

Operation & Maintenance Manual

WA500-1

WHEEL LOADER

SERIAL NUMBERS **WA500-1LE - A61001** and up

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Due to this continuous program of research and development, periodic revisions may be made to this publication. It is recommended that customers contact their distributor for information on the latest revision.

PRODUCT PUBLICATIONS INFORMATION

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

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

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

DESCRIPTION	FORM NUMBER
PARTS BOOK - PAPER:	
Engine and Chassis	BEPB000500
PARTS BOOK - MICROFICHE:	
Engine and Chassis	BEPM000500
OPERATION & MAINTENANCE MANUAL:	
Chassis	CEAM000300
Engine	3666095
SHOP MANUAL:	
Chassis	CEBM000500
Engine:	
Shop Manual	3810487
Trouble Shooting & Repair	3810456
Specifications Manual	3666090
Standard Man-Hour Guide	3666031
SAFETY MANUAL	WLT70-1

PARTS AND SERVICE PUBLICATIONS CAN ONLY BE ACQUIRED BY AUTHORIZED KOMATSU DISTRIBUTORS, USING THE KDC PARTS INFORMATION PROCESSING SYSTEM (PIPS).

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

This manual provides rules and guidelines, which will help you use this machine safely and effectively.

Keep this manual handy and have all personnel read it periodically. If this manual is lost or becomes dirty and can not be read, request a replacement manual from your local distributor if you are the owner or end user or from Komatsu America International Company if you are a distributor.

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

Continuing improvements in the design of this machine can lead to changes in detail, which may not be reflected in this manual. Consult your local distributor if you are the owner or end user or consult Komatsu America International Company if you are a distributor for the latest available information on your machine or for questions regarding 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 operation and maintenance of the machine can cause a serious accident, if they are not performed in the manner described in this manual. The precautions and procedures given in this manual apply only to the intended uses of the machine. If you use the machine for any unintended uses that are 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 as described in this manual.

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

NOTICE: For engine information not covered in this manual, refer to the Cummins Engine Operation and Maintenance Manual.

SAFETY INFORMATION

Most accidents are caused by the failure to follow fundamental safety rules for the operation and maintenance of machines.

To avoid accidents, read, understand and follow all precautions and warnings in this manual and on the machine before performing operation and maintenance.

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.

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

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 if you are the owner or end user or Komatsu America International Company if you are a distributor.

BREAKING IN THE NEW MACHINE

Each machine is carefully adjusted and tested before shipment. However, a new machine requires careful operation during the initial 100 hours as indicated by the service meter.

If a machine is subjected to unreasonably hard use at the initial operation stage, the potential of performance will prematurely deteriorate and the service life will be reduced. A new machine must be operated with care, particularly with regard to the following items.

During breaking in:

- After starting, let the engine idle for 3 to 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.
 - At the first 250 hours of operation, the machine should be maintained in the manner described in Section 3 "MAINTENANCE".
- ★ Hours of operation are indicated by the service meter.

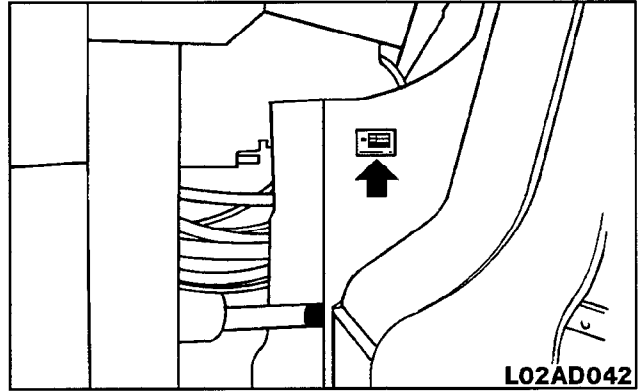
INTRODUCTION

MACHINE AND ENGINE SERIAL NUMBERS

When calling for service of a mechanic or when making a replacement parts order, be sure to give your distributor the machine and engine serial numbers as well as the service meter reading before mentioned. These numbers are found on the number plates shown in the following figures.

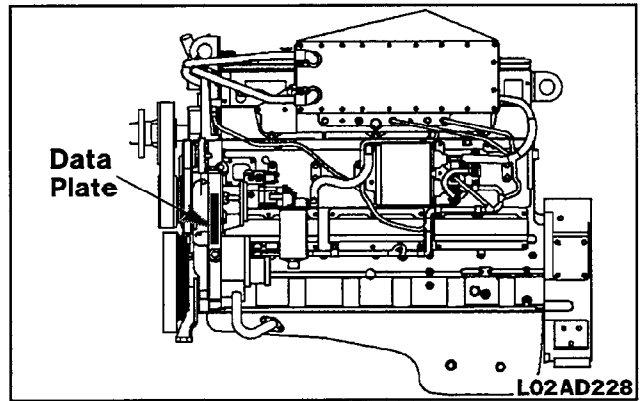
- Location of the machine serial number plate

It is located on the right side of the front frame, just in front of the center hinge pin area of the machine.



- Location of the engine data plate

It is located on the right side of the engine crankcase near the timing gear cover.



- ★ The engine data plate, shown below, shows specific information about your engine and provides the information for ordering parts and service needs.

○ Engine No.	S.O. No.					E.C.S.			Cummins	VEHICLE EMISSION CONTROL INFORMATION: This engine conforms to U.S. EPA and the CARB regulations applicable to Model Year New Heavy-Duty Engines. This engine has a primary intended service application as a heavy heavy-duty diesel engine.	
Model	Ref. No.					Injection timing code					
Advertised HP	at	RPM	Engine Cert. Ident.	C.I.D.	Family	CPL	Injector torque	Inch-Lbs.	Idle Speed	RPM	
Conf. No.	Warranty start date					Injector travel					Inch
Date of mfg.	Valve Lash Cold					Int.		Exh.		WARNING: Injury may result and warranty is voided if fuel rate RPM or altitudes exceed published maximum values for this model and application.	
● Manufactured by Cummins Engine Company Inc. U.S.A.							Fuel rate at advertised HP		mm 3 stroke		●

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INTRODUCTION

QUICK REFERENCE INFORMATION

MACHINE MODEL NAME & MACHINE SERIAL NO.

ENGINE MODEL NAME & ENGINE SERIAL NO.

DISTRIBUTOR'S NAME:

DISTRIBUTOR'S ADDRESS & TELEPHONE NO.

NOTES OR REMARKS:

PERIODIC SERVICE

ITEM	DATE	SERVICE METER READING
DELIVERY		
PERIODIC		
PERIODIC		
PERIODIC		

CONSUMABLE PARTS

PART NO.	PART DESCRIPTION	QTY.

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SECTION 1

SAFETY PRECAUTIONS



WARNING! REFER TO AND READ ALL
SAFETY PRECAUTIONS IN SECTION 1.

SAFETY PRECAUTIONS

AVOID ACCIDENTS

WORK SAFETY -- FOLLOW THESE RULES

A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST AN ACCIDENT



This symbol is used throughout this manual to call your attention to instructions concerning personal safety. Observe and follow these instructions. Be certain anyone operating or servicing this machine is aware of these rules. Failure to follow these rules may result in injury or death.

GENERAL PRECAUTIONS

PERSONNEL PRECAUTIONS

Operating and servicing this machine can be hazardous if performed improperly. Personnel must have the necessary skills, information and equipment and use safe and proper procedures. Study the Operation and Maintenance Manual before operating or servicing this machine. Consult your Distributor for information and service.

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

Read all warning product graphics before starting, operating, maintaining or repairing this machine.

DO NOT wear jewelry or loose fitting or hanging clothing because they could catch on moving parts and cause injury or death. Wear proper safety equipment, such as a hard hat, rough-soled work shoes or safety shoes, ear protectors, reflective vests, respirators, safety glasses, goggles and heavy gloves. Consult your employer for specific requirements.

DO NOT jump on or off the machine. Keep two hands and one foot, or two feet and one hand, in contact with the steps and handholds at all times. Place objects on machine from ground level before climbing on. Always face the machine when climbing on or off to reduce the chances of slipping and injury.

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.

MACHINE PRECAUTIONS

Carefully evaluate your application's particular safety needs. Each machine application can have unique requirements. You may need such attachments as: rear windshield wipers, windshield washers, heater, defroster fan, warning lights, air conditioning, ROPS, mirrors, backup alarm, fire extinguisher, spark arrestor, fire suppression system, cab screens, sound suppression, rotating beacon, additional lights, anti-vandalism attachments, guards, tow hook, Lexann windows, water glycol, communication radios, ground driven steering, turn signals, and slow moving vehicle sign. Consult your Distributor for information.

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

A rollover protective structure (ROPS) with a seat belt is required by OSHA in almost all applications. DO NOT operate this machine without a ROPS.

SAFETY PRECAUTIONS

It is recommended that the machine be equipped with a fully charged fire extinguisher with an Underwriter's Laboratory (UL) rating of 2A:10B:C (or higher). Personnel should be instructed in proper usage. Recharge immediately after use.

If the machine will be used for tree removal or site clearing, install approved operator guards per S.A.E. or OSHA requirements. Consult your Distributor for information.

If the machine will be working under conditions of flying combustible material, install screens and guards to reduce the chance of fire.

If the machine is equipped with a suction fan (or a reversible fan in the suction position), check the engine exhaust system periodically for leaks. Exhaust gases are dangerous to the operator. On machines equipped with a cab, keep a vent open to outside air.

Keep shields and guard in place for your protection. Be sure to replace them after servicing the machine.

A first-aid kit should be available in case of an injury.

When transporting the machine, use caution when loading and unloading it. Load and unload the machine in a level area which fully supports the machine and transport vehicle. Block the transport vehicle so it cannot move. Use loading ramps of adequate strength, low angle and proper height. Keep the trailer bed and the machine's tires clean of clay, oil and other slippery materials. Lock the machine's front and rear frames together with the frame locking bar and pins. Apply the machine's parking brake. Block the tires and securely tie down the machine and the machine tires, to the trailer bed.

OPERATION

BEFORE STARTING

Before entering the operator's compartment, walk completely around the machine and clear the area of personnel and obstructions.

Perform a visual check of the machine before starting the engine. Look for such things as missing protective devices, leaks, improper fluid levels, trash buildup and loose, damaged or missing parts. DO NOT start the engine until any unsafe conditions are corrected.

Before operating the machine, check that the frame locking bar and pins are in the storage position on the rear frame. A broken or lost frame locking bar or pins should be replaced immediately so that this device is always available for use.

Be sure all filler caps, dipsticks, plugs, latches, service doors, etc., are secure before starting.

BE SURE the operator's compartment, mounting steps and handholds are free of oil, grease, snow, ice, mud and foreign objects to reduce the possibility of slipping and injury. Repair any damaged steps or handholds. Remove or secure all maintenance and personal items which might interfere with the operator or jam the controls.

Do not use the machine's controls or hoses as handholds 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.

Understand all control functions before starting the engine.

Know the alternate exit routes from the operator's compartment for use in an emergency.

SAFETY PRECAUTIONS

If the machine is equipped with a cab, the right hand side door of the cab serves as an emergency exit. Use only if the left hand side door is blocked.

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.

START-UP

Never start the engine indoors unless proper exhaust ventilation is provided to remove deadly exhaust gases. Once the engine is running, move the machine outdoors as soon as possible. Exhaust gases are hazardous and can cause unconsciousness and death.

Sit in the operator's seat before operating any controls. Keep hands and footwear free of grease, water and mud to insure positive control movement.

Before starting the engine, or when machine is standing with the engine running: place the transmission directional lever in neutral (N), apply the parking brake and lower any raised equipment.

DO NOT SMOKE when using the ether start. Do not use the ether start when the air temperature is above freezing. Follow the correct method for starting the engine. Refer to "STARTING ENGINE" in Section 2.

Before driving the machine, adjust the seat and fasten the seat belt. Adjust the seat for maximum comfort and control of the machine. Adjust the seat belt to fit snugly and low around the hips to lessen the chance and severity of injury in the event of an accident. Never wear the seat belt across the abdomen.

Use of the seat belt with the ROPS is strongly recommended. In the event of a rollover, stay with the machine. Experience has shown this will reduce the chance and seriousness of injury.

Before moving the machine, check the brakes, steering, attachment controls and safety devices. DO NOT operate the machine until any unsafe conditions have been corrected.

Before moving the machine, sound the horn to warn nearby personnel.

Release the parking brake before moving the machine. The brake could burn or be damaged if the machine is driven with it applied.

Turn off the defroster fan before adjusting it to avoid injury.

NEVER HAUL PASSENGERS. Only the operator should be on the machine when it is moving.

Use caution and follow the manufacturer's instructions when using external heaters to warm the power train in cold weather.

GENERAL OPERATING PRECAUTIONS

Stay alert and aware of what you are doing. Use common sense. Do not operate when fatigued or ill. Know your machine and its capabilities. Use the machine only for its intended purposes. For your safety, read the Operation and Maintenance Manual carefully and follow all instructions and precautions.

SAFETY PRECAUTIONS

Provide proper ventilation when operating in a closed area to minimize the danger of exhaust gases. Exhaust gases are hazardous and can cause unconsciousness and death.

Maintain clear vision of all work and travel areas. Keep windows and mirrors clean and repaired.

Look in the intended travel direction to be sure personnel and allied equipment do not interfere with the machine's work pattern. Do not operate if exposed personnel enter the immediate work area.

Turn on the machine's lights at night and times of poor visibility to see and be seen.

DO NOT adjust the seat while the machine is moving because a loss of control may result. Stop the machine, apply the parking brake and then adjust the seat.

Keep head, limbs and body inside the operator's compartment at all times because of the chance of being injured by hazards outside the operator's compartment.

NEVER allow anyone near the center articulation pivot. If the machine turned, they could be crushed.

NEVER allow anyone to stand on the ladder when the bucket is raised or the machine is moving or turning to prevent injury from falling, crushing or falling material.

NEVER get on or off the machine while it is moving because serious injury or death could result.

After starting and while operating, observe instruments and warning lights frequently. Investigate any unusual indications or noises in the machine.

If the engine has a tendency to stall, investigate immediately. Do not operate the machine until the cause has been corrected.

If noise exposure exceeds 90 dBA for eight hours, wear ear protective equipment.

DRIVING THE MACHINE

Carry the bucket low for maximum visibility and stability when traveling.

Before operating in areas with overhead obstructions, carefully check overhead clearance. Obstructions, such as guy wires, power lines, tree branches, bridges and building doors could cause a rollover accident.

Drive slowly enough to insure complete control. Slow down when traveling in congested areas or on mud, ice or other slippery surfaces. Keep a safe distance away from other vehicles, according to the load and ground conditions.

Avoid crossing obstacles, such as ridges, curbs, logs and rocks. If you cannot avoid them, reduce speed and cross at an angle. Ease up to the breakover point, pass the balance point slowly and ease down on the other side.

Cross ditches and gullies slowly and at an angle after checking that the ground will safely support the machine.

Avoid sidehill travel whenever possible. Drive straight up and down the hill. If the machine starts slipping sideways, turn downhill immediately.

When traveling on hills with a loaded bucket, travel forward up the hill and in reverse down the hill.

SAFETY PRECAUTIONS

Stop, look and listen before entering a highway. Stay on the right side of the road. Slow down and signal when turning off.

When roading the machine, engage the hydraulic control lever lock to guard against accidental actuation of the levers. Personal injury could result if the bucket catches on a ledge in the road.

Do not use the transmission disconnect brake pedal when traveling fast or going downhill because this shifts the transmission into neutral. Loss of control or damage to the power train could result when the pedal is released and the transmission is re-engaged.

Never shift the transmission into neutral (N) when traveling downhill. The machine could go out of control or the power train could be damaged when the transmission is shifted into gear again.

Do not overspeed the engine. Excessive speeds can be hazardous and harmful to the power train. Select the proper gear before starting downhill. Control speed with the brakes.

Never use the bucket as a brake except in an emergency. It might catch on the ground and result in personal injury.

If the main steering light comes on, IMMEDIATELY stop the machine in a safe place. Shut off the engine and apply the parking brake. Correct the cause before operating again.

If the brake system warning light or buzzer comes on during operation, IMMEDIATELY stop the machine in a safe place. Apply the parking brake. Correct the cause before operating again.

Know the traffic flow pattern of the job site. Obey flagmen, signs and signals.

Give the right-of-way to loaded machines. On narrow or hilly roads, loaded machines should stay next to the high wall.

Keep the machine as close to the side of the road as safely as possible to leave room for oncoming and passing vehicles.

Pass other vehicles only when the road is clear and the machine has enough distance and reserve power to pass.

OPERATING THE ATTACHMENTS

Check the work area for hazardous conditions. Be alert for soft ground conditions, especially when working on slopes, near dropoffs or excavations or on fill material, which could lead to sudden tipping of the machine.

Keep the work area free from obstructions and as smooth as possible.

Know the locations of underground cables, water mains, gas lines, etc. A broken gas line or electrical cable could cause personal injury or death.

Avoid operating too close to an overhang, deep ditch or excavation because the machine's weight and vibration may cause the edge to collapse and result in personal injury. If this cannot be avoided, use extra caution and face the machine toward the edge while operating.

Avoid undercutting high banks because the bank may cave in. Ramp up and remove the top layers first.

Trucks should be loaded from the driver's side whenever possible. When the truck is being loaded, be sure the driver either stays in the cab (on cab-protected trucks) or away from the truck and loader.

When loading trucks, be careful not to hit the truck with the loader or its bucket.

SAFETY PRECAUTIONS

Use extra caution when moving with the bucket raised to minimize the chance of machine upset.

DO NOT swing a load over the heads of other workers or a truck cab.

If the loader begins to tip over because of an overload, IMMEDIATELY lower the bucket to regain stability.

There is no substitute for good judgment when working on a slope. Slope operation should be limited by ground and traction conditions, the load being carried and the speed of the machine.

NEVER operate sideways on a steep slope because a rollover and serious injury could result.

Using the loader to carry large objects which do not fit into the bucket is NOT recommended. Handling large objects can be extremely dangerous because the objects may roll or slide down the lift arms onto the operator. NEVER lift large objects higher than the operator unless the machine has a device which prevents the objects from falling back onto the operator.

When pushing over trees, the machine must have approved operator protection. Back away immediately when the tree starts to fall. Use extreme care when pushing over trees with dead branches which may fall. To reduce the chance of machine upset, never allow the machine to climb up the root structure.

PULLING/TOWING

For your safety, never push or tow a disabled machine farther than absolutely necessary to load it onto a truck.

When using a chain or cable, be sure it is strong enough for the expected load and properly secured to the drawbar pin.

Hitch only to the drawbar pin. Machine upset can result if pulling from the wrong location.

When pulling, position the machine so that the chain or cable aligns with the long axis of the machine.

Inspect chains and cable for flaws before using. Avoid kinking. Do not pull with a kinked chain or cable because the high stresses could cause a failure in the kinked area. Wear heavy gloves when handling chain or cable.

When pulling with a chain or cable, take up the slack slowly to avoid jerking. A chain or cable which fails under load can whip and cause serious injury. **STAND CLEAR. DO NOT PULL OR TOW UNLESS THE OPERATOR'S COMPARTMENT IS GUARDED AGAINST OR OUT OF REACH OF A WHIPPING CHAIN OR CABLE.**

SHUTDOWN

Never leave the machine with the engine running or the bucket raised. When parking the machine, shut off the engine, lower the bucket to the ground, place the transmission directional lever in neutral (N), apply the parking brake, turn off the electrical starting switch and remove the key.

Raised lift arms will drop when the control lever is moved to "LOWER" or "FLOAT" even with the engine off. ALWAYS lower the lift arms when parking the machine.

If the machine is equipped with a multi-purpose bucket, close the clam before dismounting.

Park the machine in a non-traffic area. If parking in traffic lanes cannot be avoided, provide appropriate flags, barriers, flares and warning signals. Also provide advance warning signals in the traffic lane for approaching traffic.

SAFETY PRECAUTIONS

Avoid parking on a slope because unexpected machine movement may occur. If necessary to park on a slope, park at right angle to the slope and block the tires.

Always lock the machine, including any anti-vandalism attachments, when leaving it unattended.

MAINTENANCE

GENERAL MACHINE PRECAUTIONS

Constantly be aware of dangers involved in working on the machine and take proper precautions. It is not possible to anticipate all conceivable ways or conditions under which this machine may be serviced or to provide precautions for all the possible hazards that may result. Safety is always the most important rule. Standard and accepted safety precautions and equipment should be used.

Do not attempt repairs you do not understand. Consult your Distributor for information and service.

NEVER run the engine when cleaning or lubricating the machine because serious injury could result from contacting moving parts.

Before servicing the machine, BE SURE the engine is off, the bucket is lowered, the transmission directional lever is in neutral (N), the parking brake is applied and the electrical starting switch is off and the key is removed. Tag the machine.

Before working on the engine or electrical system, disconnect the negative (ground) battery cable. Tag the cable and controls to warn against starting.

Before working under the machine, block the tires to prevent machine movement.

ALWAYS lock the front and rear frames together with the safety bar and pins before working near the center of the machine. If the frames move, serious injury could result.

NEVER stand near the bucket or the tires while the engine is running.

During servicing, DO NOT allow anyone in the operator's compartment who is not trained and assisting in the servicing.

When it is necessary to make any checks or adjustments with the engine running, use two people. A trained operator must be at the controls to safeguard the mechanic making the checks or adjustments. BE SURE the transmission directional lever is in neutral (N), the parking brake is applied and the front and rear frames are locked together.

Be sure the engine hood or access door(s) is secure in the open position during service work in the engine compartment. Unexpected closing could cause injury.

NEVER remove any guards or shields with the engine running because of the danger of contacting rotating parts.

When service requires access to areas that cannot be reached from the ground or a service platform on the machine, use a ladder or platform of appropriate capacity.

Use only approved parts for repairs and maintenance. Failure to do so could compromise personal safety, machine performance and reliability.

SAFETY PRECAUTIONS

This machine is assembled using high strength fasteners. Replacement fasteners must be of the same size and strength as the originals. **DO NOT SUBSTITUTE.** Refer to the Parts Book for this machine. Tighten fasteners to the proper torque. Refer to Section 4.

Replace any missing or defaced product graphics. When parts which have product graphics on them are replaced, be sure to install new product graphics. New product graphics are available from your Distributor. For the proper position of the product graphic, refer to "SAFETY PRODUCT GRAPHICS AND LOCATIONS".

NEVER adjust relief valves higher than the specified pressure because this may damage the machine and lead to an injury. When checking pressures, use the correct gauge for the expected pressure. Consult your Distributor for information and service.

GENERAL WORK PRECAUTIONS

Keep work area clean and dry. Remove water and oil spills immediately to reduce the chance of slipping and injury.

Do not pile up oily or greasy rags; they are a fire hazard. Store them in an approved, closed metal container.

Use a non-toxic, non-flammable commercial solvent for cleaning parts, unless otherwise specified.

Avoid use of gasoline, diesel fuel, kerosene or other flammable solvents for cleaning parts. **NEVER** place these solvents in an open drain.

Corrosion inhibitors are volatile and flammable. Use them only in a well ventilated area. Keep flames and sparks away. Do not smoke. Store container in a cool, well ventilated place.

Avoid prolonged exposure to volatile corrosion inhibitors because eye and skin irritation may occur.

Excessive or repeated skin contact with sealants or solvents may cause skin irritation. In case of skin contact, remove sealant or solvent promptly by washing with soap and water. Follow the manufacturer's advice whenever cleaning agents or other chemicals are used.

Wear eye protection when using air or water under pressure to clean parts. Limit air pressure to 2.1 kg/cm² (30 psi / 200 kPa) and water pressure to 2.8 kg/cm² (40 psi / 275 kPa).

When cutting, grinding, pounding, prying or whenever material could fly or fall, wear proper protective equipment such as goggles, hard hat, safety shoes and heavy gloves. Many of the machine's parts are hardened and can chip.

Wear hand and eye protection when draining hot fluids.

When welding, wear proper protective equipment, such as a helmet, dark safety glasses, protective clothing, gloves and safety shoes. **DO NOT LOOK AT THE ARC WITHOUT PROPER EYE PROTECTION.**

If necessary to do welding on the machine, attach the ground cable close to the weld area. Do not attach the ground cable where the current can flow through bearings or mounting pads because this will damage the parts.

Use extra caution when jacking up the machine. Jacking up the machine can be hazardous if performed improperly. Use jacking equipment of sufficient capacity. Be sure the jacking points are strong enough to support the machine. Be sure the jack is stable and well supported. Before jacking up the machine, block the tires which will not be lifted. Lock the front and rear frames together with the locking bar and pins. If the rear tires are being lifted, block the rear axle to prevent it from pivoting unexpectedly. **DO NOT** run the engine with the machine on jacks. For your safety, transfer the weight of the machine to approved blocks, before servicing the machine.

SAFETY PRECAUTIONS

Use the proper tool for the job. Be sure all tools are in good condition. Do not use tools which are worn, bent or have mushroomed heads because they can lead to injury.

Never align holes with fingers or hands. Use the proper aligning tool to avoid injury.

Remove sharp edges and burrs from reworked parts.

Do not carry loose objects in pockets because they might catch on the machine and result in a fall or injury.

Use only properly grounded auxiliary power sources for chargers, heaters, electrical drills and similar equipment to reduce the chance of electrical shock.

Lift and handle all heavy parts with lifting devices of adequate capacity. Secure parts with proper slings and hooks. Use lifting eyes provided. Warn nearby personnel to stand clear.

DO NOT use the bucket to lift personnel or as a work platform. Mechanical failure or human error could cause unexpected movement of the attachment and serious injury or death.

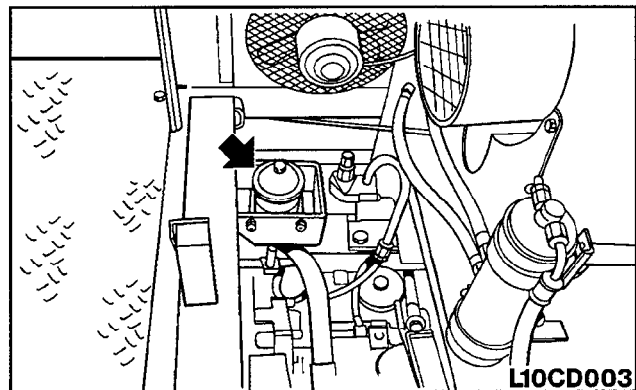
ACCUMULATORS

An accumulator is located on the rear frame on the inside of the right side plate.



WARNING! Accumulators are filled with highly pressurized nitrogen. To avoid explosions, observe the following precautions.

- If the accumulator breaks down or has trouble, immediately ask your distributor to make the repairs.
- Only personnel licensed to service high pressure equipment, may recharge an accumulator with nitrogen.
- Never strike a charged accumulator or expose it to flames.
- Never weld piping to or cut opening in an accumulator.
- Never overhaul or dispose of an accumulator without first bleeding out all the nitrogen through the air bleeder valve.
- ★ Always handle an accumulator with the utmost care!
- ★ Have your distributor check the gas pressure charge within the accumulator at the specified service interval as listed in "MAINTENANCE", Section 3.



ATTACHMENTS

For your protection, use EXTRA caution when adjusting the loader's bucket positioner or boom positioner. Use two trained people and guard against accidental movement of the machine or loader linkage.

For your protection, keep head, body, hands and fingers away from the bucket and linkage when they are in a raised position, unless they are securely blocked.

SAFETY PRECAUTIONS

When replacing cutting edges and teeth, securely block the bucket for your protection.

To install and remove bucket teeth, use a nonferrous hammer. It is hazardous to hammer on the teeth. Wear safety glasses with side shields or goggles to reduce chances of injury.

BRAKES

Block the tires to prevent machine movement before servicing the brakes.

Test the parking brake periodically. If the parking brake does not hold the machine, correct the cause as soon as possible. Until the cause is corrected, park the machine on level ground and block the tires to prevent it from moving.

When testing the parking brake, be sure the area near the machine is clear of personnel and obstructions because the machine may move during the test.

CAB/ROPS

Do not attempt to repair a rollover protective structure (ROPS) after an accident. The ROPS is designed to bend during a rollover to protect the operator from sudden impact loads. Repaired structures do not provide the original strength and protection. O.S.H.A. regulations prohibit repair to damaged ROPS. Contact your Distributor for information on ROPS replacement. Do not operate the machine again until the ROPS has been replaced.

Do not cut, grind, weld or drill holes in the ROPS because this could weaken the structure or affect its energy absorption capability.

Periodically inspect the ROPS for fatigue cracks. Cracks indicate a weakened structure which should be replaced for your protection.

Do not use bleach, dye or solvents on the seat belt because this may weaken the webbing and result in personal injury. Clean the seat belt with warm water and a mild detergent. Replace belts with worn, frayed, torn, faded, stiff or rotted webbing.

COOLING

Hot, scalding coolant can spray out if the radiator cap is removed suddenly. Relieve system pressure by slowly turning cap to the first notch or lifting the safety lever (if equipped). Remove the cap ONLY after the pressure is relieved.

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.

ELECTRICAL

Batteries give off a highly flammable gas. DO NOT SMOKE or allow sparks or open flame near the batteries because a fire or explosion could result.

BE SURE the electrical starting switch is off when connecting or disconnecting batteries to minimize the chance of sparks and explosion.

SAFETY PRECAUTIONS

DO NOT allow metal tools or a jumper cable clamp to contact the positive battery terminal and any other metal on the machine. The resulting sparks could cause an explosion.

When using a booster battery and jumper cables, connect the negative (ground) cable to the machine frame, AWAY FROM THE BATTERY. ALWAYS connect the ground cable last and disconnect it first to avoid sparks near the battery. A spark could cause a battery explosion and injury.

NEVER check the battery charge by placing a metal object across the terminals. The sparks could cause a battery explosion. Use a voltmeter or hydrometer to measure charge.

Battery acid causes severe burns. Avoid contact with eyes, skin or clothing. Wear goggles, rubber gloves and apron. If skin contact occurs, flush with water. If eye contact occurs, flush with water for 15 minutes and get prompt medical attention.

The engine can be started with the transmission in gear if the neutral start switch is bypassed. Do not connect across the terminals on the starter motor. Attach booster batteries as directed in this manual.

DO NOT charge batteries in a closed area. Provide proper ventilation to guard against explosion of an accumulation of the gas given off in the charging process.

ENGINE

Do not go into the engine compartment without securing the engine access panel door. Accidental closure of the door could cause injury.

Do not rework or modify the engine flywheel because this could weaken it and lead to a failure.

Keep the engine exhaust manifold(s) and exhaust system clear of combustible material to reduce the chance of fire.

Ether starting fluid is highly flammable. Follow the precautions on the container. An explosion can result if sparks or flame contact the ether in the container or if the container is stored where the temperature exceeds the temperature listed on the container. Observe the following precautions:

- a. Follow the correct method for starting the engine. Refer to "STARTING ENGINE" in Section 2.
- b. Do not use the ether start when the air temperature is above freezing.
- c. DO NOT SMOKE when using ether starting fluid.
- d. DO NOT store fluid containers in the operator's compartment or in direct sunlight. Store containers in a cool, well ventilated place.
- e. Keep the fluid containers out of the reach of children.
- f. Do not breathe the hazardous ether vapor.
- g. Do not let ether contact your skin because it can cause frostbite.
- h. NEVER puncture the fluid container or put it into a fire. Dispose of empty containers properly.
- i. For your safety, remove the ether container when welding, grinding or using a torch on the machine.

SAFETY PRECAUTIONS

FUEL SYSTEM

NEVER remove the fuel filler cap or fill the fuel tank while the engine is running or when the machine is indoors. The fumes are hazardous and a spark or flame could cause a fire or explosion.

DO NOT SMOKE while filling the fuel tank or servicing the fuel system because a fire or explosion could result.

When filling the fuel tank, place the fuel nozzle against the side of the filler neck to reduce the chances of static electricity sparks.

NEVER mix gasoline, gasohol or alcohol with diesel fuel. This creates a fire or explosion hazard which could result in personal injury or death.

HYDRAULICS

For your safety, lower the bucket before servicing the machine. Be sure no one is standing near the bucket when it is being lowered.

NEVER work under a raised bucket without proper blocking.

Before working on the hydraulic system, be sure the system pressure is relieved by moving the control levers in all directions with the engine off.

This machine has a pressurized hydraulic reservoir. Loosen the filler cap slowly to relieve the pressure before disassembly of any hydraulic system components. DO NOT OVERFILL.

DO NOT use hands to search for hydraulic leaks. Hydraulic oil escaping under pressure from a very small hole can be almost invisible, yet have sufficient force to penetrate the skin. Use a piece of cardboard or wood to search for suspected leaks. If injured by escaping oil, see a doctor immediately because of the possibility of serious infection or reaction to the oil.

TIRES AND RIMS

Tire and rim repairs MUST be done by specially trained people using special safety tools. An improperly repaired tire or rim can separate suddenly and cause serious injury.

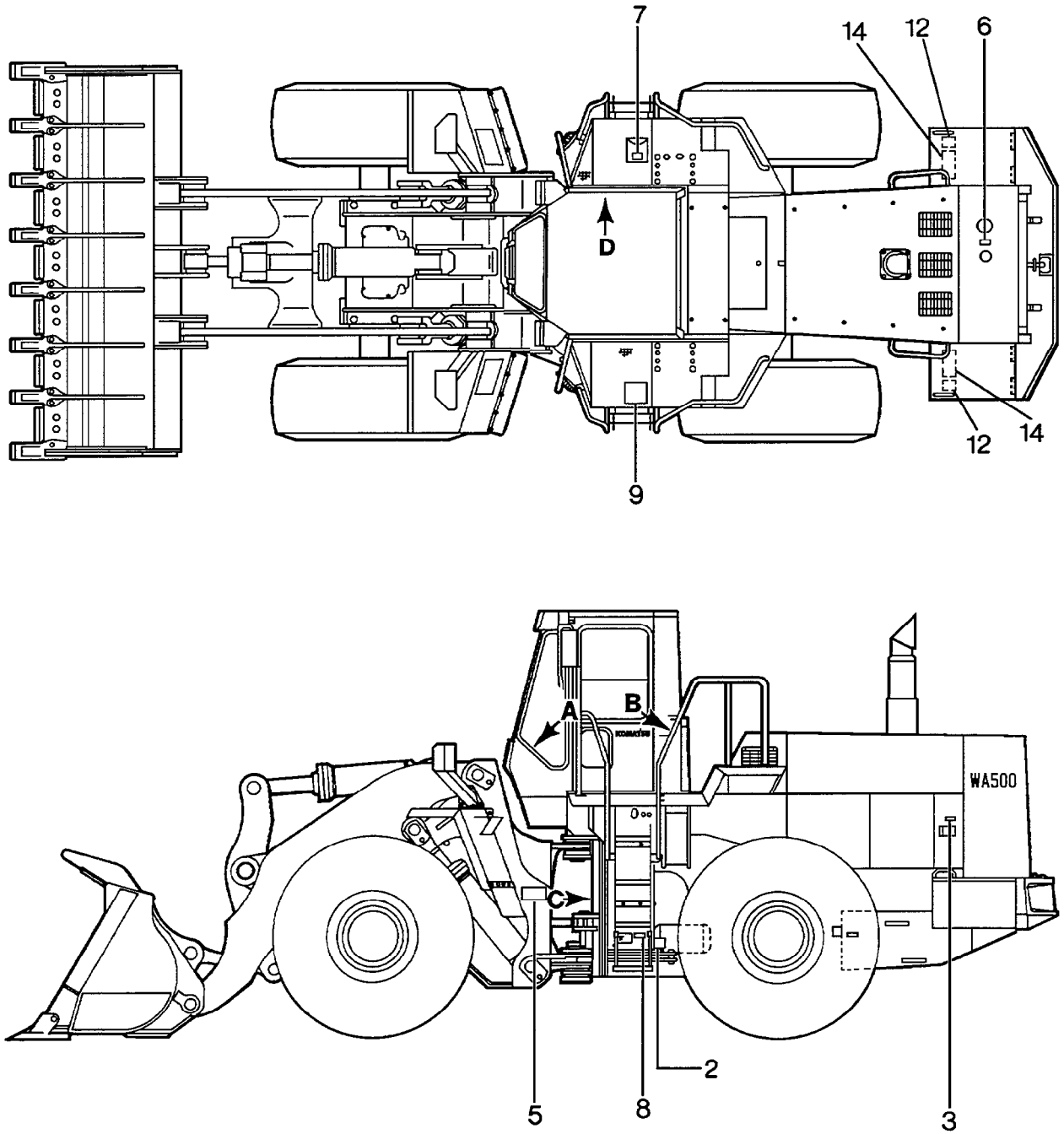
NEVER inflate a flat tire without inspecting the tire, rim and wheel for damage. Be sure all components are properly assembled. Unmounted tires being inflated or deflated should be placed in a tire safety cage. Inflate the tire to 0.3 kg/cm² (5 psi / 35 kPa) and check that all components are properly seated. NEVER stand directly in front of a tire and rim assembly while inflating. Use a clip-on chuck with a hose long enough to allow the person inflating the tire to stand to the side. Serious injury could result if the tire and rim were to separate.

TURBOCHARGER

In certain types of engine service, the turbocharger air inlet hose must be removed so other parts are accessible for service or repairs. When the air inlet hose is removed, THE TURBOCHARGER IMPELLER IS EXPOSED AND CAN CAUSE SERIOUS PERSONAL INJURY AND/OR ENGINE DAMAGE. Engine operation creates a vacuum in the compressor strong enough to suck objects into the impeller. It is imperative to install a safety shield on the turbocharger inlet opening whenever air inlet hoses are removed. Failure to follow this precaution could result in serious injury.

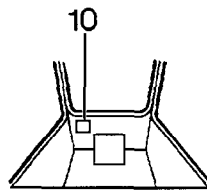
SAFETY PRECAUTIONS

SAFETY PRODUCT GRAPHICS AND LOCATIONS

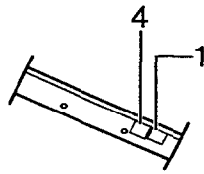


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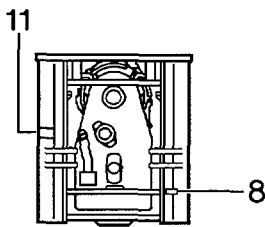
SAFETY PRECAUTIONS



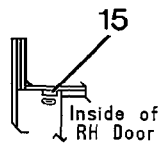
VIEW A



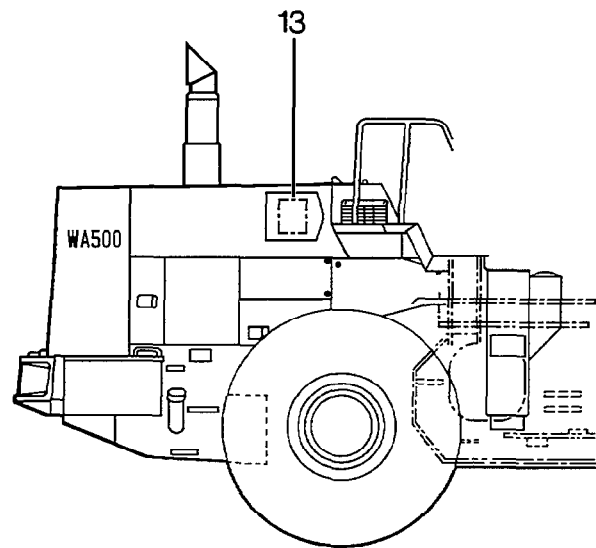
VIEW B



VIEW C



VIEW D



L02AD222


Always keep these product graphics clean. If they are missing or damaged, replace them with a new product graphic. Replacement product graphics can be ordered from your distributor.

In addition to safety product graphics, the machine has instructional and identification product graphics, which should be treated in the same manner as described above.

Safety product graphics may be available in languages other than English. To find out more information about foreign language product graphics, contact your distributor.

SAFETY PRECAUTIONS

1. Cautions when starting the machine

 **CAUTION**

1. WHEN STARTING THE MACHINE OR WHEN TRAVELING OBSERVE THE FOLLOWING.

- (1) WHEN WITH BACK-HOE WITHDRAW OUTRIGGER PERFECTLY.
- (2) CHECK EACH GAUGE AND PILOT LAMP.
- (3) RELEASE PARKING BRAKE AND START MACHINE.
- (4) USE PARKING BRAKE ONLY AFTER MACHINE HAS STOPPED COMPLETELY, EXCEPT IN EMERGENCIES.
- (5) WHEN DESCENDING A SLOPE TRAVEL AT A SPEED SUFFICIENT TO ASCEND THE SLOPE, AND DO NOT SET THE GEARSHIFT LEVER IN NEUTRAL.

2. WHEN CARRYING OUT MAINTENANCE:

- (1) PARK THE MACHINE ON LEVEL GROUND.
- (2) LOWER WORK EQUIPMENT ON THE GROUND AND LOCK THE LEVER.
- (3) DO NOT GO UNDER MACHINE WHEN IT IS RAISED BY THE WORK EQUIPMENT.

362-98-12150

L02AD045

2. Warning for frame locking bar

 **WARNING**

MAKE SURE OF SETTING THE ARTICULATE LOCK TO FIX THE FRONT/REAR FRAMES IN THE FOLLOWING CASES.

1. INSPECTION AND MAINTENANCE IN THE CENTER OF THE VEHICLE AND ITS VICINITY.
2. TRANSPORTING VEHICLE.
3. HOISTING VEHICLE.

BEFORE START A DRIVE MAKE SURE OF DISCONNECT ARTICULATE LOCK.

362-98-12160

L02AD046

3. Caution for engine fan and belts

 **CAUTION**


While engine is running:
Keep away from fan and fan-belt.

DO NOT DEFACE OR REMOVE THIS DECAL

421-93-A1210

L02AD047

4. Warnings for machine operation

 **WARNING**

READ THE OPERATION & MAINTENANCE MANUAL FOR SAFETY OPERATION AND ALWAYS PAY MAXIMUM ATTENTION FOR SAFETY.

1. WHEN STARTING THE ENGINE OR LEAVING THE MACHINE, ANYTIME FOLLOW THE PROCEDURE DESCRIBED BELOW.
 - (1) PLACE THE DIRECTION LEVER IN NEUTRAL POSITION (N).
 - (2) APPLY THE PARKING BRAKE.
 - (3) LOWER THE BUCKET (OR THE FORKS, ETC.) TO THE GROUND AND APPLY THE CONTROL LEVER LOCK.
 - (4) STOP THE ENGINE.
(IDLE THE ENGINE FOR 5 MUNUTES PRIOR TO SHUT DOWN)
2. WHEN PARKING AT INCLINED PLACE, ADDING TO THE ABOVE DESCRIBED, APPLY THE WHEEL STOPPERS FOR BOTH WHEELS (FRONT OR REAR).

421-93-11940

L02AD048

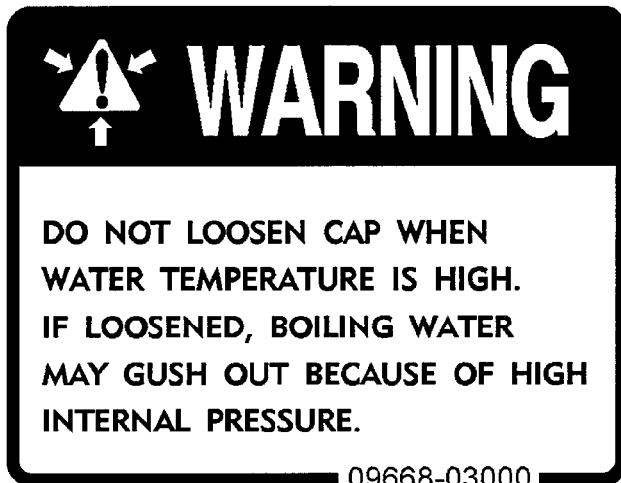
SAFETY PRECAUTIONS

5. Warning for articulation area



L02AD073

6. Warning for pressurized cooling system



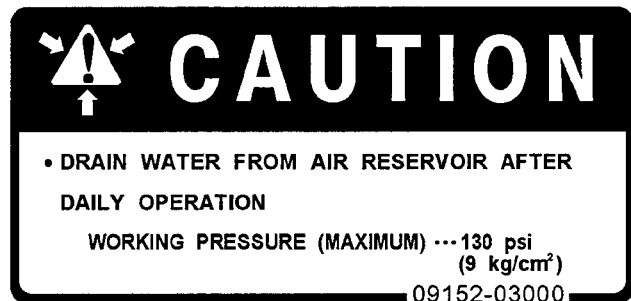
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7. Cautions for hydraulic tank



L02AD051

8. Caution for draining air tanks



L02AD052

SAFETY PRECAUTIONS

9. Caution for brake oil


 **CAUTION**

USE SPECIFIED MINERAL OIL OR SAE 10W ENGINE OIL FOR THE BRAKE OIL. REFER TO THE OPERATION & MAINTENANCE MANUAL FOR DETAILS. NEVER USE "BRAKE FLUID", OTHERWISE, SERIOUS DAMAGE ON THE BRAKE SYSTEM CAN OCCUR.

421-93-11690

L02AD054

11. Caution for transmission oil level


 **CAUTION**

- CHECK OIL LEVEL ONLY WHEN ENGINE IS STOPPED.
- IF NECESSARY TO CHECK OIL LEVEL WHILE WORKING, STOP THE ENGINE AND WAIT ABOUT 60 MINUTES BEFORE CHECKING.

427-93-11310

L02AD056

10. Caution for transmission oil temperature

 **CAUTION**

1. Under normal operating conditions, indicator lights should remain in the green range.
2. If the indicator light moves into the red range on working or prolonged transport driving, reduce load or decrease machine speed by downshifting or reducing engine speed.
3. If the alarm buzzer sounds and the warning lamp flashes due to further operation, stop the machine and run the engine at midrange speed with no load until the indicator light goes into the green range. If the indicator light remains in the red range, determine the cause of the problem.

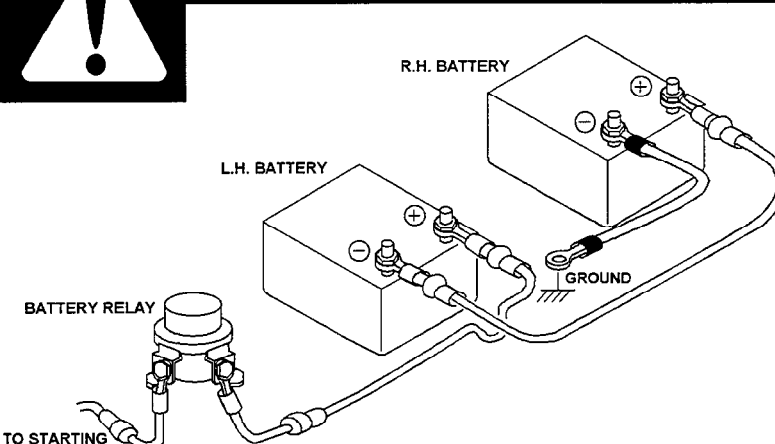
419-93-11980

L02AD055

SAFETY PRECAUTIONS


12. Caution for battery instructions

CAUTION




TO STARTING MOTOR

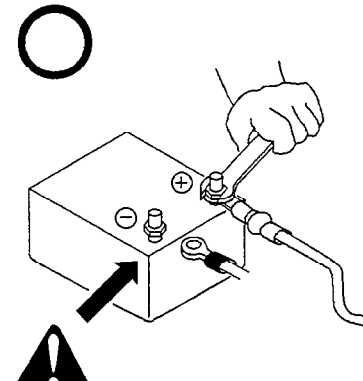
- WHEN RETIGHTEN THE BOLTS OF THE BATTERY TERMINALS, FIRST DISCONNECT THE BLACK CABLE (⊖) OF THE R.H. BATTERY, NEXT RETIGHTEN THE OTHER BOLTS AND FINALLY CONNECT THE BLACK CABLE (⊖) OF THE R.H. BATTERY.



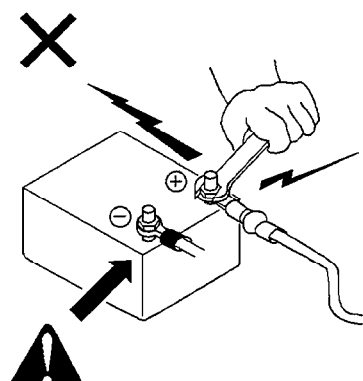
- WHEN CONNECT THE BATTERY CABLES, CONNECT LAST THE BLACK GROUND CABLE (⊖) TO THE R.H. BATTERY.



- THE BATTERY CABLE TO THE CHASSIS GROUND IS THE BLACK CABLE (⊖) ON THE R.H. BATTERY.
- THE ELECTRICAL SYSTEM OF THIS VEHICLE IS OPERATED UNDER +24V APPLIED AT THE TERMINAL OF RED CABLE (⊕) ON THE L.H. BATTERY. (SEE THE ILLUSTRATION AT THE ABOVE LEFT.)
- WHEN CHARGING BATTERIES ON THIS VEHICLE BY ANOTHER BATTERIES, CONNECT THE BOOSTER CABLE IN THE FOLLOWING PROCEDURE.
 1. FIRST CONNECT THE POSITIVE ⊕ TERMINAL OF THE BATTERY OF THE OTHER VEHICLE TO POSITIVE ⊕ TERMINAL OF THE RED CABLE ON THE L.H. BATTERY ON THIS VEHICLE.
 2. THEN CONNECT THE NEGATIVE ⊖ TERMINAL OF THE BATTERY OF THE OTHER VEHICLE TO THE FRAME OF THIS VEHICLE TOGETHER WITH THE OTHER CABLE. (DO NOT CONNECT THEM TO THE CAB OR TO ANY OTHER OUTER COMPONENT.)
 3. TO PREVENT FIRE WHEN DISCONNECTING CABLES, FOLLOW THE REVERSE ORDER OF THE ABOVE PROCEDURE.
- WHEN CHARGING BATTERIES MOUNTED ON A VEHICLE, FIRST DISCONNECT THE BLACK CABLE ON THE R.H. BATTERY, THEN PROCEED TO THE CHARGING OPERATION.
- CHARGE THE BATTERIES IN AN OPEN AREA OR IN A WELL-VENTILATED PLACE WITH THEIR COVERS KEPT RAISED, AND NEVER BRING FIRE NEAR THEM. EXPLOSIVE GASES ARE GENERATED DURING CHARGING.
- REFER TO THE OPERATION AND MAINTENANCE MANUAL FOR DETAILS.



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L02AD057

13. Cautions for air cleaner

CAUTION


- DON'T PUT OIL INTO THIS CLEANER.
- USE ONLY GENUINE KOMATSU ELEMENT.
 - WHEN DUST INDICATOR TURNS TO RED (IF THERE IS NO INDICATOR, EVERY 250 HOURS) CLEAN OUTER ELEMENT. ONE YEAR AFTER EXCHANGE OR AFTER USING CLEANED OUTER ELEMENT FOR SIX TIMES, RENEW INNER AND OUTER ELEMENT.
- IF DUST INDICATOR TURNS TO RED SOON OR COLOR OF EXHAUST GAS IS NOT CLEAN AND ALSO IN CASE OF LACKING POWER AFTER CLEANING OUTER ELEMENT, INNER AND OUTER ELEMENTS SHALL BE REPLACED. IN THIS CASE, HOWEVER, DO NOT CLEAN INNER ELEMENT.
- ELEMENT MUST BE KEPT FREE OF CRACKS AND OIL. IF ELEMENT HAS A CRACK, IT MUST BE REPLACED.
- FOR CLEANING AND REPLACEMENT OF ELEMENTS, REFER TO INSTRUCTION MANUAL.

09637-30161

L02AD058

SAFETY PRECAUTIONS

14. Caution for battery charging



CAUTION

Electrical system is 24 volt negative ground. When charging batteries, precautions must be taken to prevent personal injury or damage to electrical parts.

1. Combustible gas is produced when charging batteries. Do not charge in enclosed or unventilated area.
2. While charging, leave cover in raised position and keep sparks and open flames away.

DO NOT DEFACE OR REMOVE THIS DECAL
421-93-A1160

L02AD059

15. Emergency exit



L02AD060

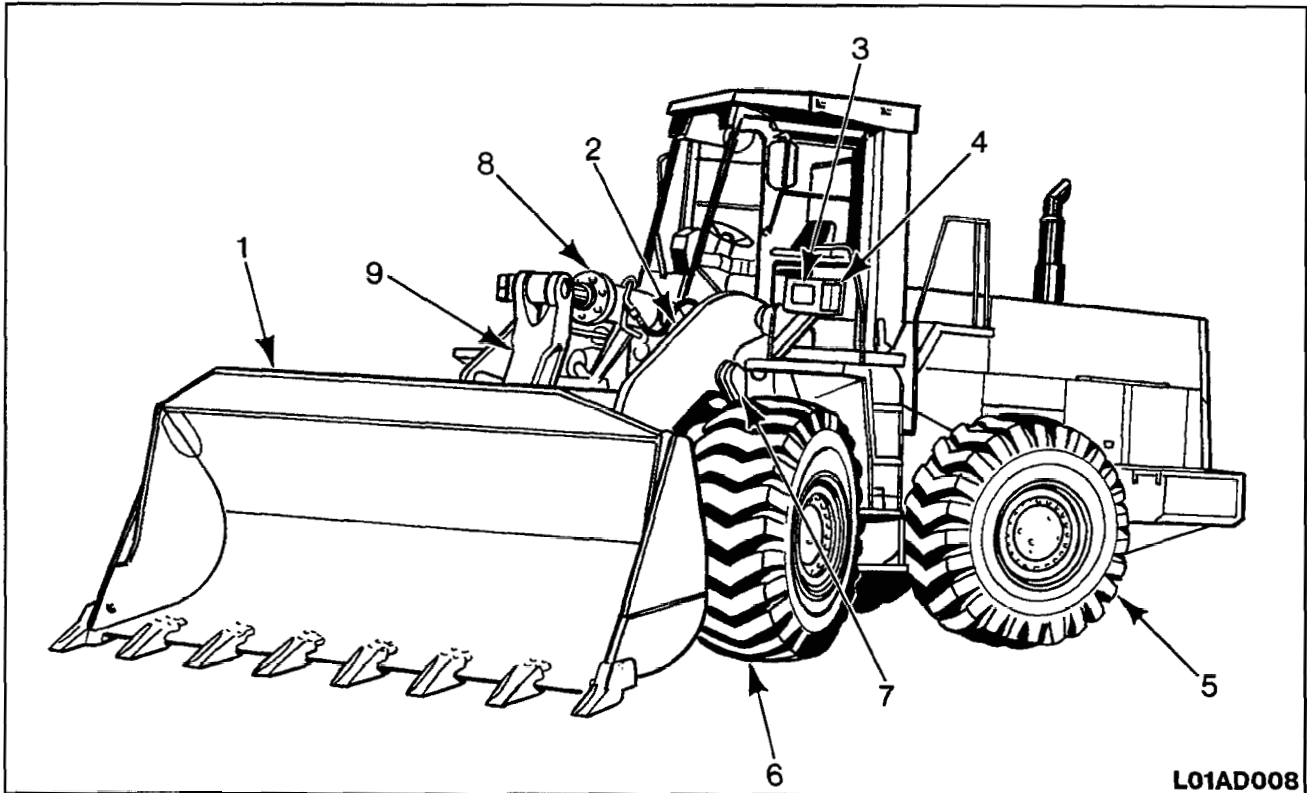
SECTION 2 OPERATION



WARNING! REFER TO AND READ ALL
SAFETY PRECAUTIONS IN SECTION 1.

