If correct lighting is not used, danger of explosion exists.

Areas with insufficient lighting have increased risk of injury. Install proper lighting.

Never use open flame (e.g. cigarette lighter) for illumination. Flammable liquids and gases near the machine can ignite.

When using the machine as the power supply for the lighting, follow the instructions in this manual.



8.2 DURING MAINTENANCE

PERSONNEL

Only authorized personnel can service and repair the machine. Extra precaution should be used when grinding, welding, and/or using a sledge-hammer.

ATTACHMENTS

Place attachments that have been removed from the machine in a safe place so that they do not fall. If the y fall on you or others, serious injury could result.

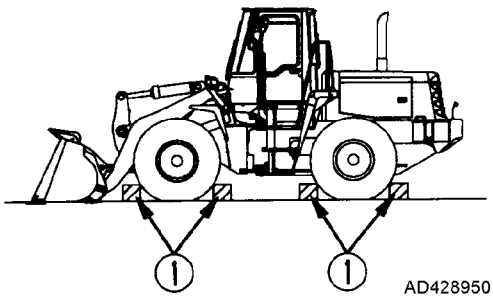
WORK UNDER THE MACHINE

Always lower all movable work equipment to the ground or to the lowest position before performing service or repairs under the machine.

When carrying out maintenance with the work equipment or chassis raised, lock the front and rear frames with the safety lock, always place the levers in the HOLD position, then lock the control levers with the safety lock, and block the work equipment and chassis.

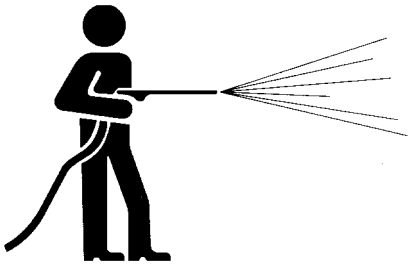
Always block the machine tires securely.

Never work under the machine if the machine is poorly supported.



KEEP THE MACHINE CLEAN

Spilled oil or grease, or scattered tools or broken pieces are dangerous because they may cause you to slip or trip.
Always keep your machine clean and tidy.
If water gets into the electrical system, there is danger that the machine may not move or may move unexpectedly.
Do not use water or steam to clean the sensors, connectors, or the inside of the operator's compartment.



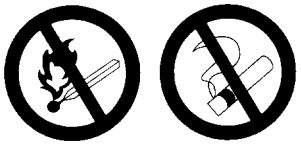
RULES TO FOLLOW WHEN ADDING FUEL OR OIL

Spilled fuel and oil may cause you to slip, so always wipe it up immediately.

Always tighten the cap of the fuel and oil fillers securely.

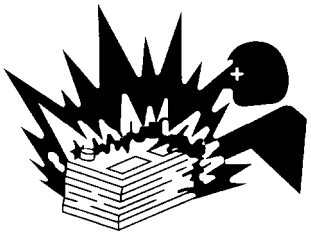
Never use fuel for washing any parts.

Always add fuel and oil in a well-ventilated place.



PRECAUTIONS WITH BATTERY

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



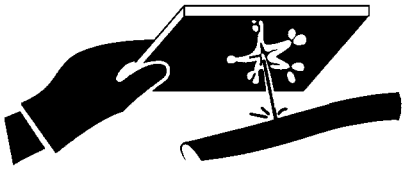
HANDLING HIGH-PRESSURE HOSES

Do not bend high-pressure hoses or hit them with hard objects. Do not use any bent or cracked piping, tubes or hoses. They may burst during use.

Always repair any loose or broken fuel hoses or oil hoses. If fuel or oil leaks, it may cause a fire.

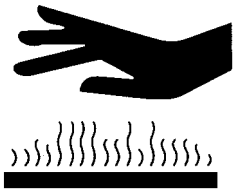
PRECAUTIONS WITH HIGH PRESSURE OIL

Do not forget that the work equipment circuits are always under pressure.
Do not add oil, drain oil, or carry out maintenance or inspection before completely releasing the internal pressure.
Oil leaking under high pressure, even from small holes, is dangerous. A jet of high-pressure oil that hits the skin or enters the eye can cause serious injury. Always wear safety glasses and thick gloves, and use a piece of cardboard or a sheet of wood to check for oil leakage.
Obtain medical attention immediately for anyone struck by a jet of high-pressure oil.



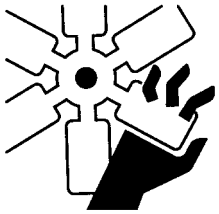
PRECAUTIONS FOR MAINTENANCE AT HIGH TEMPERATURE OR HIGH PRESSURE

Immediately after stopping machine operations, the engine cooling water and oil at all parts remain at high temperatures and under high pressure. The hot fluids will cause burns and/or other injury if the radiator cap is removed, or the oil or water are drained, or the filters are replaced.
Wait for the temperature to go down, then carry out the inspection and maintenance in accordance with the procedures given in this manual.
Clean inside of cooling system check lubricating oil level, add oil
page 3-26.
Checking cooling water level, engine oil pan level, brake oil level, add oil or water
BEFORE STARTING" on page 3-38.
Checking hydraulic oil level, adding oil
Changing oil, replacing filters
SERVICE" on page 3-40.



ROTATING FAN AND BELT

Keep away from rotating parts and be careful not to let anything get caught in them.
If your body or tools touch the fan blades or fan belt, they may be cut off or sent flying, so never touch any rotating parts.



TIRE MAINTENANCE

Disassembly, repair, and assembly of tires requires special equipment and skill; please ask your tire repair shop to perform the repairs.

CHECKS AFTER INSPECTION AND MAINTENANCE

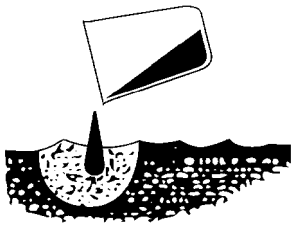
Failure to carry out inspection and maintenance fully, or failure to check the function of various maintenance items may cause unexpected problems and may even lead to personal injury and/or damage.
Stop the engine and address these questions.

- Have all the inspection and maintenance locations been checked?
- Have all inspection and maintenance items been carried out correctly?
- Have any tools or parts dropped inside the machine (especially dangerous if fallen items disrupt control levers)?
- Are hydraulic and cooling water systems free of leaks?
- Are bolts and fasteners tight?

WASTE MATERIALS

Never dump waste oil in a sewer system, rivers, etc.
Always put oil drained from your machine in containers. Never drain oil directly on the ground.
Obey appropriate laws and regulations when disposing of harmful objects such as oil, fuel, coolant, solvent, filters, batteries, and others.

INCORRECT



8.3 TIRES

HANDLING TIRES

If tires are not used under the specified conditions, they may overheat and burst or be damaged by sharp stones on rough road surfaces. This may lead to serious injury or damage.

To maintain safety, always keep the following conditions.

Inflate the tires to the specified pressure. Abnormal heat is generated particularly when the inflation pressure is too low.

Selection of tires

Suitable inflation pressure

Use the specified tires.

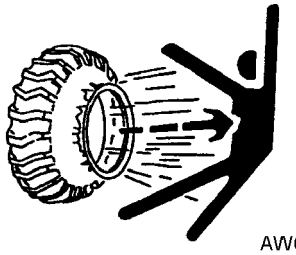
The values given in this manual for tire inflation pressures and permissible speed are general values. The actual value may differ depending on the type of tire and the condition under which they are used. For details, please contact your distributor or tire maker.

If the tire is heated when installed to the wheel, flammable gas is produced. If this catches fire, the tire may explode and cause serious injury or damage. Unlike when a tire is punctured and burst, if a tire explodes, it produces a highly destructive force, so the following operations are strictly prohibited when the tire is installed to the wheel.

Welding of the rim.

Lighting fires or carrying out welding operations near the wheel or tire.

If you do not understand the proper procedure for maintenance or replacement of the wheel or tire, and you use the wrong method, the wheel or tire may burst and cause serious injury or damage. When performing such maintenance, please consult your distributor or tire maker.



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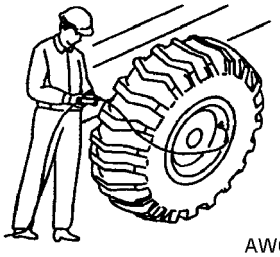


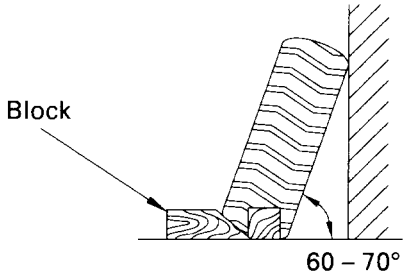
AW636380

STORING TIRES AFTER REMOVAL

As a basic rule, store the tire in a warehouse which unauthorized persons cannot enter. If the tires are stored outside, always erect a fence around the tires and put up a "No Entry" and other warning signs that even children can understand.

Stand the tire on level ground, and block it securely so that it cannot roll or fall over. If the tire rests on its side, it will be flattened and will deteriorate.

If the tire should fall over, get out of the way quickly. The tires for construction equipment are extremely heavy, so trying to hold the tire may lead to serious injury.



A0055130

1. Precautions before starting.

WARNING

Improper operation and maintenance can cause serious injury or death.

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

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

L02AD204

2. Precautions for safety lock lever.

WARNING

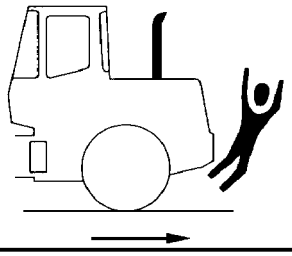
To avoid hitting unlocked operation levers, lower equipment to ground and move SAFETY LOCK LEVER (located near seat) to LOCK position before standing up from operator's seat.

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

L02AD205

3. Precautions when traveling in reverse.

WARNING



To prevent SEVERE INJURY or DEATH, do the following before moving machine or its attachments:

- Honk horn to alert people nearby.
- Be sure no one is on or near machine.
- Use spotter if view is obstructed.

Follow above even if machine equipped with back-up alarm and mirrors.

L02AD206

4. Precautions for parking brake.

WARNING

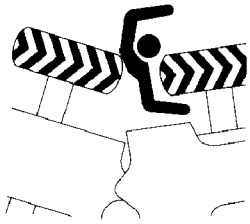
If the switch is set to RELEASE, a serious accident could result, as this operation releases the parking brake and the machine may move off suddenly.
Never set the switch to RELEASE except when towing a disabled machine.
Before towing such machine, read its manual carefully and be sure to follow the instructions given therein.

L02AD207

Part number 419-93-A1410 includes safety labels 1-3; part number 419-93-A1421 identifies safety label 4.

5. Do not enter.

DANGER



Crush Hazard. Can cause severe injury or death. When machine is being operated, never place yourself in articulated area of machine.

L02AD208

6. Precautions for safety bar.

WARNING

If safety bar is unlocked, machine can jackknife unexpectedly when it is being transported or hoisted.

Jackknifing can cause serious injury or death to bystanders.

- Always lock safety bar when machine is being transported or hoisted.
- If necessary, lock safety bar during servicing or maintenance.

L02AD209

7. Precautions for high temperature coolant.

WARNING

Hot water hazard.

To prevent hot water from spurting out:

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

L02AD210

8. Precautions when oil is at high temperature.

WARNING

Hot oil hazard.

To prevent hot oil from spurting out:

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

L02AD211

9. Precautions when handling battery cable.

WARNING

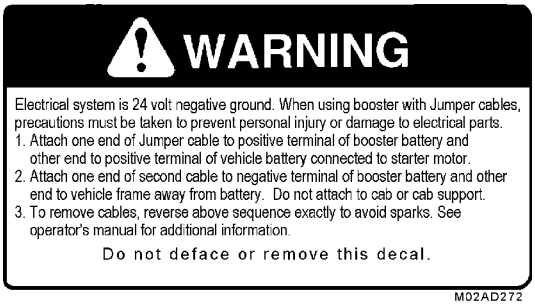
Improper use of booster cables and battery cables can cause an explosion resulting in serious injury or death.

Follow instructions in manual when using booster cables and battery cables.

L02AD212

Part number 421-93-21311 includes safety labels 5-9.

10. Precautions when using booster cables (419-93-AZ130).



11. High pressure warning.

12. Do not climb on fender.

13. Do not go under work equipment.

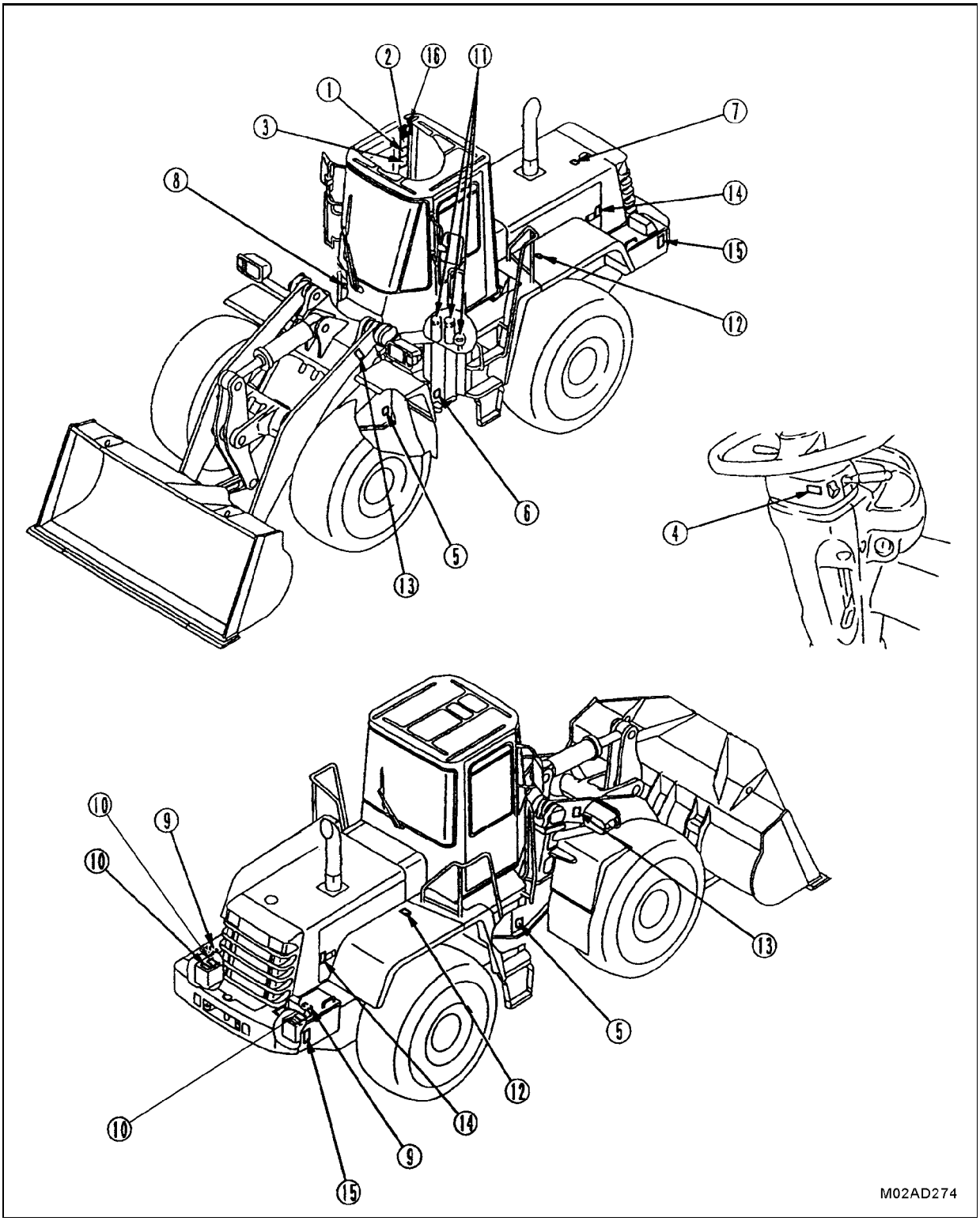
14. Do not open when engine is running.

15. Do not come near machine.

16. Precautions for back-up alarm (417-931-A180).

POSITIONS FOR ATTACHING SAFETY LABELS

Keep these labels clean. If they are lost or damaged, replace with a new label. Safety labels may be available in languages besides English. Contact your distributor for more information.


M02AD274

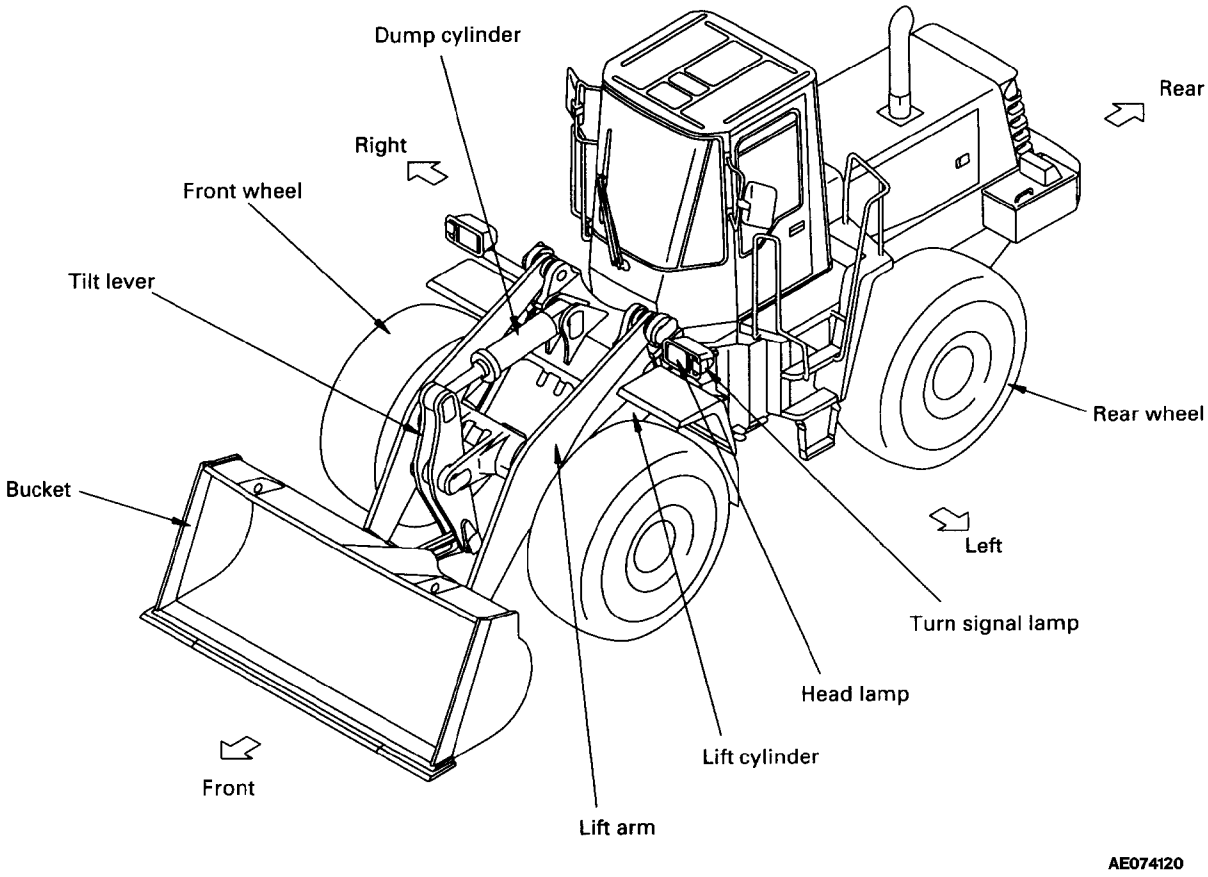
WARNING: For reasons of safety, always follow these safety precautions.

OPERATION

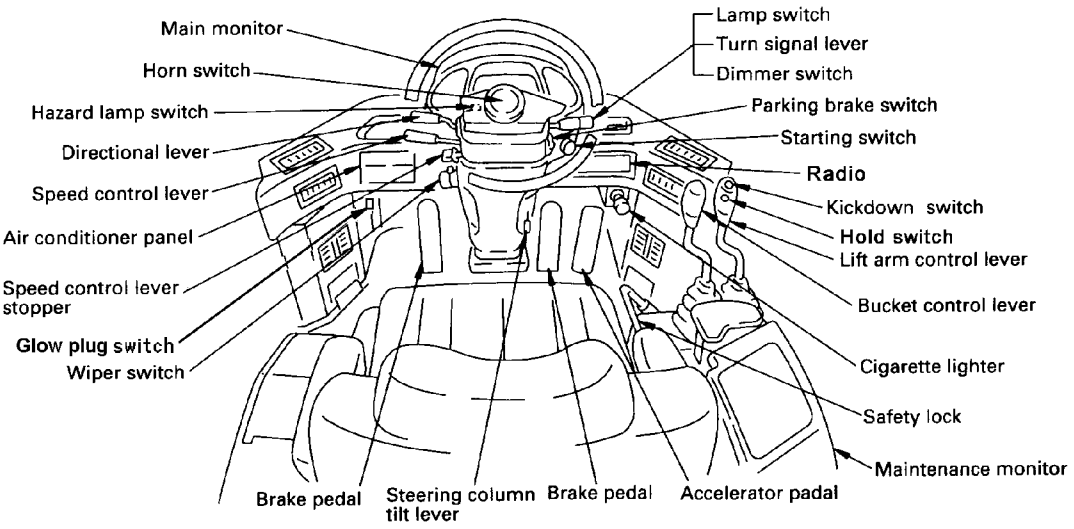
10. GENERAL VIEW

10.1 GENERAL VIEW OF MACHINE

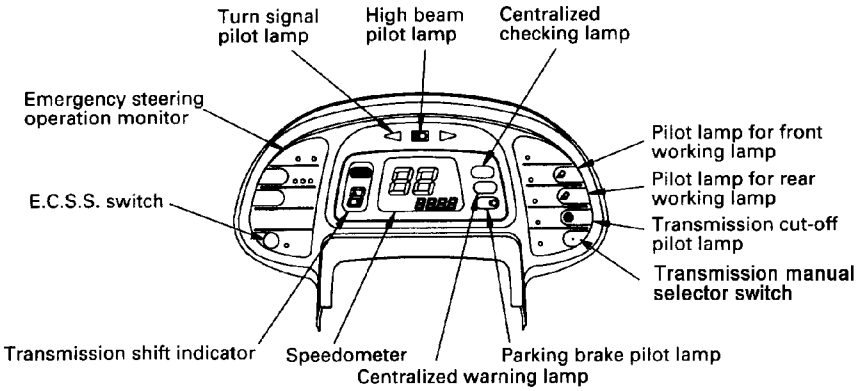
If directions are indicated in this manual, they refer to the directions shown by the arrows in the diagram below.



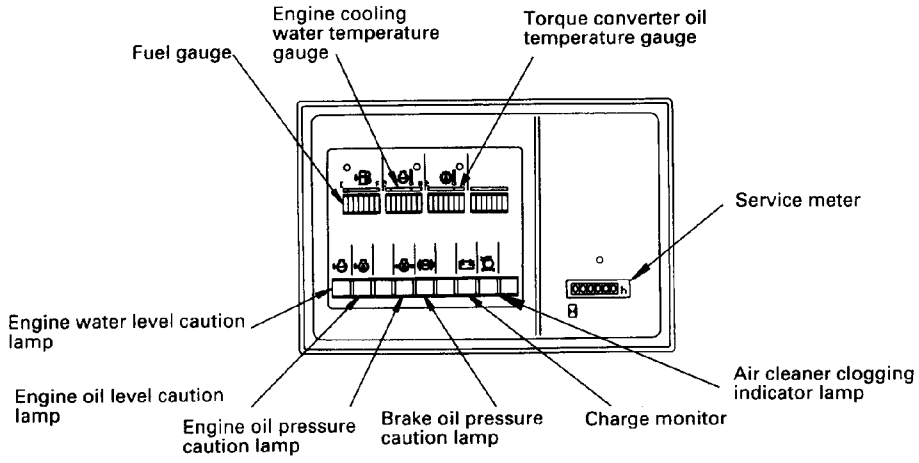
10.2 GENERAL VIEW OF CONTROLS AND GAUGES



MAIN MONITOR



MAINTENANCE MONITOR



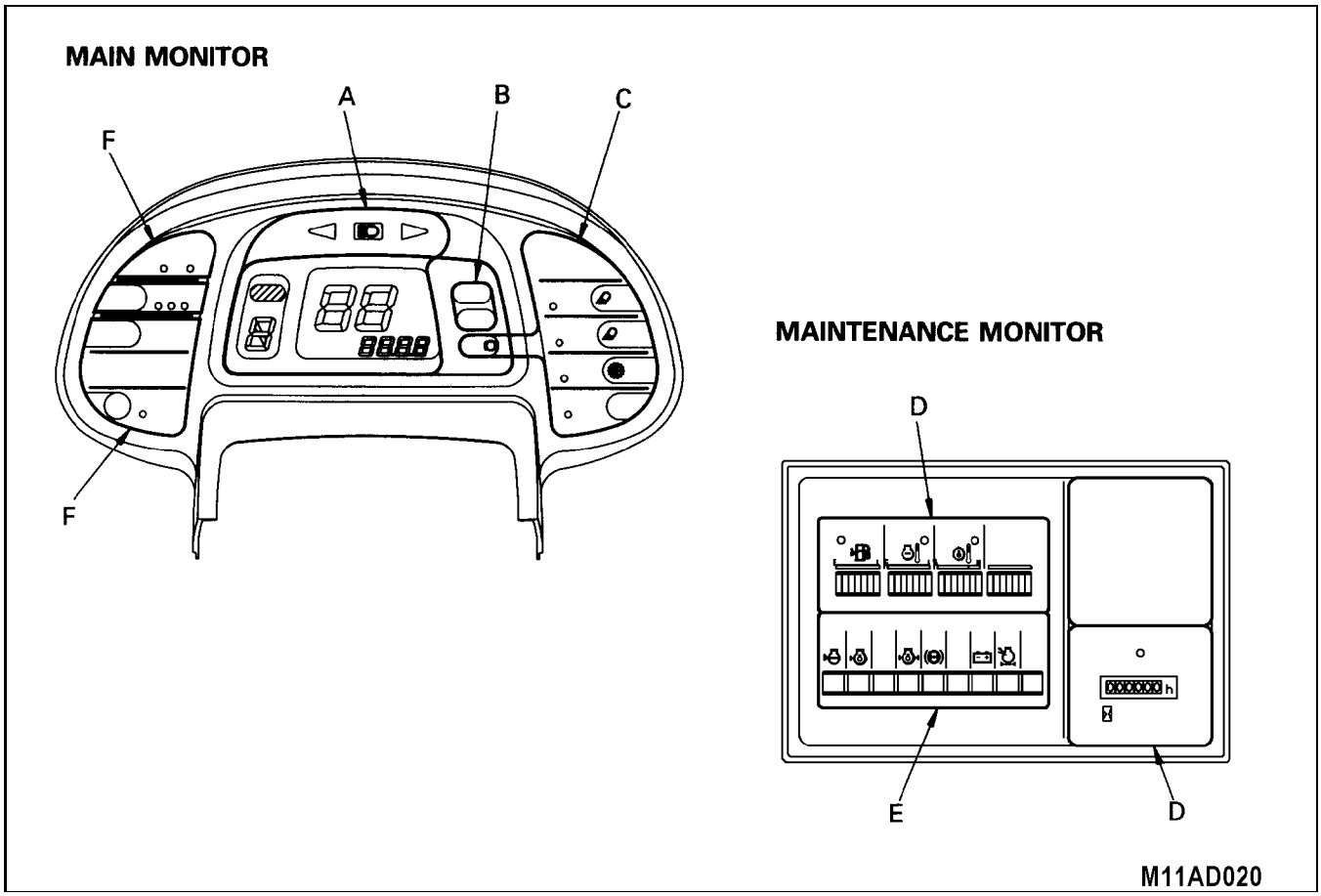
M11AD034

11. COMPONENT EXPLANATION

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

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

11.1 MACHINE MONITOR



The machine monitor system consists of the main monitor, which is in front of the operator's seat, and the maintenance monitor, which is on the right side of the operator's seat.

The monitor system can be divided functionally into the alarm display portions (B, E), and the meter display portions (A, C, D,) and option display portion (F).

ALARM DISPLAY PORTIONS (B, E) (11.1.1)
These consist of the centralized check lamp (CHECK), central warning lamp (CAUTION), and warning pilot lamps (engine water level, engine oil level, brake oil pressure, engine oil pressure, battery charge, and air cleaner clogging).

METER DISPLAY PORTION (A, C, D) (11.1.2)
These consists of meters (speedometer, fuel gauge, engine water temperature gauge, torque converter oil temperature gauge, service meter, transmission shift indicator) and the pilot lamps (turn signal indicator, head lamp Hi beam, preheating, front working lamp, rear working lamp, transmission cut-off, parking brake).

OPTION DISPLAY PORTION (F) (11.1.3)
This consists of the monitor lamps and switches for the emergency steering system, and ECSS.

For details of each system or component, see OPTIONS, ATTACHMENTS.

TESTING ACTUATION OF MACHINE MONITOR SYSTEM
When the starting switch is turned to the ON position before starting the engine, all monitor lamps, gauges and centralized warning lamps will light up for approximately 3 seconds, and thealarm buzzer will sound for about 1 second.

When this situation happens, 88 is displayed on the speedometer, and 8 is displayed on the transmission shift indicator.

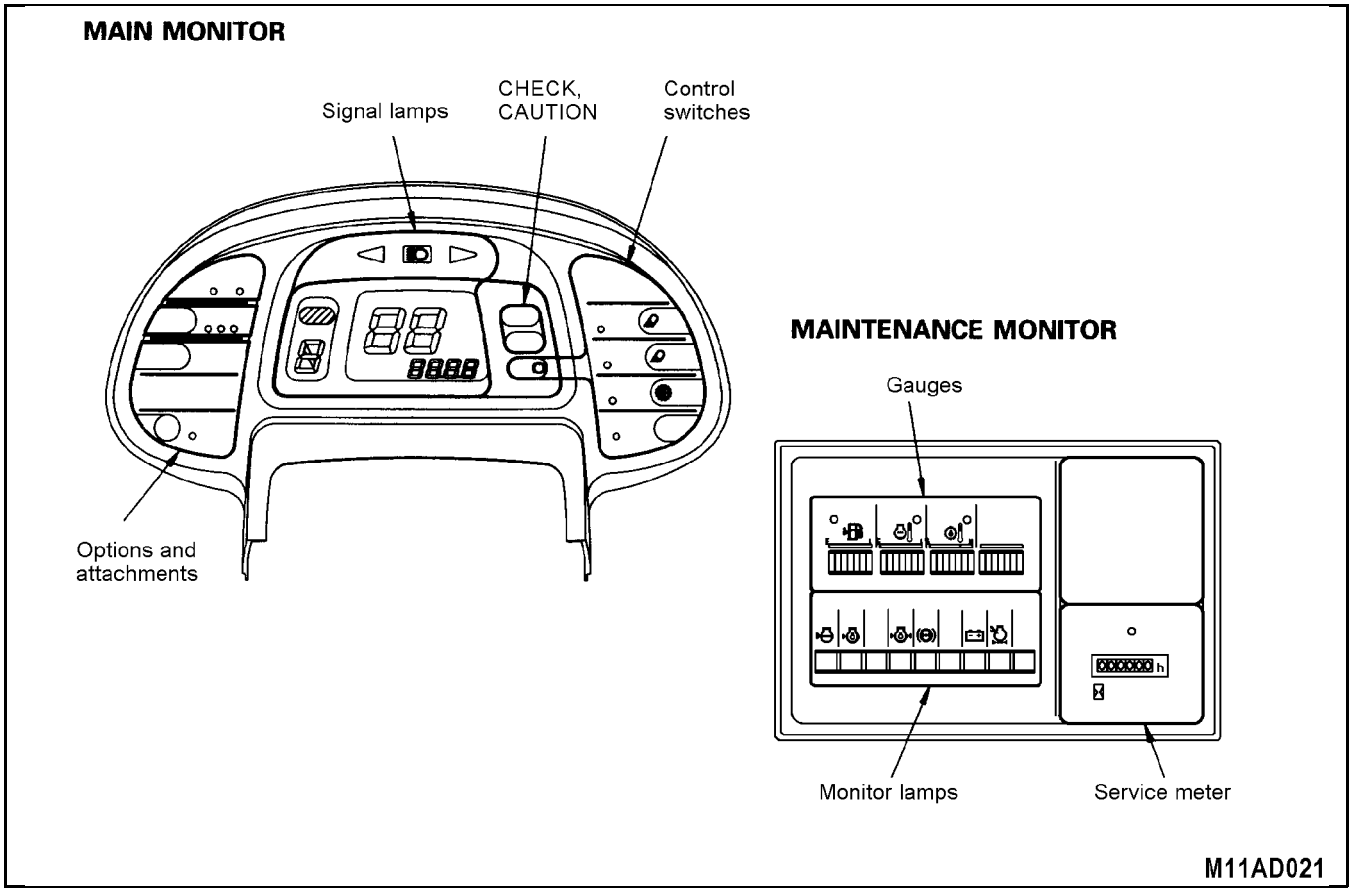
Finally, there will be two beeps to indicate that the monitor check has been completed.

If the monitor lamps do not light up, there is probably a failure or disconnection, so please contact your distributor for inspection.

When the starting switch is turned to the ON position, if the directional lever is not in the neutral position, the central warning lamp (CAUTION) will flash and the alarm buzzer will sound intermittently. If this situation happens, return the lever to the neutral position, and the lamps will go out and the buzzer will stop.

The monitor check cannot be carried out for at least 30 seconds after the engine has been stopped.

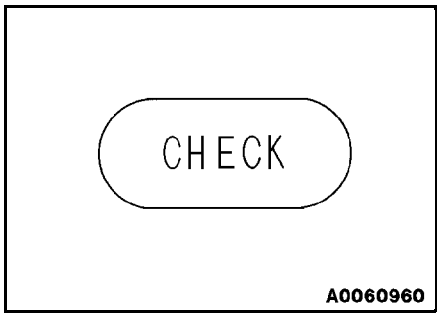
11.1.1 WARNING DISPLAYS



1. CENTRAL CHECK LAMP

⚠ WARNING

If this monitor flashes, perform an inspection and maintenance of the appropriate location as soon as possible.



If any abnormality is found in the CHECK items before starting the engine (engine oil level, engine water level), the monitor lamp for abnormal location will flash and the central CHECK lamp will also flash. Check the location where the monitor lamp is flashing and perform the check before starting. When performing the checks before starting, do not rely on just the monitor. Always carry out the specified maintenance items.

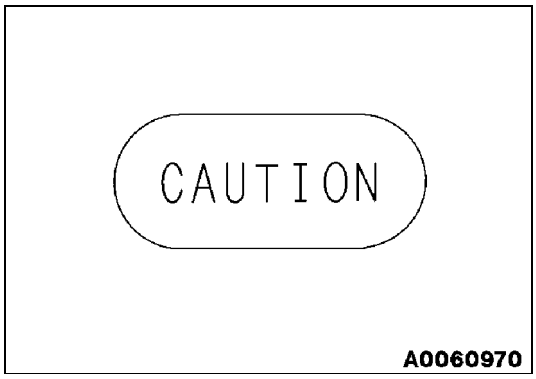
If the engine oil level is abnormal before starting the engine, the engine oil level will change after starting the engine. Thus, the central CHECK lamp and monitor lamp will stop flashing. An abnormal engine water level will cause the central CHECK lamp to flash and the alarm buzzer to sound intermittently after starting the engine. If any abnormality in the charging system exists when the engine is running, the battery charge caution pilot lamp will flash and the central CHECK lamp will also flash at the same time. If the lamps flash, check the charging circuit.

2. CENTRAL CAUTION LAMP

⚠ WARNING

If these monitor lamps flash, stop the engine immediately or run it low idle.

If there is abnormality in any CAUTION item when the engine is running (engine water temperature, torque converter oil temperature, engine water level, brake oil pressure, engine oil pressure), the alarm buzzer will sound intermittently and the monitor lamp for the location of the abnormality will flash and the central CAUTION lamp will also flash.



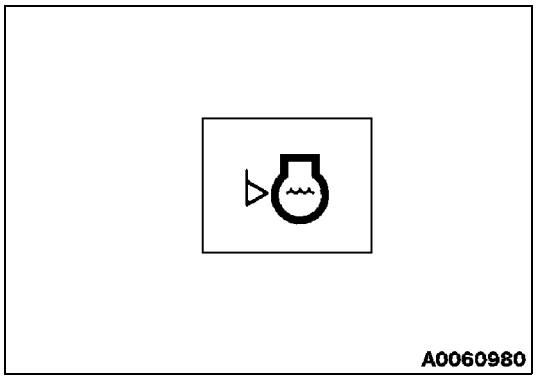
If the fuel gauges enters the red range when the engine is running, the fuel gauge will flash and the central CAUTION lamp will also flash. If they flash, check the fuel level and add fuel.

3. ENGINE WATER LEVEL CAUTION LAMP

This lamp warns the operator that the coolant level in the radiator has dropped. When performing the checks before starting (main switch ON, engine stopped):

If the coolant level in the radator is low, the caution pilot lamp and central CHECK lamp will flash.

If the monitor lamps flash, check the coolant level in the radiator sub-tank. Add water, if needed.



When operating (engine running):
If the condition is normal, the caution pilot lamp should be off.

If the coolant level in the radiator istoo low, the warning pilot lamp and the central CAUTION lamp will flash, and the alarm buzzer will sound intermittently.

If the monitor lamps flash, stop the engine and check the coolant level in the radiator and sub-tank. Add water, if needed.

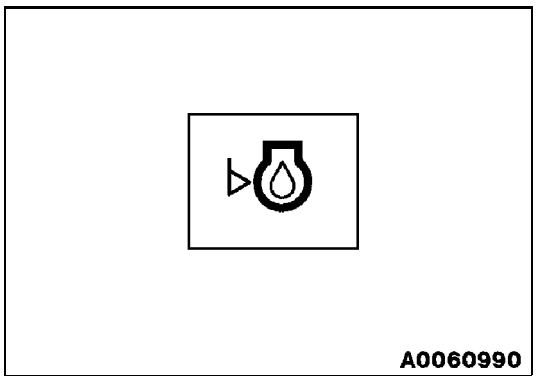
Stop the machine on level ground before performing this check.

4. ENGINE OIL LEVEL CAUTION PILOT LAMP
This lamp warns the operator that the oil level in the oil pan has dropped.

When performing checks before starting:

If the oil level in the engine oil pan is low, the caution pilot lamp and central CHECK lamp will flash.

If the monitor lamps flash, check the oil level and add oil, if needed.

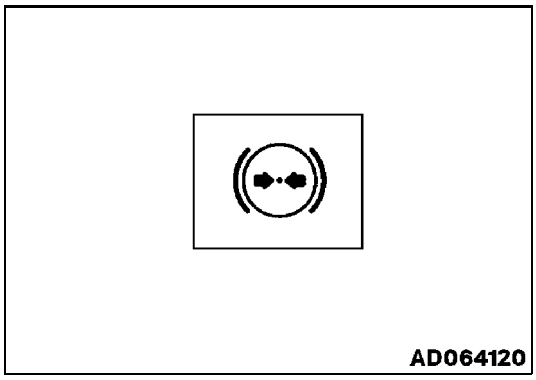


When operating:
Even if the engine oil level caution pilot lamp is flashing during the check before starting, it will go out when the engine is started.

5. BRAKE OIL PRESSURE CAUTION PILOT LAMP
This lamp warns the operator that the brake oil pressure has dropped.

When the engine is stopped, the brake oil pressure circuit is not actuated, so the caution pilot lamp and central CHECK lamp are also off.

When operating:
If the brake oil pressure goes down, the caution pilot lamp and the central CAUTION lamp will flash, and the alarm buzzer will sound intermittently. If the monitor lamps flash, stop the engine immediately and check the brake oil pressure circuit.



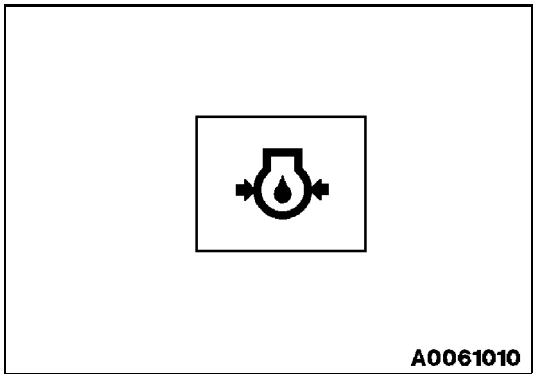
REMARKS
The monitor lamp may flash and go out after about 10 seconds after the engine is started because pressure is being stored in the brake accumulator. No malfunction is indicated.

6. ENGINE OIL PRESSURE CAUTION PILOT LAMP
This lamp warns the operator that the engine oil pressure has dropped.

If it flashes, stop the engine and check the oil level and pressure.

Check before starting: lights up

Engine running:
When the engine is started, oil pressure is formed and the lamp goes out. If the oil pressure drops, the warning pilot lamp and the central CAUTION lamp will flash, and the buzzer will sound intermittently.

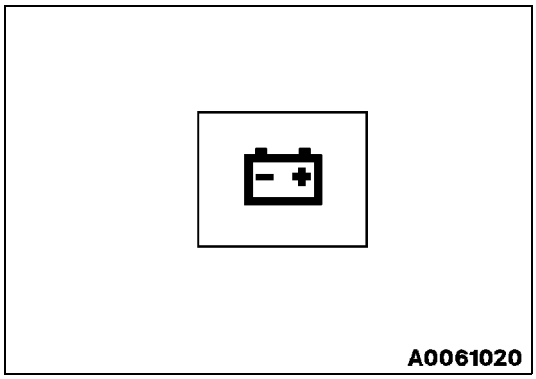


7. BATTERY CHARGE CAUTION PILOT LAMP

This lamp warns the operator that a malfunction in the charging system exists when the engine is running.

Check before starting: Lights up

Engine started or running:
When the engine is started, the alternatorgenerates electricity and the lamp goes out. If any problem occurs in the charging system, the CAUTION pilot lamp and the central CHECK lamp will flash. If they flash, check the engine charging circuit.

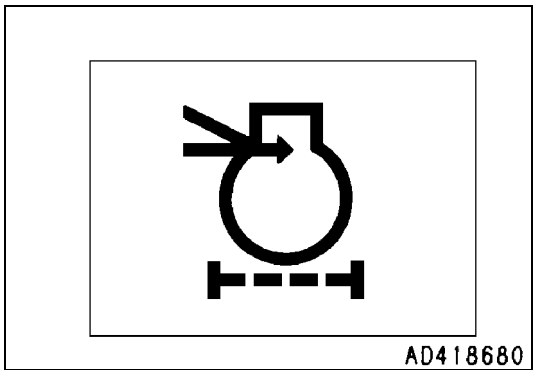


8. AIR CLEANER CLOGGING PORTION PILOT LAMP

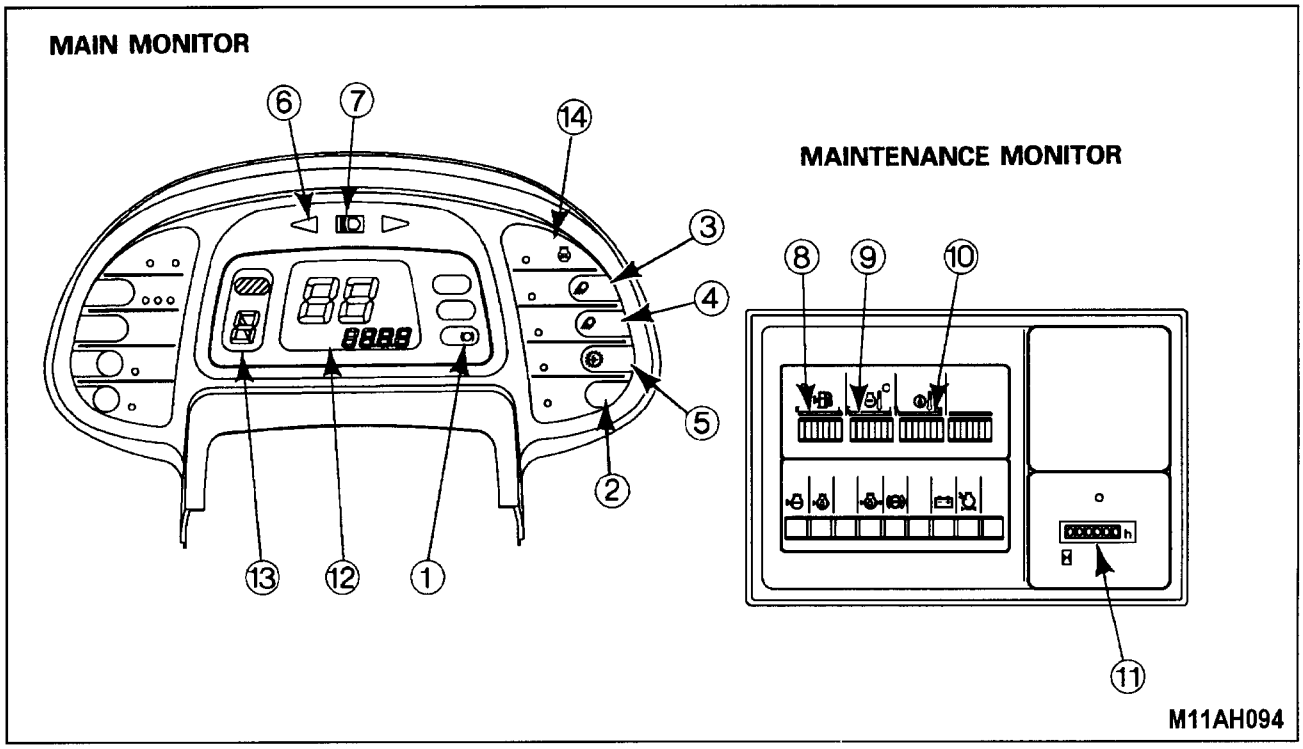
When the engine is ruming, this lamp warns the operator that the air cleaner element is clogged.

Check before starting: OFF

When operating:
If the air cleaner becomes clogged, the caution pilot lamp and central CHECK lamp will flash. If they flash, clean or replace the element.

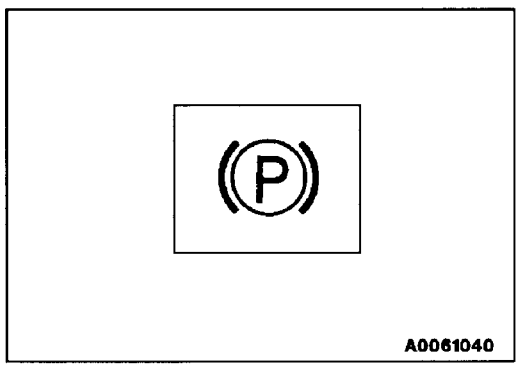


11.1.2 METER DISPLAY PORTION

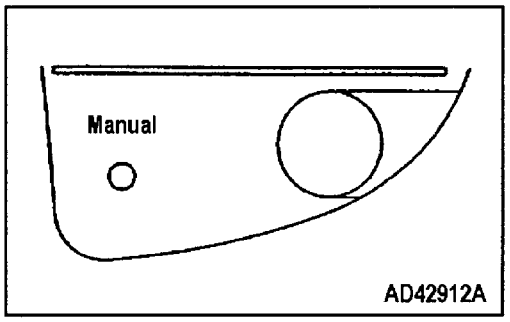


PILOT DISPLAY
When the starting switch is on, the pilot display lights up when the display items are functioning.

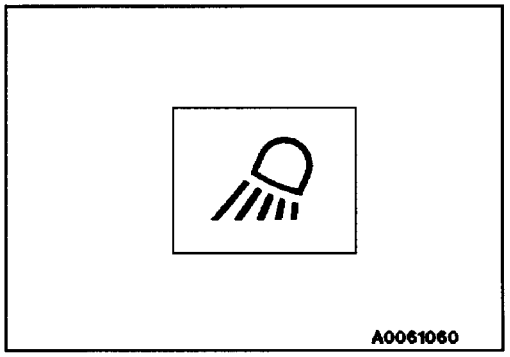
1. PARKING BRAKE PILOT LAMP
This lamp lights up when the parking brake is applied.



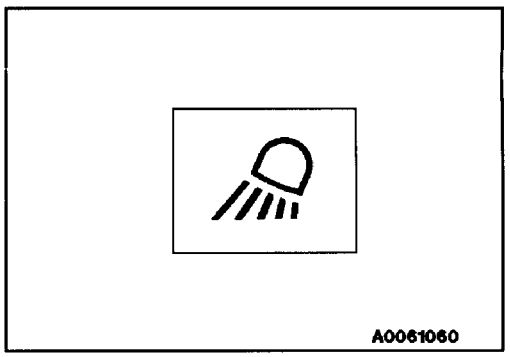
2. TRANSMISSION SHIFT SELECTOR - PILOT LAMP
Selecting the manual transmission turns this lamp on. However, selecting the auto transmission turns this lamp off.



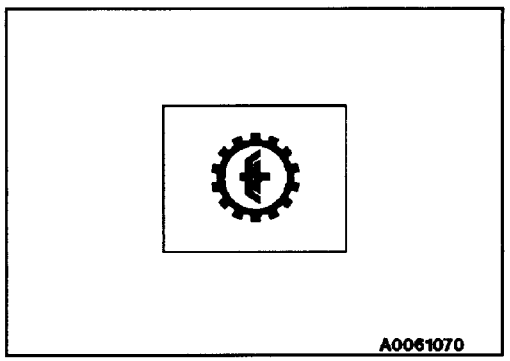
3. FRONT WORKING LAMP PILOT LAMP
This lamp lights up when the front working lamp is on.



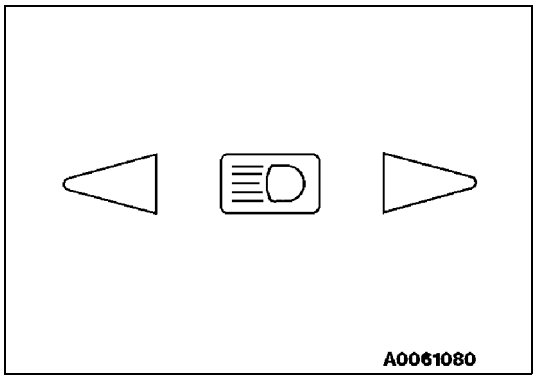
4. REAR WORKING LAMP PILOT LAMP
This lamp lights up when the rear working light is on.



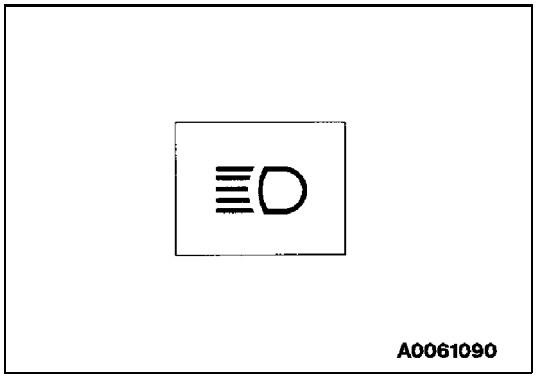
5. TRANSMISSION CUT-OFF PILOT LAMP
This lamp lights up when the transmission cut-off switch is on Depressing the left brake pedal while the monitor lamp is on causes the transmission to return to neutral.



6. TURN SIGNAL PILOT LAMP
When the turn signal lamp flashes, the pilot lamp also flashes.



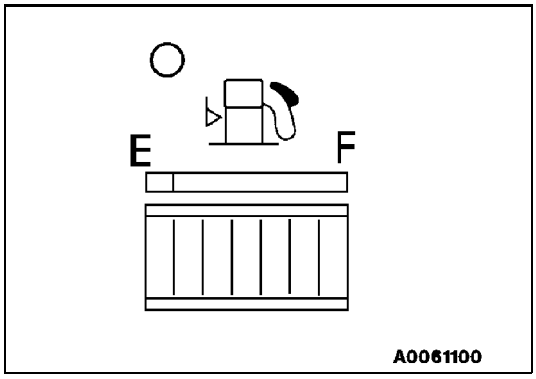
7. HIGH BEAM PILOT LAMP
This lamp is lit when the high beam lamp is on.



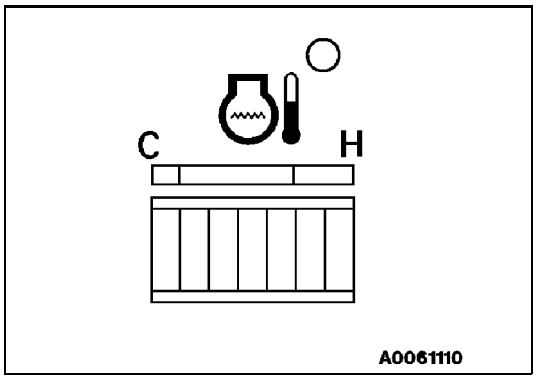
8. FUEL GAUGE
This gauge indicates the amount of fuel in the tank.

E = an empty tank
F = a full tank

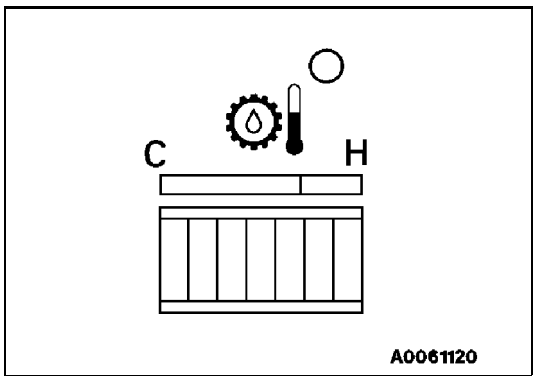
The lamp should light up in the green range during operation. If the red scale lights up, fewer than 44 liters (11.6 U.S. gallons) of fuel remains.



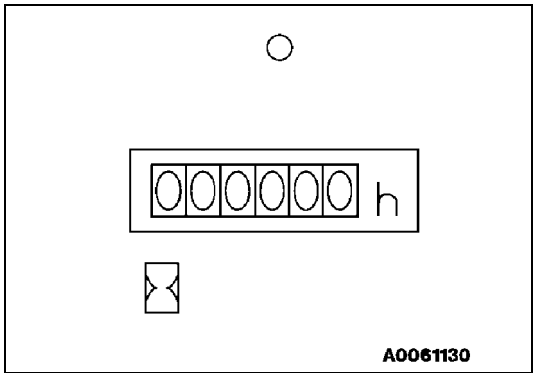
9. ENGINE WATER TEMPERATURE
This gauge indicates the engine water temperature. If the temperature is normal during operation, the green range will light. If the red range lights during operation, stop the machine and run the engine with no load at midrange speed until the green range lights. If the lamps light up to the 1st red level, the engine water temperature gauge lamp and central CAUTION lamp will flash; when the lamps light up to the 2nd red level, the alarm buzzer will also sound intermittently.



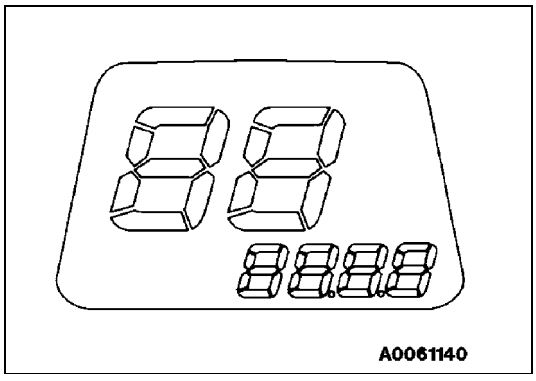
10. TORQUE CONVERTER OIL TEMPERATURE GAUGE
This gauge indicates the torque converter oil temperature. If the temperature is normal during operation, the green range will light. If the red range lights during operation, stop the machine and run the engine with no load at midrange speed until the green range lights. If the lamps light up to the 1st redlevel, the torque converter oil temperature gauge lamp and central CAUTION lamp will flash; when the lamps lights up to the 2nd red level, the alarm buzzer will also sound intermittently.



11. SERVICE METER
This meter shows the total operation hours of the machine. The service meter advances in increments of one (1) digit while the engine is running, even if the machine is nottraveling. While the engine is running, the green pilot lamp on the service meter flashes to show the service meter advances.



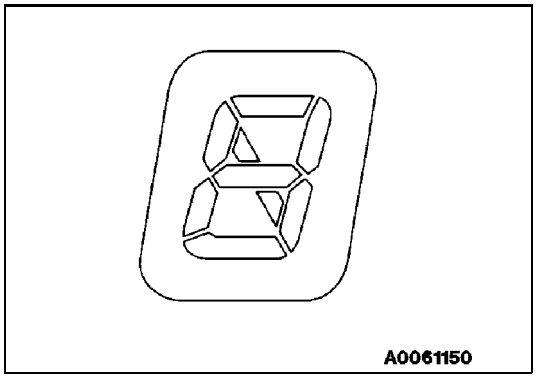
12. SPEEDOMETER
This meter indicates the travel speed of the machine.



13. TRANSMISSION SHIFT INDICATOR
This lamp indicates the present speed range of the transmission.

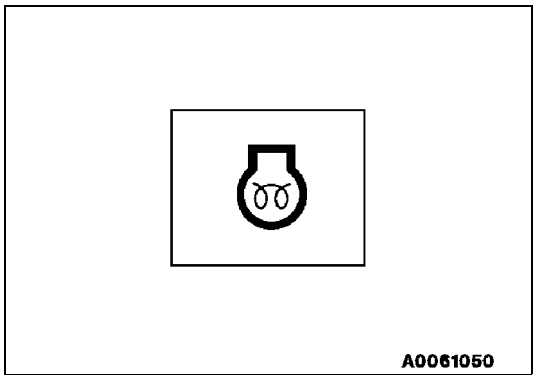
When the directional lever is at the N position, the N is displayed on the indicator.