OPERATION

GENERAL VIEW



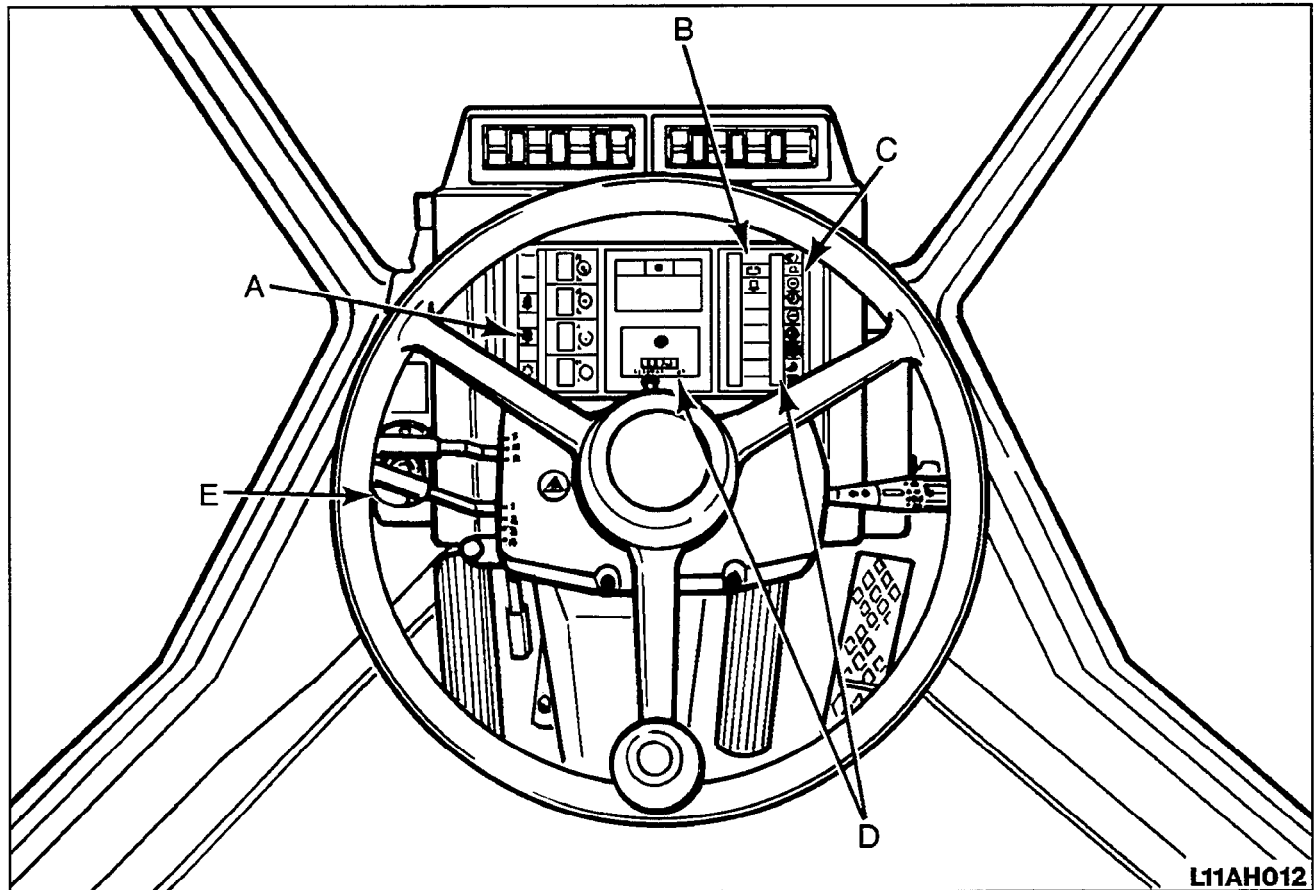
Wheel Loader With Cab and ROPS Canopy

- | | |
|------------------------|-------------------------|
| 1. Bucket | 6. Front tire and wheel |
| 2. Lift arm | 7. Lift cylinder |
| 3. Head lamp | 8. Dump cylinder |
| 4. Turn signal lamp | 9. Tilt lever |
| 5. Rear tire and wheel | |

INSTRUMENTS AND CONTROLS

MONITOR PANEL

This monitor panel consists of monitor lamp groups (A, B and C), meter group (D) and warning lamp (E).



A. CHECK MONITOR LAMP GROUP (Check items before starting)

If there is any abnormality, the appropriate monitor lamp will flash.

If necessary, check for and correct the abnormality based on the particular monitor lamp(s) before starting the engine.

★ When the engine is started, these monitor lamps will go off even if there are abnormalities.

B. CAUTION MONITOR LAMP GROUP (Caution items)

If any abnormality occurs while the engine is running, the appropriate monitor lamp and warning lamp (E) will flash to indicate the abnormality at the same time.

★ Even if any monitor lamp flashes, the machine can operate, but it should be repaired as soon as possible.

L11AH012

OPERATION

C. CAUTION MONITOR LAMP GROUP (Emergency stop items)

If any abnormality occurs while the engine is running, the appropriate monitor lamp and warning lamp (E) will flash and the alarm buzzer will sound intermittently at the same time.

- ★ If any monitor lamp flashes, stop the engine and correct the problem immediately.
- ★ However, if the machine is equipped with the ground driven steering feature and this steering system is being operated, only the monitor lamp will flash.

D. METER AND PILOT LAMP GROUP

This group consists of an air pressure gauge, engine coolant temperature gauge, torque converter oil temperature gauge, fuel level gauge, speedometer, service meter and pilot lamp display.

E. WARNING LAMP

The warning lamp will flash when there is an abnormality in any item of group (B).

The warning lamp will flash and the alarm buzzer will sound when there is an abnormality in any item of group (C) or when the parking brake is applied, but the directional lever is not in neutral.

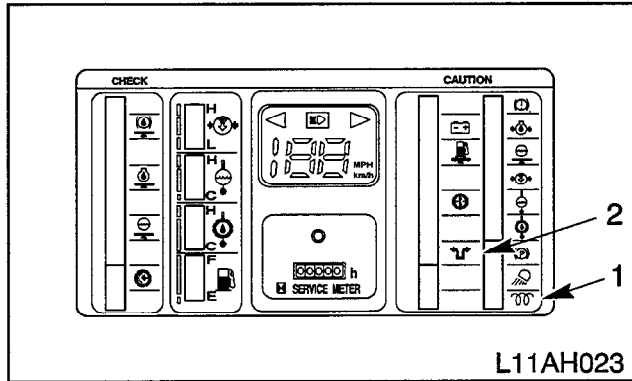
- ★ However, if the machine is equipped with the ground driven steering feature and this steering system is being operated, the warning lamp will not light up and the alarm buzzer will not sound.

SYSTEM CHECK

- To check the monitor panel system, turn the starting switch to "ON" before starting the engine. Then all monitor lamps, gauges and the warning lamp light up for about 3 seconds and the alarm buzzer sounds for about 1 second. Three figures, "188", are displayed on the speedometer while the monitor system is being checked. After that all lamps go off and the buzzer stops. If any monitor lamp does not light up, ask your distributor to inspect that monitor lamp.

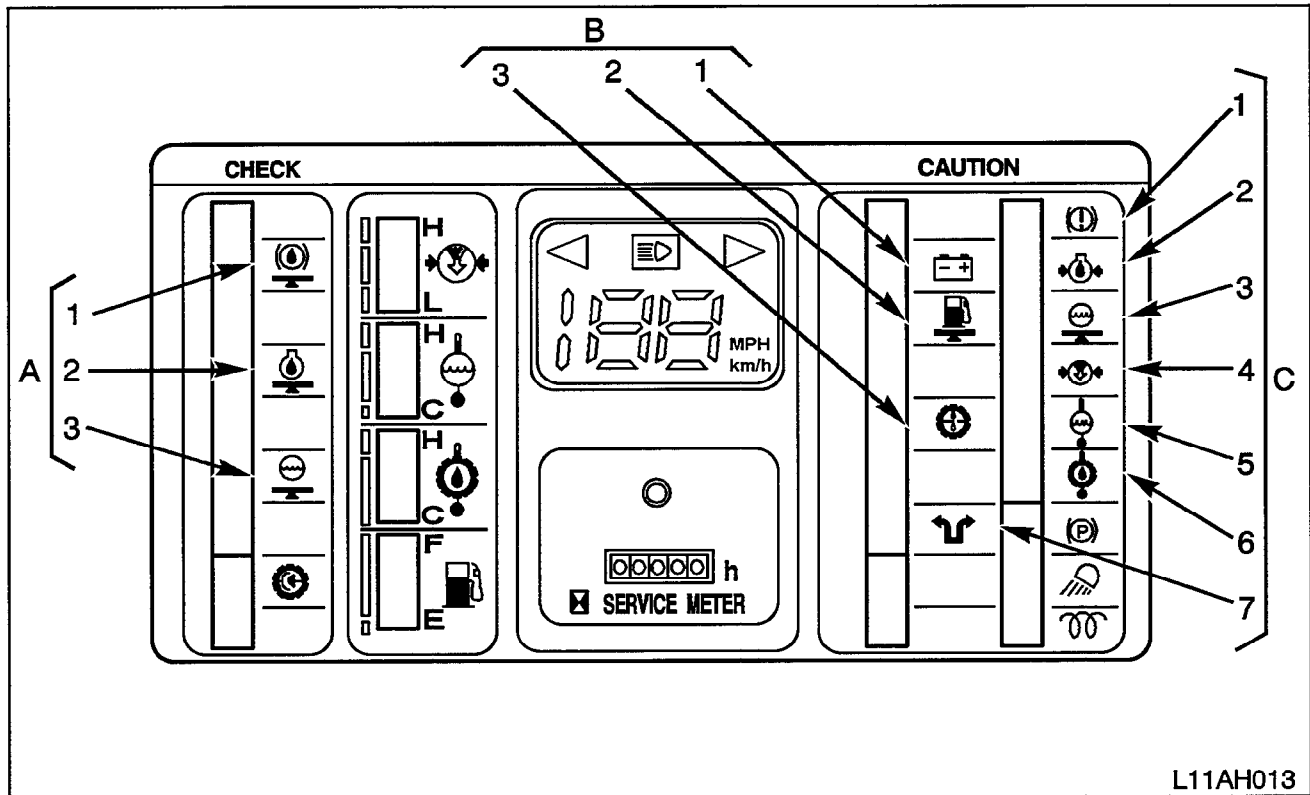
NOTE: Monitor lamp (1) does not light up because it is not used on this machine. Monitor lamp (2) lights up only if the machine is equipped with the ground driven steering option.

- ★ When the starting switch is turned to ON, if the directional lever is not at neutral, the warning lamp will flash and the alarm buzzer will continue to sound. If this happens, return the lever to neutral. The lamp will go out and the buzzer will stop.
- ★ To check the monitor immediately when the engine is stopped, wait for at least 30 seconds after the engine is stopped.



A. CHECK MONITOR LAMP GROUP (Check items before starting)

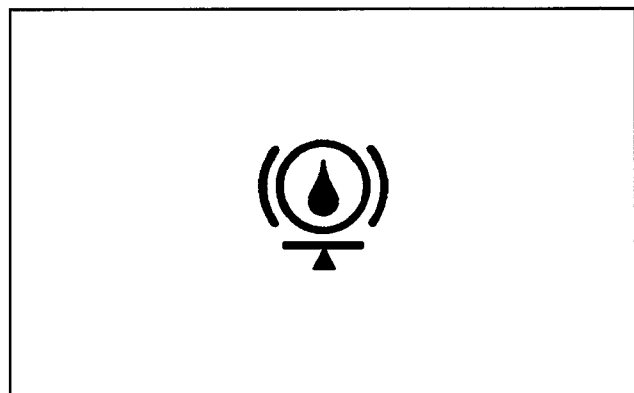
- ★ When the engine is started, these monitor lamps will go off even if there are abnormalities.
- ★ Do not rely on the "CHECK MONITOR LAMP GROUP (Check items before starting)" only for the check before starting. Always make the checks by referring to the section on "CHECKS BEFORE STARTING".



1. Brake Oil Level Monitor

This monitor indicates a low brake oil level.

If the monitor lamp flashes, check the oil level in the brake oil tank and add oil as required.

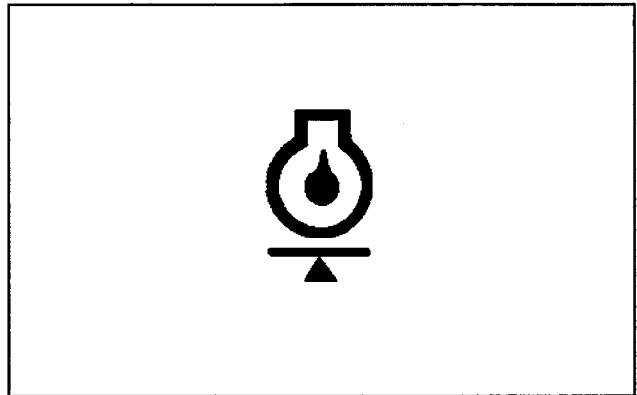


OPERATION

2. Engine Oil Level Monitor

This monitor indicates a low oil level in the engine oil pan.

If the monitor lamp flashes, check the oil level in the engine oil pan and add oil as required.

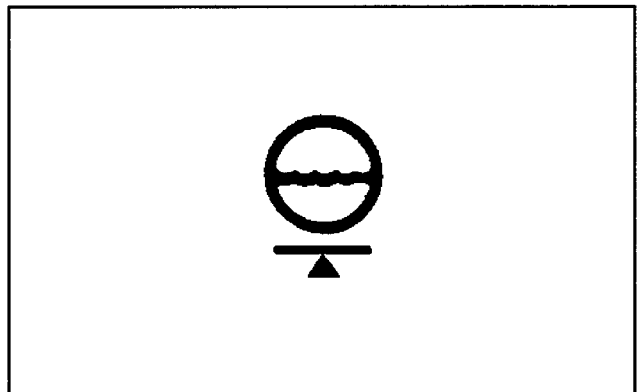


3. Engine Coolant Level Monitor

This monitor indicates a low radiator coolant level.

If the monitor lamp flashes, check the coolant level and add coolant as required.

- ★ Park the machine on level ground and check the monitor lamps.
- ★ Confirm that these monitor lamps light for about 3 seconds after turning the starting switch to ON. If any monitor lamp does not light, ask your distributor to inspect that monitor lamp.



B. CAUTION MONITOR LAMP GROUP (Caution items)

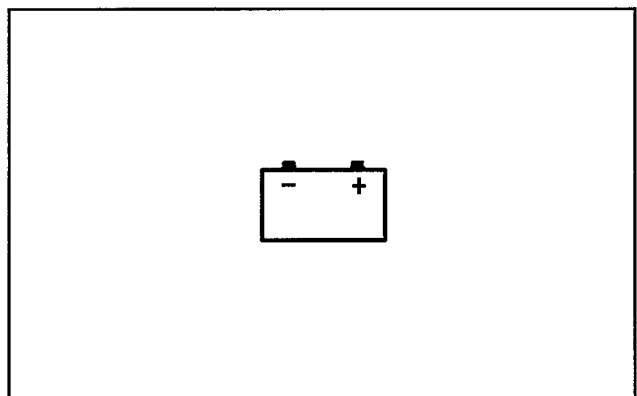
- ★ Even if any monitor lamp flashes, the machine can operate, but it should be repaired as soon as possible.

1. Charge Monitor

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

If the monitor lamp flashes, check the charging circuit.

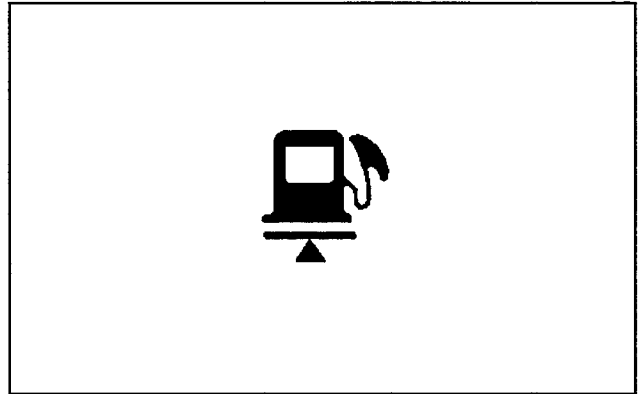
- ★ This monitor lamp flashes and the alarm buzzer sounds, when the starting switch is turned to ON. This monitor lamp and warning lamp (E) may flash when the engine is started or when the engine is running. However, if the lamps go out when the engine is accelerated momentarily, there is no abnormality.



2. Fuel Level Monitor

This monitor indicates there is less than 80 liters (21.1 gallons) of fuel in the tank.

If the monitor lamp flashes, add fuel.

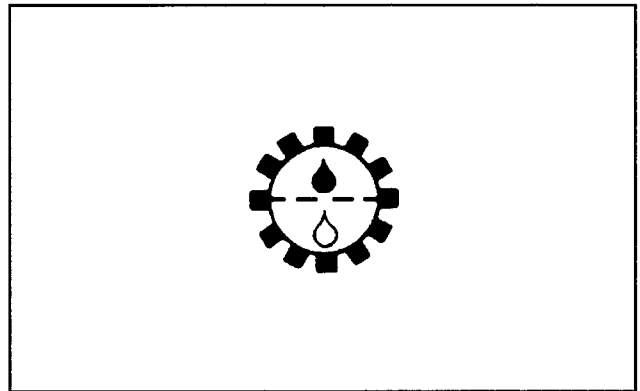


3. Transmission Oil Filter Monitor

This monitor indicates clogging of the transmission oil filter.

If the monitor lamp flashes, replace the filter element.

- ★ Park the machine on level ground and check the monitor lamps.
- ★ Confirm that these monitor lamps light for about 3 seconds after turning the starting switch to ON. If any monitor lamp does not light, ask your distributor to inspect that monitor lamp.



C. CAUTION MONITOR LAMP GROUP (Emergency stop items)

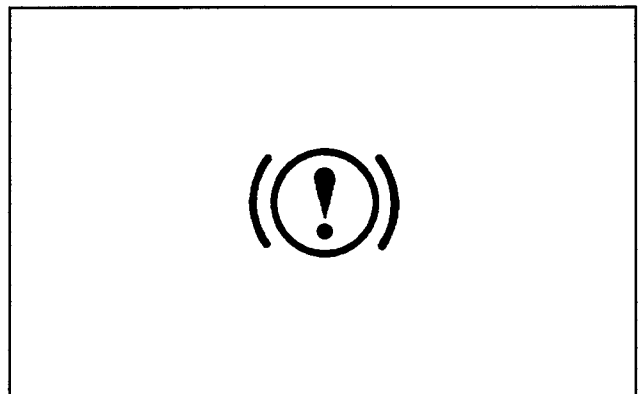
- ★ If any monitor lamp flashes, stop the engine and correct the problem immediately.

1. Brake Line Failure Monitor

This monitor indicates a drop in brake oil pressure when the brakes are operated.

If the lamp flashes, stop the machine immediately and check the brake system.

- ★ After checking and repair of brake system, push in over-stroke sensor rod on the brake chamber. If this operation is not done, a buzzer and lamp will continue to warn of brake line trouble.



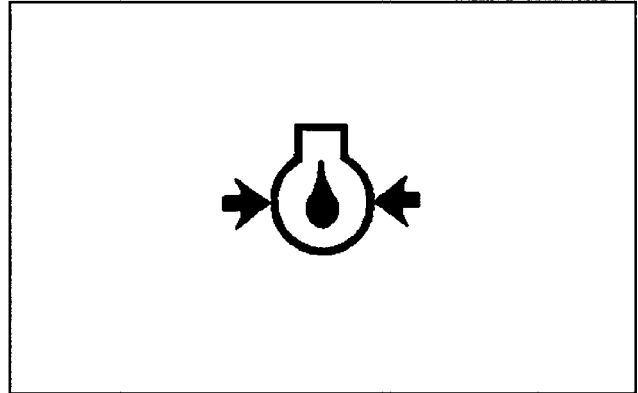
OPERATION

2. Engine Oil Pressure Monitor

This monitor indicates low engine oil pressure.

If the lamp flashes, the engine oil pressure is below the lower limit. Immediately stop the engine.

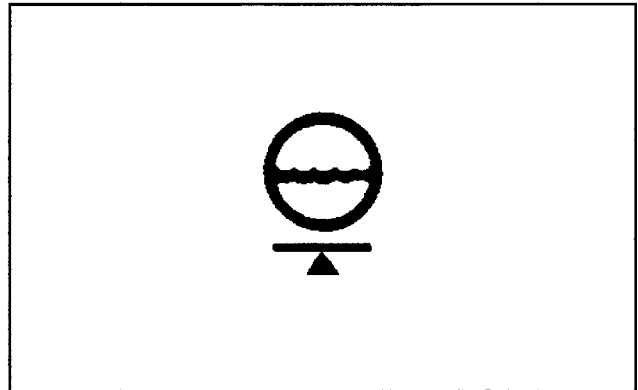
- ★ This monitor lamp flashes and the alarm buzzer sounds, when the starting switch is turned to ON, immediately after the engine is started or immediately before the engine is stopped. It does not indicate an abnormality.



3. Engine Coolant Level Monitor

This monitor indicates a low radiator coolant level.

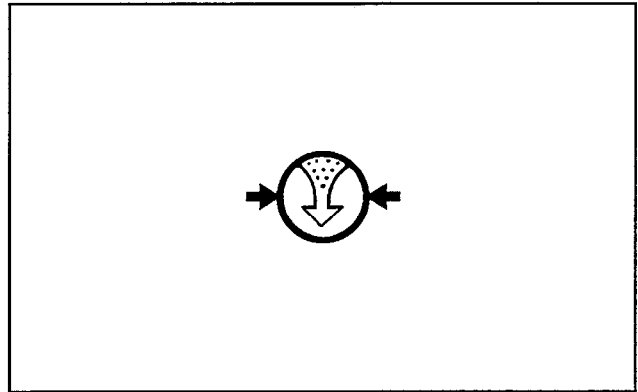
Check the coolant level when the monitor lamp flashes, stop the engine and add coolant as required.



4. Air Pressure Monitor

This monitor indicates a drop in the air pressure in the air tank.

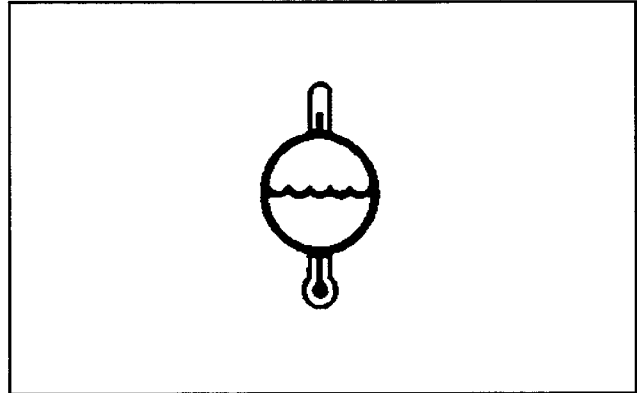
If the lamp flashes, increase the engine speed and wait until the lamp goes out.



5. Engine Coolant Temperature Monitor

This monitor indicates a rise in coolant temperature.

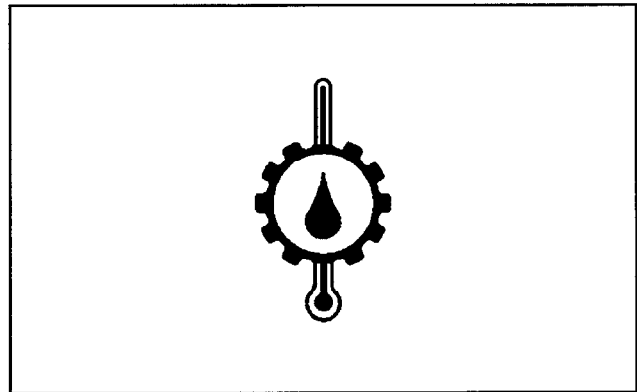
When the monitor lamp flashes, run the engine with no load at midrange speed until the green range of the engine coolant temperature gauge lights.



6. Torque Converter Oil Temperature Monitor

This monitor indicates a rise in torque converter oil temperature.

When the monitor lamp flashes, stop the machine and run the engine with no load at midrange speed until the green range of the torque converter oil temperature gauge lights.

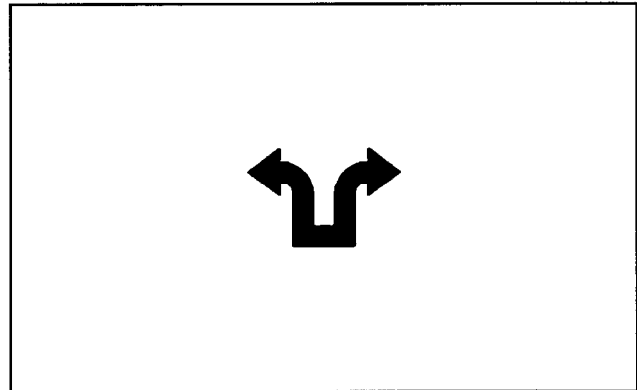


7. Ground Driven Steering Operation Monitor - If Equipped

If the engine stops while the machine is traveling or an abnormality occurs in the hydraulic steering circuit, the monitor lamp will light up and flash to show that the ground driven steering is in operation.



WARNING! If the monitor lamp flashes, move the machine immediately to a safe place and stop the machine.

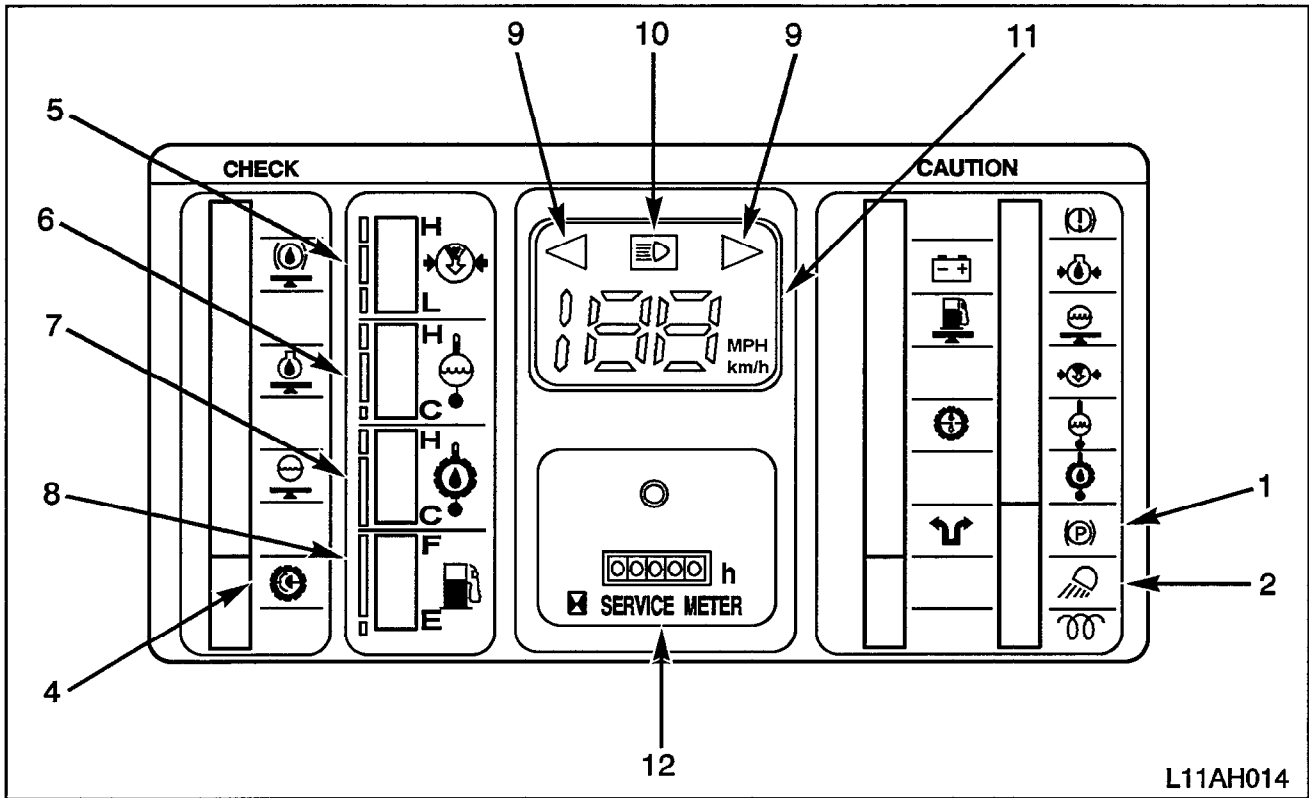


- ★ Park the machine on level ground and check the monitor lamps.
- ★ Confirm that these monitor lamps light for about 3 seconds after turning the starting switch to ON. If any monitor lamp does not light, ask your distributor to inspect that monitor lamp

OPERATION

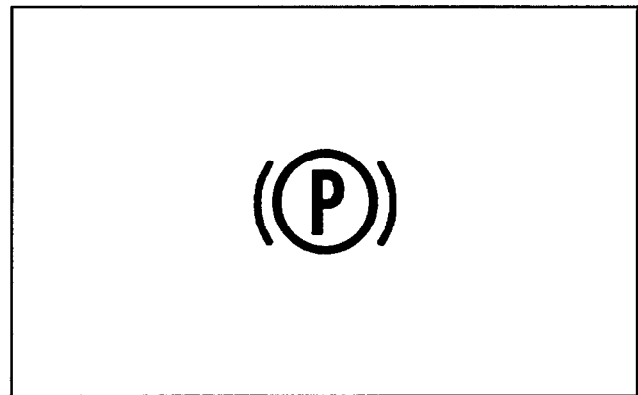
D. METER AND PILOT LAMP GROUP

When the starting switch is turned to ON, this lamp group lights up to indicate that the display items are working.



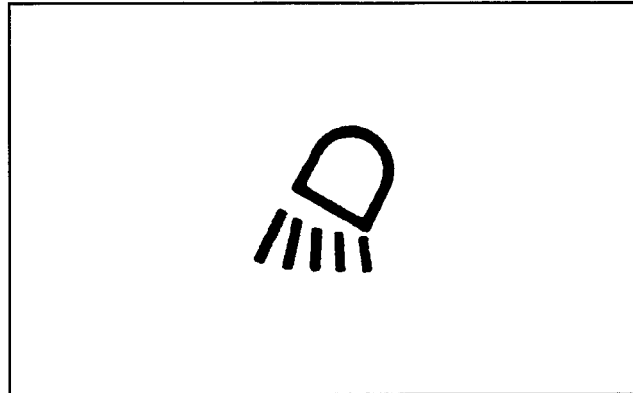
1. Parking Brake Pilot Lamp

This lamp lights up when the parking brake is applied.



2. Working Lamp Pilot Lamp

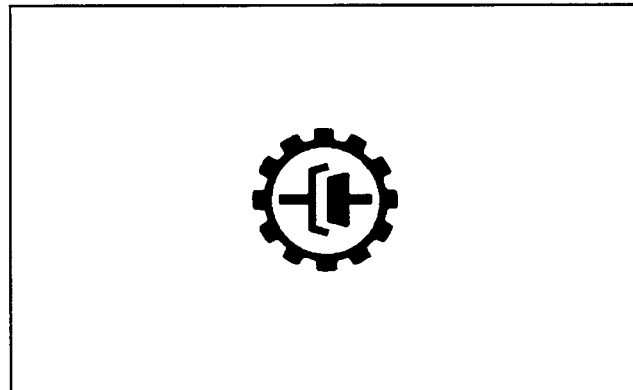
This lamp lights up when the working lamps are switched on.



4. Transmission Cut-Off Selector Pilot Lamp

This lamp lights up when the transmission cut-off selector switch is turned to ON.

- ★ If the monitor lamp is ON and the left brake pedal is depressed, the transmission will return to neutral.



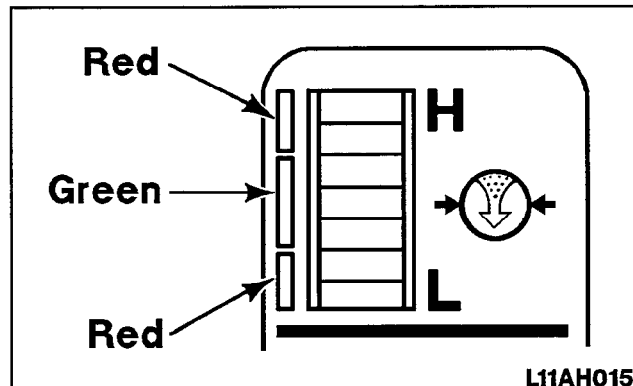
5. Air Pressure Gauge

This gauge indicates the air pressure in the air tank. The green range should be lighted during normal operation.

If the red range lights up during operations, the alarm buzzer will sound, the warning lamp will flash, and the air pressure monitor lamp will flash.

If this happens, stop the machine, increase the engine speed and wait until the green range lights up.

- ★ If the air pressure drops even lower, the parking brake will automatically apply.



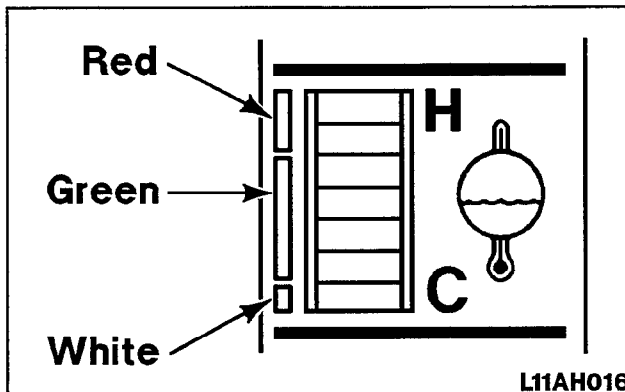
OPERATION

6. Engine Coolant Temperature Gauge

This gauge indicates the temperature of the engine coolant. 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 top lamp in the red range lights up, the alarm buzzer will sound, the warning lamp will flash and the coolant temperature monitor lamp will flash at the same time.

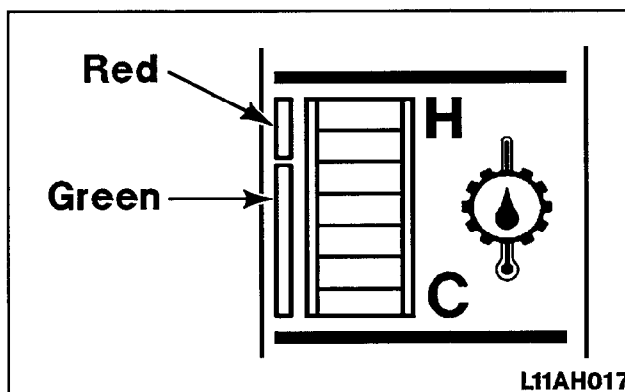
★ If the red range lights frequently, check the cooling system for a malfunction and correct the problem.



7. Torque Converter Oil Temperature Gauge

This gauge indicates the temperature of the torque converter oil. 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.

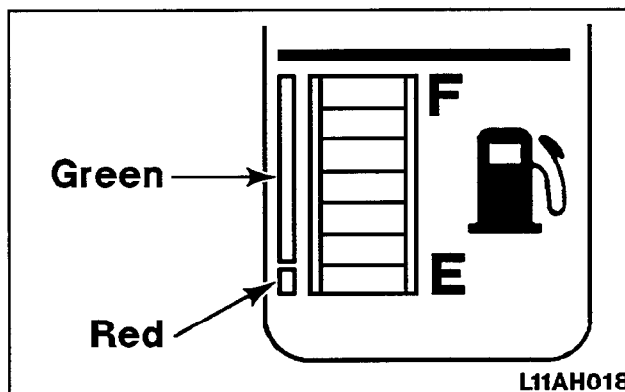
If the top lamp in the red range lights up, the alarm buzzer will sound, the warning lamp will light up and the torque converter oil temperature monitor lamp will flash at the same time.



8. Fuel Level Gauge

This gauge indicates the amount of fuel in the fuel tank. If there is enough fuel in the tank while the engine is running, the green range lights. If the red range lights, there is less than 80 liters (21.1 gallons) of fuel in the tank.

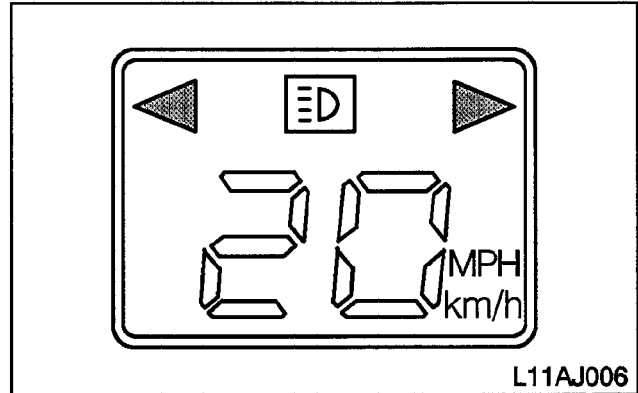
When the red range lights, add fuel.



9. Turn Signal Pilot Lamp

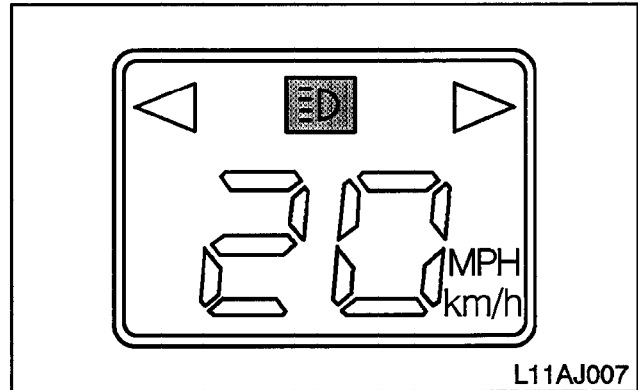
When the turn signal lamp flashes, the pilot lamp also flashes.

- ★ If the wiring of the turn signal lamp is disconnected, the pilot lamp will flash faster.



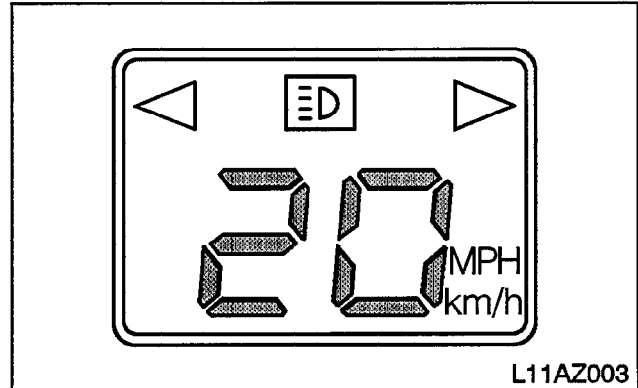
10. High Beam Pilot Lamp

This lamp lights up when the head lamps are at high beam.



11. Speedometer

This meter indicates the running speed of the machine in MPH or km/h.



OPERATION

12. Service Meter

This meter shows the total operation hours of the machine. The service meter advances while the engine is running—even if the machine is not traveling.

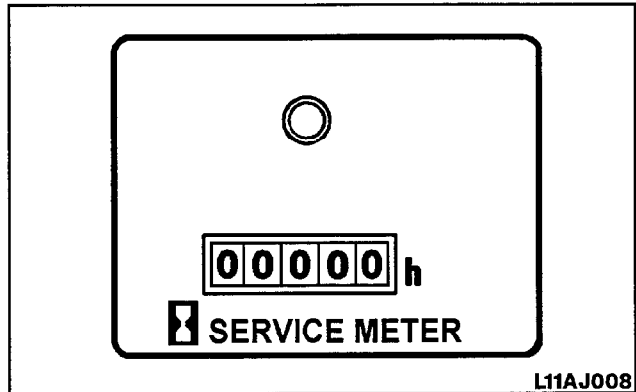
The meter progresses by one (1) when the engine is operated for one hour, regardless of the engine speed.

Consequently, if the engine is running, the service meter will advance even if the machine does not move.

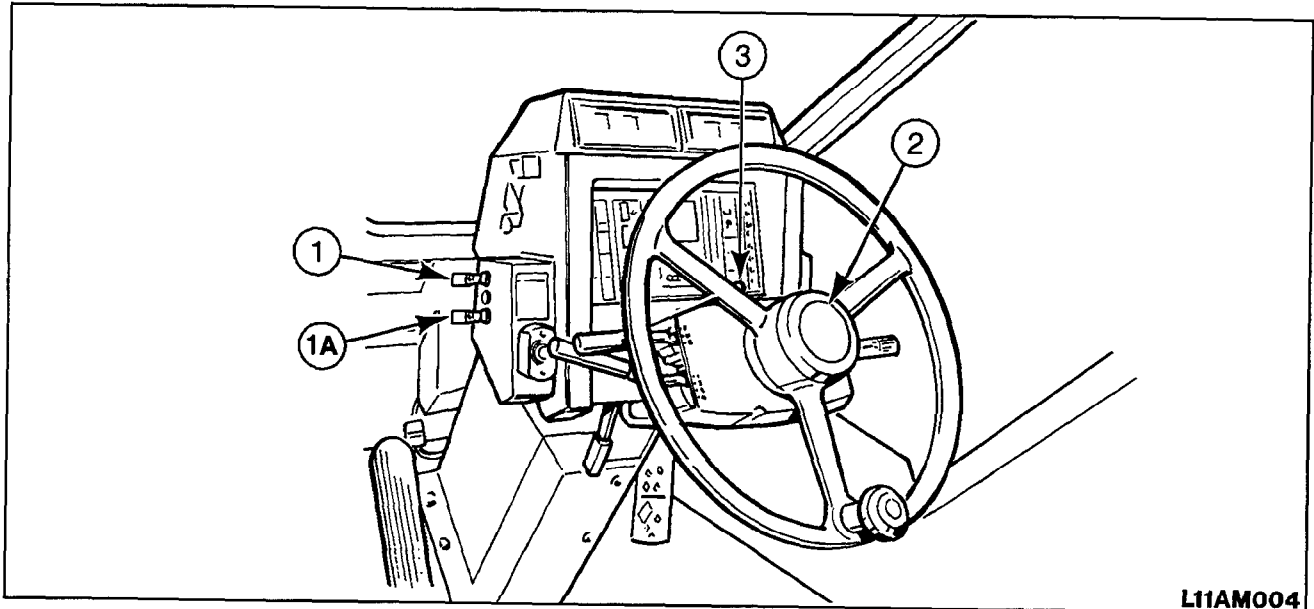
★ While the engine is running, a green pilot lamp on the service meter flashes to show the meter advances.

Use the service meter according to the following instructions.

- Record the readings of the start and the end of work, this is the work record of the machine.
- This record will indicate, when periodical maintenance is due.
- It also indicates the integrated working hours when machine problems are encountered.



SWITCHES

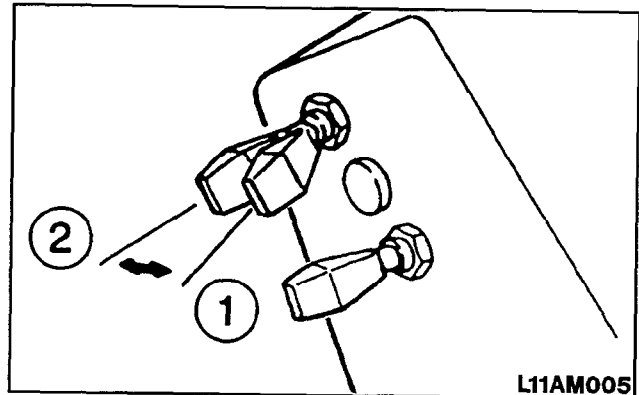


L11AM004

1. TRANSMISSION CUT-OFF SELECTOR SWITCH

This switch selects the operation of the left brake pedal. Normally, put this switch in ON position.

1. OFF POSITION:
Depressing the left brake pedal operates the wheel brakes only, like the right brake pedal.
2. ON POSITION:
Depressing the left brake pedal operates the wheel brakes and also returns the transmission to NEUTRAL.



L11AM005

- ★ If the switch is in the ON position, the transmission cut-off selector pilot lamp will light up.



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

OPERATION

1A. ETHER START SWITCH

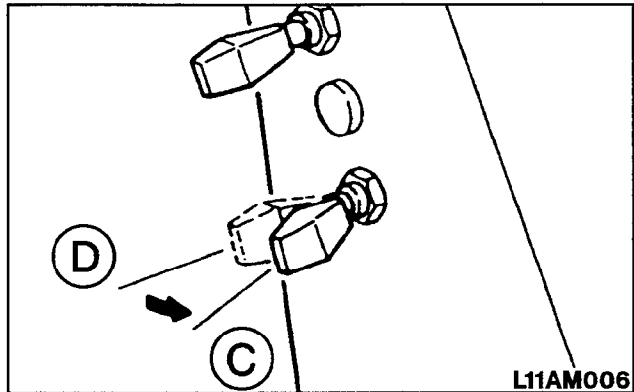
This switch is used when starting the engine in cold weather.

C. ON POSITION:

A fixed amount of ether (approx. 3 cc each time) is injected into the engine air intake to make it easier to start the engine in cold weather.

D. OFF POSITION:

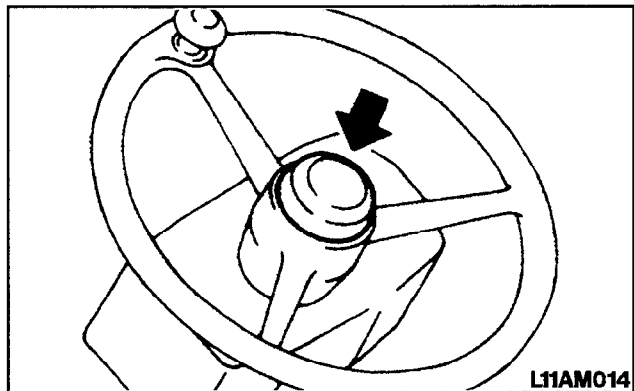
When the switch is released, it automatically returns to the OFF position.



WARNING! Do not keep the switch at the ON position for more than 5 seconds.

2. HORN BUTTON

When the button in the center of the steering wheel is pressed, the horn will sound.



3. HAZARD LAMP SWITCH

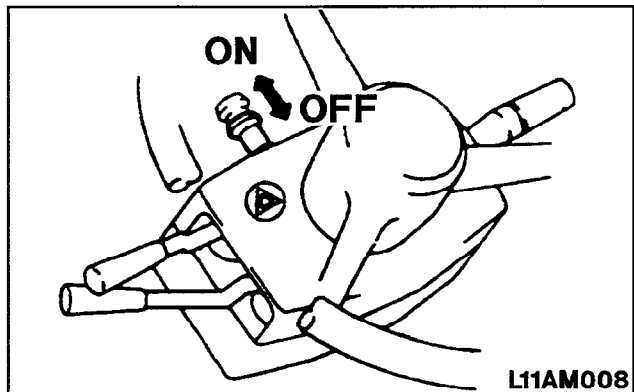
This switch is used in emergencies, such as when the machine breaks down.

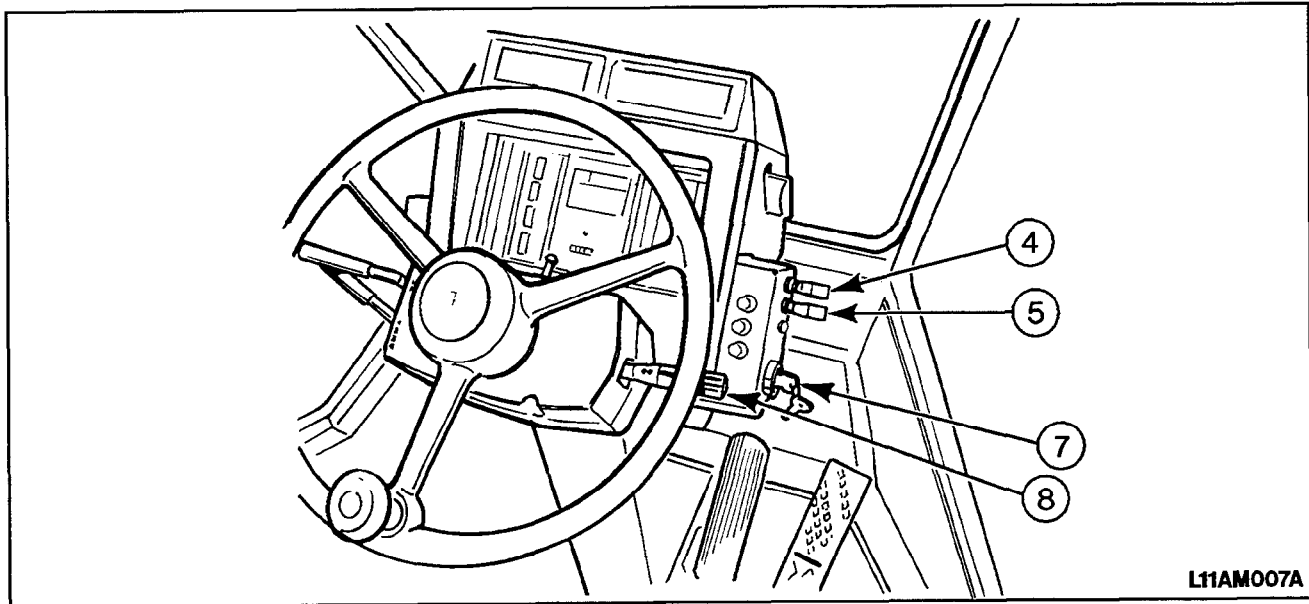
ON POSITION: All turn signal lamps flash.

★ All turn signal lamps and the pilot lamp on the steering column flash, when this switch is put in ON.



WARNING! Do not use this switch unless abnormality has occurred.





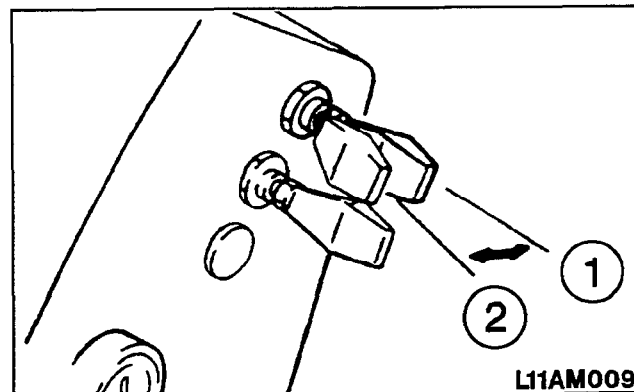
4. PARKING BRAKE SWITCH

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.



WARNING! Always apply the parking brake when leaving the machine or parking it.



★ 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.

★ When the starting switch is turned to OFF, the parking brake is automatically applied.

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

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

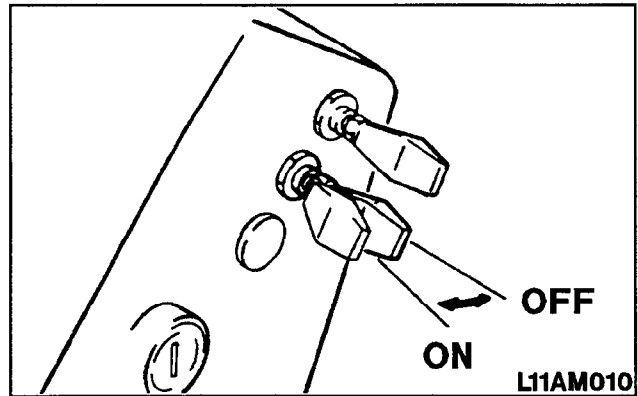
OPERATION

5. WORKING LAMP SWITCH

When the front and rear working lamps are turned ON, the pilot lamp and illumination lamp for the monitor panel will also light up.

ON POSITION: Working lamps are ON.

- ★ When traveling on public roads, turn the working lamps OFF.



7. STARTING SWITCH

This switch is used to start or stop the engine.

OFF

Key insertion-withdrawal position. No electrical circuits are activated.

The hazard lamp and the parking lamp will remain on, however, when the switch is turned OFF.

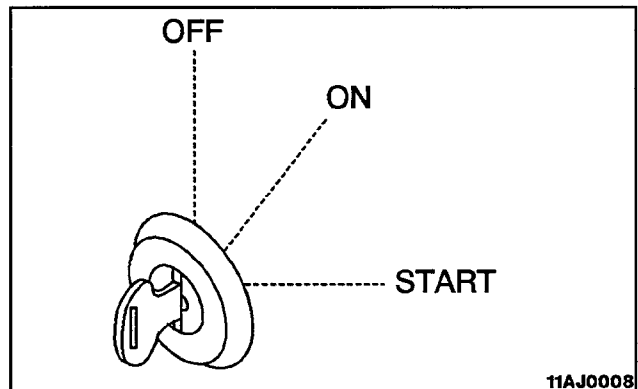
To stop the engine, turn the switch to OFF.

ON

Charging and lamp circuits activate. Keep key at ON after starting.

START

At this key position, the starting motor will crank the engine. Release the key immediately after starting, and the key will return automatically to ON.



8. LAMP SWITCHES

For head lamps, turn signal lamps, dimmer switch

Lamp switch

Position 1

Parking lamps light up.

Position 2 OFF

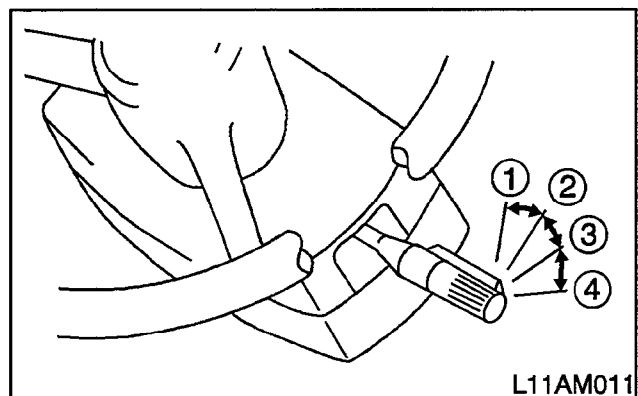
Lamps go off.

Position 3

Clearance lamps, tail lamps and machine monitor panel lighting light up.

Position 4

Head lamps light up in addition to the lamps in position 3.



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

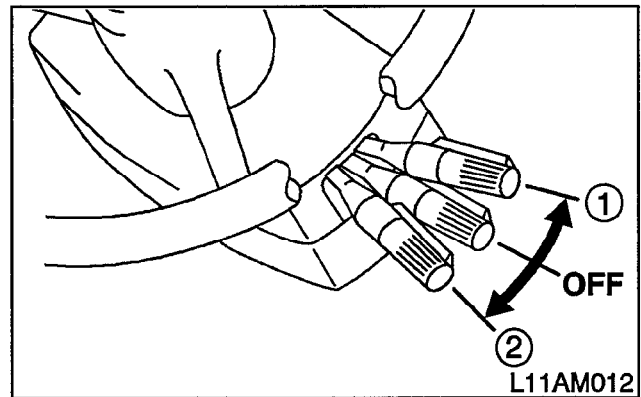
Turn signal lever

This lever operates the turn signal lamps.

1 LEFT TURN POSITION:
Push lever FORWARD.

2 RIGHT TURN POSITION:
Pull lever BACK.

- ★ When the lever is operated, the turn signal pilot lamp will also light up.
- ★ When the steering wheel is turned to the neutral position, the turn signal lever will return automatically to OFF. If not, return the lever to OFF manually.

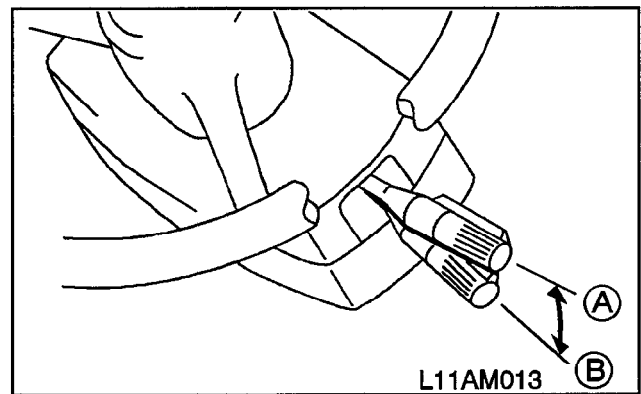


Dimmer switch

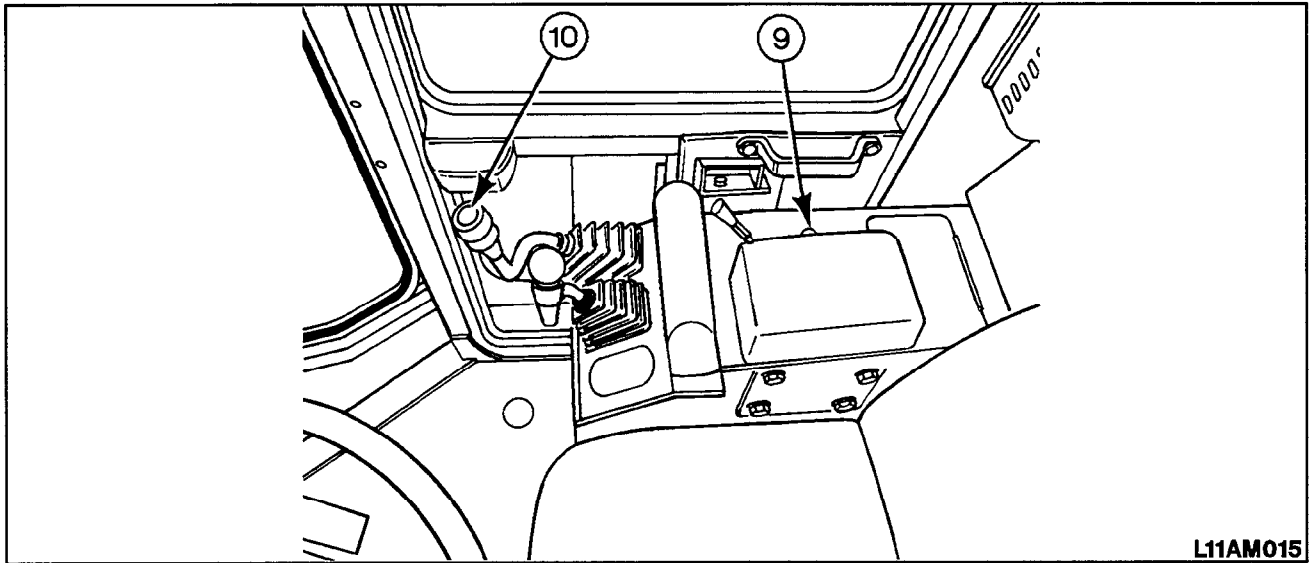
This switches the head lamps between high beam and low beam.

Position A: Low beam

Position B: High beam

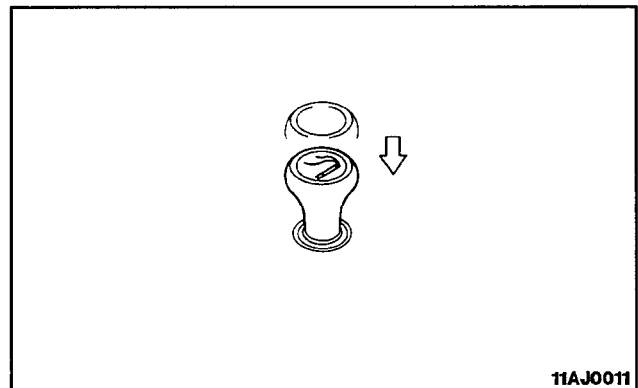


OPERATION



9. CIGARETTE LIGHTER

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

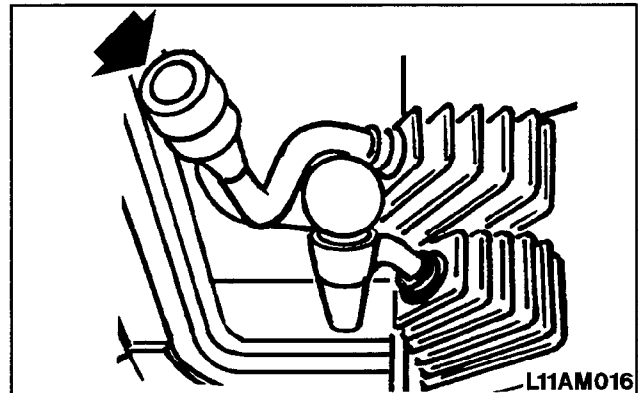


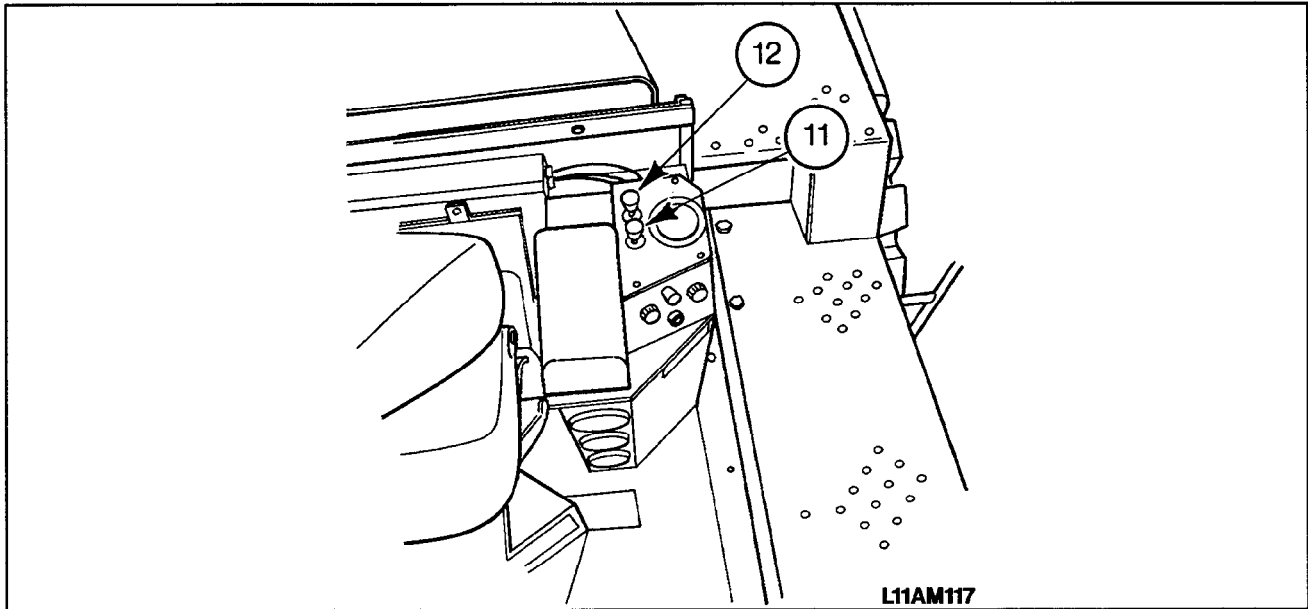
10. TRANSMISSION KICKDOWN SWITCH

If this switch is pushed when the transmission speed control lever is in 2nd, the transmission shifts down to 1st.

This switch is used to increase the drawbar pull in digging operations.

- ★ To cancel the kickdown switch, move the directional lever to REVERSE or NEUTRAL, or move the speed control lever to any position except 2nd. It is also possible to cancel the kickdown switch by operating the parking brake switch or by turning the starting switch OFF.





11. FRONT WIPER SWITCH - IF EQUIPPED

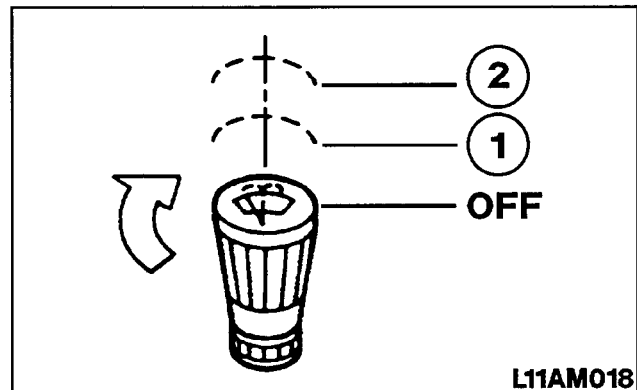
Position 1

The wiper is actuated at low speed.

Position 2

The wiper works at high speed.

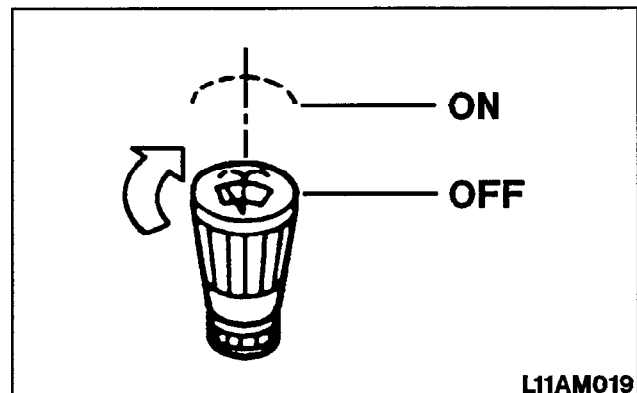
When this switch is turned clockwise, solvent will be sprayed on glass.



12. REAR WIPER SWITCH - IF EQUIPPED

When this switch is pulled to the ON position, the wiper operates on the rear glass.

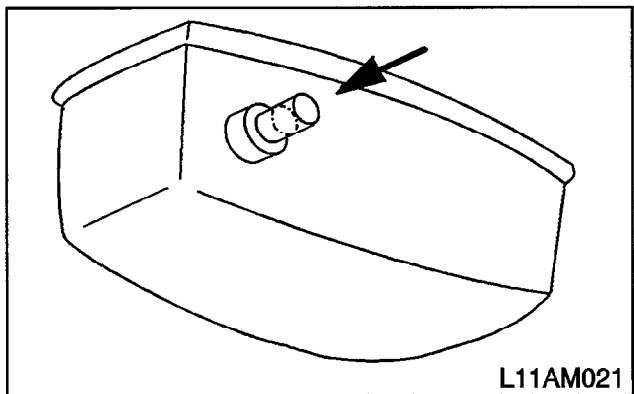
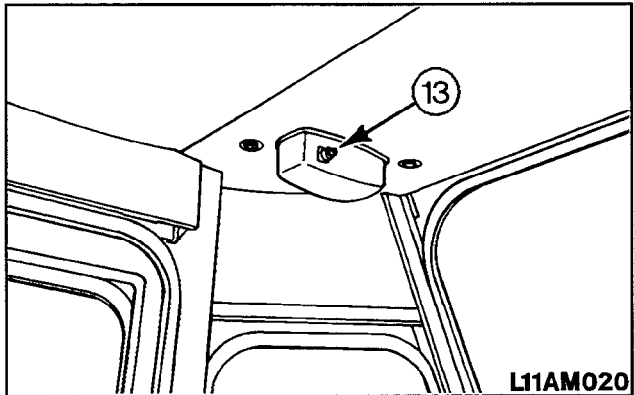
When this switch is turned clockwise, solvent will be sprayed on glass.



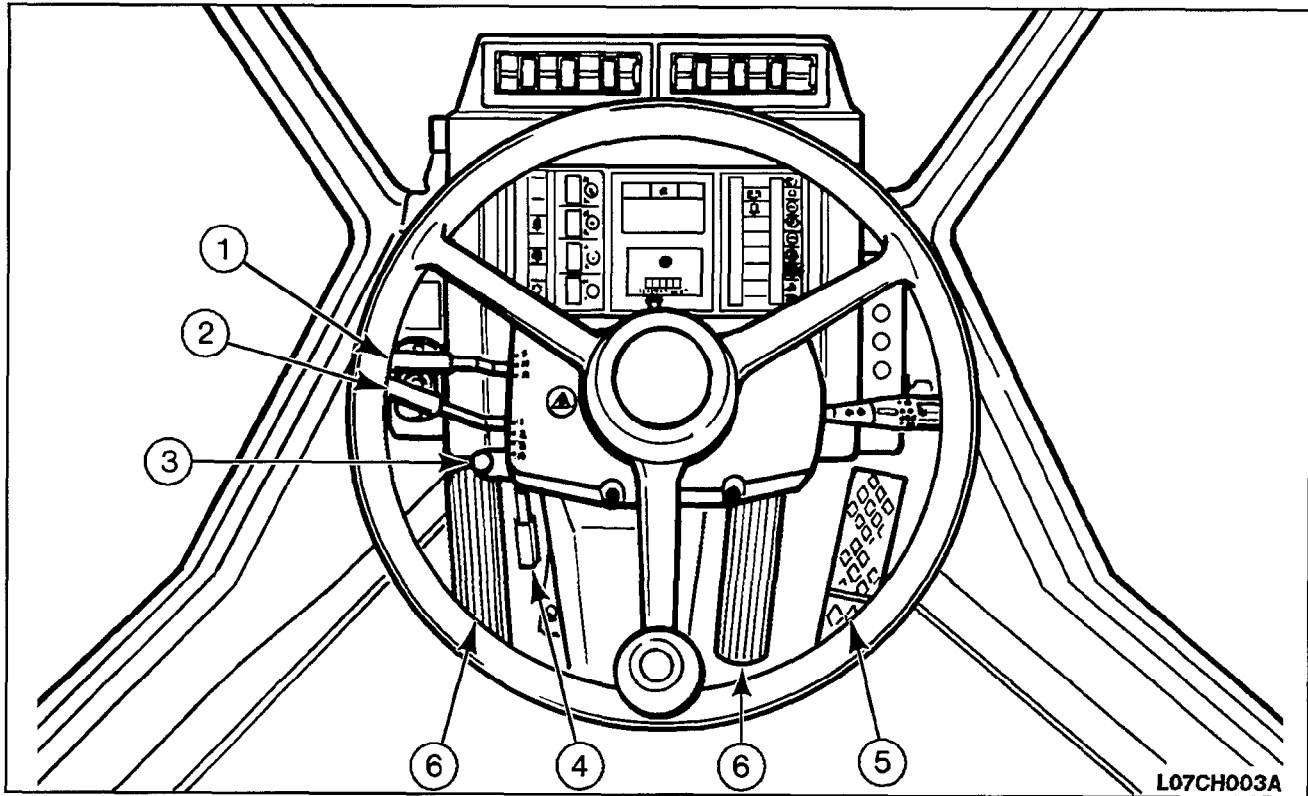
OPERATION

13. CAB DOME LAMP SWITCH - IF EQUIPPED

When this switch is pushed in, the cab dome lamp should light. When the switch is pushed in again, the cab dome lamp should go out.



LEVERS AND PEDALS



L07CH003A

1. DIRECTIONAL LEVER

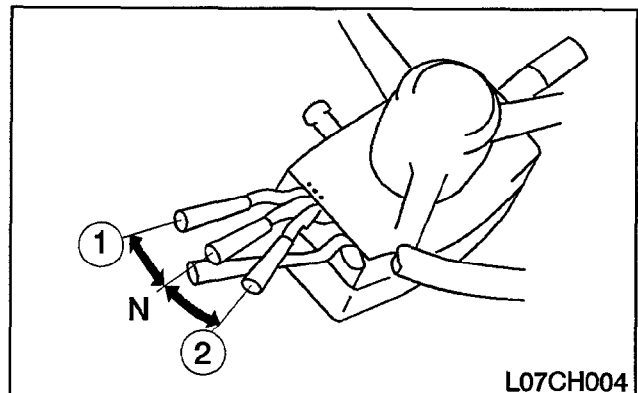
This lever is used to change the direction of travel of the machine.

- 1 Forward
- 2 Reverse
- N Neutral

★ The engine cannot be started if the directional lever is not at N (neutral).

★ When operating the directional lever, place your hand on a steering wheel and operate it by your fingers.

★ It is possible to change the length of the lever. For details of changing the length, see "TRANSMISSION CONTROL LEVERS" in Section 3.



L07CH004

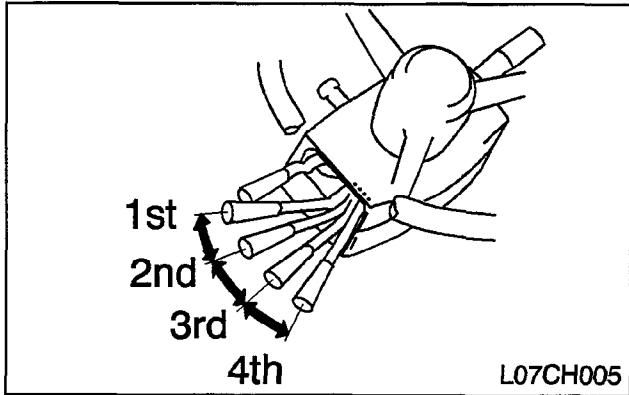
OPERATION

2. SPEED CONTROL LEVER

This lever controls the travel speed of the machine.

This machine has a 4-FORWARD, 4-REVERSE speed transmission. 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.
- ★ It is possible to change the length of the lever. For details of changing the length, see "TRANSMISSION CONTROL LEVERS" in Section 3.

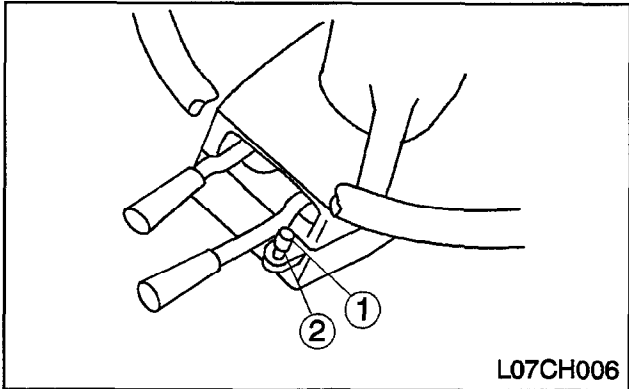


3. SPEED CONTROL LEVER STOPPER

This stopper prevents the speed control lever from entering the 3rd and 4th positions, when working.

Position 1
Stopper actuated.

Position 2
Stopper released.




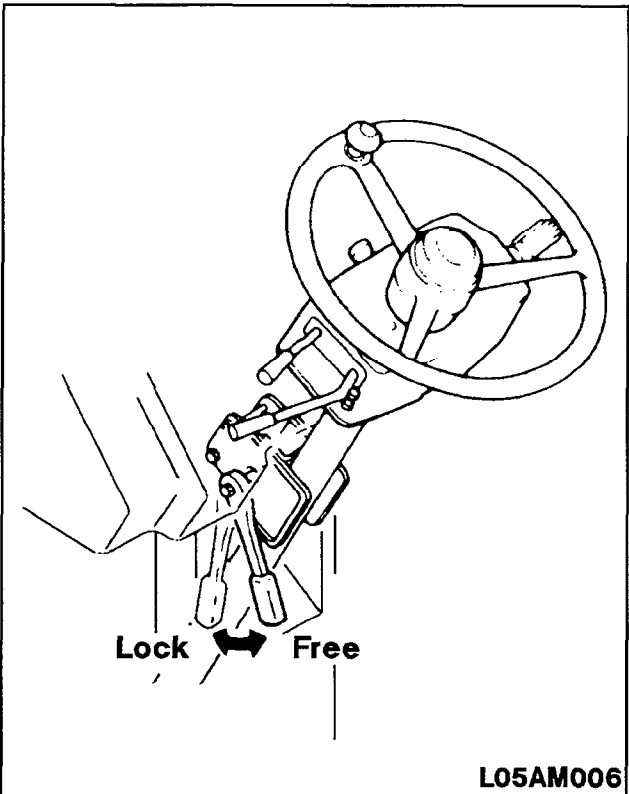
4. STEERING COLUMN TILT LEVER

This lever allows the steering column to be tilted 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 (stepless): 100 mm (3.9 in)

 **WARNING! Stop the machine before adjusting the angle of the steering wheel.**



5. ACCELERATOR PEDAL

This pedal controls the engine speed and output. The engine speed can be freely controlled between low idle and full speed.

6. BRAKE PEDALS

Right brake pedal

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



WARNING! When traveling downhill, use the engine as a brake, and always use the right brake pedal.

Left brake pedal

The left brake pedal operates the wheel brakes, and if the transmission cut-off selector switch is at ON, it also returns the transmission to neutral.

If the transmission cut-off selector switch is at OFF, the left brake pedal acts in the same way as the right brake pedal.

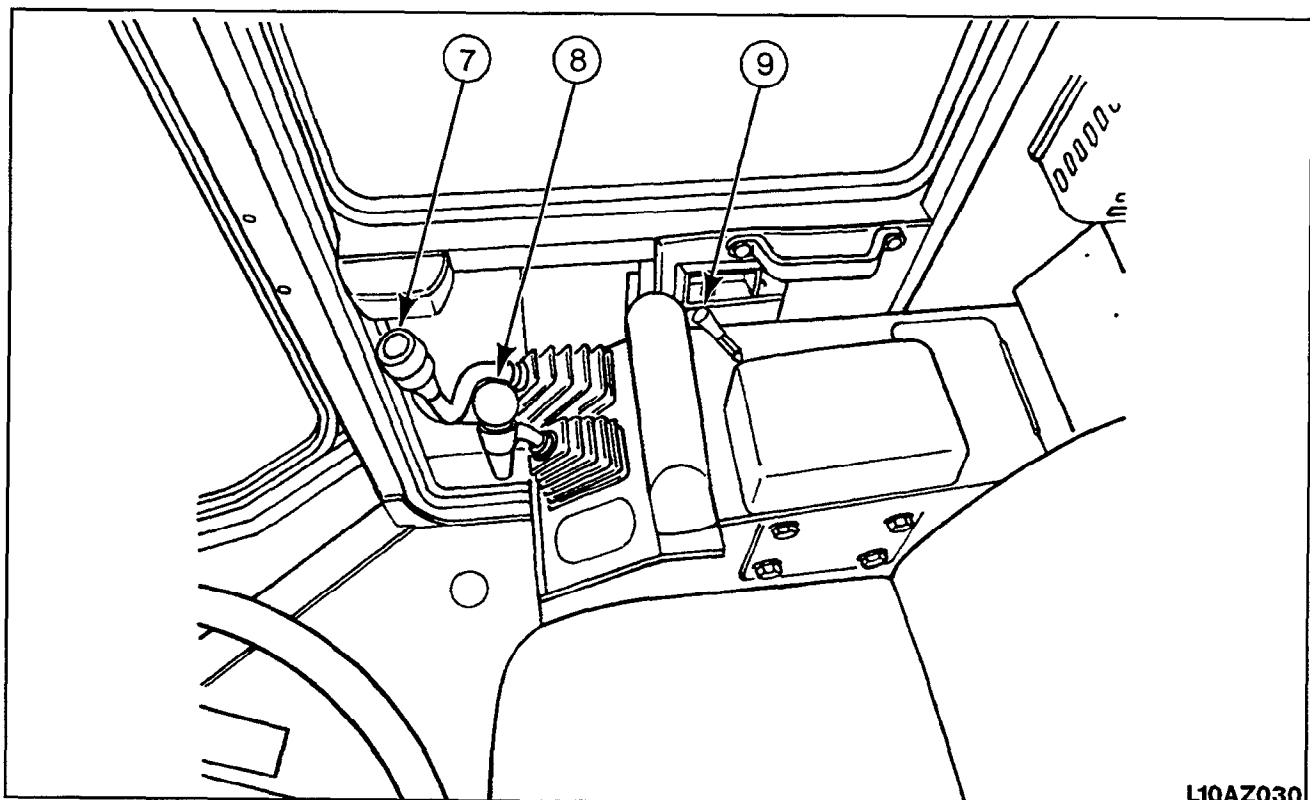


WARNING! Do not use the brake pedals repeatedly unless necessary.



WARNING! Do not use the brake pedals as footrests. Use them only when applying the brakes.

★ When the accelerator is being used for operating the work equipment, always use the left brake pedal to slow or stop the machine after putting the transmission cut-off selector switch in ON.

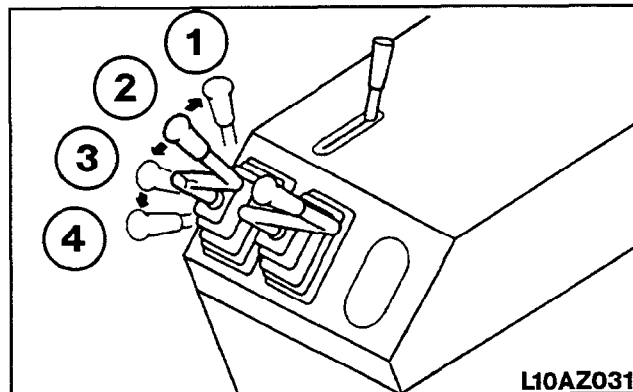


OPERATION

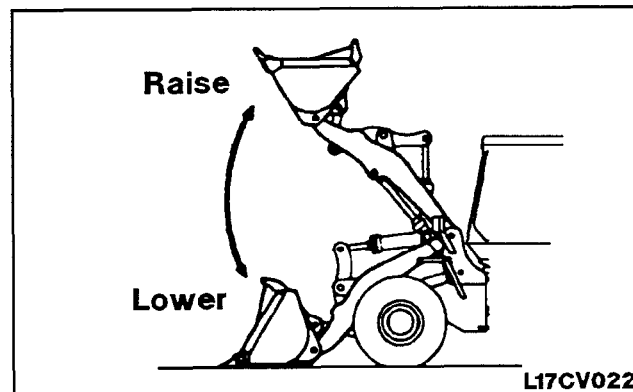
7. LIFT ARM CONTROL LEVER

This lever is used to operate the lift arm.

- 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.



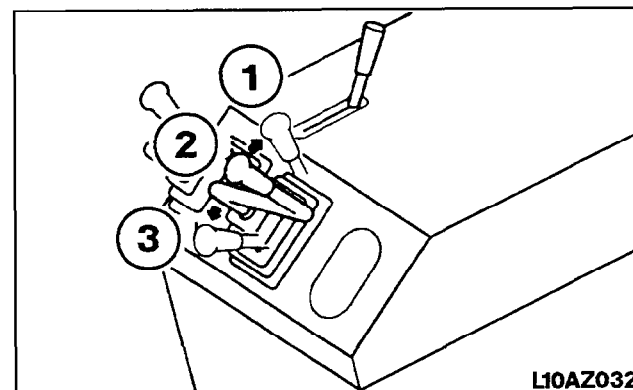
When the lift arm control lever is pulled further from 1 position, the lever is stopped in this position until lift arm reaches the preset position of kick-out, and the lever is returned to the hold position.



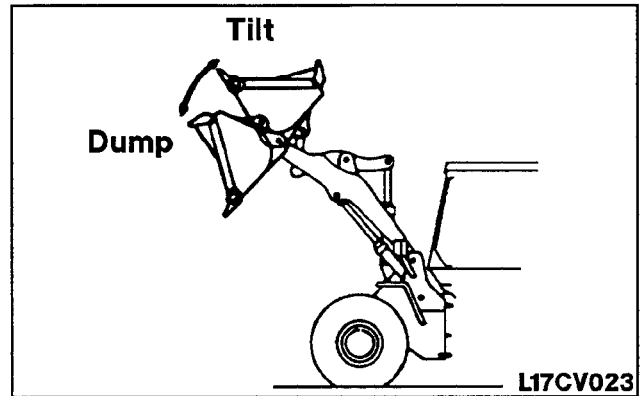
8. BUCKET CONTROL LEVER

This lever operates the bucket.

- 1 Tilt
- 2 Hold: The bucket is kept in the same position.
- 3 Dump



When the bucket control lever is pulled further from 1 position, the lever is stopped in this position until bucket reaches the preset position of positioner, and the lever is returned to the hold position.



8A. FRONT ATTACHMENT CONTROL LEVER - IF EQUIPPED

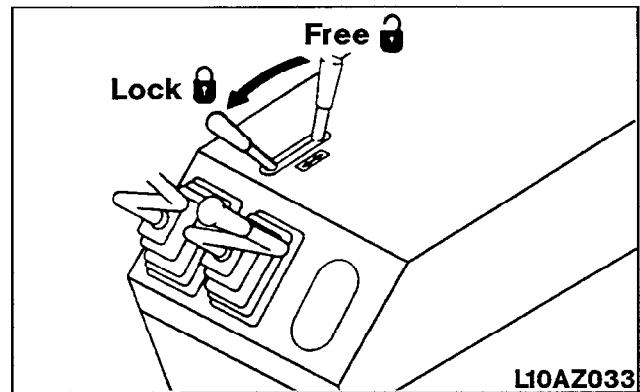
This lever controls the operation of the optional front mounted work equipment.

9. WORK EQUIPMENT CONTROL LEVER LOCK

This is used to lock the lift arm and bucket control levers.



WARNING! When parking or leaving the machine, or when performing maintenance, always lower the bucket to the ground, put the work equipment control levers in the hold position and place the lock lever in the "lock" position.



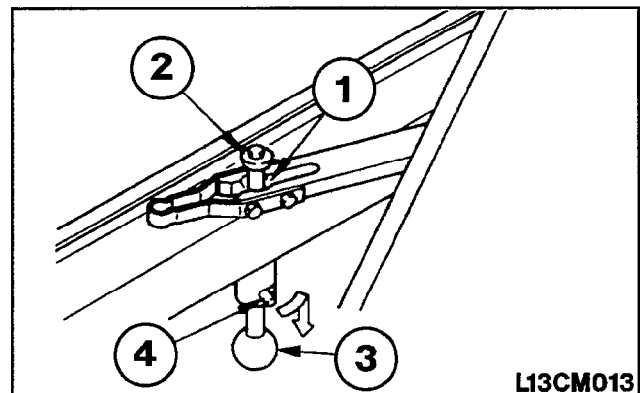
CAB DOOR HOLD OPEN LOCK - IF EQUIPPED

This lock can be used to hold the cab door open.

Open the door so that tip (2) of the lever is aligned with groove (1) for the lock, then pull down knob (3) as shown in the diagram.

When releasing the lock and closing the door, push up knob (3) and insert pin (4) securely in the groove.

★ When using the hold open lock, be sure to apply the lock securely.



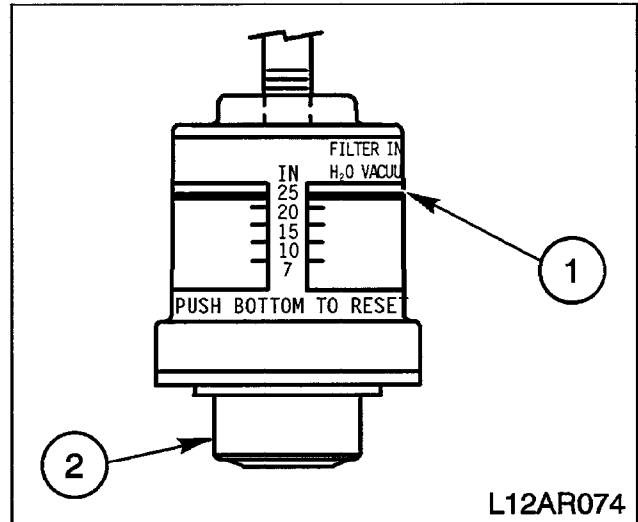
OPERATION

AIR CLEANER SERVICE INDICATOR

This device indicates clogging of the air cleaner element. When the YELLOW piston appears in the transparent part of the indicator, all the way up to the red line (1) then, the element is clogged. Immediately clean or replace the element.

After cleaning or replacing the element, push indicator reset button (2) to return the yellow piston to its original position.

The service indicator is located on the front side of the engine hood behind the operator's compartment.



FRAME LOCKING BAR

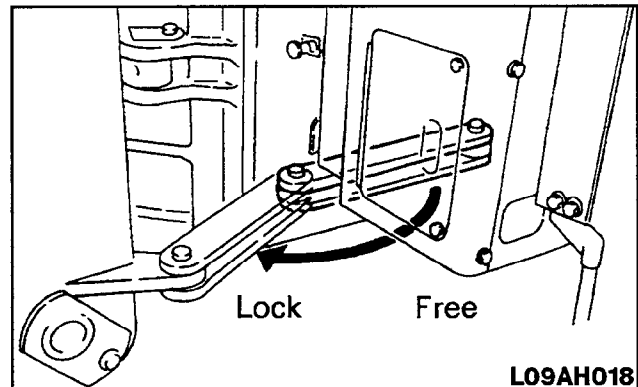
The frame locking bar is used during maintenance or when transporting the machine. It locks the front frame and rear frame, and prevents the front and rear frames from moving at the articulation point.



WARNING! Always use the locking bar for maintenance or when transporting the machine.



WARNING! Always remove the locking bar during normal travel operations.

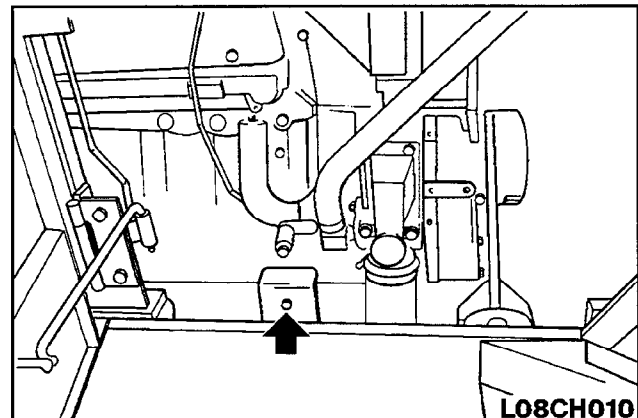


MAIN CIRCUIT BREAKER

The circuit breaker prevents damage to the electrical components and wiring.

When the breaker has been actuated, press the reset button to reset the system. However, if the circuit breaker is actuated again after the button is pressed, or the circuit breaker is frequently actuated, there may be a short circuit in the electrical system. In such cases, contact your distributor for repairs.

★ Wait for 45 seconds after the circuit breaker is actuated before resetting it.



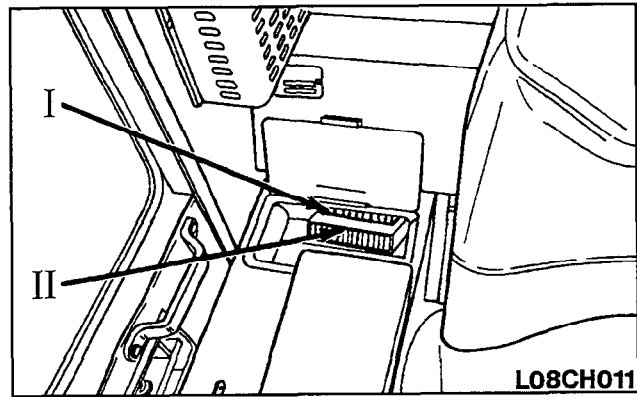
FUSE BOXES

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

- ★ Replace a fuse with another of the same capacity.



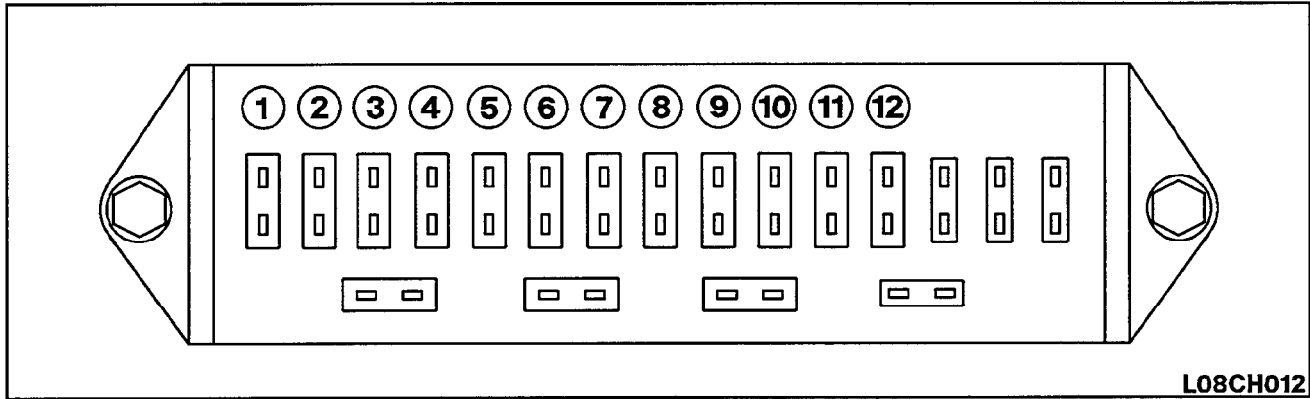
WARNING! Before replacing a fuse, be sure to turn off the starting switch.



OPERATION

FUSE ARRANGEMENT AND CIRCUIT

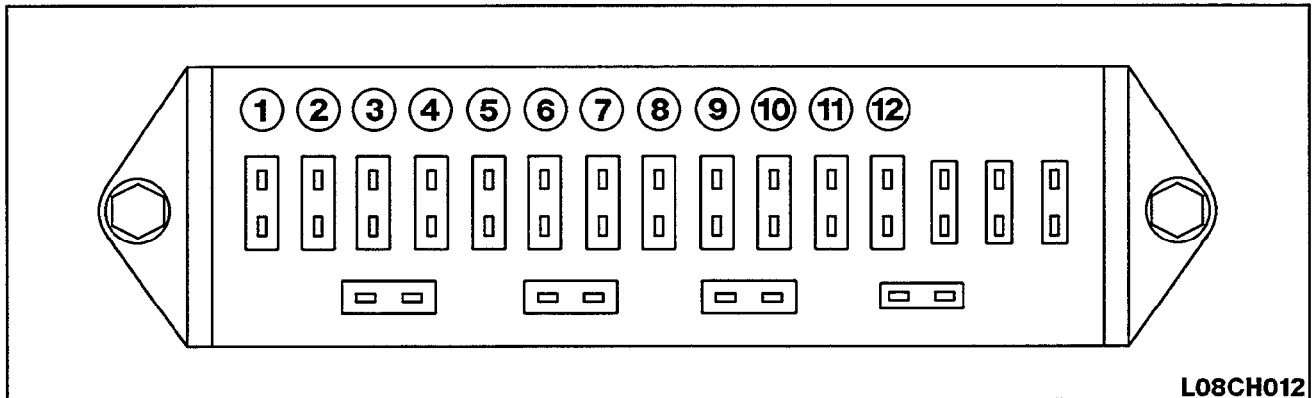
FUSE BOX I - UPPER POSITION



L08CH012

No.	Fuse Capacity	Circuit
1	20A	Starting switch
2	10A	Hazard lamp
3	10A	Left head lamp
4	10A	Right head lamp
5	10A	Left side clearance lamp
6	10A	Right side clearance lamp
7	20A	Lamp main circuit
8	10A	Turn signal lamps
9	10A	Brake and back-up lamps
10	10A	Transmission control
11	10A	Horn
12	10A	---

FUSE BOX II - LOWER POSITION



No.	Fuse Capacity	Circuit
1	20A	Working lamps
2	10A	Parking brake
3	10A	Monitor system
4	10A	Boom kick-out & bucket positioner
5	10A	---
6	10A	---
7	20A	Air conditioner condensor fan motor - if equipped
8	20A	Cab heater air conditioner blower fan motor - if equipped
9	10A	Cab dome lamp - if equipped
10	10A	Cigarette lighter
11	10A	Cab rear wiper & washer - if equipped
12	10A	Cab front wiper & washer - if equipped

OPERATION

OPERATOR'S SEAT

Operator's seat adjustment should be checked at the beginning of each shift and when operators change.



WARNING! Park the machine in a safe place and stop the engine when carrying out adjustment of the operator's seat.

A. FORWARD-BACKWARD ADJUSTMENT

Move adjustment lever (1) to the right, move the seat to the best position and release the lever. The seat can be moved forward or backward within a range of 140 mm (5.5 in) in 7 stages.

B. SEAT ANGLE ADJUSTMENT

Move adjustment lever (2) up, set the seat to the desired angle, and release the lever. The seat can be tilted up or down by about 3°.

C. WEIGHT ADJUSTMENT

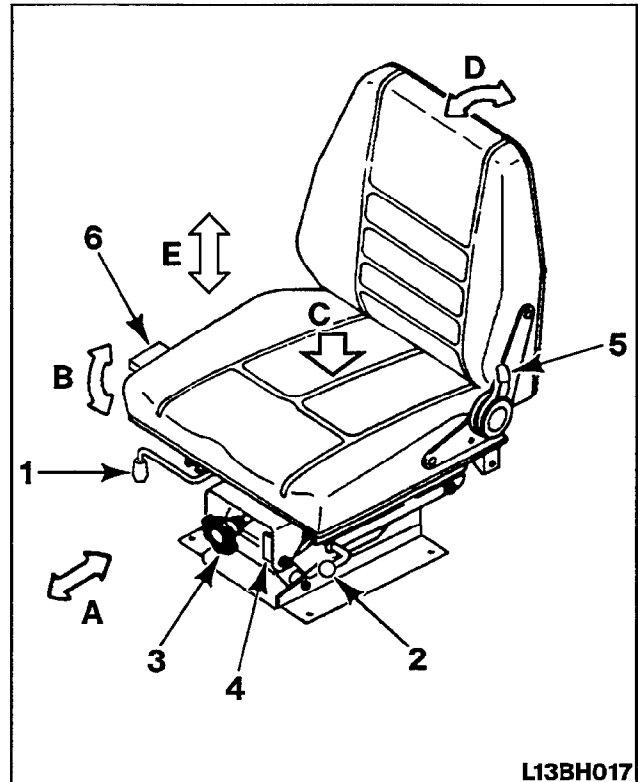
Rotate adjustment knob (3), located in front of the seat, to adjust ride scale (4) to your own weight. The weight adjustment range is 50 to 120 kg (110.2 to 264.6 lb).

D. BACKREST TILT ADJUSTMENT

Pull adjustment lever (5) up, move the backrest to the best position and release the lever. The backrest can be set within a range of 22° in 11 steps.

E. HEIGHT ADJUSTMENT

Move adjustment lever (6) upward, set the seat to the desired height and release the lever. The seat height can be set within a distance of 50 mm (2 in) in 4 stages.



L13BH017

1. Forward-backward adjustment lever
2. Seat angle adjustment lever
3. Weight adjustment knob
4. Ride indicator pointer
5. Backrest tilt adjustment lever
6. Height adjustment lever

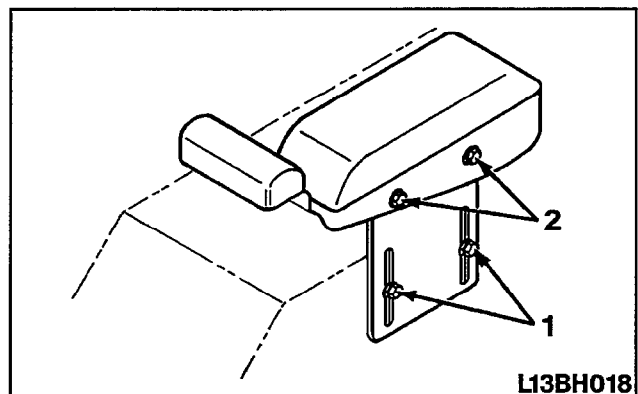
RIGHT SIDE ARMREST

HEIGHT ADJUSTMENT

Loosen mounting bolts (1) to move the armrest to the desired position and tighten the bolts.

ANGLE ADJUSTMENT

Loosen mounting bolts (2) to move the armrest to the desired angle and tighten the bolts.



L13BH018

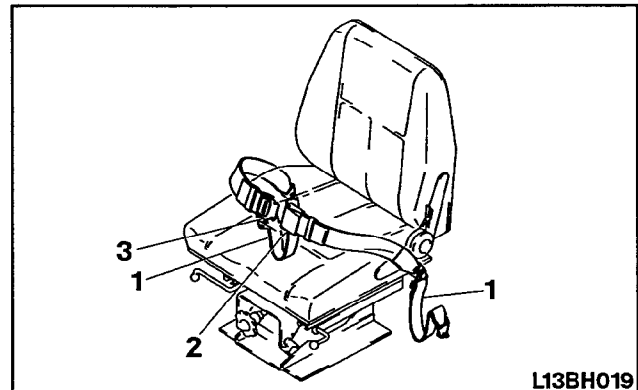
SEAT BELT

WARNING! When operating a machine equipped with a ROPS, be sure to use the seat belt.

WARNING! Before fastening the seat belt, inspect the mounting brackets and belt for abnormal conditions.

Fasten the belt and remove it in the following manner.

1. Adjust the seat so that the brake pedal can be depressed all the way with the operator's back against the backrest.



2. After positioning the seat, install the tether belt (1). With the seat unoccupied, tense the belt slightly across the seat and install.

WARNING! Check that there are no kinks in the belt.

3. Sit in the seat. Hold buckle (2) and insert tang (3) into the buckle. Check that the belt has locked by pulling it.

4. When removing the belt, raise the tip of the buckle lever to release it.

★ When leaving the operator's seat, release the seat belt and hang it over the arm rest.

★ Fasten the belt across your body without kinking it. Adjust the lengths of the belt on both the buckle and tang ends so that the buckle is located at the mid-point of your body front.

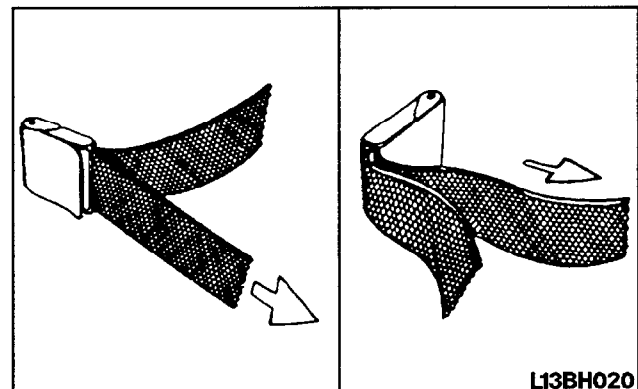
Adjust the belt length in the following manner.

1. To shorten the belt, pull the free end of the belt at either the buckle or tang end or at both ends.

2. To lengthen the belt, pull the belt while holding it at a right angle to the buckle or tang.

★ Inspect the seat belt mounting hardware for tightness. Retighten any loose bolts to a torque of 2 - 3 kgm (14 - 22 lbf ft / 19 - 30 N•m).

★ If the seat belt is worn or frayed or if the belt buckle and/or tang or any of the mounting brackets are damaged or deformed, replace the seat belt immediately.



OPERATION

CAB HEATER AND DEFROSTER - IF EQUIPPED

CONTROL PANEL

It is possible to use the cab heater to good effect in dusty jobsites. The outside air is passed through the filter and is sent to the operator's cab to increase the pressure inside the cab. In this way, dust is prevented from entering, so comfortable operating conditions are always maintained for the operator.

1. FAN SPEED SWITCH

This switch controls the air flow when the cab heater is used for heating.

- ★ It has three air flow control levels: LO (Low), ME (Medium) and HI (High)
- ★ If the outside air is extremely dusty, set the fan speed switch to the HI position. This will pressurize the cab and prevent the dust from entering.

2. TEMPERATURE CONTROL KNOB

This knob is used to control the temperature for cooling or heating.

- ★ The farther the knob is moved counter-clockwise, the lower the temperature of the air blown out from the vents.
- ★ The farther the knob is moved clockwise, the higher the temperature of the air blown out from the vents.

3. AIR INTAKE SELECTOR KNOB

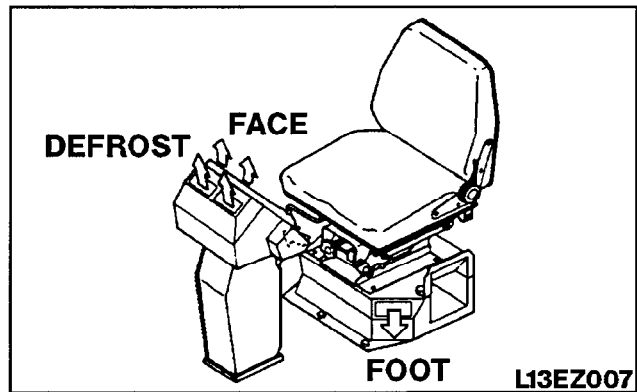
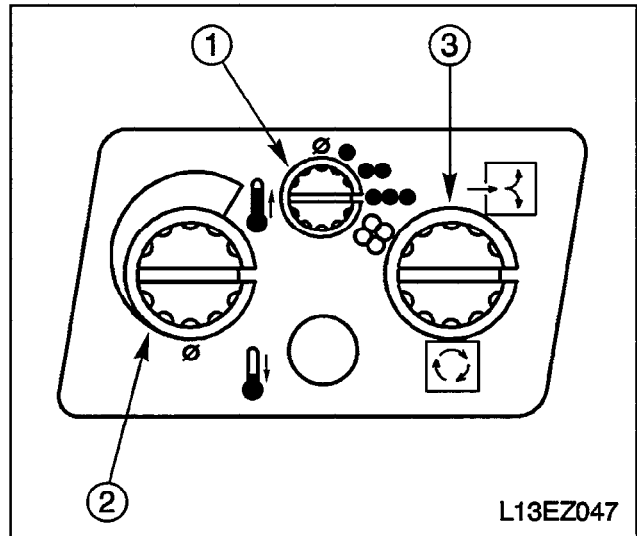
This knob switches the air intake port when heating.

- ★ FRESH: Operate the knob clockwise.

Fresh air is taken in from outside in addition to the air inside the compartment. This is used for ordinary heating and when pressurizing the inside of the cab.

- ★ RECIRC: Operate the knob counter-clockwise.

Only air inside the compartment is used. This is mainly used for quick heating.



METHOD OF OPERATION

OPERATION OF CONTROL PANEL

PURPOSE		SWITCH AND KNOB POSITIONS		
		Fan Speed Switch (1)	Temperature Control Knob (2)	Air Intake Selector Knob (3)
Heating	Quick	HI	Full clockwise to near center position	Clockwise
	Normal	HI - LO	Center position to near full counter-clockwise	Counter-clockwise
Defrosting		HI	Center position to near full counter-clockwise - Full counter-clockwise when carrying out quick defrosting or de-misting	Counter-clockwise
Ventilation or Pressurizing		HI - LO	Full counter-clockwise	Counter-clockwise

AIR VENT SELECTION

PURPOSE	VENT POSITION		
	Face (1)	Foot (2)	Defrost (3)
Heating	Open or closed	Open	Open or closed
Defrosting	Closed	Open or closed	Open
Ventilation	Open	Open	Open

- ★ The effectiveness of the heating system can be increased by selecting the most suitable vent.
- ★ Do not turn the fan speed switch on when all the vents are closed.

OPERATION

CAB HEATER, DEFROSTER AND AIR CONDITIONER - IF EQUIPPED

CONTROL PANEL

It is possible to use the cab heater and air conditioner to good effect in dusty jobsites. The outside air is passed through the filter and is sent to the operator's cab to increase the pressure inside the cab. In this way, dust is prevented from entering, so comfortable operating conditions are always maintained for the operator.

1. FAN SPEED SWITCH

This switch controls the air flow when the cab heater and air conditioner is used for heating or cooling.

- ★ It has three air flow control levels: LO (Low), ME (Medium) and HI (High)
- ★ If the outside air is extremely dusty, set the fan speed switch to the HI position. This will pressurize the cab and prevent the dust from entering.

2. TEMPERATURE CONTROL KNOB

This knob is used to control the temperature for cooling or heating.

- ★ The farther the knob is moved to counter-clockwise, the lower the temperature of the air blown out from the vents.
- ★ The farther the knob is moved to clockwise, the higher the temperature of the air blown out from the vents.

3. AIR INTAKE SELECTOR KNOB

This knob switches the air intake port when cooling or heating.

- ★ FRESH: Operate the knob clockwise.

Fresh air is taken in from outside in addition to the air inside the compartment. This is used for ordinary heating or cooling and when pressurizing the inside of the cab.

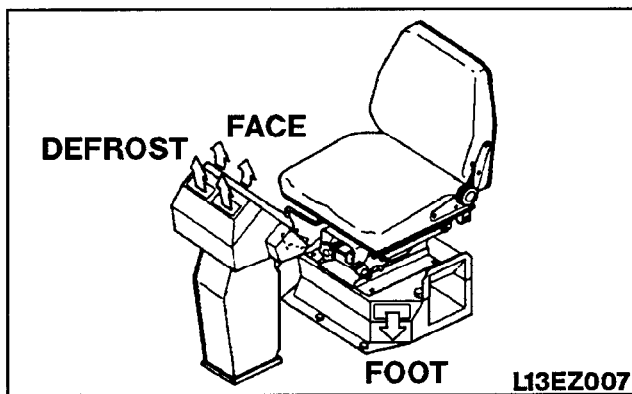
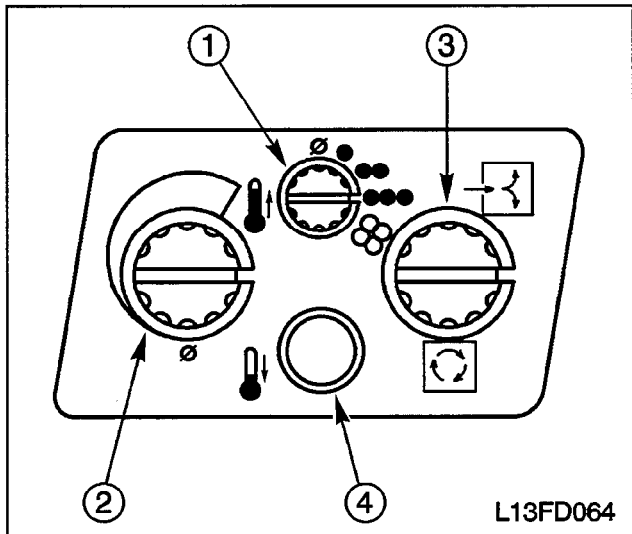
- ★ RECIRC: Operate the knob counter-clockwise.

Only air inside the compartment is used. This is mainly used for quick heating or cooling.

4. AIR CONDITIONER SWITCH

This switch turns the air conditioner on and off.

ON: Depress the switch to start dehumidification and cooling.



OPERATION

OFF: If the system is ON and the switch is depressed again, the switch returns to the up position and the air conditioner is switched off.

★ Turn the air conditioner switch on after turning the fan speed switch on.

METHOD OF OPERATION

OPERATION OF CONTROL PANEL

PURPOSE		SWITCH AND KNOB POSITIONS			
		Fan Speed Switch (1)	Air Conditioner Switch (4)	Temperature Control Knob (2)	Air Intake Selector Knob (3)
Cooling	Quick	HI	ON	Full counter-clockwise	Clockwise
	Normal	HI - LO	ON	Full counter-clockwise to near center position	Counter-clockwise
Dehumidifying and heating		HI - LO	ON	Center position to near full counter-clockwise	Counter-clockwise
Heating	Quick	HI	OFF	Full clockwise to near center position	Clockwise
	Normal	HI - LO	OFF	Center position to near full counter-clockwise	Counter-clockwise
Defrosting		HI	ON	Center position to near full counter-clockwise - Full counter-clockwise when carrying out quick defrosting or de-misting	Counter-clockwise
Ventilation or Pressurizing		HI - LO	OFF	Full counter-clockwise	Counter-clockwise

AIR VENT SELECTION

PURPOSE	VENT POSITION		
	Face (1)	Foot (2)	Defrost (3)
Cooling	Open	Open or closed	Closed
Heating	Open or closed	Open	Open or closed
Defrosting	Closed	Open or closed	Open
Ventilation	Open	Open	Open

★ The effectiveness of the heating air conditioning system can be increased by selecting the most suitable vent.

OPERATION

- ★ Do not turn the fan speed switch on when all the vents are closed.

PRECAUTIONS FOR USING AIR CONDITIONER

- ★ When cooling, change the air occasionally.
- Smoking in the air conditioned cab will cause your eyes to get sore. While smoking, open the window to let the smoke out of the cab.
- While using the air conditioner, open the window once every hour.
- ★ Be careful not to overcool the cab.
- The cab should feel cool when entering it from the outside (5°C lower than the outside temperature). It is not good for the health to have the temperature in the cab too low. Always give careful consideration to temperature regulation.

HANDLING AIR CONDITIONER IN SEASON

To use the air conditioner comfortably during its season, ask your distributor to check the air conditioner and add refrigerant if necessary.

- The standard cleaning interval for the cab air filter is every 100 hours, but if it becomes clogged, it will be impossible to pressurize the inside of the cab. In addition, it may cause failures, so check and clean the air filter immediately. For details of cleaning the air filter, refer to "MAINTENANCE" in Section 3.
- If a large amount of dirt or dust collects on the condenser, the cooling capacity drops, so check and clean when necessary. For details, of cleaning the air conditioner condenser, refer to "MAINTENANCE" in Section 3.