When the directional lever is in the F or R position, the position of the speed lever is displayed as a numeral.

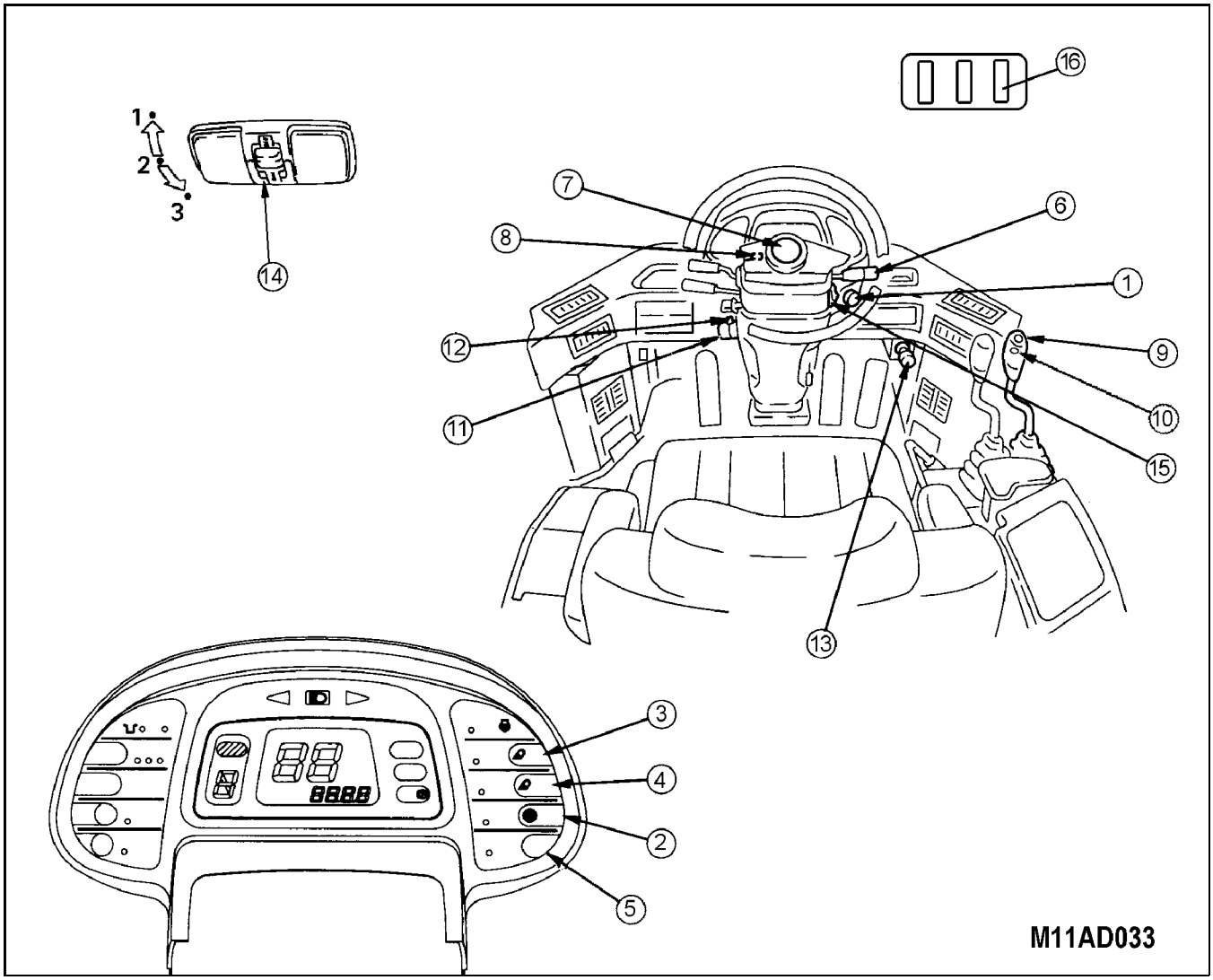


14. PREHEATING PILOT LAMP

This lamp informs the operator that the glow plug is heated. Turning the start switch to the ON position lights up this lamp, and the light goes out when the preheating is completed. The length of time that the light remains on depends on the engine water temperature when the engine is started.



11.2 SWITCHES

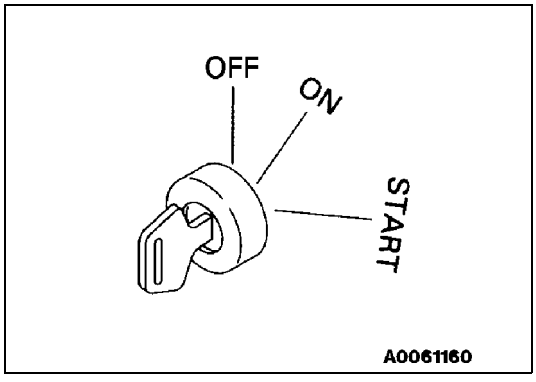


1. STARTING SWITCH
This switch is used to start or stop the engine.

OFF position
The key can be inserted and removed at this position. When the key is turned to this position, the electric circuit is turned off and the engine stops.

ON position
Electric current flows through the charging circuit, lamp, and accessory circuits while in this position. Keep the key at the ON position to keep the engine running.

START position
The engine-start position. Keep the key at this position while cranking. Immediately after starting the engine, release the key and it will automatically return to the ON position.



2. TRANSMISSION CUT-OFF SWITCH

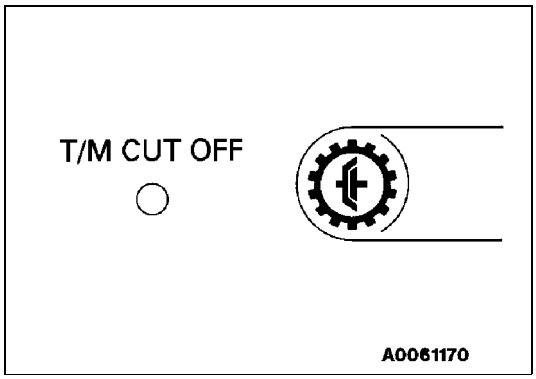
WARNING

If the machine has to be started on a slope, always turn the transmission cut-off switch to OFF and depress the left brake pedal. To start the machine moving slowly, depress the accelerator pedal while releasing the left brake pedal.

Press the push button ON and OFF. Pressing the pilot lamp lights it up. Pressing it again causes the pilot lamp to go out and the transmission cut-off turns off.

1. OFF: The left brake pedal acts as a normal brake (right brake pedal).
2. ON: The left brake pedal acts as a normal brake but also switches the transmission to Neutral.

NEUTRAL: If the switch is on, the transmission cut-off pilot lamp lights up.



3. FRONT WORKING LAMP SWITCH

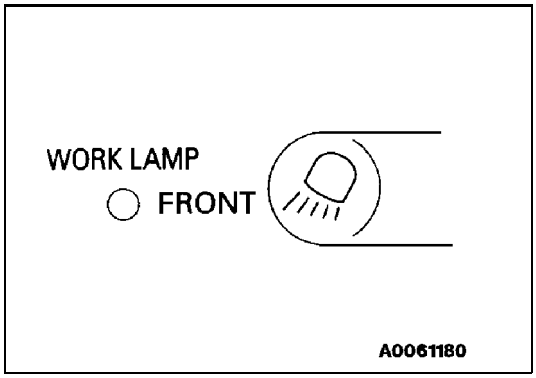
WARNING

Always turn the working lamp off before traveling on public roads.

When turning on the front work lamp, turn the lamp switch to the ON position for the sideclearance lamp or the ON position for the head lamp.

When the pilot lamp is pressed, it will light up and stay ON; if it is pressed again, the pilot lamp will go out and the working lamp will be turned off.

The working lamp will not light up if the lamp switch is not at the ON position for the side clearancelamp, or the ON position for the head lamp.



4. REAR WORKING LAMP SWITCH

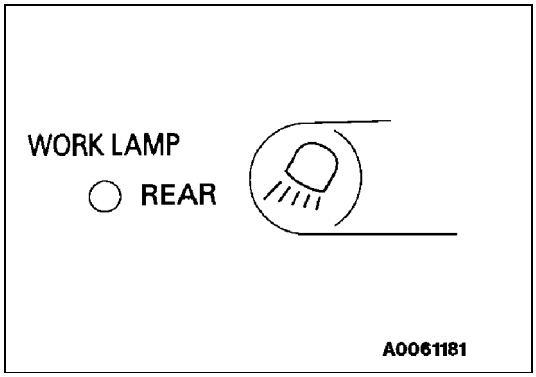
⚠ WARNING

Always turn the working lamp off before traveling on public roads.

When turning on the rear working lamp, turn the lamp switch to the ON position for the side clearance lamp, or the ON position for the head lamp.

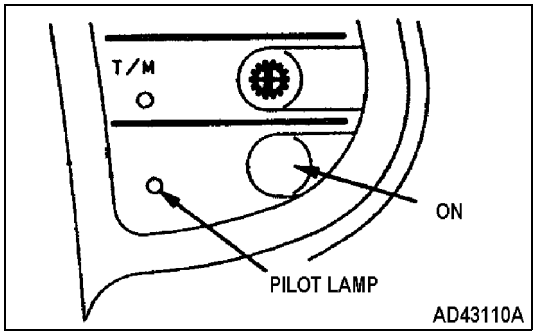
When the pilot lamp is pressed, it will light up and come ON. If the pilot light is pressed again, the pilot lamp will go out and the working lamp will be turned OFF.

The working lamp will not light up if the lamp switch is not at the ON position for the side clearancelamp, or the ON position for the head lamp.



5. TRANSMISSION SELECTOR SWITCH

This switch determines whether the manual or auto-shift mode is selected. Depressing the switch once sets the manual transmission mode (on position) and the lamp is lit. Depressing the switch again selects the off positon or the auto-shift mode and the lamp is off.



6. LAMP SWITCH/TURN SIGNAL LEVER/DIMMER

This lever performs three functions.

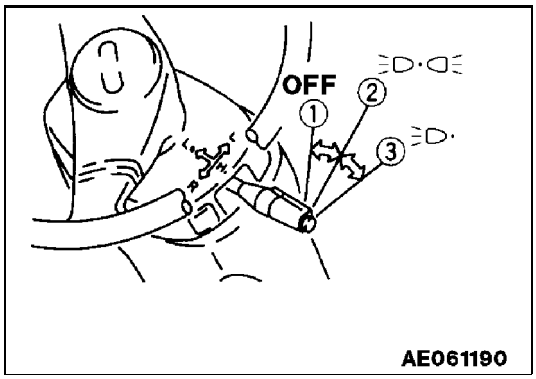
LAMP SWITCH

The lamp switch turns on the head lamps, side clearance lamps, tail lamps, and instrument panel lighting.

position 1: OFF
position 2: Side clearance lamp, tail lamps, and gauge lighting light up
position 3: Head lamps light up in addition to lamps at the (2) position

REMARKS

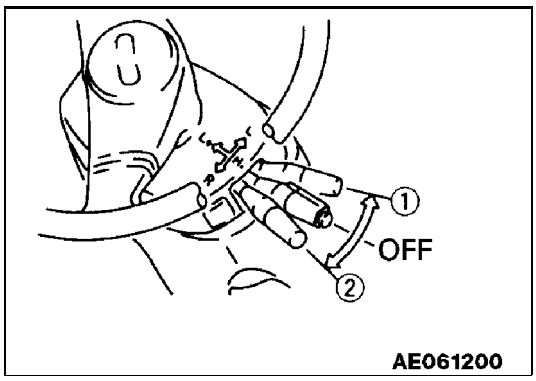
The lamp switch can be operated, regardless of the position of the lever.



TURN SIGNAL LEVER

This lever operates the turn signal lamps.
(1) LEFT TURN: Pull the lever FORWARD.
(2) RIGHT TURN: Push the lever BACK.

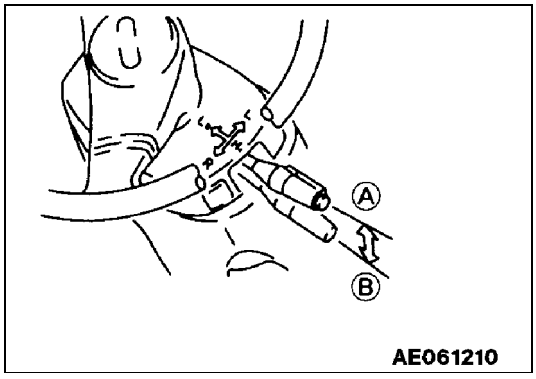
REMARKS:
Operating the lever also turns the signal pilot lamp on.
Turning the steering wheel to the neutral position, the turn signal lever will automatically return to the OFF position. If not, manually return the lever to the OFF position.



DIMMER SWITCH

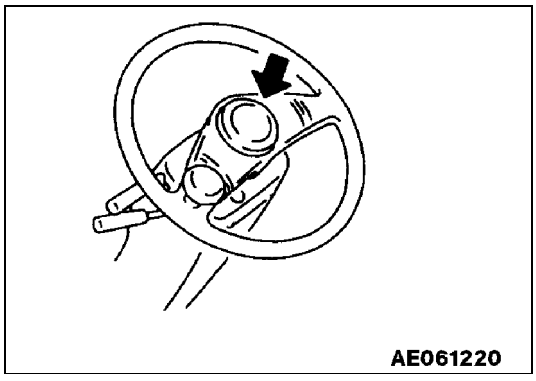
This switch turns on the high beams and low beams.

(A) Low beam
(B) High beam



7. HORN BUTTON

Pressing the button at the wheel's center sounds the horn.



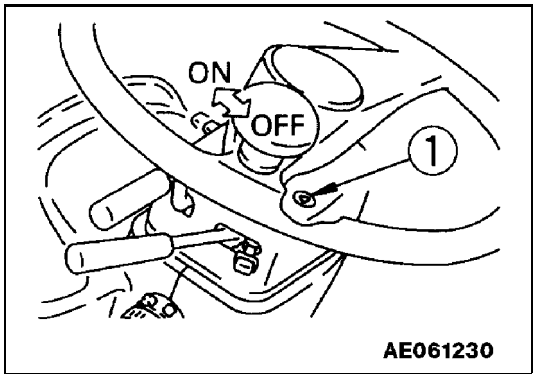
8. HAZARD LAMP SWITCH

⚠ WARNING

Use the hazard lamps only in emergencies. Using the hazard lamps when traveling will confuse the other operators.

This switch is used in emergencies, such as when the machine breaks down.

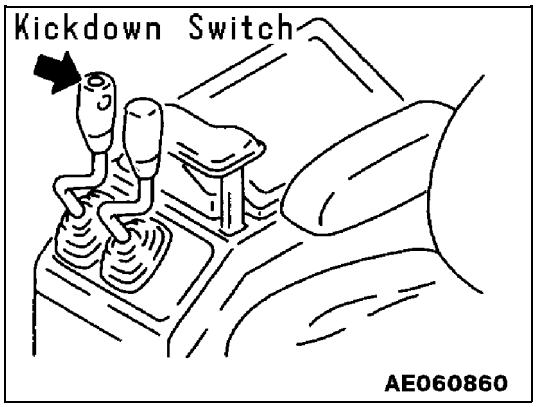
ON: All turn signal lamps flash.



REMARKS
When this switch is turned to the ON position, the turn indicator lamps and turn indicator pilot lamp flash. The display lamp (1) also lights up at the same time.

9. KICKDOWN SWITCH

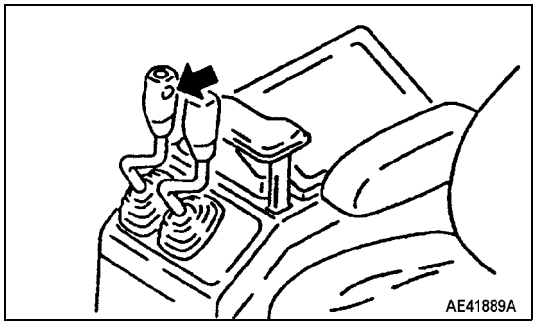
When the speed control lever is in second gear, and the switch at the top of the knob of the lift arm control lever is pressed, the transmission will down shift to first gear. This switch is used to increase the drawbar pull in digging operations.



REMARKS
To cancel the kickdown switch, move the directional lever to the REVERSE or NEUTRAL position, or move the speed control lever to any position, except second gear. It is also possible to cancel the kickdown switch by operating the parking brake switch, or by turning the starting switch OFF.

10. HOLD SWITCH

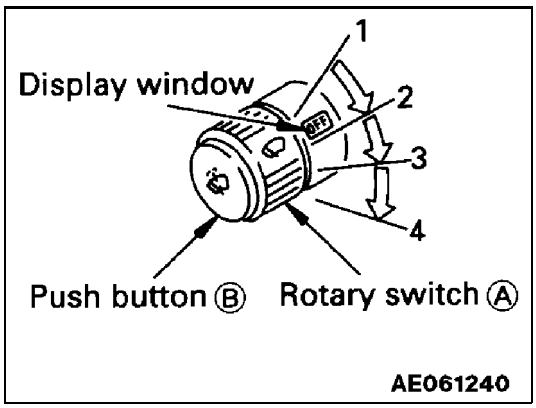
To maintain the desired transmission gear, depress the hold switch, which is located on the side of the lift lever. Depressing the switch causes the transmission indicator light on the main panel to light. Depressing this switch again releases the transmission hold function and the indicator light goes off. When the transmission hold switch is engaged, the manual speed control lever can be used to change gears. This feature is recommended to maintain travel speed while going up or down a slope.



11. FRONT WIPER SWITCH

Turn the switch (A) to operate the front wiper.

Switch position	Window display	Operation
1	OFF	OFF
2	INT	Intermittent wiper
3	1	Low-speed wiper
4	2	High-speed wiper

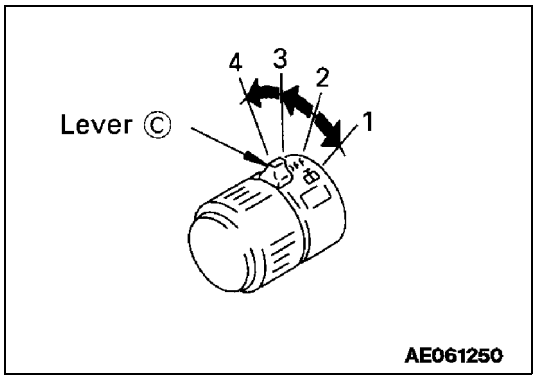


Pressing button (B) sprays the washer fluid out and onto the front glass.

12. REAR WIPER SWITCH

Turn the lever © to operate the rear wiper.

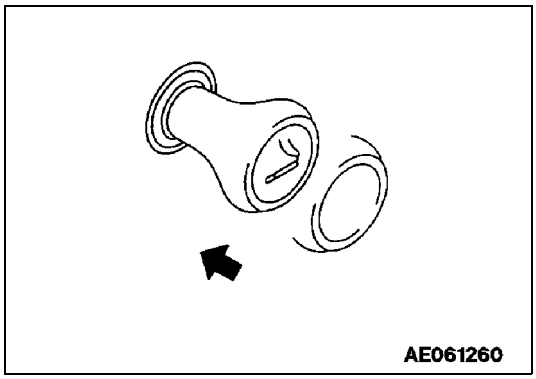
Position of switch	Display	Operation
1		Washer fluid sprayed
2	OFF	OFF
3		Wiper actuated
4		Washer fluid sprayed, wiper actuated



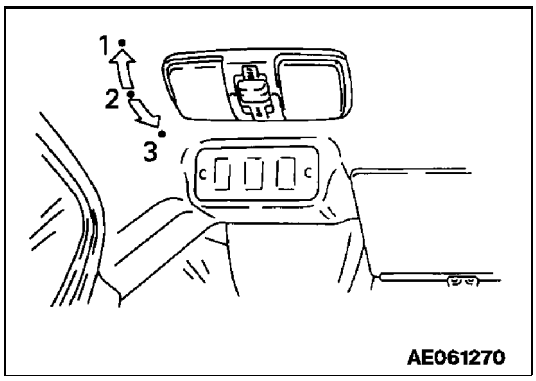
13. CIGARETTE LIGHTER

This item is used to light cigarettes. To use, push the lighter in. After a few seconds it will spring back. At that time, remove the lighter and light your cigarette.

With the lighter removed from the receptacle, the seven amp receptacle can also be used to power electrical accessories.



14. ROOM LAMP SWITCH
This switch turns on the room lamp.



ON: lights up.

Position 1: OFF
Position 2: Lights up when the cab door is opened
Position 3: Lights up

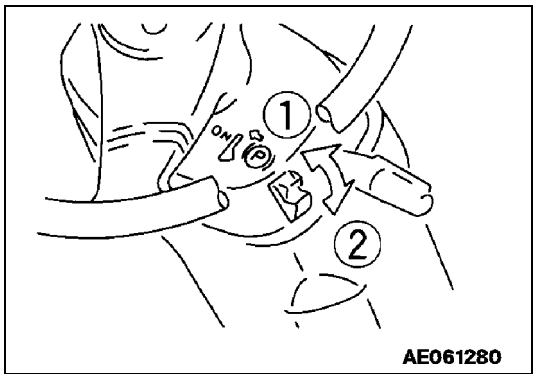
REMARKS
The room lamp lights up even when the main switch is OFF. So when leaving the operator's compartment, turn the switch to position 1 or 2.

When operating with the cab door fully open, set the switch to position 1 (OFF).

15. PARKING BRAKE SWITCH

⚠ WARNING

Always apply the parking brake when leaving the machine or parking it. Even if the parking brake switch is turned on, keep the brake pedal depressed until the parking brake pilot lamp lights.



This switch operates the parking brake.

(1) ON position: The parking brake is applied, and the parking brake pilot lamp lights up.

(2) OFF position: The parking brake is released.

REMARKS
If the directional lever is placed in F (FORWARD) or R (REVERSE) with the parking brake applied, the warning lamp will flash and the alarm buzzer will sound.

Turning the starting switch to the OFF position automatically applies the parking brake.

Before starting the engine, turn the parking brake switch ON, then turn it OFF.

The machine does not start when the directional lever is operated with the parking brake applied.

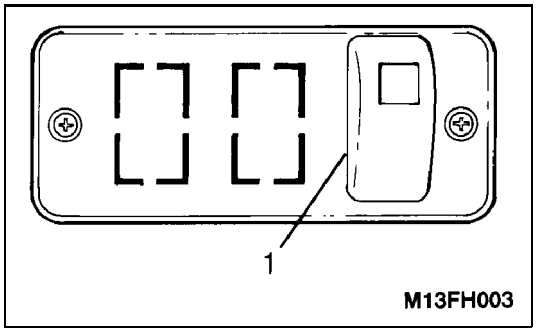
NOTE
Never use the parking brake switch to apply the brakes when traveling, except in an emergency. Apply the parking brake only after stopping the machine.

If the parking brake has been used as an emergency brake when traveling at high speed (near the maximum speed), contact your distributor to have the parking brake checked for any abnormality.

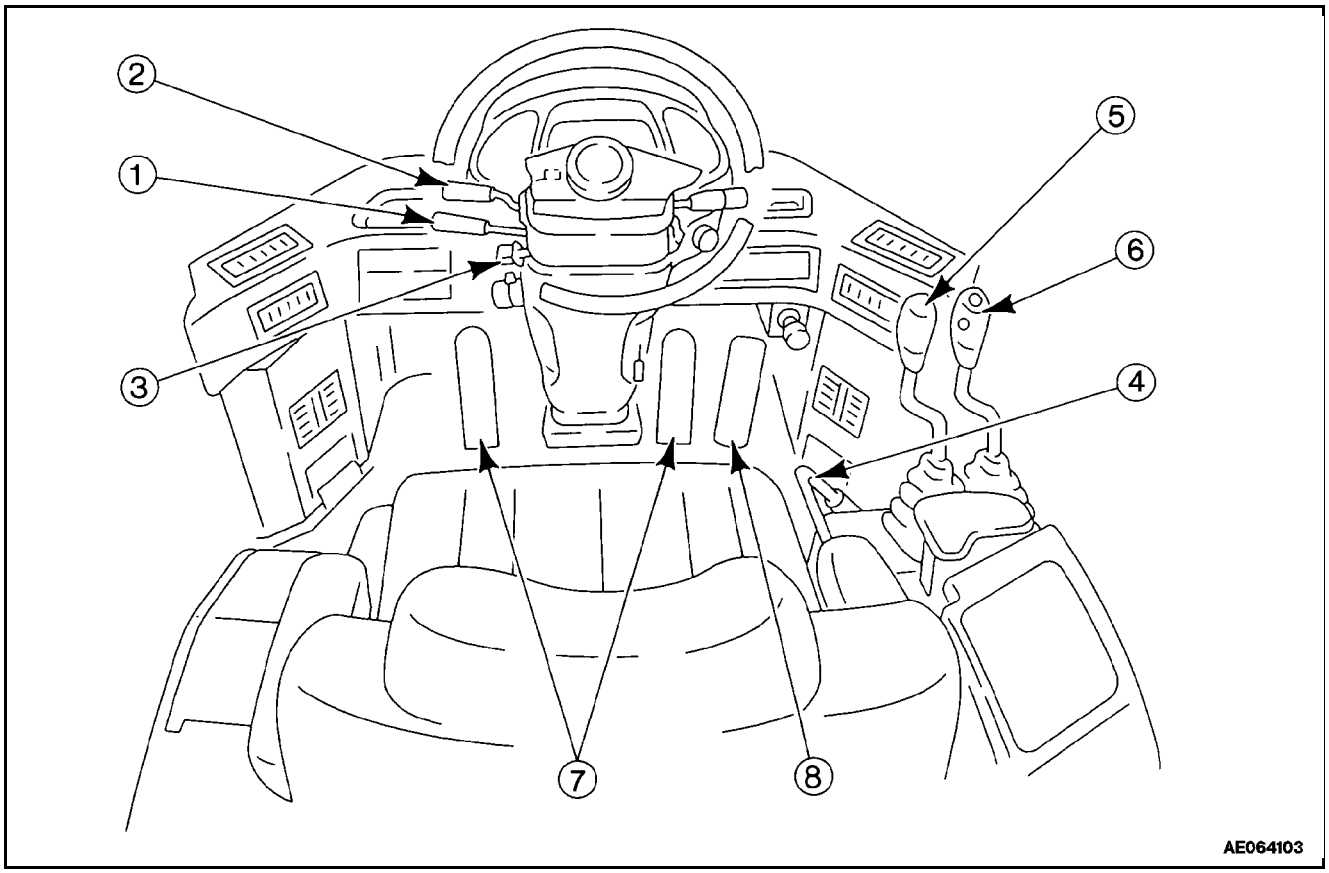
16. REAR DEFROSTER SWITCH

1. Turn the starting switch to the ON position.

2. Turn the defroster switch (1) ON and it will automatically set the switch timer on for 10 minutes.



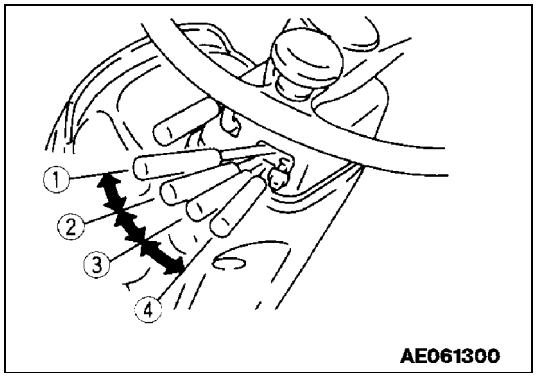
11.3 CONTROL LEVERS, PEDALS



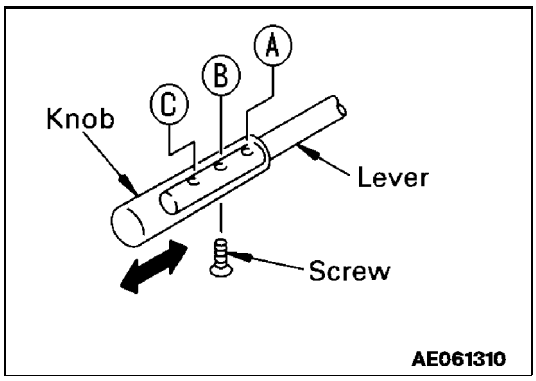
1. SPEED CONTROL LEVER
MANUAL SHIFT

This lever controls the travel speed of the machine. This machine has a transmission with four forward speeds and four reverse speeds.

Place the speed control lever in a suitable position to obtain the desired speed range: 1st and 2nd speeds are used for working; 3rd and 4th speeds are used for traveling. However, when the speed control lever stopper is being used, it is impossible to shift to 3rd or 4th. Disengage the speed control lever stopper before trying to shift gears.
Position 1: 1st gear
Position 2: 2nd gear
Position 3: 3rd gear
Position 4: 4th gear



REMARKS
The length of the lever can be adjusted to 3 stages (position A, B, C). To adjust the length, remove the screw at the bottom of the lever knob and slide the knob to the desired position. Tighten the screw again. The lever is installed at position (B) when the machine is shipped from the factory.



AUTO SHIFT FUNCTION
Automatically changes from 2nd to 4th gear based on operating conditions.
Position 1: 1st gear
Position 2: 2nd gear
Position 3: 3rd gear
Position 4: 4th gear

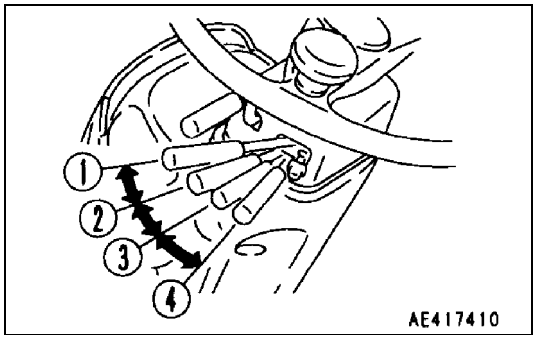
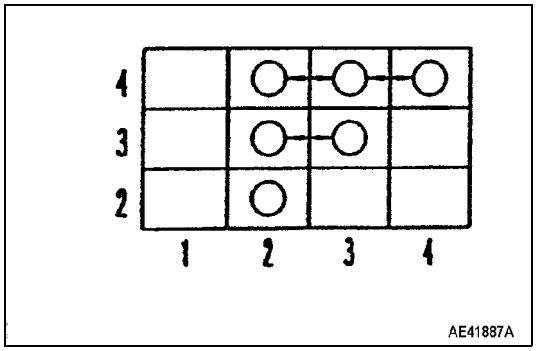


Chart at right describes the auto-shift gear options basedon the transmission shift lever position.
Position 1: 1st gear
Position 2: 2nd gear
Position 3: 3rd gear
Position 4: 4th gear

When 1st gear is selected on the transmission gear level, the auto-shift operation doesn't operate.

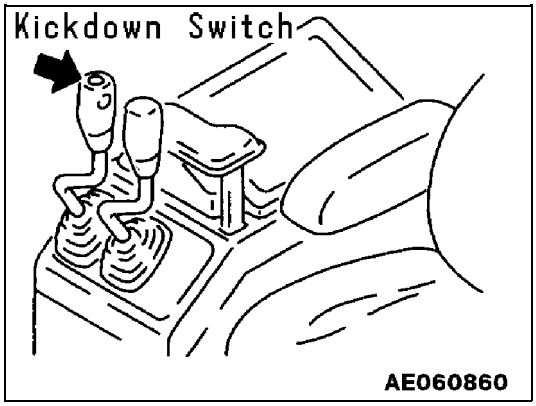


When downshifting from 2nd to 1st gear, use the kick-down switch located on the lift lever.

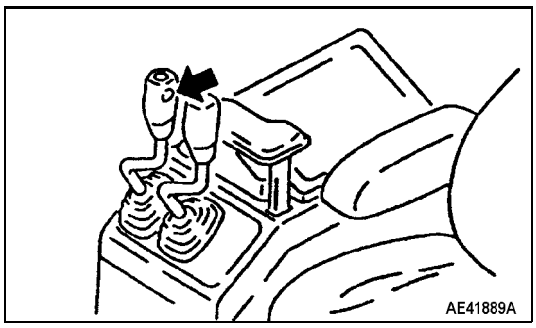
The kick-down switch can operate from any gear or direction, but the machine's speed should be slower than 7.5 mph (12 km/hr).

After depressing the kick-down switch and the gear changes from 2nd to 1st, the travel speed increases and the gear automatically changes to 2nd gear.

Use the kick down feature during load and carry operation.



The hold switch maintains the same transmission gear. Recommended for use when traveling up or down a slope.



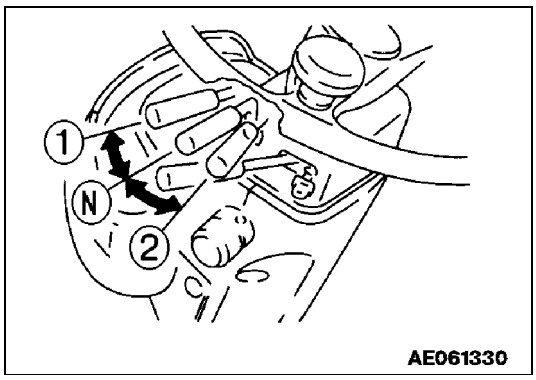
2. DIRECTIONAL LEVER

This lever changes the machine's direction of travel.
The engine cannot be started if the directional lever is not in neutral.

Position 1: Forward

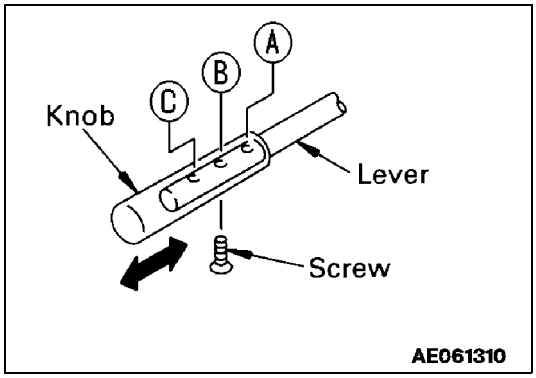
Position N: Neutral

Position 2: Reverse



REMARKS

The lever length can be adjusted to 3 stages (positions A, B, C). To adjust the length, remove the screw at the bottom of the lever knob and slide the knob to the desired position. Tighten the screw. The lever is installed to Position (B) when shipped from the factory.

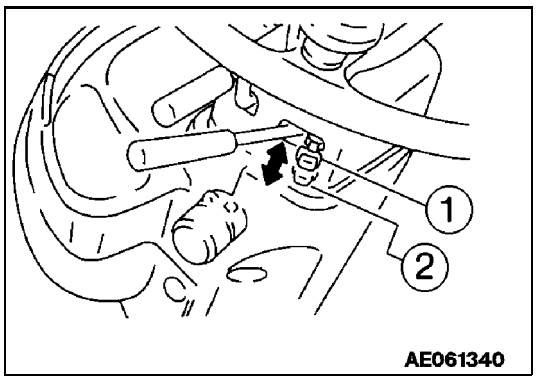


3. SPEED CONTROL LEVER STOPPER

This stopper prevents the speed control lever from entering the 3rd position when working.

Position 1: Stopper actuated

Position 2: Stopper released

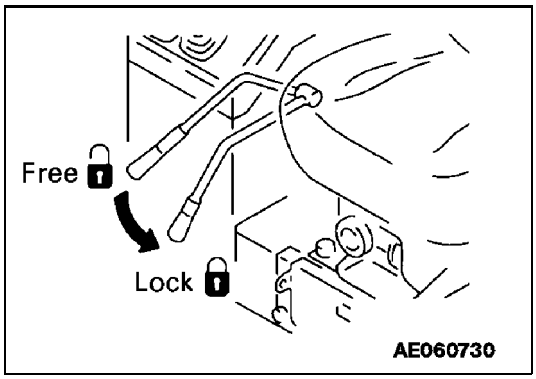


4. SAFETY LOCK LEVER

⚠ WARNING

When leaving the operator's compartment, set the safety lock lever securely to the LOCK position. If the control levers are not locked, and they are touched by mistake, a serious accident could result.
If the safety lock lever is not placed securely in the LOCK position, the control levers may not be properly locked. Check that the situation is as shown in the diagram.
When parking the machine or performing maintenance, always lower the bucket to the ground and apply the lock.

This lever locks the work equipment levers.
Push the lever down to apply the lock.



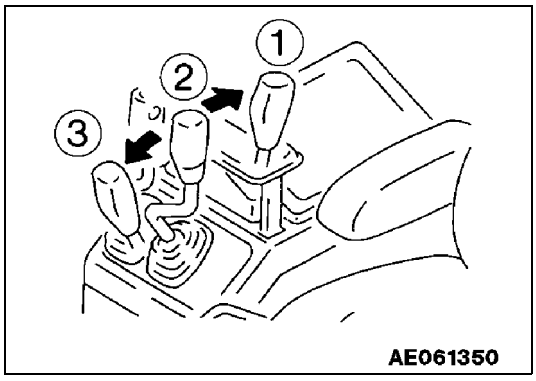
5. BUCKET CONTROL LEVER

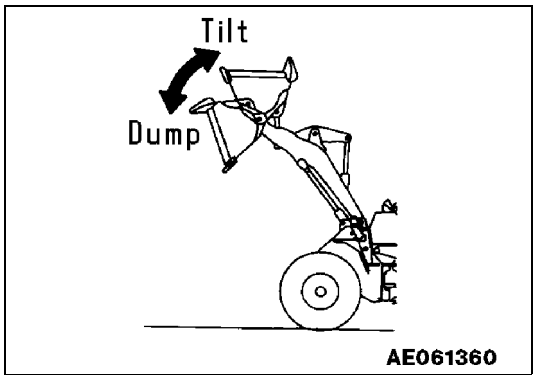
This lever operates the bucket.

(1) TILT ( ): When the bucket control lever is pulled further from the TILT position, the lever is stopped in this position until the bucket reaches the preset position of the positioner, and the lever returns to the HOLD position.

(2) HOLD ( ): The bucket is kept in the same position.

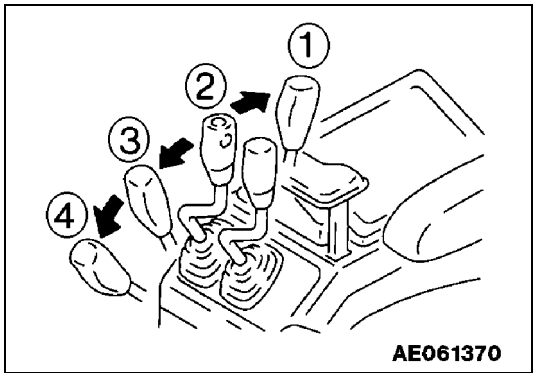
(3) DUMP ( ): When the bucket control lever is pulled to rotate the bucket down, the lever is stopped in this position until the bucket reaches the preset position of the positioner, and the lever returns to the HOLD position.





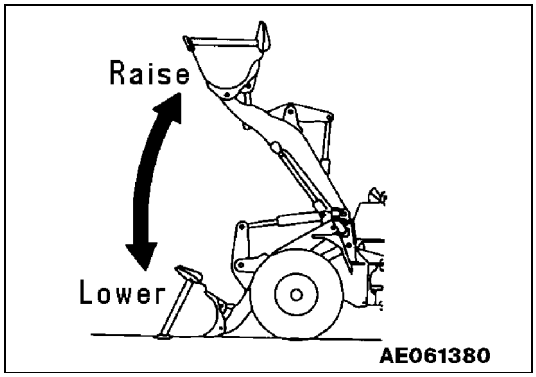
6. LIFT-ARM CONTROL LEVER

This lever operates the boom.



(1) RAISE ( ): When the lift arm control lever is pulled further from the RAISE position, the lever is stopped in this position until the lift arm reaches the preset position of the kick-out, and the lever is returned to the HOLD position.

(2) HOLD ( ): The lift arm is kept in the same position.



(3) LOWER( ): When the lift arm control lever is pulled further away from the RAISE position to retract the cylinders and lower the boom, the lever is stopped in this position until the lift arm reaches the preset lowest position, and the lever is returned to the HOLD position.

(4) FLOAT( ): The lift arm moves freely under external force.

7. BRAKE PEDALS

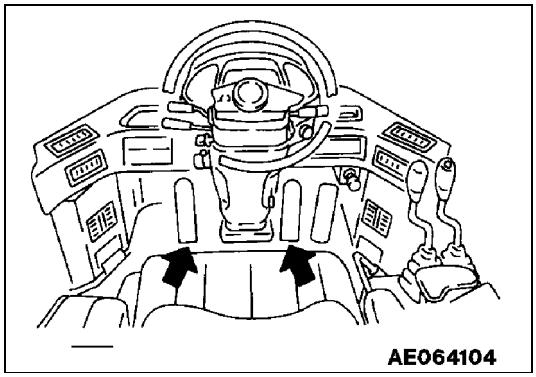
WARNING

When traveling downhill, use the engine as a brake and always use the right brake pedal. Do not use the brake pedals repeatedly, unless necessary. Do not put your foot on this pedal, unless necessary.

Right brake pedal
The right brake pedal operates the wheel brakes and used for normal braking.

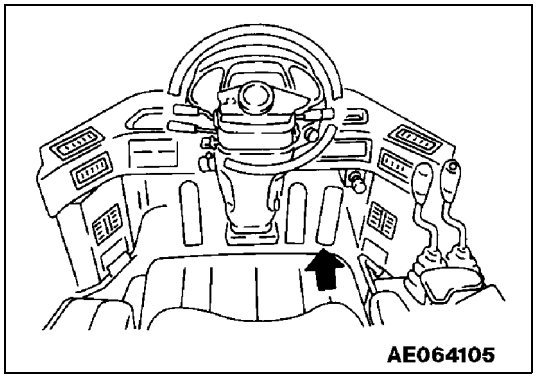
Left brake pedal
The left brake pedal operates the wheel brakes. If the transmission cut-off switch is on, it also returns the transmission to neutral. If the transmission cut-off switch is off, the left brake pedal acts in the same way as the right brake pedal.

REMARKS
When the accelerator is used for operating the work equipment, always use the left brake pedal to slow or stop the machine after placing the transmission cut-off switch to the on position.


AE064104

8. ACCELERATOR PEDAL
This pedal controls the engine speed and output.

The engine speed can be freely controlled between low idle and full speed.


AE064105

11.4 STEERING COLUMN TILT LEVER

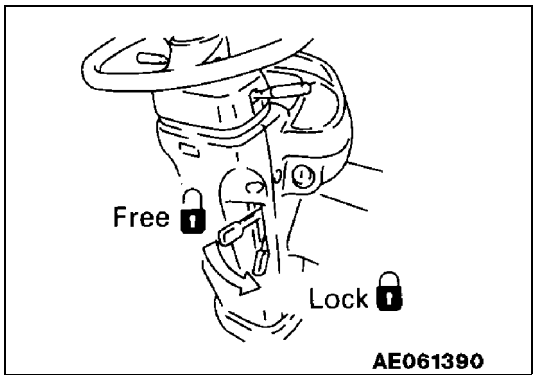
WARNING

Stop the machine before adjusting the steering wheel angle.

This lever allows the steering column to tilt forward or backward.

Pull the lever up and move the steering wheel to the desired position. Then push the lever down to lock the steering wheel in position.

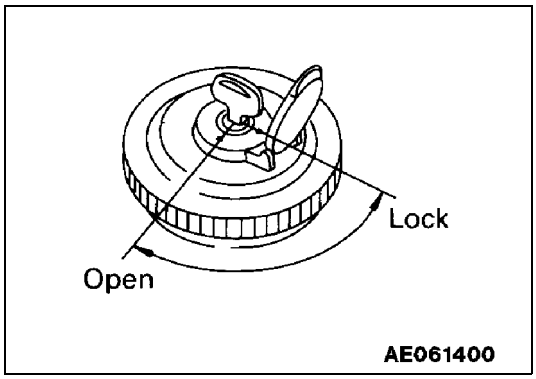
Range of adjustment: 125 mm (4.92 in.) (stepless)



AE061390

11.5 CAP WITH LOCK

The fuel tank filler port and the hydraulic tank filler port are equipped with locks. Use the starter key to open and close the cap as follows:



11.5.1 METHOD OF OPENING AND CLOSING THE CAP WITH LOCK

TO OPEN THE CAP (fuel tank filler port)

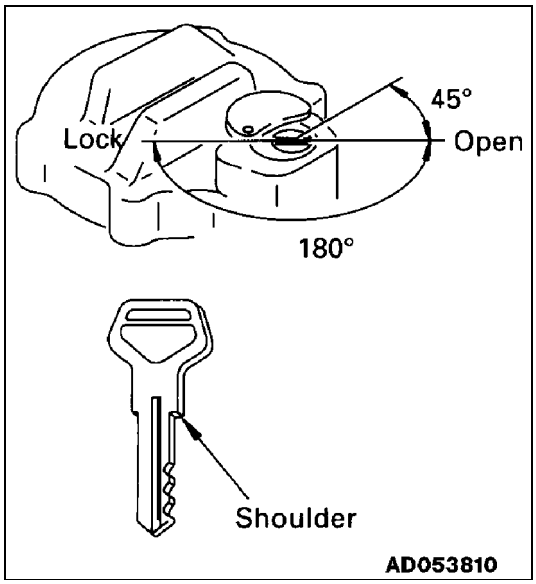
1. Insert the key into the cap. Ensure that the key is fully inserted or the key could break.
2. Turn the key clockwise and align the mark on the cap with the rotor groove. Remove the cap.

TO LOCK THE CAP

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

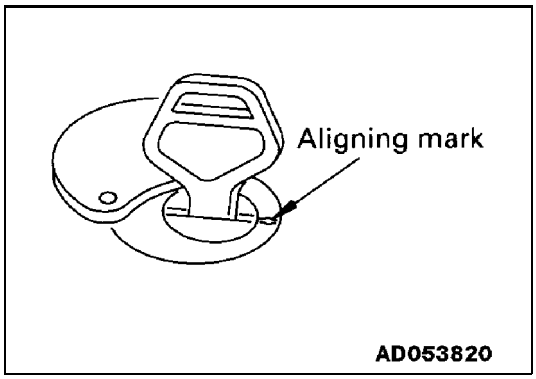
TO OPEN THE CAP (hydraulic tank filler port)

1. Insert the key into the cap as far as the key will go. If it is turned before inserting it all the way, the key could break.
2. Turn the key slowly counterclockwise and align the rotor groove with the mark on the cap until a clicking sound is heard.



TO LOCK THE CAP (hydraulic tank filler port)

1. Insert the key into the cap as far as the key will go. If it is turned before inserting it all the way, the key could break.
2. Turn the key slowly counterclockwise and align the rotor groove with the mark on the cap until a clicking sound is heard.

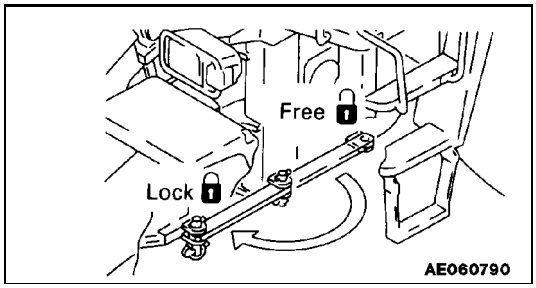


11.6 SAFETY BAR

WARNING

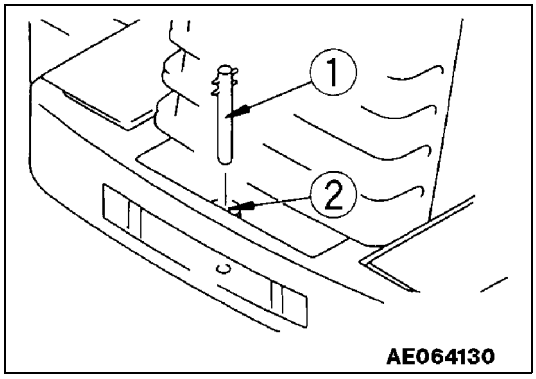
Always use the safety bar for maintenance or when transporting the machine. Always remove the safety bar during normal travel operations.

The safety bar is used during maintenance or when transporting the machine. The safety bar locks the front and rear frames, preventing them from pivoting.

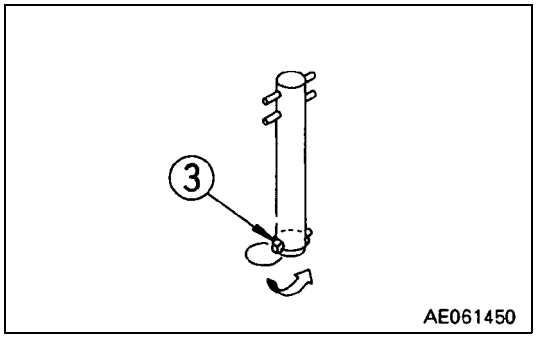


11.7 TOWING PIN

1. Insert the towing pin (1) into the hole (2) in the counterweight.



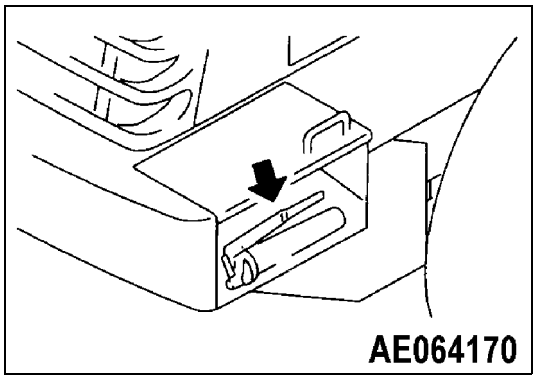
2. Insert the linch pin (3) so that the towing pin doesn't come out.



3. To remove the towing pin, reverse this procedure.

11.8 GREASE PUMP

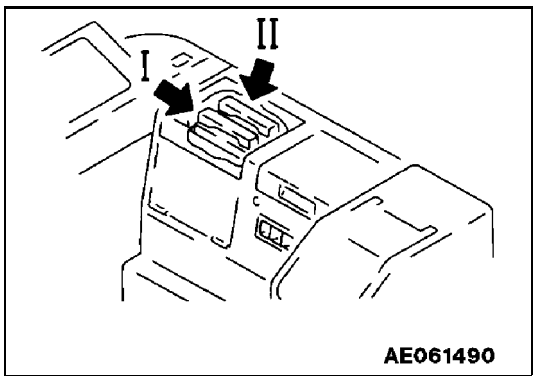
The grease pump is stored inside the battery box, which is located on the rear, left side of the machine. After using the pump, wipe off all the grease stuck to the outside of the pump and then store it in the box.



11.9 BACKUP ALARM

An alarm sounds when the directional lever is in reverse (R). The alarm warns people behind the machine that it is traveling in reverse.

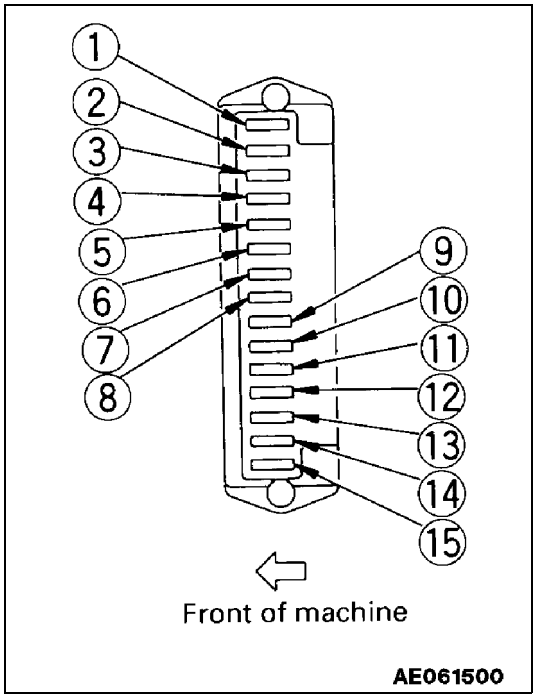
11.10 FUSE



NOTE: Before replacing a fuse, turn the starting switch off.

The fuses protect the electrical equipment and wiring from burning out. If a fuse becomes corroded, has white powder on it, or loose in its holder, replace the fuse.

11.10.1 FUSE CAPACITY AND CIRCUIT NAME

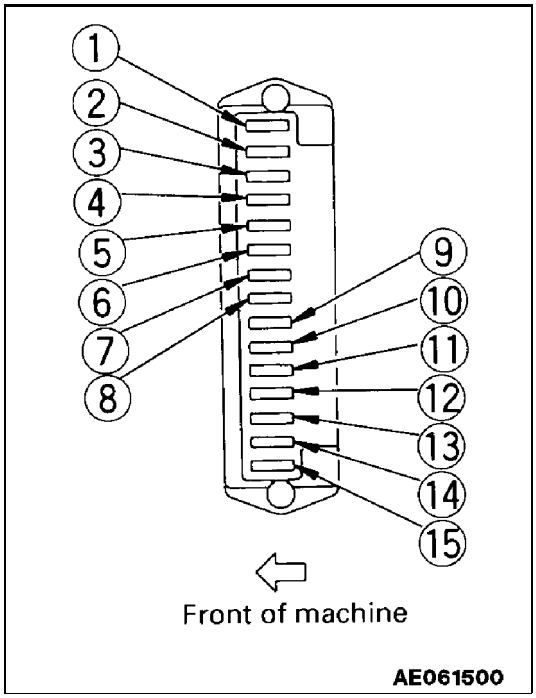


Fuse box I

No.	Fuse capacity	Name of circuit
①	20A	Main lamp circuit
②	20A	Backup lamp, brake lamp
③	10A	Turn signal indicator lamp
④	10A	R.H. head lamp
⑤	10A	L.H. head lamp
⑥	10A	R.H. side clearance lamp
⑦	10A	L.H. side clearance lamp
⑧	10A	Parking brake
⑨	10A	Transmission control
⑩	10A	Instrument panel
⑪	10A	Work equipment positioner
⑫	10A	Starting switch
⑬	20A	Hazard lamp
⑭	10A	Spare
⑮	10A	Spare

Fuse box II

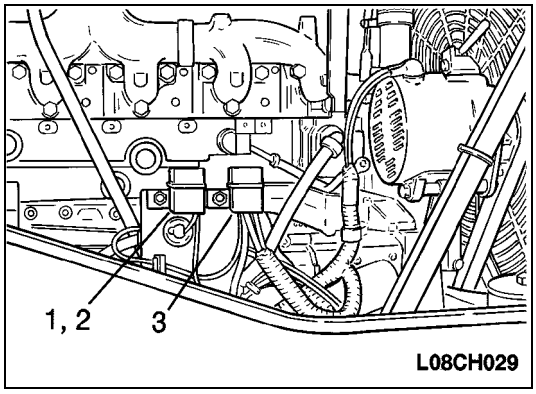
No	Fuse capacity	Name of circuit
①	20A	Front working lamp
②	20A	Rear working lamp
③	20A	Air conditioner
④	20A	Air conditioner
⑤	20A	Wiper, washer
⑥	10A	Auto shift
⑦	10A	Cigarette lighter, radio
⑧	10A	Rotating lamp
⑨	5A	Fuel shutoff solenoid
⑩	10A	Spare
⑪	10A	Spare
⑫	10A	Spare
⑬	10A	Spare
⑭	10A	Air suspension seat
⑮	25A	Defroster



11.11 SLOW-BLOW FUSE

If the power does not come on when the starting switch is turned ON, the slow-blow fuse could be blown. Check it and replace, if needed.

The slow-blow fuse is beside the engine on the left-hand side of the machine.



SLOW-BLOW FUSE

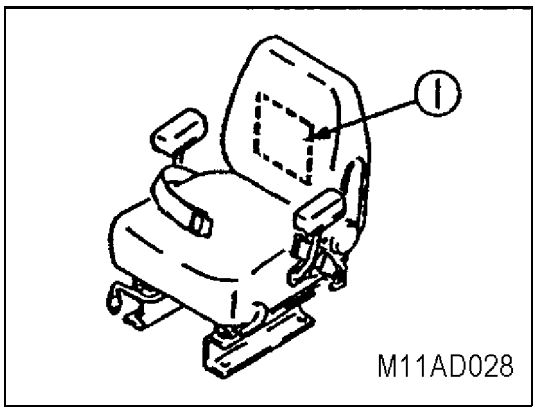
(1) 120A: Heater relay (glow plug)

(2) 80A: Main power

(3) 30A: Battery power (starting switch, hazard)

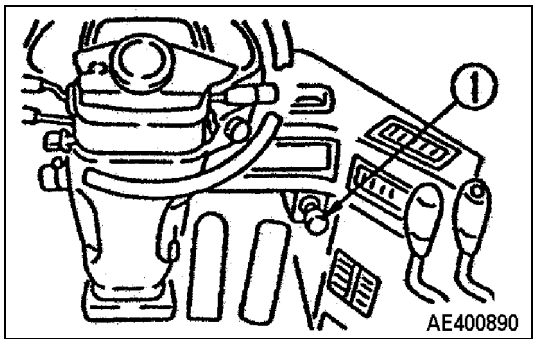
11.12 MANUAL STORAGE PLACE

Keep this manual in the rear pocket (1) of the operator's seat so that the manual is readily available.