HANDLING AIR CONDITIONER IN OFF-SEASONS

To lubricate each part of the compressor during the off-seasons, operate the air conditioner for a few minutes two or three times a month.

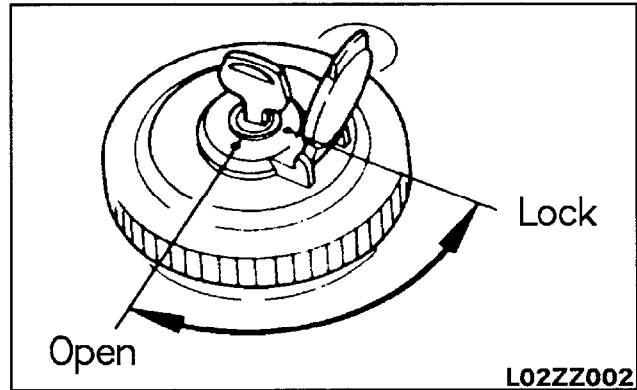
LOCKING FILLER CAPS

FUEL TANK FILLER CAP

A locking filler cap is located on the fuel tank filler opening. Open and close the locking cap as follows, using the starting switch key:

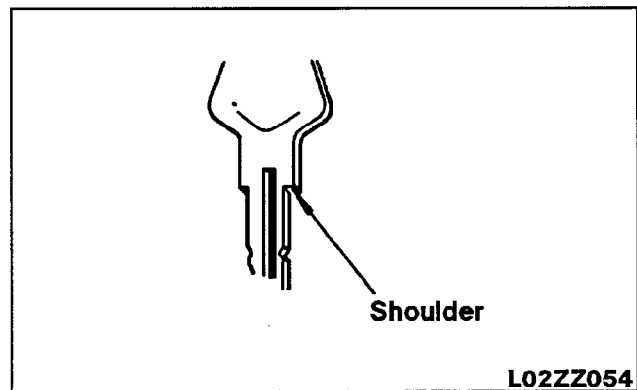
To open the cap

1. Insert the key into the cap.
- ★ Insert the key as far as it will go up to the shoulder. If the key is turned before it is inserted all the way, it may bent or break.
2. Turn the key clockwise, align the match mark on the cap with the rotor groove, then remove the cap.



To lock the cap

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



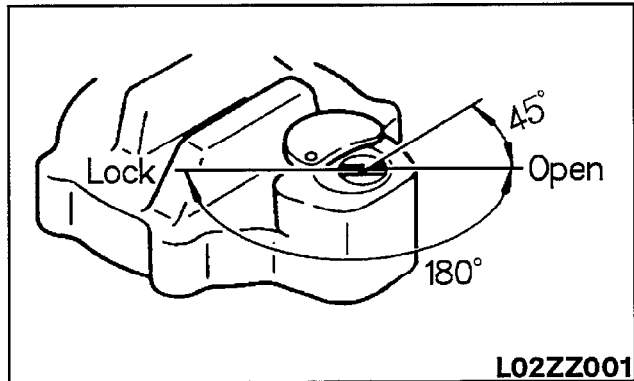
OPERATION

HYDRAULIC TANK FILLER CAP

A locking filler cap is located on the hydraulic tank filler opening. Open and close the locking cap as follows, using the starting switch key:

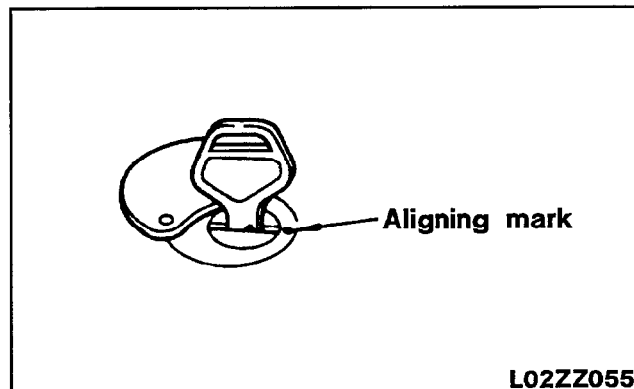
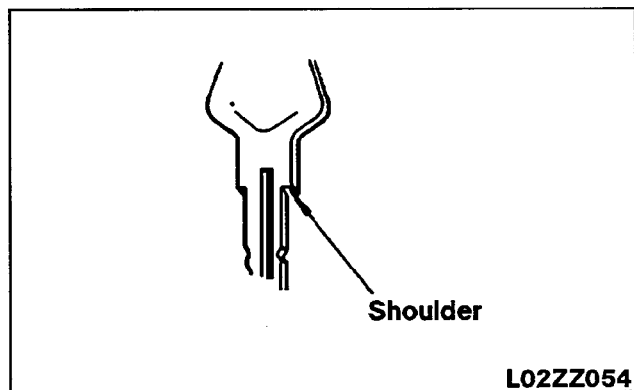
To open the cap

1. Insert the key into the cap.
- ★ Insert the key as far as it will go up to the shoulder. If the key is turned before it is inserted all the way, it may bent or break.
2. Turn the key counterclockwise and bring the rotor groove in line with the aligning mark on the cap. Turn the cap slowly until a "clicking" sound is made. This releases the lock and allows the cap to be opened.



To lock the cap

1. Turn the cap into place.
 2. Turn the key clockwise and take the key out.
- ★ When the cap is locked against vandalism, it rotates freely.



CHECKS BEFORE STARTING ENGINE

Pre-operation checks forestall machine trouble. Never neglect them.

WALK AROUND CHECK

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

1. Check bucket for wear.
2. Check tires for wear and damage.
3. Check transmission case joints for oil leak.
4. Check brake system for air leak and/or oil leak.
5. Check tightness of air cleaner mounting hardware.
6. Check tightness of battery terminals.
7. Check radiator for coolant leak.
8. Check engine for coolant and/or oil leaks.
9. Check drive axles for oil leaks.
10. Check hydraulic tank for oil leak.
11. Check for oil leaks at high pressure hydraulic hoses, hose connections and hydraulic cylinder seals.

CHECKS BEFORE STARTING

In addition to the walk around check, the following checks should be performed before starting the engine.

★ For the detailed procedures of the following checks, refer to "CHECKS BEFORE STARTING ENGINE" in Section 3.

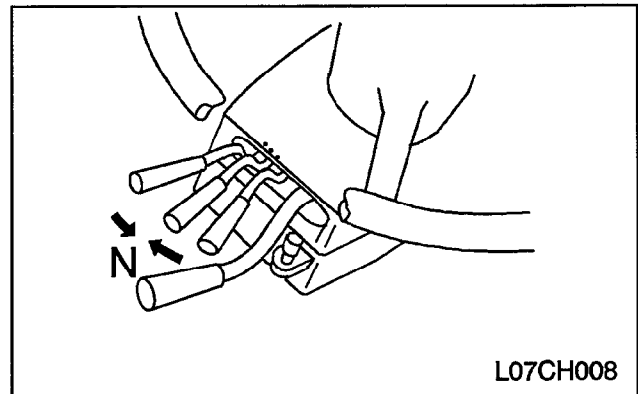
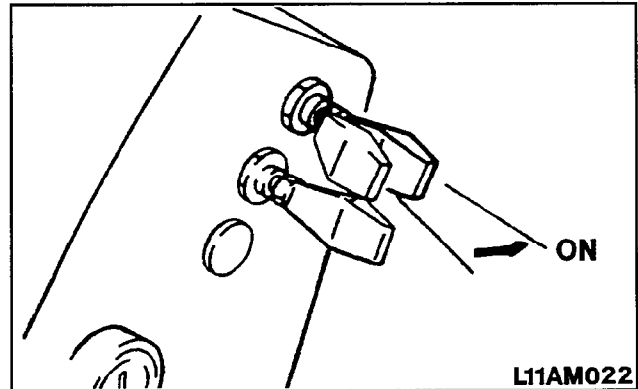
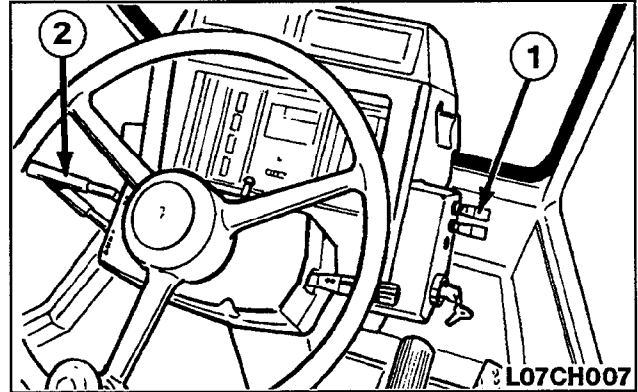
- | | |
|--|---|
| 1. Check coolant level and refill | 11. Check electrical wiring |
| 2. Check engine oil level and refill | 12. Check parking brake function |
| 3. Check fuel level and refill | 13. Check wheel brake function |
| 4. Check air cleaner service indicator | 14. Check horn function |
| 5. Drain water from air tanks | 15. Check lamp function |
| 6. Check brake oil level and refill | 16. Check rear view mirrors |
| 7. Drain fuel filter/water separator | 17. Check engine exhaust gas color |
| 8. Check engine fan | 18. Check instrument and gauge function |
| 9. Check drive belts | 19. Check steering |
| 10. Check monitor panel | 20. Check back-up alarm function |

OPERATION

OPERATING MACHINE

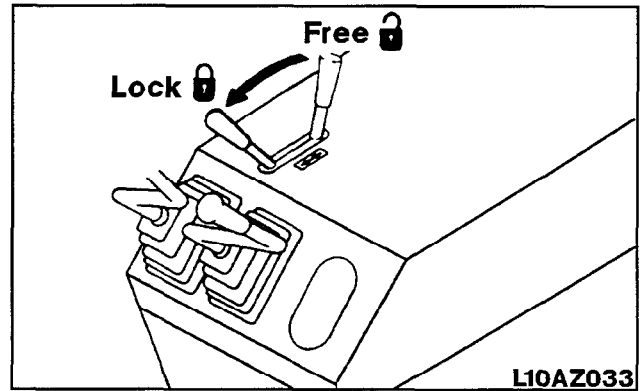
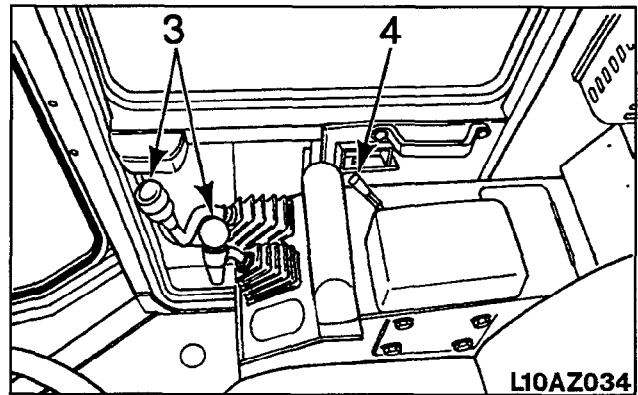
OPERATIONS BEFORE STARTING ENGINE

1. Carry out pre-operational checks. For details of the checks, refer to "CHECKS BEFORE STARTING ENGINE".
 2. With your back against the back rest of the operator's seat, adjust the seat position so that the brake pedal(s) can be easily depressed. If necessary, refer to "OPERATOR'S SEAT".
 3. Check that parking brake switch (1) is in the ON position.
 4. Check that directional lever (2) is in the "N" (neutral) position.
- ★ The engine will not start while the directional lever (2) is in any position other than "N" (neutral).



OPERATION

5. Check that work equipment control levers (3) are locked by control lever lock (4) in the "HOLD" position.

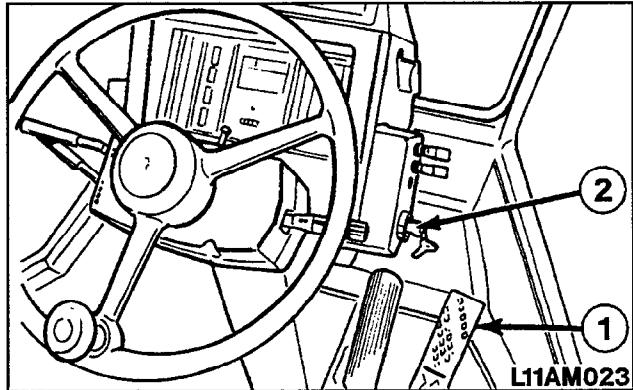


OPERATION

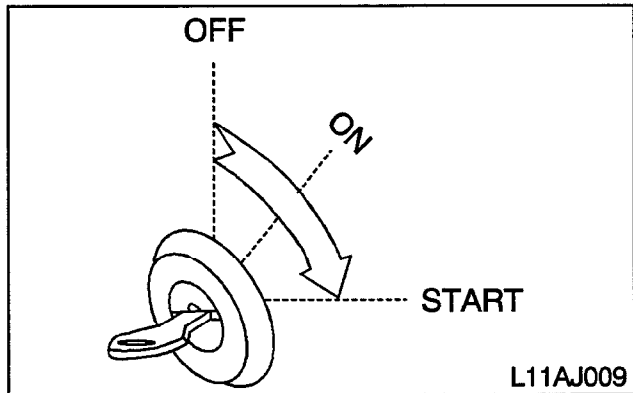
STARTING ENGINE

NORMAL STARTING

1. Depress accelerator pedal (1) lightly.
2. Turn the key of starting switch (2) to the START position to start the engine.
3. When the engine starts, release the key of starting switch (2) and the key will automatically return to the ON position.



- ★ Do not leave the key in START for more than 20 seconds.
- ★ If engine does not start, repeat the starting procedure after about 2 minutes.
- ★ To start the engine in cold weather, refer to "COLD WEATHER STARTING".

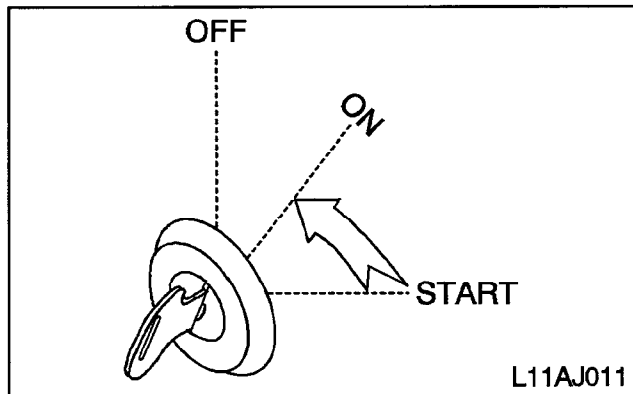


SPECIAL STARTING

When starting the engine after running out of fuel, first fill the fuel tank and then, fill the fuel filter with fuel before starting. Refer to "FUEL FILTERS" in Section 3.

When starting the engine after each engine oil change or after the engine has been shut off for more than three (3) days, perform the following steps to insure the engine receives proper lubricating oil flow through the lubricating system.

- Disconnect the electrical wire from the fuel pump solenoid valve.
- Using the starting switch, crank the engine by the cranking motor until the oil pressure monitor lamp goes out.
- Reconnect the electrical wire to the fuel pump solenoid valve.
- Start the engine as described under "NORMAL STARTING".



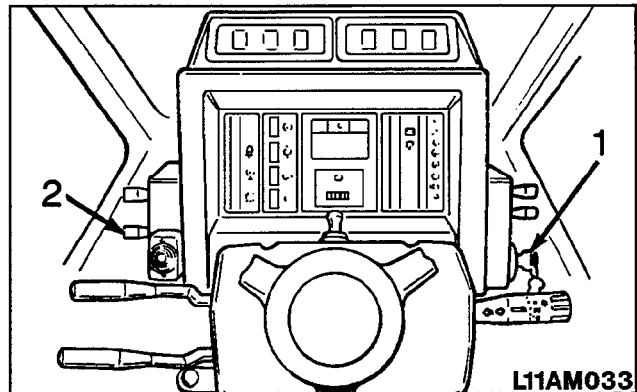
COLD WEATHER STARTING

When starting the engine in low temperatures, do as follows.

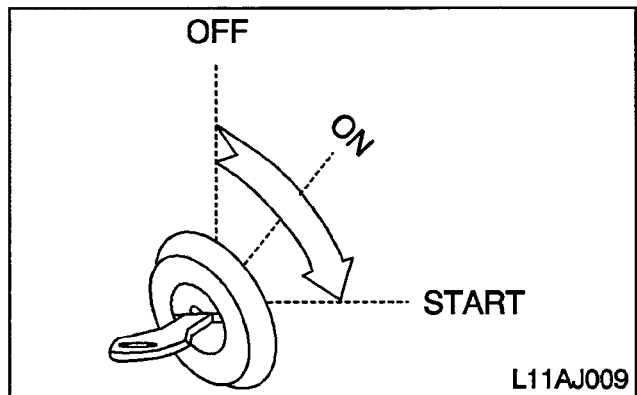
1. Turn the key of starting switch (1) to the START position.
 2. Move ether start switch (2) to the ON position, then release it immediately. Do **NOT** hold it at the ON position for more than 5 seconds. This will cause failure of the ether start valve solenoid.
- ★ If the engine does not start, repeat this 2-3 times.
3. When the engine starts, release the key of starting switch (1) and the key will automatically return to the ON position.

WARNING! Never operate ether start switch (2) except when starting the engine.

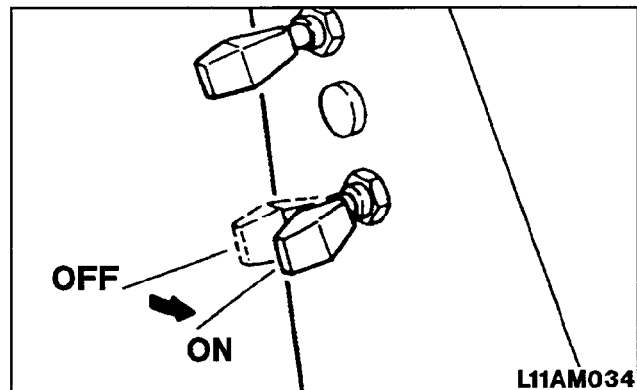
- ★ The ether cylinder can be used for about 230 times. (Amount of ether injected: 3 cc, total capacity for one cylinder: 710 cc)
- ★ Do not leave the key in START for more than 20 seconds.
- ★ If engine does not start, repeat the starting procedure after about 2 minutes.
- ★ The standard specification machine is designed to work in an ambient temperature down to -20°C (-4°F).
- ★ When operating the machine at temperatures below -20°C (-4°F), special equipment is needed. Contact your distributor for details.
- ★ For machines with an air dryer installed as an option, when in cold temperatures below -10°C ($+14^{\circ}\text{F}$) and when operating the machine after it has been stopped for several hours, run the engine for at least 10 minutes after starting before moving the machine.



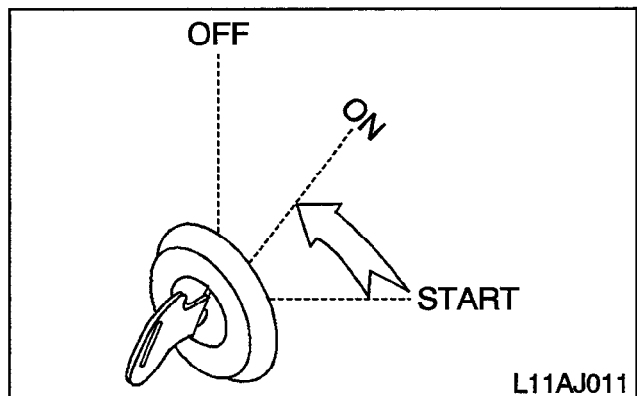
L11AM033



L11AJ009



L11AM034



L11AJ011

OPERATION

OPERATIONS AFTER STARTING ENGINE

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

1. Depress accelerator pedal (1) lightly and run the engine with no load at midrange speed for about 3 to 5 minutes.

2. After warm-up run is completed, check monitor lamps for proper operation.

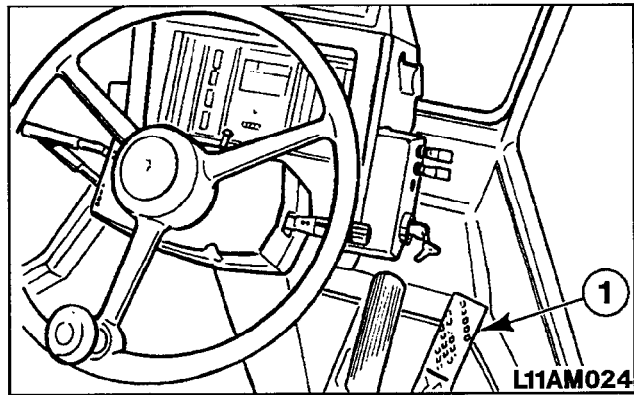
★ Continue to run the engine at light load until the green ranges of the engine coolant temperature gauge and torque converter oil temperature gauge light up.

3. Check if the exhaust color is normal or whether there is any abnormal noise or vibration.

4. If the ambient temperature is less than 0°C (32°F), perform the "COLD WEATHER WARM-UP PROCEDURE", which follows.

★ Avoid sudden acceleration of the engine until the completion of warm-up.

★ Do not run the engine at low idle continuously for more than 10 minutes.



COLD WEATHER WARM-UP PROCEDURE

When starting the engine in cold weather, do not start operations immediately. First, carry out the following.

1. Warm up the engine. Following is the guideline for warming-up time with the engine idling.

Ambient temperature	-20°C (-4°F)	-10°C (14°F)	0°C (32°F) and Above
Warm-up time	15 minutes	10 minutes	5 minutes

★ Avoid sudden acceleration of the engine before the warming-up operation is completed.

★ Do not idle the engine continuously for more than 20 minutes.

2. Warm up the work equipment circuits. After completing the warming-up operation for the engine, warm up the work equipment circuit.

1) Move the lift arm control lever slowly to the RAISE position and raise the bucket slightly.

2) Move the lift arm control lever slowly to the LOWER position and lower the bucket slightly.

3) Repeat the above operation several times and gradually increase the amount you move the lift cylinders.

4) Repeat Steps 1) - 3) for the bucket control lever to warm up the work equipment circuit.

★ Run the engine with the throttle at the 1/3 position or below.

OPERATION

- 5) Raise the bucket 10 - 30 cm (3.7 - 11.8 in) from the ground, operate the bucket control lever to the tilt position, relieve the circuit for approximately 5 seconds, then return the lever to the neutral position and hold it for approximately 2 seconds. Repeat this operation to warm up the work equipment circuit.

★ Raise the engine speed gradually from the idling speed.



WARNING! If the machine is operated suddenly before the warming-up operation is carried out, the work equipment may be damaged. The warming-up operation is also mandatory for safety reasons.

3. Warm up the steering circuit as follows.



WARNING! If this operation is carried out when the oil temperature is still low, even when the steering wheel is turned and stopped, there may be a time lag before the chassis turns or stops. In such cases, carry out the warming-up operation in a large open area. In addition, use the safety bar to ensure safety. In this case, do not relieve the circuit for more than 5 seconds.

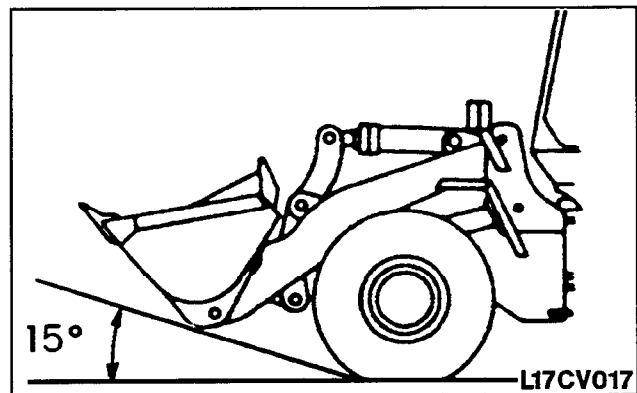
4. Turn the steering wheel slowly to the left and right to warm up the oil inside the steering valve. Repeat this operation about 10 times.

★ Turn the steering wheel a short distance, then stop it, and check that the chassis stops according to the amount the steering wheel is turned.

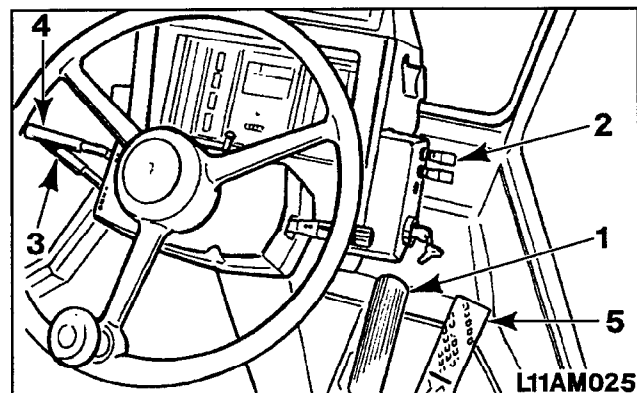
★ The recommended oil for the work equipment hydraulic system depends on the ambient temperature. Select oil according to the table under "LUBRICANTS, FUEL AND COOLANT" in Section 3.

MOVING MACHINE OFF

1. Check that a warning item is not displayed on the monitor panel.
2. Free the work equipment control lever lock for the equipment control levers. Place the work equipment in the traveling position.

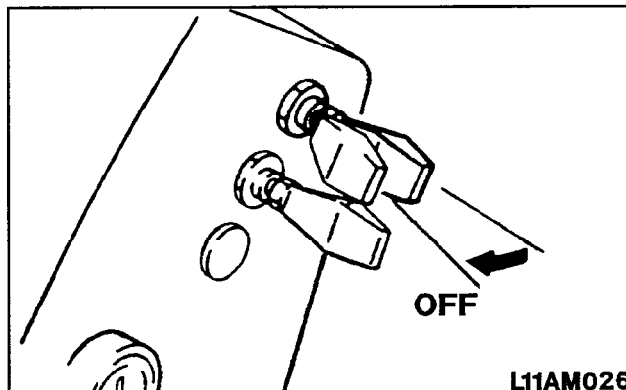


3. Depress right brake pedal (1), and turn parking brake switch (2) to OFF to release the parking brake.




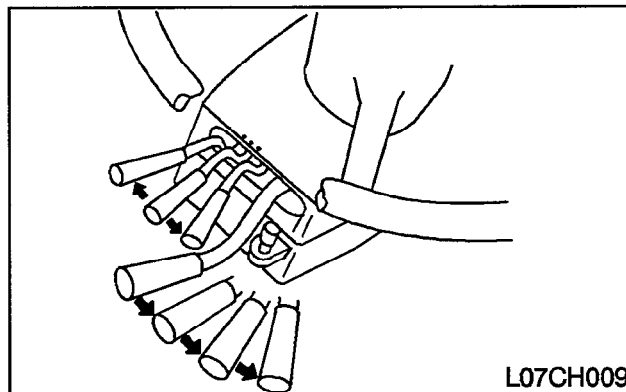
OPERATION

- ★ When the parking brake is applied with parking brake switch (2) put in OFF, put switch (2) to ON and return it to OFF again.



4. Set speed control lever (3) and directional lever (4) to the desired position.
5. Release right brake pedal (1), then depress accelerator pedal (5) to move the machine off.

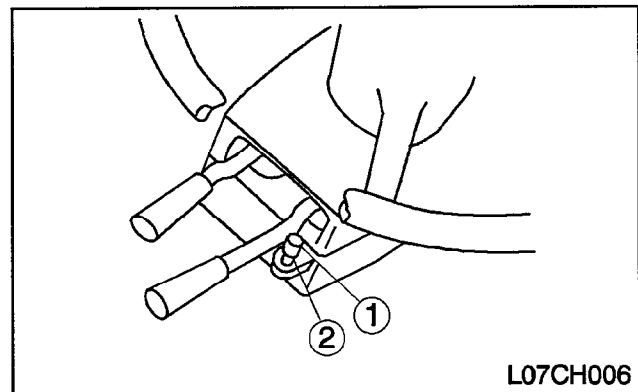
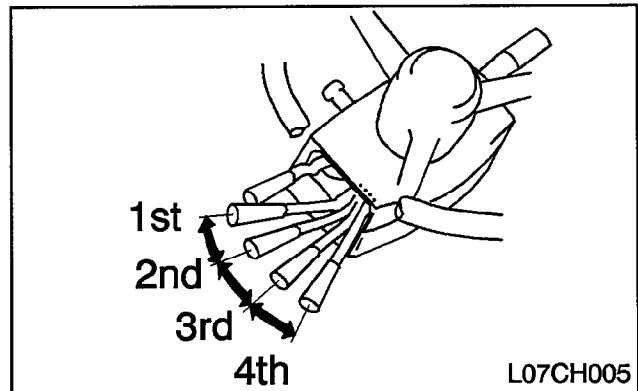
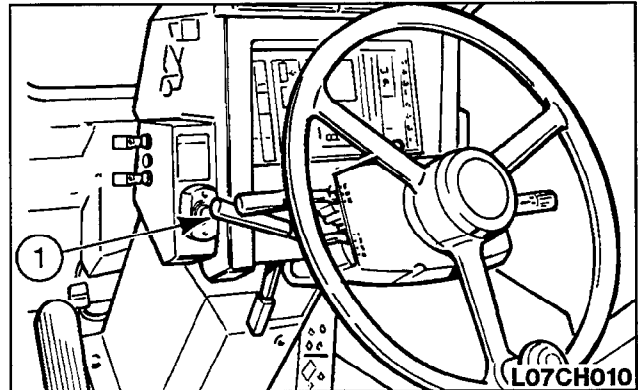
 **WARNING!** If the machine has to be started on a slope, always turn the transmission cut-off selector switch to OFF and depress the left brake pedal. Then depress the accelerator pedal while releasing the left brake pedal to start the machine off slowly.



SHIFTING GEAR

Move speed control lever (1) to the desired position.

- ★ To use 1st or 2nd speeds for digging and loading operations, actuate speed control lever stopper.
- ★ This machine is equipped with a kickdown switch that shifts the gear down to 1st 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 carrying out digging or loading operations in 1st or 2nd gear. For details of use, see "INSTRUMENTS AND CONTROLS".



OPERATION

SHIFTING BETWEEN FORWARD AND REVERSE

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

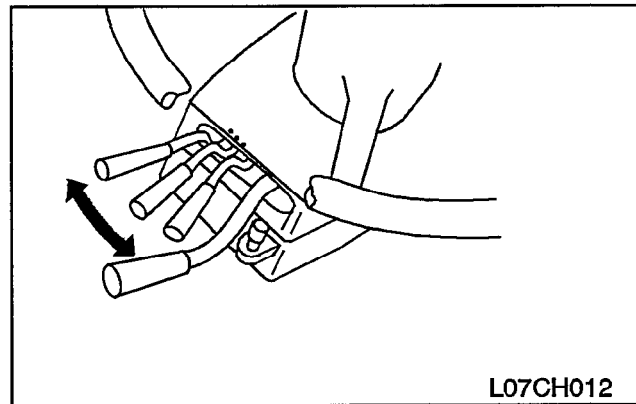
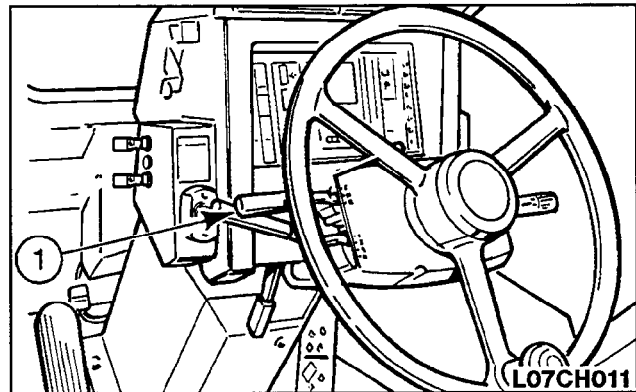
Place directional lever (1) in the desired position.



WARNING! Before changing direction, check that it is safe.



WARNING! Never change between FORWARD and REVERSE at high speed.

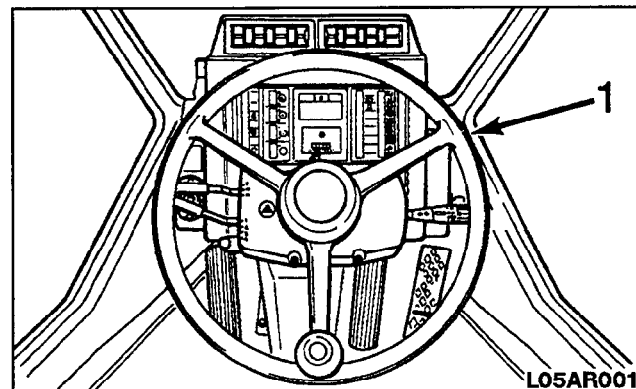


STEERING MACHINE

When traveling, use 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 move 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.



WARNING! It is dangerous to turn the machine suddenly at high speed, or to turn on steep hills.



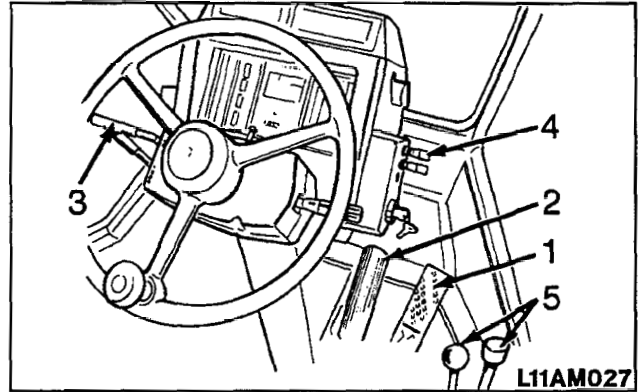
WARNING! If the engine stops when the machine is traveling, the steering cannot be used. This is particularly dangerous on hills, so never stop the engine when the machine is traveling.



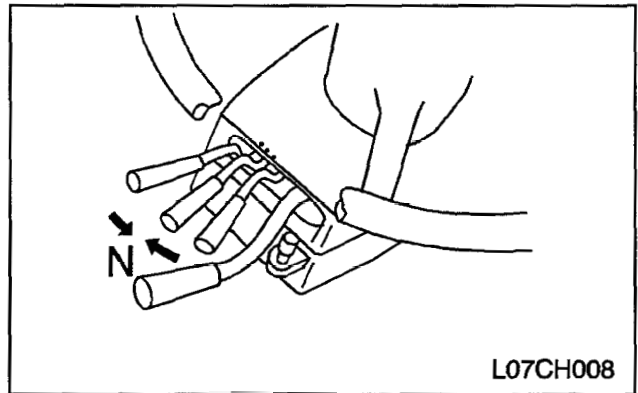
WARNING! If the engine should stop, stop the machine immediately in a safe place.

STOPPING MACHINE

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

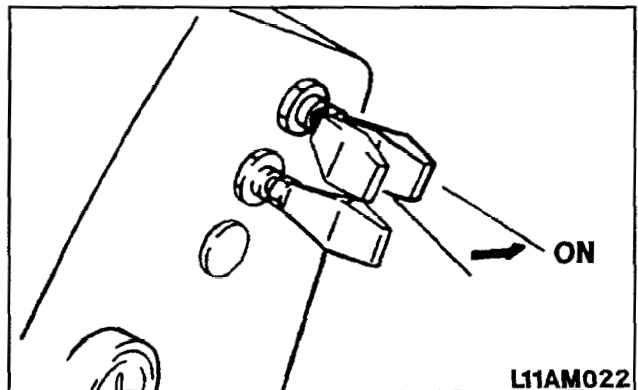


2. Place directional lever (3) in N (neutral).



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

★ When the parking brake is applied, the transmission is automatically returned to neutral.

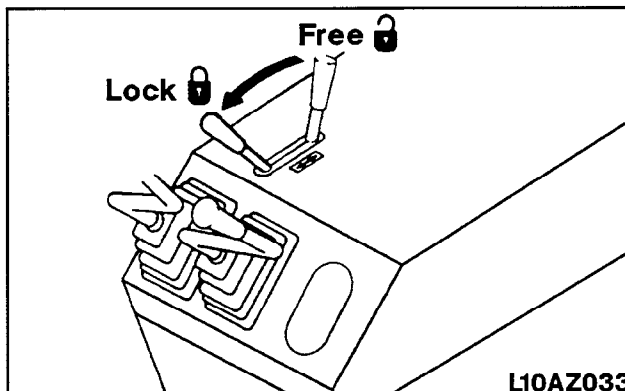


OPERATION

- Operate work equipment levers (5) to lower the bucket to the ground, move work equipment control levers (5) to their HOLD position and then move the control lever lock to the LOCK position.



WARNING! Stop the machine in a safe place on firm level ground. If the machine has to be stopped on a slope, put blocks under the wheels. In addition, dig the bucket into the ground to increase safety.

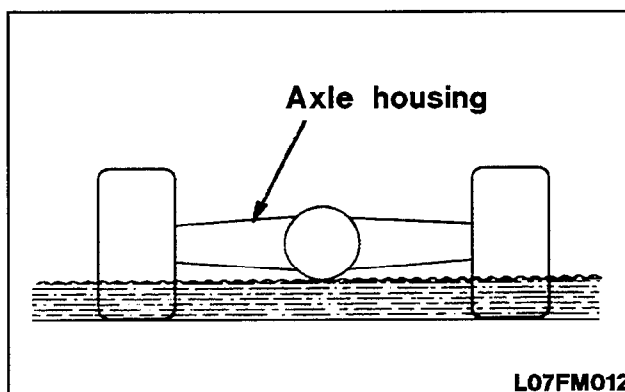


OPERATIONAL PRECAUTIONS

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.



IF WHEEL BRAKES DO NOT WORK

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

WHEN TRAVELING UP OR DOWN SLOPES

Lower Center of Gravity When 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

When driving down a slope, place the transmission speed control lever in a low speed range position to make full use of the engine braking force. When applying the service brakes, depress the right brake pedal. If the service brakes are used too frequently when traveling downhill, the brakes may overheat and damage may result.

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 speed to lower the oil temperature.

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

If Engine Stops

If the engine stops on a slope, depress the right brake pedal fully. 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.

OPERATION

POSSIBLE WORK USING LOADER

Various types of attachments are available to extend the range of application beyond the applications described below.

EXCAVATION

- When loading piled soil or blasted rock, drive the machine forward as follows to load. To prevent cutting of the tires caused by the tires slipping, be careful of the following points during the operation.

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

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

1. When driving the machine forward and lowering the bucket, stop the bucket about 30 cm (0.9 ft) from the ground, then lower it slowly.

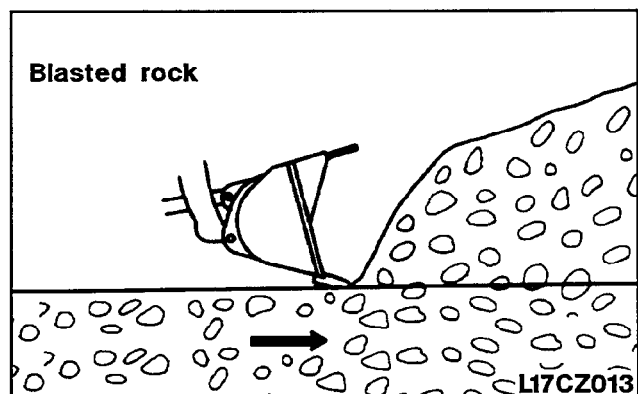
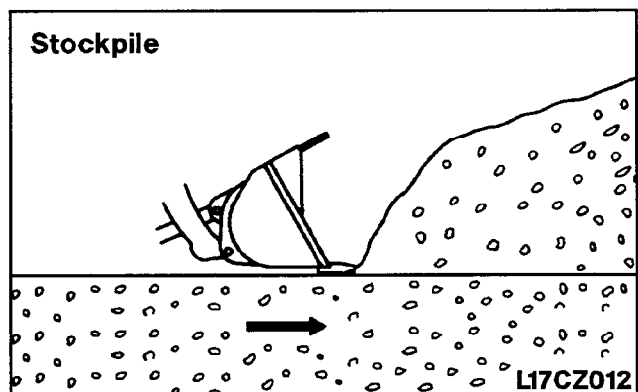
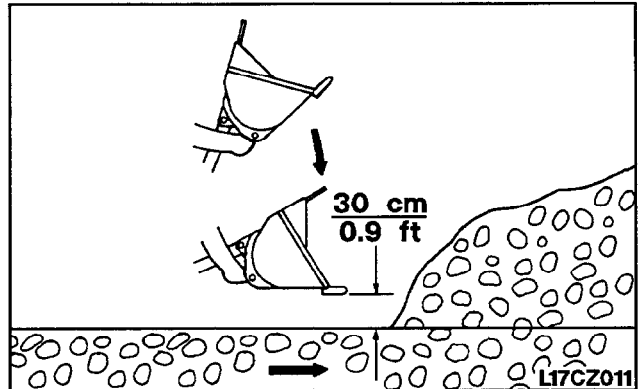
★ If the bucket hits the ground, the front tires will come off the ground, and the tires will slip.

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 tilting slightly down.

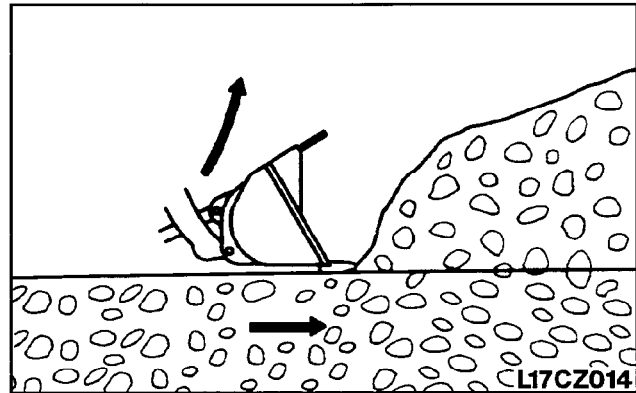
★ Be careful not to get blasted rock under the bucket. This will make the front tires come off the ground and slip.

★ Try to keep the load in the center of the bucket; if the load is on one side of the bucket, the load will be unbalanced.



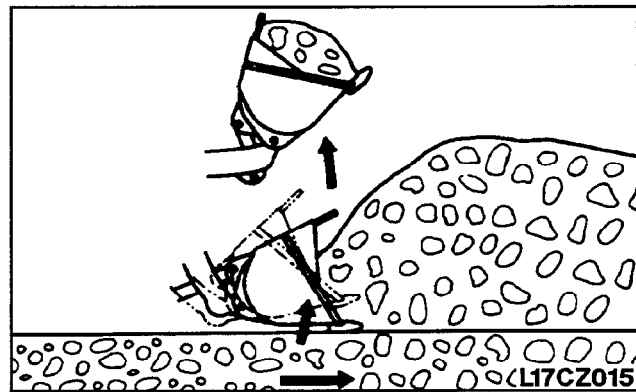
OPERATION

4. At the same time as thrusting the bucket into the material, raise the lift arm to prevent the bucket from going in too far. By raising the lift arm, ample traction will be produced by the front tires.



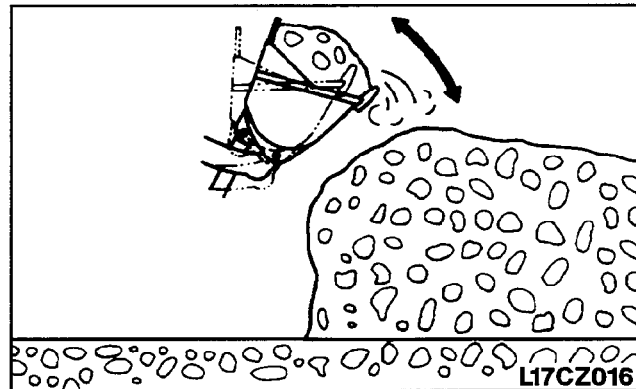
5. Check that there is enough material loaded into the bucket, then operate the bucket control lever to tilt the bucket and load the bucket fully.

- ★ If the bucket edge is moved up and down while pushing in the bucket and digging, the front tires will come off the ground and this will cause the tires to slip.



6. If there is too much material loaded in the bucket, dump and tilt the bucket quickly to remove the excessive load.

This prevents spillage of the load during hauling.

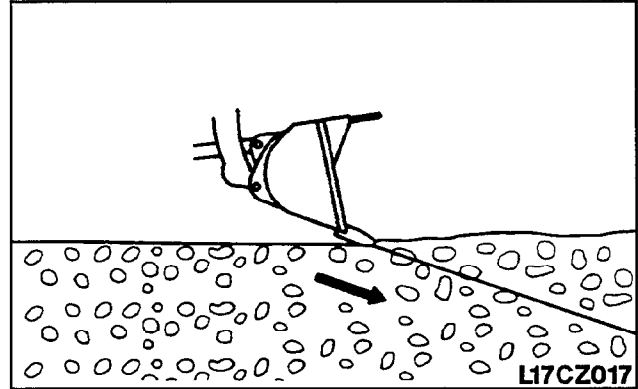


OPERATION

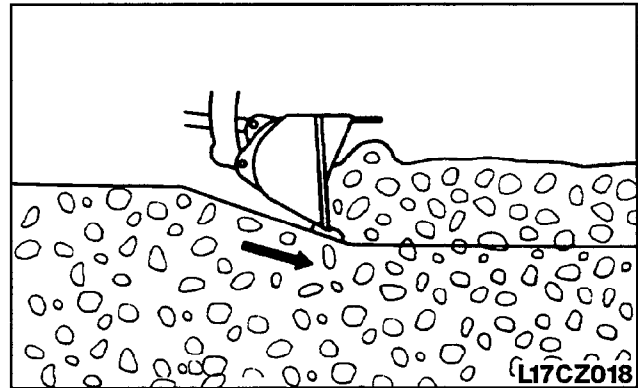
- When digging and loading on level ground, set the bucket edge facing down slightly as follows and drive the machine forward. Always be careful not to load the bucket on one side and cause an unbalanced load.

★ This operation should be carried out in 1st gear.

1. Set the edge of the bucket facing slightly down.



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.

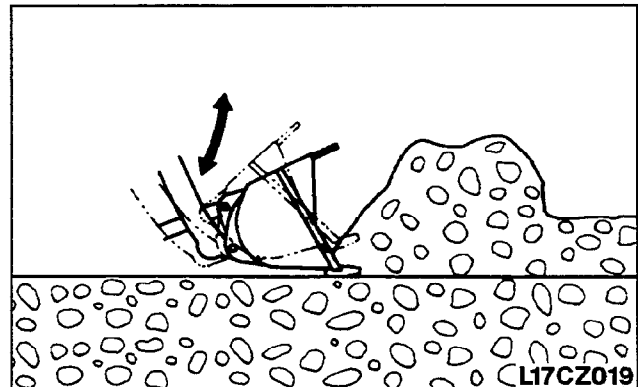


WARNING! Never dig or scoop when the machine is articulated.

Precautions when scooping up materials.

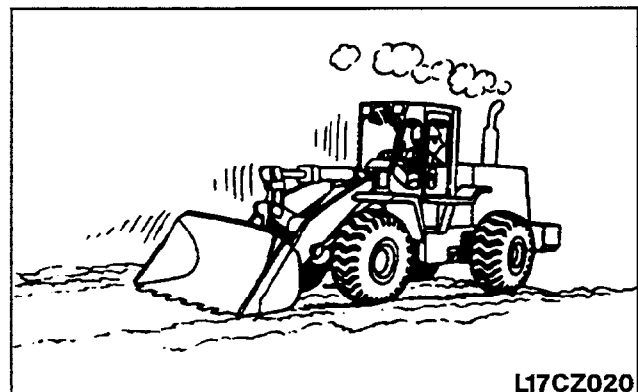
When scooping up materials, be careful not to let the counterweight at the rear touch the ground.

★ Do not allow tires slipping to occur during operation. Tire slippage shortens tire's life.



LEVELING

1. Scoop soil into the bucket. Move the machine backward while spreading soil from the bucket little by little.



2. Go over the spread soil with the bucket teeth touching the ground and level the ground by back-dragging.
3. Scoop some more soil into the bucket, put the lift arm in float, level the bucket at ground level, and smooth the ground by moving backward.

★ Always move the machine backward during leveling operations.

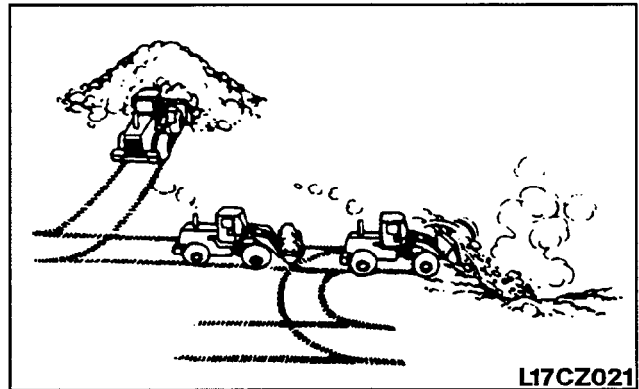
WARNING! If leveling by forward travel can not be avoided, do not dump the bucket beyond 20°. This will prevent quick wear and damage of the work equipment and frame.

LOAD AND CARRY OPERATIONS

Load and carry operation is a series of processes (scooping - carrying - loading to a hopper or glory hole) carried out by the wheel loader.

★ Always maintain the road in good condition.

WARNING! Lower the bucket to bring down the center of gravity when carrying material.



LOADING

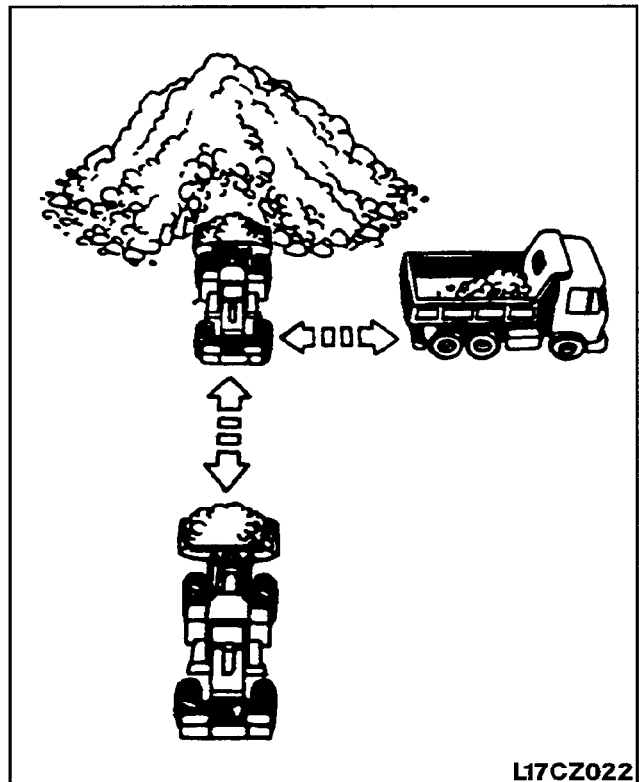
Select and proceed effective operation which avails less turning and the shortest hauling distance according to ground conditions.

Cross Drive Loading

When a wheel loader is operated, the digging should be made at a right angle toward accumulated soil. When the scooping is completed, the machine should be traveled backwards as it is. Then, bring the truck between the accumulated soil and the wheel loader for the purpose of loading upon the dump truck.

WARNING! Provide a flat road free of rocks and hollows. When the boom is raised with the bucket loaded, do not make quick turns or quick braking because it is very dangerous.

WARNING! Do not load the bucket by thrusting into a pile of soil or gravel at high speed because it is dangerous.

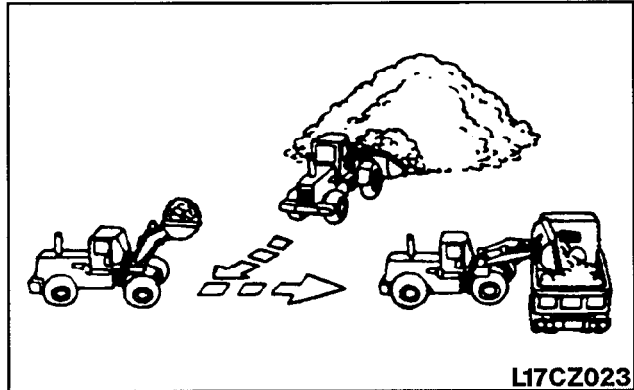


OPERATION

V-Shape Loading

Stop the truck with the angle of about 60° toward the scooping direction of the wheel loader. After scooping the soil, back the wheel loader in such a way that it makes a right angle to the truck. The loading on the truck is made by the wheel loader going forward.

The smaller the turning angle, the higher the efficiency. However, turning of 90° can be made if necessary.



PARKING MACHINE



WARNING! Never leave the machine with the engine running or the bucket raised. When parking the machine, stop the engine, lower the bucket to the ground, place the transmission in neutral (N), apply the parking brake, turn off the electrical starting switch, and remove the key.



WARNING! Park the machine in a non-traffic area. If parking in traffic lanes cannot be avoided, provide appropriate flags, barriers, flares and warning signals. Also provide advance warning signals in the traffic lane for approaching traffic.



WARNING! Avoid parking on a slope because unexpected machine movement may occur. If necessary to park on a slope, park at a right angle to the slope and block the tires.



WARNING! Before starting the engine or when the machine is standing with the engine running: Place the transmission in neutral (N), apply the parking brake, and lower all raised work equipment.

Park machine in an area free of grease and fuel puddles which cause tire deterioration.

Lower hydraulically supported equipment to the ground to avoid unexpected movement and damage possibilities.

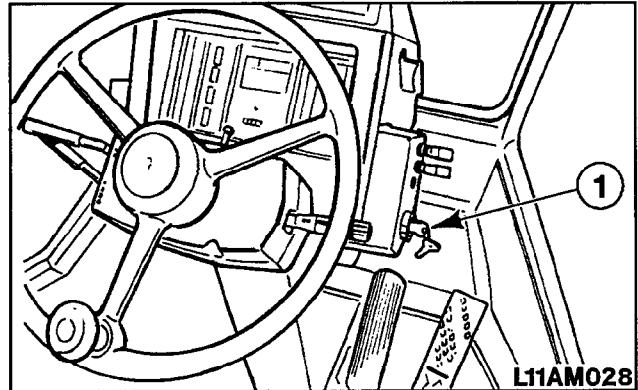
Park on level ground to obtain accurate coolant, lubricant and fuel level checks.



WARNING! Always lock up the machine, including any anti-vandalism attachment, when leaving it unattended.

STOPPING ENGINE

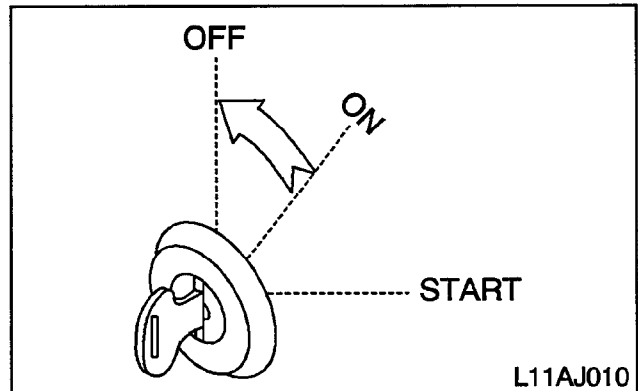
1. Run the engine at low idle speed for about 3 to 5 minutes to allow it to gradually cool down.



2. Turn starting switch (1) to the OFF position and remove the key.

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

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



OPERATIONS AFTER STOPPING ENGINE

1. Walk around the machine and check the work equipment and tires, also check for oil or coolant leakage. If any abnormalities are found, repair them.
2. Fill the fuel tank.
3. Check the engine compartment for foreign matter and debris. If found, remove the matter and/or debris to avoid a possible fire hazard.
4. Remove any mud stuck to the underside of the machine.

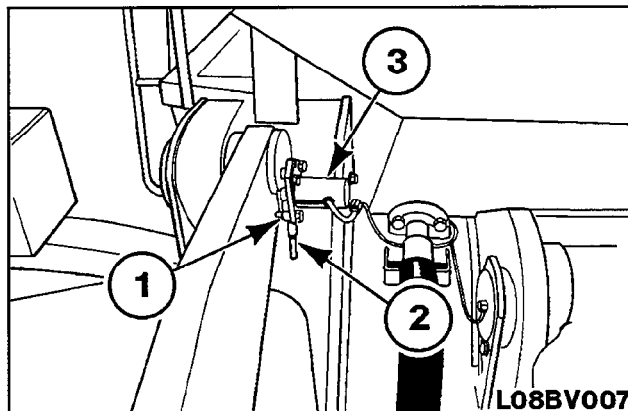
OPERATION

ADJUSTMENT OF WORK EQUIPMENT

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.

ADJUSTING BOOM KICKOUT

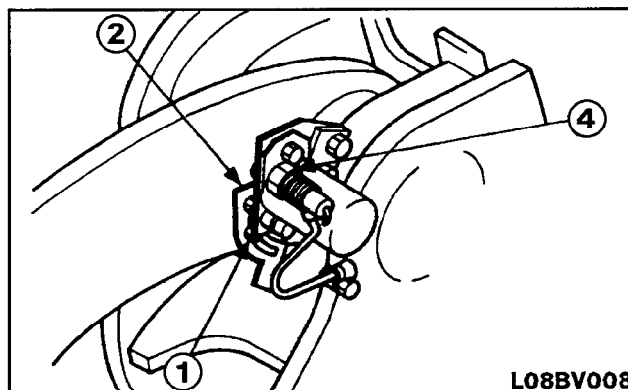
1. Raise the bucket to the desired height, set the lift arm control lever at HOLD and lock the lever in position. Then stop the engine and adjust as follows.
2. Loosen two bolts (1), and adjust plate (2) so that the bottom edge is in line with the center of the sensing surface of the proximity switch under switch cover (3). Then tighten the bolts to hold the plate in position.



3. Loosen the two nuts (4) and adjust to make a clearance of 3 - 5 mm (0.12 - 0.20 in) between plate (2) and the sensing surface of the proximity switch under switch cover (3). Then tighten the nuts to hold the switch in position.

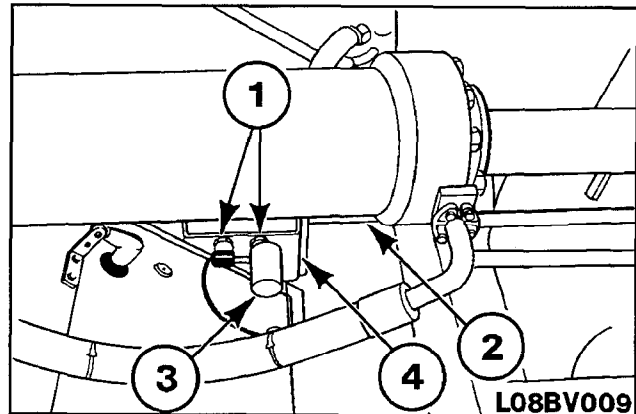
★ Tightening torque: 1.75 ± 0.25 kgm (12.7 ± 1.8 lbf ft / 17.2 ± 2.4 N•m)

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



ADJUSTING BUCKET POSITIONER

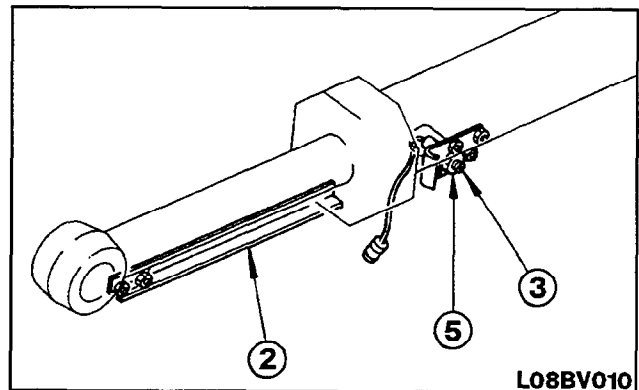
1. Lower the bucket to the ground and adjust the bucket to the desired digging angle. Set the bucket control lever at HOLD, stop the engine and adjust as follows.
2. Loosen two bolts (1) and adjust mounting bracket (4) of the proximity switch so that the rear tip of angle (2) is in line with the center of the sensing surface of the proximity switch under switch cover (3). Then tighten the bolts to hold the bracket in position.



3. Loosen the two nuts (5) and adjust to make a clearance of 3 - 5 mm (0.12 - 0.20 in) between angle (2) and the sensing surface of the proximity switch under switch cover (3). Then tighten the nuts to hold in position.

★ Tightening torque: 1.75 ± 0.25 kgm (12.7 ± 1.8 lbf ft / 17.2 ± 2.4 N•m)

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

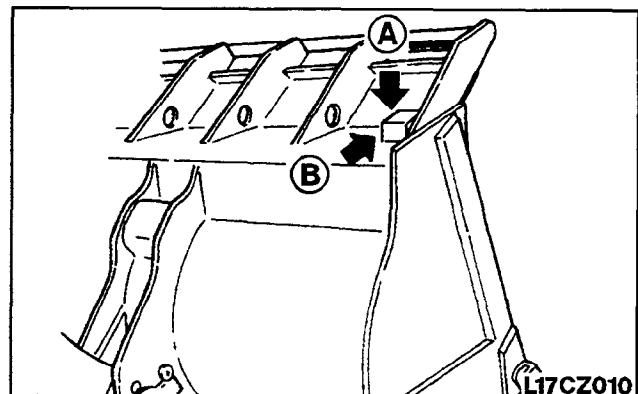


BUCKET LEVEL INDICATOR

Surfaces (A) and (B) at the top rear of the bucket are the level indicators, so the bucket angle can be checked during operations.

Surface A: Parallel with cutting edge

Surface B: 90° to cutting edge



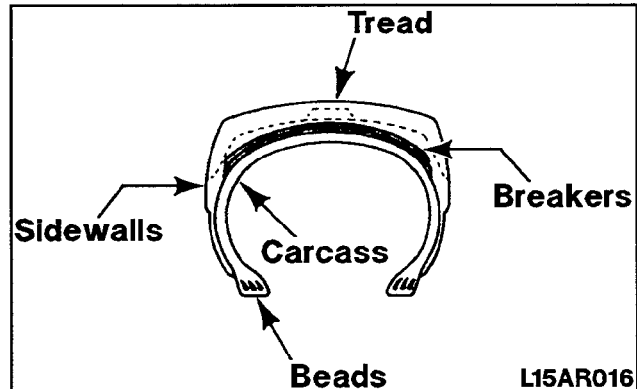
OPERATION

HANDLING TIRES

PRECAUTIONS WHEN HANDLING TIRES

If the following defects are found in tires, for safety reasons the tire should be replaced with a new tire.

- Bead wire is broken or bent, or the tire is greatly deformed.
- Wear is excessive and the carcass ply (excluding breaker) is exposed for more than 1/4 of the circumference.
- Damage to the carcass exceeds 1/3 of the tire width.
- Tire layers are separated.
- Radial cracks reach the carcass.
- Deformation or damage which makes the tire unsuitable for use.



PRECAUTIONS WHEN DRIVING MACHINE

When the machine travels at high speed for a long distance, the tires become extremely hot. This causes early wear of the tires, so it should be avoided as far as possible. If the machine must be driven for a long distance, take the following precautions.

- Follow the regulations related to this machine, and drive carefully.
- The most suitable tire pressure, travel speed, or tire type differs 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: 3.5 kg/cm² (49.8 psi / 343.4 kPa)

Speed: 19 km/h (11.8 mph)

- Check the tire pressure before starting, when the tire is 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 calcium chloride or dry ballast in the tires when traveling.

NORMAL OPERATING INFLATION PRESSURE

Measure the tire pressure before starting operations, when the tires are cool.

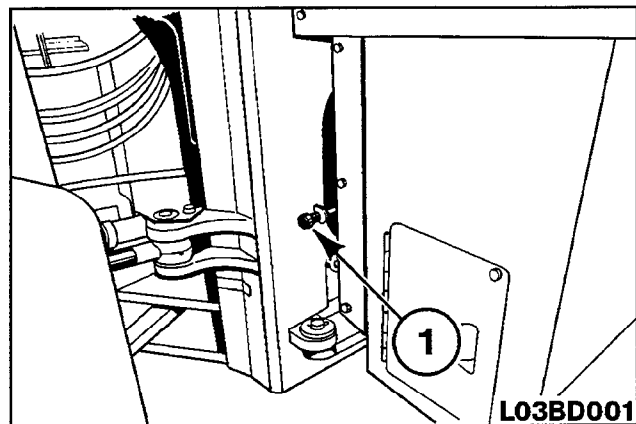
If the inflation pressure is too low, it causes overload on the tires; if the inflation pressure is too high, the tire may be cut or may burst under shock. Therefore adjust the inflation pressure to the values in the following table.

Tire Size and Type	Inflation Pressure			
	When Shipped From Factory	Soft or Sandy Ground	Normal Ground	
			Stockpiling	Digging
26.5 x 25 - 20 ply L3	Front 4.5 kg/cm ² (64.0 psi) Rear 3.5 kg/cm ² (49.8 psi)	3.0 - 4.0 kg/cm ² (42.7 - 56.9 psi)	3.5 - 4.5 kg/cm ² (49.8 - 64.0 psi)	3.5 - 4.5 kg/cm ² (49.8 - 64.0 psi)
26.5 x 25 - 20 ply L4				
26.5 x R25 XHAT1 L3	Front 4.5 kg/cm ² (64.0 psi) Rear 3.5 kg/cm ² (49.8 psi)	3.0 - 4.0 kg/cm ² (42.7 - 56.9 psi)	3.5 - 4.5 kg/cm ² (49.8 - 64.0 psi)	3.5 - 4.5 kg/cm ² (49.8 - 64.0 psi)
26.5 x R25 XRD1AT1 L4				
29.5 x 25 - 22 ply L3	Front 4.5 kg/cm ² (64.0 psi) Rear 3.5 kg/cm ² (49.8 psi)	3.0 - 4.0 kg/cm ² (42.7 - 56.9 psi)	3.5 - 4.5 kg/cm ² (49.8 - 64.0 psi)	3.5 - 4.5 kg/cm ² (49.8 - 64.0 psi)
29.5 x 25 - 22 ply L4				
29.5 x 25 - 22 ply L5				
29.5 x R25 XHAT1 L3	Front 4.5 kg/cm ² (64.0 psi) Rear 3.5 kg/cm ² (49.8 psi)	3.0 - 4.0 kg/cm ² (42.7 - 56.9 psi)	3.5 - 4.5 kg/cm ² (49.8 - 64.0 psi)	3.5 - 4.5 kg/cm ² (49.8 - 64.0 psi)
29.5 x R25 XRD2AT1 L5				

INFLATING TIRES

Connect an air hose to air supply coupling (1) to inflate the tires.

- For operations on normal road surfaces, rock digging operations ... High end of range in inflation pressure chart
- Stockpile operations on soft ground ... Average pressure in inflation pressure chart
- Operations on sand and operations not using much digging force ... Low end of range in inflation pressure chart



OPERATION

If the deflection of the tire is excessive, raise the inflation pressure within the limits given in the table to give a suitable deflection. See deflection ratio.

★ Stockpile operations mean the loading of sand and other loose materials.

★ Deflection ratio (deflection/free height)

$$= \frac{H - h}{H} \times 100$$

H: Free height

h: Height when loaded

As a guide for visual checks, the deflection ratio (deflection/free height) of the front tires should be as follows.

Normal loading and carrying operations (lift arm horizontal): approximately 15 - 25%

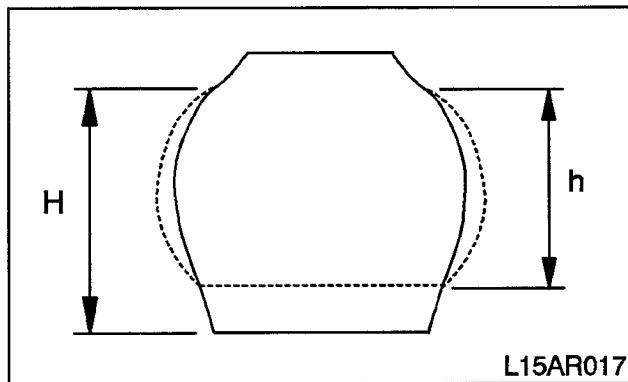
Digging operations (rear wheels off ground): approximately 25 - 35%

★ When checking the tire pressure, check also for small cracks and damage, and for wire or small pieces of metal which may cause punctures. Check also for abnormal wear.

★ Operating costs can be reduced and tire life increased by keeping the operating area in good condition and free from fallen rocks.

★ Precautions when carrying out load and carry operations

When traveling continuously for load and carry operations, select tires to match the various ground conditions, or select ground conditions to match the tires. If this is not done, the tires will be damaged, so consult your distributor or tire dealer.



PROPER BUCKET AND TIRE SELECTION TABLE

Select the most suitable bucket and tires for the type of work and the ground conditions on the jobsite.

Type of Work	Bucket Type	Ground Conditions	Tire Type
<ul style="list-style-type: none"> ● Loading materials ● Loading & carrying materials 	General purpose bucket 4.3 m ³ (5.6 yd ³)	General ground conditions	26.5 x 25 - 20 ply L3
		Leveled ground	26.5 x 25 - 20 ply L4
		Hard ground	26.5 x R25 XHAT1 L3 26.5 x R25 XRD1AT1 L4
<ul style="list-style-type: none"> ● Loading materials & blasted rock 	Excavating bucket 4.0 m ³ (5.2 yd ³)	General ground conditions	26.5 x 25 - 20 ply L3
		Hard ground	26.5 x 25 - 20 ply L4 26.5 x R25 XHAT1 L3 26.5 x R25 XRD1AT1 L4
<ul style="list-style-type: none"> ● Loading blasted rock 	Excavating bucket 4.0 m ³ (5.2 yd ³)	General ground conditions	26.5 x 25 - 20 ply L3
		Hard ground	26.5 x 25 - 20 ply L4
	Spade nose rock bucket 4.0 m ³ (5.2 yd ³)	Ground with many boulders	26.5 x R25 XHAT1 L3 26.5 x R25 XRD1AT1 L4
		Soft ground with many boulders	29.5 x 25 - 22 ply L3 29.5 x 25 - 22 ply L4 29.5 x 25 - 22 ply L5 29.5 x R25 XHAT1 L3 29.5 x R25 XRD2AT1 L5
<ul style="list-style-type: none"> ● Loading & carrying blasted rock 	Spade nose rock bucket 4.0 m ³ (5.2 yd ³)	General ground conditions	26.5 x 25 - 20 ply L3
		Hard ground	26.5 x 25 - 20 ply L4
		Ground with many rocks	26.5 x R25 XHAT1 L3
			26.5 x R25 XRD1AT1 L4
		Soft ground with many rocks	26.5 x R25 XRD1AT1 L4
Soft ground	26.5 x 25 - 20 ply L3 26.5 x 25 - 20 ply L4 26.5 x 25 - 20 ply L5 26.5 x R25 XHAT1 L3 26.5 x R25 XRD2AT1 L5		

OPERATION

TOWING

TOWING THE MACHINE

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



WARNING! If there is a failure in the brake line, the brakes cannot be used, so be extremely careful when towing.

WHEN ENGINE CAN BE USED

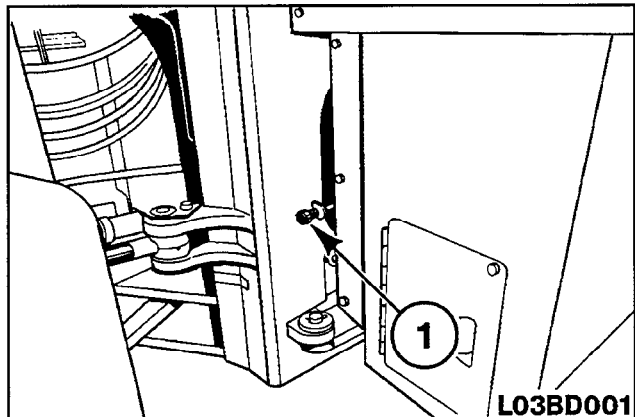
- Always keep the engine running when towing the machine, so that the steering and braking can be used.

WHEN ENGINE CANNOT BE USED

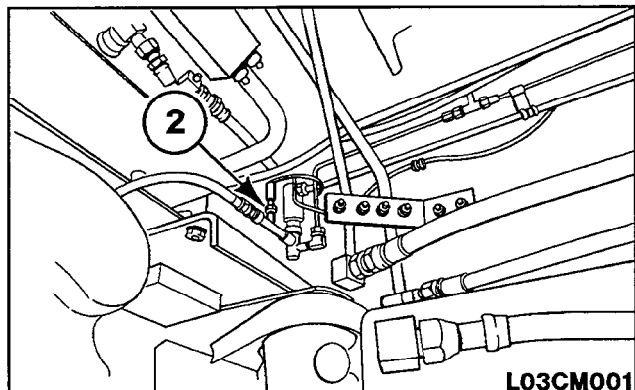
- No lubrication oil flows in the transmission, so disconnect the front and rear drive shafts before moving the machine.
- The steering cannot be used, so disconnect the steering cylinders and steering linkage.
- ★ The machine should be towed only to the nearest place for inspection and maintenance. Do not tow the machine for long distances.
- ★ If leakage in the air circuit has caused the pressure inside the air tank to drop, the parking brake will be applied. When towing the machine, release the parking brake.

RELEASING PARKING BRAKE

1. Remove air supply coupling (1) installed on the front left area of the rear frame.



2. Remove nipple (2) from the parking brake solenoid valve on the right side of the front frame and install the air supply coupling removed in Step 1.
3. Install the air charge hose for the tire to the air supply coupling.





WARNING! If there is a failure in the air circuit, the brakes cannot be used. This is dangerous, so always tow the machine at low speed. Keep the engine running so that the steering can be used.

4. Push the end of the hose on the tire valve, and air will be supplied to the brake spring cylinder to release the brake.
5. When the parking brake is released, remove the air charge hose. Tow the machine immediately to a safe place.



WARNING! Stop the machine on a flat surface when releasing the parking brake, 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.

TRANSPORTATION

When transporting the machine, observe the various road rules, road transportation vehicle laws and vehicle limit ordinances, etc. It is a good idea to obtain a special platform for loading and unloading the machine. When it is unavoidably necessary to use a gangplank, however, at the very least observe the following for the sake of safety.

1. Properly apply the brakes on the trailer and insert blocks beneath the tires to ensure that it does not move. The fix the gangplank in line with the centers of the trailer and the machine.

★ Make sure the gangplank has sufficient width, length and thickness to enable the machine to be safely loaded and unloaded.

If the gangplank sags appreciably, reinforce it with blocks, etc.

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

★ When transmission cut-off switch is put in OFF, the left brake pedal and accelerator pedal are operated at the same time.



WARNING! Remove the mud from the undercarriage to prevent the machine from slipping to the side on slopes.



WARNING! Do not on any account change the direction of the machine while it is on the gangplank. To change the direction of the machine, first take it down from the gangplank.

3. Correctly load the machine onto the specified part of the trailer.
 4. Lower the bucket and lock the work equipment control levers using the control lever lock.
 5. Lock the front and rear frames with the frame locking bar.
 6. When transporting the machine, place blocks against the front and rear tires to prevent the machine from moving about. Also, hold it down with chains or wire ropes.
- ★ Determine the route for transporting the machine by taking into account the width, height and weight of the machine.



WARNING! When loading the machine, park the trailer on a flat, firm roadbed. Keep a fairly long distance between the road shoulder and the machine.

OPERATION

COLD WEATHER OPERATION

PREPARATION FOR LOW TEMPERATURE

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

FUEL AND LUBRICANTS

Change to fuel and oil with low viscosity for all components. For details of the specified viscosity, see "LUBRICANTS, FUEL AND COOLANT" in Section 3.

COOLANT

- In climates where the temperature is above -37°C (-34°F), use a coolant mixture that contains 50 percent antifreeze. **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.
- ★ DCA4 is recommended for use in the engine.
- ★ Maintain the supplemental coolant additive concentration level between 1 and 2 units of DCA4 per 3.8 l (1 US gal) of coolant.
- ★ For details of changing the coolant, refer to "COOLING SYSTEM" in Section 3.

BATTERY

- As ambient temperature drops, battery capacity will drop, and electrolyte may sometimes freeze if battery charge is low. Maintain battery at a charge level of approximately 100% and insulate it against cold temperature so that machine can be easily started.
- ★ Measure specific gravity of fluid and obtain rate of charge from the following conversion table:

Rate of Charge	Temperature of Fluid				
	+20°C (+68°F)	0°C (+32°F)	-10°C (+14°F)	-20°C (-4°F)	-30°C (-22°F)
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

- ★ When the electrolyte level is low, add distilled water in the morning before work instead of after the day's work. This is to prevent the fluid from freezing at night.



WARNING! To avoid gas explosions, do not bring fire or sparks near the battery.



WARNING! If the electrolyte gets on your skin or clothes, immediately wash with plenty of clean water.

CAUTIONS AFTER COMPLETION OF WORK

1. Mud and water on the machine body should be completely removed. Park the machine on concrete or hard ground. If this is impossible, park the machine on wooden boards. This will prevent the tires from freezing to the ground thereby preventing machine movement the next morning. Particular attention should be given to water drops collected on the surface of the hydraulic cylinder piston rods. Such droplets must be fully wiped off because if water is frozen to the rod when the cylinder is utilized, the cylinder oil seals may be damaged.
2. Completely drain the air tanks and drain the water from the fuel system to prevent the possibility of such water from freezing at night.
3. As battery capacity drops at low ambient temperature, cover the battery or remove it from the machine to be kept warm at night.

AFTER COLD WEATHER

When the weather becomes warm, the following procedure must be performed:

- Replace the lubricating oils for the various units with the ones specified for warm weather use. For details, refer to "LUBRICANTS, FUEL AND COOLANT" in Section 3.

OPERATION

LONG TERM STORAGE

BEFORE STORAGE

To place the machine in storage for an extended period of time, the following measures must be taken to insure that it can be returned to operation with a minimum of service.

- After every part is washed and dried, the machine shall be housed in a dry building. Never leave it outdoors.
If it is unavoidable to leave it outdoors, park the machine on flat ground and cover it with canvas, etc.
- Completely fill the fuel tank, lubricate and change oil before storage.
- Apply a thin coat of grease to the metal surfaces of the hydraulic cylinder piston rods and splined shafts.
- Disconnect the negative terminals of the batteries and cover the batteries or remove them from the machine and store them separately.
- Set each control lever to neutral or hold position, lock them and apply the parking brake.
- Open the air tank drain valves to completely drain the tanks. After draining, close the drain valves.
- ★ If the engine will be out of service longer than six (6) months, take special precautions to prevent rust. Contact the nearest Cummins Authorized Repair Location for information concerning engine storage procedures.

DURING STORAGE



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

- Operate the engine and move the machine for a short distance once a month so the new oil film will be coated over movable parts and component surfaces.
- Before operating the work equipment, wipe off the grease on the hydraulic cylinder piston rods.

AFTER STORAGE

NOTICE: If the machine is stored without carrying out the monthly rust prevention operation, request your distributor for service.

Carry out the following procedure when taking the machine out of long-term storage.

- Wipe off the grease on the hydraulic cylinder piston rods.
- Completely fill the fuel tank, lubricate and add oil.

HANDLING OF BATTERY

PRECAUTIONS FOR CHARGING BATTERY

1. Before charging, disconnect the cable from the negative (-) terminal of the battery. Otherwise, an unusually high voltage will damage the alternator.
2. While charging the battery, remove all battery caps for satisfactory ventilation.



WARNING! To avoid gas explosions, do not bring fire or sparks near the battery.

3. If the electrolyte temperature exceeds 45°C (113°F), stop charging for a while.
4. Turn off the charger as soon as the battery is charged.

Overcharging the battery may cause the following:

- 1) Overheating the battery
 - 2) Decreasing the quantity of electrolyte.
 - 3) Damaging the electrode plates.
5. If the electrolyte gets on your skin or clothes, immediately wash with plenty of clean water.
 6. Do not mix up battery cables; positive (+) to negative (-) or negative (-) to positive (+), as this will damage the alternator.
 7. When inspecting or servicing a battery, be sure to stop the engine and turn the starting switch key to "OFF" position.
 8. When performing any service to battery besides checking the electrolyte level or measuring the specific gravity or voltage reading, disconnect the cables from the battery.

REMOVAL AND INSTALLATION OF BATTERY

- When removing the battery, first disconnect the cable from the ground; normally, from the negative (-) terminal.



WARNING! If a tool touches a connected positive (+) cable terminal and the chassis, there is danger that it will cause sparks.

- When installing the battery, connect the positive (+) cable first and connect the negative (-) or ground cable to the ground terminal last.
- Batteries are mounted on both sides of the machine, just in front of the counterweight. The ground cable is connected to the battery, located on the right side.

OPERATION

STARTING ENGINE WITH BOOSTER CABLES

When starting the engine with booster cables, do as follows:



WARNING! Be sure to follow all related safety precautions listed in Section 1.

BEFORE CONNECTING BOOSTER CABLES

1. The size of the booster cable and clamp should be suitable for the battery size.
2. Check booster cables and clamps for damage or corrosion.
3. Make sure that the cables and clamps are firmly connected.
4. Keep the starting switch in the "OFF" position.
5. The battery of the normal machine must be the same capacity as that of the engine to be started.

CONNECTING BOOSTER CABLES

Connect the booster cables in the following manner.

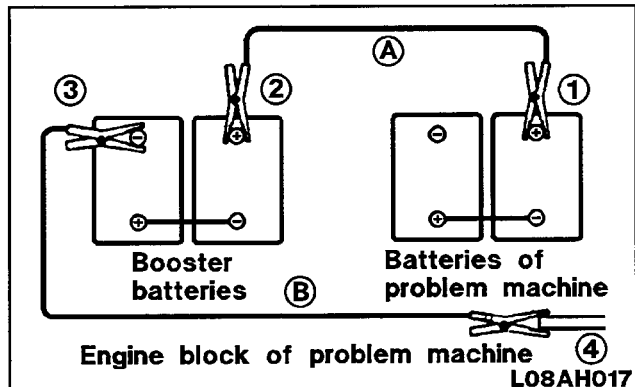


WARNING! When connecting the cables, never contact the positive (+) and negative (-) terminals.



WARNING! Make sure that the booster cable connections are correct. Connect the booster cable to the engine block as far as possible from the battery.

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



- ★ Make sure the cable clamps are firmly connected to the battery terminals.

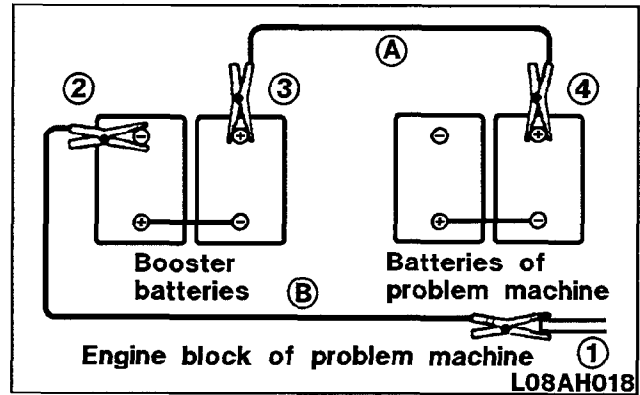
STARTING ENGINE

1. Start the engine of the normal machine and run the engine above low idle speed.
2. Start the engine of the problem machine as outlined under "STARTING ENGINE".

DISCONNECTING BOOSTER CABLES

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

1. Disconnect the clamp of booster cable (B) from the engine block of the problem machine.
2. Disconnect the other clamp of booster cable (B) from the negative (-) battery terminal of the normal machine.
3. Disconnect the clamp of booster cable (A) from the positive (+) battery terminal of the normal machine.
4. Disconnect the other clamp of booster cable (A) from the positive (+) battery terminal of the problem machine.



OPERATION

TROUBLESHOOTING

This guide is not intended to cover all conditions, however many of the more common possibilities are listed.

- In cases of abnormalities or causes which are not listed below, contact your distributor.

ELECTRICAL SYSTEM

Lamp does not glow brightly even when engine runs at high speed.

Lamp flickers while engine runs.

- Check for loose terminals and open-circuit wiring.
- Adjust belt tension.

Charge monitor does not go out even when engine runs at high speed.

- Repair or place the alternator.
- Inspect and repair wiring.

Unusual noise is emitted from the alternator.

- Repair or replace the alternator.

Cranking motor does not turn when starting switch is turned on.

- Inspect and repair the wiring.
- Charge the batteries.

The pinion of the cranking motor keeps going in and out.

- Charge the batteries.

Cranking motor turns the engine sluggishly.

- Charge the batteries.
- Replace the cranking motor.

The cranking motor disengages before the engine starts up

- Check and repair the wiring.
- Charge the batteries.

The engine oil pressure monitor does not light up when engine is stationary and when the starting switch is in ON position.

- Replace the monitor.
- Replace the monitor sensor.
- Inspect and repair the wiring.

Charge monitor does not light up when the engine is stationary and when the starting switch is in ON position.

- Replace the monitor.
- Inspect and repair the wiring.

ENGINE

The engine oil pressure monitor flashes when engine speed is raised after completion of warm-up.

- Add the oil to the specified level.
- Replace the oil filters.
- Check oil leakage from the pipe or the joint.
- Replace the monitor.

Steam is emitted from the top of the radiator at the pressure valve.

The engine coolant temperature monitor flashes.

- Supply the coolant and check for leakage.
- Adjust fan belt tension.
- Clean and flush inside of cooling system.
- Clean or repair radiator core fins.
- Replace engine thermostat.
- Tighten the radiator cap firmly or replace the cap if it has a faulty gasket.
- Replace the monitor.

The engine does not start when the cranking motor is turned over.

- Add fuel.
- Repair where air is leaking into fuel system.
- Replace the injection pump or the nozzle.
- Check engine valve clearance.
- Check engine compression pressure.
- Refer to section for ELECTRICAL SYSTEM.

Exhaust gas is white or blue.

- Adjust to specified oil quantity.
- Replace with specified fuel.

Exhaust gas occasionally turns black.

- Clean or replace the air cleaner element.
- Replace the nozzle.
- Check engine compression pressure.
- Clean and replace turbocharger.

Combustion noise occasionally changes to breathing sound.

- Replace the nozzle.

Unusual combustion noise or mechanical noise.

- Replace with specified fuel.
- Check over-heating.
- Replace the muffler.
- Adjust valve clearance.

CHASSIS

TRANSMISSION

Engine is running but machine will not move.

- Release parking brake.
- Put directional lever in position properly.
- Add oil to transmission case to the specified level.

Even at full throttle, machine moves slowly and lacks power.

- Add oil to transmission case to the specified level.
- Disassemble transmission strainer and clean.

Oil overheats.

- Add oil to transmission case to the specified level or drain oil.
- Use a suitable gear speed.
- Reduce time using torque converter at stall speed.
- Check engine.

Abnormal noise is produced.

- Add oil to transmission case to the specified level.

DRIVE AXLES

Abnormal noise is produced.

- Add oil to axle housing up to proper level.

WHEEL BRAKES

Brakes do not work when pedal is depressed.

- Raise air pressure to specified level.
- Replace discs.
- Add brake oil to the specified level.
- Bleed air from brake system.

Brake drags or stays applied.

- Clean exhaust hole of treadle valve.
- Clean breather of power cluster.
- Check and repair slack adjuster.

Brake slips.

- Replace discs.

PARKING BRAKE

Brake does not work properly.

- Adjust linkage.
- Clean brake pad.
- Replace spring in air cylinder.
- Adjust or replace brake pad.

STEERING

Steering wheel is heavy.

- Adjust steering gear.
- Check linkage, replace parts.

EQUIPMENT HYDRAULIC SYSTEM

Bucket lacks lifting power.

Bucket lifting speed is slow.

- Add oil.
- Replace filter in hydraulic tank.

Many bubbles form in oil.

- Replace with specified oil.
- Add oil.
- Bleed air from oil line.

Oil pressure is too low.

- Add oil and bleed air.

Cylinder vibrates when operating.

- Add oil.

OPERATION

MEMORANDA

SECTION 3

MAINTENANCE



WARNING! REFER TO AND READ ALL
SAFETY PRECAUTIONS IN SECTION 1.

MAINTENANCE

PERIODIC MAINTENANCE

Proper lubrication and maintenance assure trouble-free operation and long machine life. Time and money spent for scheduled periodic maintenance will be amply compensated by prolonged machine operation and reduced operating cost.

All hourly figures given in the following descriptions are based on service meter readings. In practice, however, it is recommended to rearrange all of them into units of days, weeks and months, to make the maintenance schedule more convenient. Under rough jobsite or operating conditions, it is necessary to somewhat shorten the maintenance intervals stated in this manual.

MAINTENANCE GUIDELINES

Perform maintenance work on a hard, flat surface.

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

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

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

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

Be careful of hot coolant 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°-40°C [68°-104°F]) before draining it.

Check for foreign materials in drained oil:

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:

Do not remove the fuel strainer while fueling.

Oil changes:

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 other appropriate control lever to avoid someone who is not aware of the circumstances from starting the engine.

Obey precautions:

During operation, always obey the precautions on the safety product graphics located on the machine.

Welding instructions:

- Turn off the engine starting switch.
- Do not apply more than 200 V continuously.
- Connect grounding cable within 1 m (3.3 ft) from the area to be welded.
- Avoid seals or bearings from being between the area to be welded and the position of the grounding point.

MAINTENANCE

Fire prevention:

Use a nonflammable cleaner or light oil for cleaning parts. Keep flame or cigarette light away from cleaning fluid.

Clamping faces:

When O-rings or gaskets are removed, clean the clamping faces and replace the O-rings and gaskets with new ones. Be sure to properly fit the 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.

Cleaning machine:

- Do not direct a high-pressure jet directly at the radiator.
- Do not splash water on the electrical components.

Pre- and post-work checks:

Before starting work in mud, rain, snow or at the seashore, check plugs and drain valves for tightness. Wash the machine immediately after the work to protect components from rusting. Lubricate components more frequently than usual. Be sure to lubricate work equipment pins daily if they are submerged in water.

Dusty worksites:

When working at dusty worksites, do as follows:

- Check the air cleaner for clogging more frequently. Clean the air cleaner at shorter intervals than specified.
- Clean the radiator core frequently to avoid clogging.
- Replace the fuel filter(s) frequently.
- Clean electrical components, especially the cranking motor and alternator, to avoid accumulation of dust.

Avoid mixing oils:

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

MAINTENANCE

OUTLINES OF SERVICE

LUBRICATION WHEN SHIPPED

- Use genuine oils and grease. Choose oils and grease with proper viscosities specified for the ambient temperature.
- When changing or adding oil, do not use a different type of oil.
- Unless otherwise specified, the oils, grease, fuel and coolant used at the time of shipment from the factory are as shown in the table below.

COMPARTMENT	LUBRICANT
Engine	Engine oil SAE 15W-40 API classification CF-4 or CG-4
Torque converter, Transmission, Transfer case & Oil cooler	Engine oil SAE 30W API classification CE
Service brakes	Engine oil SAE 10W API classification CE
Hydraulic system	Engine oil SAE 10W API classification CE
Drive axles - Front & rear	Axle oil - See NOTE
Lubrication fittings	No. 2 multi-purpose lithium grease with 3% molybdenum disulfide
Fuel tank	Diesel fuel ASTM D975 Grade No. 2-D or ASTM D975 Grade No. 1 for winter season of October to March
Cooling system	Coolant mixture of water, ethylene glycol antifreeze, & supplemental coolant additive

NOTE: For axle oil, one of the following oils was used:

SHELL:	DONAX TT or TD
CALTEX:	RPM TRACTOR HYDRAULIC FLUID
CHEVRON:	TRACTOR HYDRAULIC FLUID
TEXACO:	TDH OIL
MOBIL:	MOBIL AND SUPER UNIVERSAL

RELATING TO ENGINE

ENGINE OIL

- Engine oil is critical because it lubricates the engine, the heart of the machine.
- Main services relating to engine oil are: 1) daily check of oil level, 2) check for contamination and 3) periodic replacement.

COOLANT

- Coolant is used to cool the engine and to keep it in good working condition.
- Check coolant level in the radiator daily and maintain it at the proper level.
- For coolant recommendations/specifications, refer to "COOLANT" under "LUBRICANTS, FUEL AND COOLANT".

DIESEL FUEL

- Always use the fuel specified for the engine. Fuels other than the specifications can damage the engine or reduce the engine output.
- Always fill the fuel tank at the end of the day's operation.
- When adding fuel, be careful not to let any water on top of the drum or at the bottom of the drum get into the fuel.
- After the machine has run out of fuel or after the fuel filter has been replaced, bleed the air from the fuel line.

RELATING TO HYDRAULIC SYSTEM

- Use extreme caution when servicing the hydraulic system, because oil in the system soon after the operation is very hot. Also, high pressure is applied in the system not only during but also after the operation.
- Services relating to the hydraulic system are: 1) weekly check of oil level, 2) periodic filter replacement and 3) periodic oil replacement.
- Always bleed the air from the circuit after replacing the filter or changing the hydraulic oil.
- When a item, such as a hose, in the line is disconnected, check O-rings for damage and replace them if necessary.
- If a hydraulic component has been removed or any hydraulic line has been disconnected or removed, bleed the air from the hydraulic tank and system after completion of assembly. Bleed the air from the tank and system as described under "HYDRAULIC TANK" and/or "PPC (PROPORTIONAL PRESSURE CONTROL) CIRCUIT" in the section.

RELATING TO ELECTRICAL SYSTEM

- If the wiring gets wet or the insulation is damaged, the electrical system leaks and this could result in hazardous malfunction of the machine.
- Services relating to the electrical system are: 1) check fan belt tension, 2) check for damage or wear of the fan belt and 3) check the battery electrolyte level.
- Never remove or disassemble any electrical components installed on the machine.
- Never install any electrical components other than those specified by Komatsu America International Company.
- Be careful to keep the electrical system free of water when washing the machine or when it rains.
- When working on the seashore, carefully clean the electrical system to prevent corrosion.
- Never connect any optional power source to the fuse, starting switch, battery relay, etc.

MAINTENANCE

RELATING TO LUBRICATION

- Lubrication is to help smooth operation of the machine and work equipment. It prevents the machinery from being subjected to excessive load and from getting caught or generating noise. There are two lubricating methods; using oil and using grease.
- Services relating to lubrication are: 1) check of oil levels, 2) periodic changing of oil and 3) adding grease for proper lubrication.
- The machine has grease fittings in various places. Some of the fittings may not be mentioned in this manual. These fittings are equipped for the overhaul purpose, and no greasing is required for them.
- Always use only the lubricants specified under "LUBRICANTS, FUEL AND COOLANT".
- After adding new grease, wipe off old grease that was forced out, especially on rotating parts that could be worn by sand and dirt adhering to them.
- Maintain oil at the proper level. Both too high and too low oil levels are not good for the machine.

WEAR PARTS REPLACEMENT

Wear parts such as filters, filter elements, cutting edge, etc. are to be replaced at the time of scheduled maintenance or before their functional and serviceable limits.

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

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

Part Description	Quantity	Replacement Interval
Engine lubricating oil filter	1	Every 250 hours service
Fuel filters	1	Every 250 hours service
Coolant filter	1	Every 250 hours service
Transmission oil filter element	*	Every 500 hours service
Hydraulic tank oil filter element	2	Every 2000 hours service
Cab air filter - if equipped	2	Every 2000 hours service
Air cleaner elements	2	When required
Engine fan drive belt	1	When required
Engine water pump drive belt	1	When required
Alternator drive belt	1	When required
Air conditioner compressor drive belt - if equipped	1	When required
Bucket teeth - if equipped	8	When required
Bucket bolt-on cutting edge	3	When required

* Machines with serial number A61017 and below have two (2) oil filter elements and machines with serial number A61018 and up have one (1) oil filter element.

MAINTENANCE

PERIODICAL PART REPLACEMENT

The users of the machine should carry out periodical maintenance in order to ensure proper and safe operation. The parts, listed below, should be replaced periodically so that the highest safety standard can be maintained.

These parts with the passage of time may have a tendency to deteriorate in quality and to wear or deform. These parts must be replaced with new ones after a predetermined replacement interval even though there is no apparent abnormality.

If any abnormality should be found, these parts must be replaced or repaired even before the predetermined period expires.

Periodical part replacement cost does not imply reimbursement under the manufacture's warranty policy. Refer to the warranty manual for further details.

	Part Description	Replacement Interval	Remarks
1	Wheel brake hoses	Every year	
2	Rubber parts of wheel brake power clusters	Every year	Replace with repair kit
3	Packings, seals & O-rings of steering cylinders	Every 2 years	
4	Hydraulic hoses for steering cylinders	Every 2 years	
5	Fuel hoses	Every 2 years	
6	Rubber parts of wheel brake valves	Every year	Replace with repair kit
7	Rubber parts of wheel brake slack adjusters	Every year	Replace with repair kit
8	Rubber parts of parking brake cylinder	Every year	Replace with repair kit

LUBRICANTS, FUEL AND COOLANT

PROPER SELECTION TABLE

RESERVOIR	FLUID TYPE	AMBIENT TEMPERATURE										CAPACITY							
		-22	-4	14	32	50	68	86	104	122°F	-30	-20	-10	0	10	20	30	40	50°C
Engine with filter	Engine oil See NOTE 1	SAE 15W-40										42 ℓ 11.0 gal	36 ℓ 9.5 gal						
		SAE 10W-30																	
		Synthetic SAE 5W-30																	
Torque converter, Transmission, Transfer case & Oil cooler	Engine oil See NOTE 2	SAE 30W										70 ℓ 18.5 gal	62 ℓ 16.4 gal						
Hydraulic system		SAE 10W										260 ℓ 68.7 gal	150 ℓ 39.6 gal						
		SAE 5W-20																	
Service brakes		SAE 10W										5 ℓ 1.3 gal	3 ℓ 0.8 gal						
Drive axles - Front & rear	Axle oil	See NOTE 3										75 ℓ 19.8 gal each	75 ℓ 19.8 gal each						
All lubrication fittings	Grease	See NOTE 4										Fill as instructed	--						
Fuel tank	Diesel fuel	See NOTE 5										430 ℓ 113.6 gal	--						
Cooling system	Coolant	See NOTE 6										81 ℓ 21.4 gal	--						

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

Specified capacity: Total amount of oil including oil for components and oil in piping.
 Refill capacity: Amount of oil needed to refill system during normal inspection and maintenance.

MAINTENANCE

NOTES:

1. ENGINE OIL

Normal Operation

Oil performance recommendations are as follows:

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

SAE 15W-40 multi-viscosity heavy duty engine oil meeting the American Petroleum Institute (API) performance classification of CF-4 or CG-4 is recommended.

NOTE: CE oil may be used in areas where CF-4 or CG-4 oil is not yet available.

A sulfated ash content of 1.0 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-graded 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.

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°C (+23°F). However, continuous use of low 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 Heavy Duty Automotive and Industrial Engines." The data book may be ordered from the Engine Manufacturers Association, One Illinois Center, 111 East Wacker Drive, Chicago, IL U.S.A. 60601. The telephone number is (312) 644-6610.

Arctic Operation

If an engine is operated in ambient temperatures consistently below -23°C (-10°F) and there are no provisions to keep the engine warm when it is **not** in operation, use a synthetic API performance classification CE/SF engine oil 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.

IMPORTANT: 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.

2. TRANSMISSION, HYDRAULIC SYSTEM AND BRAKE SYSTEM OIL

Use API performance classification CE engine oil.

When using SAE 5W-20 engine oil in the work equipment hydraulic system in cold areas, return to SAE 10W when the cold season ends.

3. AXLE OIL

For 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 AND SUPER UNIVERSAL

★ It is possible to substitute engine oil SAE 30W API classification CD for axle oil. Although increased brake noise may result, durability should not be affected.

4. GREASE

The recommended lubricating grease is No. 2 multi-purpose lithium grease with 3% molybdenum disulfide.

5. DIESEL FUEL



WARNING! Do not mix gasoline or alcohol with diesel fuel. This mixture can cause an explosion.

IMPORTANT: Due to the precise tolerances of diesel injection systems, it is extremely important that the fuel be kept clean and free of dirt or water. Dirt or water in the system can cause severe damage to both the injection pump and nozzles.

For normal service above -12°C ($+10^{\circ}\text{F}$), the use of ASTM 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 -12°C ($+10^{\circ}\text{F}$), use ASTM Grade No. 1-D diesel fuel. The 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 at 100°C (212°F) to provide adequate fuel system lubrication.

MAINTENANCE

6. COOLANT

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 additive (SCA).

Heavy duty diesel engines require a balanced coolant mixture of water, antifreeze, and supplemental coolant additive. Supplemental coolant additive recommendations are included in the section entitled "Supplemental Coolant Additive". The coolant mixture **must** be drained and replaced at the specified service interval shown in the "SCHEDULED MAINTENANCE GUIDE" or every two years of operation, whichever comes first.

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.

NOTE: *Never use water alone in the cooling system because corrosion will occur.*

Antifreeze

In climates where the temperature is above -37°C (-34°F), use a coolant mixture that contains 50 percent antifreeze. **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% will adversely affect freeze protection and heat transfer rates. Antifreeze concentrations between 68% and 100% actually have a higher freezing point than a 68% antifreeze concentration and should not be used due to reduced heat transfer rates.

Low silicate ethylene glycol antifreeze is recommended. The antifreeze should contain no more than 0.1% 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.

MAINTENANCE

NOTE: 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.

Check the solution periodically and at normal operating temperature, to be sure the cooling system has sufficient protection against freezing.

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 60°F (16°C)
+32°F (0°C)	0	1.000
+20°F (-7°C)	15	1.025
+10°F (-12°C)	25	1.040
0°F (-18°C)	33	1.053
-10°F (-23°C)	40	1.062
-20°F (-29°C)	45	1.070
-30°F (-34°C)	48	1.074
-40°F (-40°C)	53	1.080
-50°F (-46°C)	56	1.083
-60°F (-51°C)	59	1.088
-70°F (-57°C)	62	1.092
-80°F (-62°C)	65	1.095
-90°F (-68°C)	67	1.097
-92°F (-96°C)	68	1.098

In tropical climates where antifreeze availability may be limited, use a corrosion inhibitor SCA, to protect the engine cooling system.

Supplemental Coolant Additives

1. All supplemental cooling system additives, including those in antifreeze solutions, become depleted through normal operation. If the coolant additive 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. There are no miracle additives that will increase heat transfer or prevent overheating. Conditioned water is still the best coolant.
4. SCA is recommended to inhibit corrosion in the cooling system for the following reasons:
 - Improved compatibility with high silicate antifreezes to minimize hydro-gel formation if over concentration occurs.

MAINTENANCE

- Provides engine protection in the following areas:
 - Solder corrosion/bloom
 - Oil fouling
 - Aluminum cavitation corrosion
 - Copper corrosion/erosion/stress cracking
 - Cylinder liner 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 regular scheduled interval specified in the "SCHEDULED MAINTENANCE GUIDE" with a service DCA4 filter.

Each time the coolant is drained and replaced, the coolant must be recharged with SCA. New coolant can be correctly charged with supplemental coolant additives by using a DCA4 service filter or SCA concentrate listed in the table entitled, "DCA4 Unit Guide".

If coolant is added between drain intervals, additional SCA will 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 ℓ (1 US gal) or exceed 2 units per 3.8 ℓ (1 US gal) of coolant. The only 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 the "SCHEDULED MAINTENANCE GUIDE".

NOTE: *Inadequate concentration of the supplemental coolant additive can result in major corrosive damage to cooling system components. Over concentration can cause formation of "gel" that can cause restriction, plugging of passages and overheating.*

REPLENISHING COOLANT CONDITIONER

Install a "precharge" DCA4 filter when the coolant is changed or a significant (more than 50%) coolant loss occurs. Install a service DCA4 filter as specified in the "SCHEDULED MAINTENANCE GUIDE". When antifreeze is added, add coolant conditioner equal to 1.0 unit per 3.8 ℓ (1 US gal) of antifreeze.

NOTE: *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.*

SCA UNIT 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 replace, the coolant **must** be recharged with supplemental coolant additives. Use the appropriate DCA4 spin-on filter listed in following table. The coolant mixture **must** be drained and replaced as defined under "General".

MAINTENANCE

The amount of 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 make-up 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 Pint)
DCA80L	1760 (55 US 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 ℓ (1 US gal).

NOTE: *When performing service which requires draining the cooling system, discard the coolant. Reusing coolant can introduce contaminants or over concentrated chemicals, resulting in premature failure of cooling system components.*

NOTE 2 - To precharge cooling systems larger than 114 ℓ (30 gal) do the following:

- Install appropriate service filter listed in the above table based on cooling system capacity.

Example: 95 gal (360 ℓ) cooling system capacity
 -15 Units (1) WF-2075 Filter
 80 Units

MAINTENANCE

- 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 of 1.0 unit per 3.8 ℓ (1 US gal) of coolant in the system. Less than 0.5 unit per 3.8 ℓ (1 US gal) indicates an under-concentrated coolant solution. More than 2.0 units per 3.8 ℓ (1 US gal) indicates an over-concentrated coolant solution.

To check the SCA concentration level, use coolant test kit, CC-2606. 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 ℓ (1 US gal)	Initially charge the system to a minimum of 1.0 SCA unit per 3.8 ℓ (1 US gal).
11 - 16 Drops	Marginally under-concentrated - 0.45 to 0.8 SCA units per 3.8 ℓ (1 US gal)	Add SCA liquid units to maintain 1.0 SCA unit per 3.8 ℓ (1 US gal) minimum or change the DCA 4 coolant filter.
17 - 25 Drops	Acceptable - 0.85 to 1.3 SCA units per 3.8 ℓ (1 US gal)	None.
26 - 35 Drops	Highly acceptable - 1.35 to 2.0 SCA units per 3.8 ℓ (1 US gal)	None.
36 - 55 Drops	Marginally over-concentrated - 2.1 to 3.3 SCA units per 3.8 ℓ (1 US gal)	Review maintenance practice.
Over 55 Drops	Extremely over-concentrated	Drain 50% of the coolant and replace with water antifreeze mixture. Retest the system for correct SCA unit concentration.

MAINTENANCE

SCHEDULED MAINTENANCE GUIDE

Scheduled maintenance is the normal maintenance necessary to provide proper and efficient equipment operation. To protect your investment and prolong the service life of your equipment, follow the scheduled maintenance listed below.