11.13 ELECTRIC POWER (with ROPS CAB)

Removing the cigarette lighter(1) allows an electrical device to be plugged in. The maximum electric current is 7amps (168 W).



12. OPERATION

12.1 CHECKS BEFORE STARTING

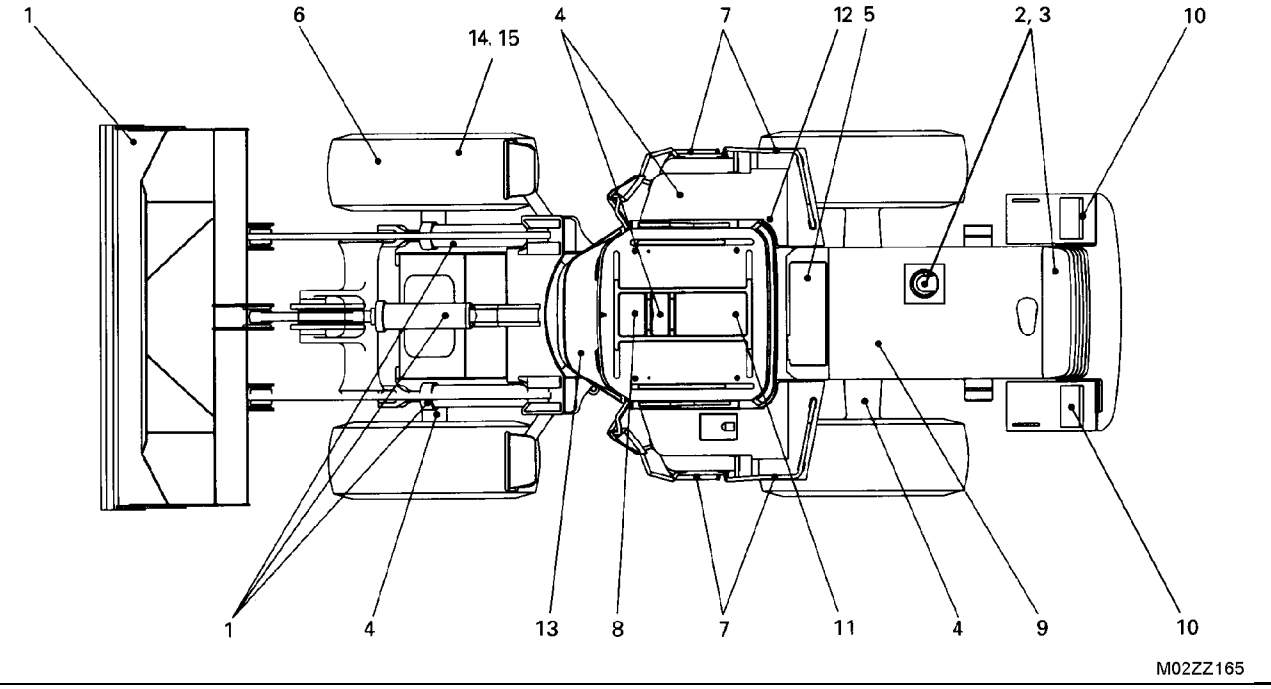
12.1.1 WALK AROUND CHECK

WARNING

Leakage of oil or fuel, or accumulation of flammable material around high temperature parts, such as the engine muffler or turbocharger, may cause a fire. If any abnormality is found, repair it or contact your distributor for assistance.

Before starting the engine, look around the machine and under it and check for loose nuts or bolts, and leakage of oil, fuel, and coolant. Also, check the condition of the work equipment and hydraulic system. Check also for loose wiring, play, and collection of dust on high-temperature parts.

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



1. Check for damage, wear, or play on the work equipment, cylinders, linkage, and hoses.
Check that there are no cracks, excessive wear, orplay in the work equipment, cylinders, linkage, or hoses. Report any abnormality to applicable personnel.

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

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

4. **Check for oil leakage from transmission case, axle, hydraulic equipment, hydraulic tank, hoses, joints**
   Check that there is no oil leakage. If any leakage is found, repair the oil leak.

5. **Check for brake line oil leakage**
   Check that there is no oil leakage. If any leak is found, repair it.

6. **Check for tire damage and wear, loose mounting bolts**
   Check for cracks or peeling of tires, and for cracks or wear to the wheels (side rim, rim base, lock ring). Tighten any loose wheel nuts. If any abnormality is found repair or replace the part. If any valve caps are missing, install new ones.

7. **Check for damaged handrail and steps, loose bolts**
   Repair any damage and tighten any loose bolts.

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

9. **Check for loose air cleaner mounting bolts**
   Check for any loose mounting bolts and tighten, if necessary.

10. **Check for loose battery terminals**
    Tighten any loose terminals.

11. Check the seat belt

WARNING

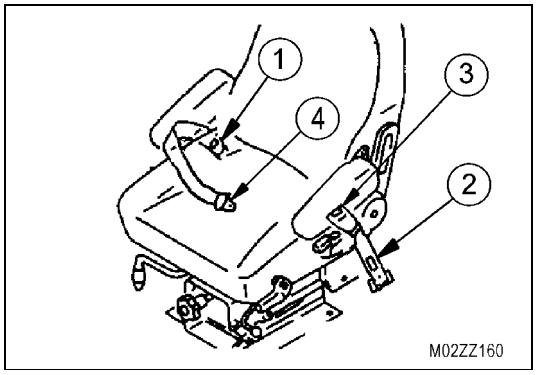
Although a seat belt may appear undamaged, replace it every three years.

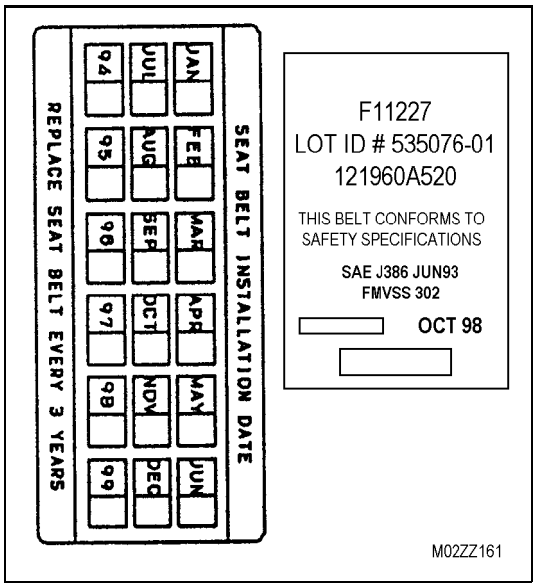
The date of manufacture of the seat belt is marked on the belt.

Check that there are no loose bolts on the equipment mounting the seat belt to the machine, and tighten, if necessary.

Tightening torque: 24.5 ± 4.9 N

If the belt is damaged or frayed, or if there is any damage or deformation of the seat belt holders, replace the seat belt with a new one.





12. Check for loose bolts on ROPS

Check for any loose or damaged bolts. If any loose bolts are found, tighten them to 927 ± 103 N y bolts are damaged, replace them with genuine Komatsu bolts.

13. Clean the cab window

Clean the cab window to ensure good visibility when operating the machine.

14. Tire Inspection

WARNING

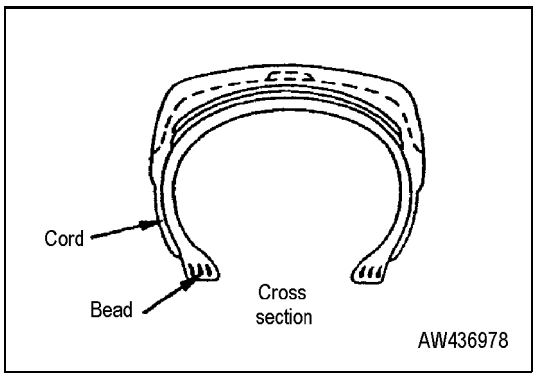
If worn or damaged tires are used, they may burst and cause serious injury or death. When the tires show the following wear or damage, replace them:

Wear:

Tires with a tread groove of less than 15% of that of a new tire.
Tires with uneven wear or with stepped wear.

Damage:

Tires with damage that reaches the cords.
Cracks in the rubber.
Tires with cut or pulled cords.
Tires with damaged bead.
Tires with peeled or separated surface.
Deteriorated, deformed or abnormally damaged tires that do not seem usable.



15. Rim inspection

WARNING

Check the rims (wheels) and rings for deformation, corrosion, and cracks.

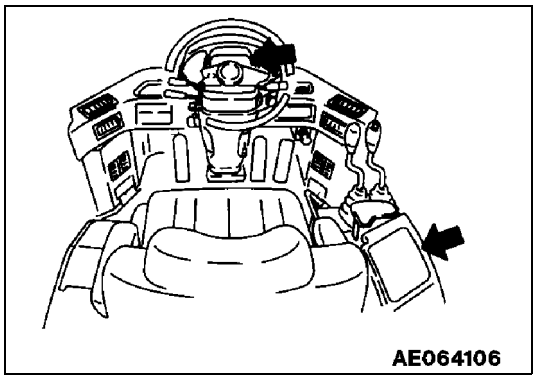
In particular, check the side rings, lock rings and rim flanges thoroughly.

12.1.2 CHECK BEFORE STARTING

1. Turn the start switch ON.

2. Check that all the monitor lamps, the gauges, and the warning lamp light up for about 3 seconds while the alarm buzzer sounds for 1 second.

Do not perform the checks using just the monitor; always perform the items specified for the periodic maintenance.



CHECK THE COOLANT LEVEL

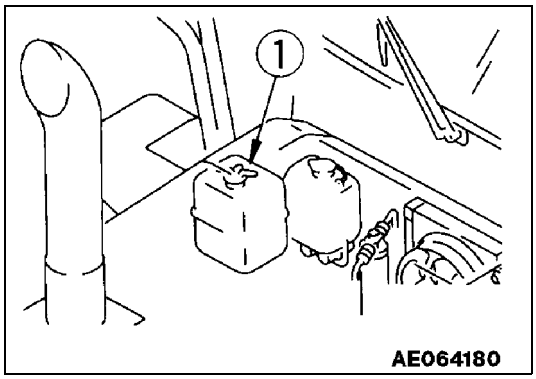
⚠ WARNING

Always wait for the engine to cool down before checking the water level. When checking the water level, check the radiator overflow subtank.

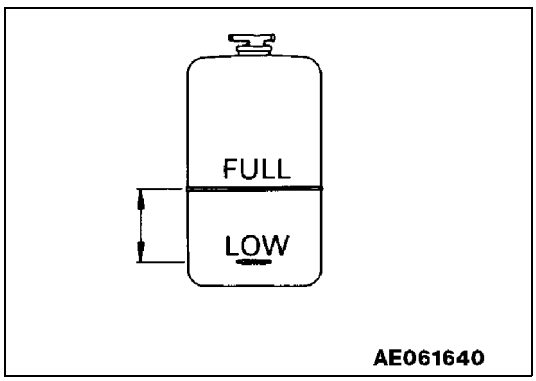
1. Open the top cover at the front of the engine hood in the middle of the machine, and check that the coolant level is between the FULL and LOW marks on the sub-tank (1). If the coolant level is low, add coolant to the FULL mark through the filler in the sub-tank.

   For complete coolant specifications See "20.6 COOLANT SPECIFICATIONS" on page 3-12

2. After adding coolant, tighten the filler cap securely.



NOTE: If the sub-tank was empty or the volume of coolant added was more than usual, then check for possible leaks. Ensure that engine oil is not present in the coolant.

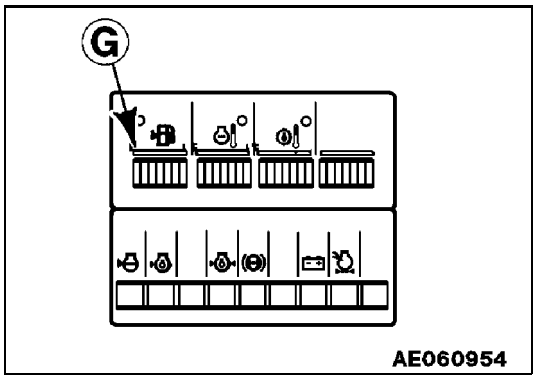


CHECK THE FUEL LEVEL

⚠ WARNING

When adding fuel, never let the fuel overflow or a fire could result. Clean up any fuel spills immediately.

1. Turn the engine starting switch to the ON position, then check the fuel level on the fuel gauge (G). After checking the fuel level, return the starting switch to the OFF position.



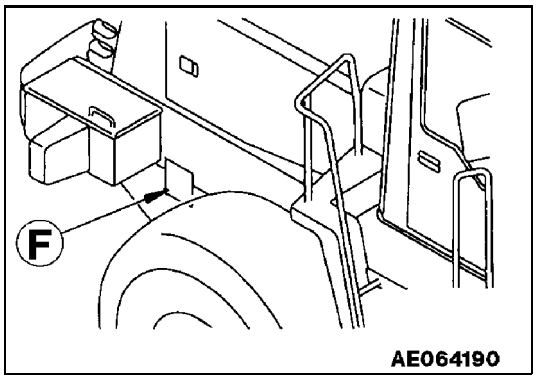
2. Add the fuel through the filler (F).

For details of the method of opening and closing the fuel cap, See **11.5 CAP WITH LOCK on page 2-29.**

3. After adding the fuel, tighten the cap securely.

FUEL CAPACITY: 390 liters (102.96 U.S. gallons)

NOTE: To eliminate moisture or corrosion in the fuel tank, fill it with fuel before storing the machine.



INSPECT THE ENGINE COOLING FAN

⚠ WARNING

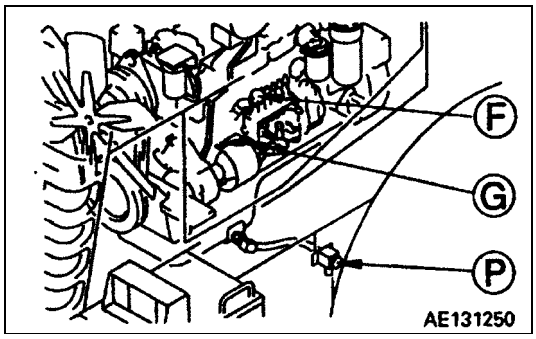
Personal injury can result from fan blade failure. Never pull or pry on the engine fan or the fan blade damage and failure may result.

CHECK THE ENGINE OIL LEVEL

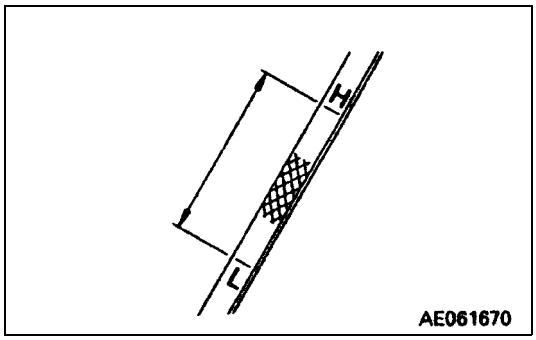
1. Open the engine side cover at the right rear side of the machine.

2. Remove the dipstick (G) and wipe off the oil with a clean cloth.

3. Reinsert the dipstick (G) fully in the tube, and then remove the dipstick again.



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



For the correct oil to use, **See "20.1 PROPER SELECTION OF FUEL, COOLANT AND LUBRICANTS" on page 3-9 .**

5. If the oil level is above the H mark, open the drain plug (P) and drain the excess oil. Close the drain plug (P) and recheck the oil level.

6. If the oil level is correct, tighten the oil filler cap securely, then tighten the engine side cover.

REMARK

Before checking the oil level, ensure that the machine is on a horizontal surface.

Wait at least 15 minutes after the engine has stopped before checking the oil level. This step allows the oil in the upper part of the engine to drain back to the oil pan so that an accurate reading can be taken.

CHECK THE ELECTRICAL WIRING

WARNING

Frequently blown fuses, or if there are signs of arcing, indicate an electrical short circuit may be the cause. Locate the cause and repair it.
Accumulation of all flammable material (dead leaves, twigs, grass, etc.) around the battery may cause fire, so always remove such material.

Check for damaged fuses and any sign of disconnection or short circuit in the wiring. Check also for loose parts. Check the following points carefully.

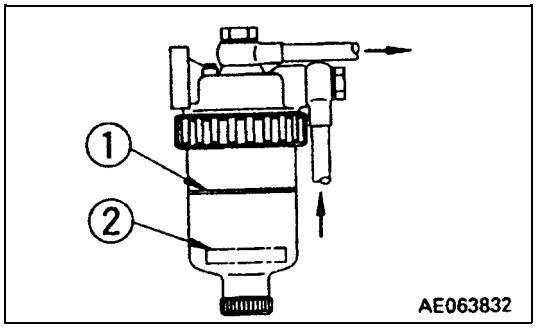
- Battery
- Starting motor
- Alternator

When performing walk-around checks before starting, always check for an accumulation of flammable material around the battery. If found, remove the flammable material. Please contact your distributor for investigation and correction of the cause.

CHECK FOR WATER AND SEDIMENT IN THE WATER SEPARATOR (if equipped)

The water separator separates the water from the fuel so that only fuel is delivered to the combustion chamber. If the float (2) is at or above the red line (1), drain the water from the separator.

If a machine is equipped with a water separator, the water from the fuel tank must still be emptied before starting the machine each day.



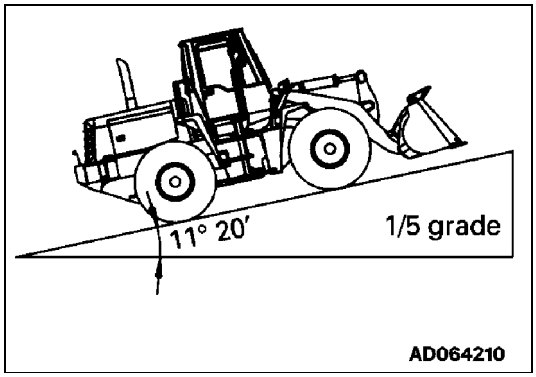
CHECK THE PARKING BRAKE

⚠ WARNING

Even if the parking brake switch is turned ON, keep the brake pedal depressed until the parking brake pilot lamp lights up.

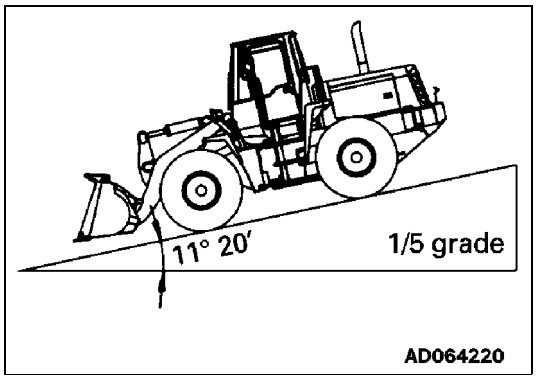
Measurement conditions

Tire inflation pressure:	Specified pressure
Road surface:	Dry paved surface with 1/5 (11
Machine:	Operating condition



Method of measurement

1. Start the engine, set the machine facing straight to the front, then drive the machine up 1/5 grade with the bucket empty.
2. Depress the brake, stop the machine, return the directional lever to the neutral position, then stop the engine.
3. Press the parking brake switch to the ON position, release the brake pedal slowly.



CHECK THE WHEEL BRAKES

Drive the machine at a speed of 20 km/h (12.4 mph) on a dry, flat concrete road surface. After applying the brakes, check the stopping distance, which should be less than 5 m (16.4 ft).

CHECK SOUND OF HORN AND BACKUP ALARM

CHECK FLASHING OF LAMPS, CHECK FOR DIRT AND DAMAGE

CHECK ENGINE EXHAUST COLOR AND SOUND

CHECK OPERATIONS OF GAUGES

CHECK STEERING WHEEL PLAY, CHECK OPERATION OF STEERING

CHECK DIRECTION OF REAR VIEW MIRROR, CHECK FOR DIRT OR DAMAGE

CHECK TIRE INFLATION PRESSURE

Using a tire pressure gauge, measure the pressure of all tires before starting work each day.

Check the tires and rims for wear and damage.

Check for loose wheel hub nuts (bolts). The proper tire inflation pressure is shown below.

Tire Size	Inflation pressure
23.5-25-20PR (L3 rock) standard	Front tire: 0.39 MPa (4.0 kgf/cm^2) Rear tire: 0.31 MPa (3.2 kgf/cm^2)
26.5-25-16PR (L3 rock) optional	Front tire: 0.34 MPa (3.5 kgf/cm^2) Rear tire: 0.29 MPa (3.0 kgf/cm^2)

12.1.3 ADJUSTMENT BEFORE OPERATION
ADJUSTING OPERATOR'S SEAT

⚠ WARNING

Park the machine in a safe place and stop the engine when carrying out adjustment of the operator's seat.
Adjust the seat before starting operations or when changing operators.
Check that you can depress the brake pedal fully with your back against the seat backrest.

A: Forward-backward adjustment
Pull lever (1) up, and move the seat to the desired position, then release the lever to lock in place.
For-and-aft adjustment: 120 mm (4.7 in.) (16 mm (0.63 in.) x 10)

B: Adjusting the seat angle

Pull the lever (2) up and push down on the rear of the seat to tilt it backwards.
Push the lever (2) down and push down on the front of the seat to tilt it forward.
Range of adjustment: 13

C: Adjusting the seat weight

Turn grip (3) to adjust the strength of the suspension.
Adjustment range: (Target) 50 kg - 120 kg (110.3 - 264.6 lb)

D: Adjusting the backrest angle

Move the lever (4) and move the backrest to the front or rear.
Adjustment range: Front 24

E: Seat height adjustment

Move the lever (2) up/down, then move the seat up or down as desired. Because the lever (2) is also used for adjusting the seat angle, set the seat to the desired height while adjusting the angle.
Adjustment range: 60 mm (2.36 in)

F: Adjusting the headrest height

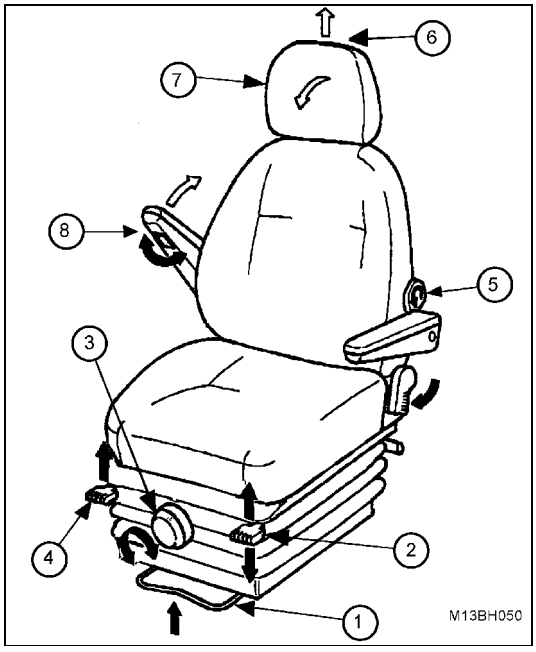
Move the headrest up and down to the desired height.
Adjustment range: 50 mm (2 in.)

G: Adjusting the headrest angle

Adjustment: 60

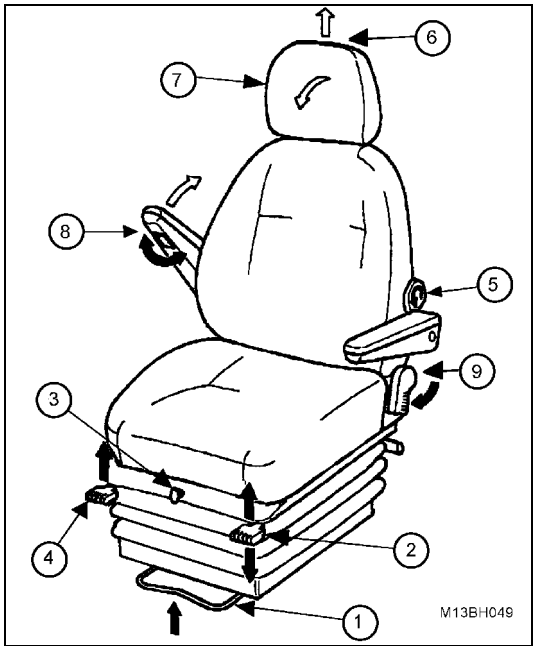
H: Adjusting the armrest angle
Adjust angle of the armrest by rotating knob (5) (left side only).
Adjustment range: 30

Also, when the armrest is turned, it will spring up.



AIR RIDE SUSPENSION SEAT

The optional Air Ride Seat includes a suspension system for added comfort over uneven terrain. A built-in air compressor provides the cusion of air in the seat. Controls resemble those of the standard seat, but with a few exceptions.



(1) Forward-backward adjustment

Pull the lever (1) to release the seat and then slide the seat to a position that provides comfort and accessibility to the controls. Adjustment range fore and aft: 120 mm (4.7 in.)

(2) Seat-angle adjustment

Pull the lever (2) up and push down on the rear of the seat to tilt it backwards. Push the lever (2) down and push down on the front of the seat to tilt it forward. The settings can be changed independently to suit an operator's preference.

(3) Weight adjustment

The knob (3) controls the air suspension system's air valve Push or pull the knob to adjust the suspension's strength and compensate for the operator's weight and/or preference.

(4) Height adjustment

Move the lever (2) up or down, then move the seat up or down as desired. The lever is also usedfor adjusting the seat angle. Set the seat to the desired height while adjusting the angle Move the lever (2) and tilt the backrest to the front or rear.
Height adjustment range: 60 mm (2.36 in.)
Backrest angle adjustment range: Front (24

(5) Lumbar support adjustment

Rotate the knob (9) to increase or decrease the support in the lumbar (lower back) area.

(6) Adjusting the height of the headrest

Move the headrest up and down to the desired height.
Adjustment range: 50 mm (1.96 in.)

(7) Adjusting the headrest angle

The headrest is adjustable through 60

(8) Armrest angle

Release the armrest with the control (8) on the left side and move the armrest to the desired position. The armrest can be moved vertically, if needed.
Adjustment range: 30 (forward 25 d 5

ADJUST THE SEAT BELT

Always install a seat belt on machines equipped with ROPS.

WARNING

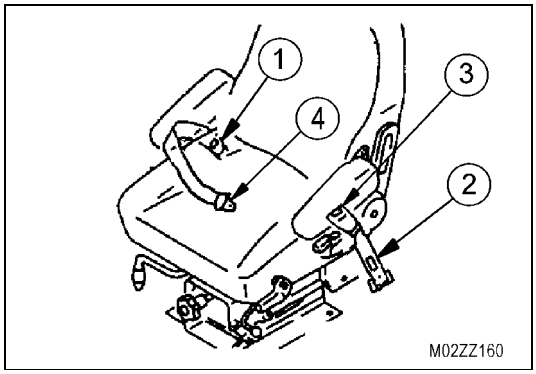
Before fitting the seat belt, check that there is no abnormality in the mounting bracket and belt mounting. If the belt is worn or damaged, replace it.
Always fasten the seat belt before starting operations.
Do not twist the left or right side of the seat belt when fastening it.

Fastening and removing the belt

1. Sit on the seat. Depress the brake pedal fully, and adjust the seat so that your back is pressedagainst the backrest.

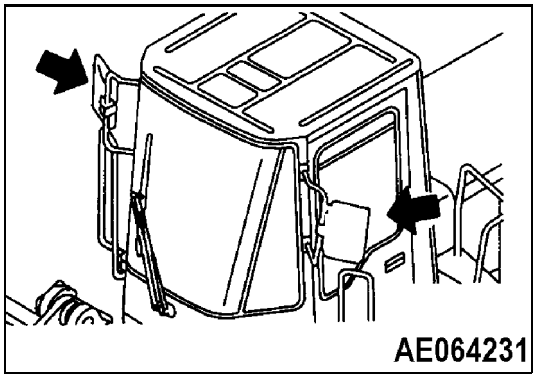
2. While still on the seat, pull the tongue end of the seat belt from the retractor (1). Insert the tongue (4) into the buckle (3). Pull the belt to check that it is securely locked.

3. To remove the belt, depress the release button on the buckle (3) and guide the tongue end of the belt into the retractor (1).

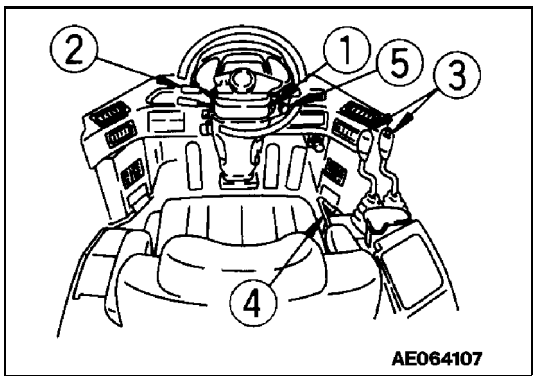


ADJUST THE REAR VIEW MIRROR

Sit in the operator's seat and adjust the rear view mirror so that you have an unobstructed view to the rear.



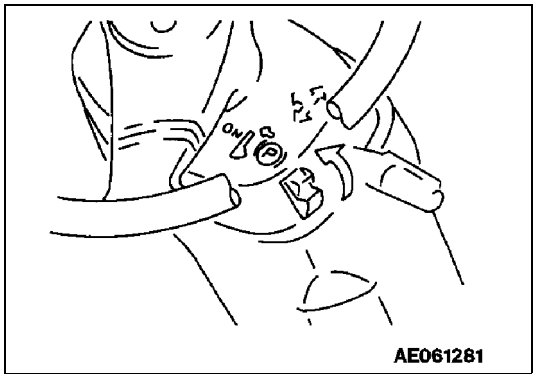
12.1.4 OPERATIONS AND CHECKS BEFORE STARTING ENGINE



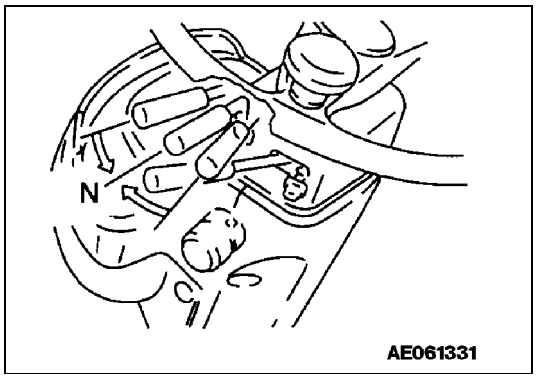
⚠ WARNING

Accidentally touching the control levers can cause the work equipment to move suddenly. When leaving the operator's compartment, always set the safety lever securely to the LOCK position. Before starting the engine, wipe off the dust atop the battery or on the starting motor and alternator with a damp cloth.

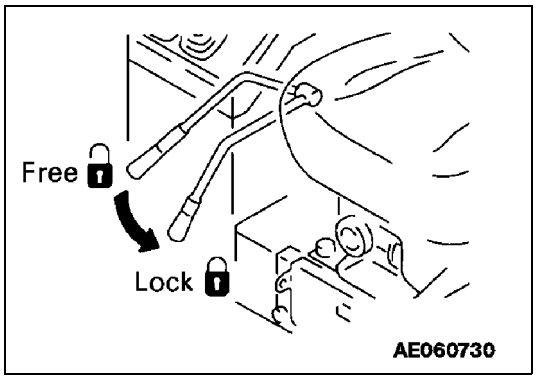
1. Ensure that the parking brake switch (1) is ON.



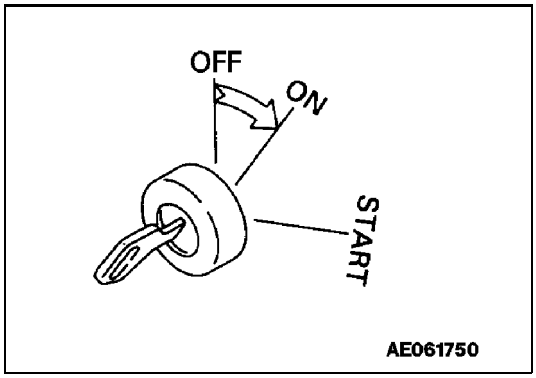
2. Check that the directional lever (2) is in the neutral position. If this lever is not in the neutral position, the engine will not start.



3. After lowering the bucket to the ground, check that the work equipment control lever (3) is locked by the safety lock (4).



4. Insert the key in the start switch (5), and turn the key to the ON position. Check that the pilot lamp lights up.



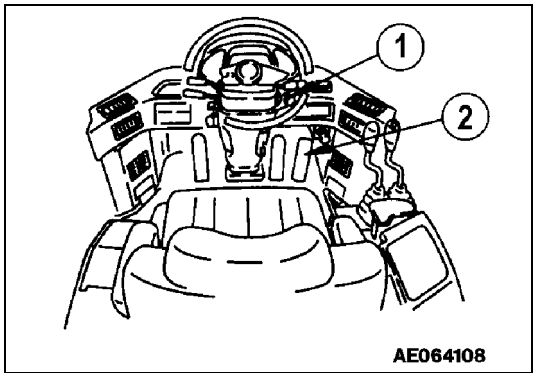
12.2 STARTING THE ENGINE

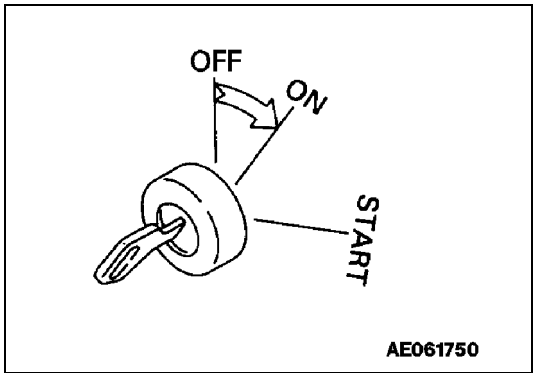
WARNING

After checking that there are no persons or obstacles in the surrounding area, sound the hound and then start the engine.

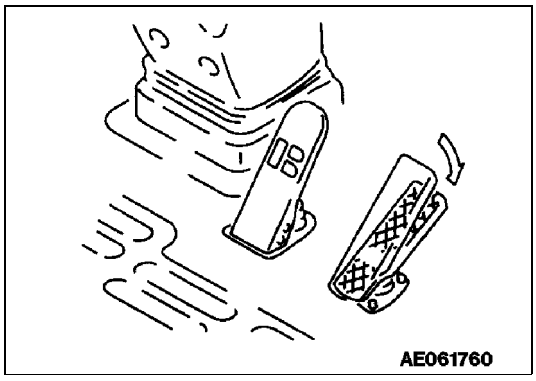
NOTE: Do not keep the starting motor rotating continuously for more than 20 seconds. If the engine will not start, wait for at least 2 minutes before trying to start the engine again.

1. With the key in the starting switch (1), turn the key to the ON position.



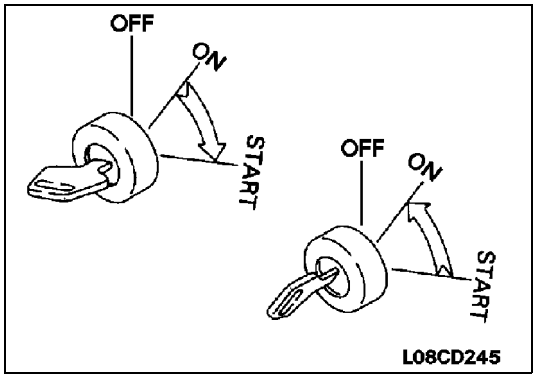


2. Depress the accelerator pedal lightly.



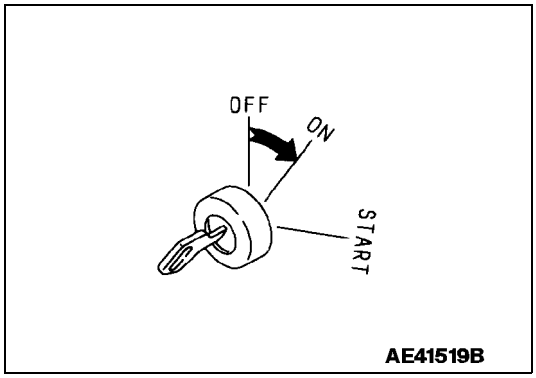
3. Turn the key to the START position.

4. After starting the engine, release the key and it will automatically return to the ON position.

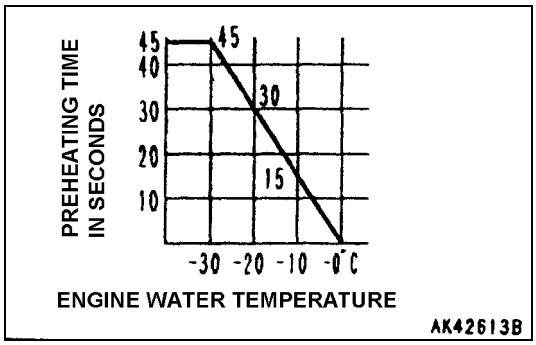


12.2.1 COLD WEATHER STARTING

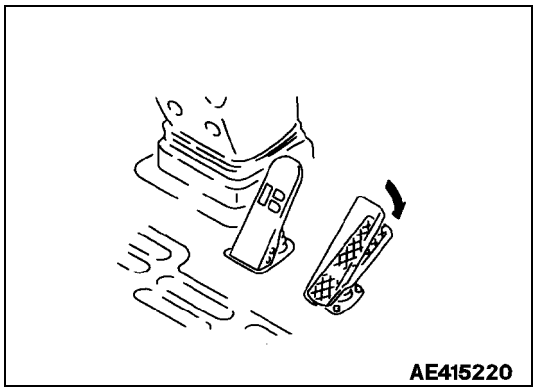
1. Turn the key in the start switch to the ON position. The preheating pilot light on the dashcomes on, indicating that the preheating process is activated.



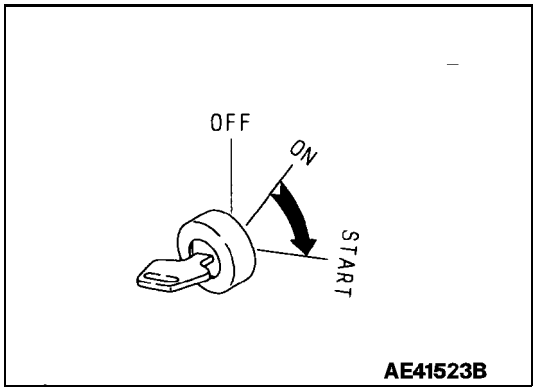
The table at the right indicates that the preheating time varies depending on the engine water temperature.



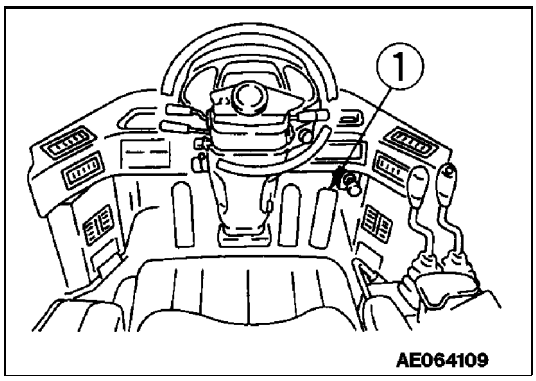
2. After the preheating pilot pilot light turns off, depress the accelerator pedal lightly.



3. Turn the key to the START position to start the engine.



12.3 OPERATIONS AND CHECKS AFTER STARTING THE ENGINE



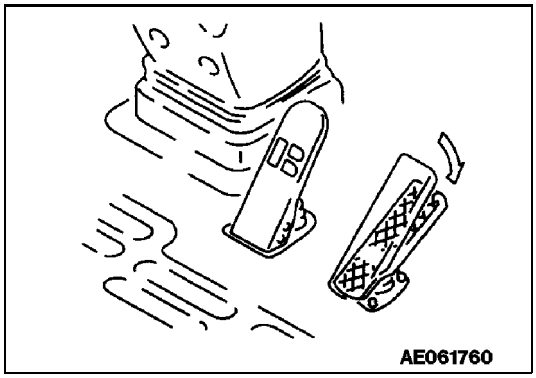
STARTING THE ENGINE

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

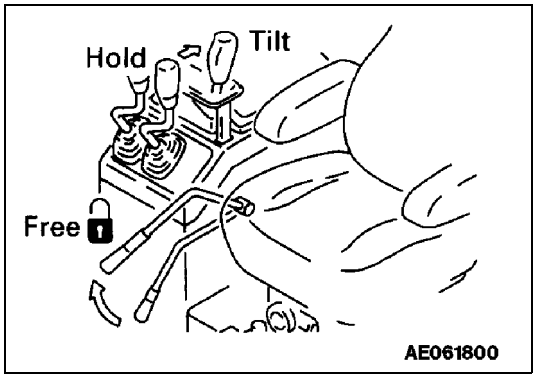
NOTE

Do not suddenly accelerate the engine before the warming-up operation is completed. Do not run the engine at low idle or high idle continuously for more than 20 minutes. If it is necessary to run the engine at idle, apply a load from time to time or run the engine at mid-range speed.

1. Lightly depress the accelerator pedal (1) with no load at mid-range for about 5 minutes.

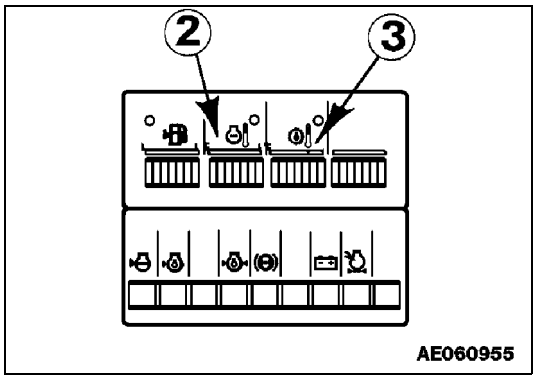


2. In cold climates, warm up the hydraulic oil. Ensure that the engine rotation is smooth. Set the safety lock on the work equipment control lever to the FREE position. Move the bucket control lever in and out of the TILT position to warm up the hydraulic oil. The relief time at the tilt position should be a maximum of 10 seconds. With this operation, the oil will reach the relief pressure and quickly warm up the hydraulic oil.



3. After performing the warm-up operation, check that the gauges and caution lamps are normal. If any defect exists, repair it.

4. Run the engine under a light load until the engine water temperature gauge (2) and the torque converter oil gauge (3) are in the green range.

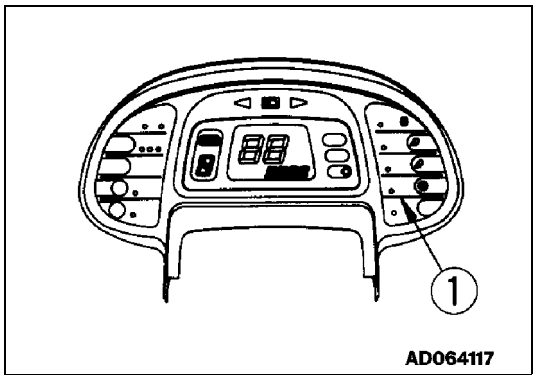


5. Check that the exhaust color, sound, or vibration is normal. If any problems exist, repair them.

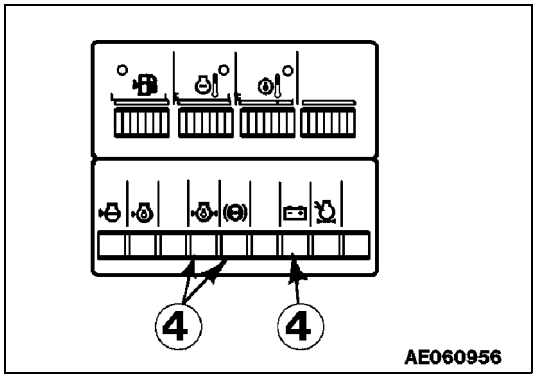
12.4 MOVING THE MACHINE

⚠ WARNING

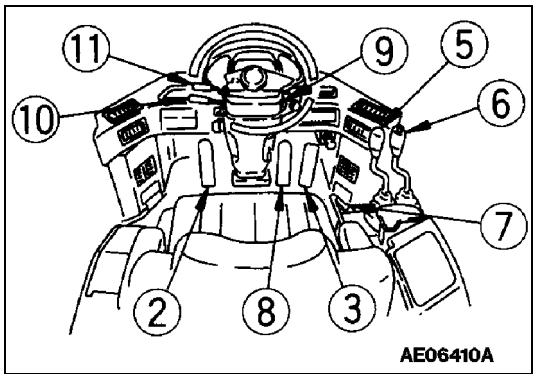
When moving the machine, check that the area around the machine is safe, then sound the horn before starting the engine. Do not allow people near the machine. A blind spot exists behind the machine, so be particularly careful when traveling in reverse. When starting the machine on a slope, set the transmission cut-off switch (1) to the OFF position, depress the left brake pedal (2) while depressing the accelerator pedal (3) , then gradually release the left brake pedal (2) to allow the machine to start.

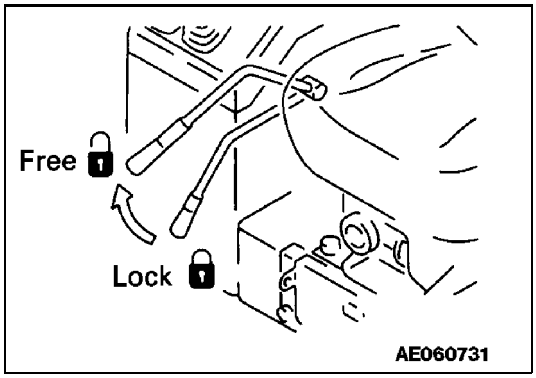


1. Check that the caution pilot lamp (4) is not lit up.

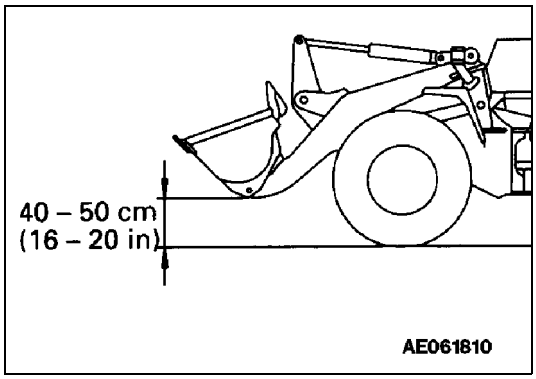


2. Set the safety lock (7) on the bucket control lever (5) and lift the arm control lever (6) to the FREE position.





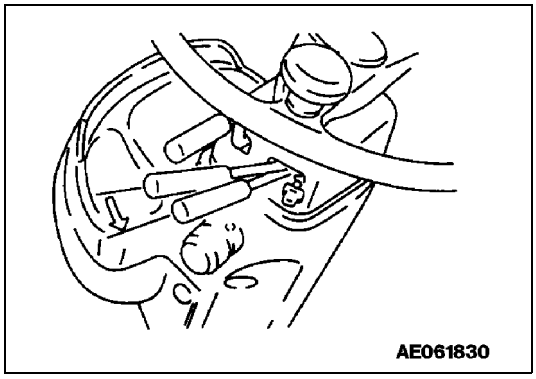
3. Operate the lift arm control lever (6) to set the work equipment to the travel mode.



4. Depress the right brake pedal (8) and turn the parking switch (9) to the OFF position to release the parking brake.

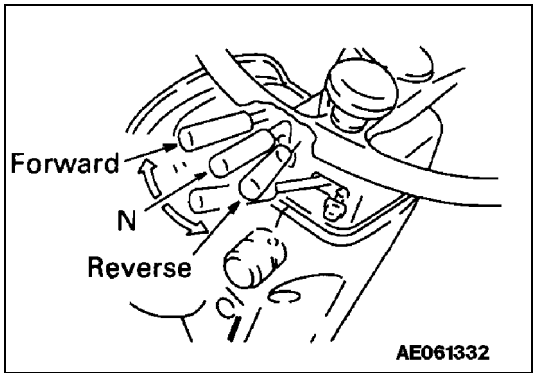
   If the parking brake remains actuated when the parking brake switch (9) is in the OFF position, turn the parking brake ON and then OFF again.

5. Set the speed control lever (10) to the desired position.



6. Set the directional lever (11) to the desired position.

7. Release the right brake pedal (8) and depress the accelerator pedal (3) to move the machine.

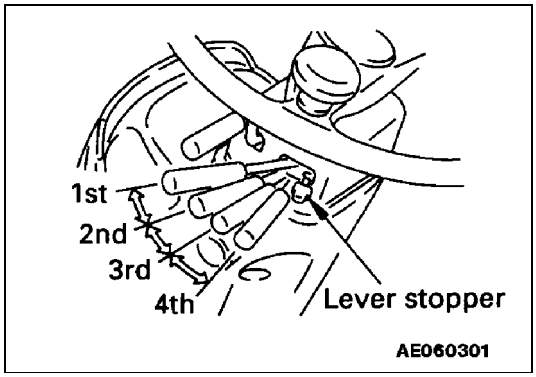


12.5 CHANGING GEAR SPEED

WARNING

When traveling at high speed, do not change the gear speed suddenly. When shifting gears, use the brake to reduce the travel speed, then shift gears.

Shift gears as follows:
Move the speed control lever (1) to the desired position.
Only 1st or 2nd speeds are used for digging and loading operations, so actuate the speed control lever stopper.



REMARKS

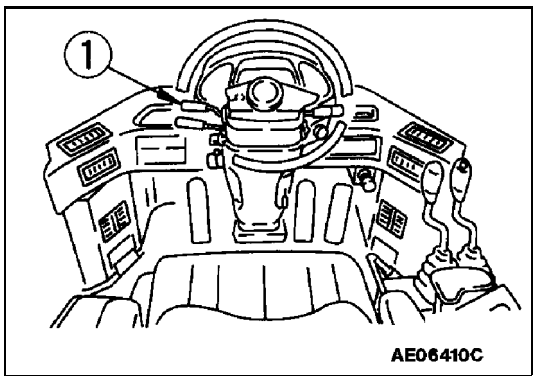
This machine is equipped with a kickdown switch that down shifts the gear to first, if the button at the tip of the lift arm control lever is pushed when the machine is traveling in 2nd gear. We recommend the use of the kickdown switch when performing digging or loading operations in first or second gear.
For details of use, **SEE "11. COMPONENT EXPLANATION" on page 2-4.**

NOTE
When operating the shift lever slowly or positioning the lever movement between the detent positions, sometimes the main motor will display error message “EO3 + CALL.” This message doesn’t indicate a malfunction. Gear shifting should be within a 2 second time frame.

12.6 CHANGING DIRECTION

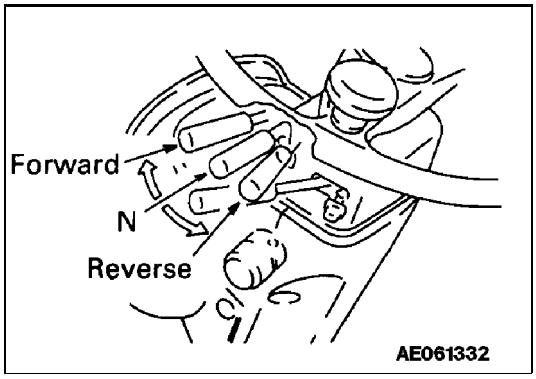
WARNING

When changing direction between FORWARD and REVERSE, check that the new direction of travel is safe. There is a blind spot behind the machine, so be particularly careful when changing direction to travel in reverse. Do not switch FORWARD and REVERSE, when traveling at high speed. When switching between FORWARD and REVERSE, depress the brake to reduce the travel speed sufficiently, then change the direction of travel. (Max. speed for changing direction: 12 km/h (7.5 mph))



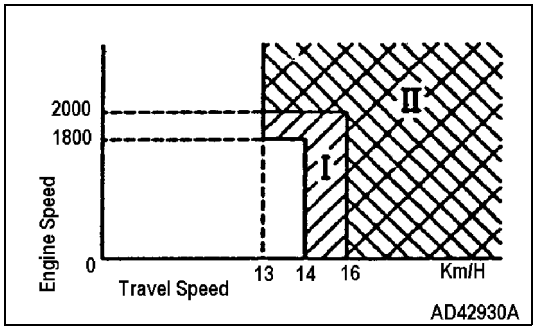
There is no need to stop the machine when switching between FORWARD and REVERSE.

Place the directional lever (1) in the desired position.



AUTO SHIFT TRANSMISSION

A warning alarm sounds for 3 seconds when changing direction while engine speed and travel speed are within Area I and II of the chart. When the alarm sounds, depress the brake pedal to reduce travel speed and then change direction. Direction change will be from F3 or R3, F4 to R4, R3 to F3, and R4 to F4.

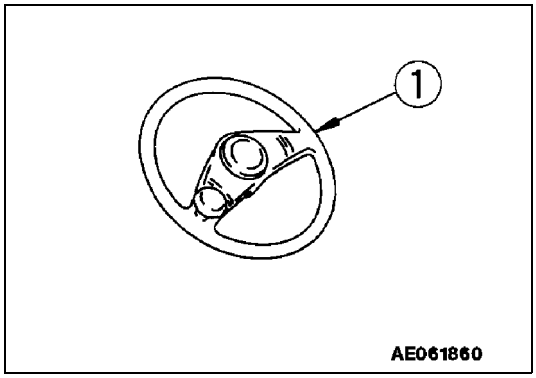


12.7 TURNING

WARNING

It is dangerous to turn the machine suddenly at high speed, or to turn on steep hills. If the engine quits while the machine is traveling, the steering wheel becomes heavy and hard to turn, so avoid killing the engine. This situation is particularly dangerous on hills, so never stop the engine while the machine is traveling. If the engine quits, stop the machine immediately at a safe place.

When traveling, use the steering wheel (1) to turn the machine With this machine, the front frame is joined to the rear frame at the center of the machine by the center pin. The front and rear frames pivot at this point , and the rear wheels follow in the same track as the front wheels when turning. Turn the steering wheel lightly to follow the machine as it turns. When turning the steering wheel fully, do not turn it beyond the end of the stroke.



12.8 STOPPING THE MACHINE

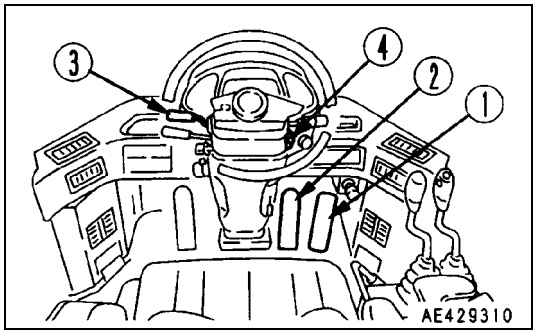
⚠ WARNING

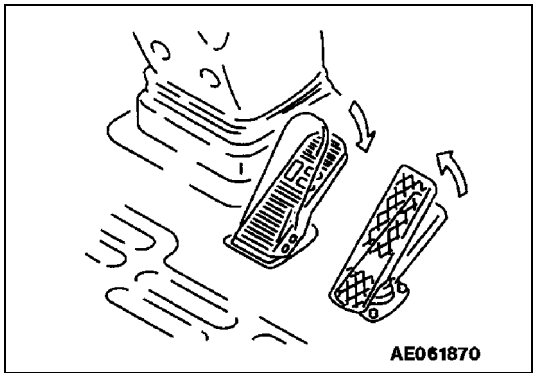
Avoid stopping suddenly. Allow ample room when stopping. Do not park the machine on the slopes. If the machine has to be parked on a slope, set it facing directly down the slope, then dig the bucket into the ground and put blocks under the tires to prevent the machine from moving.
Accidentally touching the control lever could cause an accident. Before leaving the operators seat, always set the safety lock lever securely to the LOCK position. Even if the parking brake switch is turned ON, keep the brake pedal depressed until the pilot lamps lights up.

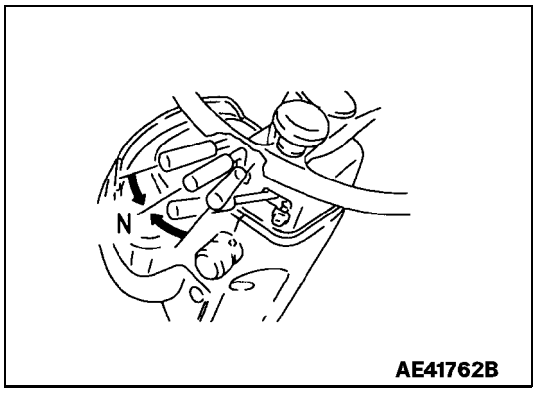
NOTE
Never use the parking brake switch to brake the machine while traveling, except in an emergency. Apply the parking brake only after stopping the machine.

1. Release the accelerator pedal (1) and depress the brake pedal (2) to stop the machine.

2. Place the directional lever (3) in the neutral position.

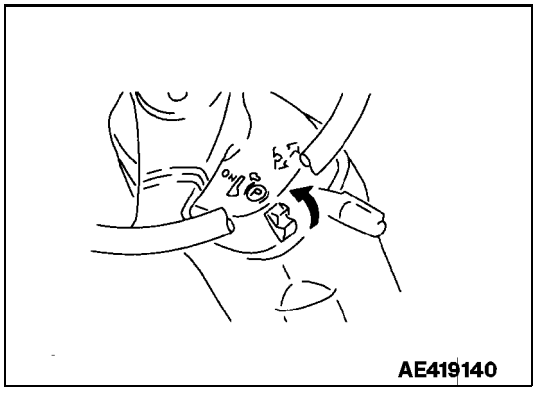






3. Turn the parking brake switch (4) ON to apply the parking brake.

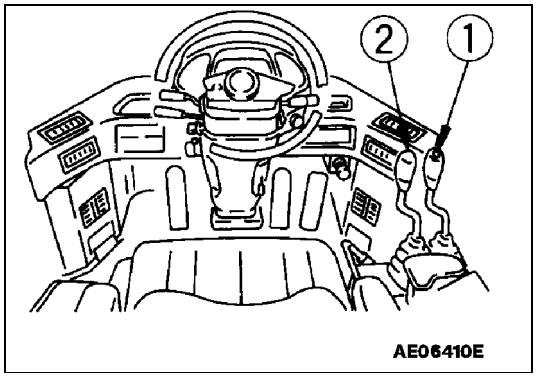
REMARKS
After applying the parking brake, the transmission automatically returns to neutral.