ITEM	SERVICE	PAGE
INITIAL 250 HOURS SERVICE ONLY		
Transmission oil filter	Replace element(s)	26
Normal 250 hour scheduled maintenance	Refer to "EVERY 250 HOURS SERVICE"	
WHEN REQUIRED		
Supplemental coolant additive concentration - SCA	Check and supply	26
Air cleaner elements	Check, clean or replace	26
Transmission oil level	Check and refill	30
Radiator core	Clean	32
Drive axle oil level	Check and refill	33
Drive axle housing breathers	Clean	34
Lubrication		
Work equipment control valve linkage	Lubricate 2 points	35
Steering column	Lubricate 1 point	35
Hydraulic tank	Bleed air	36
PPC (Proportional pressure control) circuit	Bleed air	36
Wheel brake hydraulic circuit	Bleed air	37
Parking brake	Adjust	39
Bucket teeth - if equipped	Replace	40
Bucket bolt-on cutting edge - if equipped	Reverse or replace	42
Window washer tanks - if equipped	Check and refill	42
Air conditioner condenser - if equipped	Check and clean	43

MAINTENANCE

ITEM	SERVICE	PAGE
Air conditioner refrigerant charge - if equipped	Check	43
Alternator drive belt	Adjust or replace	44
Fan drive belt	Adjust or replace	44
Water pump drive belt	Adjust or replace	44
Alternator	Repair/replace	44
Cranking motor	Repair/replace	44
Air governor	Repair/replace	45
Transmission control levers	Adjust	46
CHECKS BEFORE STARTING ENGINE		
Walk around check		47
Coolant level	Check and refill	47
Engine oil level	Check and refill	47
Fuel level	Check and refill	49
Air cleaner service indicator	Check	50
Air tanks	Drain water	50
Brake oil level	Check and refill	51
Fuel filter/water separator	Drain water	51
Engine fan	Check	52
Drive belts	Check condition and tension	52
Monitor panel	Check	54
Additional checks		
Electrical wiring	Check	55
Parking brake	Check function	55
Wheel brakes	Check function	55

MAINTENANCE

ITEM	SERVICE	PAGE
Horn	Check function	55
Lamps	Check function	55
Rear view mirrors	Check	55
Engine exhaust gas color	Check	55
Instruments and gauges	Check function	55
Steering	Check play	55
Back-up alarm	Check function	55
EVERY 50 HOURS SERVICE		
Fuel tank	Drain water and sediment	55
Tires	Check air pressure and for damage	55
Engine air intake system	Check	56
EVERY 100 HOURS SERVICE		
Hydraulic tank oil level	Check and refill	56
Lubrication		
Rear axle pivot pins	Lubricate 3 points	58
Cab air filter - if equipped	Clean element	58
EVERY 250 HOURS SERVICE		
Engine oil and filter	Change oil and replace filter	60
Fuel filters	Replace	62
Coolant filter	Replace	64
Engine crankcase breather and tube	Clean or replace	65
Battery electrolyte levels	Check and refill	65

MAINTENANCE

ITEM	SERVICE	PAGE
Lubrication		
Bucket pins	Lubricate 2 points	67
Bucket link pins	Lubricate 2 points	68
Tilt lever pin	Lubricate 1 point	68
Bucket cylinder pins	Lubricate 2 points	68
Lift cylinder pins	Lubricate 4 points	69
Lift arm pivot pins	Lubricate 2 points	69
Steering cylinder housing end pins	Lubricate 2 points	70
Steering cylinder rod end pins	Lubricate 2 points	70
Wheel hub nuts	Check and retighten	70
Air conditioner compressor drive belt - if equipped	Check tension	71
EVERY 500 HOURS SERVICE		
Transmission oil filter	Replace element(s)	72, 73
Lubrication		
Center drive shaft spline	Lubricate 1 point	74
Air dryer - if equipped	Check	74
EVERY 1000 HOURS SERVICE		
Transmission oil and strainer	Change oil and clean strainer	74
Transmission case breather	Clean	75
Lubrication		
Center hinge pins	Lubricate 2 points	76
Front drive shaft	Lubricate 3 points	76
Drive shaft center support	Lubricate 1 point	76

MAINTENANCE

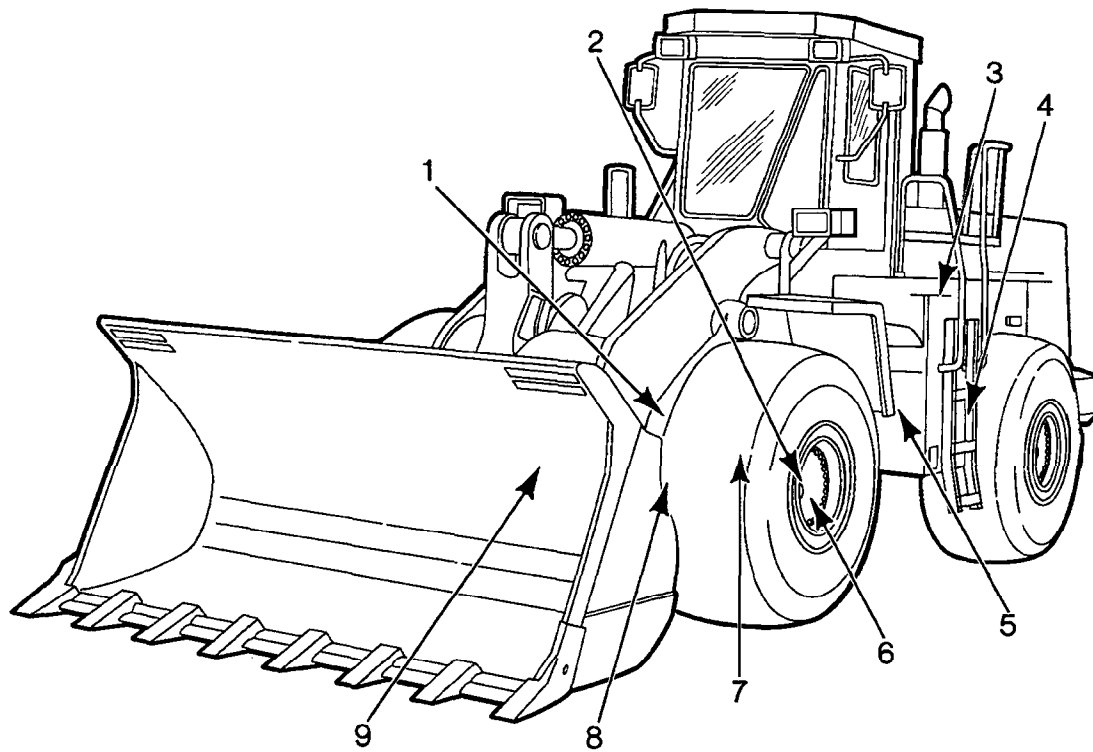
ITEM	SERVICE	PAGE
Center drive shaft	Lubricate 2 points	77
Rear drive shaft	Lubricate 3 points	77
Upper drive shaft	Lubricate 2 points	77
Damper	Lubricate 1 point	77
Transmission mounting trunnion	Lubricate 1 point	78
Parking brake caliper	Lubricate 2 points	78
EVERY 1500 HOURS SERVICE		
Engine valves and injectors	Check and adjust	78
Engine	Steam clean	78
Engine mounted hoses	Check and replace as required	79
Engine mounting hardware	Check and retighten	79
Turbocharger mounting	Check	79
Water pump	Check	79
EVERY 2000 HOURS SERVICE		
Batteries	Check	80
Hydraulic tank oil and filters	Change oil and replace elements	83
Hydraulic tank breather	Replace element	84
PPC (Proportional pressure control) circuit strainer	Clean	84
Cab air filter - if equipped	Replace element	85
Drive axle oil	Change	85
Parking brake disc	Check	86
Air dryer - if equipped	Replace internal parts	86
Accumulator	Check	87

MAINTENANCE

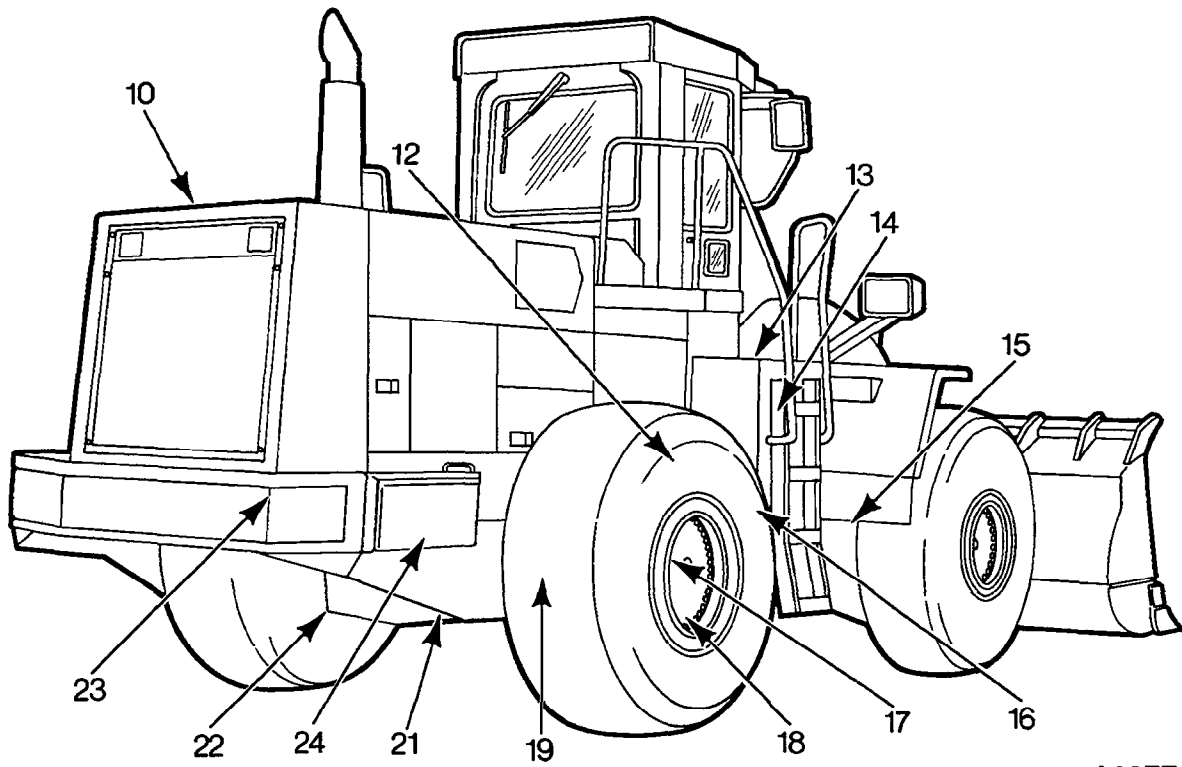
ITEM	SERVICE	PAGE
Cooling system	Change coolant and clean and flush system	87
EVERY 6000 HOURS SERVICE		
Fuel pump	Clean and calibrate	89
Fuel injectors	Clean and calibrate	89
Engine fan hub	Check	89
Engine idler pulley	Check	89
Turbocharger	Check	89
Air compressor	Check	89
Engine vibration damper	Check	89

FILLER AND LEVEL GAUGE POSITIONS

- | | | |
|--|---|--|
| 1. Front drive axle oil filler plug | 10. Radiator filler cap | 17. Rear final drive oil level and filler plug |
| 2. Front final drive oil level and filler plug | 11. Engine oil level gauge and oil filler | 18. Rear final drive oil drain plug |
| 3. Brake oil level gauge | 12. Transmission oil level gauge and oil filler | 19. Rear drive axle oil level plug |
| 4. Rear drive axle oil filler plug | 13. Hydraulic tank oil filler cap | 20. Engine oil drain valve |
| 5. Rear drive axle oil drain plug | 14. Hydraulic tank oil level sight gauge | 21. Fuel tank drain valve |
| 6. Front final drive oil drain plug | 15. Front drive axle oil level plug | 22. Rear drive axle brake chamber drain plug |
| 7. Transmission oil drain plug | 16. Hydraulic tank oil drain plug | 23. Coolant drain valve |
| 8. Front drive axle brake chamber drain plug | | 24. Fuel tank filler cap |
| 9. Front drive axle oil drain plug | | |



L02ZZ070



L02ZZ060

MAINTENANCE

INITIAL 250 HOURS SERVICE ONLY

Perform the following maintenance only after the first 250 hours of service.

TRANSMISSION OIL FILTER

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

WHEN REQUIRED

SUPPLEMENTAL COOLANT ADDITIVE CONCENTRATION - SCA

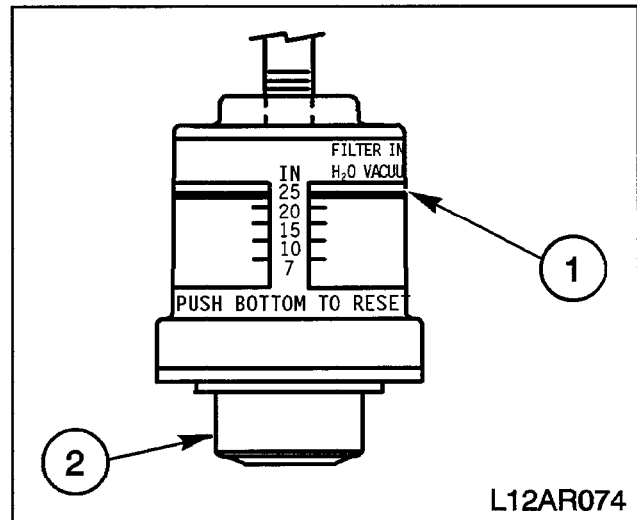
Check and supply. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

AIR CLEANER ELEMENTS

CHECKING

Whenever the yellow piston in service indicator appears in the transparent part of the indicator, clean or replace the air cleaner outer element. Stop the engine when cleaning the element.

After cleaning or replacing the element, push indicator reset button (2) to return the yellow piston to its original position.

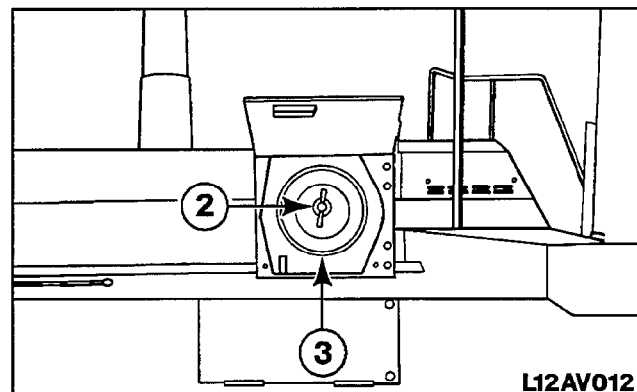


CLEANING OR REPLACING OUTER ELEMENT

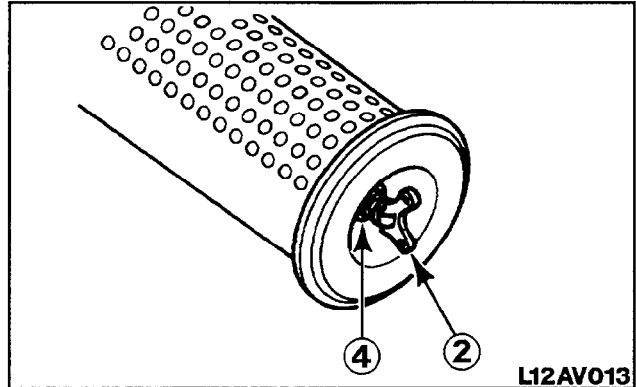


WARNING! Do not clean or replace the air cleaner element with the engine running.

1. Open the air cleaner access door on the right side of the machine.
2. Loosen element wing nut (2) and remove the outer element (3).
3. Clean the inside of the air cleaner body.
4. Clean and inspect the element. Refer to "CLEANING OUTER ELEMENT" for cleaning procedure.
5. Install the cleaned and inspected element.



6. Push the service indicator reset button to return the piston to the original position.
- ★ Replace the outer element which has been cleaned six (6) times repeatedly or used throughout a year. Replace the inner element at the same time.
 - ★ Replace both inner and outer elements when the service indicator piston appears soon after installing the cleaned outer element even though it has not been cleaned six (6) times.
 - ★ Remove one seal from the outer element. The number of times the outer element has been cleaned can be seen by the number of removed seals.
 - ★ Check inner element wing nut for looseness and, if necessary, retighten.
 - ★ Replace seal washer (4) or wing nut (2) if they are damaged.



REPLACING INNER ELEMENT



WARNING! Do not replace the air cleaner element with the engine running.

1. First open the air cleaner access door, remove the outer element, and then remove the inner element.
2. Place a protective cover over the air intake opening to prevent dust from entering.
3. Clean the inside of the air cleaner body. Remove the protective cover from the air intake opening.
4. Install a new inner element and tighten it with the wing nut.

NOTICE: Do not attempt to clean the inner element.

5. Reinstall the outer element and close the air cleaner access door. Push the service indicator reset button.

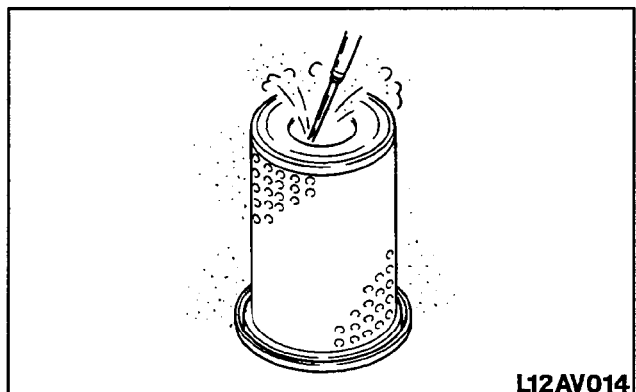
CLEANING OUTER ELEMENT

Using Compressed Air



WARNING! When using compressed air, wear safety glasses and other things required to maintain safety.

Direct dry compressed air, less than 7 kg/cm² (100 psi / 689 kPa), to the element from inside along its folds, then direct it from outside along its folds and again from inside. Check the element as follows.



Using Water

NOTICE: The following method requires a spare element.

MAINTENANCE

Wash the element with city water at less than 3 kg/cm² (43 psi / 296 kPa) of pressure, from the inside along the folds, then from the outside and again from the inside. Dry the element and check it as follows.

Using Water With Cleaning Agent

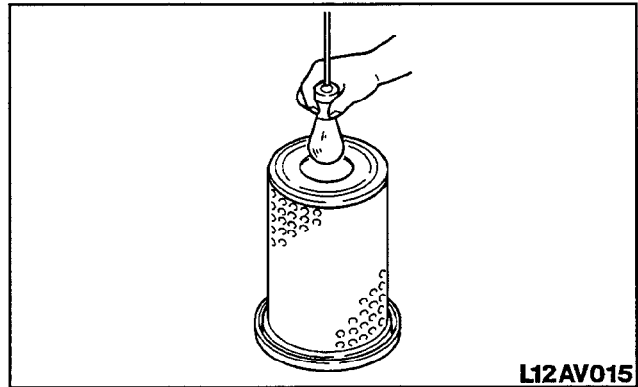
NOTICE: The following method requires a spare element.

For removing oil and grease as well as carbon etc. on the element, the element may be cleaned in a lukewarm solution of mild detergent, then rinsed in clean water and left to air dry.

- ★ Using warm water at about 40°C (104°F) instead of soapy water may also be effective.
- ★ The drying process can be speeded up by applying dry compressed air, at less than 7 kg/cm² (100 psi / 689 kPa), to the element from the inside to the outside of the element.

NOTICE: Never attempt to heat the element.

- ★ If small holes or thin areas are found in the element when it is checked with an electric light bulb after cleaning and drying, replace the element.
- ★ If the element is reusable, wrap it and store it in a dry place.
- ★ Do not use an element which has folds, gasket or seal damaged.
- ★ When cleaning the element, do not hit it or beat it against something.



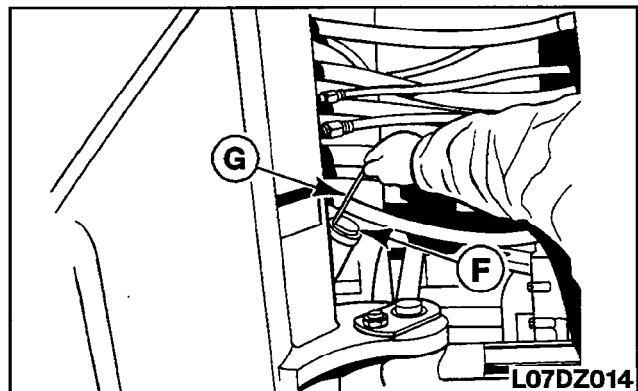
TRANSMISSION OIL LEVEL

Carry out this procedure if there is any sign of oil on the transmission case, or if there is oil mixed with the engine coolant.



WARNING! When checking the oil level, apply the parking brake, and lock the front and rear frames with the frame locking bar and pin.

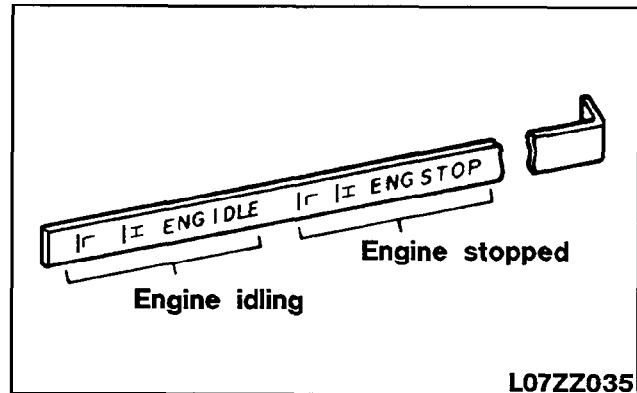
1. Stop the engine and remove the cap of oil filler tube (F).
2. Use oil level gauge (G) to check the oil level.
3. The oil level should be between mark "L" and "H", if necessary, add oil at the oil filler tube.



MAINTENANCE

- ★ The type of lubricant used depends on the ambient temperature. Select according to the table entitled "LUBRICANTS, FUEL AND COOLANT".
- ★ There are two sets of level marks on the same side of the oil level gauge: one is for measuring when the engine is stopped "(ENG STOP)", and the other is for measuring when the engine is idling "(ENG IDLE)".
- ★ When measuring the oil level, wait for at least 60 minutes after stopping the engine, and measure with the "ENG STOP" marks.
- ★ It is possible to measure the oil level when the engine is at low idle, but in such cases, do as follows.

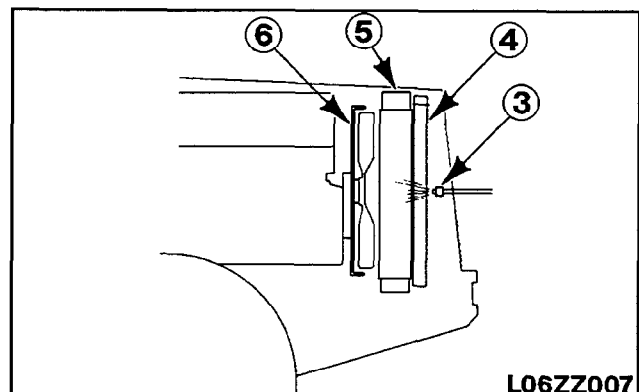
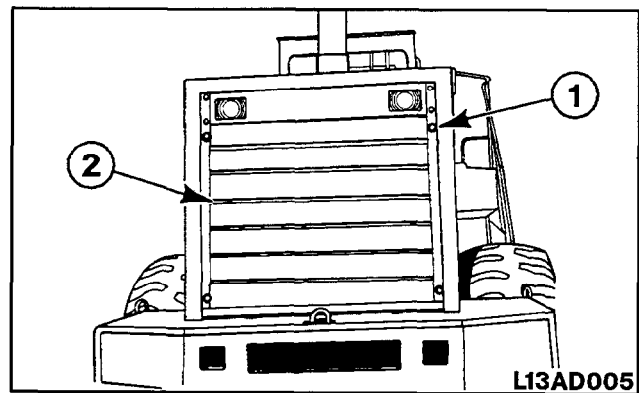
Start the engine and run it until the oil level is stable, then wait for 5 minutes and measure with the "ENG IDLE" marks.



RADIATOR CORE

Carry out this procedure if there is any mud or dirt stuck to the radiator and/or oil cooler.

1. Loosen the four mounting bolts (1) and remove radiator grille (2).
 2. Clean the radiator core and oil cooler that are clogged with mud, dirt, etc., with compressed air. Steam or water may be used instead of compressed air.
- ★ When cleaning the radiator core and oil cooler, choose a 2 mm (0.07 in) diameter nozzle (3) and use high pressure water at a pressure less than 40 kg/cm² (569 psi / 3923 kPa).
 - ★ If it is impossible to remove all mud and dirt when cleaning from the radiator grille side of oil cooler (4), remove engine fan guard (6) and clean from the front side of radiator (5).
 - ★ Hydraulic oil hoses should be checked at the same time. If a hose is found to have cracks or to be hardened by aging, such a hose should be replaced by new one. Furthermore, check for loosened hose clamps.



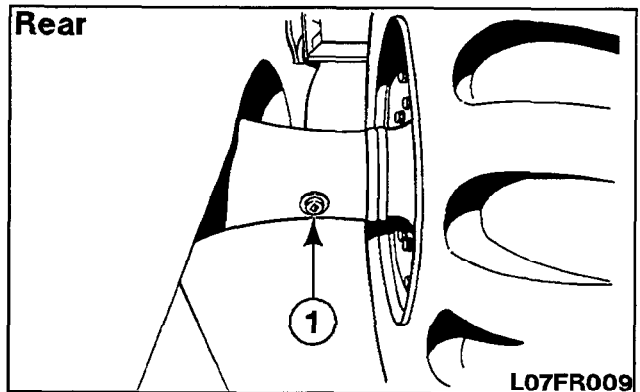
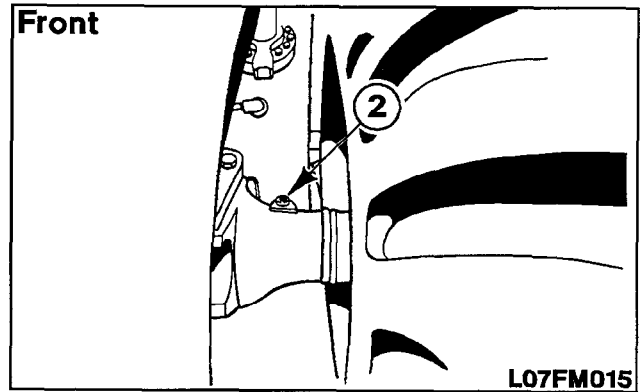
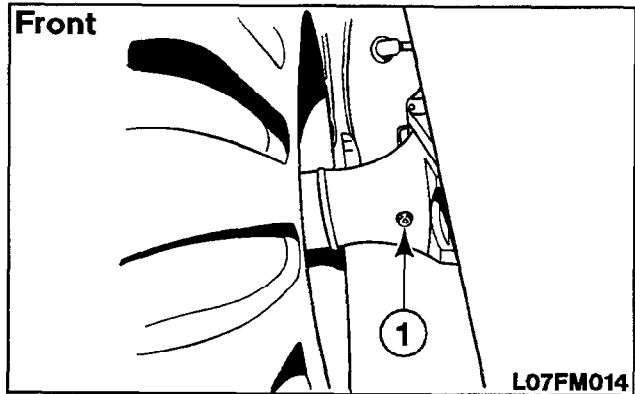
MAINTENANCE

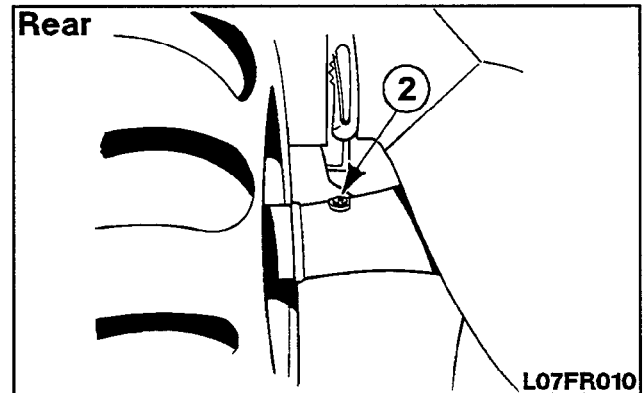
DRIVE AXLE OIL LEVEL

Carry out this procedure if there is any sign of oil on the axle housing.

Remove oil level plug (1), and check that the oil level reaches the bottom of the plug hole. If necessary, add oil through the hole of oil filler plug (2).

- ★ The type of lubricant used depends on the ambient temperature. Select according to the table entitled "LUBRICANTS, FUEL AND COOLANT".
- ★ Use the same procedure to check and add oil for the front and rear drive axles.



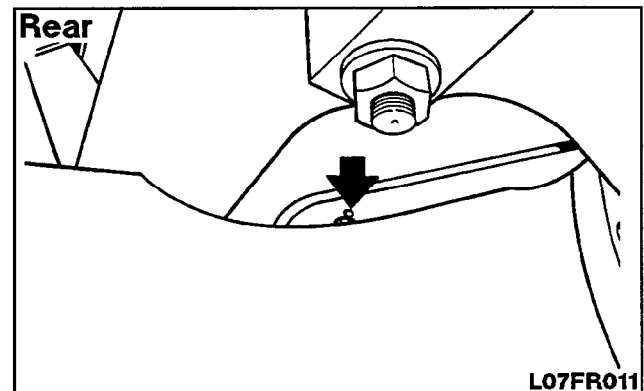
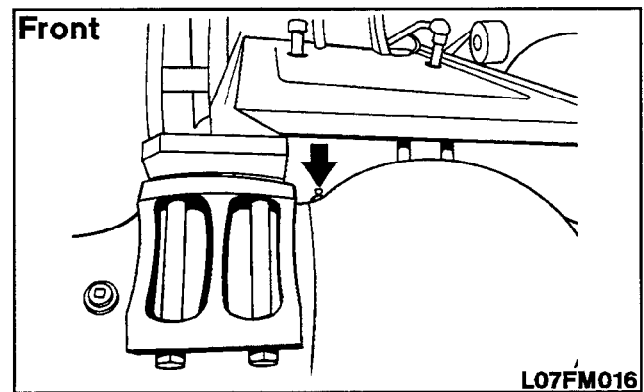


DRIVE AXLE HOUSING BREATHERS

Carry out this procedure if there is any mud or dirt stuck around the breather.

Remove all mud and dirt from around the breather. Remove the breather from the axle housing, clean the breather in cleaning fluid and reinstall it on the axle housing.

- ★ Clean the breathers of the front and rear drive axles in the same way.



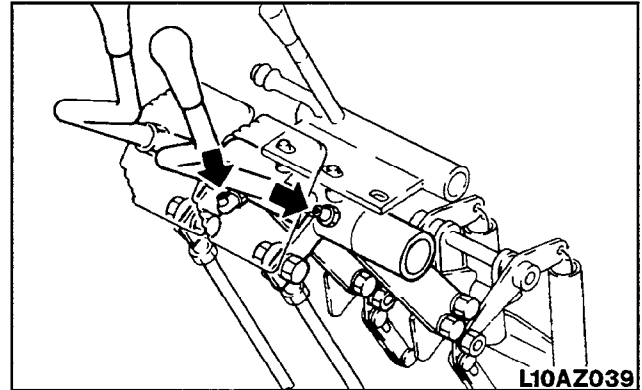
MAINTENANCE

LUBRICATION

Apply grease to the grease fittings shown by the arrows.

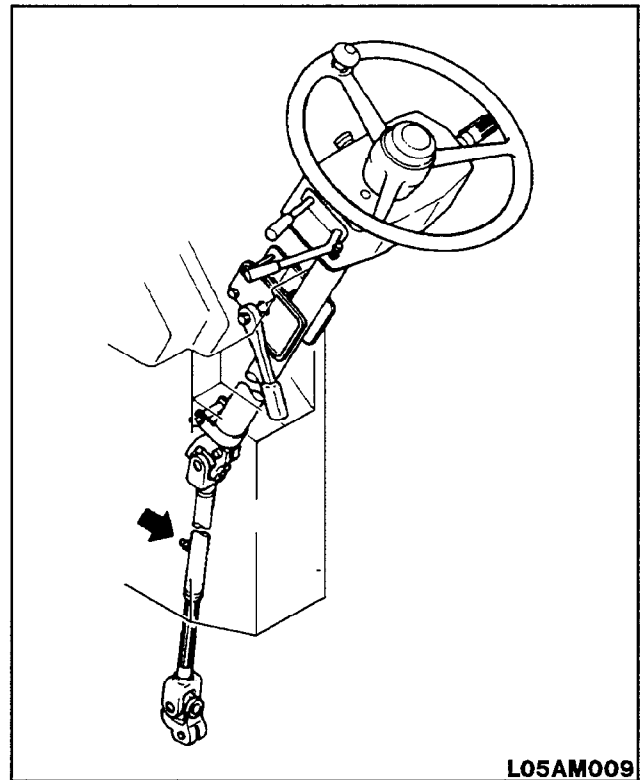
1. Work equipment control valve linkage (2 points)

If the work equipment control lever(s) do not move smoothly, apply grease.



2. Steering column (1 point)

If the steering column wheel does not return properly, apply grease.



HYDRAULIC TANK

The hydraulic tank and system should be bleed free of air after the following:

- Replacing the hydraulic oil and filter elements or cleaning the oil strainer.
- Removing a hydraulic component or disconnecting hydraulic piping.

After reassembly, bleed the air from the hydraulic tank and system as follows:

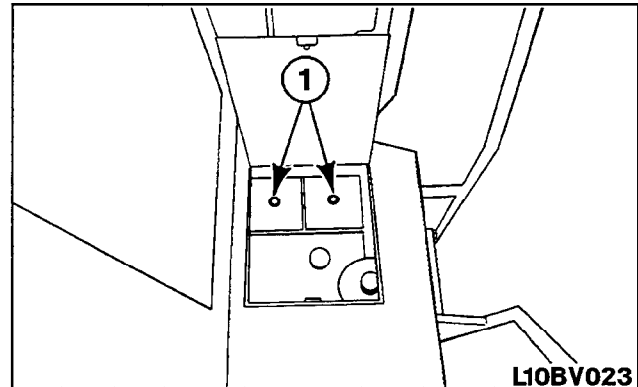
1. Check and if necessary refill the hydraulic tank with oil up to the specified oil level of the sight gauge.

NOTICE: Check the hydraulic tank oil level and refill with oil frequently when bleeding the system.

★ At first, if the engine is operated at high speed or if the hydraulic cylinder is moved to the end of its stroke, the air in the cylinder may damage the cylinder piston packing, etc.

2. Run the engine at low idle. One at a time, operate the hydraulic steering, bucket and lift arm cylinders four (4) to five (5) times, stopping 100 mm (3.9 in) from the end of its full stroke.
3. Next, operate each hydraulic cylinder three (3) to four (4) times, to the end of its stroke, then stop the engine.

4. Loosen the two air bleed plugs (1) on the hydraulic tank to bleed the air. After bleeding the air, tighten the two air bleed plugs.



5. Recheck the hydraulic tank oil level and add oil as necessary.

6. Start the engine, increase the engine speed and repeat Steps 3 and 4 to bleed the air until no more bubbles come out from the bleed plug ports.

7. After bleeding the air, tighten the two air bleed plugs (1).

★ Tightening torque of bleed plug: 1.15 ± 0.15 kgm
(8.3 ± 1.0 lbf ft / 11.3 ± 1.4 N•m)

8. Recheck the oil level in the hydraulic tank and add oil as necessary. After adding oil, tighten the oil filler cap securely.

PPC (PROPORTIONAL PRESSURE CONTROL) CIRCUIT

The PPC, proportional pressure control, circuit should be bleed free of air after the following:

- Cleaning the PPC circuit hydraulic oil strainer.
- Removing or disconnecting hydraulic piping of the PPC circuit.

After reassembly, bleed the air from within the pressure control circuit as follows:

1. Check and if necessary refill the hydraulic tank with oil up to the specified oil level of the sight gauge.

MAINTENANCE

2. Start the engine. Move the bucket control lever to the "Tilt" position and the lift arm control lever to the "Float" position and after the hydraulic bucket and lift arm cylinders reach the end of their stroke, maintain this cylinder position for one (1) minute.
 3. Place the bucket control lever in the "Dump" position and the lift arm control lever in the "Raise" position and after the hydraulic bucket and lift arm cylinders reach the end of their stroke, maintain this cylinder position for one (1) minute.
 4. Lower the bucket to the ground and stop the engine.
 5. Recheck the oil level in the hydraulic tank and add oil as necessary. After adding oil, tighten the oil filler cap securely.
- ★ For further details, contact your distributor.

WHEEL BRAKE HYDRAULIC CIRCUIT

The wheel brake hydraulic circuit should be bleed free of air after the following:

- Removing a brake hydraulic component or disconnecting brake hydraulic piping.

After reassembly, bleed the air from within the brake hydraulic circuit as follows:

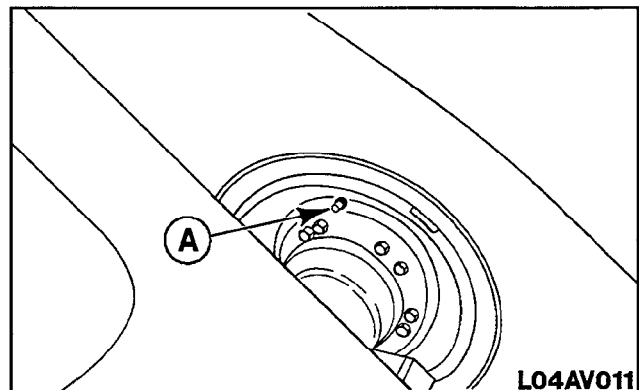


WARNING! When bleeding air from within the brake hydraulic circuit, always place blocks or chocks under the tires to prevent the machine from moving.

1. Check and if necessary refill the brake oil tank with oil up to the specified oil level of the sight gauge.

NOTICE: Check the brake oil level and refill with oil frequently when bleeding the system.

2. Run the engine at low idle. Remove the protective cap of air bleed plug (A).
3. Depress and hold the brake pedal and loosen air bleed plug (A) about 3/4 of a turn at one of the wheel brakes to bleed the air. After bleeding the air, tighten the air bleed plug and release the brake pedal.
4. Repeat the previous step to bleed the air until air bubbles stop coming out from the bleed plug port. After bleeding the air, tighten air bleed plug (A) and install the protective cap.



5. Recheck the brake oil level and add oil as necessary.
6. Repeat Steps 2 thru 5 to bleed the air at the remaining three (3) brakes.
7. Stop the engine.
8. Recheck the oil level in the brake oil tank and add oil as necessary. After adding oil, tighten the oil filler cap securely.

★ For further details, contact your distributor.

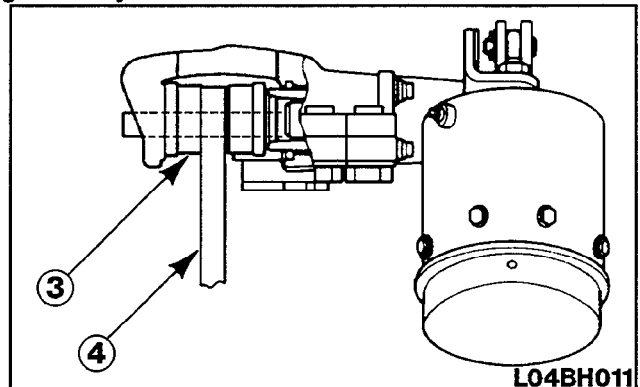
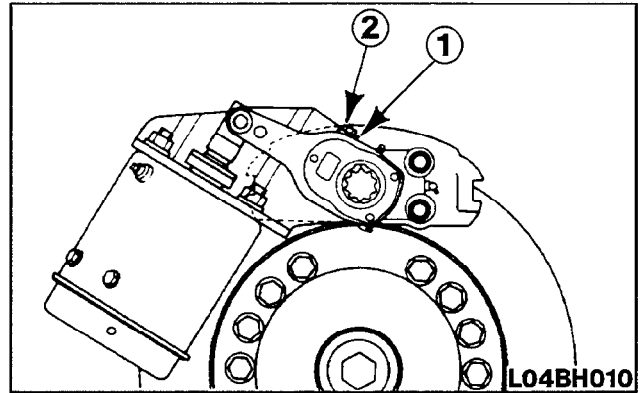
PARKING BRAKE

If the effect of the parking brake is poor, adjust it in the following manner.

WARNING! When adjusting the parking brake, always place blocks or chocks under the tires to prevent the machine from moving.

WARNING! To prevent the parking brake from being applied automatically during adjustment, provide and maintain sufficient air pressure at the brake air cylinder, using an external air pressure source. Also, attach a warning tag to the parking brake switch to prevent other people from operating the parking brake by mistake.

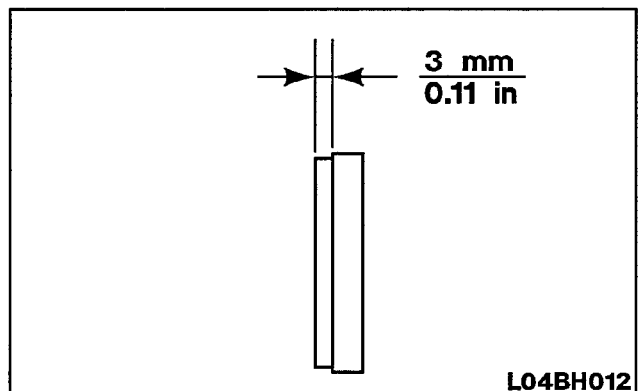
1. Move the parking brake switch to OFF to release the parking brake.
2. Turn adjustment bolt (2) clockwise while pressing on bolt retainer (1) until brake pads (3) come in contact with brake disc (4) on both sides.
3. Turn adjustment bolt (2) one half turn counterclockwise while pressing on bolt retainer (1). Release the bolt retainer and confirm that the retainer is in the locking position with the adjustment bolt.



When the brake pad lining wears to a thickness of 3 mm (0.11 in) or less, replace the pads.

- ★ Replace the two brake pads as a set at the same time.
- ★ Contact your distributor for brake pad replacement.

WARNING! Do not get any oil or grease on the surfaces of the brake pads or disc.



MAINTENANCE

BUCKET TEETH - IF EQUIPPED

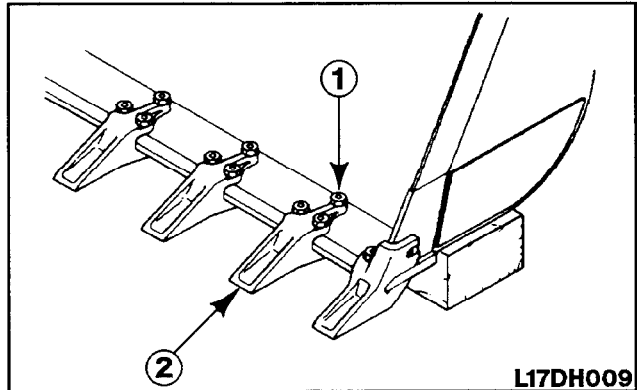
BUCKET EQUIPPED WITH BOLT-ON TEETH.

When the bucket teeth are worn, replace them as follows.

1. Raise the bucket to a convenient height, and put blocks under the bucket to prevent it from coming down.

★ Position the bucket so that the bottom is horizontal.

2. Remove mounting bolts and nuts (1), then remove bucket tooth (2).



3. Install the new teeth on the bucket. When installing the teeth, insert a shim so that there is no clearance between the teeth and the top surface of the bucket.

★ Thickness of shims is 0.5 mm (0.01 in) and 1.6 mm (0.06 in). So the clearance should be less than 0.5 mm (0.01 in).

4. To prevent any clearance between the tooth and the edge of the bucket, tighten the mounting nut partially, then hit the tip of the tooth with a hammer.

★ Tightening torque of mounting bolt: 225 ± 25 kgm (1627 ± 180 lbf ft / 2206 ± 244 N•m)

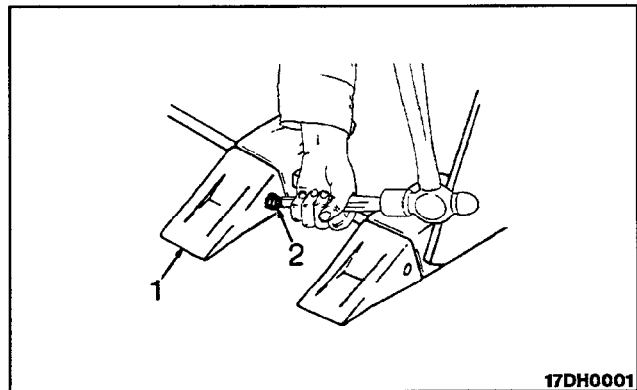
★ After operating the machine for a few hours, retighten the mounting bolts again.

BUCKET EQUIPPED WITH REPLACEABLE TOOTH TIP

Replace the teeth before they wear down as far as the adaptor.

1. Extract pin (2) fitted to the bucket and then remove tooth (1).

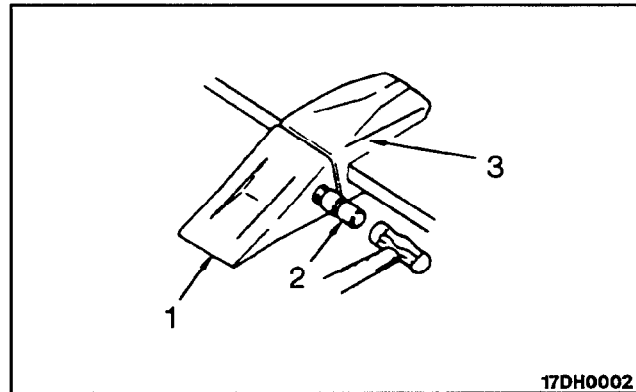
★ When extracting pin (2), strike the part (either the left or right part) with a sharp object. This will enable the pin to be extracted from the opposite side.



MAINTENANCE

2. Insert the new tooth (1) on to the adaptor (3), and insert pin (2) partway as shown in the diagram. Then drive it home by means of a hammer.

★ After operating the machine for a few hours, check that the pin does come out.



BUCKET BOLT-ON CUTTING EDGE - IF EQUIPPED

If the bucket bolt-on cutting edge is worn, reverse or replace the cutting edge as follows.

★ After the cutting edge has been reversed once and is worn out, replace it with a new part.

1. Raise the bucket to a convenient height, and put blocks under the bucket to support it.

★ Position the bucket so that the bottom is horizontal.

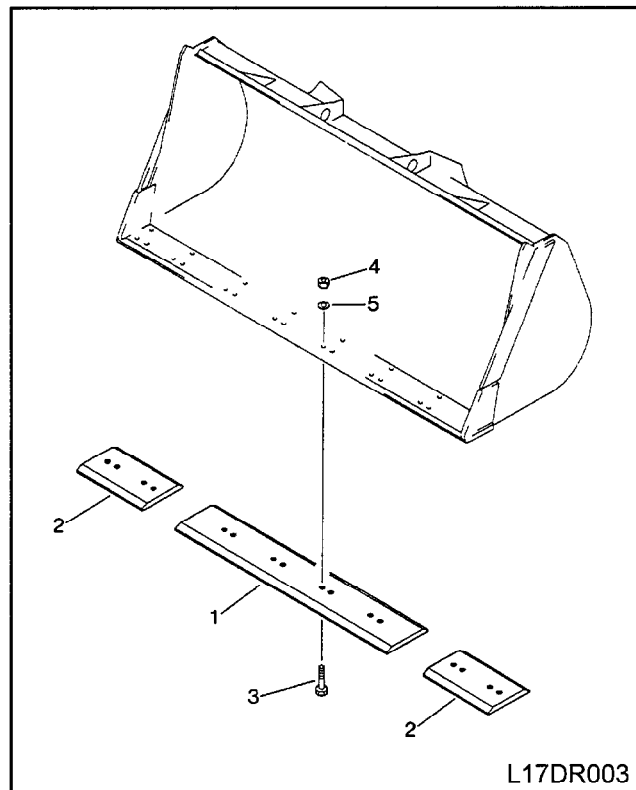
2. Remove mounting nuts (4), flat washers (5), bolts (3), end cutting edges (2) and center cutting edge (1).

★ Before installing the cutting edge to the bucket, clean its mounting surface.

3. Install the cutting edges to the bucket. Tighten the mounting bolts and nuts.

★ Tightening torque: 230 - 280 kgm (1664 - 2025 lbf ft / 2256 - 2745 N•m)

★ After operating the machine for a few hours, retighten the mounting bolts again.

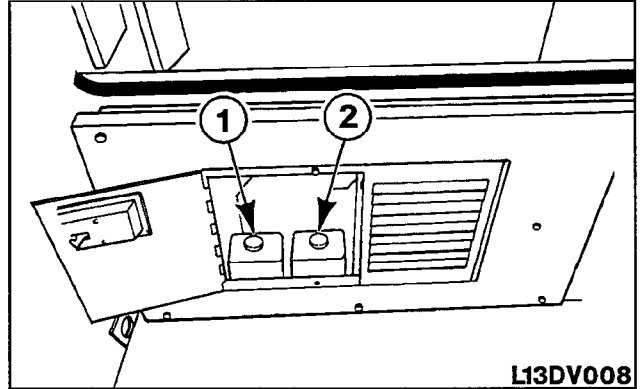


MAINTENANCE

WINDOW WASHER TANKS - IF EQUIPPED

Check the washer fluid levels in washer tanks (1 and 2). When the fluid has run short, add automotive window washer fluid.

- ★ To prevent the washer nozzles from plugging up, be careful not to let dirt into the fluid.



1. Front window washer tank
2. Rear window washer tank

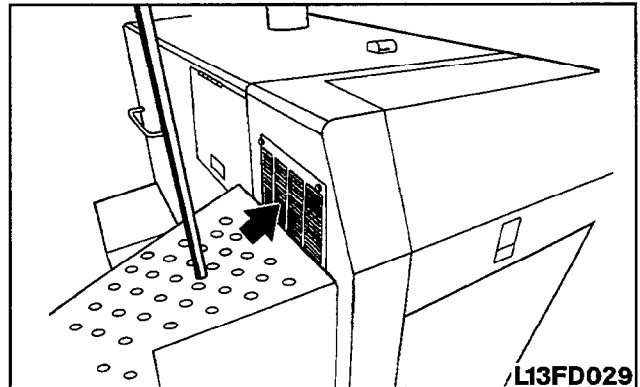
AIR CONDITIONER CONDENSER - IF EQUIPPED

If there is mud or dust on the air conditioner condenser, clean it with water.

- ★ If the water pressure is too high, the fins may get deformed. When washing with a high pressure washing machine, apply the water from a reasonable distance.



WARNING! Do not clean the condenser with a stream cleaner. The condenser will become hot and may be damaged.



AIR CONDITIONER REFRIGERANT CHARGE - IF EQUIPPED

Check the air conditioner refrigerant charge twice a year, in spring and autumn.

Operate the air conditioner for 5 - 10 minutes at the coolest setting, then touch the high pressure hose and low pressure hoses at the refrigerant compressor by hand. Next, check the flow of refrigerant gas (freon 12) through the sight glass to check the gas level.

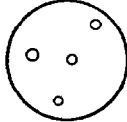
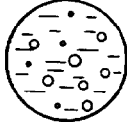
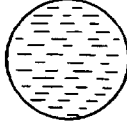
Contact your distributor for this inspection.

The sight glass is located on the air conditioner dryer receiver, which is located on the right side of the machine next to the condenser.



WARNING! Air conditioner refrigerant is colorless and odorless and does not cause pollution of the atmosphere, if handled properly. However, it may cause injury if it gets in the eyes or on the hands, so never loosen any parts of the refrigerant system.

MAINTENANCE

CONDITION	NORMAL	ABNORMAL	
Temperature of high & low pressure lines	High pressure line is hot Low pressure line is cold Clear difference in temperature	High pressure line is warm Low pressure line is cold Little difference in temperature	Almost no difference in temperature between high & low pressure lines
Sight glass	Almost transparent. Any bubbles disappear if 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.	May have refrigerant leak. Contact your distributor for inspection and repair.	Almost all refrigerant has leaked out. Contact your distributor for immediate repair.

ALTERNATOR DRIVE BELT

Adjust or replace alternator drive belt. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

FAN DRIVE BELT

Adjust or replace fan drive belt. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

WATER PUMP DRIVE BELT

Adjust or replace water pump drive belt. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

ALTERNATOR

Repair/replace. Contact your distributor for the detailed information.

CRANKING MOTOR

Under normal operating conditions, no maintenance is required between engine overhaul periods. At the time of engine overhaul, the motor should be disassembled, inspected, cleaned and tested. Contact your distributor for the detailed information.

MAINTENANCE

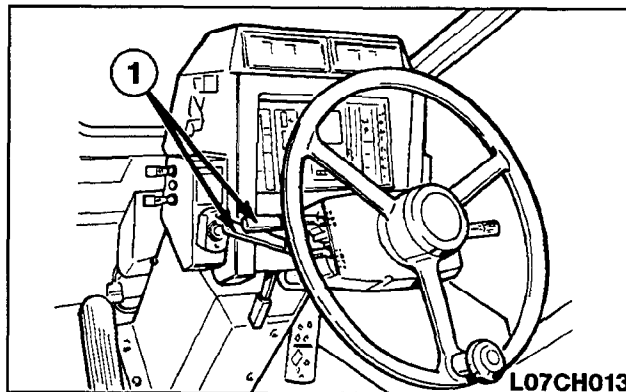
AIR GOVERNOR

Repair/replace. Contact your distributor for the detailed information.

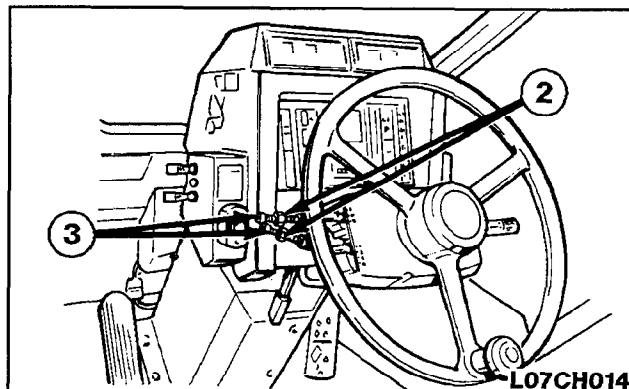
TRANSMISSION CONTROL LEVERS

It is possible to adjust the length of the directional lever and speed control levers.

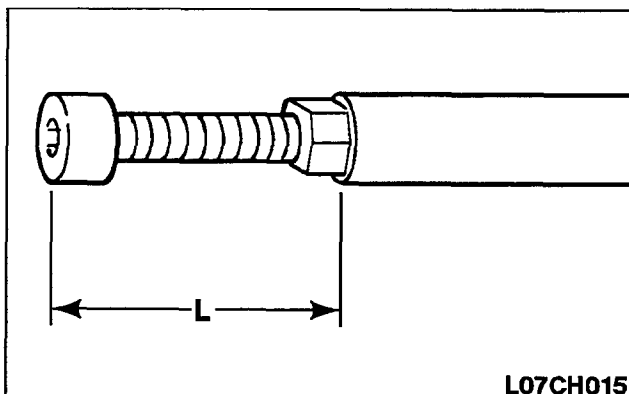
1. Pull off lever knob (1).



2. Loosen locknut (2) and turn bolt (3) to adjust.
3. After adjusting, tighten locknut (2), and fully push on lever knob (1).



- ★ Keep distance (L) under 43 mm (1.7 in). If it is not screwed in far enough it is dangerous.



CHECKS BEFORE STARTING ENGINE

WALK AROUND CHECK

Perform a walk around check of the machine as outlined in Section 2.

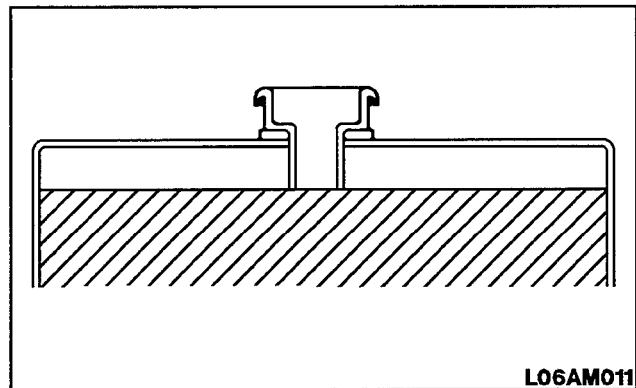
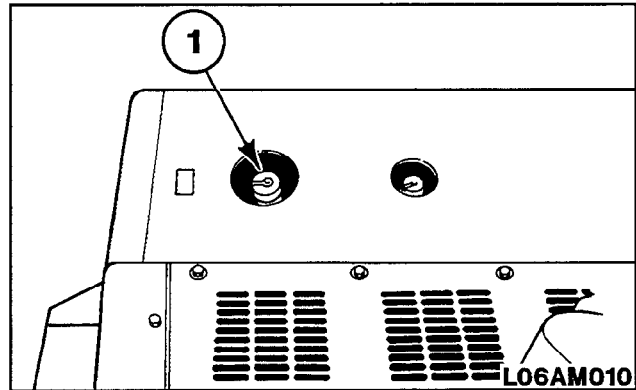
COOLANT LEVEL



WARNING! Do not remove radiator cap (1) when the engine coolant is hot. Hot coolant may spout out and cause serious personal injury. When removing radiator cap, lift the safety lever to relieve the system inner pressure.

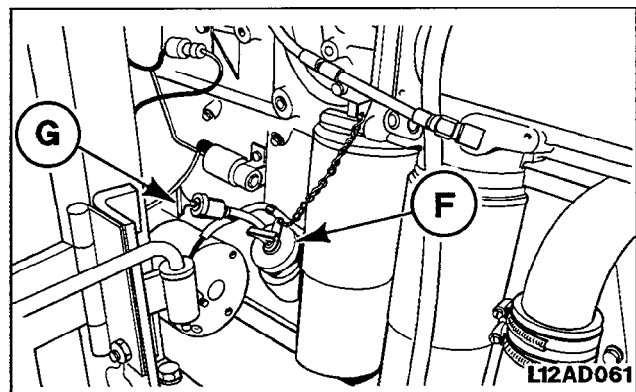
Remove radiator cap (1) and strainer from the radiator filler opening and check the coolant level. The coolant should be up to the level as indicated by the shadowed portion in the illustration. If not, add coolant as necessary.

- ★ Do not add cold coolant to a hot engine. Engine damage may result. Allow the engine to cool below 50°C (120°F) before adding coolant.
- ★ If the volume of coolant added is more than usual, check for possible leakage.
- ★ Confirm that oil is not present in the coolant.
- ★ Never use a sealing additive to stop leaks in the cooling system. This can result in cooling system plugging and inadequate coolant flow.



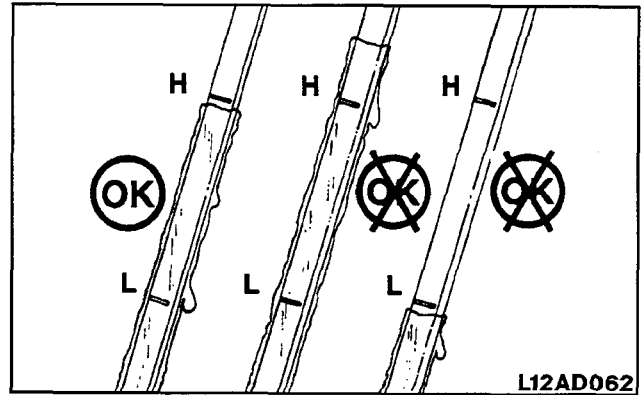
ENGINE OIL LEVEL

1. Open the engine side cover located on the left rear side of the machine.
 2. Use dipstick (G) to check the oil level.
 3. The oil level should be between mark L and H, if necessary, add oil at oil filler (F).
- ★ When checking the oil level, park the machine on a level surface and make an oil level check before starting the engine or 5 minutes or more after the engine is stopped.



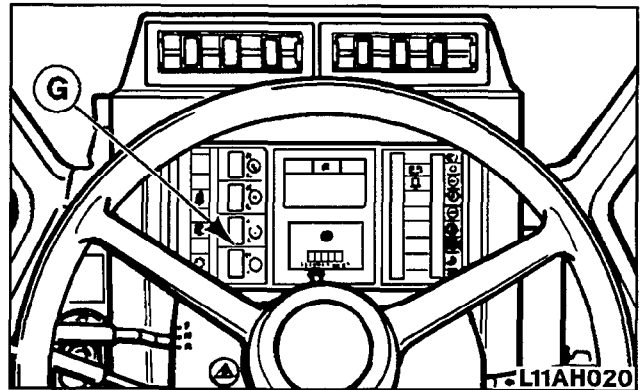
MAINTENANCE

- ★ Never operate the engine with the oil level below the L mark or above the H mark.
- ★ The type of engine oil used depends on the ambient temperature. Select oil according to the table under "LUBRICANTS, FUEL AND COOLANT" in this section.



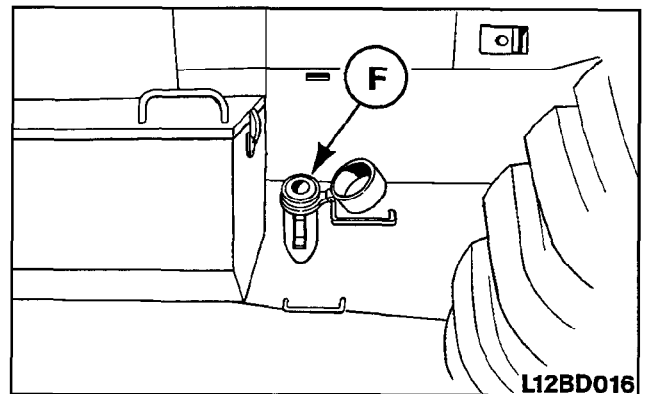
FUEL LEVEL

1. Check the fuel level using fuel level gauge (G) on the monitor panel.



2. Upon completion of work, pour in additional fuel at tank filler (F) until the fuel tank is full.

- ★ Fuel capacity: 430 ℓ (113.6 gal)
- ★ When adding fuel, never let the fuel overflow. This may cause a fire.