12.9 WORK EQUIPMENT OPERATION

12.9.1 STANDARD WORK EQUIPMENT CONTROLS

The lift arm control lever (1) and the bucket control lever (2) can be used to operate the lift arm and bucket as follows.



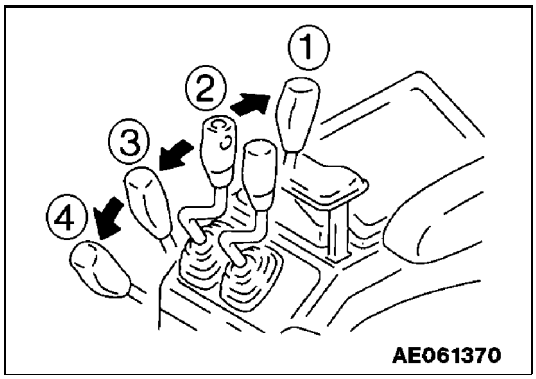
LIFT ARM OPERATION (LEVER (1))

(1) RAISE ( ):

(2) HOLD ( ): The lift arm is kept in the same position.

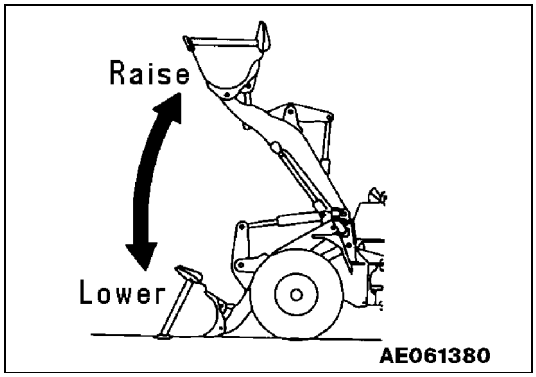
(3) LOWER ( )

(4) FLOAT ( ): The lift arm moves freely under external force.



When the lift arm control lever is pulled farther from the raised portion, the lever is stopped in this position until the lift arm reaches the preset kickout position, and the lever is returned to the hold position.

NOTE
Do not use the float position when lowering the bucket.

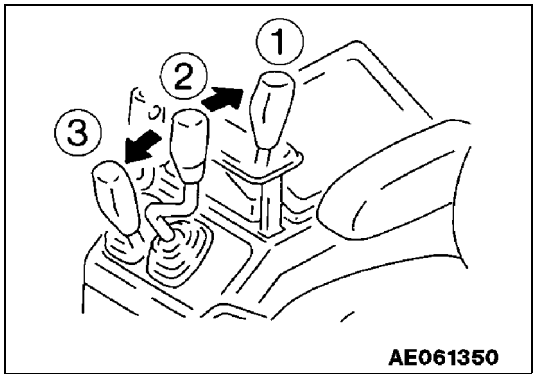


BUCKET OPERATION (LEVER (2))

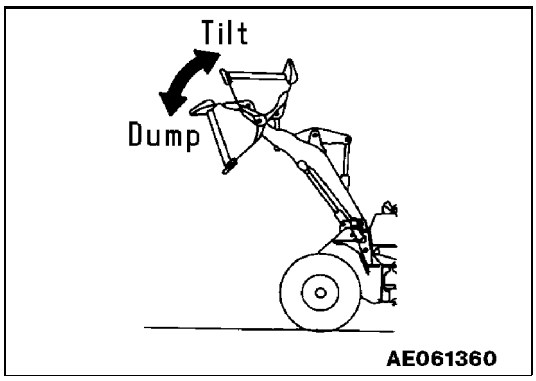
(1) TILT ( ):

(2) HOLD ( ): The bucket is kept in the same position.

(3) DUMP ( )

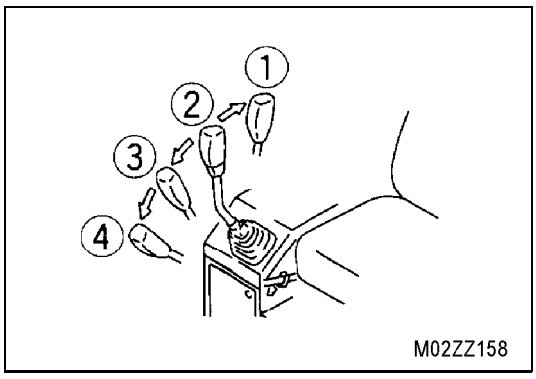


When the bucket control lever is pulled further from the tilt position, the lever is stopped in this position until the bucket reaches the preset position of the positioner, and the lever is returned to the hold position.



12.9.2 MONO-LEVER WORK EQUIPMENT CONTROLS

With the optional mono-lever controls, the work equipment lever (1) can be used to operate the lift arm and bucket as follows.



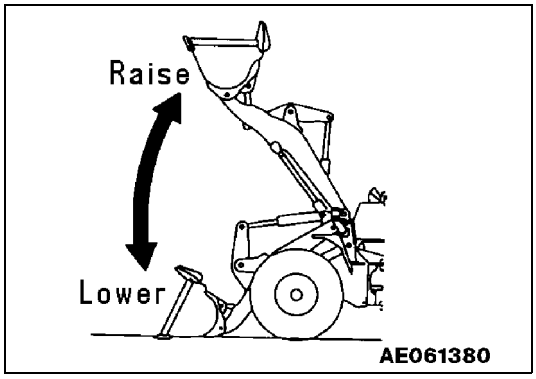
LIFT ARM OPERATION (LEVER)

(1) RAISE ( )

(2) HOLD ( ): The lift arm is kept in the same position.

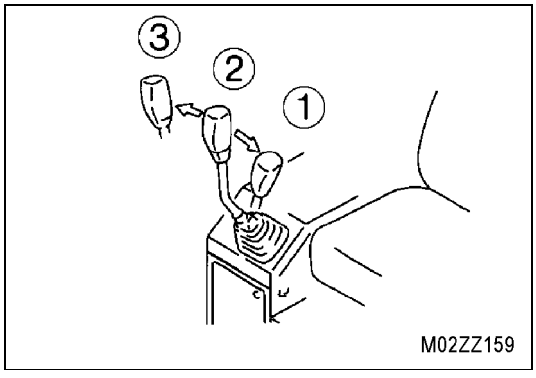
(3) LOWER ( )

(4) FLOAT ( ): The lift arm moves freely under external force.



When the lift arm control lever is pulled further from the raise position, the lever is stopped in this position until the lift arm reaches the preset kick-out position, and the lever is returned to the hold position.

NOTE:
Do not use the FLOAT position when lowering the bucket.



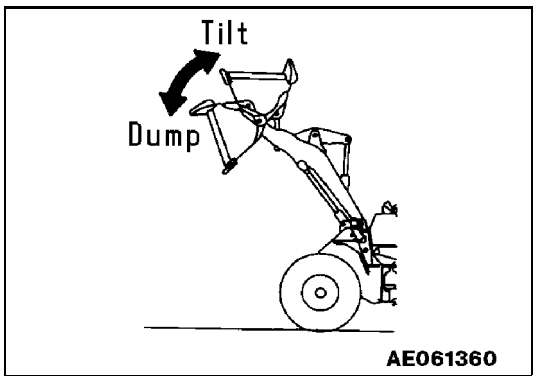
BUCKET OPERATION (LEVER)

(1) TILT ( )

(2) HOLD ( ): The bucket is kept in the same position.

(3) DUMP ( )

When the bucket control lever is pulled further from the tilt position, the lever is stopped in this position until the bucket reaches the preset position of the positioner, and the lever is returned to the hold position.



12.10 WORK POSSIBLE USING A WHEEL LOADER

Using various attachments increases the range of applications, in addition to the following:

WARNING

Always set the machine facing directly to the front when carrying out digging or scooping operations. Never perform these operations with the machine articulated.

12.10.1 DIGGING OPERATIONS

NOTE: If the tires slip, the life of the tires will be reduced. Avoid slipping or spinning the tires when operating the machine.

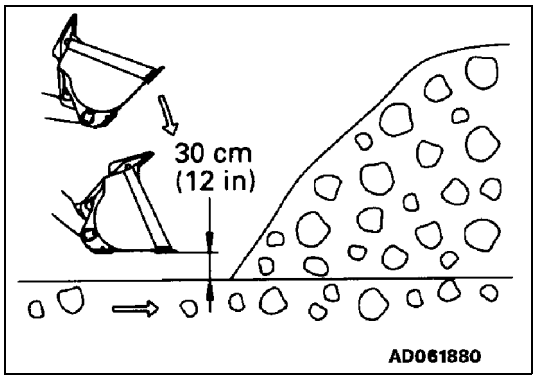
When loading piled soil or blasted rock, drive the machine forward as follows to load. To prevent the tires from becoming cut because of the tires slipping, be careful of the following points.

Always keep the jobsite flat, and remove any fallen rocks.

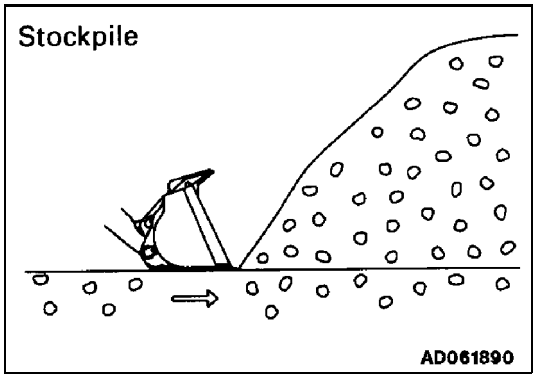
When working with stockpiles, operate the machine in 1st or 2nd; when loading blasted rock, operate in 1st.

1. When driving forward and lowering the bucket, stop the bucket about 30 cm (12 in.) from the ground, then lower it slowly.

REMARKS
If the bucket hits the ground, the front wheels will raise up and the tires will slip.



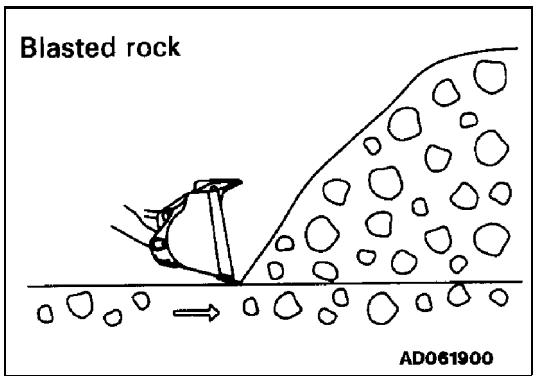
2. Shift down immediately in front of the material to be loaded. When completing the shift down, depress the accelerator pedal at the same time and thrust the bucket into the load.



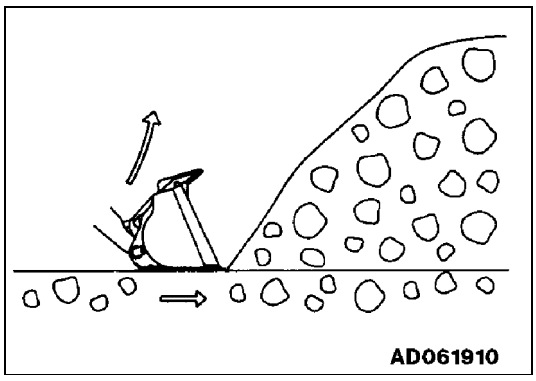
3. When the material is in a stockpile, keep the cutting edge of the bucket horizontal; when loading blasted rock, have the bucket tilted slightly down.

   Be careful not to get blasted rock under the bucket, or the front tires will come off the ground and slip.

   Try to keep the load in the center of the bucket, or the load will become unbalanced.

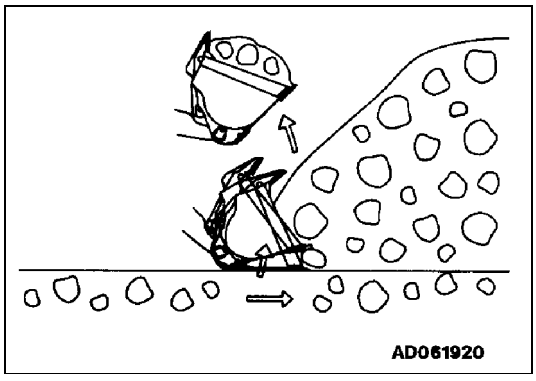


4. While thrusting the bucket into the material, raise the lift arm to prevent the bucket from going in too far. Raising the lift arm provides ample traction for the front tires.

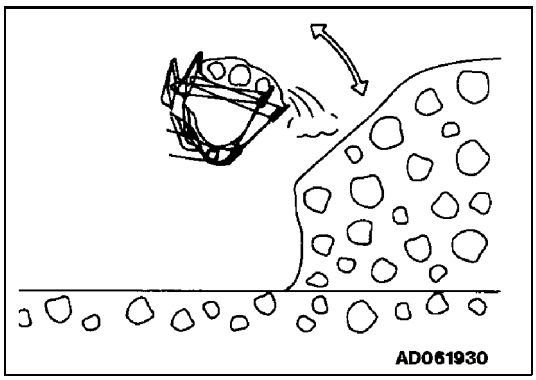


5. Check that there is enough material loaded into the bucket, then operate the bucket control lever to tilt the bucket up.

REMARKS
Moving the bucket edge up and down while pushing it in and digging could cause the front tires wheels to raise up and slip.

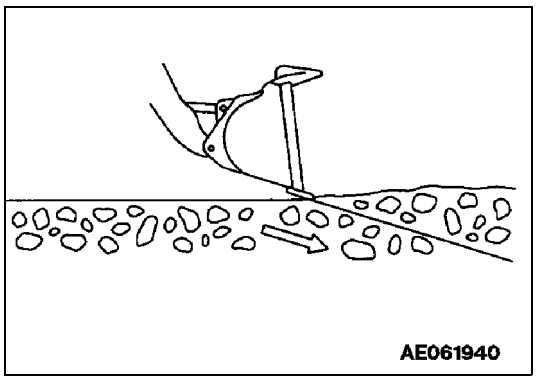


6. If too much material is loaded in the bucket, tilt and dump the bucket quickly to remove the excess load. This action prevents the load from spilling while hauling.

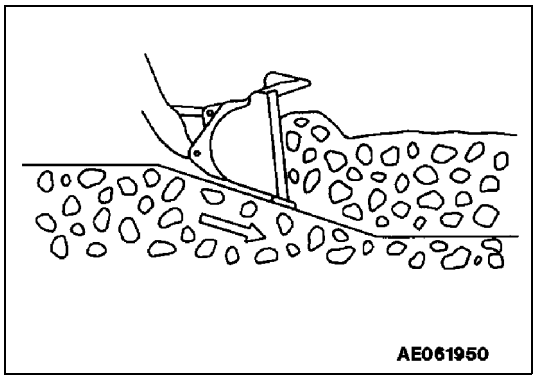


When digging and loading on level ground, set the bucket edge face down slightly and drive the machine forward. Always be careful not to load the bucket on one side, causing an unbalanced load. Perform this operation in first gear.

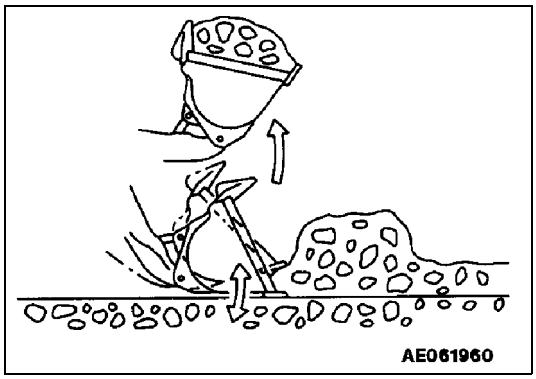
1. Set the bucket edge in a slightly face down position.



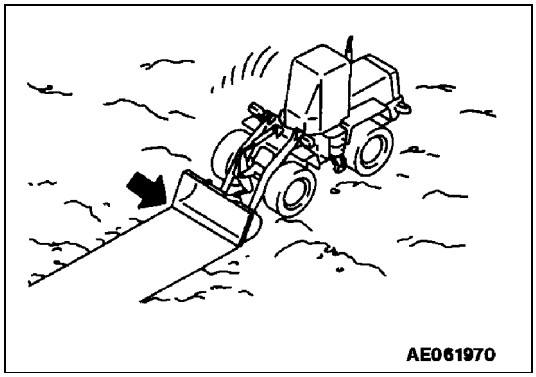
2. Drive the machine forward and operate the lift arm control lever forward to cut a thin layer of the surface each time when excavating the soil.



3. Operate the lift arm control lever slightly up and down to reduce the resistance when driving the machine forward. When digging with the bucket, avoid imposing the digging force onto only one side of the bucket.



12.10.2 LEVELING OPERATIONS



NOTE
Always operate the machine in reverse when performing leveling operations.

If it is necessary to perform the leveling operations when traveling forward, do not set the bucket dumping angle to more than 20

1. Scoop the soil into the bucket. Move the machine backward while spreading the soil from the bucket, little by little.
2. Go over the spread soil with the bucket teeth touching the ground. Level the ground by back-dragging.
3. After scooping more soil into the bucket, put the lift arm in float and level the bucket at ground level. Smooth the ground by moving backwards.

12.10.3 PUSHING OPERATION

NOTE:
Never set the bucket to the DUMP position when performing the pushing operation.

When performing the pushing operations, set the bottom of the bucket parallel to the ground surface.

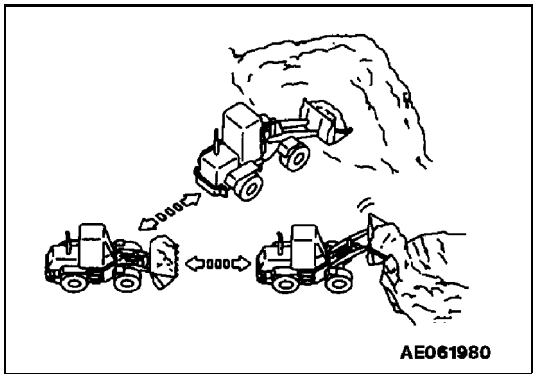
12.10.4 LOAD AND CARRY OPERATIONS

WARNING

When carrying a load, lower the bucket to lower the center of gravity while traveling.

The load and carry method for wheel loaders consist of a cycle of scooping - hauling - loading (into a hopper, pit, etc.)
Always keep the travel path maintained.

When using the load and carry method**, See 12.18 HANDLING TIRES on page 2-76.**



12.10.5 LOADING OPERATIONS

WARNING

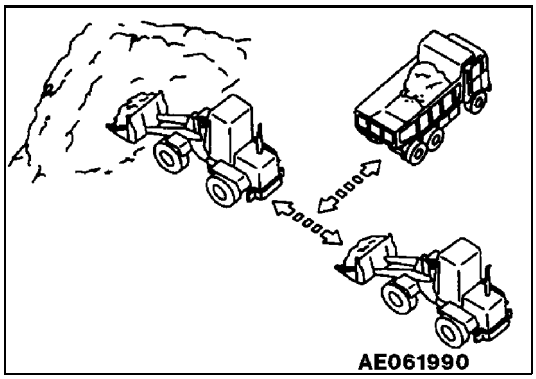
Select the method of operation that will give the minimum amount of turns and travel, providing the most efficient method for the jobsite.

NOTE
If the tires slip, the life of the tires will be reduced. Thus, avoid slipping or spinning the tires during operation.

Avoid excess shaking of the bucket.

CROSS-DRIVE LOADING
Always set the wheel loader facing at a right angle to the stock pile. After digging in and scooping up the load, drive the machine straight back in reverse, then bring the dump truck in between the stock pile and the wheel loader.

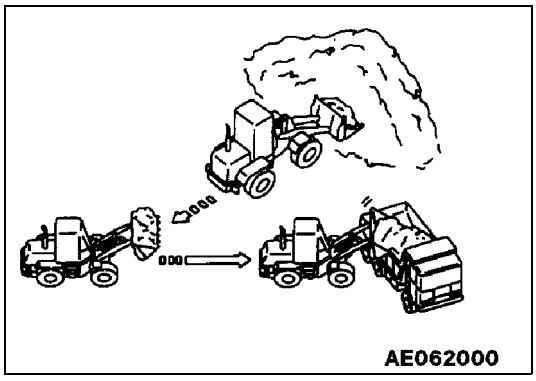
This method requires the least time for loading, and is extremely effective in reducing the cycle time.



V-SHAPE LOADING
Position the dump truck so that the direction of approach of the wheel loader is approximately 60
to the stockpile. After loading the bucket, drive the wheel loader in reverse, then turn it to face the dump truck and travel forward to load the dump truck.

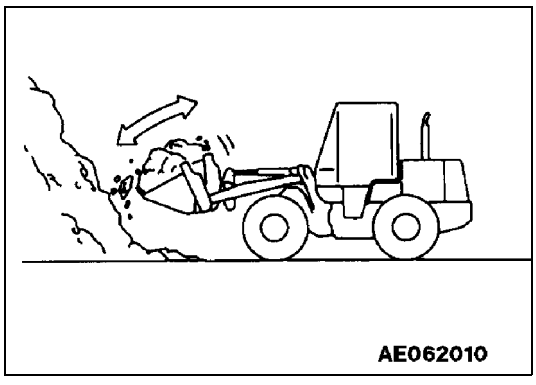
The smaller the turning angle of the wheel loader is, the more efficient the operation becomes.

When loading a full bucket and raising it to maximum height, first shake the bucket to stabilize the load before raising the bucket This will prevent the load from spilling to the rear.



Precautions when piling up loads
When forming products into a pile, be careful not to let the rear counterweight come into contact with the ground.

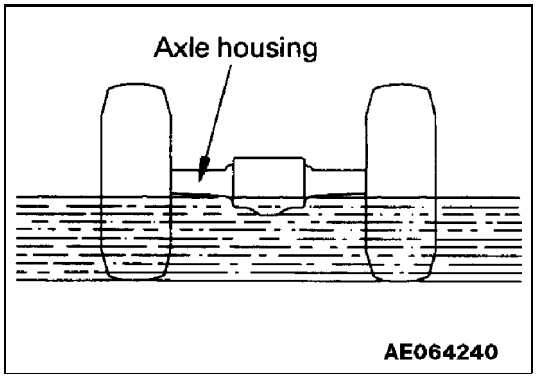
Do not set the bucket to the DUMP position when performing piling-up operations.



12.11 PRECAUTION FOR OPERATION

12.11.1 PERMISSIBLE WATER DEPTH

When working in water or on swampy ground, do not let the water come above the bottom of the axle housing. After finishing the operation, wash and check the lubricating points.



12.11.2 IF WHEEL BRAKES DO NOT WORK

If the machine is not stopped by depressing the brake pedal, use the parking brake to stop the machine.

NOTE:
If the parking brake has been used as an emergency brake, contact your distributor to have the parking brake checked for any abnormality.

12.11.3 PRECAUTIONS WHEN DRIVING UP OR DOWN SLOPES

LOWER THE CENTER OF GRAVITY BEFORE TURNING

When turning on slopes, lower the work equipment to lower the center of gravity before turning. It is dangerous to turn the machine with the work equipment raised.

BRAKING ON DOWNHILL SLOPES

If the service brake is used too frequently when traveling downhill, the brake may overheat and be damaged. To avoid this problem, downshift to a lower range and make full use of the braking force of the engine.

When braking, use the right brake pedal.

If the speed control lever is not placed in a proper speed position, the torque converter oil may overheat. If it overheats, place the speed control lever in the next lower gear to lower the oil temperature.

If the temperature gauge does not indicate the green range of the scale and the lever is in 1st speed, stop the machine. Place the lever in neutral, and run the engine at medium speed until the gauge indicates the green range.

IF THE ENGINE STOPS

If the engine stops on a slope, fully depress the right brake pedal. Next, lower the work equipment to the ground and apply the parking brake. Then, put the directional and speed control levers in neutral, and start the engine again. If the directional lever is not in neutral, the engine will not start.

12.11.4 PRECAUTIONS WHEN DRIVING THE MACHINE

When the machine travels at high speed for a long distance, the tires become extremely hot. This situation causes premature tire wear. Thus, avoid high-speed, long-distance trips. If the machine must be driven for a long distance, take the following precautions.

Follow the regulations relating to this machine, and drive carefully.

Before driving the machine, perform the checks before starting.

The most suitable tire pressure, travel speed, or tire type differ according to the condition of the travel surface. Contact your distributor or tire dealer for information.

The following is a guide to suitable tire pressures and speeds when traveling on a paved surface with standard tires.

Tire pressure (front and rear): (3.5 kg/cm^2, 49.7 psi)

Speed: 14 km/h (8.7 mph)

Check the tire pressure before starting the trip, when the tires are cool.

After traveling for 1 hour, stop for 30 minutes. Check the tires and other parts for damage; also check the oil and coolant levels.

Always travel with the bucket empty.

Never put dry ballast in the tires when traveling.

12.12 ADJUSTING THE WORK EQUIPMENT POSTURE

WARNING

Stop the machine on flat ground and put the blocks in front and behind the wheels. Apply the parking brake. Secure the front and rear frames with safety bar. Never go under the work equipment when the arm is raised.

The boom kickout makes it possible to set the bucket so that it automatically stops at the desired lifting height (lift arm higher than horizontal) and the bucket positioner makes it possible to set the bucket so that it automatically stops at the desired digging angle.

The setting can be adjusted to match the working conditions.

12.12.1 ADJUSTING THE BOOM KICKOUT

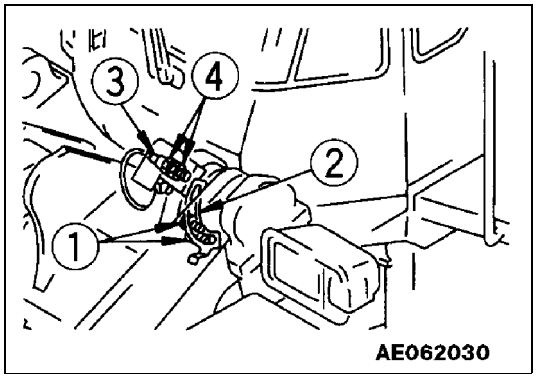
1. Raise the bucket to the desired height. Set the lift arm control lever at Hold and lock the lever in position. Then stop the engine and adjust as follows.

2. Loosen the two bolts (1), and adjust the plate (2) so that the bottom edge aligns with the center of the sensing surface of the proximity switch (3). Tighten the nuts to the plate.

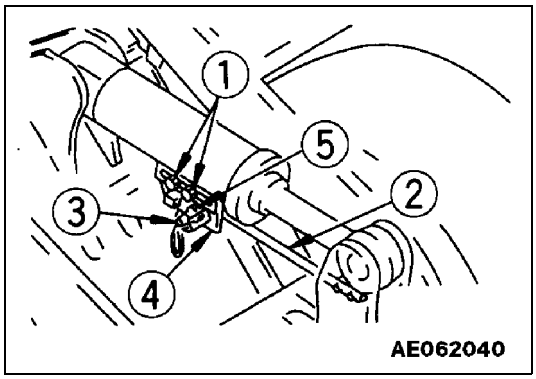
3. Loosen the two nuts (4) and make a clearance from 3 to 5 mm (0.12 to 0.20 in) between the plate (2) and the sensing surface of the proximity switch (3). Tighten the nuts.

Tightening torque: 17.2 ± 2.5 N

4. After adjusting, start the engine and operate the lift arm control lever. Check that the lever automatically returns to HOLD when the bucket reaches the desired height.



12.12.2 ADJUSTING THE BUCKET POSITIONER



1. Lower the bucket to the ground and adjust the bucket to the desired digging angle. Set the bucket control lever at HOLD, stop the engine and adjust as follows.

2. Loosen the two bolts (1) and adjust the mounting bracket (4) of the proximity switch so that the rear tip of the angle (2) aligns with the center of the sensing surface of the proximity switch(3). Tighten the bolts to hold the bracket in position.

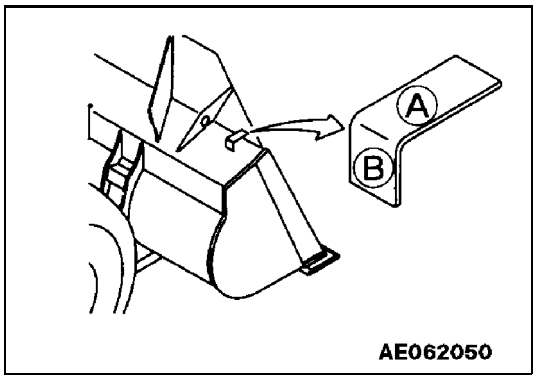
3. Loosen the two nuts (5) and adjust them to obtain from 3 to 5 mm (0.12 to 0.20 in) clearance between the bar (2) and the sensing surface of the proximity switch (3). Tighten the nuts.

Tightening torque: 17.2 ± 2.5 N

4. After adjusting, start the engine and raise the lift arm Operate the bucket control lever to the DUMP position Operate the lever to the TILT position and check that the bucket control lever automatically returns to HOLD when the bucket reaches the desired angle.

12.12.3 BUCKET LEVEL INDICATOR

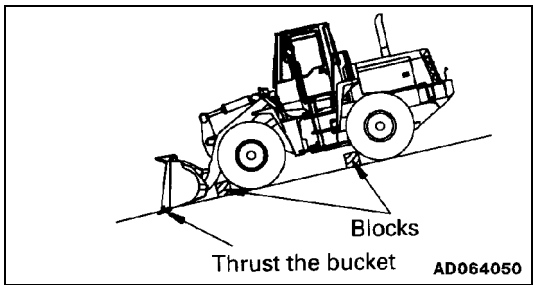
An angle iron welded to the rear of the bucket provides the operator with a visible indication of the blade angle. Side A is parallel to the cutting edge, making side B 90 g edge.



12.13 PARKING THE MACHINE

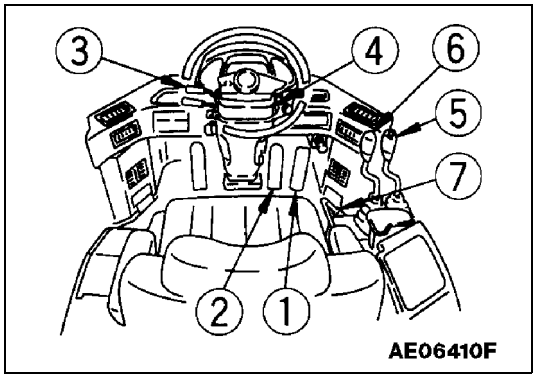
WARNING

Avoid stopping suddenly. Allow ample room when stopping. Do not park the machine on slopes. If the machine must be parked on a slope, position the machine facing directly down the slope, and dig the bucket into the ground. Finally, position the blocks under the tires to prevent the machine from moving.

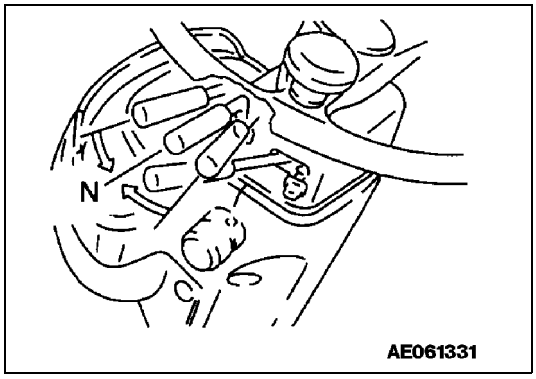


NOTE
Never use the parking brake switch to brake the machine when traveling except in an emergency. Apply the parking brake only after the machine has stopped.

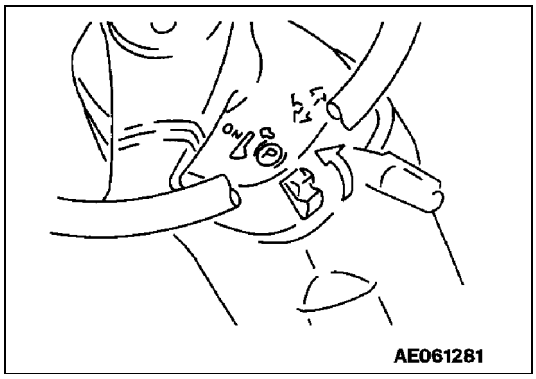
1. Release the accelerator pedal (1) and depress the brake pedal (2) to stop the machine.



2. Place the directional lever (3) in neutral.

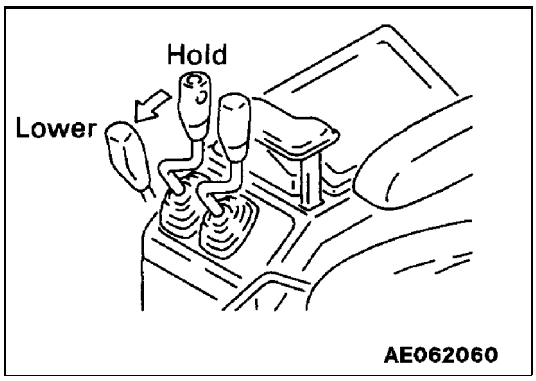


3. Turn the parking brake switch (4) ON to apply the parking brake.

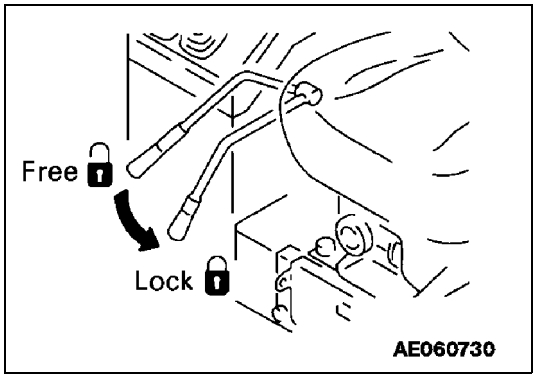


REMARKS
When the parking brake is applied, the transmission automatically returns to neutral.

4. Operate the lift arm control lever (5) to lower the bucket to the ground.



5. Lock the lift arm control lever (5) and the bucket control lever (6) with the safety lock (7).



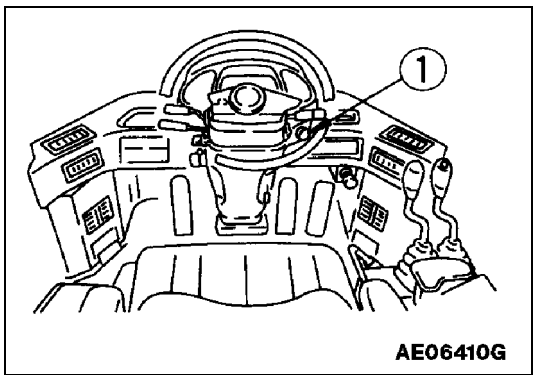
12.14 CHECKS AFTER COMPLETION OF OPERATION

Check the engine water temperature, engine oil pressure, torque converter oil temperature, and fuel level with the meter and lamps. If the engine has overheated, do not stop suddenly. Run the engine at a midrange speed to allow the engine to cool down before stopping it.

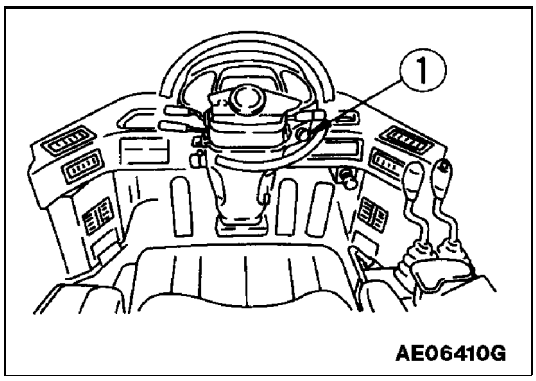
12.15 STOPPING THE ENGINE

NOTE:
If the engine is abruptly stopped before it has cooled down, engine life may be greatly shortened. Consequently, do not abruptly stop the engine, EXCEPT for an emergency. If the engine has overheated, run it at medium speed to allow it to cool gradually. Once cooled down, stop the engine.

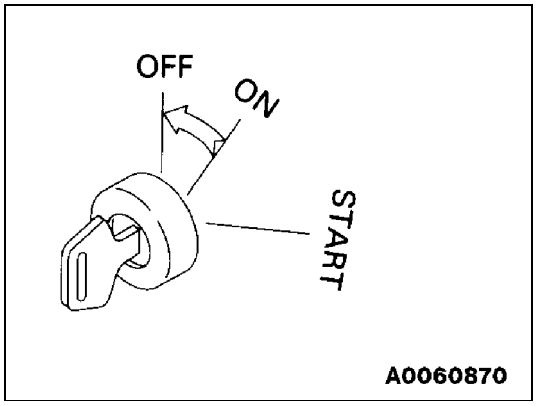
1. Run the engine at low idle for about 5 minutes to allow it to gradually cool down.



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



3. Remove the key from the starting switch (1) .



12.16 CHECK AFTER STOPPING THE ENGINE

1. Walk around the machine and check the work equipment, body work, and undercarriage and check for oil and water leaks. If any leaks exist, repair them.
2. Fill the fuel tank.
3. Remove any waste paper or leaves from inside the engine compartment because they could cause a fire.
4. Remove any mud stuck to the undercarriage.

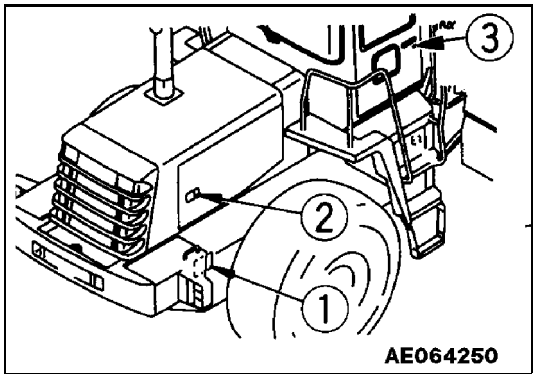
12.17 LOCKING

Always lock the following places.

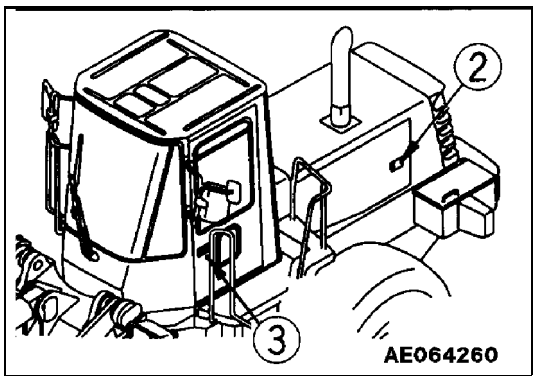
(1) = Fuel tank filler cap

(2) = Engine side panel (left, right)

(3) = Cab door



REMARKS
The starting switch key is used also for the locks at locations 1, 2, and 3.

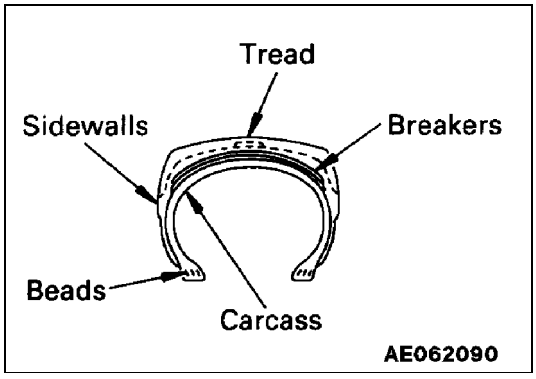


12.18 HANDLING THE TIRES

12.18.1 PRECAUTIONS WHEN HANDLING TIRES

If any of the following defects are found in a tire, replace it with a new one.

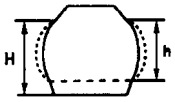
Broken or bent bead wire, or the tire is deformed.
Excessive wear and the carcass ply, excluding the breaker, is exposed for more than one-fourth of the circumference.
Separated tire layers.
Radial cracks reach the carcass.



12.18.2 TIRE PRESSURE
Measure the tire pressure before starting operations when the tires are cool.

If the tire inflation pressure is too low, the tire will be overloaded; if the pressure is too high, it will cause tire cuts and shock bursts. To prevent these problems, adjust the tire pressure, according to the table on the next page.

$$\text{Deflection ratio} = \frac{H-h}{H} \times 100$$



As a guideline, the front tire's deflection ratio (deflection/free height) when:

Carrying a normal load (lift arm horizontal): about 15-25%
Digging (rear wheels off ground): about 25 -35%

When checking the tire inflation pressure, check also for small scratches or tire peeling, for nails or pieces of metal that may cause punctures, and for any abnormal wear. Removing stones and rocks from the operating area and maintaining the surface extends tire life.

TIRE PRESSURE VARIABLES

When operating the machine on various surfaces and operations, adjust the tire pressure accordingly:

Normal road surfaces, rock digging: high end of range in air pressure chart.
Stockpile operations, soft ground: average air pressure in air pressure chart.
Sand, not much digging force: low end of range in air pressure chart.

If tire deflection is excessive, raise the inflation pressure within the limits given in this table (see deflection ratio).

Tire size (pattern)	Ply rating	Inflation pressure (kg/cm^2)			
		Soft or sandy ground	Normal road		Shipped from factory
			Stockpile	Digging	
20.5-25 (L. rock)	16	2.6-3.8	2.8-4.5	2.8-4.5	Front tire: 3.5 Rear tire: 3.5
20.5-25 (L. rock)	20	2.6-3.8	2.8-4.5	2.8-4.5	
20.5-25 (L. traction)	16	2.6-3.8	2.8-4.5	2.8-4.5	
23.5-25 (L. traction)	20	2.6-3.8	2.8-4.5	2.8-4.5	
23.5-25 (L. rock)	12	—	2.6-3.6	2.6-3.6	Front tire: 3.1 Rear tire: 3.1
23.5-25 (L. traction)	12	2.4-3.6	2.6-3.6	2.6-3.6	

Stockpile operations means the loading of sand and other loose material.

PRECAUTION WITH LOAD AND CARRY METHOD

When traveling continuously with load and carry operations, choose the correct tires to match the operating conditions, or the operating conditions to match the tires. Failing to match the tires and condition could result in damaged tires. Contact your distributor or tire dealer when selecting tires.

13. TRANSPORTATION

13.1 LOADING, UNLOADING WORK

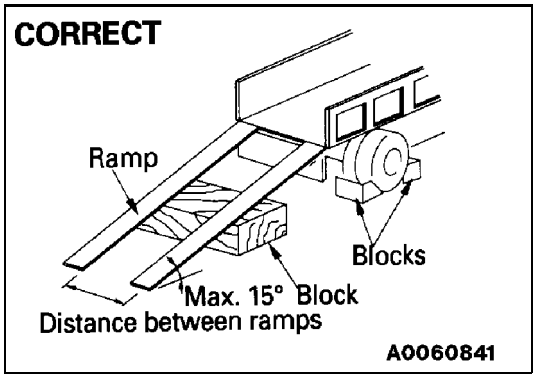
WARNING

Make sure the ramp has sufficient width, length, and thickness to enable the machine to be safely loaded and unloaded.
When loading and unloading the machine, park the trailer on a flat, firm roadbed. Keep a fairly long distance between the road shoulder and the machine.
Remove the mud from the undercarriage to prevent the machine from slipping to the side on the slopes.
Be sure the ramp surface is clean and free of grease, oil, ice, and loose materials.
Never change the direction of travel when on the ramps. If it is necessary to change direction, drive off the ramp and correct the direction, then drive onto the ramp again
When transporting the machine, observe all the related laws and regulations, and always assure safety.

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

1. Properly apply the brakes on the trailer and insert the blocks beneath the tires to ensure that it does not move. Then align the ramps with the centers of the trailer and the machine. Be sure that the two sides are level with one another. If the ramp sags appreciably, reinforce it with blocks, etc.

2. Determine the ramp direction, then slowly load or unload the machine.



REMARKS
When the transmission cut-off switch is set to the off position, the left brake pedal and accelerator pedal are operated at the same time.

3. Correctly load the machine onto the specified part of the trailer.

13.2 LOADING PRECAUTIONS

After loading the machine in the specified position, secure it in the place as follows.

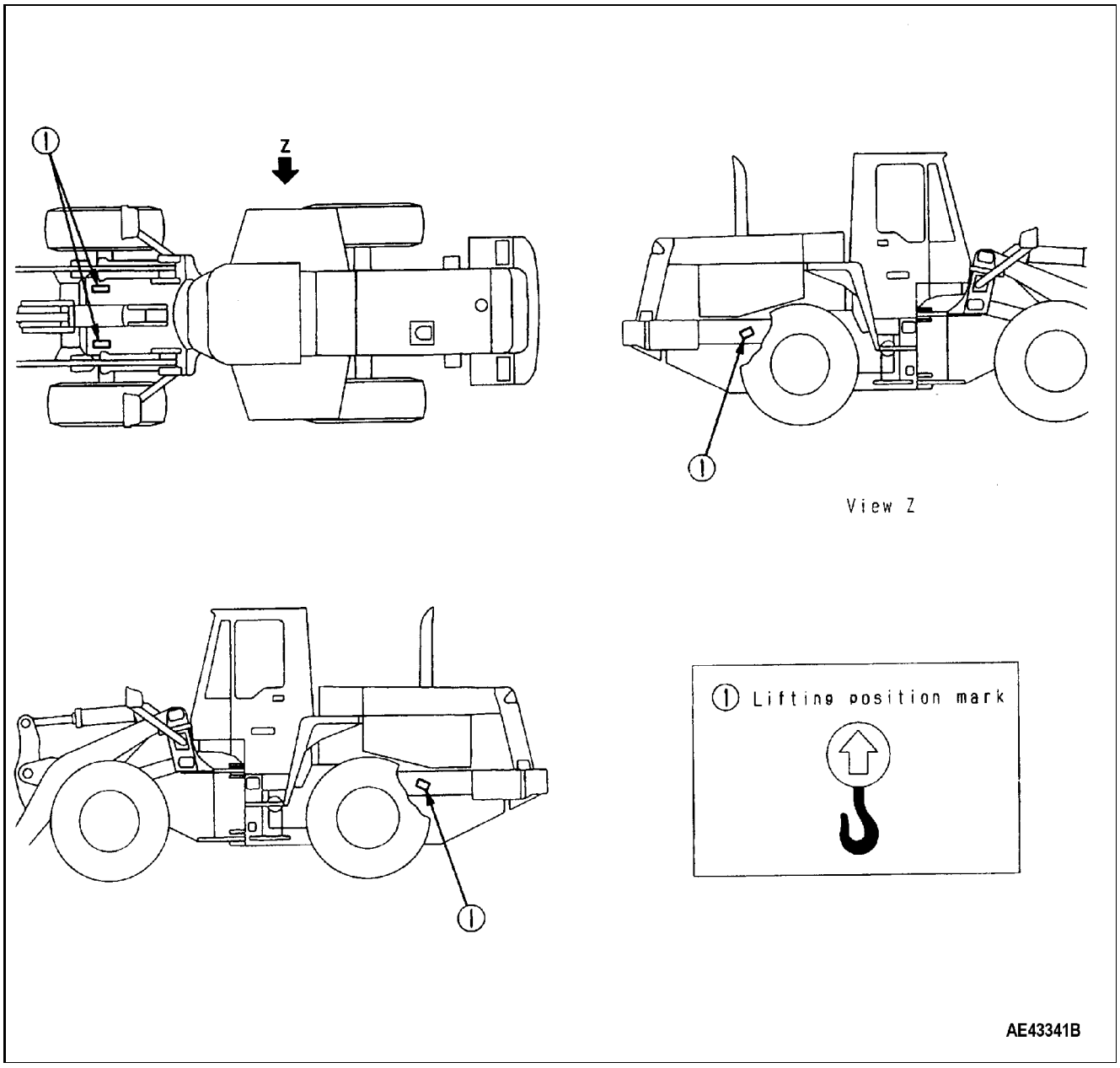
1. Lower the work equipment slowly.
2. Apply the safety lock to lock all the control levers securely.
3. Turn the starting switch to the OFF position and stop the engine. Remove the key from the starting switch.
4. Lock the front and rear frame with the safety bar.
5. Put the blocks in front of and behind the wheels. Secure the machine with chains or rope to prevent the machine from moving during transportation.
6. Always retract the cab radio antenna fully.

13.3 LIFTING THE MACHINE

⚠ WARNING

If the wire rope is not fitted correctly while lifting the machine, it may fall and cause serious injury or death.
Raise the machine 100-200 mm (3.9 - 7.9 in.) from the ground. After checking that the machine is horizontal and no slack exists in the wire rope, continue lifting the machine.
Before lifting the machine, always stop the engine and lock the brakes.
A qualified crane operator must perform all lifting operations.
Never raise the machine with any worker on it.
Always ensure that the wire rope used for lifting the machine is ample strength for the weight of the machine.
Never try to lift the machine at a position other than the one specified on the next page.

13.3.1 POSITION FOR STICKING THE LIFTING POSITION MARK



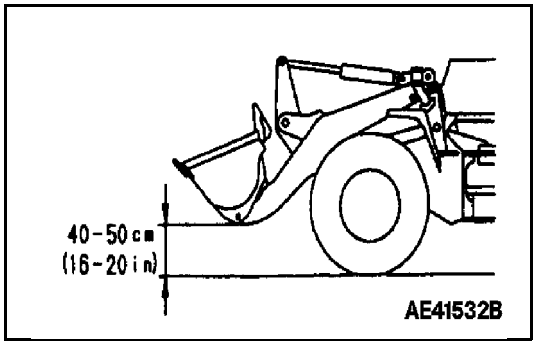
13.3.2 WEIGHT TABLE

	Operating Weight	Front wheel load	Rear wheel load	Center of gravity (from front axle)
WA450-3	22,700 kg (500,541 lb.)	10,541 kg. (23,240 lb.)	12,160 kg. (26,814 lb.)	1,821 mm (5 ft. 11.7 in.)

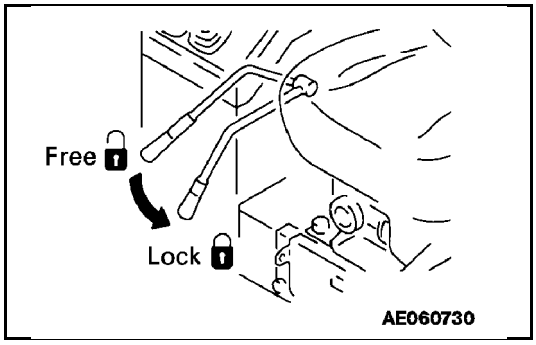
13.3.3 LIFTING PROCEDURE

Lifting work can be performed only for machines with lifting marks. Before starting the lifting operation, stop the machine in a horizontal place and then do the following.

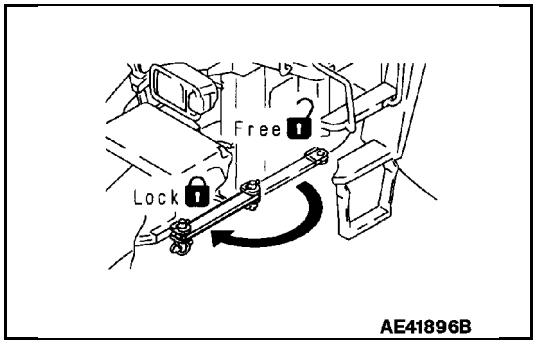
1. Start the engine, make sure that the machine is horizontal, then set the work equipment to the travel posture. For details, **See 12.4 MOVING THE MACHINE on page 2-55.**



2. Move the work equipment safety lock lever to the LOCK position.



3. Stop the engine and check that the area around the operator's compartment is safe. With the safety bar, lock the rear and front frame so they do not articulate.

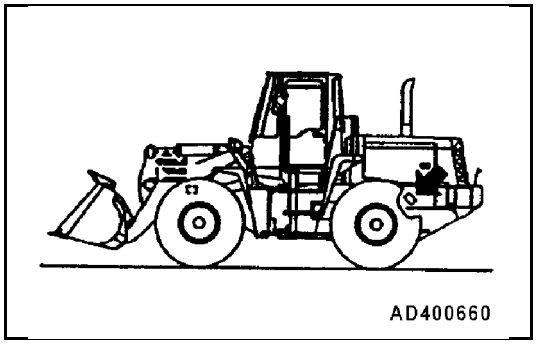


4. Fit the lifting equipment to the lifting hooks (marked by the lifting mark) at the front of the front frame and at the rear of the rear frame.

5. When the machine leaves the ground, stop for a moment and wait for the machine to stabilize, and then continue the lifting operation.

⚠ WARNING

When lifting the machine, check that no hydraulic oil leaks exist.



13.4 TRANSPORTATION PRECAUTIONS

WARNING

When determining the transportation route, the machine's width, height, and weight must be considered.

Obey all state and local laws governing the weight, width, and length of the load. Observe all regulations governing wide loads.

14. COLD WEATHER OPERATION

14.1 LOW TEMPERATURE PRECAUTIONS

14.1.1 FUEL AND LUBRICANTS

Change to fuel and oil with low viscosity for all components. For details of the specified viscosity, **See 20 FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE on page 3-9.**

14.1.2 COOLANT

WARNING

Keep the antifreeze fluid away from an open flame. Never smoke when near the antifreeze.

NOTICE

Never use methanol, ethanol, or propanol-based antifreeze.
Never use any water-leak preventative agent, regardless if it is used by itself or mixed with an antifreeze.
Do not mix one antifreeze brand with another brand.

For details of the antifreeze mixture requirements, **See 20.6 COOLANT SPECIFICATIONS on page 3-12.**

Use a permanent antifreeze (ethylene glycol mixed with corrosion inhibitor, antifoam agent, etc.) meeting the standard requirements shown below. Permanent antifreeze needs to be changed only once a year. Use only permanent antifreeze that meets the below standard specifications.

SAE J1034
FEDERAL STANDARD O-A-548D

14.1.3 BATTERY

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 your doctor.

When the ambient temperature drops, the battery's capacity will also drop. If the battery's charge ratio is low, the battery electrolyte may freeze. Maintain the batery charge as close to 100 percent as possible. Insulate the battery from the cold temperatures so that the machine will start easily the next morning.

REMARKS

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

Rate of charge	Temperature of fluid				
	20 (68	0 (32	-10 (14	-20 (-4	-30 (-22
100%	1.28	1.29	1.30	1.31	1.32
90%	1.26	1.27	1.28	1.29	1.30
80%	1.24	1.25	1.26	1.27	1.28
75%	1.23	1.24	1.25	1.26	1.27

14.2 PRECAUTIONS AFTER WORK COMPLETION

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

Mud and water in and on the machine should be completely removed.
Park the machine on hard, dry ground or on wooden boards. The boards will help protect the machine from freezing to the soil.
Drain any water collected in the fuel system to prevent it from freezing.
Because the battery capacity drops as the temperature drops, cover the battery. Or, remove it from the machine and store it in a warm place overnight, and then reinstall it in the morning.

14.3 AFTER COLD WEATHER

When the season changes and the weather is warmer, proceed as follows.

Replace the fuel and oil with the specified viscosity. For details, **See 20 FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE on page 3-9.**

If for any reason permanent antifreeze cannot be used, and ethyl-glycol based antifreeze (winter, one-season type) is used instead, or if no antifreeze is used, drain the cooling system completely. After cleaning out the inside of the cooling system thoroughly, fill it with fresh water.

15. LONG-TERM STORAGE

15.1 BEFORE STORAGE

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

After every part is washed and dried, house the machine in a dry building. If the machine must be left outdoors, park it on well-drained concrete and cover it with canvas, etc.
Completely fill the fuel tank, lubricate the machine, and change the oil before storage.
Apply a thin coat of grease to the metal surface of the hydraulic piston rods.
Disconnect the battery negative terminal and cover it. Or, remove the battery from the machine and store it separately.
If the ambient temperature is expected to drop below 0
After applying the safety locks to the bucket control lever, lift arm control lever, and directional lever, apply the parking brake.

⚠ WARNING

Provide necessary ventilation, if the machine is operated indoors.

15.2 DURING STORAGE

Operate the engine and move the machine a short distance once a month. This step coats the parts and surfaces with a new oil film. Before operating the work equipment, wipe off the grease on the hydraulic piston rod.

15.3 AFTER STORAGE

NOTE:
If the machine is stored without the monthly rust prevention operation, consult your distributor for service.

Perform the following procedures after removing the machine from storage.

Wipe off the grease from the hydraulic cylinder rods.
Add oil and grease to all places.

16. TROUBLESHOOTING

16.1 WHEN THE MACHINE RUNS OUT OF FUEL

⚠ WARNING

Before cranking the engine, ensure that the area around the engine is safe.

If the machine runs out of fuel, add the fuel and bleed the air from the fuel system before starting the engine.

PROCEDURE FOR BLEEDING AIR
The air can be quickly bled from the system, if the fuel tank is completely filled with fuel.

Turn the key in the starting switch to the start position and crank the engine for 15-20 seconds. Wait 2 minutes before repeating this procedure so that the starter motor can cool. Repeat this cycle2 - 3 times. Do not turn the starting motor for more than 20 seconds any one time.

16.2 TOWING THE MACHINE

⚠ WARNING

Towing the machine the wrong way could result in serious injury or death.

NOTE:
Towing is for moving the machine to a place where repairs can be performed, not for moving it long distances. Do not tow the machine long distances.
For detailed procedures for towing a disabled machine, contact your distributor.

This machine must not be towed except in emergencies. When towing the machine, take the following precautions:

When releasing the brakes, put blocks under the wheels to prevent the machine from moving. If the wheels are not blocked, the machine could suddenly move.
When towing a machine, tow it at a speed of fewer than 2 km/h (1.24 mph), and a distance of a few meters to a place where repairs can be performed. Tow the machine only in emergencies. If the machine must be moved a long distance, use a transporter.
Fit a guard plate to the machine being towed to protect the operator, if the tow rope or bar should break.
Never let anyone sit on the machine being towed, if the steering and brakes cannot be operated.
Check that the tow rope or bar is of ample strength for the weight of the machine being towed. If the machine being towed must travel through mud or up hill, use a tow rope or bar of a strength of at least 1.5 times the weight of the machine being towed.
Keep the tow rope angle as small as possible. Keep the angle between the center lines of the two machines to within 30
Moving the machine suddenly applies an excessive load to the tow rope or bar, and it could snap. Always move the machine slowly at a fixed speed.
The towing machine should normally be of the same class as the machine being towed. Check that the towing machine has ample braking power, weight, and rimpull to control both machines while on a slope.
When towing the machine downhill, use a larger machine for towing to provide ample rimpull and braking power. Or, connect another machine to the rear of the machine being towed to prevent either machine from loosing control and turning over.
Towing may be performed under many different conditions. Thus, it is impossible to determine all the towing requirements for all possibilities. Towing on flat horizontal roads requires minimum rimpull while towing on slopes or uneven road surfaces requires maximum rimpull.

16.2.1 WHEN ENGINE CAN BE USED

If the transmission and steering wheel can be operated and the engine is running, it is possible to tow the machine out of the mud.
The operator should sit on the machine being towed and operate the steering in the direction that the machine is being towed.

16.2.2 WHEN ENGINE CANNOT BE USED

When towing a machine with the engine stopped, use the following procedure.

1. Because the transmission oil does not lubricate the system, remove the front and rear drive shafts. If necessary, block the tires to prevent the machine from moving while removing the drive shafts.

2. When the steering cannot be operated, remove the steering cylinder.

3. Even if the brakes are in good condition, the braking force is reduced each time the pedal is depressed. After a specified number of brake applications, the brakes will not work.

4. Connect the towing equipment securely. When performing towing operations, use two machines of the same class as the machine being towed. Connect one machine to the front and one to the rear of the machine being towed. Remove the blocks from under the tires and tow the machine.

16.2.3 RELEASING THE PARKING BRAKE

WARNING

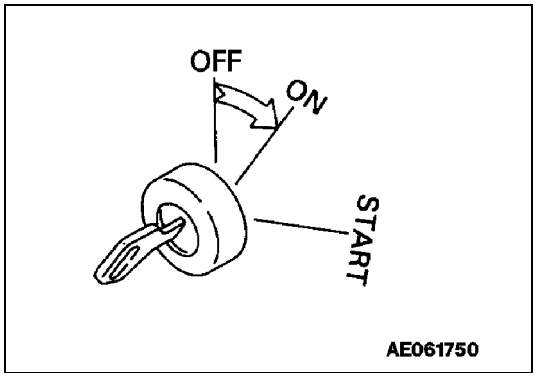
When releasing the parking brake, stop the machine on a flat surface and check that the surroundings are safe. In emergencies or when the parking brake must be released on a hill, block the tires carefully before releasing the brake.
When the parking brake is released, no braking force can be applied. Check that the situation is safe before moving the machine.

If the engine will not run, use the following method to release the parking brake and tow the machine.

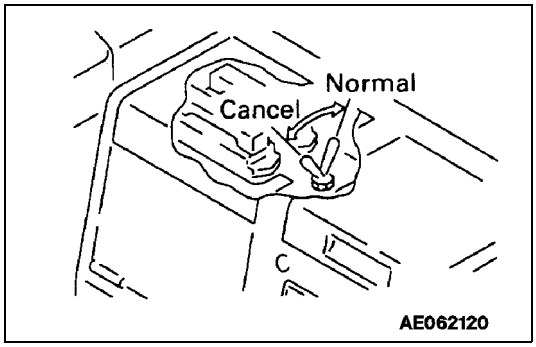
1. METHOD OF RELEASING THE BRAKE BY USING THE EMERGENCY PARKING BRAKE CANCEL SWITCH

If the brake accumulator pressure is high, perform the following steps.

1. Turn the starting switch to the ON position.



2. Turn the emergency parking brake switch to the CANCEL position. While doing this step, check that the parking brake caution lamp goes out. When the switch is set to the CANCEL position, the alarm buzzer will sound continuously.



REMARKS:

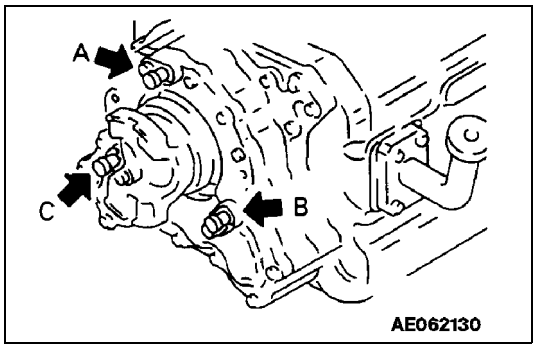
Normally, keep the switch at the NORMAL position to actuate it.

If the brake accumulator pressure is low, the parking brake caution lamp will not go out, or the alarm buzzer will sound with a continuous beep. If this situation happens, follow the instructions in METHOD FOR CANCELING WITH ADJUSTMENT SCREW to release the brake.

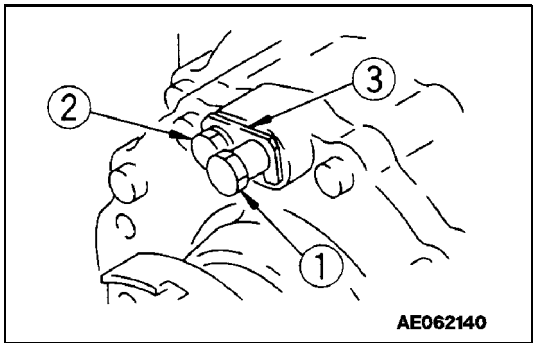
2. METHOD FOR CANCELING WITH ADJUSTMENT SCREW

If the brake pressure is low, do the following steps.

1. Loosen the adjustment screws (1) and the bolts (2) at A, B, C at the front of the transmission case.



2. After rotating the lock plate (3) to release the lock, tighten the adjustment screw (1) until it stops.
3. Performing this step simultaneously at all three places (A, B, C), releases the parking brake.



16.2.4 EMERGENCY TRAVEL OPERATION

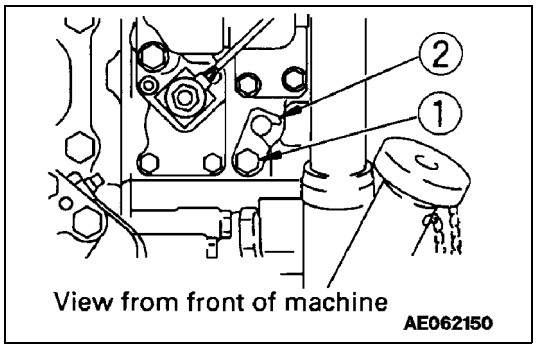
The normal gear shift operation is performed by electric signals. In the event of an electrical system failure and the machine does not move, use the following procedure to move the machine.

⚠ WARNING

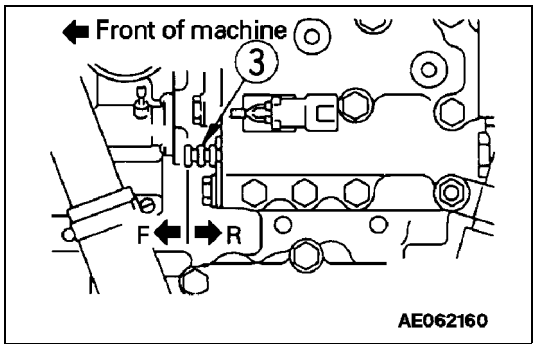
When performing this operation, always keep the engine stopped, except when starting the machine.
When starting the engine, always depress the brake pedal and check that the surrounding area is safe.
This operation enables the machine to be driven under its own power to the nearest repair shop when there is an electrical system failure. This operation must not be used for any other purpose.
Always keep the speed lever at the normal position
Install the plate (2) securely, ensuring that the spool does not come out when traveling.

Always request that your distributor perform the emergency travel operation, or consult your distributor before performing it yourself.

1. Set the parking brake switch to the ON position and set the speed lever to the neutral position.
2. After loosening the bolt (1), remove the plate (2).



3. Pull out the spool (3) to the F position, or push the spool into the R position. The transmission range for this operation is 2nd.
4. After resetting the spool (3) to the neutral position, install the plate (2) and the bolt (1) to hold it into position.
5. Depress the brake pedal, start the engine, release the parking brake and let the brake pedal out slowly.



16.3 IF BATTERY IS DISCHARGED

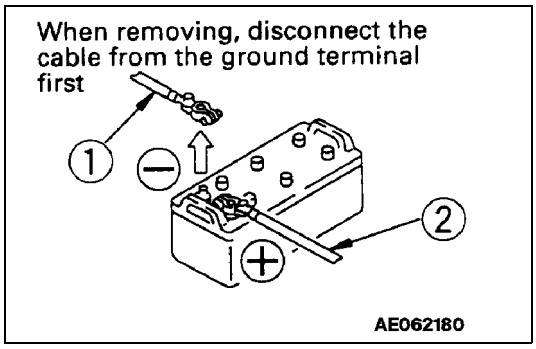
⚠ WARNING

When checking or handling the battery, stop the engine and turn the starting switch key to the OFF position.
Before starting the engine, use a damp cloth to wipe off the dust atop the battery.
The battery generates hydrogen gas, so there is danger 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 electrolyte gets on your clothes or on your skin, wash it off immediately with lots of water. If electrolyte gets in your eyes, wash it out with fresh water, and consult a doctor immediately.
When handling a battery, always wear protective goggles.
If the terminals are loose, there is danger that the defective contact may generate sparks that will cause an explosion. When installing the terminals, install them tightly.
When removing or installing the battery, check which terminal is the positive (+) terminal and which is the negative (-).

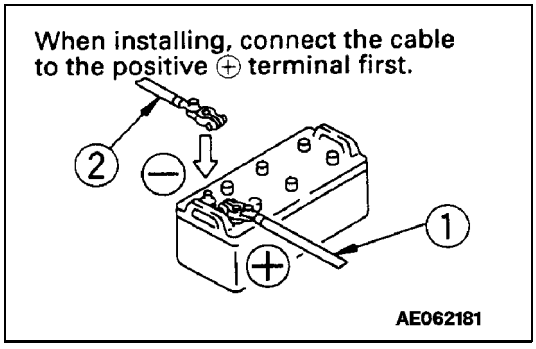
16.3.1 BATTERY INSTALLATION AND REMOVAL

When starting the engine with a booster cable, do the following:

When removing the battery, first disconnect the cable from the ground terminal (normally, from the negative (-) terminal). When installing a battery, install the positive (+) terminal first. That way, if a tool touches the cable connecting the positive terminal and the chassis, there is no danger that sparks will ignite the hydrogen gas.



REMARKS
The batteries are on both sides of the rear of the machine. The battery used for the ground is on the left side of the machine.



16.3.2 PRECAUTION FOR CHARGING THE BATTERY

CHARGING THE BATTERY WHEN MOUNTED ON THE MACHINE

Before charging the battery, disconnect the negative (-) battery cable from the battery. This action prevents voltage spikes from damaging the alternator.

While charging the battery, remove all battery vents for satisfactory ventilation. To avoid gas explosions, do not bring fire or sparks near the battery.

If the electrolyte temperature exceeds 113
charging the battery temporarily.

Turn off the charger as soon as the battery is charged. Over charging the battery may cause the following:
1) Overheating the battery
2) Decreasing the quantity of electrolyte
3) Damaging the electrode plate

Do not mix the cables (positive (+) to negative (-)), or the alternator could be damaged.

When performing any service to the battery besides checking the electrolyte level or measuring the specific gravity, disconnect the cables from the battery.

REMARKS
The batteries are on both sides at the rear of the machine. The battery used for the ground is on the left side of the machine.

16.3.3 STARTING THE ENGINE WITH BOOSTER CABLE

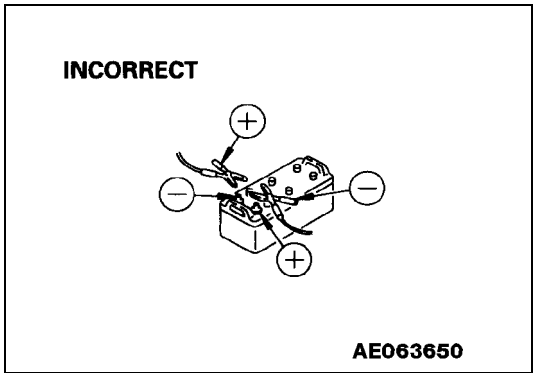
When starting the engine with booster cables, perform the following steps:

WARNING

When connecting the booster cables, never touch the positive (+) terminal from one battery to the negative (-) terminal of another battery.
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 step prevents sparks from generating near the battery which could ignite the hydrogen gas given off by the battery. If hydrogen gas explodes, it could cause serious injury.
Make sure there is no mistake in the booster cable connections. The final connection is to the engine block of the problem machine. Making the last connection generates sparks, so make the last connection as far as possible from the battery. However, avoid connecting the cable to the work equipment, as electrical conduction is poor.
Use care when removing the cables from the machine that has been started. Prevent the cable ends from contacting each other or the machine to avoid an explosion.

NOTE
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.

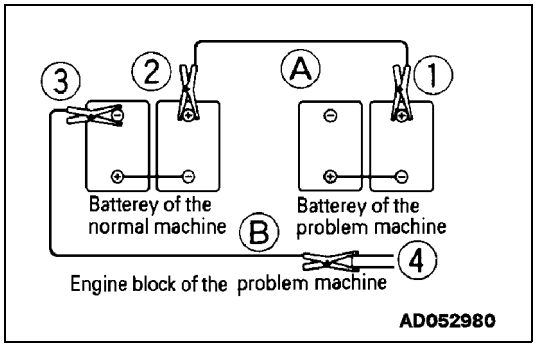
REMARKS:
The batteries are on both sides at the rear of the machine. The battery used for the ground is on the left side of the machine.



CONNECTING THE BOOSTER CABLES
Keep the starting switch at the OFF position.

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

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



STARTING THE ENGINE

1. Make sure the clips are firmly connected to the battery terminals.

2. Start the engine of the normal machine and run it at high idle speed.

3. Turn the starting switch of the problem machine to the START position and start the engine. If the engine doesn't start at first, try again after 2 minutes or so.

DISCONNECTING THE BOOSTER CABLE

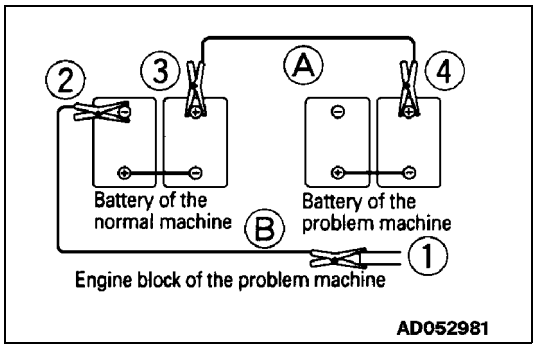
After the engine has started, disconnect the booster cables in the reverse order in which they were connected.

1. Remove one clip of the booster cable (B) from the engine block of the problem machine.

2. Remove the other clip of the booster cable (B) from the negative (-) terminal of the normal machine.

3. Remove one clip of the booster cable (A) from the positive (+) terminal of the normal machine.

4. Remove the other clip of the booster cable (A) from the positive (+) terminal of the problem machine.



16.4 OTHER TROUBLE

16.4.1 ELECTRICAL SYSTEM

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

Problem	Main causes	Remedy
Lamp does not glow brightly even when the engine runs at high speed	Defective wiring Improper fan belt tension	(Check, repair loose terminals, disconnections) Adjust the fan belt tension For details, **See ? CHECK TENSION OF DRIVE BELT on page ?-?.**
Lamp flickers while engine is running		
Even when the engine is running, the charge caution pilot lamp does not go out	Defective alternator Defective wiring Improper fan belt tension	(Replace) (Check, repair) Adjust fan belt tension. **See ? CHECK TENSION OF DRIVE BELT on page ?-?.**
Abnormal noise is generated from the alternator	Defective alternator	(Replace)
Starting motor does not turn when the starting switch is turned ON	Defective wiring Insufficient battery charge Defective starting motor	(Check, repair) Charge (Replace)
Pinion of starting motor keeps going in and out	Insufficient battery charge	Charge
Starting motor turns the engine sluggishly	Insufficient battery charge Defective starting motor	Charge (Replace)
Starting motor disengages before the engine starts	Defective wiring Insufficient battery charge	(Check, repair) Charge
Preheating monitor does not light	Defective wiring Defective glow relay, glow controller, water temperature sensor Defective preheating pilot lamp	(Check, repair) (Replace) (Replace)
When engine is stopped, charge caution pilot lamp does not light up (starting switch at ON position}	Defective wiring Defective monitor	(Check, repair) (Replace)

16.4.2 CHASSIS

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

Problem	Main causes	Remedy
TRANSMISSION		
Engine is running but machine doesn't move	Parking brake is applied Directional lever is improperly shifted Lack of transmission oil	Release parking brake Shift lever properly Add oil to specified level. **See 24.2.2 CHECK TRANSMISSION OIL LEVEL, ADD OIL on page 3-29.**
Even when the engine is running at full power, the machine only moves slowly and lacks power.	Lack of transmission oil Clogged screen	Add oil to specified level. **See 24.2.2 CHECK TRANSMISSION OIL LEVEL, ADD OIL on page 3-29.** (Disassemble and clean)
Oil overheats	Incorrect oil level Machine is not traveling in the correct speed range Torque converter is stalled for long periods Engine is overheating	Add or drain oil to specified level. **See 24.2.2 CHECK TRANSMISSION OIL LEVEL, ADD OIL on page 3-29.** Place in correct speed range Reduce stall time (Check engine)
Noise	Lack of oil	Add oil to specified level. **See 24.2.2 CHECK TRANSMISSION OIL LEVEL, ADD OIL on page 3-29.**
AXLE		
Noise generated	Lack of oil	Add oil to specified level. **See 24.2.3 CHECK AXLE OIL LEVEL, ADD OIL on page 3-30.**

CHASSIS continued (16.4.2)

Problem	Main causes	Remedy
BRAKE		
Brake is not applied when pedal is depressed	Worn disc Defective hydraulic system Lack of oil Air in brake line	(Replace disc) Add oil to specified level **See ? EVERY 100 HOURS SERVICE on page ?-38.** Bleed air
Brake drags or remains applied	Vent hole of brake valve clogged	Clean
Brakes squeal	Worn disc Large amount of water in axle oil Axle oil deteriorated due to brake overuse	(Replace disc) Change axle oil Change axle oil
PARKING BRAKE		
Braking effect is poor	Worn disc	(Replace disc)
Brake drags or remains applied	Lack of transmission oil Screen is clogged	Add oil to specified level. **See 24.2.2 CHECK TRANSMISSION OIL LEVEL, ADD OIL on page 3-29.** (Disassemble and clean)
STEERING		
Steering wheel is heavy	Defective hydraulic system Lack of oil	Add oil to specified level. **See ? EVERY 100 HOURS SERVICE on page ?-38.**
Steering wheel is loose	Play in steering cylinder pin Defective hydraulic system Lack of oil	Grease bearing or replace pin and bushing where there is play Add oil to specified level. **See ? EVERY 100 HOURS SERVICE on page ?-38.**

CHASSIS continued (16.4.2)

Problem	Main causes	Remedy
HYDRAULIC SYSTEM		
Lack of lifting power for bucket Bucket takes time to raise	Lack of oil Clogged hydraulic tank	Add oil to specified level. **See ? EVERY 100 HOURS SERVICE on page ?-38.** Replace filter. **See 24.9.2 REPLACE THE FILTER ELEMENT on page 3-55.**
Excessive bubbles in oil	Low oil quality Low oil level Air in oil line	Replace with good quality oil Add oil to specified level. **See ? EVERY 100 HOURS SERVICE on page ?-38.** Bleed air
Low hydraulic pressure	Low oil level, pump sucking air	Add oil to specified level. **See ? EVERY 100 HOURS SERVICE on page ?-38.**
Irregular cylinder movement	Low oil level	Add oil to specified level. **See ? EVERY 100 HOURS SERVICE on page ?-38.**

16.4.3 ENGINE

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

Problem	Main causes	Remedy
Engine oil pressure caution pilot lamp	Engine oil pan oil level is low (sucking in air)	Add oil, **See ? CHECK BEFORE STARTING on page ?-?.**
	Clogged air filter cartridge	Replace cartridge, **See ? WHEN REQUIRED on page ?-26.**
	Defective tightening of oil pipe joint, oil leaks from damage parts	(Check, repair)
	Defective engine oil pressure sensor	(Replace sensor)
Steam is emitted from the top part of the radiator (pressure valve). Water temperature gauge is in the red range. Coolant temperature monitor lights up.	Cooling water level low, water leakage	Add coolant, repair, **See ? CHECK BEFORE STARTING on page ?-?.**
	Loose fan belt	Adjust fan belt tension, **See 24.6.2 CHECK TENSION OF DRIVE BELT on page ?-42.**
	Dirt or scale accumulated in cooling system	Change cooling water, clean inside of cooling system.
		Clean or repair, **See 24.2.5 CLEAN THE RADIATOR FINS on page 3-31.**
	Clogged radiator fin or damaged fin	(Replace the thermostat)
	Defective thermostat	Tighten the cap or replace the packing
	Loose radiator filler cap (high altitude operation)	(Replace sensor)
	Defective water level sensor	
Water temperature gauge is in the white range on the left	Defective thermostat	(Replace the thermostat)
	Defective monitor	(Replace)
Engine does not start when starting motor is turned	Lack of fuel	Add fuel,
	Air in the fuel system	Repair the place where the air is sucked in, **See 24.7 EVERY 500 HOURS SERVICE on page 3-47.**
	Defective fuel injection pump or nozzle	(Replace pump or nozzle)
	Starting motor cranks sluggishly	**See ELECTRICAL SYSTEM**
	Preheating pilot lamp does light up	
	Defective compression	(Adjust valve clearance)
	Defective valve clearance	

ENGINE 16.4.3 (continued)

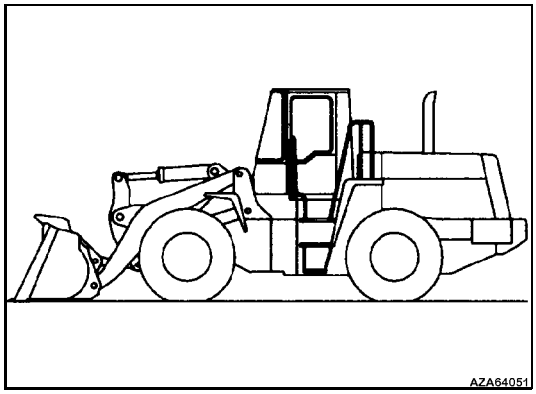
Problem	Main causes	Remedy
Exhaust is white or blue	Too much oil in the oil pan	Add oil to specified level. **See ? CHECK BEFORE STARTING on page ?-?.**
	Improper fuel	Change to specified fuel
Exhaust gas occasionally turns black	Clogged air cleaner element	Clean or replace, **See ? WHEN REQUIRED on page ?-26.**
	Defective nozzle	(Replace nozzle)
	Defective compression	(See defective compression above)
	Defective turbocharger	(Clean or replace turbocharger)
Combustion noise occasionally makes breathing sound	Defective nozzle	(Replace nozzle)
Abnormal noise generated (combustion or mechanical)	Low grade fuel being used	Change to specified fuel
	Overheating	Refer to "Water temperature gauge is in red range" as above
	Damage inside muffler	(Replace muffler)
	Excessive valve clearance	(Adjust valve clearance)

MAINTENANCE

17. GUIDES TO MAINTENANCE

Do not perform any inspection and maintenance operation not given in this manual.

Perform maintenance work on hard, flat ground.
Set to the inspection and maintenance posture.
Always perform an inspection with the machine in the following posture unless otherwise specified.
Lower the work equipment to the ground and set in the posture shown in the diagram on the right.



Set all control levers to the neutral or HOLD position.
Set the safety levers to the LOCK position.
Press the parking brake switch to apply the parking brake.
Put blocks in front and behind the tires.
Lock the front and rear frames with the safety bar.

Check service meter:
Check the service meter reading every day to see if it is time for any necessary maintenance to be carried out.

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

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

Always use clean washer fluid:
Use automobile window washer fluid and be careful not to let any dirt get into it.

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

Keeping the machine clean:
Always keep the machine clean. This makes it easier to find parts causing problems. In particular keep grease fittings, breathers and oil level gauges clean and avoid foreign matters from getting in them.

Be careful of hot water and oil:
Draining hot oils and coolants and removing their filters immediately after the engine stops are hazardous. Allow the engine to cool. If the oil has to be drained when it is cold, warm up the oil to a suitable temperature (approx. 20 to 40 [68 to 104

Check for foreign materials in drained oil and on filter:
After oil is changed or filters are replaced, check the oil and filters for metallic particles and foreign materials. If large quantities of metallic particles or foreign materials are found, consult your distributor.

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

Oil change:
Check or change oils in the places where dust is scarce to keep foreign materials away from oils.

Warning tag:
Attach the warning tag to the starting switch or otherappropriate control lever to avoid someone who is not aware of the circumstances from starting the engine.
The warning tag is supplied together with the tools.

Obey precautions:
During machine operation, always obey the precautions on the safety label attached to the machine.

Welding instructions:
- Turn off the engine starting switch.
- Do not apply more than 200 V continuously.
- Connect the grounding cable within 1 m from the area to be welded.
- Avoid seals or bearings from being between the area to be welded and the position of grounding point.
- Do not use the area around the work equipment pins or the hydraulic cylinders as the grounding point.
- Never weld any pipe or tube containing fuel or oil.

Fire prevention:
Use nonflammable cleaner or light oil for cleaning parts. Keep flame or lighted cigarette away from light oil.

Clamp faces:
When O-rings or gaskets are removed, clean the clamp faces and replace the O-rings and gaskets with new ones. Be sure to carefully install O-rings and gaskets when assembling.

Objects in your pockets:
Keep your pockets free of loose objects which can fall out and drop into the machinery; especially when you work on the machinery while bending over it.

Checking underneath machine:
When working in rocky areas, check for damage underneath the machine and for damaged bolts and nuts.

Precautions when washing machine:
- Never spray steam or water directly at the radiator.
- Do not allow water to get on any electrical component

Pre-and post-work checks:
Before starting work in mud, rain, snow or at seashore, check plugs and valves for tightness.
Wash the machine immediately after working to protect components from rusting.
Lubricate components more frequently than usual. Be sure to lubricatework equipment pins daily if they are submerged in water.
On job sites were heavy-duty operations are common, reduce the maintenance intervals and grease the machine more frequently.

Dusty work sites:
When working at dusty work sites, do as follows:
- Inspect the air cleaner clogging pilot lamp to see whether the air cleaner isplugged up. Clean the air cleaner at shorter intervals 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.

Avoid mixing oils:
Never mix oils of different brands. If the only oil you have is a different brand from the one that is used in the machine, do not add it in but replace all the oil.

18. OUTLINES OF SERVICE

Use genuine Komatsu parts for replacement.

When changing or adding oil, do not use a different type of oil.

Unless otherwise specified, the oil and coolant used at the time of shipment from the factory are as shown in the table below.

Item	Kind of fluid
Engine oil pan	SAE 10W-30, 15W-40 API classification CD
Transmission case	SAE 10W API classification CD
Axle (Front and rear)	AX075
Hydraulic tank	SAE 10W API classification CD
Linkage Pins	Lithium base grease No. 2
Fuel tank	ASTM D975 No. 2 ASTM D975 No. 1 is used for the winter season
Radiator	50/50 mix of Komatsu Super Coolant and water

18.1 OUTLINE OF OIL, FUEL, COOLANT

18.1.1 OIL

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. Although the oil may not be dirty, always replace the oil after the specified interval.

Oil is like blood in the human body. Therefore, always be careful when handling the oil to prevent any impurities (water, metal particles, dirt, etc.) from entering the system. The majority of problems with machines are caused by the entry of such impurities. Take particular care not to let any impurities get in when storing or adding oil.

Never mix oils of different grades or brands.

Always maintain the specified oil levels. Having too much or too little oil causes problems.

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

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

It is recommended that an analysis be made of the oil periodically to check the engine's condition. For those who wish to use this service, please contact your distributor.

18.1.2 FUEL

The fuel pump is a precision instrument. If the fuel contains water or dirt, the pump cannot work properly.

Be extremely careful not to let impurities get in the system 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 temperatures below -15
to a fuel that matches the temperature.

To prevent the moisture in the air from condensing 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.

18.1.3 COOLANT

River water contains large amounts of calcium and other impurities, so if it is used, scale will stick to the engine and radiator. This will prevent proper heat exchange and cause overheating. For specific requirements of the water, **see 20.6 COOLANT SPECIFICATIONS on page 3-12.**

When using anti-freeze, always observe the precautions given in the Operation and Maintenance Manual.

An antifreeze concentration greater than 68percent will adversely affect freeze protection and heat transfer rates. Anti-freeze concentrations between 68percent and 100percent actually have a higher freezing point than a 68percent antifreeze concentration and should not be used due to reduced heat transfer rates.

All cooling system inhibitors, including those in antifreeze solutions, become depleted through normal operation. If the inhibitors in antifreeze are allowed to become depleted, the antifreeze becomes corrosive and attacks and coats the metallic surfaces of the cooling system which reduces heat transfer. Cooling system conditioners that contain these inhibitors must be added to maintain corrosion protection.

Antifreeze is inflammable, so be extremely careful not to expose it to flame or fire.

The proportion of antifreeze to water differs according to the ambient temperature. For details of the mixing proportions, **see 20.6 COOLANT SPECIFICATIONS on page 3-12.**

If the engine overheats, wait for the engine to cool before adding coolant.

A low coolant level will cause overheating. Also the low coolant level allows the air in the system to contact the metal surfaces, accelerating corrosion.

18.1.4 GREASE

Grease is used to reduce friction and help prevent wear, twisting and noise at the joints.

Grease fittings that were not referred to in the maintenance schedule do not require any scheduled greasing. Add grease to these areas only if something becomes stiff or squeaky.

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.

18.1.5 STORING OIL AND FUEL

Keep the fuel indoors to prevent any water, dirt, or other impurities from getting into storage containers.

When keeping drums for a long period, put the drum on its side so that the filler port of the drum is at the side to prevent the moisture from being sucked in. Periodically inspect the drums for leakage. If the 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).

18.1.6 FILTERS

Filters are extremely important safety parts. Filters prevent impurities in the fluid and air circuits from entering important equipment and causing problems. Replace all filters periodically. For details,**see 23 MAINTENANCE SCHEDULE CHART on page 3-25.** However, when working in severe conditions, it is necessary to consider replacing 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 stuck to the old filter. If any metal particles are found, please contact your distributor.

Do not open packs of spare filters until just before they are to be used.

Always use genuine Komatsu filters.

18.2 FUEL INJECTION PUMP

⚠ WARNING

Do not attempt to adjust the fuel injection pump.

Unsatisfactory operation of the engine may not be due to the fuel injection pump. If unsatisfactory operation persists after servicing the filters, consult your distributor to service the fuel injection pump. Special equipment and knowledge are required for proper injection pump service. These are available at your distributor.

18.3 OUTLINE OF ELECTRIC SYSTEM

If the wiring gets wet or the insulation is damaged, the electrical system may short circuit, which could result in hazardous machine malfunction.

Services relating to the electric system are (1) check of fan belt tension, (2) check of damage or wear in the fan belt and (3) check of battery fluid level.

Never remove or disassemble any electric components installed in the machine.

Never install any electric components other than those specified by Komatsu.

Be careful to keep the electric system free of water when washing the machine or when it rains.

When working on the seashore or any corrosive environment, carefully clean the electric system to prevent corrosion.

When installing a cab cooler or any other electrical equipment, connect it to an independent power source connector. The optional power source must never be connected to the fuse, starting switch, or battery relay.

18.4 OUTLINE OF HYDRAULIC SYSTEM

During operation and immediately after operation is ended, the temperature of the hydraulic system still remains high. In addition,high hydraulic pressure is applied to the system. Take care when inspecting and maintaining the hydraulic system.

Stop the machine on level ground, lower the bucket to the ground, then set so that there is no pressure applied to the cylinder circuits.

Always stop the engine.

Immediately after operations, the hydraulic oil and lubricating oil are at high temperature and high pressure, so wait for the oil temperature to go down before starting maintenance. Even when the temperature goes down, the circuit may still be under internal pressure, so when loosening the plug or screw, or the hose joint, do not stand in front of the part. Loosen it slowly to release the internal pressure before removing it.

When carrying out inspection or maintenance of the hydraulic circuit, always bleed the air from the hydraulic tank to remove the internal pressure.

Periodic maintenance includes the inspection of the hydraulic oil level, replacement of the filter and refilling of hydraulic oil.

When a high pressure hose, etc. is removed, check the O-ring for damage. If necessary, replace it.

After the hydraulic filter element and strainer are cleaned or replaced, or after the hydraulic system is repaired or replaced or the hydraulic piping is removed, bleed air from the hydraulic circuit.

19. WEAR PARTS LIST

Wear parts such as the filter elements, bucket teeth, etc. are to be replaced at the time of periodic maintenance or before their abrasion limits. The wear parts should be changed correctly in order to use the machine economically. For part change, genuine Komatsu parts of excellent quality should be used. When ordering parts, please check the part number in the parts book. Use the current parts book to write in the numbers.

( ): The items in parentheses are to be replaced at the same time.

Item	Part No.	Part Name	Qty.	Replacement frequency
Air conditioner air filter		Element	2	Every 100 hours of service
Engine oil filter		Cartridge	1	Every 250 hours of service
Transmission oil filter		Element (O-ring) (O-ring) (O-ring) (Gasket)	1	Every 500 hours of service
Fuel filter		Cartridge	1	Every 500 hours of service
Coolant corrosion resistor		Cartridge	1 1 (1) (1) (1) (1)	Every 1,000 hours of service
Transmission strainer		O-ring	1	Every 1,000 hours of service
Hydraulic oil filter		Element (O-ring)	1 (1)	Every 2,000 hours of service
Hydraulic tank breather		Element	1	Every 2,000 hours of service
Air cleaner		Outer Element Inner Element	1 1	When required
Bucket teeth and mounting bolts		Center edge Side edge (Bolt) (Washer) (Nut)	1 2 (8) (8) (8)	When required

20. FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE

20.1 PROPER SELECTION OF FUEL, COOLANT AND LUBRICANTS

It is not our policy to approve of fuel, coolant, and lubricants or to guarantee performance in service. The quality of the fuel, coolant and lubricant is the responsibility of the supplier. When in doubt, consult your distributor. The specified fuel, coolant, and lubricants recommended for this machine are shown in the following table.

RESERVOIR	FLUID TYPE	AMBIENT TEMPERATURE	CAPACITY	
		-22 -4 14 32 50 68 86 104 -30 -20 -10 0 10 20 30 40	Specified	Refill
Engine oil pan	Engine oil	SAE 30 SAE 10W SAE 10W-30 SAE 15W-40	47 12.4 gal	38 10 gal
Transmission case	Engine oil	SAE 10W	65 17.16 gal	60 15.8 gal
Hydraulic system			280 73.9 gal	192 50.7 gal
Front axle	Axle oil	See 20.4 DRIVE AXLE OIL SPECIFICATIONS on page 3-11.	65 17.2 gal	65 17.2 gal
Rear axle				
Pins	Grease	NLGI No. 2	---	---
Fuel tank	Diesel fuel	ASTM D975 No. 2 ASTM D975 No. 1	390 102.96 gal	- -
Cooling system	Coolant	See 20.6 COOLANT SPECIFICATIONS on page 3-12.	68 18 gal	- -

SPECIFIED CAPACITY: Total amount of oil, including the oil for the components and oil in the piping.
REFILL CAPACITY: Amount of oil needed to refill the system during normal inspection and maintenance.

20.2 ENGINE OIL SPECIFICATIONS

20.2.1 NORMAL OPERATION

Oil performance recommendations are as follows:

The use of a quality engine lubricating oil combined with appropriate oil and filter change intervals are critical factors in maintaining engine performance and durability.

Komatsu Engine Oil or multi-viscosity engine oil meeting American Petroleum Institute (API) performance classification CF-4, CG-4, CF-4/SG or CG-4/SH or MIL-L-2104D or E is recommended.

NOTICE:
Classification CD, CE, CD/SF or CE/SF oils may be used in areas where CF-4, CG-4, CF-4/SG or CG-4/SH oil is not yet available. If API classification CC or CC/CD is used, reduce the engine oil change interval by half.

A sulfated ash limit of 1.0 to 1.5 mass percent is suggested for optimum valve and piston deposit and oil consumption control. The sulfated ash **must not** exceed 1.85 mass percent. The sulfated ash limit of 1.85 mass percent has been placed on all engine lubricating oils recommended for use in the engine. Higher ash oils can cause valve and/or piston damage and lead to excessive oil consumption.

The API service symbol displays the following information. The upper half of the symbol displays the appropriate oil categories; the lower half may contain words to describe oil energy conserving features. The center section identifies the SAE oil viscosity grade.

Oil viscosity recommendations are as follows:

The use of a multi-grade lubricating oil has been found to improve oil consumption control and improve engine cranking in cold temperatures while maintaining lubrication at high operating temperatures.

While SAE 15W-40 multi-viscosity oil is recommended for most operating climates, refer to the previous table for oil viscosity recommendations for extreme climates.

NOTICE:
Limited use of low viscosity oils, such as SAE 10W-30 may be used for easier starting and providing sufficient oil flow at ambient temperatures below -5 w viscosity oils can decrease engine life due to wear.

Special "break-in" lubricating oils are **not** recommended for a new or rebuilt engine. Use the same type of oil during the "break-in" as specified for normal operation.

Additional information regarding lubricating oil availability throughout the world is available in the "E.M.A. Lubricating Oils Data Book for Automotive and Industrial Engines." The data book may be ordered from the Engine Manufacturers Association, 401 North Michigan Ave., Chicago, Il U.S.A. 60611. The telephone number is (312) 644-6610.

20.2.2 ARCTIC OPERATION

If an engine is operated in ambient temperatures consistently below-23
to keep the engine warm when it is **not** in operation, use a synthetic engine oil API performance classification CF-4, CG-4, CF-4/SG or CG-4/SH with adequate low temperature properties such as SAE 5W-20 or 5W-30.

The oil supplier **must** be responsible for meeting the performance service specifications.

NOTICE:
The use of a synthetic base oil does not justify extended oil change intervals. Extended oil change intervals can decrease engine life due to factors such as; corrosion, deposits and wear.

20.3 TRANSMISSION, TORQUE CONVERTER, TRANSFER CASE AND OIL COOLER, SERVICE BRAKES AND HYDRAULIC SYSTEM OIL SPECIFICATIONS

Komatsu Engine Oil or engine oil meeting American Petroleum Institute (API) performance classification CF-4, CG-4, CF-4/SG or CG-4/SH or MIL-L-2104D or E is recommended.

NOTICE:

Classification CD, CE, CD/SF or CE/SF oils may be used in areas where CF-4, CG-4, CF-4/SG or CG-4/SH oil is not yet available.

20.4 DRIVE AXLE OIL SPECIFICATIONS

For drive axle oil, use only the recommended oil as follows:

SHELL:	DONAX TT or TD
CALTEX:	RPM TRACTOR HYDRAULIC FLUID
CHEVRON:	TRACTOR HYDRAULIC FLUID
TEXACO:	TDH OIL
MOBIL:	MOBIL 424

It is possible to substitute engine oil SAE 30W API classification CD or CE for axle oil. Although increased brake noise may result, durability should not be affected.

20.5 DIESEL FUEL SPECIFICATIONS

⚠ WARNING

Possible fire hazard - never mix gasoline, gasohol and/or alcohol with diesel fuel. This practice creates an extreme fire hazard and under certain conditions an explosion which could result in personal injury or death.

⚠ WARNING

Never remove the fuel tank filler cap or refill the fuel tank while the engine is running or when hot or when the machine is indoors. Fumes are dangerous, a spark or flame could result in a fire or explosion.

NOTICE:

Due to the precise tolerances of diesel fuel injection systems, it is extremely important that the fuel be kept clean and free of contaminates or water. Contaminates or water in the system can cause severe damage to both the injection pump and nozzles.

REMARK

Below -12 uel will change to wax particles and clog the fuel filters. For best results use Grade No. 1-D diesel fuel in cold weather.

For normal service above -10 Grade No. 2-D diesel fuel with a minimum Cetane number of 40 is recommended. The use of No. 2-D diesel fuel will result in optimum engine performance under most operating conditions. Fuels with Cetane numbers higher than 40 may be needed in high altitudes or extremely low ambient temperatures to prevent misfires and excessive smoke.

At operating temperatures below -10 +14
use of lighter fuels can reduce fuel economy.

Where a winterized blend of Grade No. 2-D and No. 1-D fuels is available, it may be substituted for Grade No. 1-D fuel. However, it is the supplier's responsibility to provide the fuel for the anticipated ambient temperature.

Use a low sulfur content fuel having a cloud point that is at least 10 degrees below the lowest expected fuel temperature. Cloud point is the temperature at which crystals begin to form in the fuel.

The viscosity of the fuel **must** be kept above 1.3 cSt to provide adequate fuel system lubrication.

Optionally, the equivalent grades of recognized Federal Government specifications may be used; the latest revisions of VV-F-800a.

20.6 COOLANT SPECIFICATIONS

20.6.1 GENERAL

Selection and maintenance of the engine coolant is important to long engine life. The following information provides recommendations for selecting the engine coolant and maintaining the supplemental coolant additives (SCA).

Heavy duty diesel engines require a balanced coolant mixture of water, antifreeze, and supplemental coolant additives. Supplemental coolant additive recommendations are included in the section entitled **20.6.4 SUPPLEMENTAL COOLANT ADDITIVES on page 3-14.** The coolant mixture **must** be drained and replaced at the specified service interval shown in **23 MAINTENANCE SCHEDULE CHART on page 3-25**, or every two years of operation, whichever comes first.

20.6.2 WATER

Use water which has a low mineral content. Water used in conjunction with antifreeze, coolant filters and inhibited water must meet the following standards:

Total Hardness - Not to exceed 170 parts per million (10 grains/gallon maximum) to prevent scale deposits. Water containing dissolved magnesium and calcium (the usual reason for water hardness) above the specified amount will cause scale deposits to develop in the engine.

Chlorides - Not to exceed 40 parts per million (2.5 grains/gallon maximum) to prevent corrosion.

Sulfites - Not to exceed 100 parts per million (5.8 grains/gallon maximum) to prevent corrosion.

Dissolved Solids - Not to exceed 340 parts per million (20 grains/gallon maximum) to minimize sludge deposits, scale deposits, corrosion or a combination of these.

If any of the above requirements cannot be met, use distilled, de-ionized, or de-mineralized water. To determine if local water supplies meet these standards, water samples can be tested by water treatment laboratories. Softened water that is prepared using common salt (sodium chloride) contains excessive amounts of chlorides and should not be used.

NOTICE:
Never use water alone in the cooling system because rust, scale deposits and corrosion will occur.

20.6.3 ANTIFREEZE

In climates where the temperature is above -34
Antifreeze is essential in any climate. It broadens the operating temperature range by lowering the coolant freezing point and by raising its boiling point. Do **not** use more than 50 percent antifreeze in the mixture unless additional freeze protection is required. **Never** use more than 68 percent antifreeze under any condition.

An antifreeze concentration greater than 68 percent will adversely affect freeze protection and heat transfer rates. Antifreeze concentrations between 68 and 100 percent actually have a higher freezing point than a 68 percent antifreeze concentration and should not be used due to reduced heat transfer rates.

Ethylene glycol, low silicate antifreeze is recommended. The antifreeze should contain no more than 0.1 percent anhydrous alkali metasilicate. Low silicate antifreeze is recommended to avoid the formation of silica-gel (hydro-gel). This gel formation can occur when the cooling system contains an over concentration of high silicate antifreeze and/or supplemental coolant additive. DO NOT use methanol or alcohol as an antifreeze because of its low boiling point.

Antifreeze may retain its freeze protection for more than one season but coolant conditioners must be added to maintain corrosion protection.

Antifreeze formulated with methoxy propanol, or propylene glycol, is not recommended for this system.

NOTICE:

Do not mix types of antifreeze solutions. Mixed solutions make it impossible to determine the protection against freezing. Antifreeze containing sealer or anti-leak additives should NOT be used in this system. Sealer or anti-leak additives will cause plugging problems in the cooling system.

⚠ WARNING

Use extreme caution when adding coolant to a hot radiator to avoid being burned. Wear gloves and goggles and keep face away from the filler neck.

Check the solution periodically and at normal operating temperature, to be sure the cooling system has sufficient protection against freezing. An antifreeze concentration greater than 68 percent will adversely affect antifreeze protection and heat transfer rates. Antifreeze concentrations between 68 percent and 100 percent actually have a higher freezing point than a 68 percent antifreeze concentration and should not be used due to reduced heat transfer rates.

REMARK

Do not use a 100 percent antifreeze solution for protection from freeze-up. Using 100 percent antifreeze will cause severe corrosion in the cooling system radiator and oil cooler core. Use a water/antifreeze solution as described in the following table.

The following table shows the approximate percentage of antifreeze solution required for various temperatures.

Approximate Freezing Point	Percentage of Antifreeze Concentration by Volume	Specific Gravity at 16
0 (+32	0	1.000
-7 (+20	15	1.025
-12	25	1.040
-18	33	1.053
-23 (-10	40	1.062
-29 (-20	45	1.070
-34 (-30	48	1.074
-40 (-40	53	1.080
-46 (-50	56	1.083
-51 (-60	59	1.088
-57 (-70	62	1.092
-62 (-80	65	1.095
-68 (-90	67	1.097
-69 (-92	68	1.098

In tropical climates where antifreeze availability may be limited, use a corrosion inhibitor or supplemental coolant additive (SCA), to protect the engine cooling system.

20.6.4 SUPPLEMENTAL COOLANT ADDITIVES

1. All supplemental cooling system additives, including those in antifreeze solutions, become depleted through normal operation. If the coolant additives in antifreeze are allowed to become depleted, the antifreeze becomes corrosive and attacks and coats the metallic surfaces of the cooling system which reduces heat transfer. Cooling system conditioners which contain these additives must be added to maintain corrosion protection.

2. SOLUBLE OIL IS NOT RECOMMENDED for use in this engine as its use will reduce heat transfer and allow internal engine damage.

3. Miracle additives will not increase heat transfer or prevent overheating. Conditioned water is the best coolant.

4. A corrosion inhibitor/conditioner is recommended to inhibit corrosion in the cooling system for the following reasons:
   Improved compatibility with high silicate antifreezes minimizes hydro-gel formation, if over-concentration occurs.
   Provides engine protection in the following areas:
   - Solder corrosion/bloom
   - Copper corrosion/erosion/stress cracking
   - Oil fouling
   - Cylinder liner cavitation corrosion
   - Aluminum cavitation corrosion
   - Seal and gasket degradation

Maintenance of Supplemental Coolant Additives

Keeping the engine coolant properly inhibited will keep the engine and radiator free of rust, scale deposits and corrosion.

New machines are delivered with antifreeze protection. Service at a regular scheduled interval specified in **23 MAINTENANCE SCHEDULE CHART on page 3-25**, with a replacement coolant filter.

Each time the coolant is drained and replaced, the coolant must be recharged with supplemental coolant additives. New coolant can be correctly charged with coolant additives by using a replacement coolant filter and/or concentrate.

If coolant is added between drain intervals, additional coolant additives may be required.

Coolant Testing for Conditioner Concentration

When the cooling system is maintained as recommended, the conditioner concentration should be satisfactory. The SCA concentration must not fall below 1.0 unit per 3.8
accurate method for testing chemical concentrations in coolant with mixed chemical compounds is a laboratory analysis. For this reason, the coolant inhibitor should be maintained as shown in **23 MAINTENANCE SCHEDULE CHART on page 3-25**.

NOTICE:
Inadequate concentration of the coolant additive can result in major corrosive damage to cooling system components. Over-concentration can cause gel formation that can cause restriction, plugging of passages, and overheating.

Replenishing Coolant Conditioner

Install a "precharge" coolant filter when the coolant is changed or a significant (more than 50 percent) coolant loss occurs. Install a service coolant filter as specified in **23 MAINTENANCE SCHEDULE CHART on page 3-25**. When antifreeze is added, add coolant conditioner equal to 1.0 unit per 3.8

NOTICE:
Mixing of DCA4 and other supplemental coolant additives is not recommended because there is currently no test kit available to measure concentration levels with mixed chemical solutions.

Supplemental Coolant Additive Maintenance Guide

Use supplemental coolant additives (corrosion inhibitors) to protect the engine cooling system from corrosion. Antifreeze alone does **not** provide enough corrosion protection for a heavy duty diesel engine. Supplemental corrosion protection **must** be supplied through periodic additions of supplemental coolant additives to the coolant.

To protect against corrosion, a new coolant charge **must** be brought up to 0.26 SCA unit per liter [one unit per U.S. gallon] of coolant (initial charge). Maintain the correct SCA concentration by changing the service coolant filter at each engine oil and filter change interval.

Each time the coolant is drained and replaced, the coolant **must** be recharged with supplemental coolant additives. Use the appropriate replacement coolant filter listed in following tables. The coolant mixture **must** be drained and replaced as defined under "General."

The amount of a replacement inhibitor is determined by the length of the service interval and the cooling system capacity. Refer to the DCA4 Unit Guide for the selection of the correct filter to replenish the SCA.

If coolant is added between drain intervals, additional SCA will be required. Check the coolant DCA concentration level anytime coolant is added to the system. The SCA concentration **must not** fall below 0.13 units per liter or exceed 0.5 units per liter [0.5 units per U.S. gallon or exceed 2 units per U.S. gallon].

DCA4 UNIT GUIDE	
Fleetguard Part No.	DCA4 Units
DCA4 Coolant Filter	
WF-2070	2
WF-2071	4
WF-2072	6
WF-2073	8
WF-2074	12
WF-2075	15
WF-2076	23
WF-2077	0
DCA4 Liquid	
DCA60L	4 (1 pt)
DCA80L	1760 (55 gal)
DCA4 Powder	
DCA95	20

DCA4 Precharge and Service Filters			
System Capacity		**Precharge Filter (See NOTE 1)**	**Service Filter (See NOTE 3)**
Liters	**Gallons**		
19-26	5-7	WF-2072	WF-2070
30-38	8-10	WF-2073	WF-2071
42-57	11-15	WF-2074	WF-2071
61-76	16-20	WF-2075	WF-2071
80-114	21-30	WF-2076	WF-2072
118-190	31-50	(See NOTE 2)	WF-2073

NOTE 1 - After draining and replacing coolant, always precharge the cooling system to maintain the SCA concentration between 1.0 and 2.0 units per 3.8

NOTICE:

When performing service which requires draining the cooling system, discard the coolant. Reusing coolant can introduce contaminates or over concentrated chemicals, resulting in premature failure of cooling system components.

NOTE 2 - To precharge cooling systems larger than 114

Install appropriate service filter listed in the above table based on cooling system capacity.

Example: 95 gal (360
-15 Units (1) WF-2075 Filter
80 Units

The answer represents the additional units required to precharge the cooling system. Four bottles of powder, part number DCA95, will provide a sufficient amount of SCA units (80) to precharge the example cooling system.

Install the appropriate service filter at the next and subsequent maintenance intervals.

NOTE 3 - Change the coolant filter at every engine oil and filter change interval to protect the cooling system.

Maintain a nominal SCA concentration of1.0 unit per 3.8
3.8 S gal) indicates an under-concentrated coolant solution. More than 2.0 units per 3.8
an over-concentrated coolant solution.

To check the SCA concentration level, use coolant test kit, CC-2626. Instructions are included with the test kit.

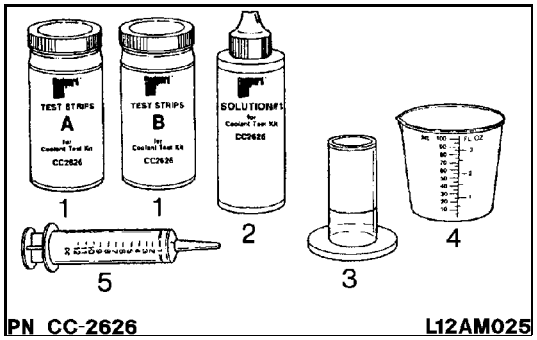
SCA Unit Concentration Guide		
Number of Solution A Drops to Cause Color Change	**Coolant Condition**	**Action Required**
0 - 10 Drops	Extremely under-concentrated - less than 0.4 SCA units per 3.8 (1 US gal)	Initially charge the system to a minimum of 1.0 SCA unit per 3.8
11 - 16 Drops	Marginally under-concentrated - 0.45 to 0.8 SCA units per 3.8 US gal)	Add SCA liquid units to maintain 1.0 SCA unit per 3.8 minimum or change the DCA 4 coolant filter.
17 - 25 Drops	Acceptable - 0.85 to 1.3 SCA units per 3.8	None.
26 - 35 Drops	Highly acceptable - 1.35 to 2.0 SCA units per 3.8	None.
36 - 55 Drops	Marginally over-concentrated - 2.1 to 3.3 SCA units per 3.8 gal)	Review maintenance practice.
Over 55 Drops	Extremely over-concentrated	Drain 50 percent of the coolant and replace with water antifreeze mixture. Retest the system for correct SCA unit concentration.

Cooling System Test Kit

The following cooling system test kit may be purchased from your Komatsu America International Company distributor.

This Fleetguard® coolant test kit, part number CC-2626 is used to check the concentration of coolant additives in the cooling system.

1. Test strip bottles
2. Solution #1 bottle
3. Small plastic container
4. Large plastic cup
5. Syringe



21. STANDARD TIGHTENING TORQUES FOR BOLTS AND NUTS

21.1 INTRODUCTION OF NECESSARY TOOLS

The following tools are needed when performing maintenance.

No.	Name of tool	Part No.	Remarks
1	Wrench set	09000-3006	Width across flats 8 mm - 10 mm 12 mm - 14 mm 13 mm - 17 mm 19 mm - 22 mm 24 mm - 27 mm 30 mm - 32 mm 
2	Socket wrench set	09020-10284	
3	Screwdriver	09033-00190	Cross head/flat head interchangeable type
4	Wrench	09014-10200	
5	Pliers	09036-00150	
6	Wrench	09001-03600	36 jaw
7	Tire wrench	417-98-11121	
8	Filter wrench	09019-08035	For filter change
9	Bar	417-98-11110	
10	Tire gauge	09289-00000	
11	Grease pump	07952-70004	For greasing work
12	Nozzle	07951-41017	Hose nozzle for grease pump
13	Grease cartridge	07950-90403	Lithium based grease - 400 g
14	Thickness gauge	09054-00009	
15	Hammer	09039-00150	
16	Plate	09963-03000	Warning tag

If any of the above tools are broken, please order them from your distributor.