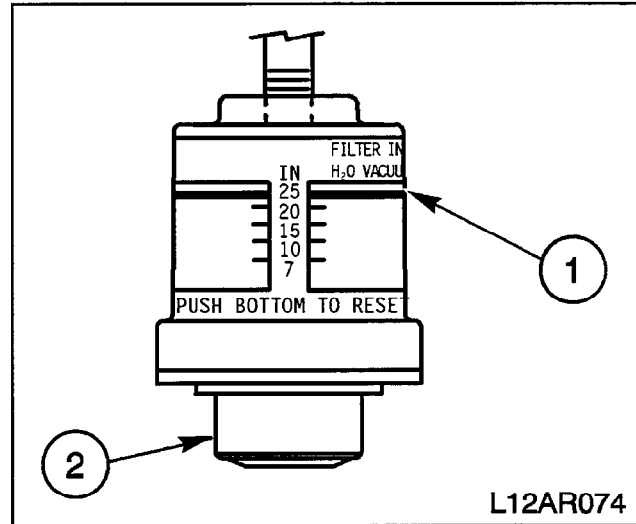


AIR CLEANER SERVICE INDICATOR

When the air cleaner element is clogged, the yellow piston of service indicator (1) reaches service level and gets locked.

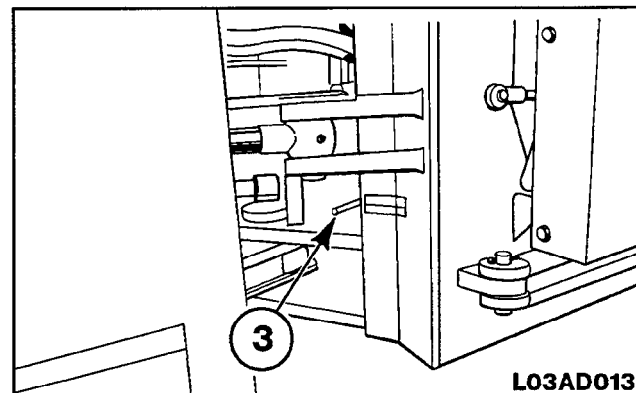
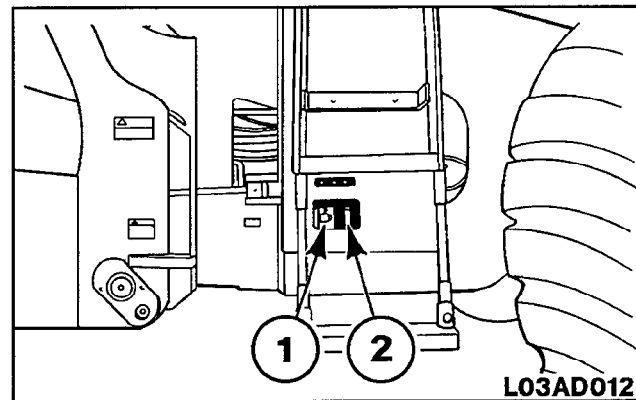
In that case, clean or replace the element as described under "WHEN REQUIRED" in this section.

After cleaning or replacing the element, push reset button (2) to return the indicator to its original position.



AIR TANKS

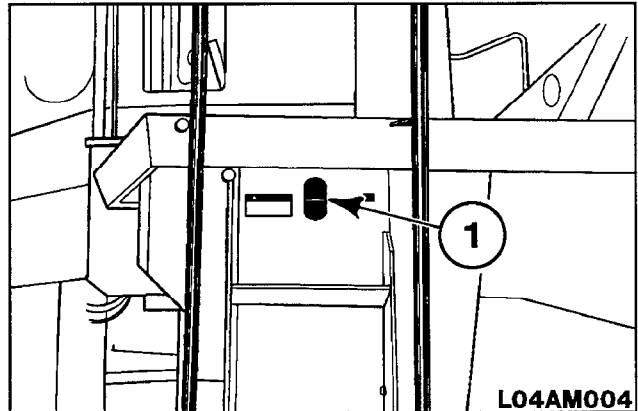
Upon completion of work, stop the engine, open drain valves (1), (2) and (3) and drain water out of the tanks.



MAINTENANCE

BRAKE OIL LEVEL

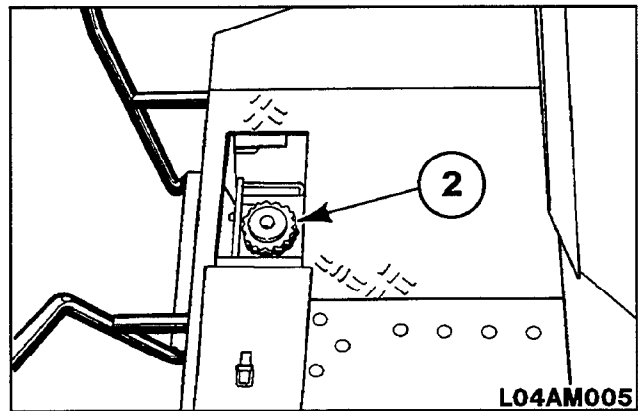
1. Check the brake oil level in oil tank (1), located on the left side of the machine. The oil level should be between the "MAX" and "MIN" oil level marks on the tank.



2. If necessary, remove oil filler cap (2) and refill with engine oil.

- ★ The type of engine oil used depends on the ambient temperature. Select oil according to the table under "LUBRICANTS, FUEL AND COOLANT" in this section.

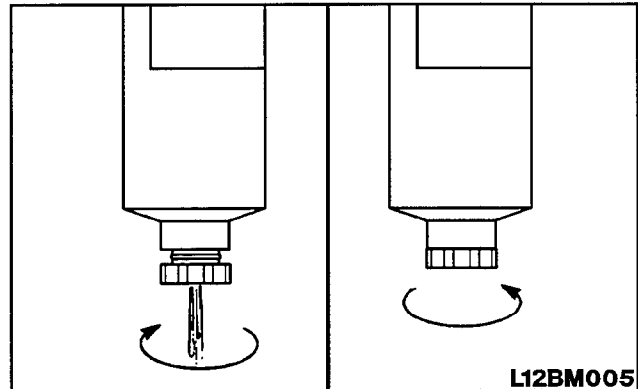
 **WARNING! Always use engine oil to refill the brake oil tank.**



FUEL FILTER/WATER SEPARATOR

With the engine shut-off, open the drain valve. Turn the valve counterclockwise approximately 1-1/2 to 2 turns until draining occurs. Drain the filter sump of water until clear fuel is visible.

- ★ Do not overtighten the valve. Overtightening can damage the threads.
- ★ Turn the valve clockwise approximately 1-1/2 to 2 turns to close the drain valve.



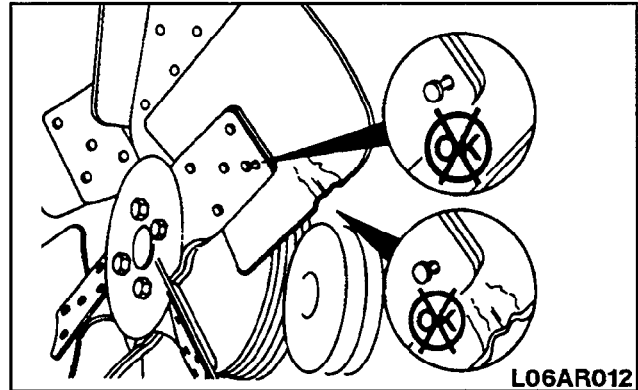
ENGINE FAN



WARNING! Personal injury can result from a fan blade failure. Never pull or pry on the fan. This can damage the fan blade(s) and cause fan failure.

- ★ Rotate the crankshaft by using the crankshaft barring techniques recommended by Cummins Engine Company, Inc.

Check for cracks, loose rivets, and bent or loose blades. Check the fan to make sure it is securely mounted. Tighten the capscrews if necessary. Replace any fan that is damaged.



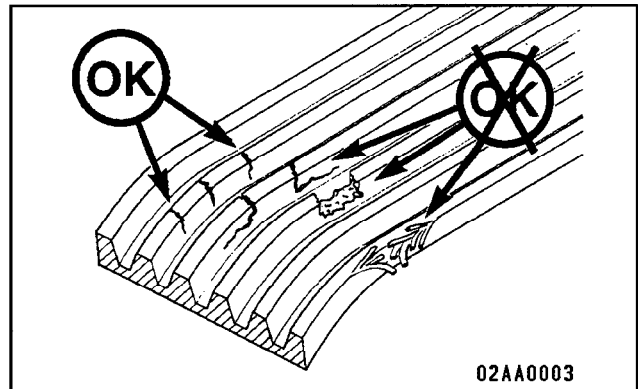
DRIVE BELTS

BELT INSPECTION

Visually inspect the drive belts. Replace belts that are cracked or frayed. Adjust belts that have a glazed or shiny surface which indicates belt slippage. Correctly installed and tensioned belts will show even pulley and belt wear.

Belt damage can be caused by:

- Incorrect tension
- Incorrect size or length
- Pulley misalignment
- Incorrect installation
- Severe operating environment
- Oil or grease on the belts

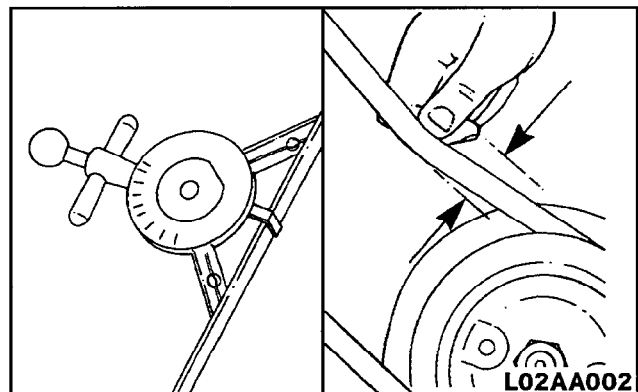


BELT TENSION CHECK

Measure belt tension at the center point of the longest pulley span using a belt tension gauge.

Refer to the following "DRIVE BELT TENSION CHART", for the correct belt tension gauge and belt tension value for the belt width used.

An alternate method, known as the deflection method, can be used to check belt tension by applying 110 N (25 lbf) of force between the pulleys on the v-belts. If the deflection is more than one (1) belt thickness per foot of pulley center distance, the belt tension **must** be adjusted.



All new belts will lose tension during use. They **must** be adjusted to the tension value listed in the following chart.

- ★ A belt is considered used if has been in operation for ten (10) minutes or longer.

MAINTENANCE

DRIVE BELT TENSION CHART

Belt Width	Belt Tension Gauge Tool No.		New Belt Tension Value		Used Belt Tension Value See NOTES	
	Click-type	Burroughs	N	lbf	N	lbf
0.380 in.	3822524	N/A	620	140	270 - 490	60 - 110
0.440 in.	3822524	N/A	620	140	270 - 490	60 - 110
1/2 in.	3822524	ST-1138	620	140	270 - 490	60 - 110
11/16 in.	3822524	ST-1138	620	140	270 - 490	60 - 110
3/4 in.	3822524	ST-1138	620	140	270 - 490	60 - 110
7/8 in.	3822524	ST-1138	620	140	270 - 490	60 - 110
4 rib	3822524	ST-1138	620	140	270 - 490	60 - 110
6 rib	3822525	ST-1293	710	160	290 - 580	65 - 130
8 rib	3822525	ST-1293	890	200	360 - 710	80 - 160

NOTE: A belt is considered used if has been in service for ten (10) minutes or longer.

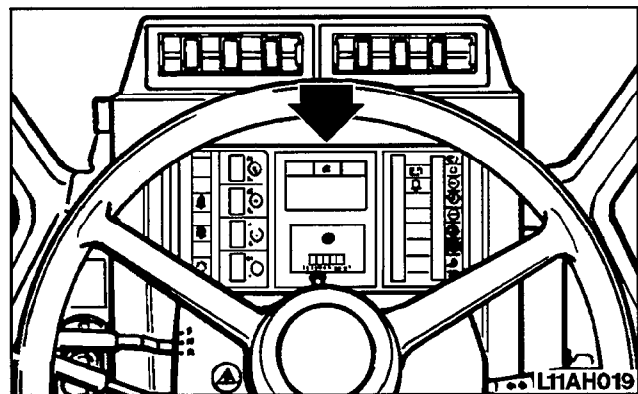
NOTE: If the used belt tension is less than the minimum value, adjust and tighten the belt to the maximum value.

MONITOR PANEL

★ Always make the checks listed under the section entitled "CHECKS BEFORE STARTING ENGINE".

1. Turn the starting switch to ON.
2. Check that all monitor lamps, gauges and the warning lamp light up for about 3 seconds and the alarm buzzer sounds for about 1 second as described under "SYSTEM CHECK" in Section 2.

★ If any monitor lamp does not light up, ask your distributor to inspect that monitor lamp.



ADDITIONAL CHECKS

A. CHECK ELECTRICAL WIRING.

Check for any sign of disconnection or short circuit in the electrical wiring. Check also for loose terminals and tighten any loose parts. Check the following points carefully:

- Batteries
- Cranking motor
- Alternator

B. CHECK THAT PARKING BRAKE WORKS PROPERLY.

C. CHECK THAT WHEEL BRAKES WORK PROPERLY.

D. CHECK THAT HORN SOUNDS PROPERLY.

E. CHECK THAT LAMPS FLASH PROPERLY; CHECK FOR DIRT OR DAMAGE.

F. CHECK DIRECTION OF REAR VIEW MIRRORS; CHECK FOR DIRT OR DAMAGE.

G. CHECK THAT ENGINE EXHAUST GAS COLOR IS NORMAL.

H. CHECK THAT INSTRUMENTS AND GAUGES WORK PROPERLY.

I. CHECK STEERING PLAY; CHECK THAT STEERING WORKS PROPERLY.

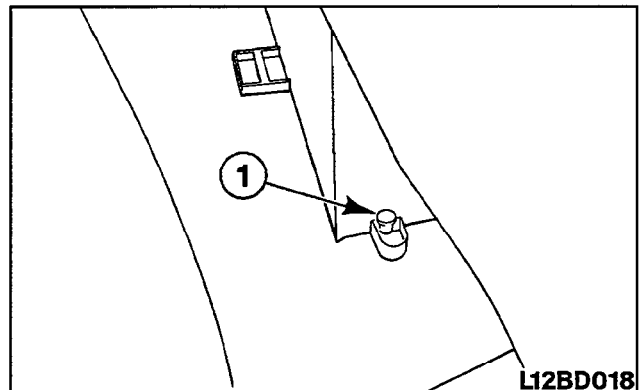
J. CHECK THAT BACK-UP ALARM SOUNDS PROPERLY.

EVERY 50 HOURS SERVICE

FUEL TANK

★ Drain water and sediment before starting the engine.

Open drain valve (1) on the bottom right of the tank so that the sediment and mixed water will be drained in accompaniment with the fuel.



TIRES

Measure the tire inflation pressures before operating when the tires are cool. Refer to "HANDLING TIRES" in Section 2. Also at this time, check for tire damage.

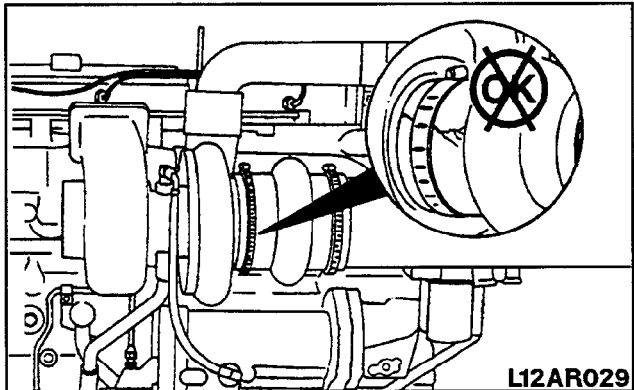
MAINTENANCE

ENGINE AIR INTAKE SYSTEM

Inspect the intake piping for cracked hoses, loose clamps, or punctures which can damage the engine.

Tighten or replace parts as necessary to make sure the air intake system does **not** leak.

Check for corrosion of the intake system piping under the clamps and hoses. Corrosion can allow corrosive products and dirt to enter the intake system. Disassemble and clean as required.

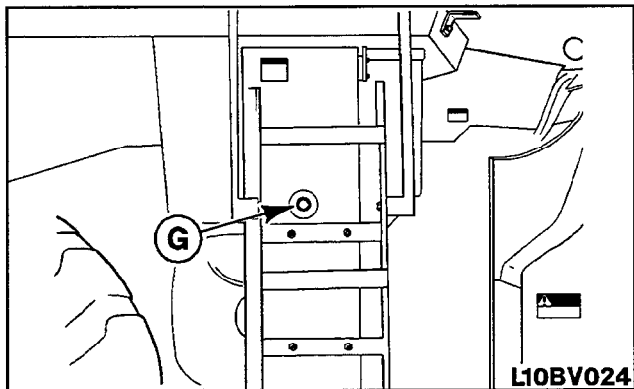


EVERY 100 HOURS SERVICE

★ Maintenance for every 50 hours should be carried out at the same time.

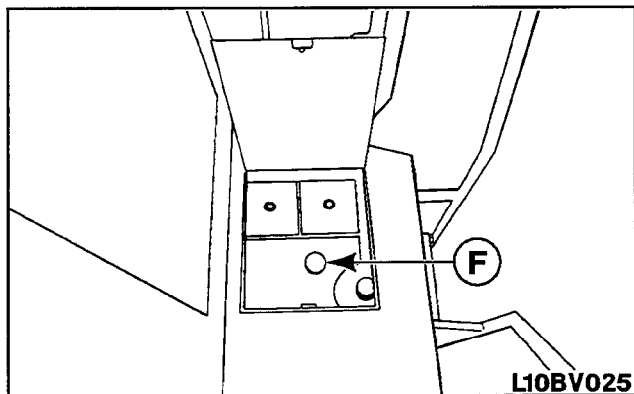
HYDRAULIC TANK OIL LEVEL

1. Lower the bucket horizontally to the ground and stop the engine. Wait for 5 minutes, then check sight gauge (G). Oil should be visible in sight gauge (G).
2. Add engine oil at oil filler cap (F), if necessary.



WARNING! When removing the oil filler cap, turn it slowly to relieve inner pressure.

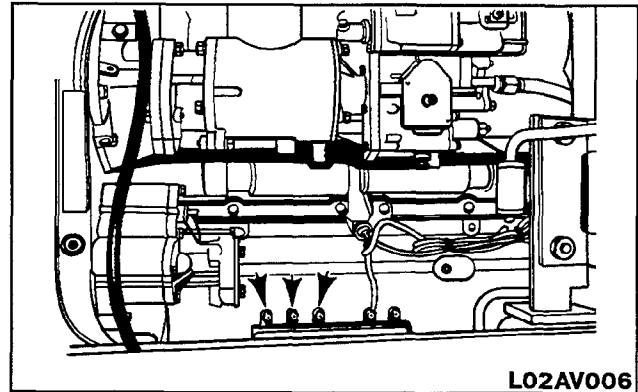
- ★ The type of lubricant used depends on the ambient temperature. Select according to the table under "LUBRICANTS, FUEL AND COOLANT".



LUBRICATION

Apply grease to the grease fittings shown by the arrows.

1. Rear axle pivot pins (3 points)



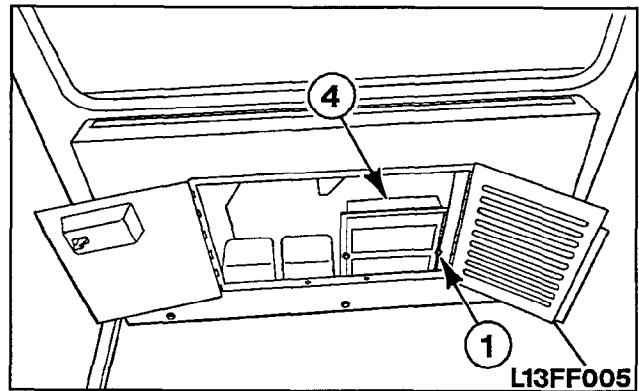
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CAB AIR FILTER - IF EQUIPPED

Clean the cab air filters as follows:

- ★ Be sure the cab blower fan is stopped before cleaning the filters.

1. Open the access doors located at the rear of the cab to gain access to the fresh air filter.
2. Remove holder mounting knobs (1), holder (2) and spacers (3) holding filter (4). Pull out the filter element and clean it.



L13FF005

- ★ Direct dry compressed air (less than 7 kg/cm² [100 psi / 689 kPa]) to the element from the inside along its folds, then direct it from the outside along its folds and again from the inside. Check the element for damage and/or deterioration.

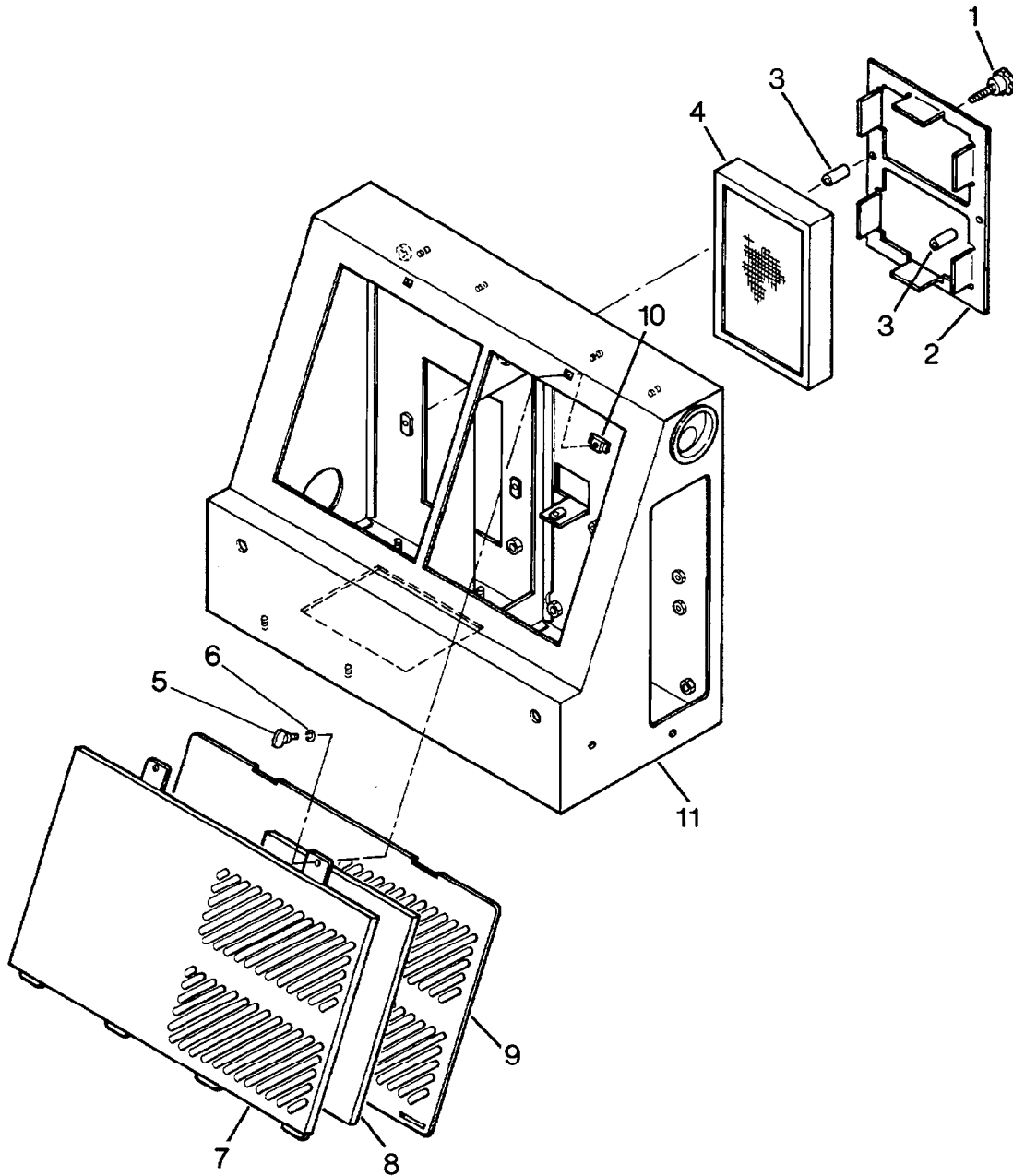


WARNING! When using compressed air, wear safety glasses and other things required to maintain safety.

3. After cleaning the filter element, reinstall it with the arrow pointing inward.
4. Install filter holder (2), spacers (3) and mounting knobs (1).
5. Close the access doors located at the rear of the cab.
6. Move the operator's seat forward, then tilt the seat backrest forward and down.
7. Loosen the two access panel thumb screws (5) and retainers (6) and remove access panel (7) to gain access to recirculating air filter (8). Remove air filter and clean it.
8. After cleaning the recirculating air filter, reinstall air filter (8).
9. Install access panel (7), retainers (6) and thumb screws (5). Tighten the access panel thumb screws.

MAINTENANCE

10. Return the operator's seat back to its original position.



L13FF006

- | | | | |
|----|------------------------|-----|--------------------------|
| 1. | Holder mounting knob | 7. | Outer access panel |
| 2. | Filter holder | 8. | Recirculating air filter |
| 3. | Holder mounting spacer | 9. | Inner access panel |
| 4. | Fresh air filter | 10. | Retainer |
| 5. | Thumb screw | 11. | Filter box |
| 6. | Retainer | | |

EVERY 250 HOURS SERVICE

- ★ Maintenance for every 50 hours should be carried out at the same time.

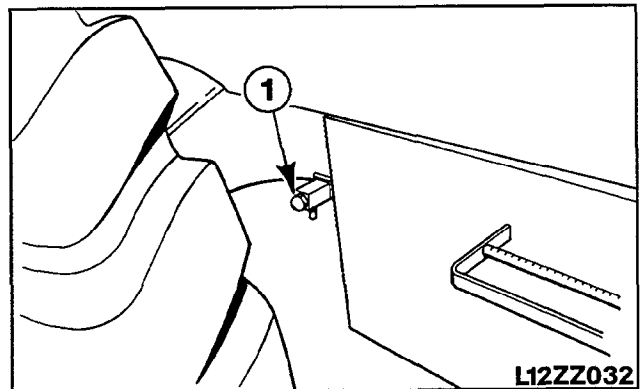
ENGINE OIL AND FILTER

- ★ Change the engine lubricating oil AND filter at every oil change interval.
1. Operate the engine until it reaches operating temperature. Park the machine on a level surface, apply the parking brake, lower the bucket to the ground and stop the engine.
 2. Open the engine side access door on the left side of the machine.



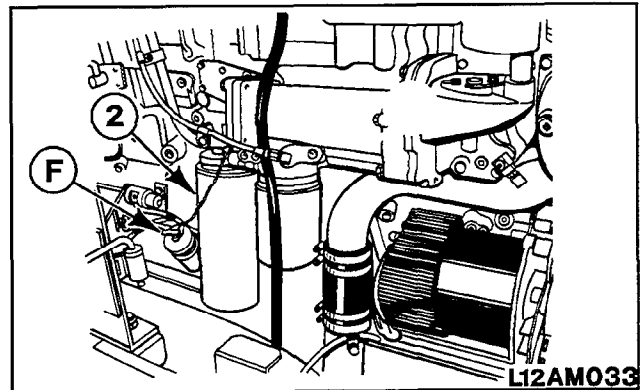
WARNING! Avoid direct contact of hot oil with your skin. Hot oil can cause personal injury.

3. Remove oil drain plug (1). Allow the oil to drain completely.



4. Clean the area around the oil filter (2).
5. Using a filter wrench, remove the oil filter (2) by turning it counterclockwise. Discard the filter in a suitable manner if they are **not** needed for any reason.
6. Clean the filter gasket surface of the filter header.

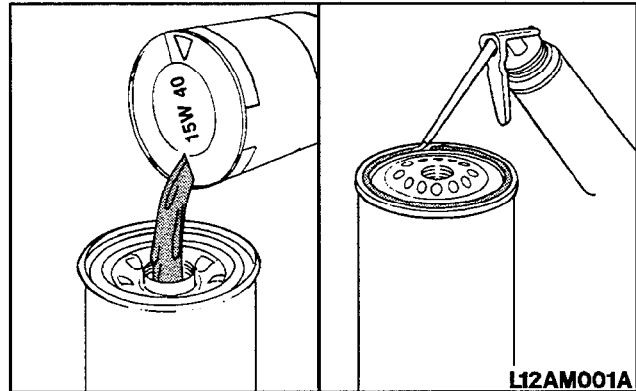
- ★ An oil filter O-ring may stick on the filter header. Make sure the O-ring is removed.



MAINTENANCE

7. Fill a new filter with clean engine oil. Then, apply a thin coat of clean engine oil to the seal of the filter.

★ If the filter is not filled with engine oil, there will be a lack of lubrication during the delay until the filter is pumped full of oil. This lack of lubrication is harmful to the engine.

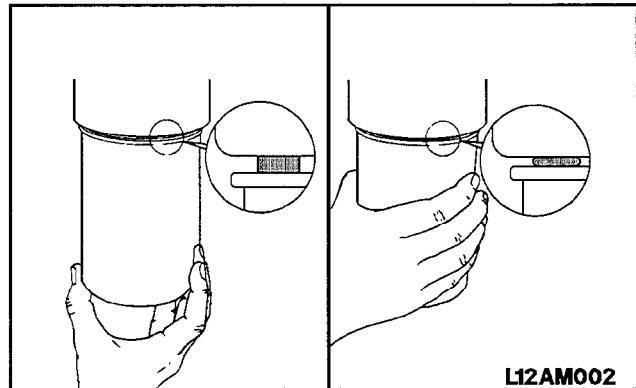


8. Install the filter on the filter header until the filter seal contacts the seal surface of the filter header and then, turn the filter an additional 1/2 to 3/4 turn by hand.

★ Do not over tighten the filter or damage may result to the filter seal or threads.

★ Use a genuine filter.

9. Clean and check the oil drain plug threads and the seal surface. Reinstall and tighten the oil drain plug.



10. Clean and check the oil drain plug threads and the seal surface. Reinstall and tighten the oil drain plug.

11. Remove oil filler cap (F). Fill the engine with the specified type and quantity of engine oil at the oil filler.

★ Refill capacity: 36 ℓ (9.5 gal)

★ The type of lubricant used depends on the ambient temperature. Select according to the table entitled "LUBRICANTS, FUEL AND COOLANT".

12. After refilling the engine with oil and before starting the engine, perform the procedure outlined under " SPECIAL STARTING" in Section 2. This procedure insures that the engine receives proper lubricating oil flow. Lack of lubrication will damage the engine.

13. Start the engine and idle it for a few minutes. Inspect for oil leaks at the filters and drain plug. Then, stop the engine, wait for 5 minutes to allow the oil to drain and check the oil level. As necessary, add oil to bring the oil level up to the specified mark on the oil level gauge.

14. Close the engine side access door.

★ Diluted oil can cause severe damage to the engine. Check the condition of the used oil.

- Thin black oil indicates fuel dilution.
- Milky discoloration indicates coolant dilution.

FUEL FILTERS

GENERAL

The fuel filters are spin-on type filters. These filters cannot be cleaned and should not be disturbed except when it becomes necessary to replace them.

Change the fuel filters as listed on the SCHEDULED MAINTENANCE GUIDE or sooner if a power loss is evident. If a power loss persists, consult your distributor.

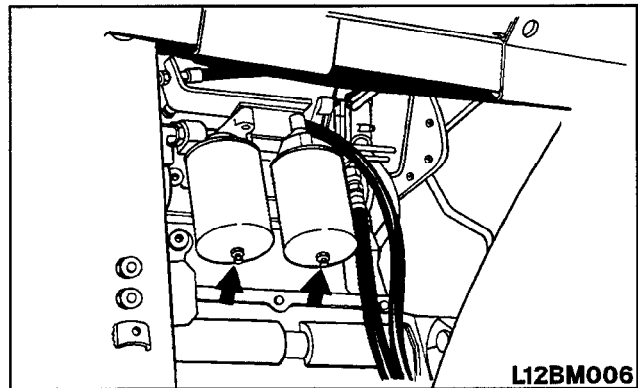
NOTE: Fuel with more than the average impurities may require changing filters at shorter intervals.

The fuel filters are located on the right side of the engine.

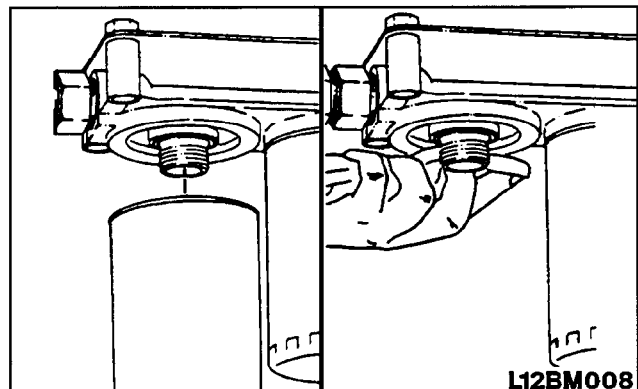
Be careful not to allow dirt, water or other foreign material to get in the new filter. Keep new filters in the original package until ready for installation.

REPLACEMENT

1. Open the engine side access cover on the right side of the machine.
2. Clean the area around the fuel filters.

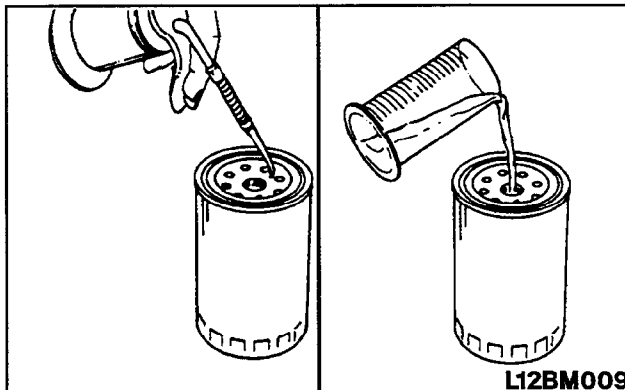


3. Using a filter wrench, remove the fuel filters by turning them counterclockwise. Discard the filters in a suitable manner if they are **not** needed for any reason.
4. Clean the filter gasket surfaces of the filter header for each filter. Replace the filter O-rings.



MAINTENANCE

5. Fill the new filters with clean diesel fuel. Then, apply a thin coat of clean engine oil to the seal of the filter.

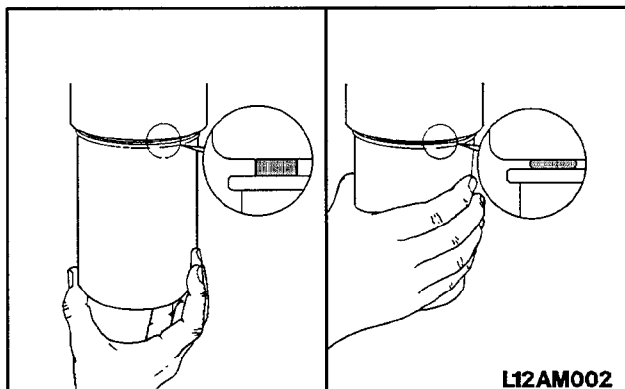


6. Install the filters on the filter header until the filter seal contacts the seal surface of the filter header and then, turn the filter an additional 1/2 to 3/4 turn by hand.

★ Do not over tighten the filter or damage may result to the filter seal or threads.

★ Use a genuine filter.

7. After replacing the filters, start the engine and idle it for a few minutes. Check the filters for possible fuel leakage.



8. Close the engine side access cover.

COOLANT FILTER

GENERAL

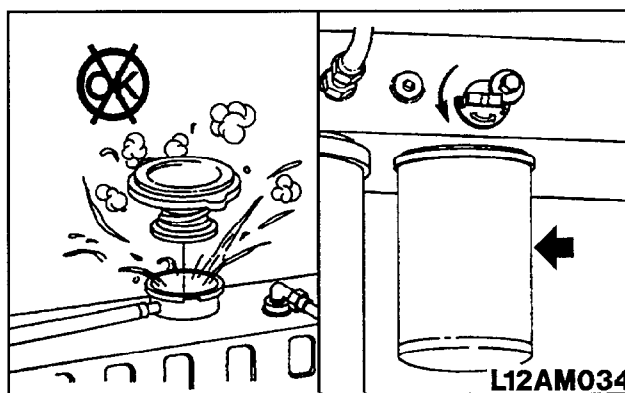
The coolant filter is a spin-on type filter. This filter cannot be cleaned and should not be disturbed except when it becomes necessary to replace it.

Replace the coolant filter at every engine oil change.

★ The correct coolant filter to be used is determined by the total cooling system capacity and operational factors. For further information, refer to "SCA UNIT MAINTENANCE GUIDE".

The coolant filter is located on the left side of the engine.

Be careful not to allow dirt, water or other foreign material to get in the new filter. Keep new filters in the original package until ready for installation.

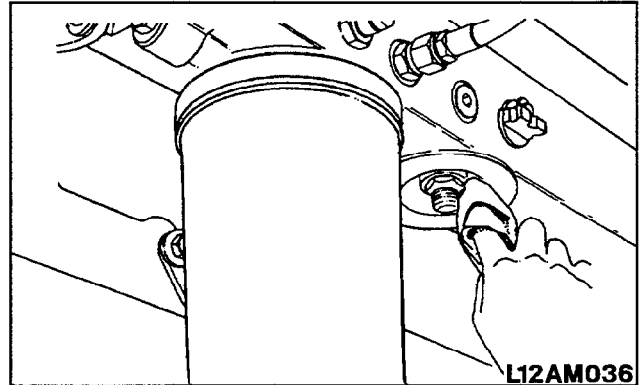
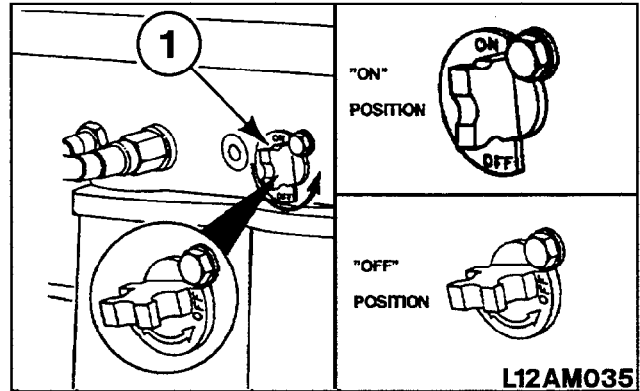


REPLACEMENT

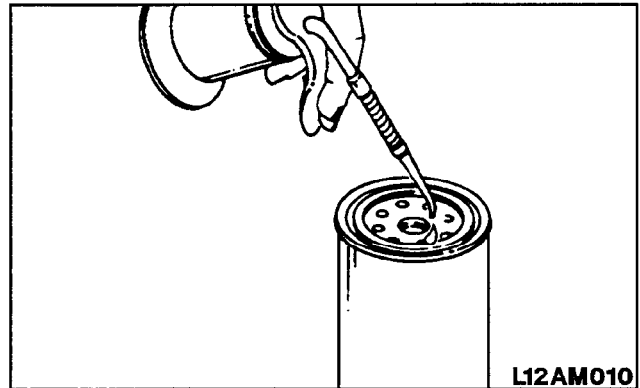


WARNING! Do not remove the radiator cap when the engine coolant is hot. Hot coolant will cause serious personal injury. Remove the radiator cap and close the shutoff valves, before removing the coolant filter. Failure to do so can result in personal injury from heated coolant spray.

1. Open the engine side access door on the left side of the machine.
2. Remove the radiator cap. Close the shutoff valve (1).
3. Clean the area around the coolant filter.
4. Using a filter wrench, remove the coolant filter by turning it counterclockwise. Discard the filter in a suitable manner if is **not** needed for any reason.
5. Clean the filter gasket surface of the filter header.

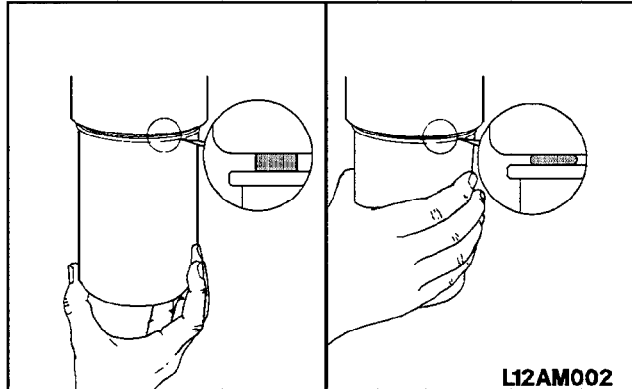


6. Apply a thin coat of clean engine oil to the seal of the new filter.
- ★ Do **not** allow the engine oil to get into the filter because it will adversely affect the SCA concentration level.



MAINTENANCE

7. Install the new filter on the filter header until the filter seal contacts the seal surface of the filter header and then, turn the filter an additional 1/2 to 3/4 turn by hand.
- ★ Do not over tighten the filter or damage may result to the filter seal or threads.
- ★ Use a genuine filter.
8. After filter replacement, open the shutoff valve (1) and reinstall the radiator cap.
9. Start the engine and idle it for a few minutes. Check the filter for possible coolant leakage.
10. Close the engine side access door.



ENGINE CRANKCASE BREATHER AND TUBE

Clean or replace the engine crankcase breather and tube/hose. If the breather and/or tube become plugged up, this condition could produce excessive crankcase pressure. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

BATTERY ELECTROLYTE LEVELS

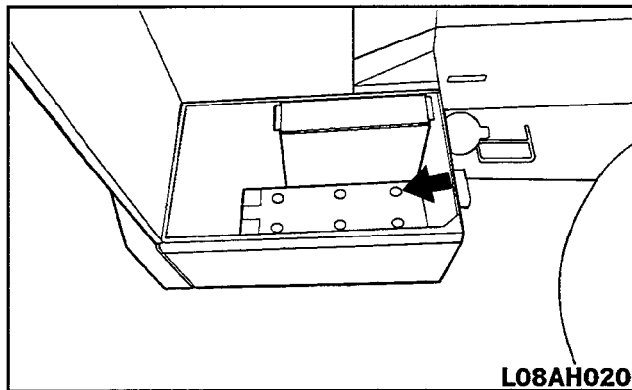


WARNING! If the electrolyte gets on your skin or clothes, immediately wash with plenty of clean water.



WARNING! To avoid gas explosions, do not bring fire or sparks near the battery.

1. Open the two battery box covers. Remove the battery caps.
2. If the electrolyte level is lower than the prescribed level (10 - 12 mm [0.39 - 0.47 in] above the plates), add distilled water.



- ★ Should any of the acid be spilt, have it replenished by the nearest battery shop with acid of the correct specific gravity.
- ★ When checking electrolyte level, clean the vent hole in the battery caps.
3. Reinstall the battery caps and close the battery box covers.

LUBRICATION

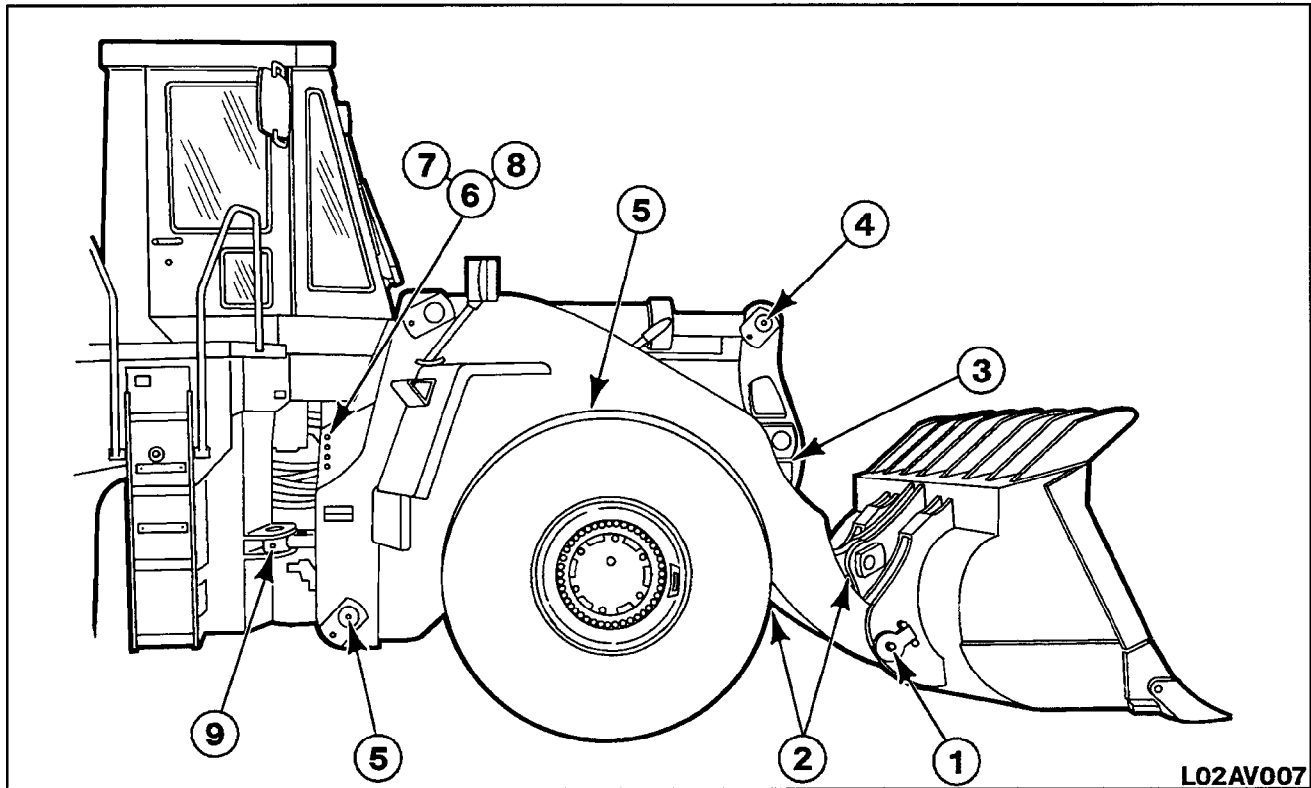
NOTICE: When operating under average conditions, lubricate the loader linkage pivot points as listed on the SCHEDULED MAINTENANCE GUIDE. When operating under severe service conditions, lubricate the loader linkage pivot points at every work shift change or every work day, whichever comes first.

MAINTENANCE

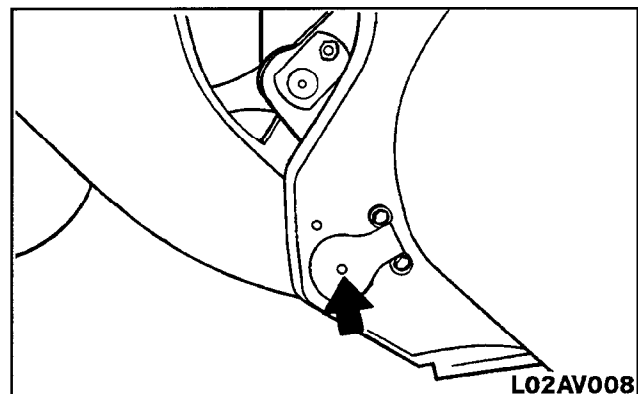
To ensure proper lubrication, grease the linkage pivot points as follows:

1. Apply grease to the grease fittings shown by the arrows until it seeps out of the pivot points.
2. Start the engine and operate the work equipment through several complete cycles.
3. Reapply grease to the grease fittings again.

★ If grease does not flow into the pivot point, correct the problem before operating or damage could occur.

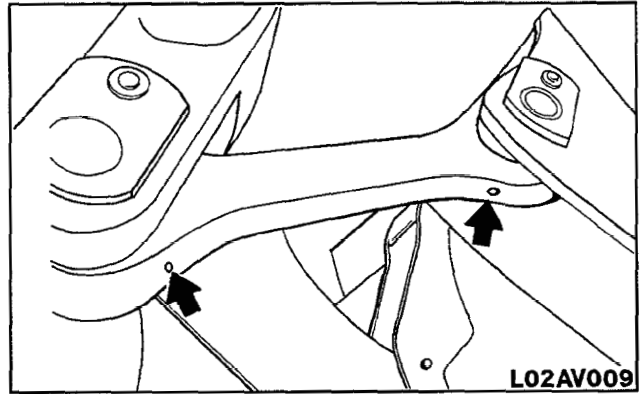


1. Bucket pins (2 points)

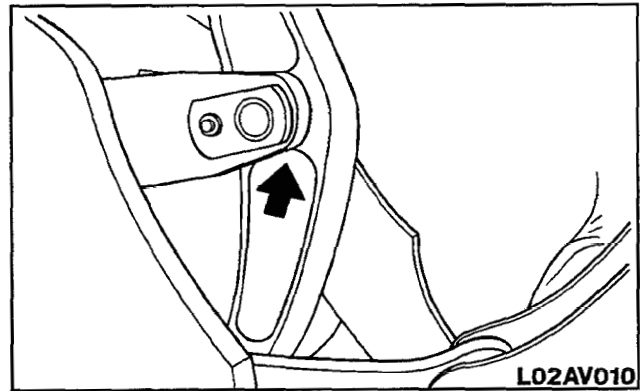


MAINTENANCE

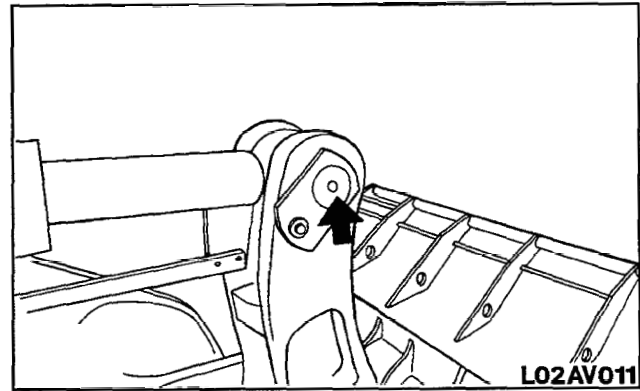
2. Bucket link pins (2 points)



3. Tilt lever pin (1 point)

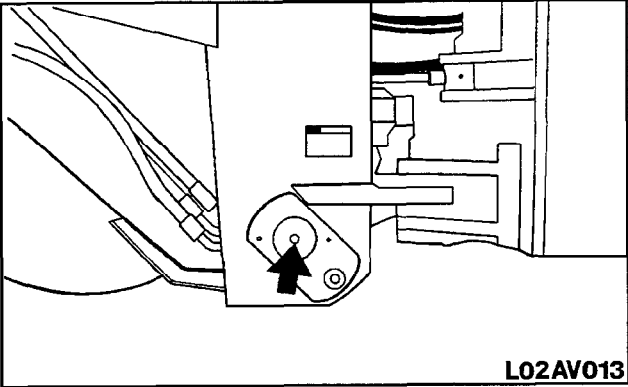
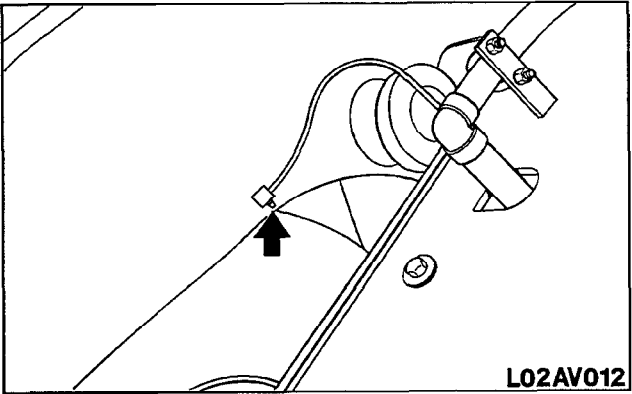


4. Bucket cylinder rod end pin (1 point)



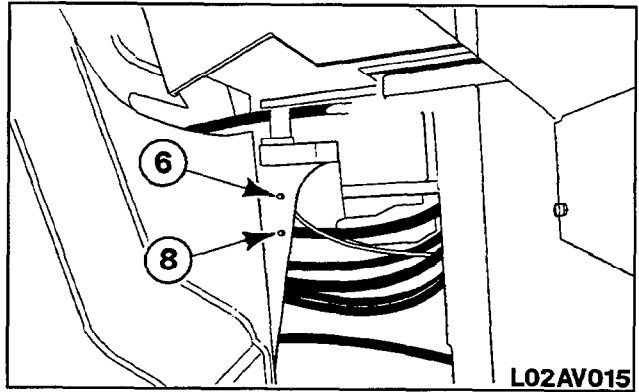
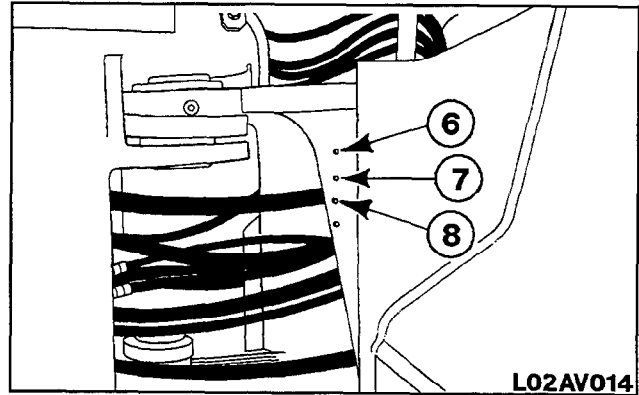
MAINTENANCE

5. Lift cylinder pins (4 points)

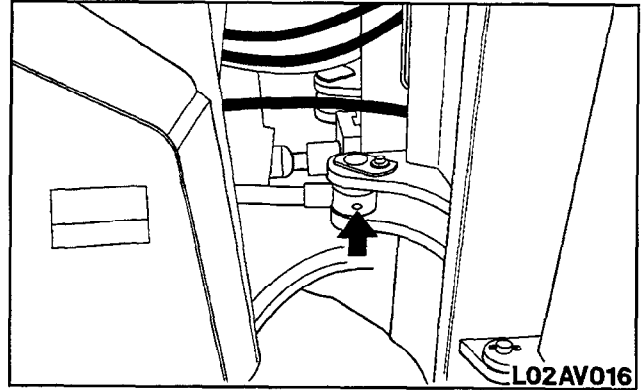


MAINTENANCE

- 6. Lift arm pivot pins (2 points)
- 7. Bucket cylinder housing end pin (1 point)
- 8. Steering cylinder housing end pins (2 points)



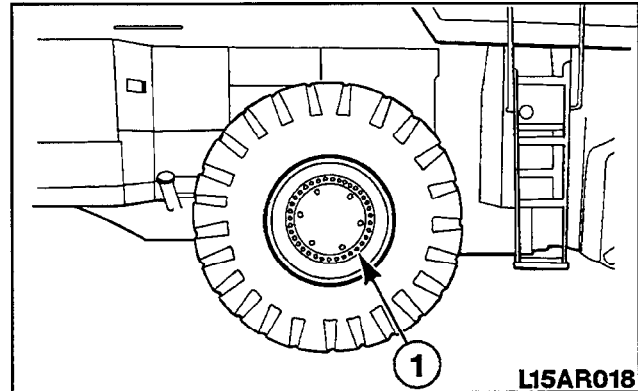
- 9. Steering cylinder rod end pins (2 points)



WHEEL HUB NUTS

If wheel hub nuts (1) are loose, tire wear will be increased and accidents may be caused. If any hub nuts are loose, tighten them to the specified tightening torque.

- ★ Tightening torque: 48 ± 5 kgm (347 ± 36 lbf ft / 470 ± 49 N•m)
- ★ If any wheel mounting studs are broken, replace all studs for that wheel.
- ★ Always rotate in the direction of tightening when checking for loose nuts.