21.2 TORQUE LIST

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

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

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

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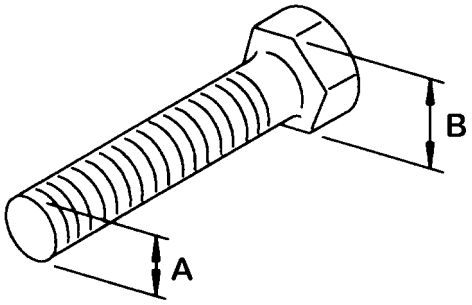

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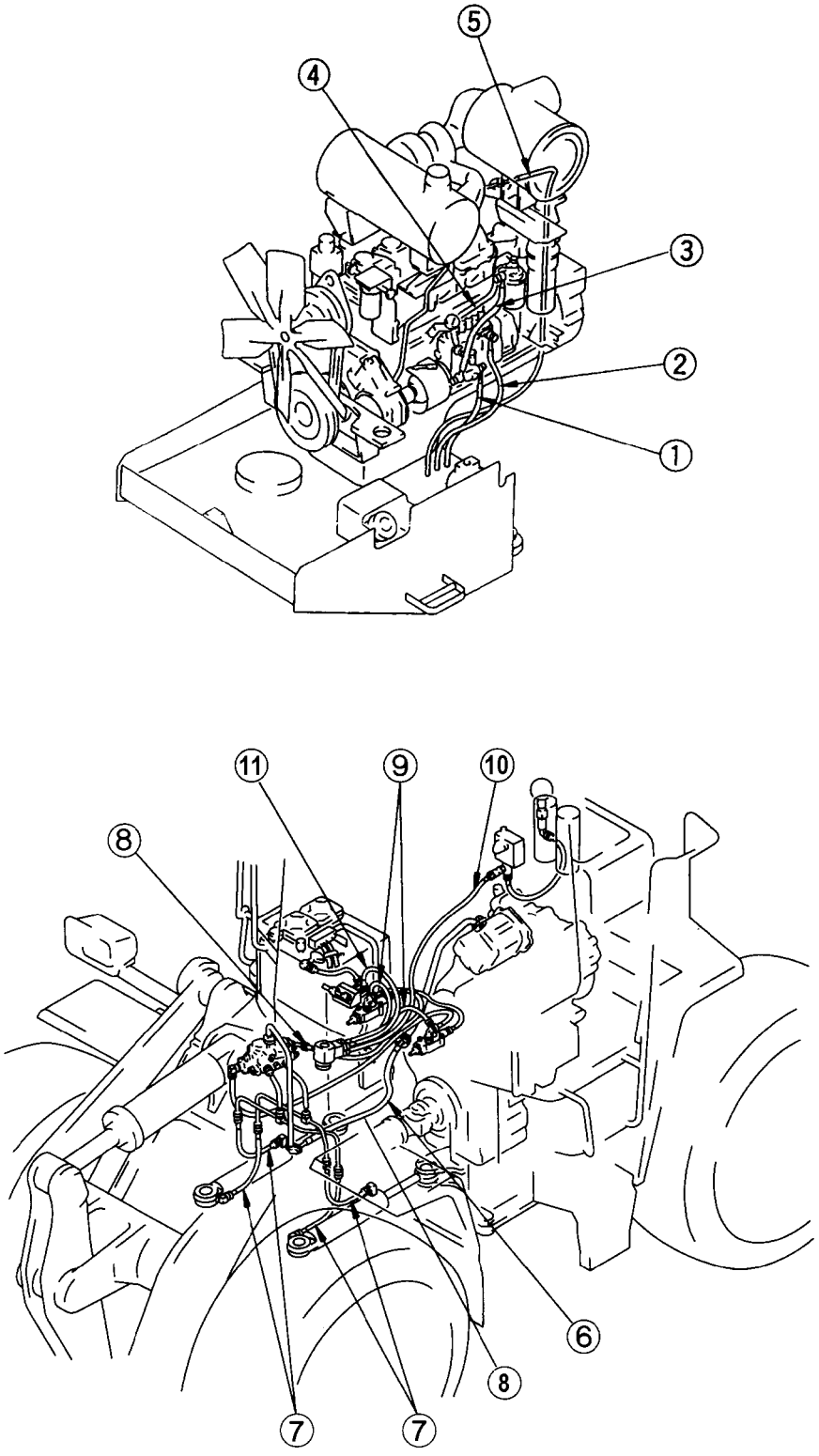
Thread diameter of bolt (mm) (a)	Width across flat (mm) (b)	(T)	(H)
		N	lbft
6	10	13.2 ± 1.4	97.3 ± 1.03
8	13	31.4 ± 2.9	23.2 ± 2.1
10	17	65.7 ± 6.8	48.5 ± 5.0
12	19	112 ± 9.8	82.6 ± 7.2
14	22	177 ± 19	131 ± 14
16	24	279 ± 29	206 ± 21
18	27	383 ± 39	282 ± 29
20	30	549 ± 58	405 ± 43
22	32	745 ± 78	549 ± 58
24	36	927 ± 98	684 ± 72
27	41	1320 ± 140	973 ± 100
30	46	1720 ± 190	1270 ± 140
33	50	2210 ± 240	1630 ± 180
36	55	2750 ± 290	2030 ± 210
39	60	3280 ± 340	2420 ± 250

NOTE

When tightening panels or other parts having fixtures made of plastic, be careful not to use excessive tightening torque: doing so will damage the plastic parts.

22. PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS

To ensure safety at all times when operating or driving the machine, the user of the machine must always perfom periodic maintenance. In addition, to further improve safety, the user should also perform periodic replacement of the parts given in the table. These parts are particularly closely connected to safety and fire prevention. With these parts, the material changes as time passed, or they easily wear or deteriorate. However, it is difficult to judge the condition of the parts simply by periodic maintenance, so they should always be replaced after a fixed time has passed, regardless of their condition. This step ensures that they always maintain their function completely. However, if these parts show any abnormality before the replacement interval has passed, they should be repaired or replaced immediately. If the hose clamps show any deterioration, such as deformation or cracking, replace the clamps at the same as the hoses. When replacing the hoses, always replace the O-rings, gaskets, and other such parts at the same time. Ask your distributor to replace the safety critical parts.



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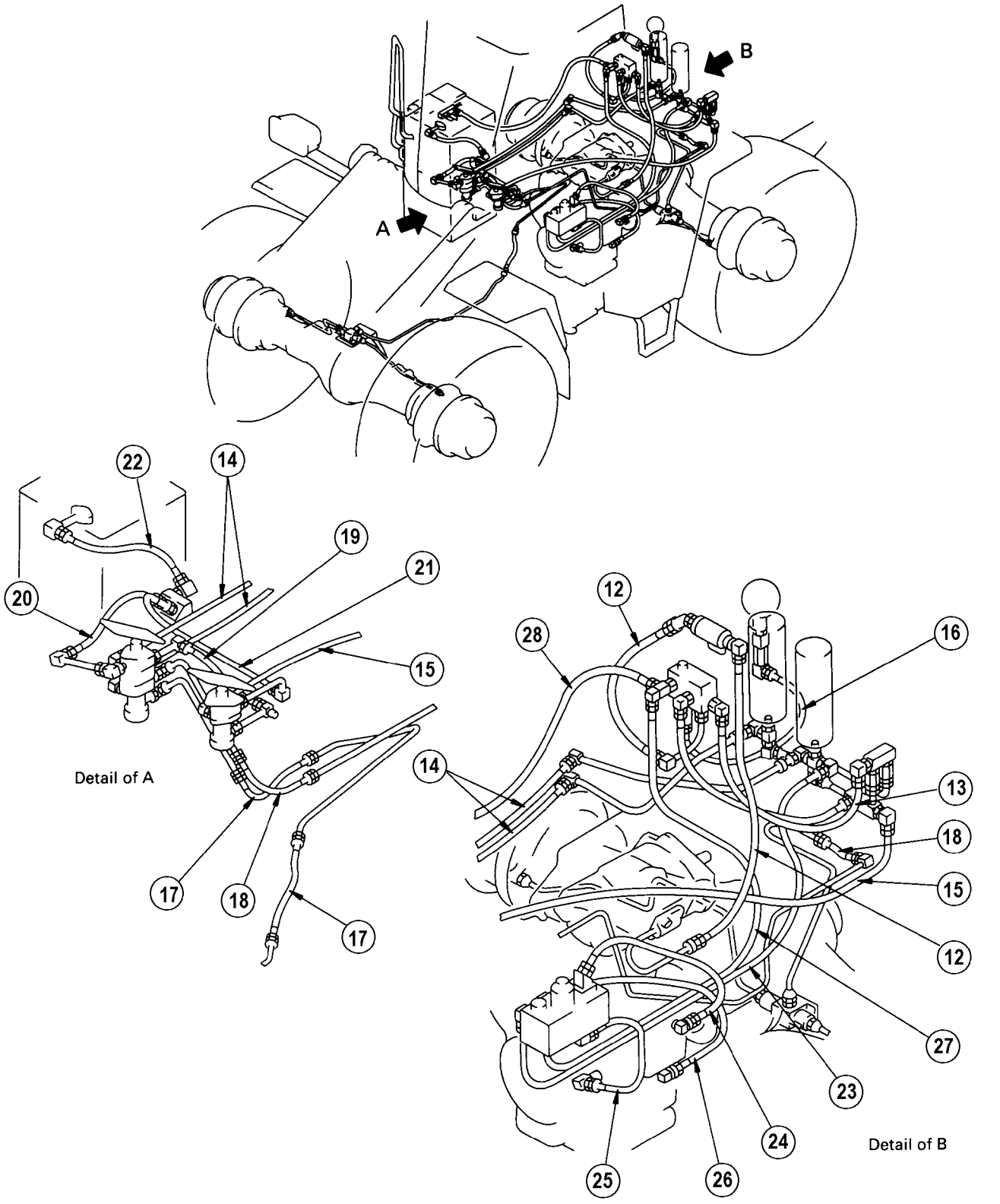
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Detail of B
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SAFETY CRITICAL PARTS

No.	Safety critical parts for periodic replacement	Qty.	Replacement interval
1	Fuel hose (fuel tank to injection pump)	1	Every 2 years or 4,000 hours, whichever comes first.
2	Fuel hose (fuel tank to engine)	1	
3	Fuel pump hose (injection pump to fuel filter)	1	
4	Fuel hose (fuel filter to injection pump)	1	
5	Fuel spill hose (injection nozzle to fuel tank)	1	
6	Steering hose (pump to steering valve)	2	
7	Steering hose (steering valve to steering cylinder)	4	
8	Steering hose (steering valve to stop valve)	2	
9	Steering hose (orbitrol valve to stop valve)	2	
10	Steering hose (orbitrol valve to pump accumulator)	1	
11	Steering hose (orbitrol valve to joint to tank)	1	
12	Packings, seals, o-rings of steering cylinder	2	
13	Brake hose (pump to accumulator charge valve)	2	
14	Brake hose (check valve to tandem valve)	3	
15	Brake hose (check valve to single valve)	2	
16	Brake hose (check valve to accumulator PP port)	1	
17	Brake hose (tandem valve to front brake)	2	
18	Brake hose (tandem valve to rear brake)	2	
19	Brake hose (single valve to tandem valve)	1	
20	Brake hose (tandem valve to drain block)	1	
21	Brake hose (single valve to drain block)	1	
22	Brake hose (drain block to hydraulic tank)	1	
23	Bake hose (accumulator to reduction valve)	1	
24	Brake hose (transmission valve to reduction valve)	1	
25	Brake hose (reduction valve to parking brake)	1	
26	Brake hose (parking brake to reduction valve)	1	
27	Brake hose (reduction valve to charge valve drain)	1	
28	Brake hose (charge valve drain to hydraulic tank)	1	
29	Seat belt	1	Replace every 3 years

23. MAINTENANCE SCHEDULE CHART

23.1 SCHEDULED MAINTENANCE CHART

SERVICE ITEM	PAGE
5. Check alternator, starting motor	3-59
6. Check engine valve clearance, adjust	3-59
7. Check vibration damper	3-59
8. Replace air conditioner recirculation and fresh air filter element	3-59
9. Clean and check turbocharger	3-59
10. Clean PPC circuit strainer	3-59
11. Check accumulator gas pressure	3-59
EVERY 4,000 HOURS SERVICE - 24.9	
1. Check water pump	3-60
The interval of 2,000 hours for changing the axle oil is for standard operations. If the brakes are used frequently or they make a sound upon application, change the oil after a shorter interval.	

24. INITIAL 250 HOURS SERVICE

24.1 INITIAL 250 HOURS SERVICE

Perform the following maintenance after the first 250 hours only.
- REPLACE FUEL FILTER CARTRIDGE
- REPLACE TRANSMISSION OIL FILTER ELEMENT
- REPLACE HYDRAULIC TANK FILTER ELEMENT
- CHECK ENGINE VALVE CLEARANCE, ADJUST

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

24.2 WHEN REQUIRED

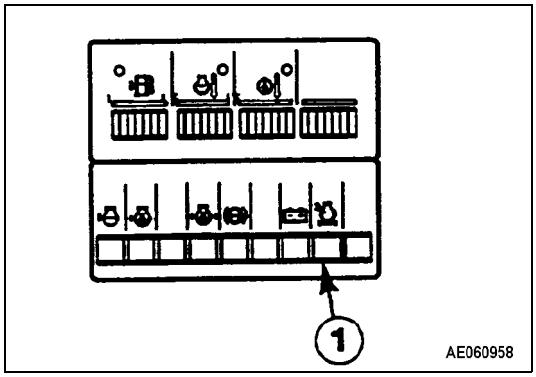
24.2.1 CHECK, CLEAN, AND REPLACE AIR CLEANER ELEMENT

⚠ WARNING

Never clean or replace the air cleaner element with the engine running.
When using pressurized air to clean the element, wear safety glasses or goggles to protect the eyes.

Checking

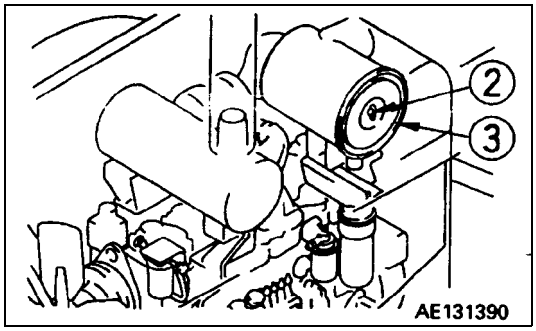
If the air cleaner clogging caution lamp (1) on the maintenance monitor flashes, clean the air cleaner element.



Cleaning or replacing outer element

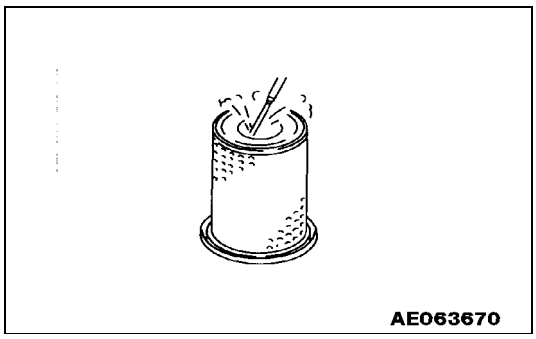
1. After unscrewing the wing nut (2), remove the cover (3) and then the outer element.

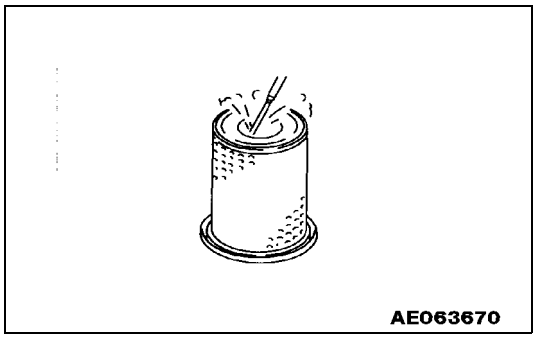
2. Clean the inside of the air cleaner body.



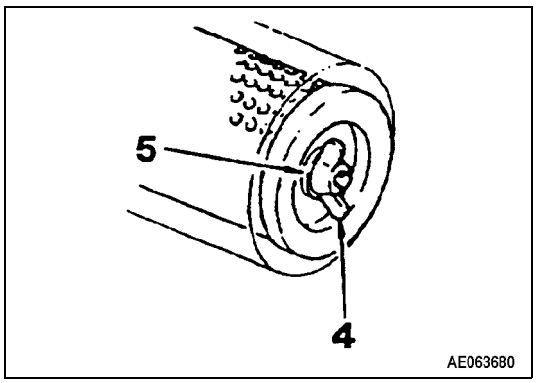
3. Direct dry, compressed air, lower than 7 kg/cm^2 (100 psi), to the element from the inside along its folds. Then direct it from the outside along its folds and again from the inside.

   A. Remove one seal from the outer element whenever the outer element has been cleaned.
   B. Replace the outer element which has been cleaned six times repeatedly or used throughout a year. Replace the inner element at the same time.
   C. If a red dust indicator appears immediately after the outer element has been cleaned, replace both the inner and outer elements, especially if the outer element has not been cleaned six times.



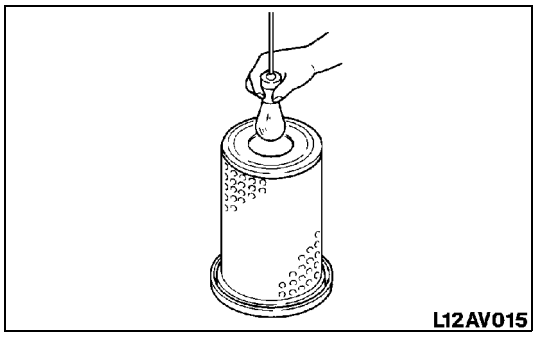


4. Check the inner element mounting nuts for looseness and, if necessary, retighten them. Replace the seal washer (5) or wing nut (4) with new parts, if they are broken.



NOTE: After cleaning and drying the element, shine a light through the element. If any small holes or thin cracks are found, replace the element. When cleaning it, do not hit it or beat it against anything. Do not use an element that has any damaged folds, gaskets, or seals.

5. After cleaning the element, reinstall it.



Replacing Inner Element

1. After removing the cover and outer element, remove the inner element.
2. To prevent dust from getting in, use a clean cloth or tape to cover the air connector (outlet side).
3. After cleaning the air cleaner body interior, remove the cover installed in Step 2.
4. Fit a new inner element to the connector and tighten it with nuts.

   Do not clean and reinstall an inner element.
5. Install the outer element.

Using Water

Wash the filter element with water at less than 3 kg/cm² (43 psi) of pressure, from the inside along the folds, and then from the outside and again from the inside. Let the element dry.

Using Water with a Cleaning Agent

To remove oil, grease, and carbon etc., clean the element in a lukewarm solution of mild detergent. Rinse the element in clean water. Let the element dry.

REMARK

Using warm water (40 y also be effective in cleaning the element. To speed up the drying process, direct compressed air (lower than 7 kg/cm² (100 psi)) to the inside of the element.

NOTE:
Do not attempt to heat the element.

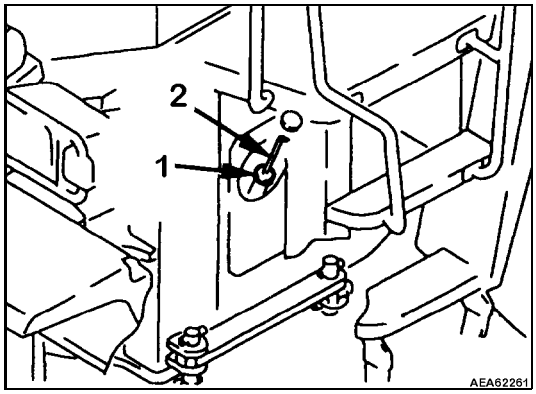
24.2.2 CHECK TRANSMISSION OIL LEVEL, ADD OIL

⚠ WARNING

When checking the oil level, apply the parking brake and lock the front and rear frames with the safety bar and pin.
The oil is at a high temperature after the machine has been operated. Always wait for the temperature to go down before performing this procedure.

Perform this procedure, if any oil is on the transmission case, or if there is oil mixed with the cooling water.

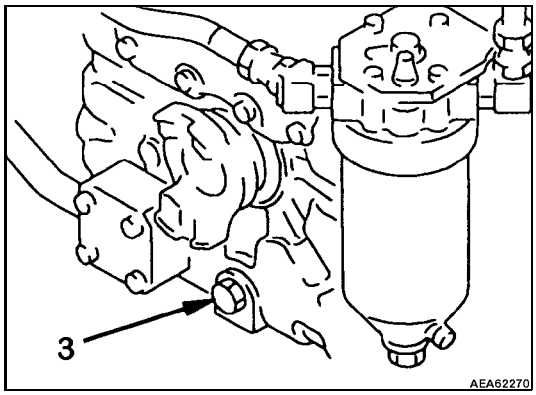
1. Start the engine and run it for at least 5 minutes.
2. Open the cap of the oil filler port (1), remove the dipstick (2), and wipe the oil off with a cloth.
3. Insert the dipstick (2) fully into the oil filler pipe, then remove it.
4. The oil level should be between **H** and **L** on the dipstick



If the oil level is below the **L** mark, then add oil through the oil filler.

For details of the oil to use, **see 20 FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE on page 3-9.**

5. If the oil is above the **H** mark, drain the excessive oil by removing the drain plug (3). Check the oil level again.
6. If the oil level is correct, insert the dipstick back into the filler and tighten the cap.

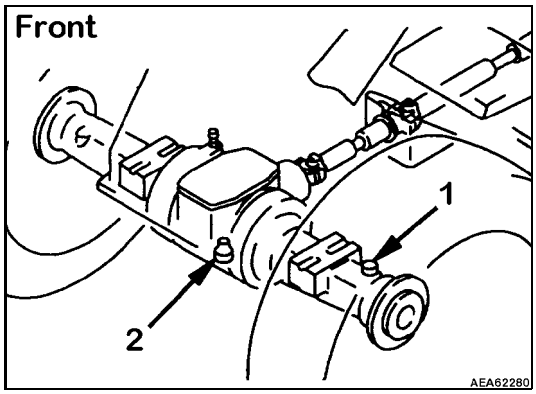


24.2.3 CHECK AXLE OIL LEVEL, ADD OIL

⚠ WARNING

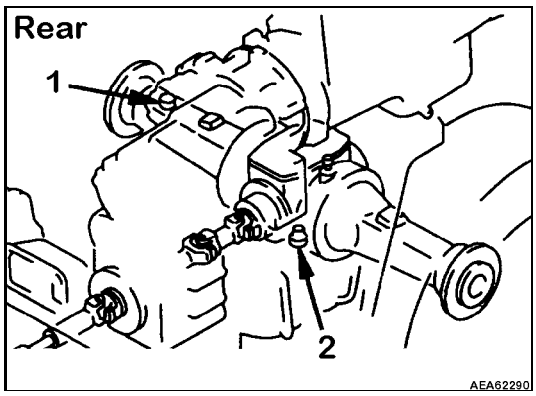
When checking the oil level, apply the parking brake and lock the front and rear frames with the safety bar and pin.
The oil is at a high temperature after the machine has been operated. Always wait for the temperature to go down before performing this procedure.

Perform this procedure if there is any sign of oil on the axle.



Perform this inspection with the machine on a horizontal road surface. If the road is at an angle, the oil level check will not be accurate.

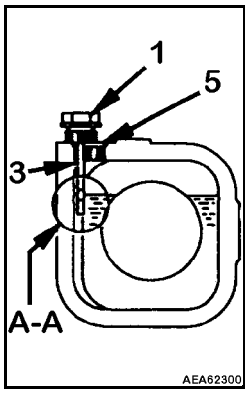
1. Turn OFF the engine and remove the oil level plug (1).
2. Wipe off the gauge attached to the plug with a cloth.
3. Set the oil level gauge (3) as shown in the diagram.
4. The oil level is correct when it is between the two lines (4) provided on the oil level gauge. If the oil does not reach the lower line, add oil through the filler port (5).

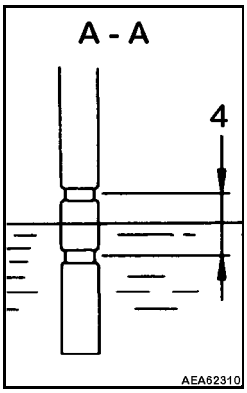


For details of the oil to use, **see 20 FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE on page 3-9.**

5. If the oil is level is above the upper line, drain off the excess oil through the drain plug (2). Check the oil level again.
6. If the oil level is correct, install the plug (1).

Oil level plug . . . . . 132 ± 39 N



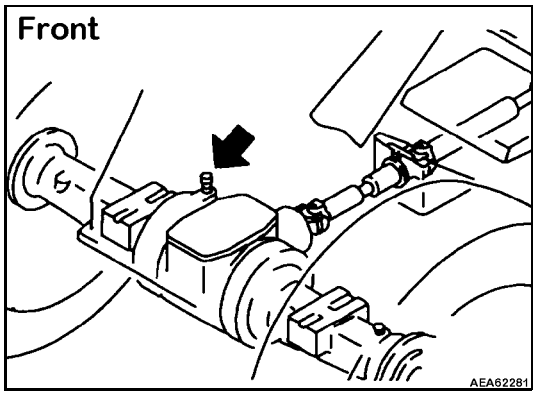


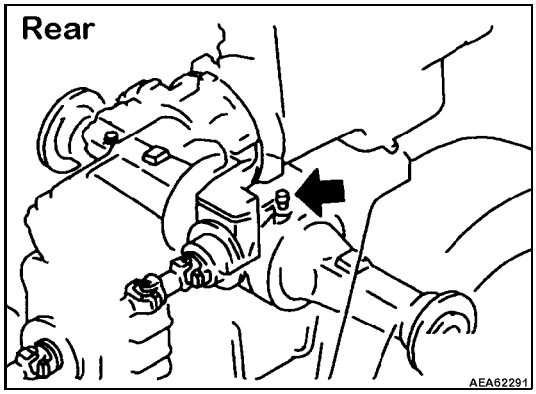
24.2.4 CLEAN THE AXLE CASE BREATHER

⚠ WARNING

When checking the oil level, apply the parking brake and lock the front and rear frames with the safety bar and pin.

Remove all mud and dirt from around the breather with a brush. When cleaning the breather, clean the breather at two places (front and rear).

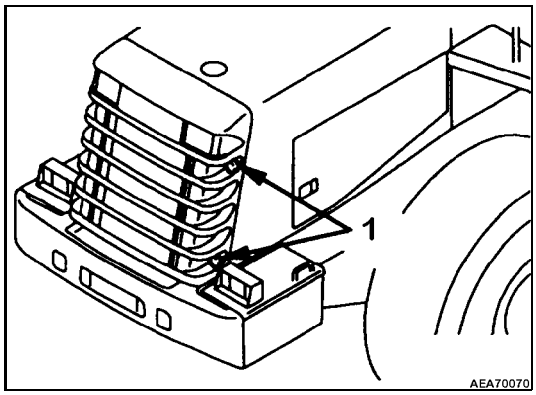




24.2.5 CLEAN THE RADIATOR FINS

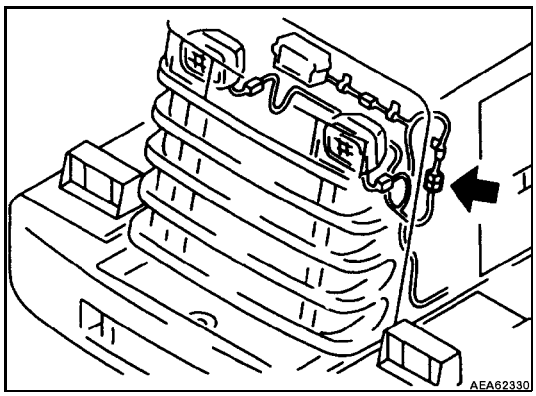
Perform this procedure if there is any dirt, mud, leaves, or insects stuck to the radiator.

1. After removing the bolts (1), open the rear grill from the rear of the machine. Remove the connector of the rear working lamp at the same time.



2. Use compressed air to clean the dirt, mud, leaves etc. from the radiator fins. Steam or water may also be used.

NOTE: This is a good time to check the hoses. See if any hoses show cracks or hardness due to ageing, and if any of the clamps are loose.



24.2.6 REPLACE THE BOLT-ON CUTTING EDGES

⚠ WARNING

It is extremely dangerous if the work equipment moves when performing this procedure. Set the work equipment in a stable position, turn off the engine, then set the safety lock for the work equipment control lever securely to the LOCK position.

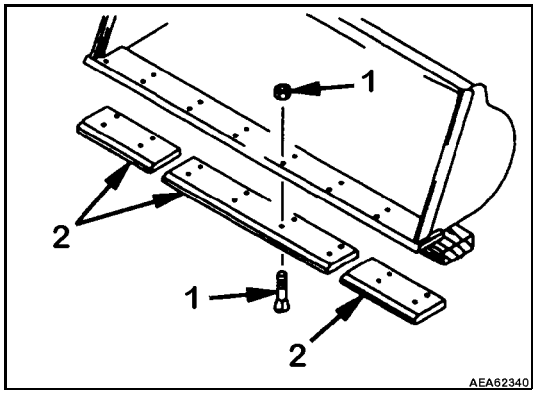
Turn or replace the cutting edges before the wear reaches the edge of the bucket.

1. After raising the bucket to a suitable height, position the bucket so that the bottom surface of the bucket is horizontal. Place blocks under the bucket to prevent it from coming down.

2. After removing the nuts and bolts (1), remove the cutting edge (2).

3. Clean the mounting surface of the cutting edges.

4. Flip the cutting edges (2) over and reassemble the end edges by placing them to the opposite side (left edge to the right side, right edge to the left side).



If both sides of the cutting edge are worn then replace it with a new one.

NOTE:
If the wear extended to the mounting surface then repair the surface before installing the cutting edge.

5. Tighten nuts and bolts (1) uniformly to prevent any gap from occurring between the bucket and the cutting edge.

N·m Mounting nuts . . . . . 1040 ± 157 N

6. Retorque the mounting bolts again after operating the equipment for several hours.

24.2.7 REPLACE BUCKET TEETH

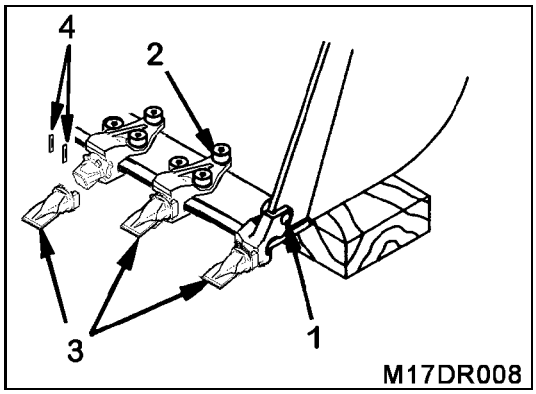
⚠ WARNING

It is extremely dangerous if the work equipment moves when performing this procedure. Set the work equipment in a stable position, turn off the engine, then set the safety lock for the work equipment control lever to the LOCK position.

When the bucket teeth are worn, replace them as follows.

1. Raise the bucket to a suitable height, then position the bucket so that the bottom surface of the bucket is horizontal and put blocks under it to prevent it from coming down.

2. For one-piece bucket teeth, proceed to step 3. To replace the Super V-type removable bucket teeth points, proceed as follows.
   A. Remove the clips (4) with the special tool provided.
   B. Remove the points (3) from the adapters. Remove the adapters after removing the bolts and nuts.
   C. After cleaning the adapter, install the new points (3) on the adapters and secure them with the clips (4) previously removed.
   D. Proceed to step 6.



3. After removing the nuts and bolts (1) and (2), remove the teeth (3).

4. Clean the mounting surface of the bucket teeth.

If the mounting surface is worn, repair it before installing new teeth.

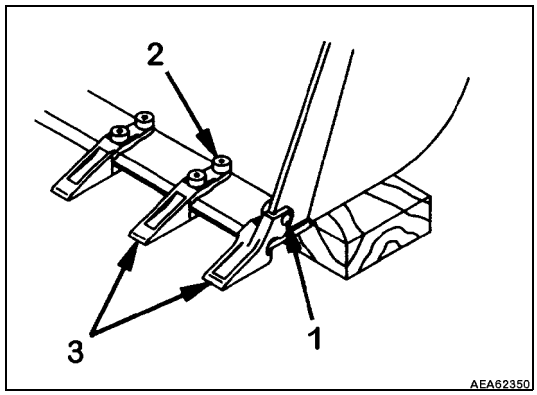
5. Install new teeth and use shims to eliminate any clearance between the teeth and the top surface of the bucket.

Minimum clearance . . . . . less than 0.5 mm (0.02 in.)

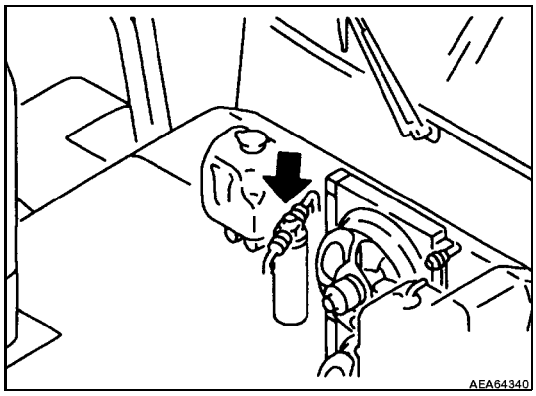
6. To prevent any gap from occurring between the tooth and the tip of the bucket, tighten the hardware. Hit the tip of the tooth with a hammer.

N·m Mounting nuts . . . . . 1265 ± 69 N

7. Retorque the mounting bolts again after operating the equipment for several hours.



24.2.8 CHECK AIR CONDITIONER



Check twice a year, spring and autumn.

Check Levels of Refrigerant (Gas)

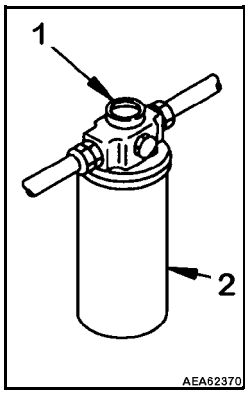
⚠ WARNING

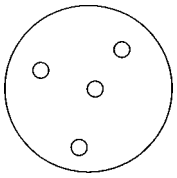
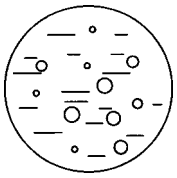
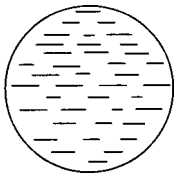
If the refrigerant used in the system gets into your eyes or on your hands, it could cause loss of sight or frostbite. So NEVER loosen any part of the refrigerant circuit.

Operate the air conditioner system from 5 to 10 minutes. Feel the high pressure side and low pressure side of the compressor. The high side should be hot while the low side should be cold to the touch. Inspect the refrigerant level by observing the refrigerant gas flow (R134a) through the sight glass.

Contact your distributor concerning this inspection.

The sight glass is located on the air conditioner drier-receiver, which is located on the right side of the machine and next to the condenser.



COOLER CONDITION	NORMAL	ABNORMAL	
Temperature of high and low pressure pipes	High pressure pipe is hot. Low pressure pipe is cold. Clear difference in temperature	High pressure pipe is warm. Low pressure pipe is cold. Little difference in temperature.	Almost no difference in temperature between high and low pressure pipes.
Sight glass	Almost transparent. Any bubbles disappear if the engine speed is raised or lowered. 	Bubbles are always flowing. Sometimes becomes transparent or white bubbles appear. 	Misty substance is flowing. 
System line connections	Properly connected	Some parts dirty with oil	Some parts very dirty with oil
General condition of air conditioner	Refrigerant level correct, no abnormalities. Ready for use.	Could have a gas leak. Contact your distributor for inspection and repair.	Almost all gas has leaked out. Contact your distributor for inspection and repair

OPERATING THE AIR CONDITIONER OFF SEASON

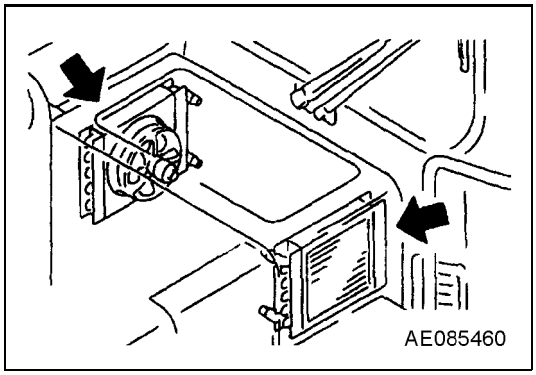
To lubricate each portion of the air conditioner compressor during the off season, operate the air conditioner for about 3 to 5 minutes once a month. Be sure to idle the engine at low speed for this purpose.

24.2.9 CLEAN THE AIR CONDITIONER CONDENSER

⚠ WARNING

Do not wash the condenser with a steam cleaner or the condenser will get hot and could break down

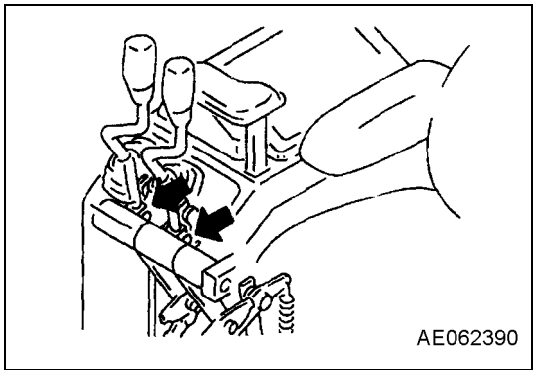
If there is mud or dust on the air conditioner condenser, clean it with water. When washing with a high-pressure machine, apply the water from a reasonable distance. If the water pressure is too high, the fins could deform.



24.2.10 LUBRICATE WORK EQUIPMENT CONTROL VALVE LINKAGE

If the work equipment control lever is heavy or does not move smoothly, apply grease.

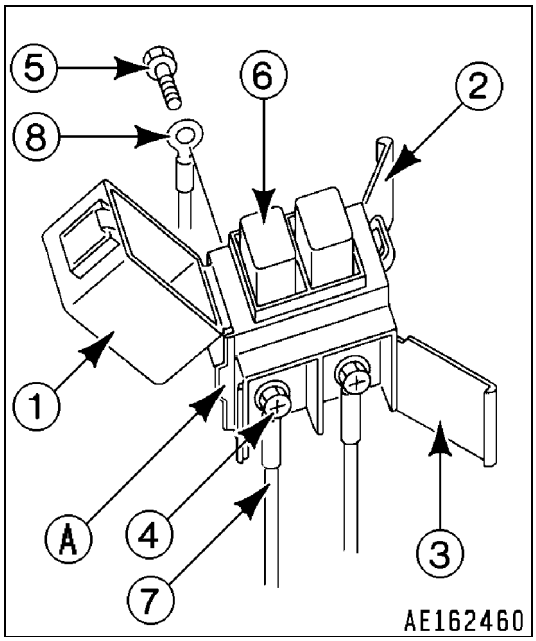
1. Using a grease pump, grease the two fittings indicated by the arrows.
2. Wipe off any old grease that was pushed out.



24.2.11 REPLACE THE SLOW-BLOW FUSE

NOTE
Always turn the power OFF when replacing the slow-blow fuse (turn the starting switch to the OFF position). Always replace the slow- blow fuse with one of the same capacity.

1. Turn the starting switch to the OFF position.
2. Remove the slow-blow fuse box from the chassis.
3. Open covers (1), (2) and (3) of the slow-blow fuse box. Covers (2) and (3) can be removed easily by using protrusion **A** on the body as a fulcrum and levering the catch of the cover with a flat headed screwdriver to release it.
4. Loosen the screws (4) and (5) and remove. When the screws (4) and (5) are removed, the slow-blow fuse (6) will come off with the electric wiring (7) and (8).
5. Using the screws (4) and (5), install a new slow-blow fuse with electric wiring (7) and (8) to the slow-blow fuse box, and close the covers (1), (2) and (3).
6. Install the slow-blow fuse box to the chassis.

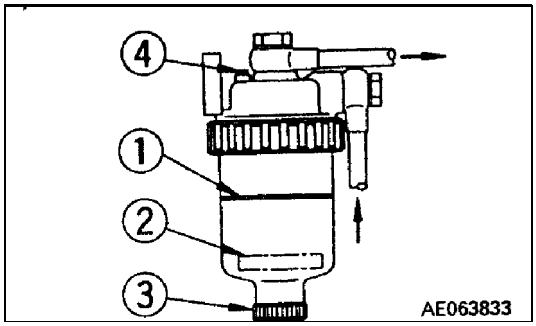


24.2.12 DRAIN WATER FROM WATER SEPARATOR (if equipped)

When the float (2) is at or above the red line (1), drain the water according to the following procedure.

1. Loosen the drain plug (3) and the air bleed plug (4) (if equipped). Drain the accumulated water until the float reaches the bottom.

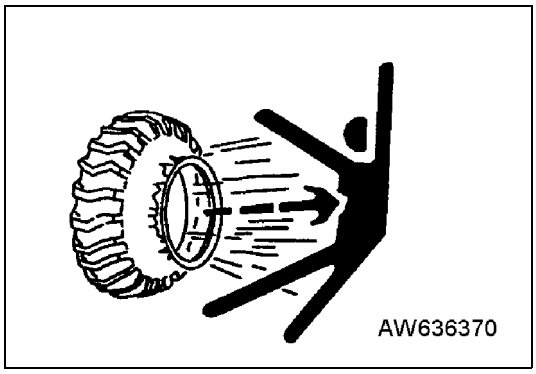
2. Tighten the air bleed plug (4) and the drain plug (3).



24.2.13 SELECTION AND INSPECTION OF TIRES

⚠ WARNING

If a tire or a rim is handled incorrectly, the tire may burst or may be damaged and the rim may be broken and scattered, and that can cause serious injury and death.
Since maintenance, disassembly, repair, and assembly of the tires and rims require special equipment and skill, be sure to ask a tire repair shop to perform the work.
Do not heat or weld the rim to which the tire is installed. Do not make a fire near the tire.
Select the tires according to the conditions of use and attachments on the machine. Use only the specified tires and inflate them to the specified pressure.



Selection of Tires

Select the tires according to the conditions of use and attachments of the machine. Because the indicated speed varies with the tire size, consult your distributor when using optional tires.

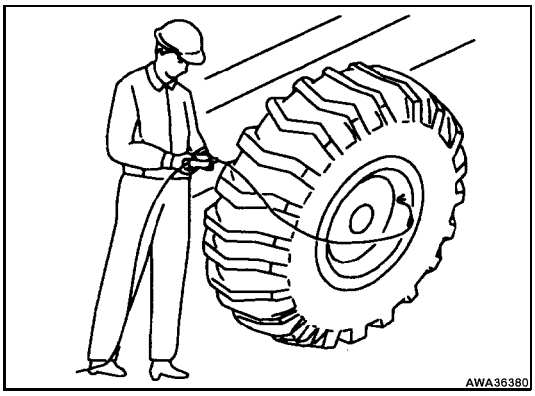
Check Tire Pressure and Inflating Tires

⚠ WARNING

When inflating a tire, check that no one will enter the working area and use an air chuck which has a clip and which can be fixed to the air valve. While inflating the tire, check the inflation pressure occasionally so that it will not rise too high. If the rim is not fitted normally, it may be broken and scattered while the tire is inflated. To ensure safety, place a guard around tire and do not work in front of the rim but work on the tread side of the tire.
Abnormal drop of inflation pressure and abnormal fitting of the rim indicate a trouble in the tire or rim. In this case, be sure to ask a tire repair shop to carry out repairs. Be sure to observe the specified inflation pressure. Do not adjust the inflation pressure of the tires after high-speed travel or heavy-duty work.

Check

Measure the inflation pressure with a tire pressure gauge while the tires are cool before starting work.



Inflation of tires

Adjust the inflation pressure properly. When inflating a tire, use an air chuck which can be fixed to the valve of the tire. Do not work in front of the rim but work on the tread side of the tire.

Standard tire inflation pressure (front and rear wheels)

Tire size	Inflation pressure
23.5-25-20PR (L3 rock) (standard)	Front tire: 0.39 MPa (4.0 kgf/cm^2) Rear tire: 0.31 MPa (3.2 kgf/cm^2)
26.5-25-16PR (L3 rock) (if equipped)	Front tire: 0.34 MPa (3.5 kgf/cm^2) Rear tire: 0.29 MPa (3.0 kgf/cm^2)

NOTE
The appropriate tire inflation pressure differs according to the type of work, **See 12.18.2 TIRE PRESSURE on page 2-76.**

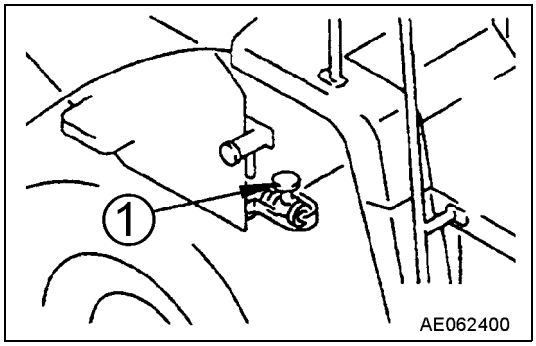
24.3 CHECKS BEFORE STARTING

See the section on CHECKS BEFORE STARTING in SECTION 2.

24.4 EVERY 50 HOURS SERVICE

24.4.1 DRAIN WATER, SEDIMENT FROM FUEL TANK

Loosen the valve (1) on the right side of the tank so that the sediment and water will be drained with the fuel.



24.5 EVERY 100 HOURS SERVICE

Perform maintenance for every 50 hours at the same time.

24.5.1 CHECK OIL LEVEL IN HYDRAULIC TANK, ADD OIL

⚠ WARNING

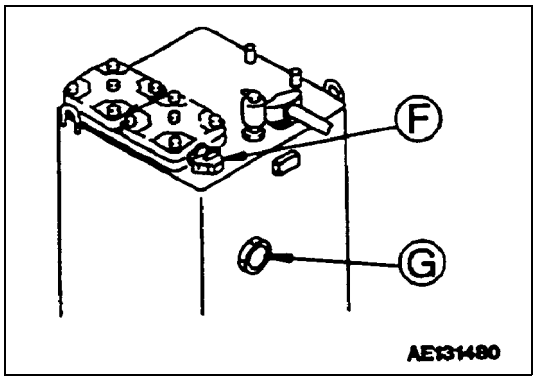
When the oil filler cap is removed, oil may spurt out, so turn the engine off and wait for the oil to cool. Turn the cap slowly to release the internal pressure before removing the cap.
If the oil level is above the H mark, turn the engine off and wait for the hydraulic oil to cool. Drain the excess oil.

1. Lower the bucket horizontally to the ground and turn the engine off. Wait 5 minutes, then check sight gauge (G). The oil level should be between the **H** and **L** marks.

NOTE: Do not add oil, if the oil is above the **H** line. This will damage the hydraulic equipment and cause oil to spurt out.

2. If the oil level is below the **L** mark, open the inspection cover above the step and add oil through the oil filler port (F).

For specification of the oil to use, **see 20 FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE on page 3-9.**



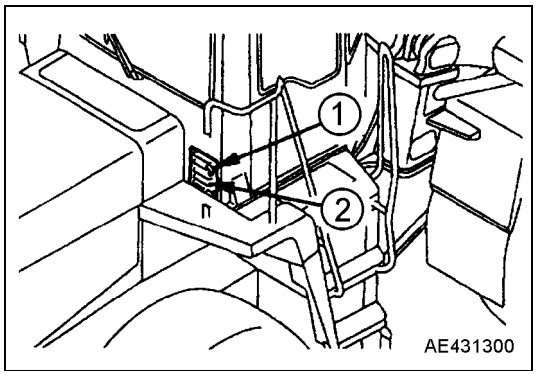
24.5.2 CLEAN ELEMENT IN AIR CONDITIONER FRESH AIR FILTER

⚠ WARNING

When using compressed air, wear safety glasses and other things required to maintain safety.

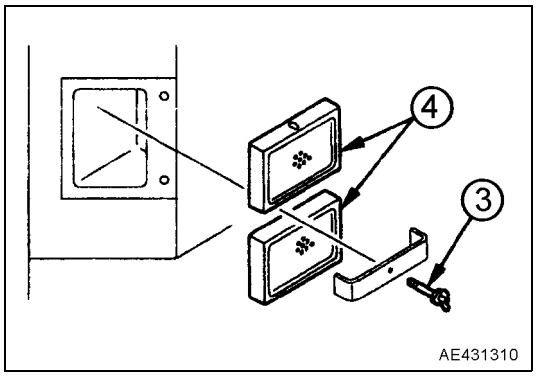
If the air conditioner has been used, then its air filter element could need cleaning. Before cleaning the elements, turn the air conditioner OFF.

1. Loosen the thumb screws (1) and remove the cover (2).



2. After loosening the screw (3), remove the element (4) and clean it.

3. Direct compressed air, lower than 7 kg/cm^2 (100 psi), to the element from the inside along its folds. Then direct the compressed air from the outside along its folds and again from the inside. Check the element for damage and/or deterioration.



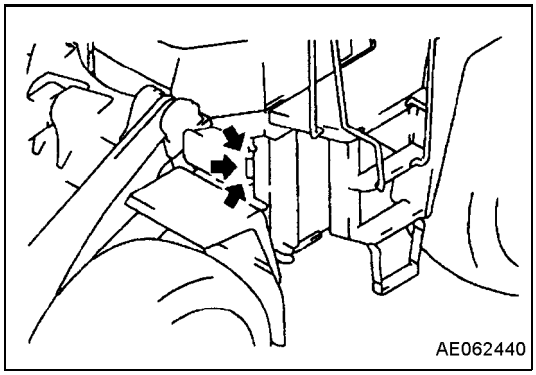
REMARK
When assembling the element, install it so that the arrow atop the element is facing inside the cab.

24.5.3 LUBRICATE REAR AXLE PIVOT PIN (3 PLACES)

⚠ WARNING

Set the work equipment in a stable condition. Turn the machine off and apply the lock for the work equipment control levers.
Apply the parking brake, and lock the front and rear frames with the safety bar and pin.

1. Use a grease pump to grease the fittings, which are identified by the arrows.
2. After greasing, wipe off any old grease that was pushed out.



24.6 EVERY 250 HOURS SERVICE

Maintenance for every 50 and 100 hours should be carried out at the same time.

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

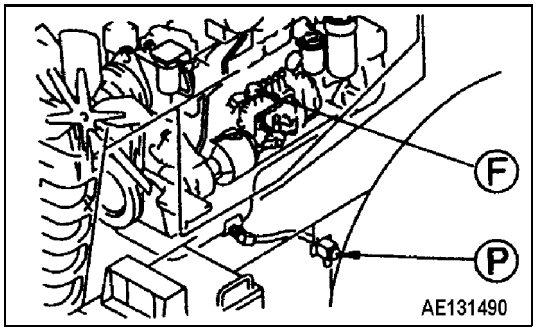
⚠ WARNING

Before changing the oil, wait at least 10 minutes for the engine to cool.

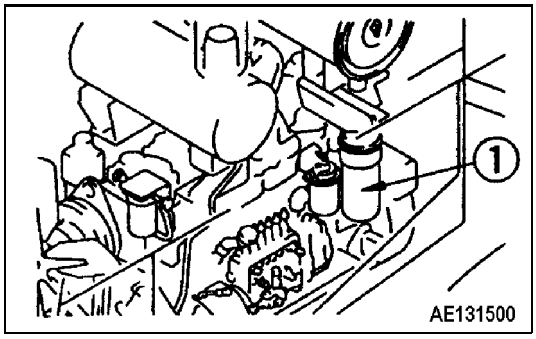
Prepare the following.

Oil catch container: Min. 38
Refill capacity: 38
Filter wrench

1. Open the oil filler (F).
2. Place the oil catch container under the drain plug (P).
3. Remove the drain plug (P) to drain the oil. After draining the oil, reinsert the drain plug (P) and tighten it.
4. Check the drained oil for excessive metal particles or foreign material. If found, contact your Komatsu distributor.



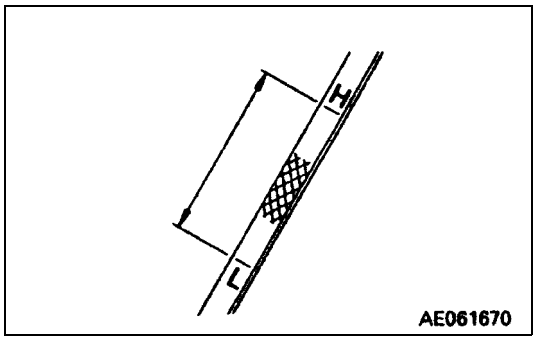
5. Using the filter wrench, turn the filter cartridge (1) counterclockwise.



6. Clean the filter holder. After filling the new filter cartridge with engine oil, coat the filter seal and thread with engine oil. Install the filter.

7. Once the filter's seal contacts the filter holder's surface, tighten the filter an additional 3/4 to 1 turn.

8. After replacing the filter cartridge, add engine oil through the oil filler (F) until the oil level is between the **H** and **L** marks on the dipstick.



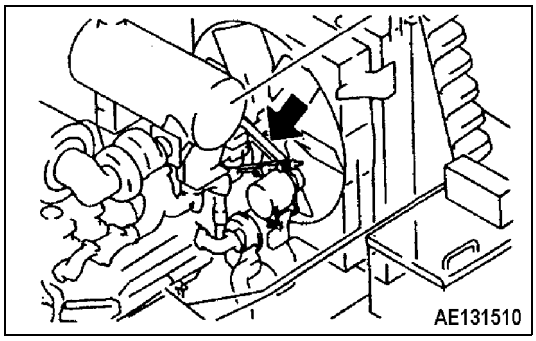
For details of the oil to use, **see 20 FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE on page 3-9.**

9. Run the engine at an idle for a short time and then stop the engine. Check that the oil level is between the **H** and **L** marks on the dipstick. For details, **See 12.1 CHECKS BEFORE STARTING on page 2-35.**

REMARK
If the machine has not been operated for 250 hours and has been in service at least 6 months, replace the oil and filter.

NOTE
Use the API category CD class oil. If using the CC class oil, change the oil and filter twice as often (125 hours instead of 250 hours).

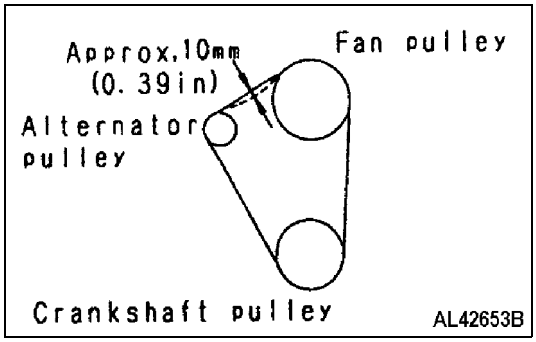
24.6.2 CHECK TENSION OF FAN BELT, ALTERNATOR BELT, ADJUST



CHECK

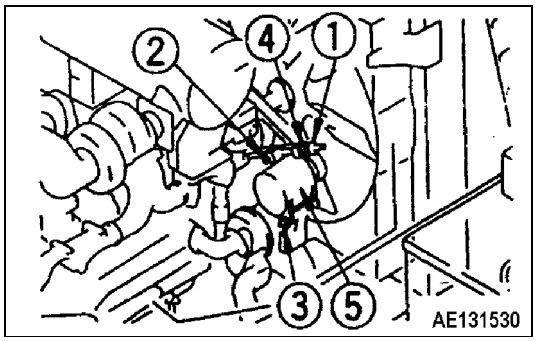
The belt deflection should be about 10 mm (0.39 in.) when pressed with a finger force of about 58.8 N (6 kgf) at a point midway between the fan pulley and the alternator pulley.

1. Check the belt for cuts or cracks. If found, replace the belt.
2. Check each pulley for damage and groove wear. If the belt touches the bottom of the groove, the pulley needs replacement.



ADJUSTMENT

1. Loosen the nuts and bolts (1), (2), and (3).
2. Turn the nut (4) to the right and move the alternator (5) to obtain the specified belt deflection (10 mm or 0.39 in.).
3. If the specified belt deflection cannot be obtained, the belt is stretched and must be replaced.
4. Tighten the nuts and bolts (1), (2), and (3) to hold the alternator in position.
5. After operating the engine for one hour, adjust the belt tension again.



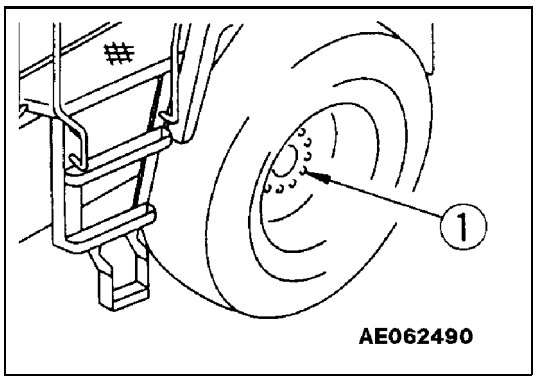
24.6.3 CHECK FOR LOOSE WHEEL HUB NUTS, TIGHTEN

Loose wheel hub nuts (1) accelerate tire wear, and may cause an accident.

1. Using a torque wrench, check each nut for the specified torque.

Hub nut torque: 471+/- 49 N•m (347.2 +/- 36.2 lbft.)

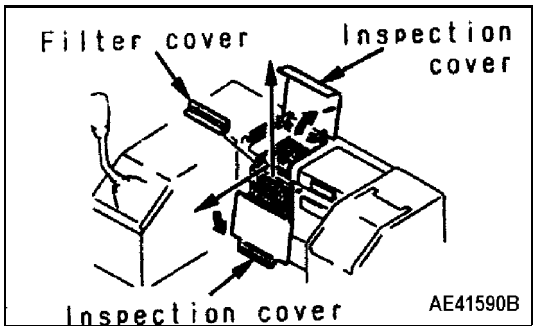
2. If any one stud bolt is broken on a wheel, replace all the stud bolts for that wheel.



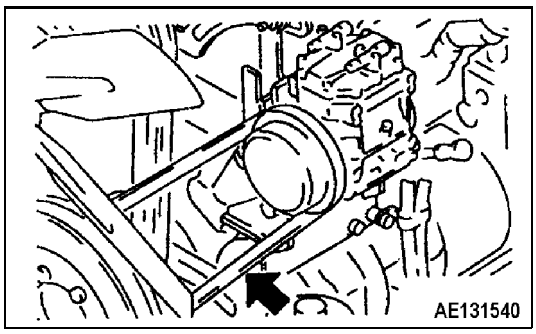
24.6.4 CLEAN ELEMENT IN AIR CONDITIONER RECIRCULATION FILTER

1. After opening the filter inspection cover, remove the filter cover and then remove the filter in the direction of the arrow. When removing the filter to the side, put your weight on theseat and push down.

2. Clean the filter with compressed air in the same method as cleaning the fresh air filter. If the filter is extremely dirty, rinse it in water. After rinsing the filter, dry it before reinstalling it.



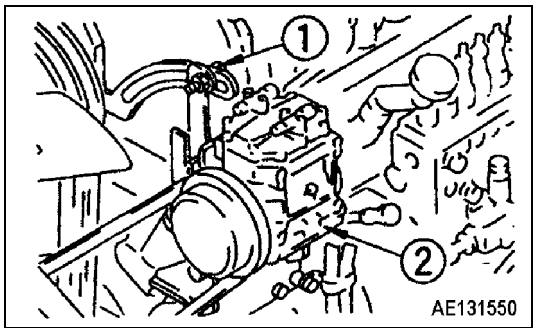
24.6.5 CHECK AIR CONDITIONER COMPRESSOR BELT TENSION, ADJUST



Checking
The belt deflection should be from 16 to 20 mm (0.6 to 0.8 in.) when pressed with the thumb at a force of 98 N (22 lbf) at a point midway between the air conditioner compressor pulley and the fan pulley.

When the belt tension gauge is used, tension should remain in the range from 353 to 530 N•m (79 to 119 lbf).

Check each pulley for damage and groove wear. If the belt is touching the bottom of the groove, replace the pulley.



Adjusting
Loosen the bolt (1) and move the compressor (2) to adjust the belt tension.

When adjusting the belt tension, use a wrench. Do not press directly on the compressor with a bar.

If the specified belt deflection cannot be obtained, the belt is stretched and must be replaced.

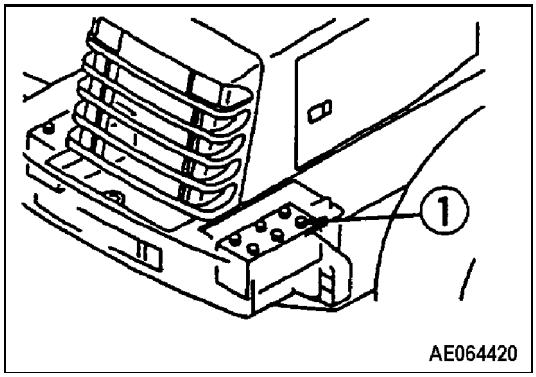
24.6.6 CHECK BATTERY ELECTROLYTE LEVEL

⚠ WARNING

To avoid gas explosions, do not bring fire or spark near the battery.
Battery electrolyte is dangerous. If it gets in your eyes or on your skin, wash it off with lots of water, and consult your doctor.

Perform this check before operating the machine.

1. Open the cover of the battery box. There are two battery boxes: One on each side at the rear of the machine.
2. Remove the battery caps (1), and check each cell. The electrolyte level should be from 10 to 12 mm (0.40 to 0.47 in.) above the plates. If the electrolyte levelis low, add distilled water to the specified level.
3. Clean the air hole in each battery cap, then tighten securely.



NOTE
When adding distilled water in cold weather, add it just before operating the machine, to prevent the electrolyte from freezing.

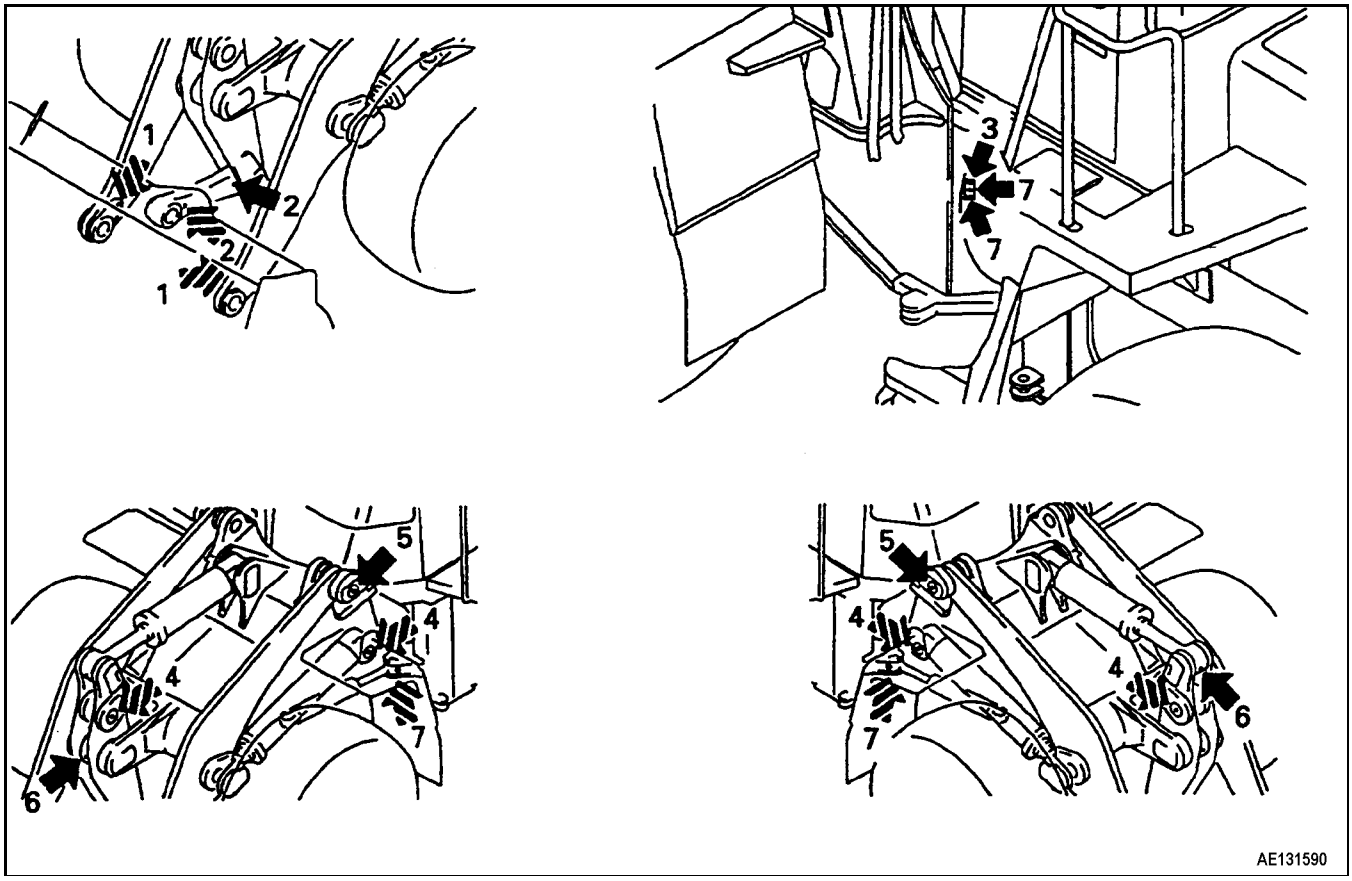
24.6.7 LUBRICATING

⚠ WARNING

Set the work equipment in a stable condition and turn the machine off. Apply the lock for the work equipment control levers.
Apply the parking brake and lock the front and rear frames with the safety bar and pin.

1. Use a grease pump to grease the fittings, which are identified by the arrows in the illustration below.

2. After greasing, wipe off the old grease that was pushed out.



1. Bucket pin (2 places)
2. Bucket link pin (2 places)
3. Dump cylinder pin (2 places)
4. Lift cylinder pin (4 places)
5. Lift arm pivot pin (2 places)
6. Tilt lever pin (1 place)
7. Steering cylinder pin (4 places)

24.7 EVERY 500 HOURS SERVICE

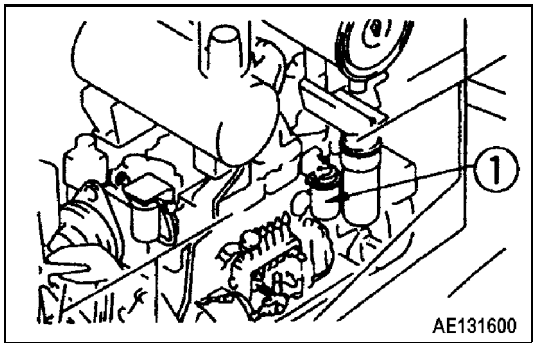
Maintenance for every 50, 100, and 250 hours should be performed at the same time.

24.7.1 REPLACE THE FUEL FILTER CARTRIDGE

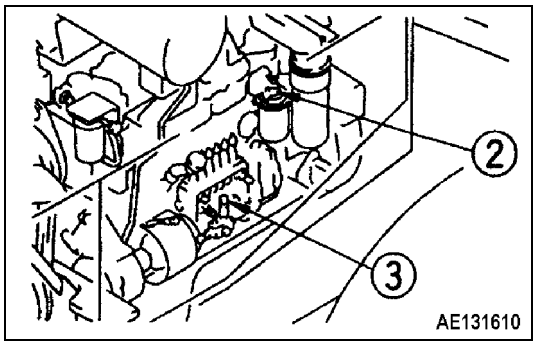
⚠ WARNING

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. Open the side cover located on the right side of the machine.
2. Set the container to catch the fuel under the filter cartridge.
3. Using a filter wrench, turn the filter cartridge (1) counterclockwise to remove it.
4. Clean the filter holder. Fill a new fuel filter cartridge with clean fuel.
5. After coating the filter's seal with engine oil, install the filter to the holder. Tighten the filter until the seal contacts the surface of the holder, and then turn the filter an additional two-thirds of a turn. Excessive tightening of the filter will damage the seal and cause a fuel leakage. A loose fuel filter cartridge will also cause fuel leakage.
6. After replacing the filter cartridge (1), loosen the air bleed plug (2).
7. Loosen the feed pump knob (3) and move the pump up and down to draw off the fuel until air ceases to come out of the air bleed plug (2).
8. Tighten the air bleed plug (2). Push in the feed pump knob (3) and then tighten it.



⚠ WARNING

When cranking the engine, confirm that the area around the engine is safe because the engine could start.

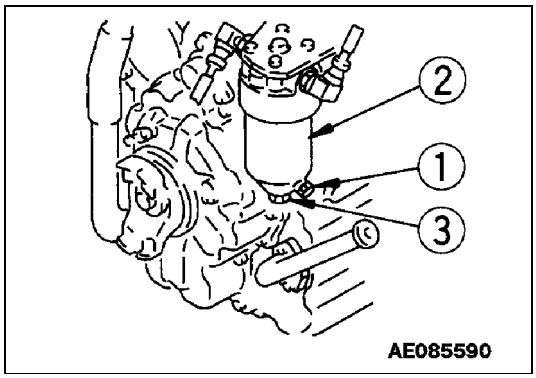
9. After replacing the fuel filter cartridge, turn the key in the starting switch to the START position. The air will be bled from the fuel system within a few seconds.
10. After starting the engine, check for fuel leaks at the fuel filter. If any fuel leakage exists, repeat steps 2 and 3 to remove the filter cartridge and check the seal. If it is damaged, replace the seal with a new one. Repeat steps 4 to 9.

24.7.2 REPLACE TRANSMISSION OIL FILTER ELEMENT

1. Remove the drain plug (1) at the bottom of the filter case, and drain the oil. After draining the oil, tighten the plug to:

   107.9 +/- 14.7 N•m (79.6 +/- 10.8 lbf ft.)

2. Hold the case (2) and loosen the center bolt (3). Remove the case (2).

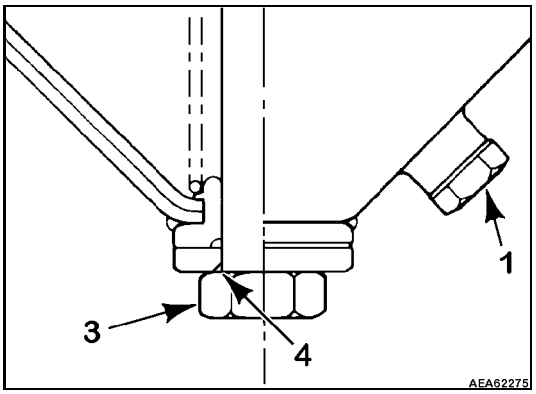


Be sure to use a new genuine Komatsu filter element. Replace the filter gasket and O-rings with new parts. Coat the gasket and O-rings with clean engine oil before installing.

3. Remove the element, and clean the inside of the case. Assemble a new element, then install the case.

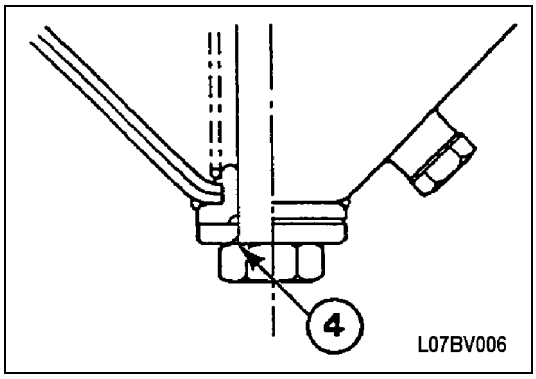
Before tightening the center bolt (3), install the bolt washer (4) so that the chamfered surfaces face the hexagonal head of the center bolt. Torque the center bolt (3) to:

76.5 +/- 11.8 N•m (56.4 +/- 8.7 lbf ft.).



4. Add the specified transmission oil. For details, **see 24.2.2 CHECK TRANSMISSION OIL LEVEL, ADD OIL on page 3-31.**

5. Run the engine for a short period of time at idle. Turn the engine off and check that the oil is at the specified level.

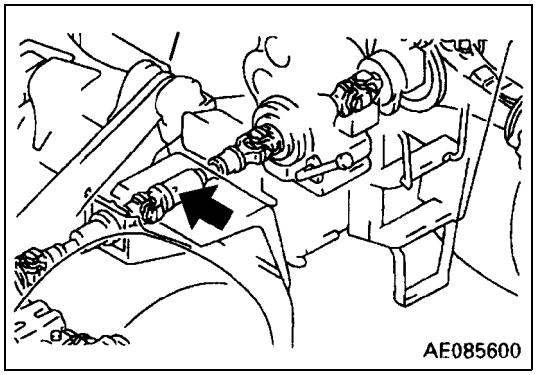


24.7.3 LUBRICATE CENTER DRIVE SHAFT SPLINE

⚠ WARNING

Set the work equipment in a stable condition. Turn the machine off and apply the lock for the work equipment control levers.
Apply the parking brake. Lock the front and rear frames with the safety bar and pin.

1. Use a grease pump to grease the one fitting, which the arrow points to in the illustration.



2. After greasing, wipe off any old grease that was pushed out.

REMARKS
Perform this same procedure for machines with auto-greasing systems.

24.8 EVERY 1,000 HOURS SERVICE

⚠ WARNING

The transmission oil will be hot immediately after turning the machine off. Wait for the oil to cool down before changing the transmission oil.

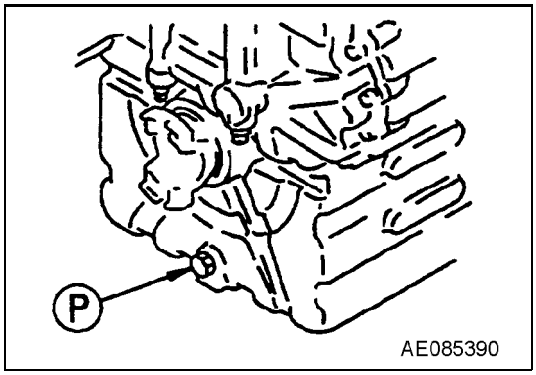
Maintenance for every 50, 100, 250 and 500 hours should be performed at the same time.

24.8.1 CHANGE OIL IN TRANSMISSION, CLEAN STRAINER

Prepare a container to catch the oil.

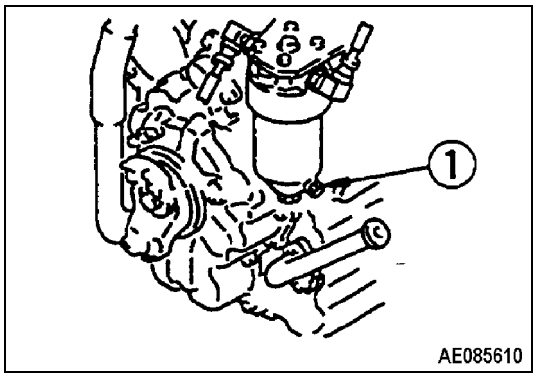
1. Loosen the drain plug (P) slowly to prevent the oil from spurting out. After draining the oil, tighten the drain plug to:

   68.6 +/- 9.8 N•m (50.6 +/- 7.2 lbf ft.)



2. Remove the transmission oil filter drain plug (1) and drain the oil. After draining the oil, tighten the drain plug to:

   107.9 +/- 14.7 N•m (79.6 +/- 10.8 lbf ft.)

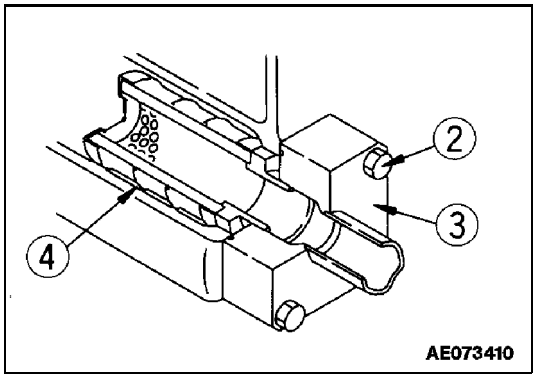


3. After removing the bolts (2) and the cover (3), remove the strainer (4).

4. Remove all dirt from the strainer (4) before washing it in clean, light oil (diesel or flushing oil). Replace the strainer if it is torn.

5. Replace the O-ring in the cover with a new one. Reinstall the strainer (4) to the cover (3). Tighten the bolts (2) to:

   107.9 +/- 14.7 N•m (79.6 +/- 10.8 lbf ft.)

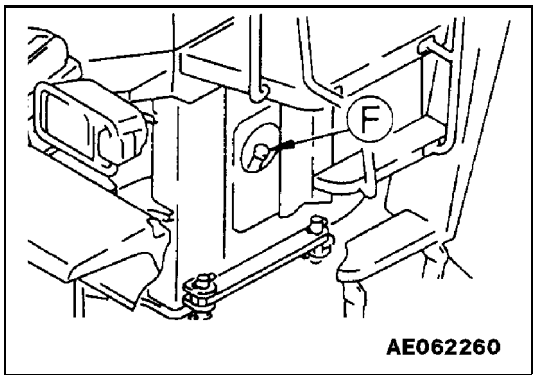


6. Pour in the specified amount of oil at the oil filler (F).

For details of the oil to use and refill capacity, **see 20 FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE on page 3-9.**

7. After filling the transmission with oil, check the transmission oil level.

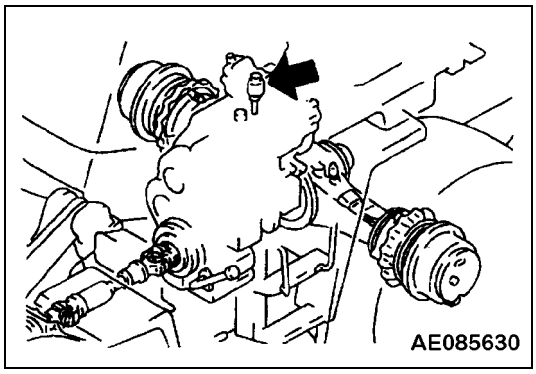
8. Check for oil leaks a the transmission case and filter.



24.8.2 CLEAN TRANSMISSION CASE BREATHER

Remove all mud and dirt from around the breather. Remove the breather and put it into a cleaning fluid to clean.

Take care, so as not to let any dust or dirt get into the transmission case through the port while the breather is removed.



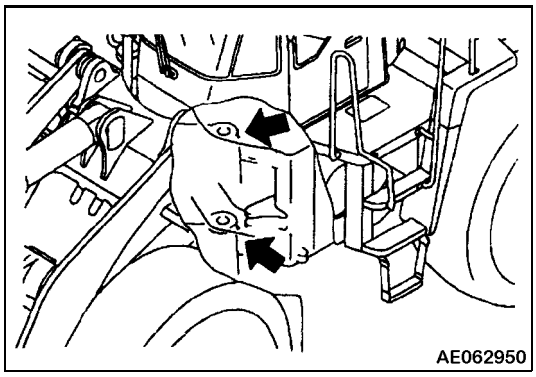
24.8.3 LUBRICATE

⚠ WARNING

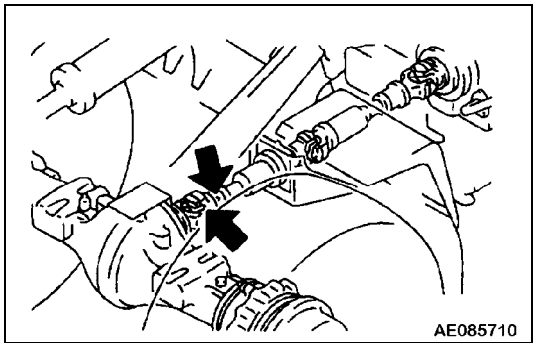
Set the work equipment in a stable condition, then turn OFF the machine and apply the lock for the work equipment control levers.
Apply the parking brake, and lock the front and rear frames with the safety bar and pin.

Use a grease pump to grease the grease fittings, which are identified by the arrows in the illustration. After greasing, wipe off any old grease that was pushed out.

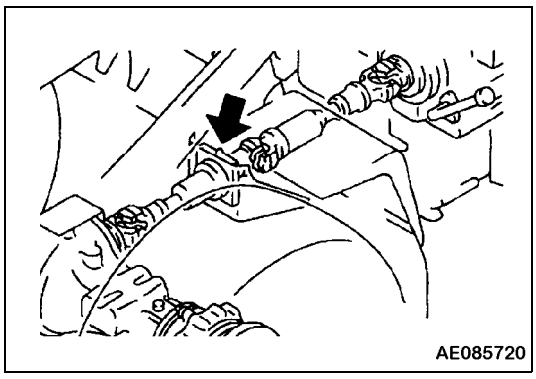
1. Center hinge pin (2 places).



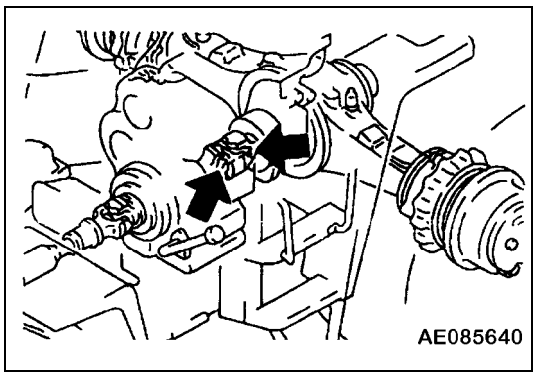
2. Front drive shaft (2 places)



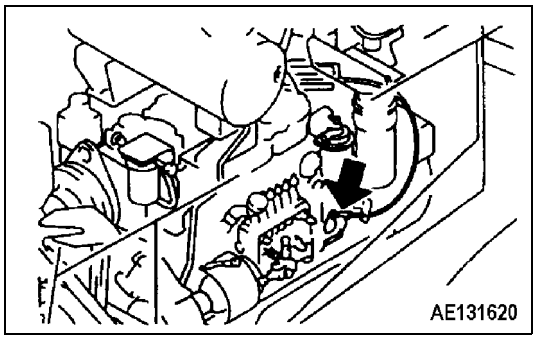
3. Drive shaft center support (1 place)



4. Rear drive shaft (2 places)



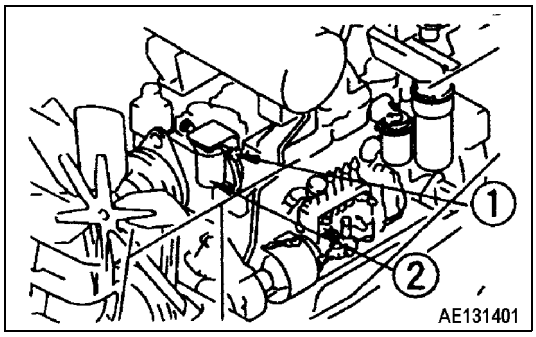
5. Engine stop motor linkage (1 place)



24.8.4 CHECK TIGHTENING PARTS OF TURBOCHARGER
Contact your distributor to have the tightening points checked.

24.8.5 CHECK PLAY OF TURBOCHARGER ROTOR
Ask your distributor to check the turbocharger rotor play.

24.8.6 REPLACE CORROSION RESISTOR CARTRIDGE



1. Screw in the valve (1) at the side of the corrosion resistor.
2. Using the filter wrench provided, turn the cartridge (2) counterclockwise.
3. Coat the new cartridge's seal with engine oil.
4. After installing the cartridge to the filter holder, turn the cartridge an additional two-thirds turn after the seal contacts the filter holder's surface.
5. Open the valve (1).
6. After replacing the cartridge, check that no water leakage exists from the filter surface area.

24.9 EVERY 2000 HOURS SERVICE

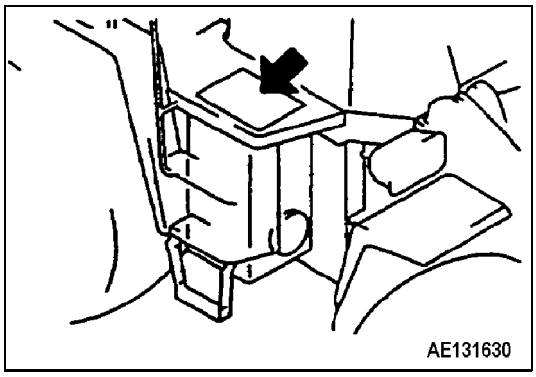
Perform the maintenance for every 50, 100, 250, 500, 1000 hours at the same time.

24.9.1 CHANGE OIL IN HYDRAULIC TANK

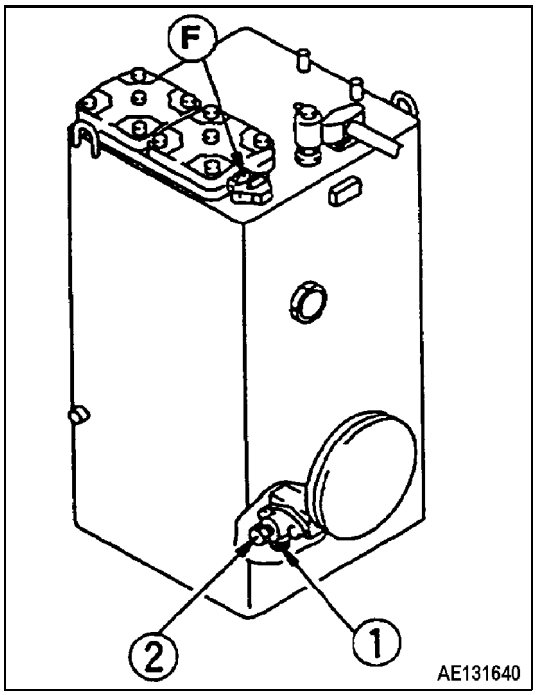
⚠ WARNING

The oil is hot if the machine has just been operated. Wait for the oil to cool down before changing it.
When removing the oil filler cap turn it slowly to release the internal pressure.

1. Lower the bucket to the ground and apply the parking brake, then turn OFF the engine.
2. After removing the bolt, remove the cover. The cover design varies, depending on the machine.



3. Remove the oil filler cap (F).
4. Set a container to catch the oil under the drain plug (1).
5. Remove the drain plug (1).
6. Open the drain valve (2) gradually to drain the oil.
7. After draining the oil, close the drain valve (2). Torque the drain valve to 63.7 +/- 14.7 N•m (47.0 +/- 10.8 lbf).
8. Tighten the drain plug (1) to 68.6 +/- 9.8 N•m (50.6 +/- 7.2 lbf).



8. Remove the cover bolts (4) of the two filter covers (3) at the top of the tank and remove the covers.

9. After removing the spring (5) and the bypass valve (6), remove the element (7).

10. Before cleaning the element, ensure that no foreign material exists inside the tank.

11. After installing the new element, install the bypass valve (6), the spring (5), and the cover (3). If the O-ring for the cover is damaged or deteriorated, replace it with a new part.

12. When installing the cover bolts, push down on the cover and tighten the bolts evenly.

13. Add hydraulic oil through the oil filler port (F) to the specified level and install the cap.

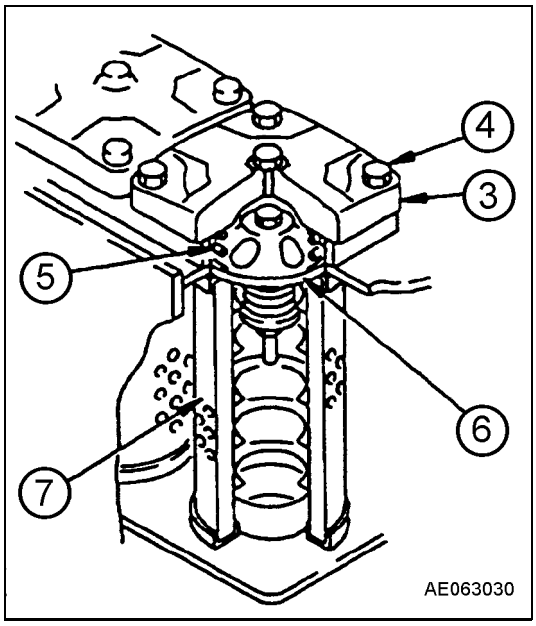
For details of the oil to use and refill capacity, **See 20 FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE on page 3-9.**

14. Check that the hydraulic oil is at a standard level. **See 24.5 EVERY 100 HOURS SERVICE on page 3-38.**

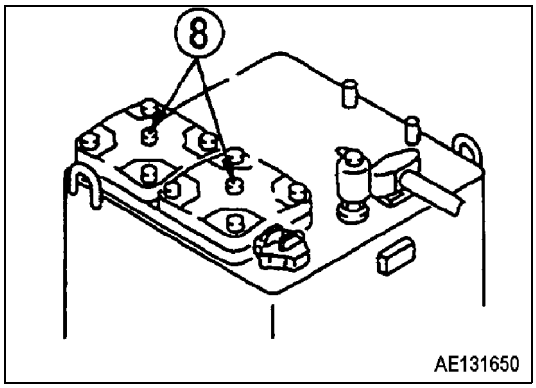
15. Run the engine at low idle to bleed air from the hydraulic tank. Extend and retract the steering, bucket, and lift arm cylinders four to five times. Be careful not to operate the cylinder to the end of its stroke; stop the cylinder about 100 mm (4 in.) before the end of the stroke.

⚠ WARNING

Operating the engine immediately at high speed or the cylinder to the end of its stroke could damage the piston seal.



16. Operate the steering, bucket, and lift arm cylinders to the end of their strokes three to four times. Turn the engine off and loosen the bleed plug (8).



17. Check the hydraulic oil level and add oil to the specified level. For details, **See 24.5 EVERY 100 HOURS SERVICE on page 3-38.**

18. Increase the engine speed and repeat the procedure in step 16 to bleed the air from the system. Repeat this procedure until air stops coming out from the plug.

19. Torque the bleed plug (8) to 11.3 +/- 1.5 N•m (8.3 +/- 1.1 lbf).

20. Check that the hydraulic oil is at the standard level. For details, **See 24.5 EVERY 100 HOURS SERVICE on page 3-38.**

21. Check to be sure that no oil leaks exist from the filter cover.

24.9.2 REPLACE THE HYDRAULIC TANK BREATHER ELEMENT

⚠ WARNING

Before removing the cap, turn it slowly to release the internal pressure.

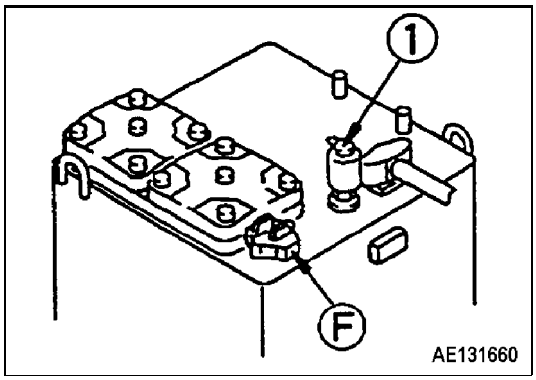
1. Remove the oil filler cap (F).

2. After removing the snap ring on the breather (1), remove the breather cap.

3. Replace the filter element with a new one.

4. Reinstall the breather cap and snap ring.

5. Reinstall the oil filler cap.



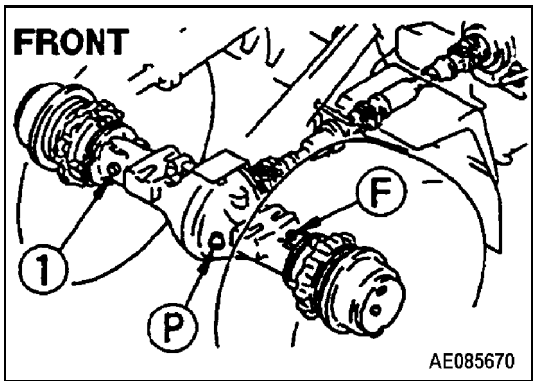
REMARKS
It is possible to replace theelement with the breather installed in the tank. However, if the breather is removed, do not wrap the tapered thread of the breather with seal tape when assembling, and be careful not to over tighten.

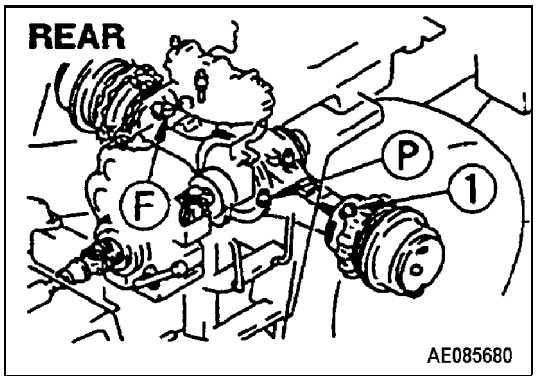
24.9.3 CHANGE AXLE OIL

⚠ WARNING

The axle oil will be hot if the machine was just turned off after having been operational. Wait for the oil to cool before changing it.

1. Place a container under the oil plug (P) to catch the oil.
2. After removing the front and rear oil filler plugs (1), remove the drain plug (P) and drain the oil.
3. Clean all of the plugs.
4. Add axle oil through the plug hole (1) to the specified level.





For details of the oil to use and the refill capacity, **See 20 FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE on page 3-9.**

REMARKS
For operations where the brake is used frequently, change the axle oil at shorter intervals.

24.9.4 CHECK BRAKE DISC WEAR
Have your distributor check and repair brake discs.

24.9.5 CHECK ALTERNATOR, STARTING MOTOR
The brush may be worn or the bearing may lack grease. Contact your distributor for inspection or repair. If the machine is started frequently, perform the inspection every 1,000 hours.

24.9.6 CHECK ENGINE VALVE CLEARANCE, ADJUST
A special tool is required for removing and adjusting the parts. Contact your distributor for service.

24.9.7 CHECK VIBRATION DAMPER
Check that no cracks or peeling exist in the outside surface of the rubber. If either condition is present, contact you distributor.

24.9.8 REPLACE THE ELEMENT IN AIR CONDITIONER RECIRCULATION AIR FILTER, FRESH AIR FILTER
Remove both the recirculation air filter and the fresh air filter in the same manner as when cleaning.

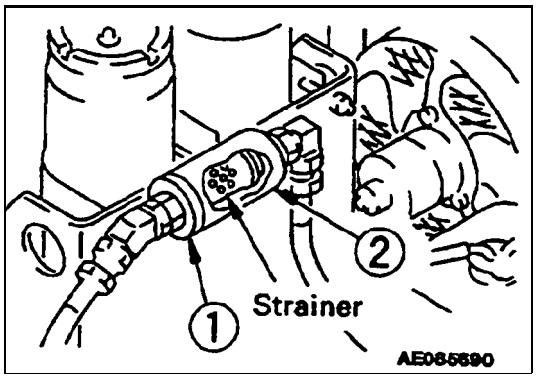
For details of cleaning the recirculation air filter, **See 24.6.4 CLEAN ELEMENT IN AIR CONDITIONER RECIRCULATION FILTER on page 3-46.**

For details of cleaning the fresh air filter, **See 24.5.2 CLEAN ELEMENT IN AIR CONDITIONER FRESH AIR FILTER on page 3-39.**

24.9.9 CLEAN AND CHECK TURBOCHARGER
Carbon or sludge stuck to the blower impeller reduces turbocharger performance, or may damage the turbocharger. Ask your distributor to perform the turbocharger cleaning.

24.9.10 CLEAN PPC CIRCUIT STRAINER

1. Remove the flange (1).
2. After removing the strainer case (2), remove the strainer. Wash it in clean diesel oil.
3. After assembling the strainer to the strainer case (2), install the flange (1).



24.9.11 CHECK ACCUMULATOR GAS PRESSURE
When performing the **EVERY 2000 HOURS SERVICE** or **EVERY YEAR SERVICE** or when making periodic replacement of the critical parts, have your distributor check the accumulator gas pressure.

24.10 EVERY 4,000 HOURS SERVICE

Perform the maintenance for every 50, 100, 250, 500, 1000 and 2000 hours at the same time.

24.10.1 CHECK WATER PUMP

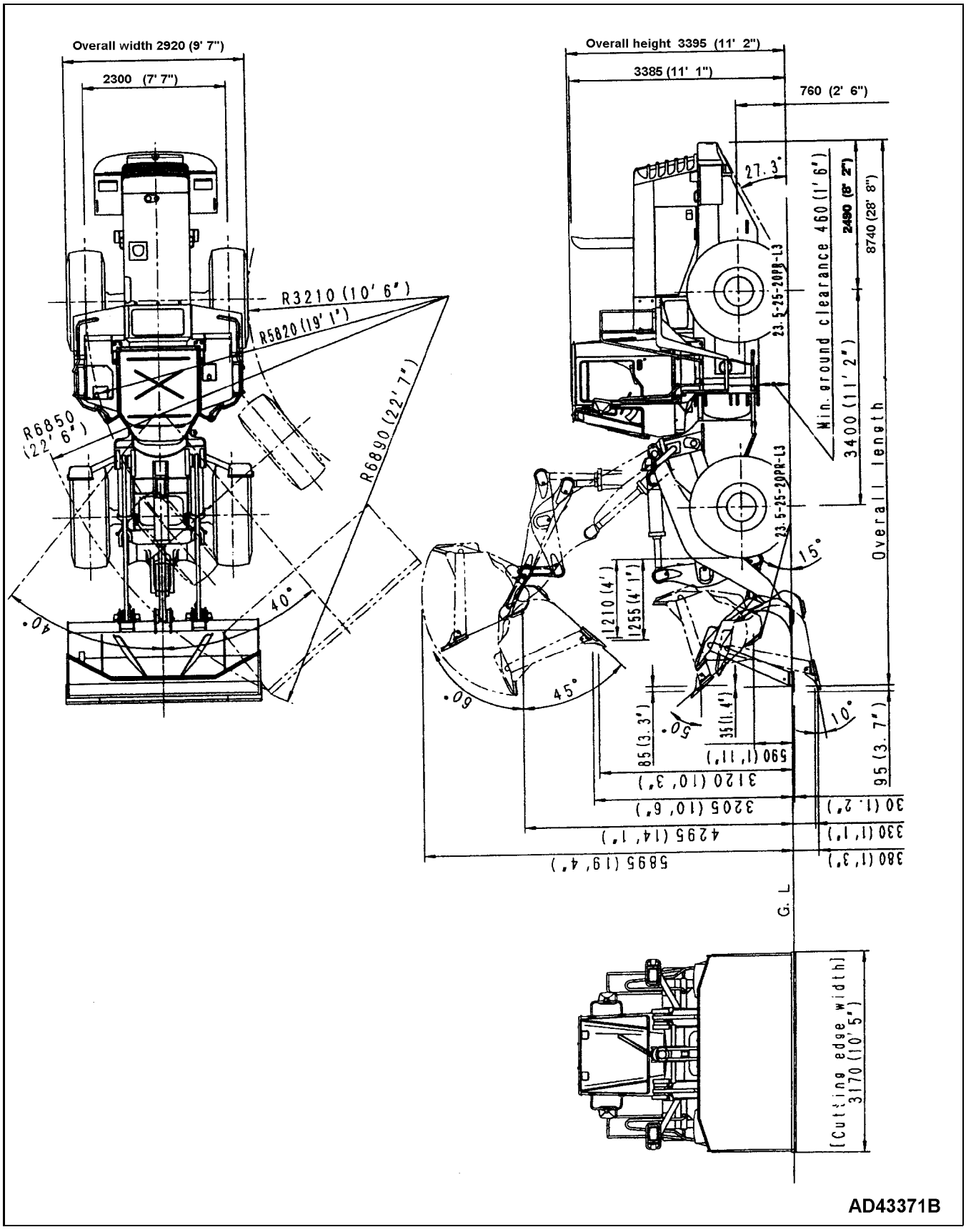
Check that no play exists in the pulley. Also, check that no grease or water leaks from the drain hole, or that it is clogged. If any problem is detected, contact your distributor.

SPECIFICATIONS

25. SPECIFICATIONS

25.1 GENERAL

				Smaller size tire	Larger size tire
				23.5-25 L3	26.5-25 L3
PERFORMANCE	Bucket capacity			4.2 m³ (5.4 yd³)	
	Normal load			6,720 kg (14,820 lb.)	
	Travel speed	Forward	1st	6.2 km/h (3.9 mph)	6.6 km/h (4.1 mph)
			2nd	11.2 km/h (7.0 mph)	12.3 km/h (7.6 mph)
			3rd	19.8 km/h (12.3 mph)	21.8 km/h (13.5 mph)
			4th	31.5 km/h (19.6 mph)	34.0 km/h (21.1 mph)
		Reverse	1st	6.4 km/h (4.0 mph)	6.8 km/h (4.2 mph)
			2nd	11.7 km/h (7.3 mph)	12.8 km/h (7.9 mph)
			3rd	20.7 km/h (12.9 mph)	22.7 km/h (14.1 mph)
			4th	32.7 km/h (20.3 mph)	36.0 km/h (22.4 mph)
	Maximum rimpull			159,850 N (35, 935 lbf)	147, 100 N (33, 069 lbf)
	Minimum turning radius	Outside of chassis		6,430 mm (253 in.)	
		Center of outside tire		5, 475 mm (216 in.)	
WEIGHT	Operating weight Includes: 1 operator 80 kg (176 lbs), full fuel and oil, ROPS cab, front fenders and additional counterweight.			22, 310 kg (49, 194 lbs.)	22, 780 kg (50, 230 lbs.)
ENGINE	Model			Komatsu SA6D125E	
	Flywheel horsepower			194 kW (260 hp) @ 2, 200 RPM	
	Maiximum torque - gross			1, 050 N	
	Starting motor			24 Volt 7.5 kW	
	Alternator			24 Volt, 50 Amp	
	Battery			12 Volt, 170 Amp hours	


Overall width 2920 (9' 7")
2300 (7' 7")
R3210 (10' 6")
R5820 (19' 1")
R6850 (22' 6")
R6890 (22' 7")
40°
40°
Overall height 3395 (11' 2")
3385 (11' 1")
760 (2' 6")
27.3°
23.5-25-20PR-L3
Min. ground clearance 460 (1' 6")
2490 (8' 2")
8740 (28' 8")
3400 (11' 2")
Overall length
23.5-25-20PR-L3
15°
1210 (4')
1255 (4' 1")
60°
45°
50°
10°
85 (3.3")
35 (1.4")
590 (1' 11")
3120 (10' 3")
95 (3.7")
3205 (10' 6")
30 (1.2")
4295 (14' 1")
330 (1' 1")
5895 (19' 4")
380 (1' 3")
G. L
[Cutting edge width]
3170 (10' 5")

AD43371B

OPTIONS, ATTACHMENTS

26. OPTIONAL PARTS AND ATTACHMENTS

NAME	SPECIFICATION, USE
Excavating bucket	Capacity 2.6 m^3 (3.4 yd^3) Capacity (with BOC) 2.8 m^3 (3.6 yd^3)
Light material bucket	Capacity (for light duty work) 3.8 m^3 (4.9 yd^3) Capacity (for light duty work, with BOC) 4.0 m^3 (5.2 yd^3)
Bucket tooth	Bolt-on tooth / Tip tooth
Cutting edge	Bolt-on edge

The following attachments are also available.

ROPS canopy
ROPS/FOPS Canopy
ECSS (Electronic Controlled Suspension System)
Auxiliary steering
Fenders, front and rear
Tires
Air Conditioning w/cold box
Counterweight, additional options
Heater and defroster
Hydraulic adapter kit: 3 spool with piping
Limited slip differential, front and rear
Mirrors, outside cab
Mono-lever, loader control for 2-spool valve
Mono-lever, loader control (plus one lever for 3-spool valve)
Radio with cassette stereo, auto tuning
3-spool valve
Tool kit

27. SELECTING BUCKETS AND TIRES

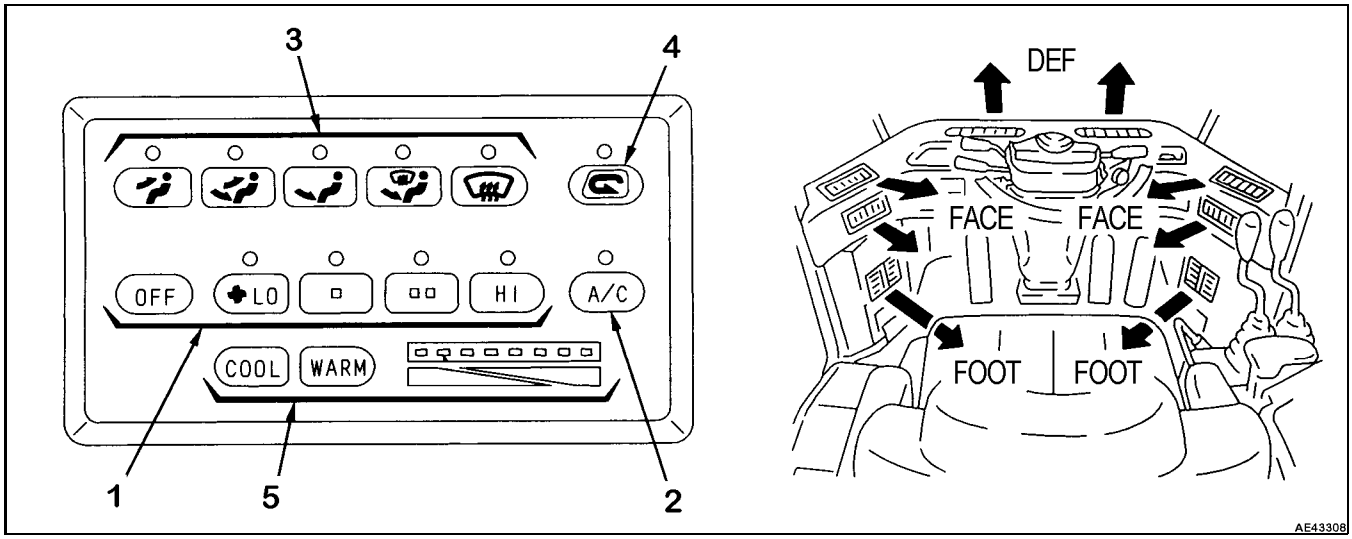
Select the most suitable bucket and tires for the type of work and job site conditions.

TYPE OF WORK	BUCKET	GROUND CONDITIONS	TIRE	
Loading products Loading and carrying products	Stockpile bucket with bolt on edge 4.2 m³ (5.4 yd³)	General ground condition	20.5-25-16PR Rock	23.5-25-16PR Rock
		Leveled ground condition	20.5-25-16PR Traction	26.5-25-16PR Traction
		Hard ground	23.5-25-20pr Rock	26.5-25-20pr Rock
Loading products and crushed rock	Stockpile bucket with teeth 3.9 m³ (5.1 yd³)	General ground condition	23.5-25-20PR Rock	26.5-25-20PR Rock
		Hard ground	23.5-25-20PR Rock	26.5-25-20PR Rock
Loading crushed rock	Excavating bucket with teeth 3.6 m³ (4.7 yd³)	General ground condition	23.5-25-20PR Rock	26.5-25-20PR Rock
		Hard ground	23.5-25-20PR Rock	26.5-25-20PR Rock

The speed display differs according to tire size, so when using optional tires, please contact your distributor.

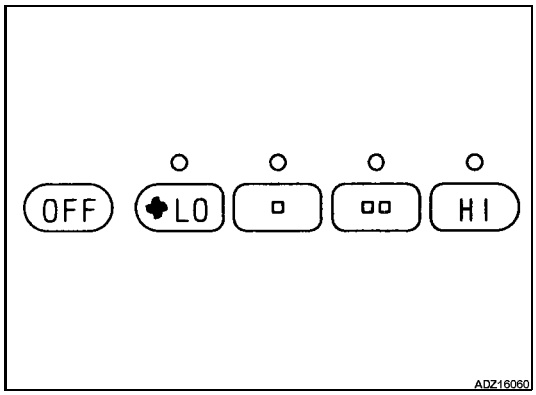
28. AIR CONDITIONING

28.1 GENERAL LOCATIONS AND FUNCTION OF CONTROL PANEL



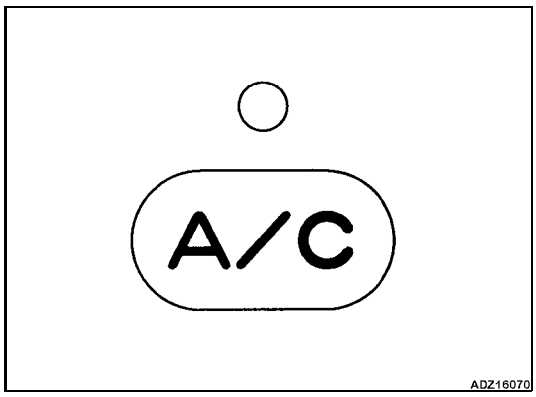
28.1.1 FAN SWITCH

This can be used to adjust the air flow to 4 stages. This switch also acts as the main switch for the air conditioner. When the switch is pressed, the indicator lamp above the switch lights up to indicate the air flow.

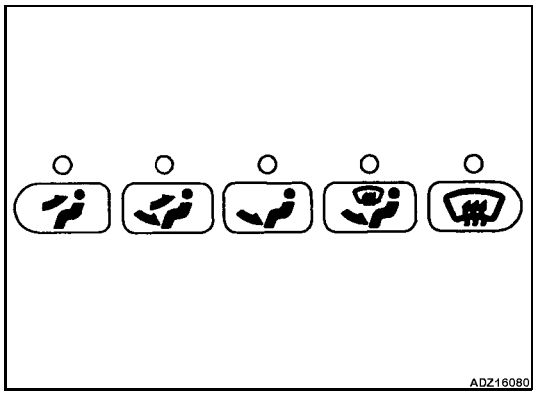


28.1.2 AIR CONDITIONER SWITCH

This switch starts or stops the cooling and dehumidifying action. When the fan switch is turned ON and the air conditioner switch is pressed, the indicator lamp above the switch lights up. When the switch is pressed again, the switch is turned OFF and the indicator lamp goes out.



28.1.3 MODE SELECTOR SWITCHES

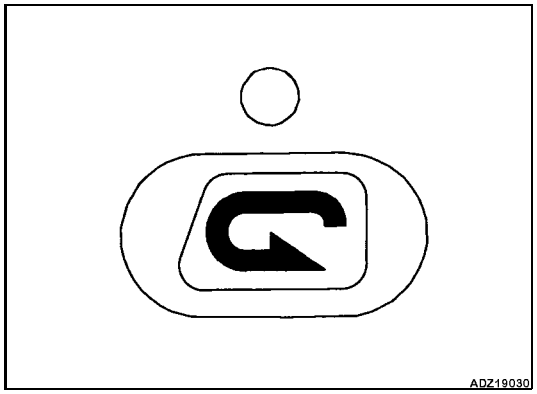


Selecting the individual mode switch determines the ventsthat the air is distributed from:

FACE
FACE/FEET
FEET
FEET/DEF
DEF

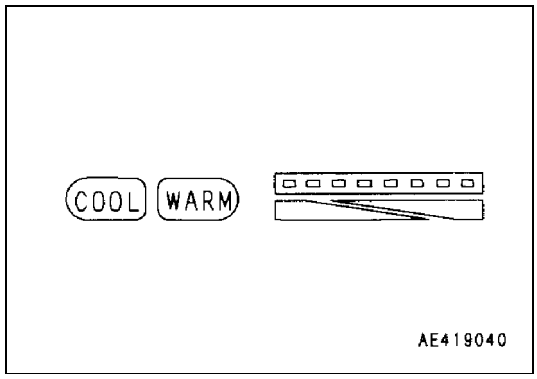
Pressing the individual switch lights up the indicator lamp above the the selected vent mode.

28.1.4 FRESH/RECIRC SELECTOR SWITCH



This switch is used to select between recirculating the air inside the cab or taking in fresh air from outside. When the RECIRC position is selected, the indicator lamp above the switch lights up. When the switch is pressed again, the indicator lamp goes out, and fresh air is taken in.

28.1.5 TEMPERATURE CONTROL SWITCH



The temperature can be adjusted steplessly from low temperature to high temperature. The temperature-level indicator lamps light up to display the air temperature coming from the vents. The more blue lamps that are lit, the colder the temperature is. The color of the indicator lamp changes while the switch is being pressed. When the temperature reaches the desired level, release the switch to set the temperature. The settings for each mode are retained in memory, even when the starting switch is turned OFF. However, the settings must be made again in the following cases:

When the machine has been out of use for more than 7 days.

When the battery voltage is extremely low.

When there has been abnormal interference from the outside.

When the fan switch is turned OFF (the setting is not kept in memory with only the air conditioner switch)

If the air conditioner is used in the FRESH position, the inside of the cab will be pressurized and this will prevent the entry of dust. The higher the position of the fan switch, the more effective the pressurizing becomes.

28.2 METHOD OF OPERATION

Switch / Condition of use		Fan switch	Air conditioner switch	Temperature control switch	FRESH/RECIR switch	Vent mode selector switch
Cooling	Rapid	HI	ON	All blue	RECIR	FACE
	Normal	HI-LO	ON	More than half are blue	FRESH	FACE
Dehumidifying, heating		HI-LO	ON	More than half are red	FRESH	FEET
Heating	Rapid	HI	OFF	All red	RECIR	FEET
	Normal	HI-LO	OFF	More than half are red	FRESH	FEET
Defroster		HI	ON	More than half are red	FRESH	DEF
Ventilation or pressurizing		HI-LO	OFF	All blue	FRESH	FACE

Setting the temperature control switch so that all lamps are red improves the defrosting operation. Set the vent mode selector switch to the intermediate position to give the desired condition. In the FACE mode, it is possible to adjust the air flow direction and to turn it on or off. However, do not select the FACE mode when the vents closed.

28.2.1 WHEN NOT USING THE AIR CONDITIONER REGULARLY

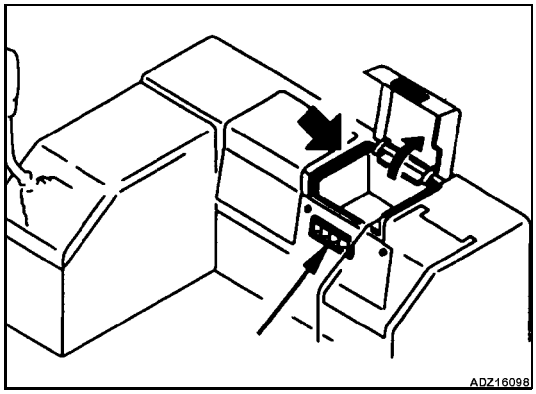
To lubricate the compressor, occasionally operate the air conditioner or defroster for a few minutes.

REMARK
When the temperature in the cab is low, the air conditioner may not operate. In such cases, turn on the air conditioner after warming the air inside the cab.

28.3 COOL BOX

The cool box can heat or cool food and beverages. When the air conditioner is being used, this box can be used for keeping drinks and other things cool. When the heater is being used, it can be used to keep things warm.

When using the box, open the vent grill. When not using the box, close the grill. Do not use the cool box for things that smell or leak water or break easily. Do not use it as a holder for tools or other small objects.

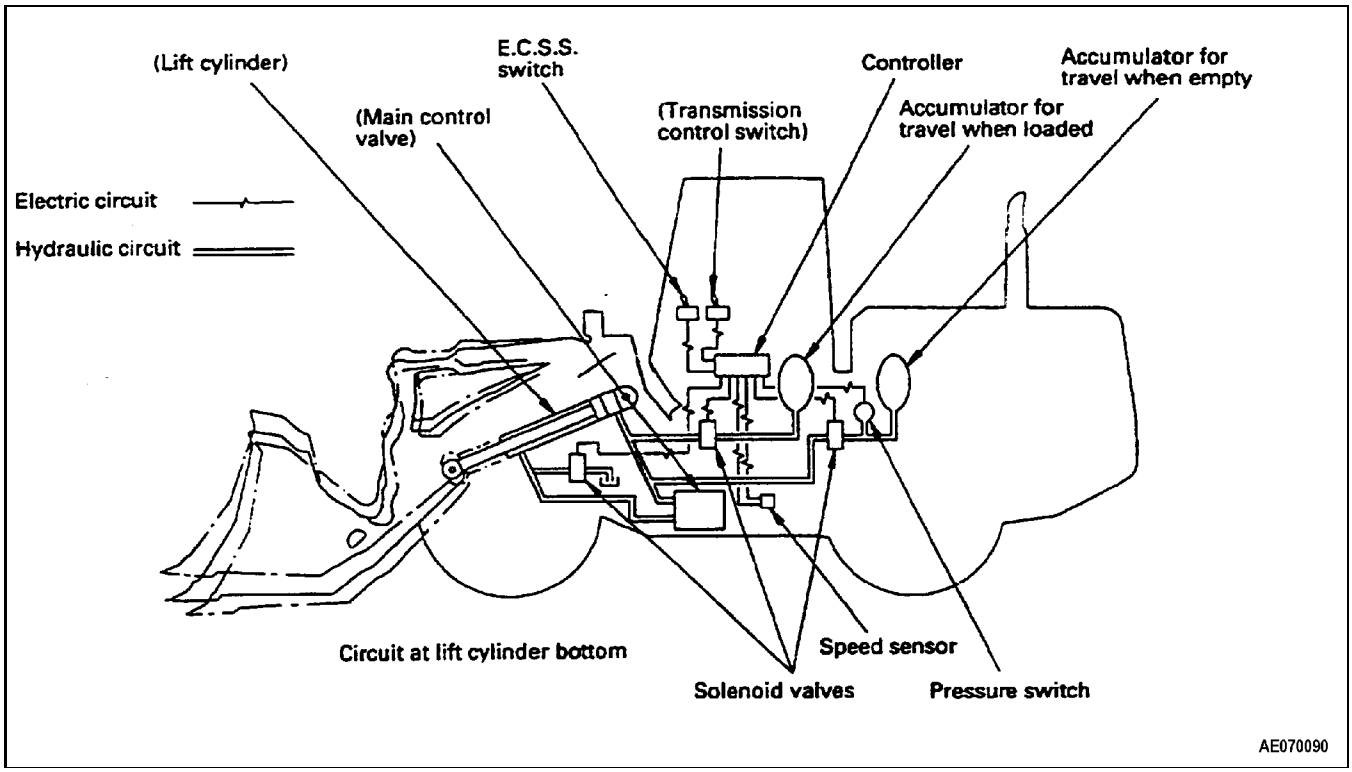


29. HANDLING ECSS

(Electronic Controlled Suspension System)

Always read this section before using the ECSS in order to enable you to use it safely and effectively.

29.1 STRUCTURE AND FUNCTION OF ECSS

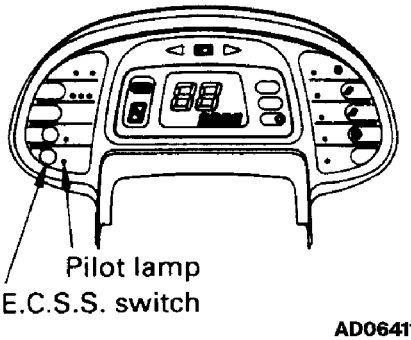


The ECSS uses the hydraulic spring effect ofthe hydraulic accumulator installed to the circuit at the lift cylinder bottom to absorb the vibration of the chassis when the machine is traveling. This enables the machine to travel smoothly at high speed.

The ECSS consist of the ECSS switch, travel speed sensor, controller, hydraulic accumulator, solenoid valves and pressure switches. When the ECSS switch is turned ON, if the travel speed rises to 5 km/h (3.1 mph) or higher, the solenoid valves open, the circuit at the lift cylinder bottom is connected with the hydraulic accumulator, and the ECSS is actuated. If the travel speed lowers below 5 km/h (3.1 mph), the solenoid valves close, the circuit at the lift cylinder bottom is shut off from the hydraulic accumulator, and the ECSS is not actuated.

When the ECSS is actuated, the pressure switches automatically open and the close the solenoid valves in accordance with the bucket load to switch the accumulators. If the bucket is empty, the hydraulic accumulator for travel when empty (1) is actuated; and if the machine is loaded, the hydraulic accumulator for travel when loaded (2) is actuated. This enables the damper to provide the most effective absorption of travel vibration both whentraveling empty and when traveling loaded.

29.2 METHOD OF OPERATING ECSS



The ECSS switch is on the leftside of the panel. Pressing the ECSS switch turns on ECCS and the pilot lamp (orange) lights up. Pressing the switch again turns off the pilot lamp and the ECSS is canceled.

It is possible to perform this operation with the ECSS switchON. If the damper is kept ON during operations, and the hydraulic pressure in the circuit at the bottom end of the liftcylinder exceeds 150 kg/cm² (2,130 psi) during operations, the solenoid valves are automatically closed, and the ECSS is canceled to protect the hydraulic accumulator from high pressure.

29.3 PRECAUTIONS WHEN OPERATING ECSS SWITCH

⚠ WARNING

Turning the ECSS switch ON while the machine is traveling or when the work equipment is raised connects the hydraulic ECCS accumulator to the bottom of the lift cylinder. Oil then enters or leaves the hydraulic accumulator in the direction to maintain the balance. The work equipment will move, so be extremely careful when operating the switch.
If operations are performed with the ECSS switch ON, and the hydraulic accumulator is automatically switched by the action of the pressure switches during operation, the work equipment could immediately move.
Never perform an inspection and maintenance with the ECSS switch ON. This situation is extremely dangerous, as the work equipment could move.
Always stop the machine and lower the equipment to the ground before operating the ECSS switch.
When performing an inspection and maintenance, also lower the work equipment to the ground. Turn the ECSS switch OFF before starting the maintenance operation.

REMARKS
If the ECSS switch is at the ON position and the starting switch is at the OFF position, the ECSS will not work. However, if the starting switch is at the ON position, the ECSS can be actuated.

ECSS is not actuated if the transmission is in 1st gear, and speed is slower than 5 km/h (3.1 mph).

ECCS is actuated when the transmission is in 2nd to 4th gear, and the accumulator pressure is switched to two levels in accordance with the load to absorb the chassis vibration effectively.

29.4 PRECAUTIONS WHEN HANDLING ACCUMULATOR

⚠ WARNING

The accumulator is charged with a high pressure nitrogen gas, which is extremely dangerous. Read the following items and handle the accumulator properly.

If any problem or failure occurs within the accumulator, contact your distributor immediately.

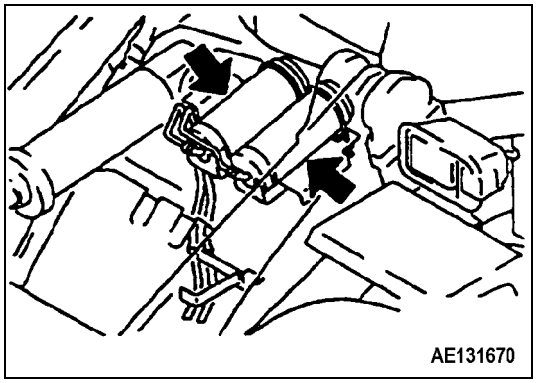
The gas must be charged into the accumulator only by a qualified person from your distributor or by a person licensed to handle a high pressure gas.

Do not bring any flame or heat close to the accumulator when it is charged with gas.

Do not make any hole in or weld anything to the accumulator.

Always release the gas before disposing of the accumulator or disassembling it for maintenance. Use the air bleed valve to release the gas.

Every 2,000 hours or once a year, have your distributor check the gas pressure.



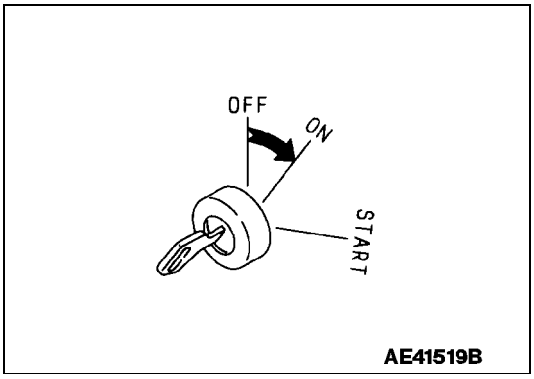
29.5 DISCONNECTING THE ECSS PIPING

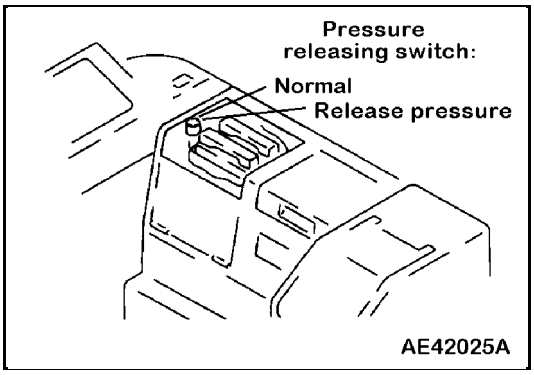
⚠ WARNING

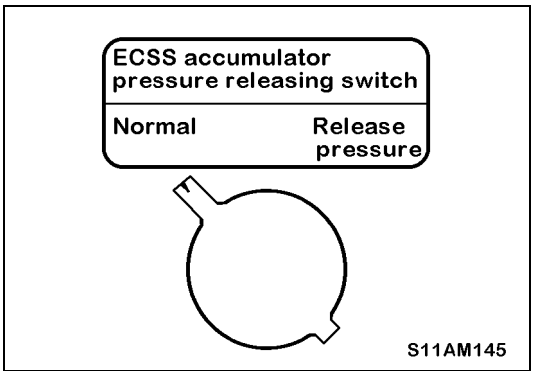
Park the vehicle on a level surface, and install the safety bar to lock the front and rear frames together. Lower the bucket to the ground, stop the engine, actuate the parking brake and block the wheels.

Turn the ECSS pressure releasing switch to the "Release pressure" position only when disconnecting the ECSS piping or removing related equipment. Otherwise keep this switch in its NORMAL position or the boom will raise unexpectedly.

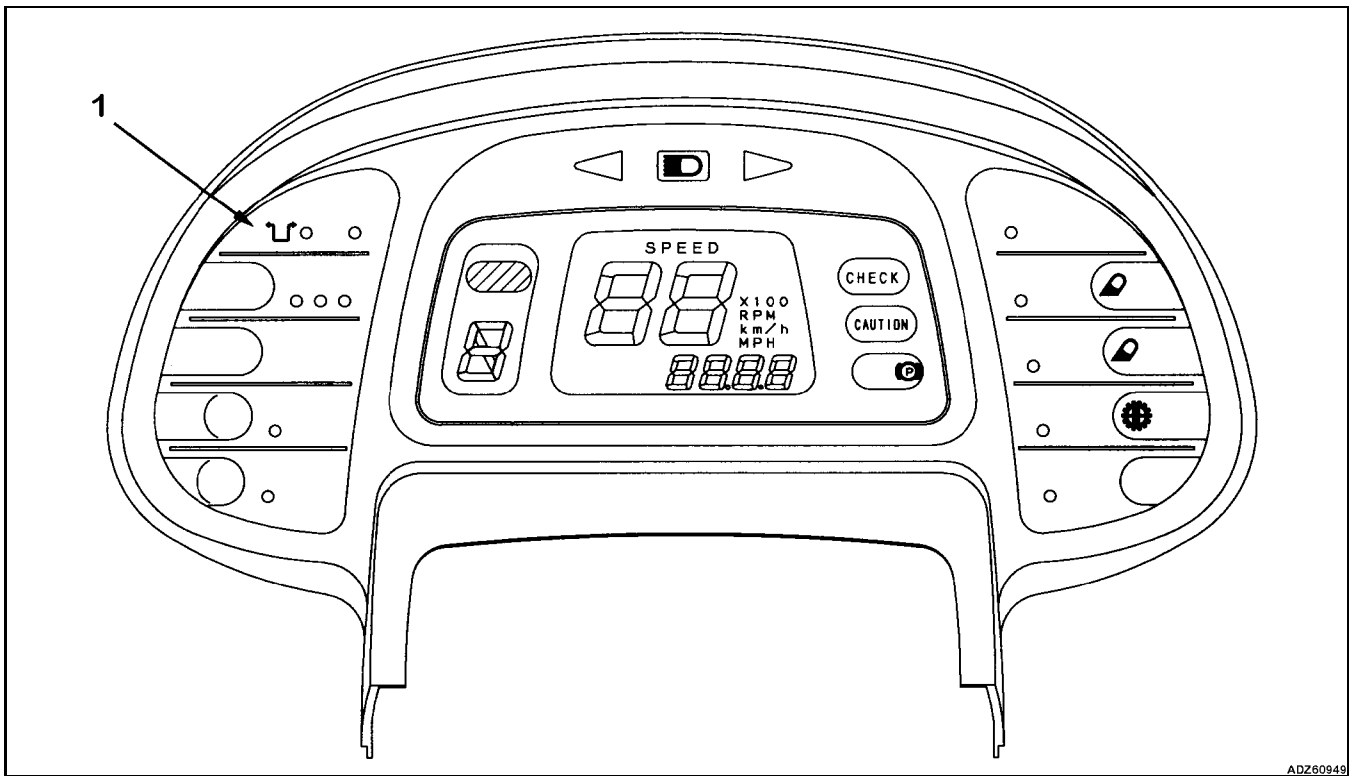
1. Loosen the oil filler port cap to release pressure from the hydraulic oil tank.
2. Turn the starter switch to the ON position. Do not start the engine.
3. Turn the ECSS accumulator pressure releasing switch to the "Release pressure" position. Set the boom lift lever to the raise position. Bucket should rise instantaneously when the pressure is released properly.
4. Operate the control levers two or three times to release trapped pressure from inside the circuits.
5. Repeat steps 2, 3 and 4 as necessary until the bucket does not move. When there no longer is enough pressure in the circuit to move the bucket, the starter switch can be turned OFF and piping work begun.







30. OPTION DISPLAY

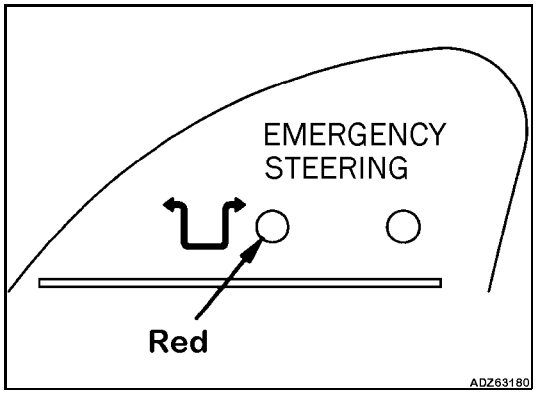


This is on the left side of the main panel and indicates the condition of actuation of the options.

30.1 EMERGENCY STEERING PILOT LAMP

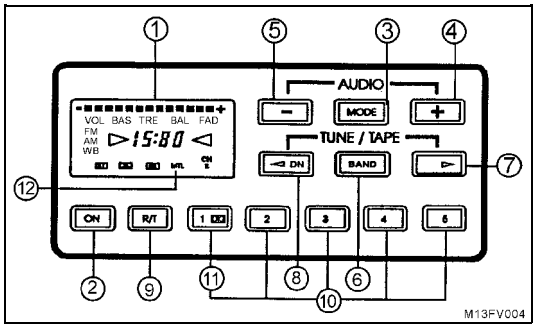
This lamp indicates that the main pump is operating normally when the machine is traveling.

If the engine stops when the machine is traveling, or if there is an abnormality in the pump circuit, the monitor flashes to indicate that the emergency steering system has been actuated. If the monitor flashes, turn the engine off immediately.



30.2 RADIO

30.2.1 OPERATION



1. LIQUID CRYSTAL DISPLAY (LCD) PANEL
   The LCD panel is the primary information display: radio frequency, time, audio settings, and cassette operation (if used).

2. ON-OFF POWER BUTTON
   Press this button to turnoff the power for the radio and cassette player. Press this button again to turn on the power.

3. AUDIO MODE SELECTOR BUTTON
   After selecting the desired audio function, the LCDwill display the selected function: VOL (volume), BAS (bass), TRE (treble), FAD (fader). FAD will be displayed only if the four speakers connect to the system. Once the audio mode is selected, use the (+) button (4) or the (-) button (5) to adjust the level.

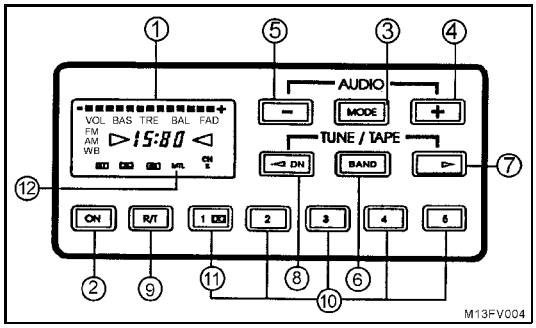
   Volume
   After VOL appears on the LCD, hold the (+) to increase the volume or the (-) button decrease the volume. A bar graph on the LCD indicates the progress. The bar graph has a maximum of 13 squares:

   Bass
   After BAS appears on the LCD, press the (+) or (-) button within five seconds to obtain the desired emphasis of the low range tones. A triangle (splay panel to indicate the level. The unit will retain this setting when turned off.

   Treble
   After TRE appears on the LCD, press the (+) or (-) button within five seconds to obtain the desired emphasis of the high range tones. A triangle (e the level. The unit will retain this setting when turned off.

   Balance
   After BAL appears on the LCD, press the (+) button within five seconds to emphasize the right speaker volume and the (-) button to emphasize the left speaker volume. The center illuminated arrow indicates mid-balance position.

4, 5. AUDIO LEVEL BUTTONS (+) (-)
   After obtaining the desired mode (3) to adjust, use these buttons to make the adjustments.



6. RADIO BAND SELECTOR (BAND)
   Radio operation: Press this button to change the radio band (FM1, FM2, AM, Weather Band).
   Cassette operation: Press this button to manually change the cassette from Side One to Side Two.

7, 8. UP, DOWN TUNING/SEEK TUNING/CASSETTE FAST FORWARD AND REWIND

To manually select a radio station, momentarily press the "UP" tuning button (7) to advance the tuning and display one digit higher, or the "DN" tuning button to tune one digit lower. Continue tapping the desired button to change to the desired station.

To automatically "seek" the station nearest the one being received, press the UP button (7) to seek upward or the the DN button (8) to seek downward. Hold the button until a "beep" is heard. Release the button and the radio tuning will stop at the next broadcasting station.

During cassette operation, the UP and DN buttons actuate the fast forward and rewind functions, respectively, regardless of which side of the cassette is being played. Press and release to start the rewind or fast forward; press again to halt the function.

9. RADIO, TIME/RADIO, TAPE SELECTOR (R/T)
   This displays the frequency, time, and operation modes.

   Pushing a cassette tape into the player automatically engages the tape mode.

   Operation (tape playing): Tap the R/T button to pause the cassette and operate the radio; tap the R/T button again to display the frequency for five seconds; press the button until a "beep" is heard and then release to resume cassette play.

   Operation (radio playing): The time is displayed until the radio frequency is changed or this button is pressed, causing the radio frequency being received is displayed for five seconds.

NOTE:
If a cassette is in the player, a small cassette symbol appears on the LCD display. Leaving cassettes in the player for extended periods (overnight) can cause damage.

10. PRESET RADIO STATION MEMORIES
    To set any of the five memories in each band:
    A. Turn on the system and select the band.
    B. Select the first station to be preset with the UP and DN tuning controls (7) and (8).
    C. Press the desired preset button (1 through 5) and hold it until a "beep" is heard.
    D. Release the button. The display will show "CH1", "CH2" etc., depending on which button was set. Press the desired preset button to tune to the station in the memory.

E. Repeat the procedure for each button and four bands. You can change any preset memory without affecting the others. It's unlikely that more than one Weather Band station will be available in a given area. Thus, most of the Weather Band preset radio stations will go unused.

11. DOLBY ® NOISE REDUCTION ( )

Dolby® Noise Reduction helps reduce background noises common on cassette recordings. If the cassette has been recorded with Dolby® Noise Reduction (indicated by the Dolby® symbol), press this button to engage the system.

Press the button again to turn the system off. To most listeners, tapes recorded without Dolby® Noise Reduction sound better when played back without Dolby® Noise Reduction.

Dolby® and are trademarks of Dolby Laboratories Licensing Corporation.

12. AUTO METAL TAPE SENSOR

Cassettes with metal or CrO_2 tape require special equalization circuitry to play back the best sound. The system automatically recognizes and adjusts for the special tape and displays MTL on the LCD.

30.2.2 SETTING THE CLOCK

1. Turn the radio power on. Remove the cassette from the cassette player.

2. Press and hold R/T button (9) until the time display begins to flash. Release the R/T button.

3. Within 10 seconds after releasing the R/T button, press the down tuning (DN) (8) to advance the hours. Press the UP button (7) to advance the minutes.

4. About 10 seconds after the time is set, the display will stop flashing and the time keeping will begin.

30.2.3 REMOTE CONTROL UNIT

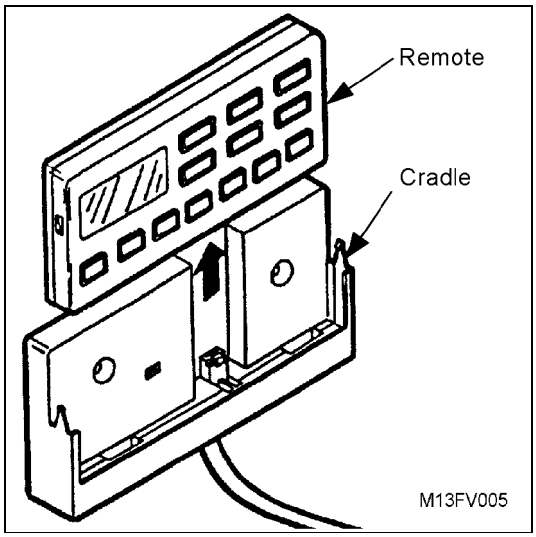
1. Turn the radio power off.

2. Grasp the sides of the remote at the top serrated edges and pull upward.

NOTE:

When removed from its cradle, the remote is inoperable.
Do not expose the remote or cradle to extreme heat, direct sunlight, solvents, or water.
Use a slightly damp, soft cloth to clean the remote. Never immerse the remote in water.
Keep the male telephone-type plug in the cradle clean. Use of a damp cotton swab is acceptable.

3. Reverse steps 1 and 2 to reinstall the remote control unit.



30.2.4 BATTERY REPLACEMENT

Two AA-size alkaline batteries in the electronics module are required to maintain the unit's memory when its main power is turned off. Battery replacement is required when the clock fails to keep time or the memory presets fail.

NOTE:
Turn off the radio's power before replacing the batteries.

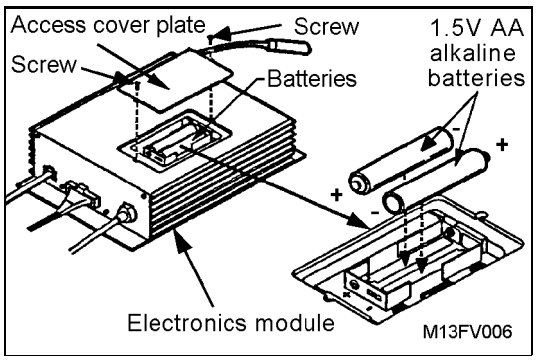
1. After removing the two screws that secure the access cover plate atop the module, remove the access cover plate.

2. Remove the two batteries.

3. Install two new 1.5 volt AA-size alkaline batteries.

NOTE:
Observe the proper polarity when installing the batteries. The correct battery polarity is illustrated on the battery holder.

4. Replace the access cover plate and secure with the two screws.



30.2.5 PRECAUTIONS WHEN USING

Retract the antenna when traveling in places with a low overhead clearance.

For safety reasons, when operating, keep the radio volume at a level that permits hearing sounds outside the vehicle.

Water can cause damage, if allowed in the speaker enclosures, radio, cassette player, or remote control unit. Keep water away from these parts.

Do not wipe the knobs or buttons, or any other parts, with solvents such as benzene or thinner. Always use a soft, dry cloth (in extreme cases, alcohol may be applied sparingly to the cleaning cloth).

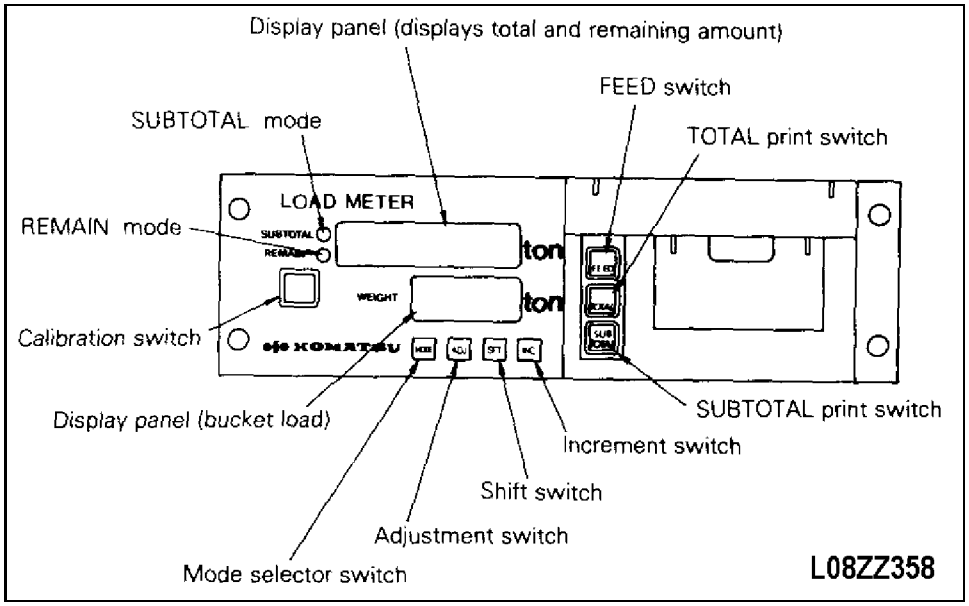
31. LOAD METER

This section explains the use of the load meter in determining the amount of load, the production amount, and to check the operation when loading fixed amounts.

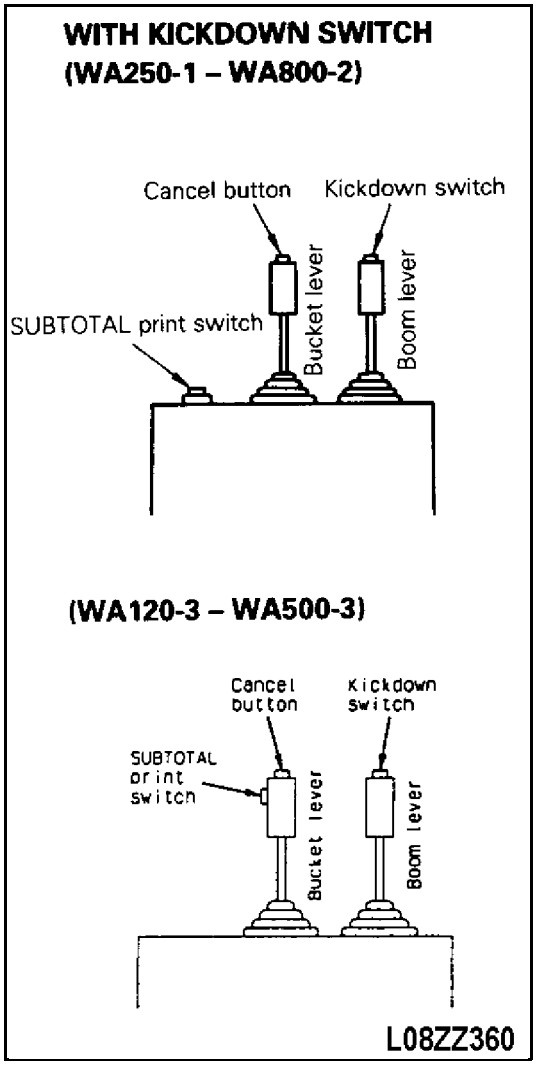
The load meter is a system to convert the lift cylinder oil pressure to the weight of the load and then display it. This equipment is intended to assist our customers in their internal administration.

Do not modify the bucket or the center of gravity will change, reducing the load meter's precision.

31.1 GENERAL LOCATIONS



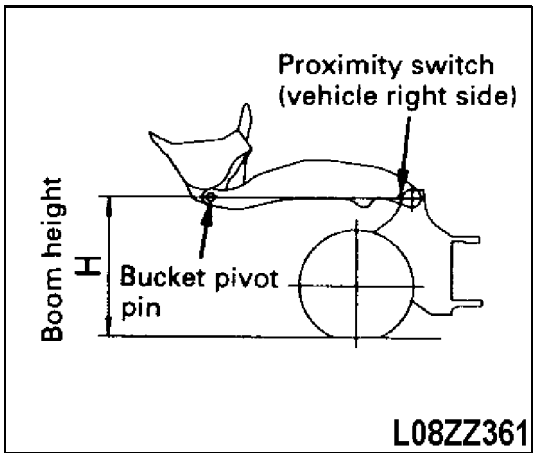
GENERAL LOCATIONS (continued)



31.2 ADJUSTING LOAD MEASUREMENT POINTS

To improve the position when measuring, perform the following operation.

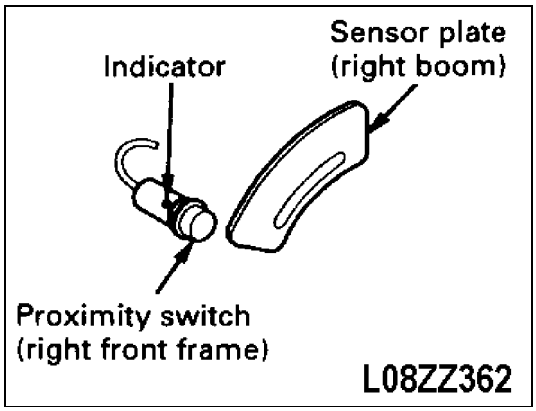
1. Tilt the bucket fully back and raise the boom until the arm is in the horizontal position (boom height “H”).



2. Watch the indicator on the proximity switch, which is located on the right boom. Adjust the sensor plate as follows:

   A. With the bucket on the ground, the indicator should light up.

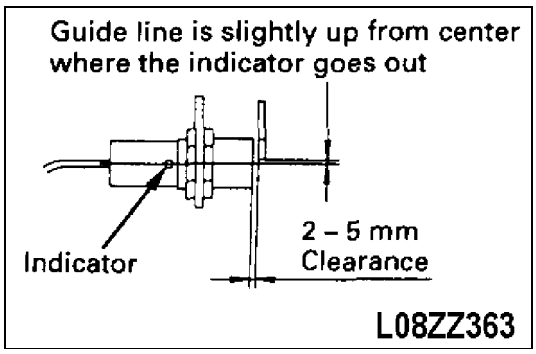
   B. With the boom horizontal (boom height H), the indicator light should be off.



3. After performing the calibration, load the bucket with a known weight. If the load displayed on the meter is too low, raise the boom height setting. If the load displayed on the meter is too high, lower the boom height setting. Adjust the calibration again.

REMARK

The mounting position of the proximity switch and sensor plate is set, per the illustration at the right.

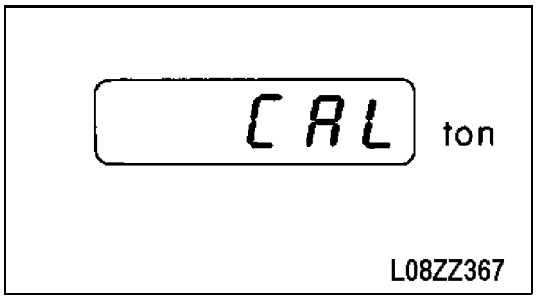


31.3 CALIBRATION (ADJUSTING 0 POINT)

To ensure accurate measurements, always calibrate (adjust the zero point) before using.

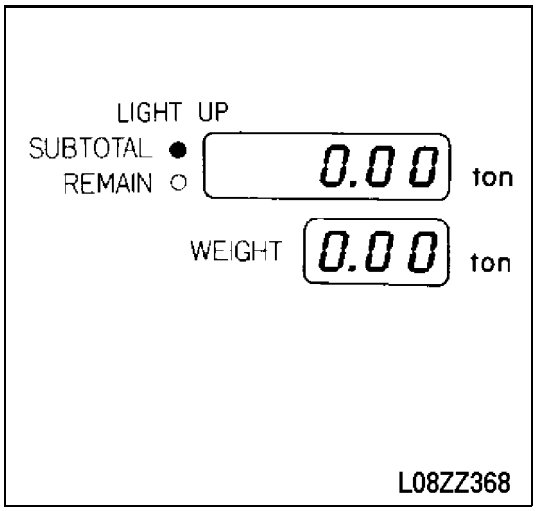
31.3.1 CHECK BEFORE ADJUSTING

Check that the word “CAL” is flashing in the upper display panel.

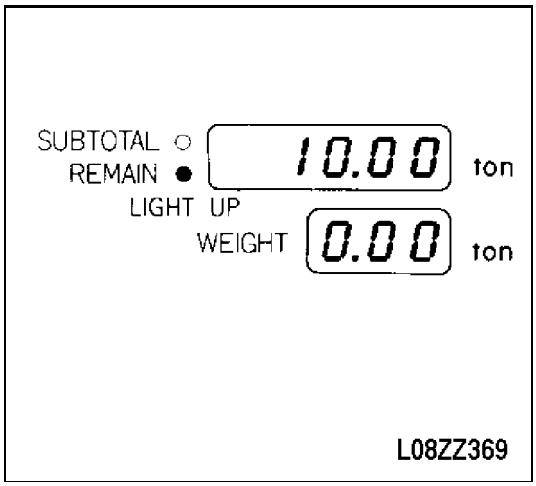


If the word “CAL” is not displayed, perform the following steps.

If the green LED lights up (SUBTOTAL mode): If both the top and bottom display panels show 0.00 (0.0) tons, press the CAL switch and the display will change to CAL. Calibration cannot performed when the subtotal and the weight in the bucket are displayed. Always press the CAL switch after setting the display to 0.00 (0.0) ton to delete the subtotal.



If the red LED lights up (REMAIN mode): If the top display (REMAIN) shows target production and if the bottom display (WEIGHT) shows 0.00 (0.0), press the CAL switch to display CAL. Calibration cannot performed when the subtotal and the weight in the bucket are displayed. Always press the CAL switch to set the REMAIN display to the target production amount.



31.3.2 ADJUSTING

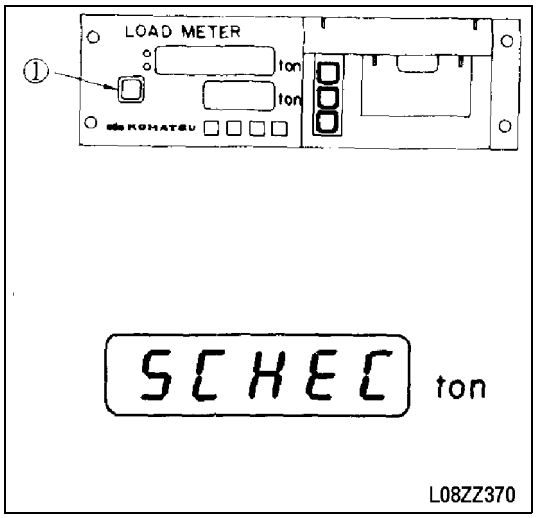
Perform this adjustment when the word CAL is flashing.

After the engine reaches operating temperature, tilt the bucket forward to empty it. Raise the boom until the buzzer sounds, which indicates that the calibration is complete.

31.3.3 CHECKING CALIBRATION

Press the CAL switch (1) twice to make the word “SCHEC” flash.

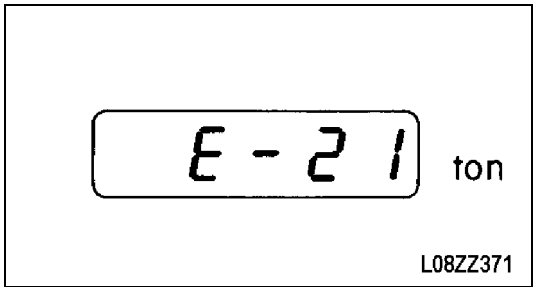
After the engine reaches operating temperature, tilt the bucket fully forward to empty it.



When E-21 is displayed in the upper display panel, press the CAL switch (1) to delete the error message and perform the calibration.

If the display returns to the display shown before the calibration check, there is no need to perform the calibration.

Check the calibration once a week.



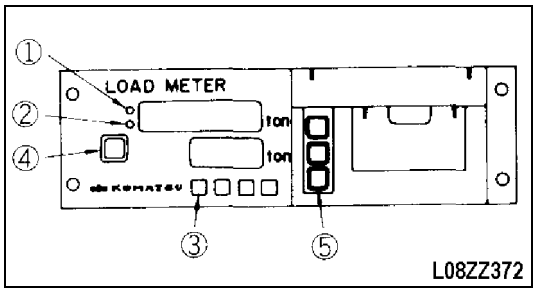
31.4 MEASURING

The load meter can measure the SUBTOTAL and REMAIN.

SUBTOTAL: Use to find the amount loaded into a dump truck, hopper, and so on. Data can accumulate for a maximum of 500 loads.

REMAIN: The operator can dial in any value, up to a maximum of 500.00 ton, on the load meter as the target amount to be loaded. The meter keeps track of the amount loaded and informs the operator of the amount remaining that needs to be loaded to reach the target amount.

31.4.1 MEASURING SUBTOTAL



Check that the green LED (1) for the SUBTOTAL display lights up. If the red LED for the REMAIN display lights up, press the MODE switch (3) for about 3 seconds so that the green LED (1) lights up.

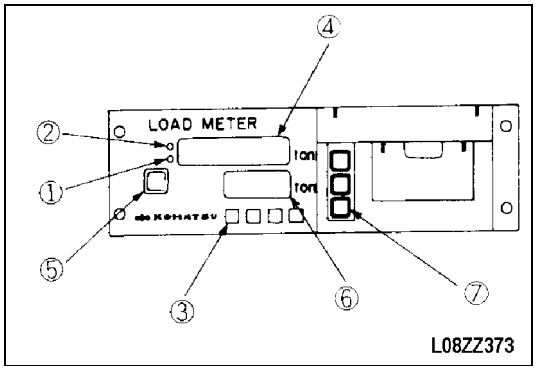
Pressing the CAL switch (4) erases the SUBTOTAL display and the data in the memory.

After loading the bucket, fully tilt it and raise the boom. The buzzer will sound indicating the weight of the load is displayed in the lower display panel while the SUBTOTAL is displayed in the upper panel. If the data is not needed, press the data cancel button on the control lever while the weight is displayed in the lower panel.

To set the upper display panel to 0.00 (0.0) ton, press the SUBTOTAL switch (5) to print the present production amount.

REMARK
To ensure precise measurement, raise the boom and keep the boom control lever fully open until the buzzer sounds, indicating the measurement is complete. Dump the load.

31.4.2 MEASURING REMAIN



Check that the red LED (1) for the REMAIN display lights up. If the green LED (2) for the SUBTOTAL display lights up, press the MODE switch (3) for about 3 seconds so that the red LED (1) lights up.

To return the REMAIN display (4) to the target production amount, press the CAL switch. For details of changing the target production amount, **See ? SETTING TARGET PRODUCTION AMOUNT N REMAIN MODE on page ?-?.**

After loading the material into the bucket, fully tilt it and raise the boom. The buzzer will sound indicating the weight is displayed in the lower display panel (6). A value showing the previous REMAIN amount minus the load in the bucket is displayed in the upper display panel (4). If the displayed data is not needed, press the data cancel button on the control lever while the weight is displayed in the lower display panel (6).

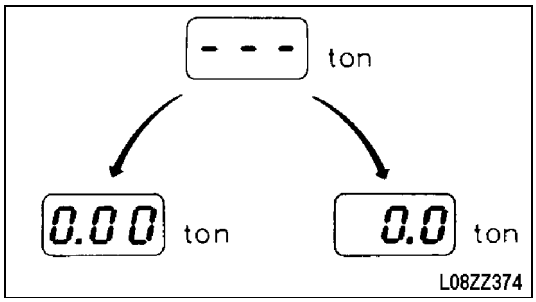
Use the REMAIN display (4) in conjunction with the lower display panel (6) to adjust the bucket load. Tilt the bucket back after loading it. After placing the boom to the horizontal position, lower the boom to a point midway between horizontal and the ground. Raise the boom until the buzzer sounds, indicating the measurement is complete. The amount inside the bucket will be subtracted and the amount remaining will be displayed. The amount indicated on the REMAIN display (4) and the weight indicated in the lower display (6) can be used to judge how much of the load that should be dumped into the truck.

If the values in the REMAIN display (4) and the lower display panel (6) are close and the entire bucket load is dumped into the dump truck, press the SUBTOTAL switch after dumping the load. The print out will indicate the amount loaded into the truck. Press the CAL switch (5) to erase the data. The amount in the REMAIN display (4) will prepare the operator for the next load.

If the value in the REMAIN display (4) is about zero (0) tons, the target amount is completed. Press the SUBTOTAL switch (7) to print the data. However, if the amount exceeds the target production, the buzzer sounds and a negative value appears in the REMAIN display (4), indicating an excess load. No further measurement will be taken. Press the SUBTOTAL switch (7) to print the data for the amount dumped into the truck. When pressing the SUBTOTAL switch (7), any remaining load in the bucket can be loaded into the next dump truck. The amount remaining in the bucket is displayed in the lower display panel (6) for 15 seconds. This data is stored in memory for the first bucket load for the next dump truck. Thus, if the target production amount is not changed, continuous work can be performed. For example, when two and one-half buckets are loaded onto one dump truck, the remaining one-half bucket can be loaded onto a second dump truck. However, if the amount remaining in the bucket is not needed, the load can be tipped out and the cancel button, which is at the tip of the knob on the work equipment control lever, pressed after pressing the SUBTOTAL switch (7).

If the target amount is exceeded, the REMAIN display (4) will show a negative amount, and 3 seconds later the previous display will flash. In addition, the lower display panel (6), which normally displays 0 tons for 15 seconds after the measurement is displayed, will continue to display the weight inside the bucket.

Failing to press the SUBTOTAL switch (7) before raising the boom with a load remaining in the bucket, the load meter interprets this situation as abnormal. The buzzer will sound intermittently and the lower display panel (6) will flash — — — and no measurement can be performed. Press the CAL switch (5) once to display the target production amount in the REMAIN display (4) and zero (0) in the lower display panel (6).

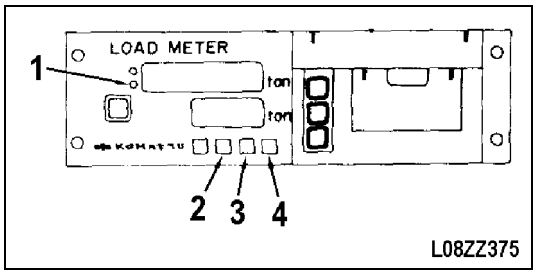


REMARK
To ensure precise measurement, raise the boom and keep the boom control lever fully open until the buzzer sounds, indicating the measurement is complete. After the buzzer sounds, dump the load.

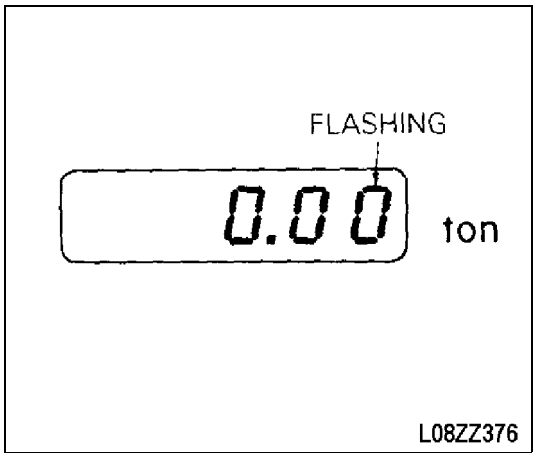
31.5 SETTING TARGET AMOUNT IN REMAIN MODE

To set the target amount in the REMAIN mode:

Check that the red LED (1) is flashing in the remain display.

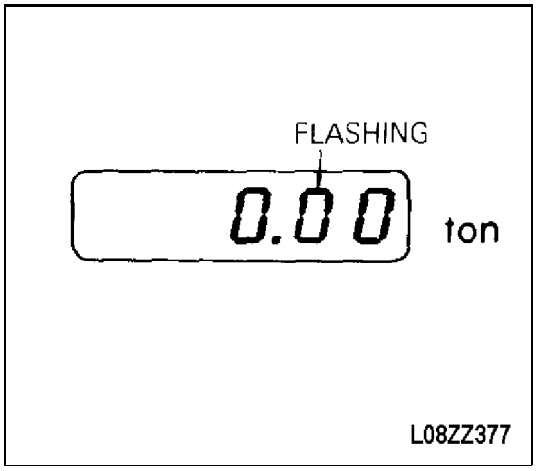


Pressing the ADJ switch (2) will cause the lowest digit to flash.



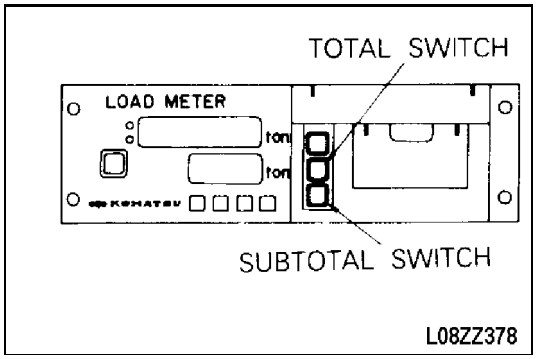
Pressing the SFT switch (3) causes the next digit to the left to flash.

Pressing the INC switch (4) increasesthe flashing digit in increments of one. When the desired target amount is obtained, press the ADJ switch (2) to stop the flashing and complete the setting.



31.6 PRINTING DATA

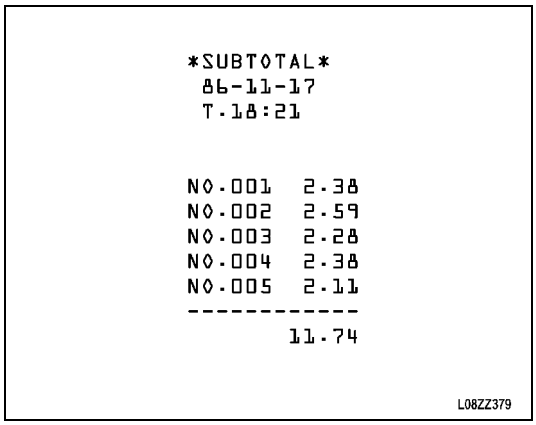
Two types of data can be printed: SUBTOTAL and TOTAL. The data can only be printed while the amount loaded in the bucket is being displayed.



31.6.1 PRINTING SUBTOTAL

Press the SUBTOTAL switch to print the data. The switch is located on the load meter and the work equipment control lever. The display is as follows:

SUBTOTAL mode
- Date of print out
- Time of print out
- Amount of each load
- Total load



After the SUBTOTAL is printed, the SUBTOTAL display becomes 0.00 (0.0) tons. If no new measurement is performed, the same data can be printed as many times as desired.

REMAIN mode
- Date of print out
- Time of print out
- Target production amount
- Amount of each load
- Total load

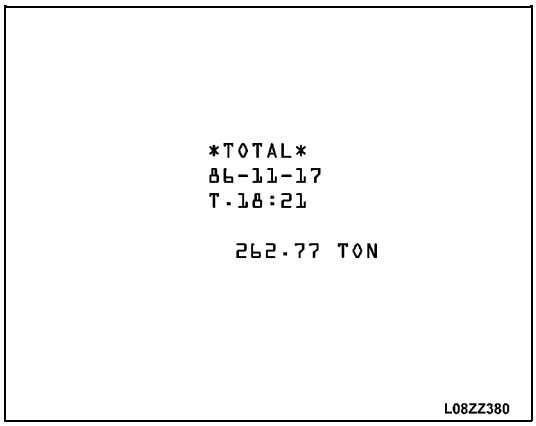
31.6.2 PRINTING TOTAL

Pressing the TOTAL switch erases the data in the load meter memory. All of the measured loads are printed as a total.

The TOTAL is the accumulated total, regardless of the data printed for the SUBTOTAL. The loads are added until the total reaches a maximum of 16, 772.15 tons.

However, if printing just the TOTAL amount loaded each day is needed, erase the memory before starting work.

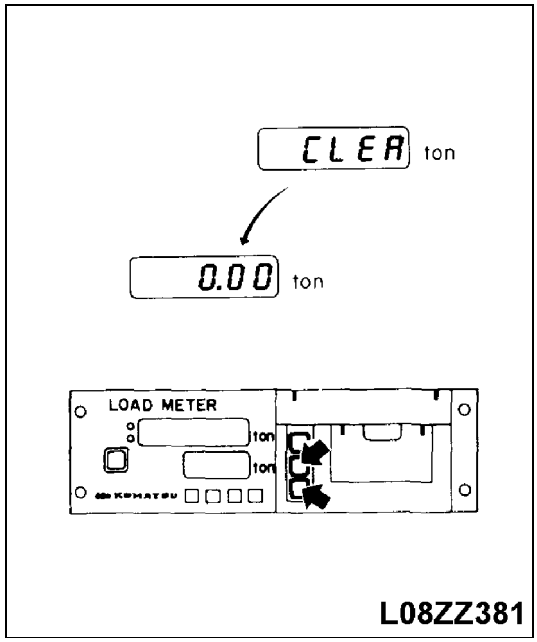
To erase the data, **See 31.7 DELETING DATA FROM STORAGE DEVICE on page 5-97.**



31.7 DELETING DATA FROM STORAGE DEVICE

The data in the memory is retained after the power is turned off. To delete the data:

Press the TOTAL switch and SUBTOTAL switch simultaneously. The word “CLEA” flashes in the upper display panel. Continue pressing both switches and 0.00 will be displayed, indicating that the data in the memory has been erased.

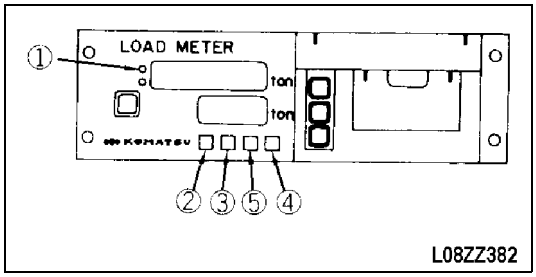


31.8 SETTING TIME ON CLOCK

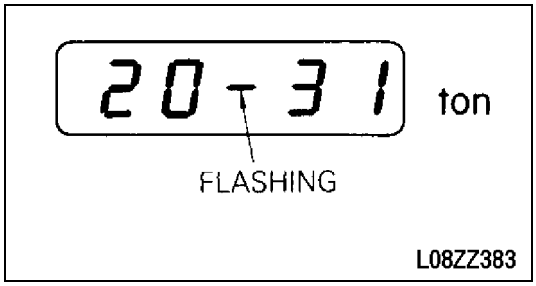
The load meter has a built-in clock. It provides the date and time when the data is printed. To adjust the date and time:

Check that the green LED (1) of the SUBTOTAL display is flashing.

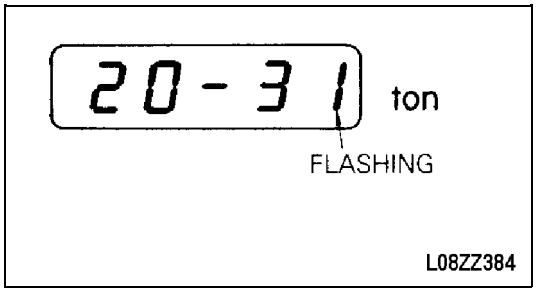
Press the MODE switch (2) and ADJ switch (3) simultaneously for 3 seconds to switch to the clock mode.



In the clock mode, the dash will be flashing.

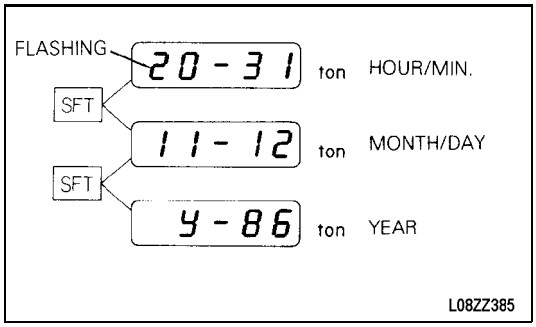


Press the ADJ switch (3). The digit at the extreme right will be flashing, indicating that the clock can now be adjusted. To increase the flashing digit in increments of one, press the INC switch (4).



To adjust the next digit to the left, press the SFT switch (5). When the left digit of the hour setting flashes, the display will change to the month/day setting. When the left digit of the month setting flashes, the display will change to the year setting. After setting the year, the display will revert to the time. Press the ADJ switch (3) to complete the setting.

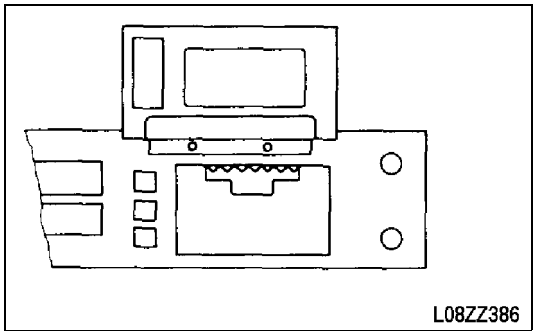
Press the MODE switch (2) to revert to the SUBTOTAL mode.



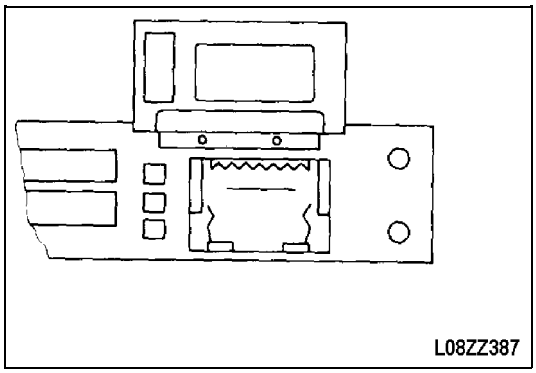
31.9 REPLACING PRINTER PAPER

When the printer runs out of paper, install a new roll of paper as follows:

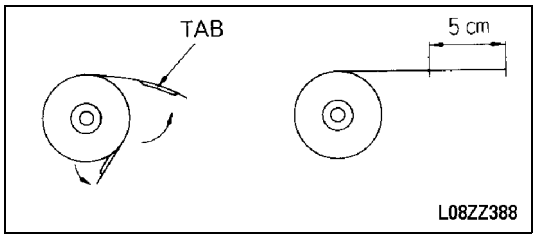
Raise the acryl dust cover.



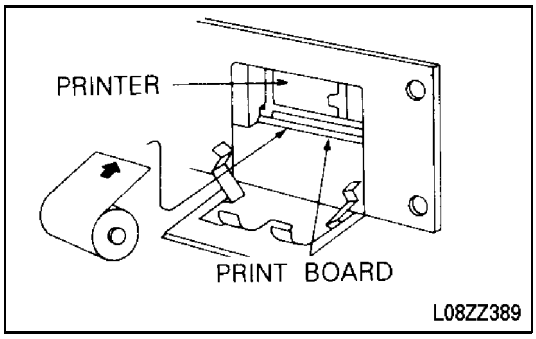
Open the paper cover to the front.



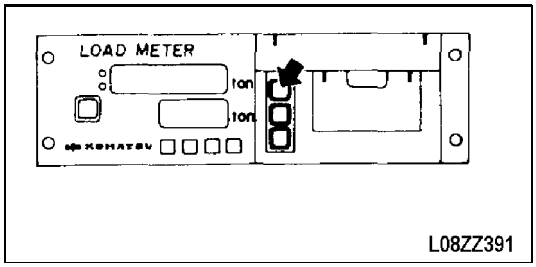
Remove the tab from the roll of paper and cut off the first 5 cm of the roll.



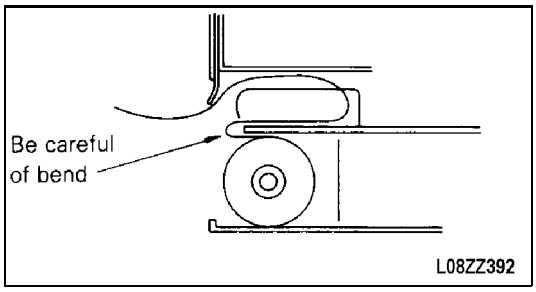
Insert the paper as follows. With the red arrow on the outside face of the roll at the top, insert the paper into the printer.



Press the FEED switch and the printer will feed the paper.



After inserting the roll of paper into the meter, ensure that the paper doesn't bend too sharply at select points.



31.10 TROUBLESHOOTING FUNCTION

The load meter is equipped with a self-diagnostics function. If any one of the error codes below appears on the display, press the CAL switch once. This action should cancel the error code. However, if the error code appears continuously, note it and contact your Komatsu distributor.

Error Code	Problem*
E-8	Defective load meter
E-01	Defective sensor, open circuit in the wiring
E-11	Defective sensor, wiring harness in contact with the sensor power line.
E-31	Short circuit in the sensor power source
E-33	Internal battery voltage drop
PAGE	Paper jam

* Most probable cause, but other things not listed could cause the problem.

31.11 SPARE PARTS

When changing the printer paper or the internal battery, use the Komatsu part numbers listed below. When changing the internal battery, contact your Komatsu distributor.

Item	Part No.	Part Name
Printer paper	7818-27-2910	Paper
Internal battery	7818-27-2860	Battery

Komatsu America International Company
440 North Fairway Drive
Vernon Hills, IL 60061-8112 U.S.A.
Attn: Technical Publications
Fax No. (847) 970-4186

PROPOSAL FOR MANUAL REVISION

FOR INTERNAL USE ONLY -- No. PMR

PROPOSER		
	NAME OF COMPANY:	LOCATION:
		PHONE NO:
	DEPARTMENT:	DATE:
	NAME:	

MANUAL NAME:

MANUAL NO:

MACHINE MODEL:
S/N IF APPLICABLE:

PAGE NO:

PROBLEM:

Attach photo or sketch.
If more space is needed, use another sheet.

FOR INTERNAL USE ONLY

CORRECTIVE ACTION:

PFMR1 081696