AIR CONDITIONER COMPRESSOR DRIVE BELT - IF EQUIPPED

1. Open the engine side access door on the right side of the machine.
2. Visually inspect the drive belt. Replace belts that are cracked or frayed. Adjust belts that have a glazed or shiny surface, indicating belt slippage. Correctly installed and tensioned belts show even pulley and belt wear.
3. Check each belt pulley for damage and pulley groove wear. Particularly, check whether the drive belt is contacting the bottom of the pulley groove through wear. Also, check for pulley alignment.
4. Check belt tension at the midway point of the longest pulley span using the deflection method.
 - ★ Proper belt deflection is 10-15 mm (13/32-19/32 in) when applying approximately 6 kg (13 lbf / 58 N) of force on the belt between the compressor drive pulley and the magnetic clutch. If the deflection is more than the specified range, the belt tension **must** be adjusted.
5. If necessary, adjust drive belt tension as follows:
 - 1) Loosen the arm adjusting bolts and the mounting bracket pivot bolt.
 - ★ When adjusting drive belt tension, do not attempt to move the compressor directly with a bar or similar tool, but use a wood block to prevent damage.
 - 2) Move the compressor to adjust belt tension.
 - 3) When proper belt tension is obtained, tighten the arm adjusting bolts and the mounting bracket pivot bolt securely to hold the compressor in place.
6. Close the engine side access door on the right side of the machine.
 - ★ If proper belt tension can **not** be obtained, the drive belt may be stretched, leaving no allowance for adjustment, and should be replaced.
 - ★ When the belt is replaced, readjust its tension after running for one (1) hour.

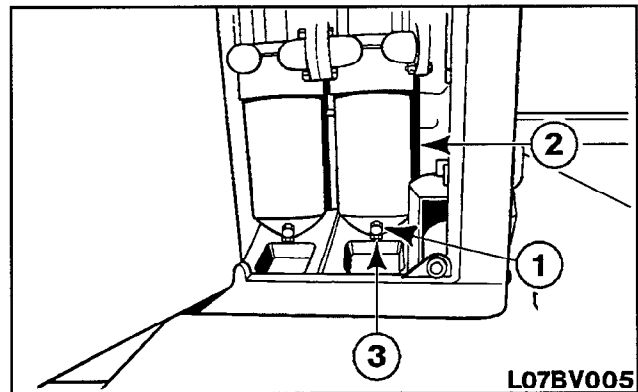
MAINTENANCE

EVERY 500 HOURS SERVICE

★ Maintenance for every 50, 100 and 250 hours should be carried out at the same time.

TRANSMISSION OIL FILTER - S/N A61017 AND BELOW

1. Remove drain plugs (1) at the bottom of filter cases (2), and drain the oil. After draining the oil, tighten the plugs.
2. Hold filter cases (2) and loosen center bolts (3), then remove the filter cases.
3. Remove the filter element and clean the inside of the filter case. Assemble a new element, then install the filter case.



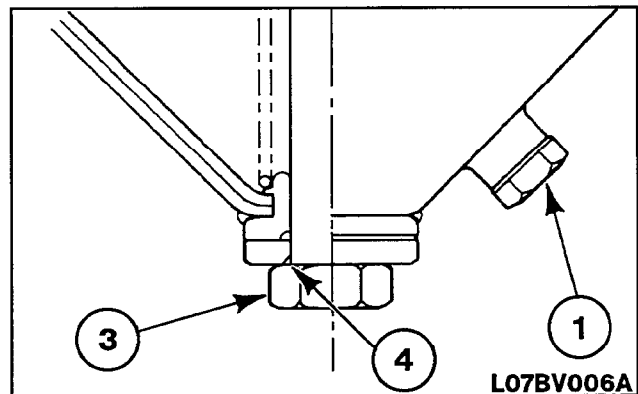
★ Use a genuine oil filter element.

★ Replace the filter gasket and O-rings with new parts. Coat the gasket and O-rings with clean engine oil before installing.

★ Before tightening center bolt (3), install bolt washer (4) so that its chamfered surface faces the hexagonal head of the center bolt.

★ Be careful not to apply excessive torque to center bolts (3).

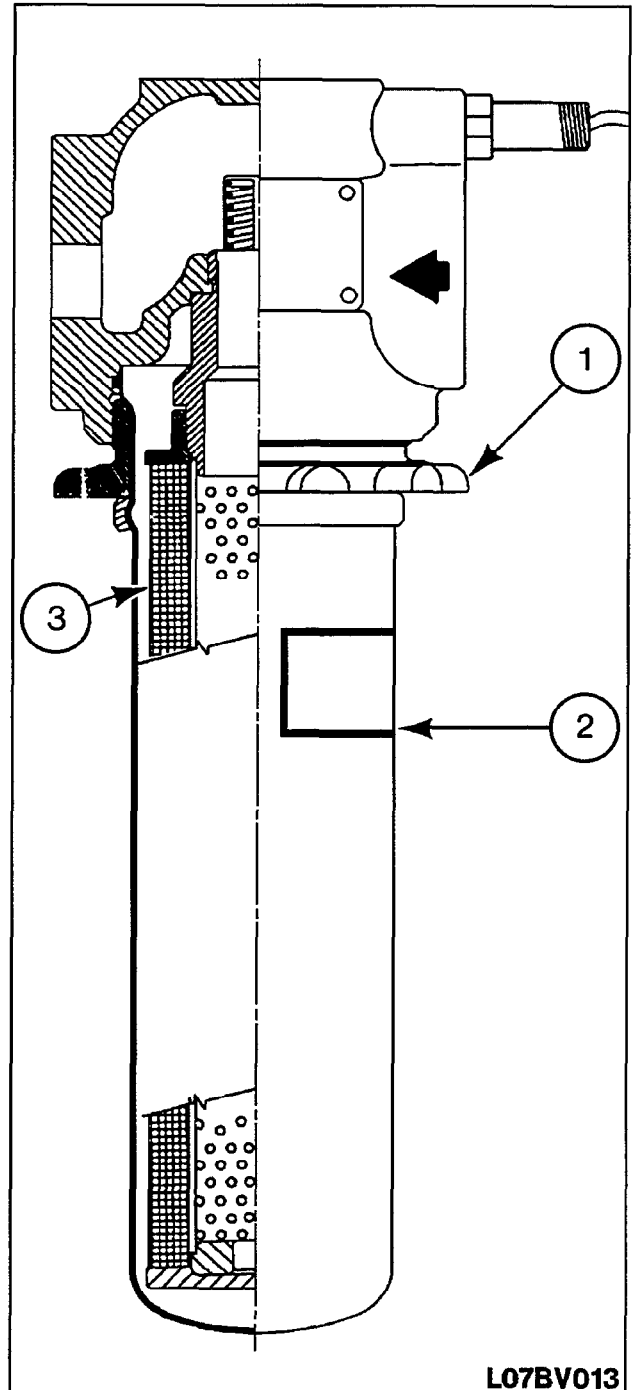
★ Tightening torque: 18.5 ± 1.5 kgm (134 ± 11 lbf ft / 182 ± 15 N•m)



4. Run the engine for a short time at idle speed and check for oil leaks. Stop the engine. Check that the transmission oil is at the specified level. For details, see "TRANSMISSION OIL LEVEL".

TRANSMISSION OIL FILTER - S/N A61018 AND UP

1. Position a container under the filter case to catch any oil spillage, then loosen the retainer ring (1) and lower the filter case (2) past the filter element (3).
2. Empty and discard the oil in the filter case, then clean out the filter case.
3. Remove the used filter element by sliding it off the filter core.
4. Install a new filter element.
5. Install the filter element case and secure it into position by tightening the retainer ring.
6. Run the engine for a short time at idle speed and check for oil leaks. Stop the engine. Check that the transmission oil is at the specified level. For details, see "TRANSMISSION OIL LEVEL".

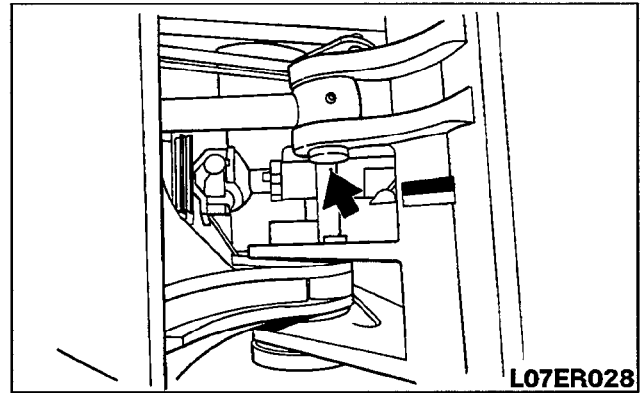


MAINTENANCE

LUBRICATION

Apply grease to the grease fitting shown by the arrow.

1. Center drive shaft spline (1 point)



AIR DRYER - IF EQUIPPED

Perform the following inspection of the air dryer and if there is any abnormality, contact your distributor.

- ★ Open the air tank drain valves and check that only a small amount of water is drained. Note that if the ambient temperature is lower than 16°C (61°F), a small amount of water may be collected in the drain.
- ★ Check that there is no abnormal inclusion of oil in water drained from the exhaust port of the air dryer.

EVERY 1000 HOURS SERVICE

- ★ Maintenance for every 50, 100, 250 and 500 hours should be carried out at the same time.

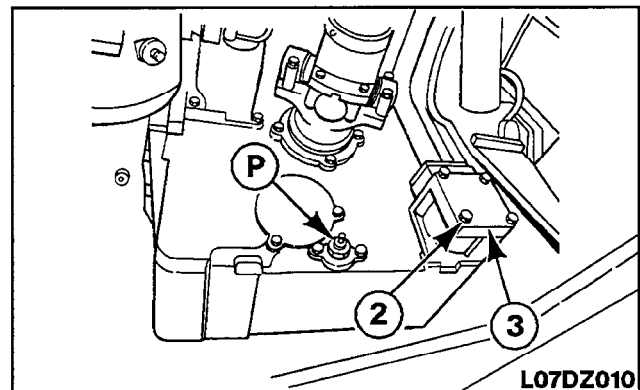
TRANSMISSION OIL AND STRAINER

1. Operate the machine until the transmission oil reaches operating temperature. Park the machine on a level surface, apply the parking brake, lower the bucket to the ground and stop the engine.



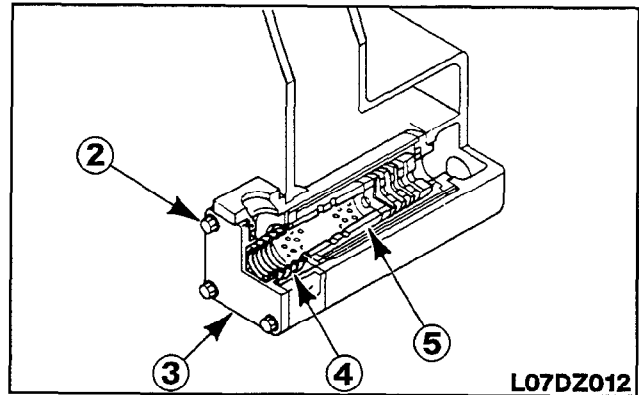
WARNING! Avoid direct contact of hot oil with your skin. Hot oil can cause personal injury.

2. Remove oil drain plug (P). After the oil has drained completely, reinstall and tighten the drain plug.
- ★ After loosening drain plug (P), pull out the plug slowly to prevent the oil from spouting out.
3. Replace the transmission oil filter element(s) as described under "TRANSMISSION OIL FILTER".



MAINTENANCE

4. Remove the four mounting bolts (2) and strainer cover (3), then remove spring (4) together with strainer (5).
5. Remove all dirt from the surface of strainer (5), then wash in clean light oil. If the strainer is damaged, replace with a new part.
6. Replace the O-ring of strainer cover (3) with a new part. Install spring (4) and strainer (5) in cover (3), then install the cover.

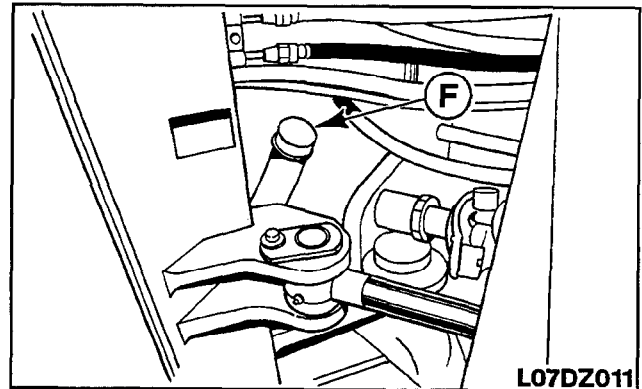


7. Remove oil filler cap (F). Fill the transmission with the specified type and quantity of engine oil at the oil filler.

★ Refill capacity: 62 ℓ (16.4 gal)

★ The type of lubricant used depends on the ambient temperature. Select according to the table entitled "LUBRICANTS, FUEL AND COOLANT".

8. Start the engine and idle it for a few minutes. Inspect for oil leaks at the filters, strainer and drain plug. Then, stop the engine, wait for 15 minutes to allow the oil to drain and check the oil level. As necessary, add oil to bring the oil level up to the specified mark on the oil level gauge.

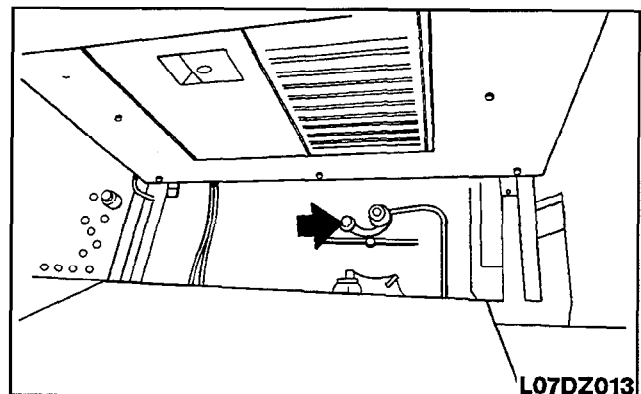


★ For the oil level checking procedure, refer to "TRANSMISSION OIL LEVEL" in this section.

TRANSMISSION CASE BREATHER

Remove all mud and dirt from around the breather, then remove the breather. Using cleaning fluid, clean the breather. Reinstall the breather.

★ While the breather is removed, be careful not to allow foreign material to enter the transmission case.

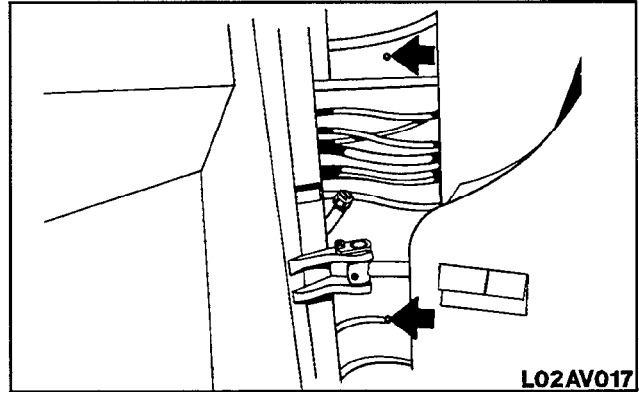


MAINTENANCE

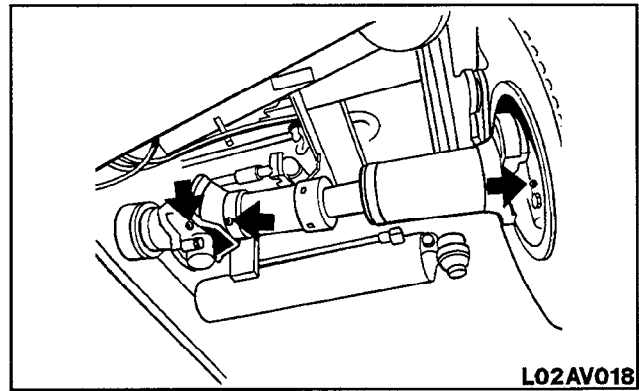
LUBRICATION

Apply grease to the grease fittings shown by the arrows.

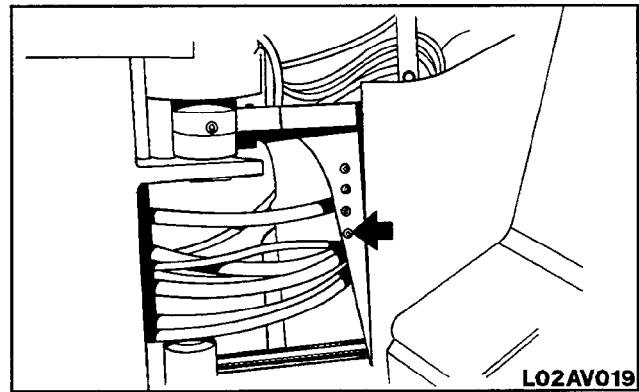
1. Center hinge pins (2 points)



2. Front drive shaft (3 points)

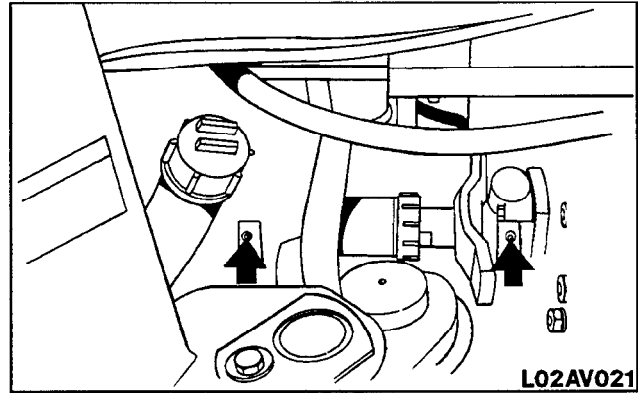


3. Drive shaft center support (1 point)

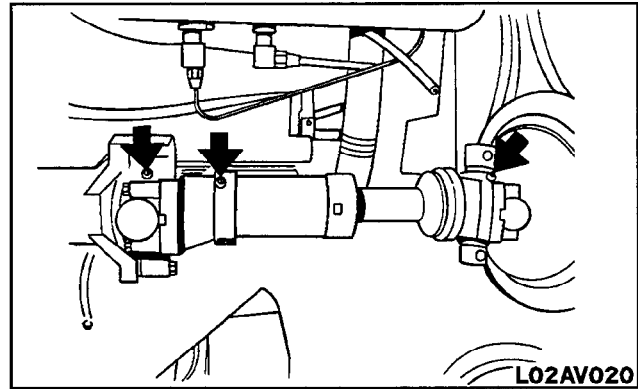


MAINTENANCE

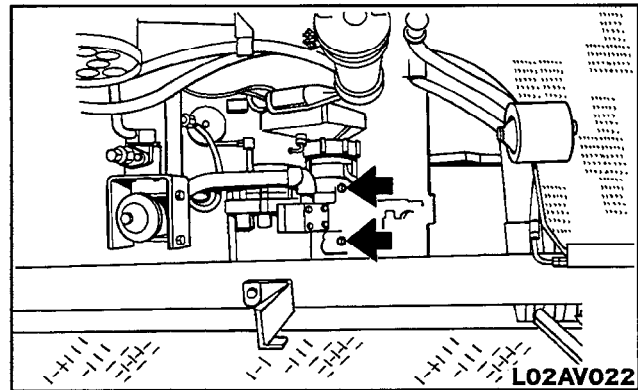
4. Center drive shaft (2 points)



5. Rear drive shaft (3 points)

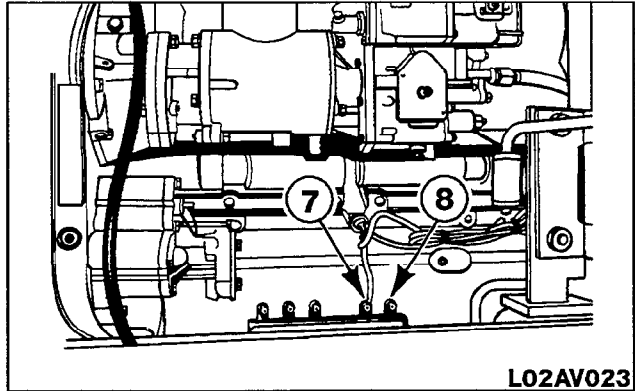


6. Upper drive shaft (2 points)

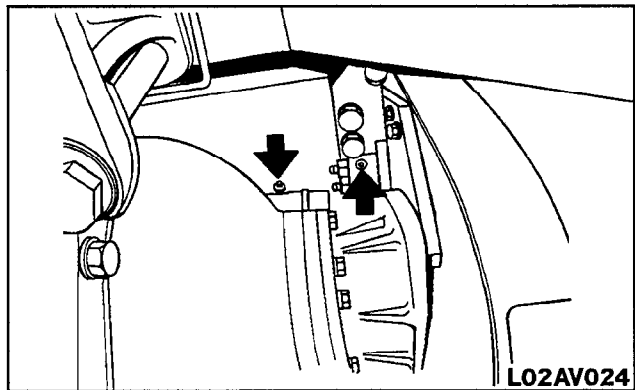


MAINTENANCE

- 7. Damper (1 point)
- 8. Transmission mounting trunnion (1 point)



- 9. Parking brake caliper (2 points)



EVERY 1500 HOURS SERVICE

★ Maintenance for every 50, 100, 250 and 500 hours should be carried out at the same time.

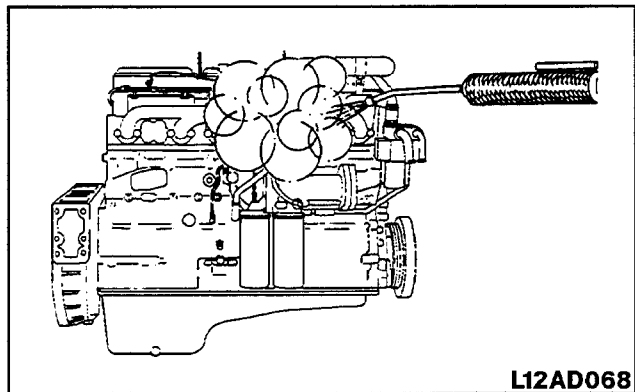
ENGINE VALVES AND INJECTORS

Engine valves and injectors must be correctly adjusted for the engine to operate efficiently. Check and adjust the engine valves and injectors. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

ENGINE

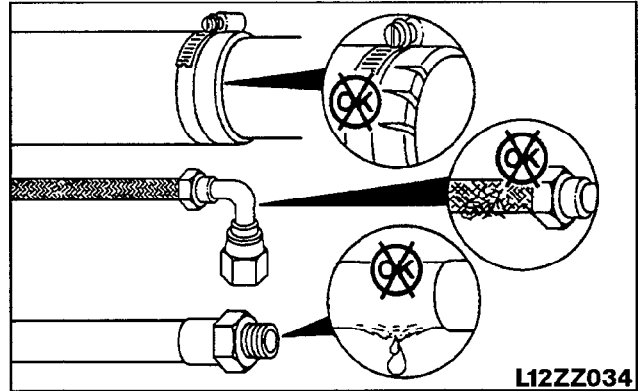
Clean the engine every 1500 hours of service or annually, whichever comes first. Steam is the best method of cleaning a dirty engine or a piece of equipment. If steam is **not** available, use a solvent to wash the engine.

Protect all electrical components, openings and wiring from the full force of the cleaner spray nozzle.



ENGINE MOUNTED HOSES

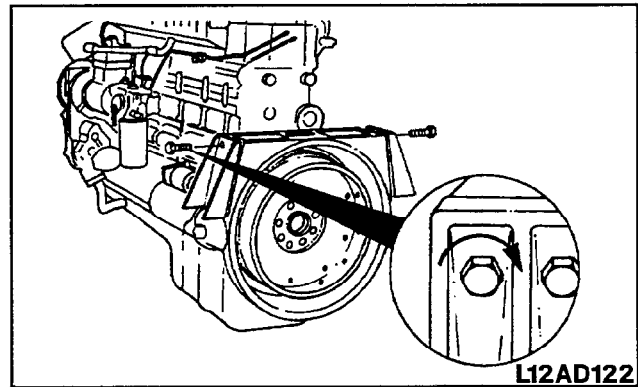
Check the lubricating oil, cooling and fuel system hoses and hose connections for leaks and/or deterioration. Particles of deteriorated hose can be carried through the related system and restrict or clog small passages, especially the radiator core or lubricating oil cooler, and partially stop circulation. Replace hoses, hose fittings and clamps as necessary.



ENGINE MOUNTING HARDWARE

Check the torque on the mounting bolts and nuts. Retighten any that are loose. Inspect the rubber mounting cushions for deterioration and/or age hardening. Replace any broken or missing mounting hardware and/or damaged mounting cushions.

- ★ Tightening torques:
 - Mounting cushion bolts and nuts 67.5-84.5 kgm
(488-611 lbf ft / 662-828 N•m)
 - Front mounting bracket bolts Standard torque
 - Rear mounting bracket bolts and nuts 25-31.5 kgm
(181-228 lbf ft / 245-309 N•m)

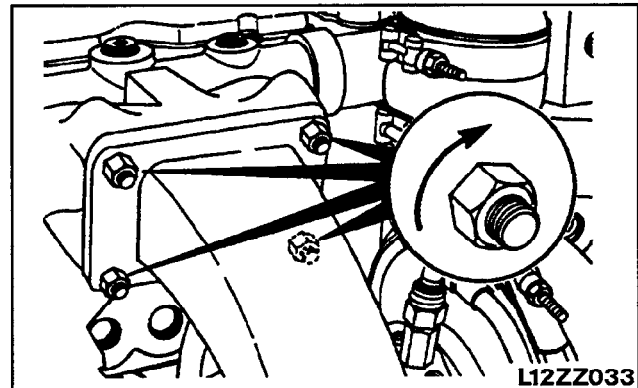


TURBOCHARGER MOUNTING

Check the turbocharger mounting nuts annually.

Tighten the mounting nuts.

- ★ Tightening torque: 4.8 kgm (35 lbf ft / 48 N•m)



WATER PUMP

Check the engine water pump. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

MAINTENANCE

EVERY 2000 HOURS SERVICE

★ Maintenance for every 50, 100, 250, 500 and 1000 hours should be carried out at the same time.

BATTERIES

Check the batteries and mounting for defective cables, loose connections, loose or damaged hold down parts, damaged terminal posts, clogged vent holes, cracked, or distorted battery case or cover and accumulations of dirt, moisture and corrosion. Replace any damaged parts.

If corrosion is found on the terminal posts, disconnect the cables from the battery, ground cable first, using the proper tools. A terminal cleaning brush can be used to clean tapered posts and the mating surfaces of the cable clamps. The cable terminals should then be cleaned with an acid neutralizing solution of baking soda and water. Clean the dirt from the battery top with a cloth wetted with baking soda and water. Then wipe with a cloth with clear water. A wire brush can be used to remove dirt, corrosion or rust from the battery tray or hold down parts. After the tray and/or hold down parts are cleaned, rinse with clear water, dry with compressed air and repaint.

After cleaning, reinstall the battery and hold down parts. Coat the battery and cable terminals with terminal grease, and connect the cables to the battery terminals. Connect ground cable last.

IMPORTANT: Frequent need for refilling battery cells may indicate that battery is being overcharged. Check charging system and voltage regulator as needed.



WARNING! When performing battery tests, observe the rules of safety. Always follow instructions of the test equipment manufacturer.

STEP I - VISUAL INSPECTION

1. Visually inspect the outside of the battery for obvious damage such as cracked or broken case or cover which would allow electrolyte loss. Check for terminal damage. If obvious physical damage is found, replace the battery. If possible, determine the cause of damage and correct.
2. Check the electrolyte level.
3. If the electrolyte level is above the separator plates in all cells, proceed to Step II.
4. If the electrolyte level is below the tops of the separator plates in one or more cells, add distilled water until the electrolyte level is at the level indicator or 13 mm (1/2 in) above the tops of the separator plates.
5. Then charge the battery for 15 minutes at 15-25 amperes to mix the water with the electrolyte. After mixing electrolyte proceed to Step II.

STEP II - STATE OF CHARGE TEST

The battery's state of charge can be determined by either the specific gravity hydrometer test or by the stabilized open circuit voltage test.

Specific Gravity Hydrometer Test

NOTE: *If necessary, refer to the instructions for reading a hydrometer.*

MAINTENANCE

- Using a hydrometer, extract electrolyte from each battery cell. Measure and record the specific gravity, corrected to 26.7°C (80°F), of each cell. Compare the readings obtained with the following table to determine battery's state of charge.

Specific Gravity (Corrected to 26.7°C or 80°F)	State of Charge
1.265	Fully Charged
1.225	75% Charged
1.190	50% Charged
1.555	25% Charged
1.120	Discharged

- If the specific gravity readings of all cells are 1.225 or higher and are within 50 points (0.050 specific gravity) between the highest and lowest cells, the battery is OK.
- If the specific gravity readings are below 1.225 or vary more than 50 points between the highest and lowest cells, recharge the battery. Inspect the electrical system to determine the cause for the under-charged battery.
- If, after charging, the specific gravity readings are within 50 points between the highest and lowest cells, the battery is OK. If the readings still vary more than 50 points after charging, replace the battery.

Stabilized Open Circuit Voltage Test

NOTE: A service tool is required for this test.

- If the battery has just been recharged or has been in vehicle service, the surface charge must be removed before an accurate voltage measurement can be made. Do this by turning "ON" the high beam headlights for fifteen (15) seconds or by placing a 15 ampere load across the battery terminals for fifteen (15) seconds. Turn "OFF" the lights or remove the load, then let the battery stand for at least three (3) minutes to stabilize voltage.
- Connect a Voltmeter or Electronic Battery Tester across the battery terminals and observe the reading. Compare the reading obtained with the following table to determine battery's state of charge.

Stabilized Open Circuit Voltage	State of Charge
12.6 or more	Fully Charged
12.4	75% Charged
12.2	50% Charged
12.0	25% Charged
11.7 or less	Discharged

- If the stabilized voltage is at least 12.4 volts or higher, the battery is OK.
- If stabilized voltage is below 12.4 volts, recharge the battery. Inspect the electrical system to determine the cause for the under-charged battery.

MAINTENANCE

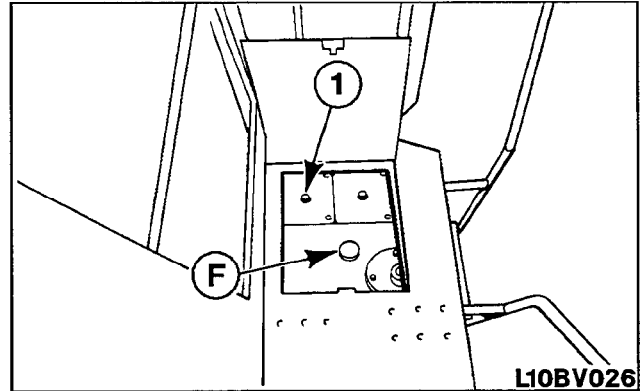
HYDRAULIC TANK OIL AND FILTERS

1. Lower the bucket horizontally to the ground and apply the parking brake, then stop the engine.

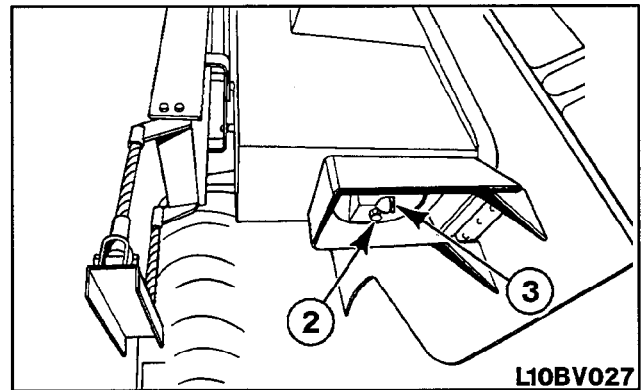


WARNING! When removing oil filler cap (F), turn it slowly to relieve inner pressure.

2. Remove oil filler cap (F) and the two air vent plugs (1) on the filter covers.

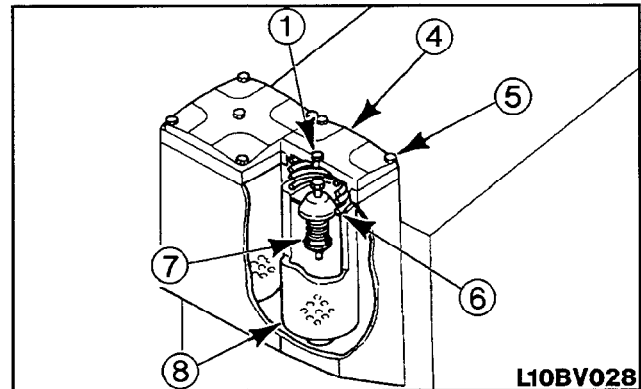


3. Remove oil drain plug (2) and loosen drain valve (3). After the oil has drained completely, reinstall and tighten the drain plug and valve.



WARNING! Filter covers (4) are pushed up by spring tension, so hold the covers down when removing the mounting bolts.

4. Remove mounting bolts (5) of filter covers (4), then remove the covers.
5. Remove springs (6) and bypass valves (7), then remove filter elements (8).
6. Check that there is no foreign matter inside the tank before cleaning it.
7. Install new filter elements (8), then install bypass valves (7), springs (6), and filter covers (4).



- ★ If the O-ring of the filter cover is damaged or deteriorated, replace it with a new part.
 - ★ When installing the filter cover mounting bolts, push down the cover and tighten the bolts evenly.
8. Fill the hydraulic tank with the specified type and quantity of engine oil at oil filler (F).
- ★ Refill capacity: 150 ℓ (39.6 gal)

MAINTENANCE

- ★ The type of lubricant used depends on the ambient temperature. Select according to the table entitled "LUBRICANTS, FUEL AND COOLANT".
- 9. Bleed the air from the hydraulic tank as described under "HYDRAULIC TANK" in this section. Lower the bucket horizontally to the ground and stop the engine.
- 10. Check that there is no oil leaking at the oil drain plug and valve and the filter covers.
- 11. Check the oil level and ensure that it is correct. For the procedure, refer to "HYDRAULIC TANK OIL LEVEL" in this section.

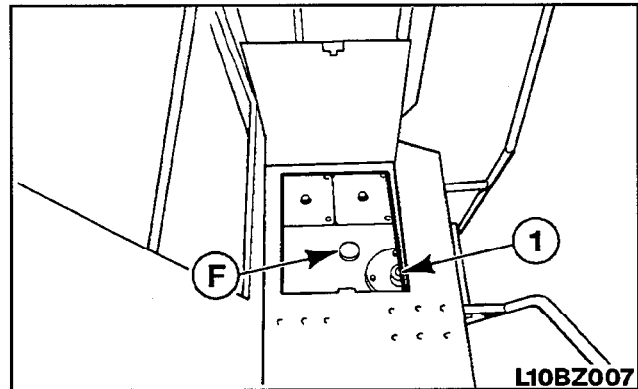
HYDRAULIC TANK BREATHER



WARNING! When removing oil filler cap (F), turn it slowly to relieve inner pressure.

1. Remove oil filler cap (F).
2. Remove the snap ring on breather (1), then remove the breather cap.
3. Replace the filter element with a new part, then install the breather cap and snap ring.

- ★ It is possible to replace the filter element 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 reinstalling the breather. Also, be careful not to over tighten it.

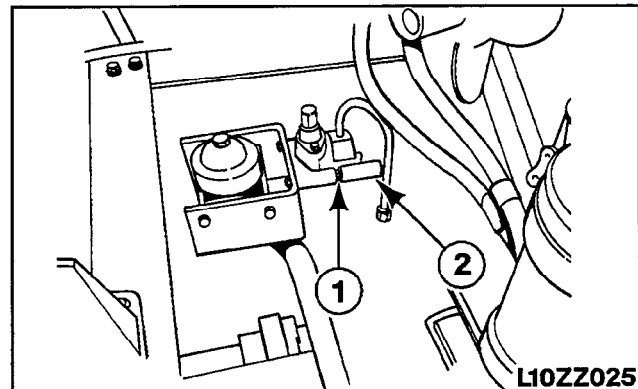


PPC CIRCUIT STRAINER

The PPC circuit strainer is located on the rear frame near the brake oil tank at the rear of the cab.

Clean the strainer as follows:

1. Loosen the three case mounting bolts (1).
2. Remove strainer case (2) and pull out the strainer. Wash the strainer with approved cleaning fluid.
3. Install the strainer in strainer case (2), and mount with the three bolts (1).
4. Bleed the air from the PPC hydraulic oil circuit as described under "PPC CIRCUIT" in this section.



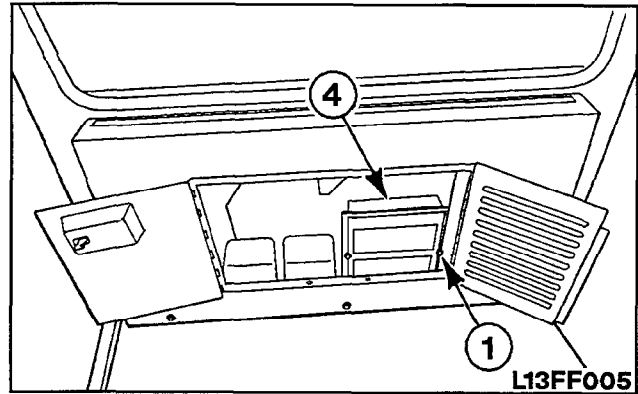
MAINTENANCE

CAB AIR FILTER - IF EQUIPPED

Replace the cab air filter as follows:

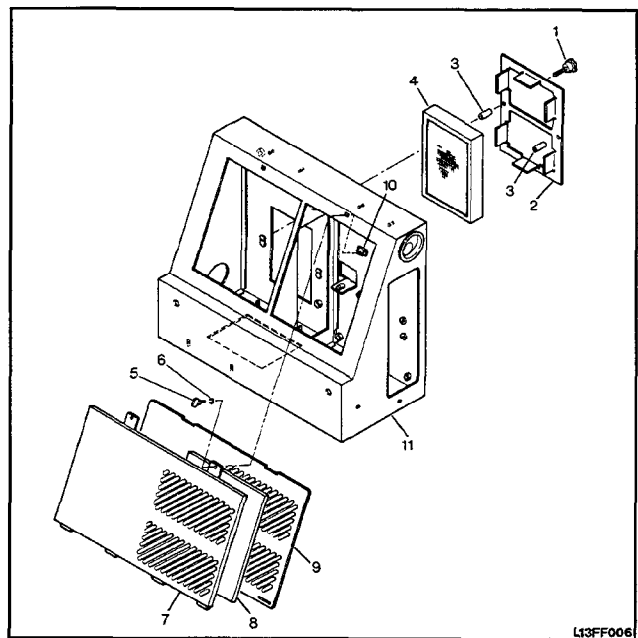
★ Be sure the cab blower fan is stopped before replacing the filter.

1. Open the access doors located at the rear of the cab to gain access to the filter element.
2. Remove holder mounting knobs (1), holder (2) and spacers (3) holding filter (4). Pull out the filter element and discard it.



3. Install the new filter element with the arrow pointing inward.
4. Install filter holder (2), spacers (3) and mounting knobs (1).
5. Close the access doors located at the rear of the cab.

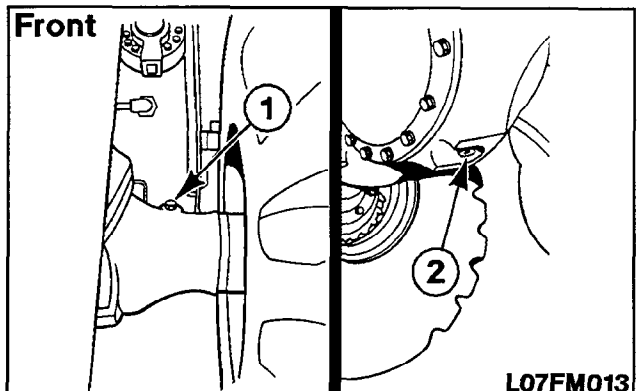
1. Holder mounting knob
2. Filter holder
3. Holder mounting spacer
4. Fresh air filter
5. Thumb screw
6. Retainer
7. Outer access panel
8. Recirculating air filter
9. Inner access panel
10. Retainer
11. Filter box



DRIVE AXLE OIL

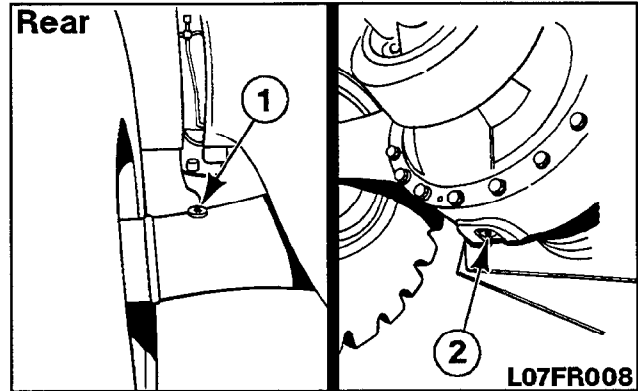
★ Use the same procedure to change the oil for the front and rear drive axles.

1. Remove front and rear oil filler plugs (1), then remove oil drain plugs (2) to drain the oil.

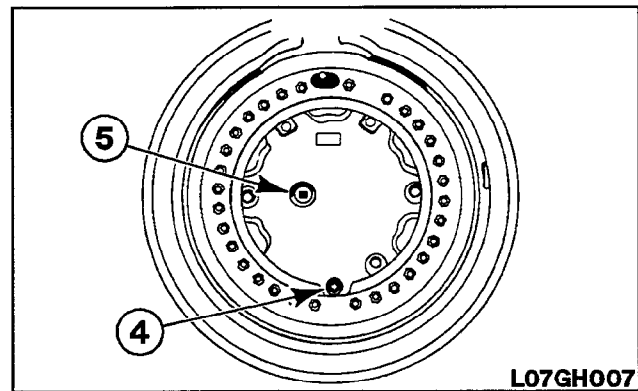
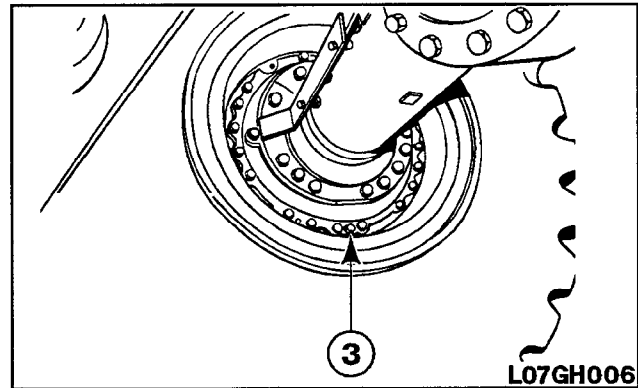


MAINTENANCE

2. Remove front and rear oil drain plugs (3) on each side of the axle to drain the oil.
 3. Move the machine so that oil drain plug (4) of the final drive is at the bottom. Remove oil filler plug (5) and oil drain plug (4) and drain the oil.
- ★ If desired, a drain pipe can be installed in the hole of oil drain plug (4) to facilitate draining.
4. After the oil has completely drained, clean oil drain plugs (2), (3) and (4) and reinstall and tighten them.



5. Fill the drive axles with the specified type and quantity of axle oil at the plug openings of oil filler plugs (1) on the axle housing and oil filler plugs (5) of the left and right final drives.
- ★ Refill capacity - each axle: 78 ℓ (20.6 gal)
- ★ The type of lubricant used depends on the ambient temperature. Select according to the table entitled "LUBRICANTS, FUEL AND COOLANT".
6. Check the oil level and ensure that it is correct. For the procedure, refer to "DRIVE AXLE OIL LEVEL" in this section.



PARKING BRAKE DISC

Ask your distributor to check the condition of the parking brake disc.

AIR DRYER - IF EQUIPPED

Replace the following internal parts of the air dryer:

Desiccant, oil filter, filter, and all rubber parts.

Contact your distributor to have these items replaced.

MAINTENANCE

ACCUMULATOR

Check the gas pressure charge within the accumulator as follows:

1. Stop the machine on level ground and apply the parking brake.
 2. Raise the work equipment to the maximum height, then place the lift arm control lever the HOLD position.
 3. Leave the work equipment in this position, and stop the engine.
 4. Confirm that it is safe around the machine, then set the lift arm control lever in FLOAT and lower the work equipment to a position of 1 m (1 yd) from the ground.
 5. When the work equipment reaches a position 1 m (1 yd) from the ground, move the lift arm control lever to the LOWER position, and lower the work equipment slowly to the ground.
- ★ If the work equipment stops moving during checking, the gas pressure may be below the service limit of 7 kg/cm² (100 psi / 689 kPa). If so, contact your distributor to have the gas pressure measured and/or gas charged.
- ★ Carry out the checks within five minutes of stopping the engine. If the machine is left with the engine stopped, the accumulator pressure will drop and it will be impossible to carry out the check.

COOLING SYSTEM

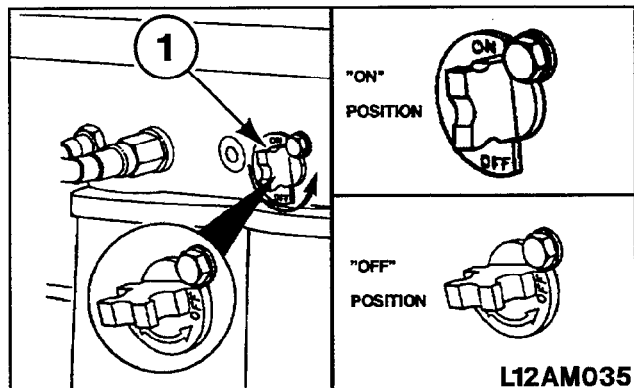
COOLANT RECOMMENDATIONS/SPECIFICATIONS

For coolant recommendations/specifications, refer to "COOLANT" under "LUBRICANTS, FUEL AND COOLANT".

CHANGING COOLANT AND FLUSHING SYSTEM

The coolant mixture **must** be drained and replaced at the specified service interval shown in the "SCHEDULED MAINTENANCE GUIDE" or every two years of operation, whichever comes first.

1. Open the engine side access door on the left side of the machine.
2. Close the coolant filter shutoff valve (1), located on the left side of the engine.

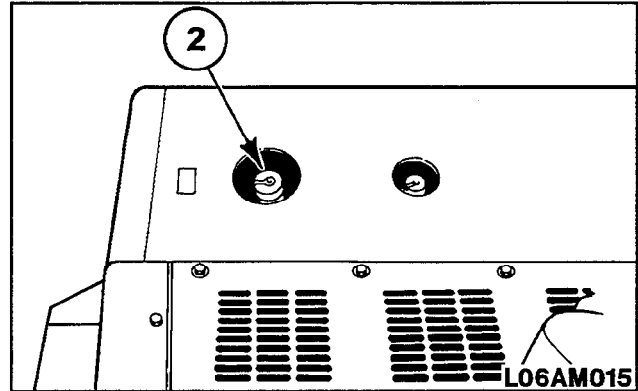


MAINTENANCE

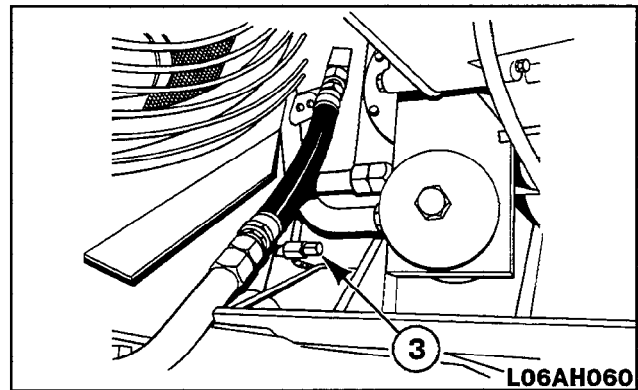


WARNING! Do not remove radiator cap (2) when the engine coolant is hot. Hot coolant may spout out and cause serious personal injury. When removing the radiator cap, lift the cap lever to relieve the system inner pressure.

3. Remove radiator cap (2) by lifting the cap lever to relieve the system inner pressure and slowly turn it until it comes off.



4. Open radiator drain valve (3). Open engine drain valve (4) on the left side of the crankcase. Allow all coolant to drain.



5. After the coolant has drained, close the radiator drain valve (3), and close engine drain valve (4). Fill the cooling system with clean soft water (ex: city water) up to the radiator filler opening.

6. When the water reaches the radiator filler opening, start and run the engine at low idle, open radiator drain valve (3) and engine drain valve (4) so the water flows through the cooling system for 10 minutes.

★ When doing this, adjust the water inlet and outlet flows so that the radiator is always full.

7. After flushing the system with water, stop the engine. Allow the water to drain.

8. After the water has drained, close radiator drain valve (3) and close engine drain valve (4).

9. After draining water, use a flushing agent to clean the cooling system.

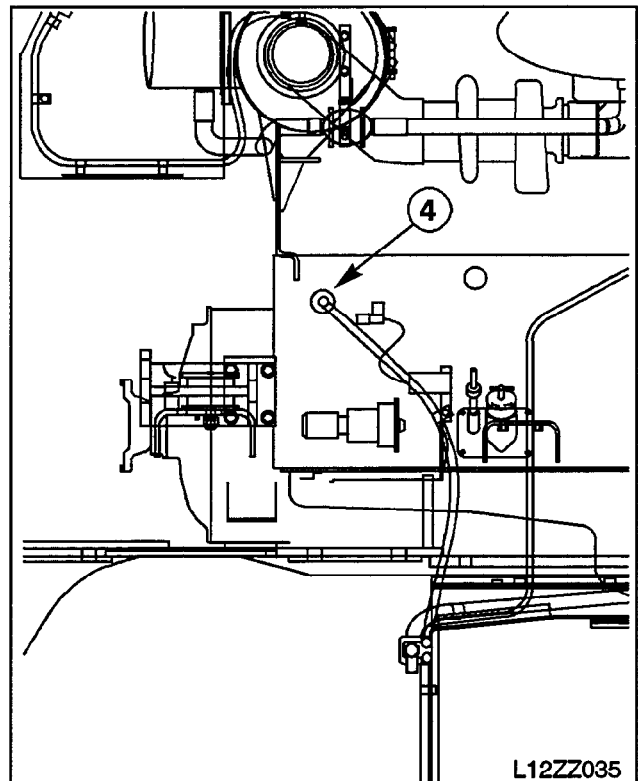
★ Do NOT use caustic cleaners in the cooling system. Aluminum components will be damaged.

★ Follow the instructions on the label of the flushing agent used to clean the system.

10. After cleaning the cooling system, again flush the system with soft water until clean water flows out of the drain openings by repeating Steps 4 thru 6.

11. When the water becomes completely clean, stop the engine. Allow the water to drain.

12. After the water has drained, close radiator drain valve (3) and close engine drain valve (4).



MAINTENANCE

13. Replace the coolant filter as described under "COOLANT FILTER". Open the coolant filter shut-off valve (1), located on the left side of the engine.
14. Fill the cooling system with the correct mixture of water, antifreeze and the correct amount of SCA units.
15. Run the engine for 5 minutes at low idle to eliminate air trapped in the cooling system, and run the engine for 5 minutes at high idle. Leave radiator cap (2) off during this operation.
16. Stop the engine and 3 minutes later supply the system with the correct mixture of water, antifreeze and the correct amount of SCA units up to the bottom of the radiator filler opening.
17. Repeat Steps 15 and 16 to ensure that the coolant mixture is up to the bottom of the radiator filler opening. Install and tighten the radiator cap.
18. Close the engine side access door.

EVERY 6000 HOURS SERVICE

★ Maintenance for every 50, 100, 250, 500, 1000, 1500 and 2000 hours should be carried out at the same time.

FUEL PUMP

Clean and calibrate the fuel pump. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

FUEL INJECTORS

Clean and calibrate the fuel injectors. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

ENGINE FAN HUB

Check the engine fan hub. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

ENGINE IDLER PULLEY

Check the engine idler pulley. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

TURBOCHARGER

Check the engine turbocharger. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

AIR COMPRESSOR

Inspect the air compressor. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

ENGINE VIBRATION DAMPER

Inspect the engine vibration damper. For the detailed procedure, refer to the Engine Operation and Maintenance Manual.

SECTION 4
SPECIFICATIONS



WARNING! REFER TO AND READ ALL
SAFETY PRECAUTIONS IN SECTION 1.

SPECIFICATIONS

GENERAL SPECIFICATIONS

	With General Purpose Bucket 4.3 m ³ (5.6 yd ³)		With Excavating Bucket 4.0 m ³ (5.2 yd ³)		With Spade Nose Rock Bucket 4.0 m ³ (5.2 yd ³)	
	26.5 x 25 Tires	29.5 x 25 Tires	26.5 x 25 Tires	29.5 x 25 Tires	26.5 x 25 Tires	29.5 x 25 Tires
OPERATING WEIGHT - With standard counter-weight	27 285 kg (60 150 lb)	27 825 kg (61 340 lb)	27 615 kg (60 880 lb)	28 155 kg (62 070 lb)	27 885 kg (61 470 lb)	28 425 kg (62 670 lb)

PERFORMANCE

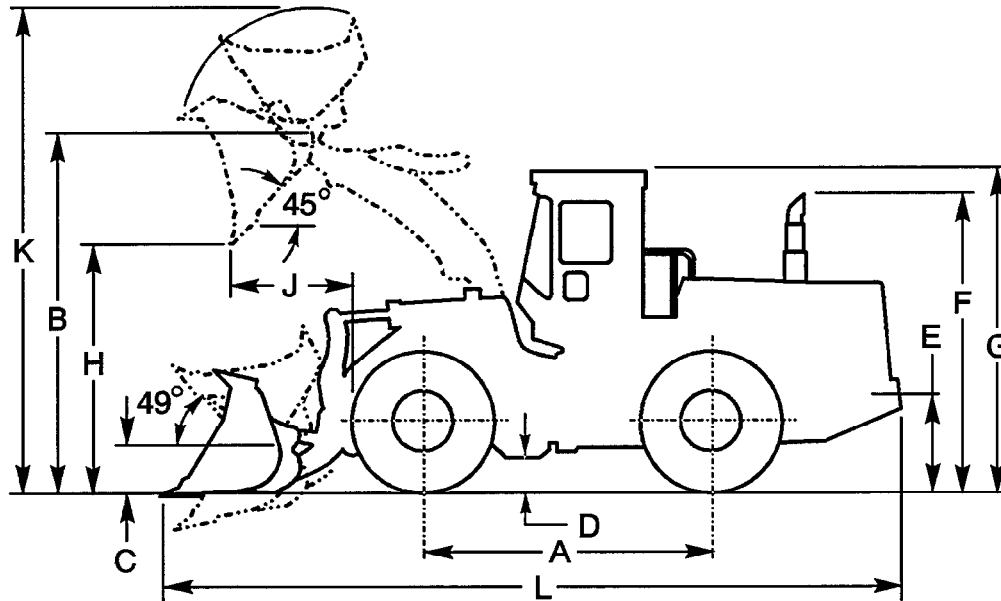
• Travel speeds - Maximum:						
Forward 1st	7.3 km/h (4.5 mph)	7.5 km/h (4.7 mph)	7.3 km/h (4.5 mph)	7.5 km/h (4.7 mph)	7.3 km/h (4.5 mph)	7.5 km/h (4.7 mph)
Forward 2nd	12.6 km/h (7.8 mph)	12.9 km/h (8.0 mph)	12.6 km/h (7.8 mph)	12.9 km/h (8.0 mph)	12.6 km/h (7.8 mph)	12.9 km/h (8.0 mph)
Forward 3rd	21.1 km/h (13.1 mph)	21.8 km/h (13.5 mph)	21.1 km/h (13.1 mph)	21.8 km/h (13.5 mph)	21.1 km/h (13.1 mph)	21.8 km/h (13.5 mph)
Forward 4th	34.2 km/h (21.3 mph)	34.9 km/h (21.7 mph)	34.2 km/h (21.3 mph)	34.9 km/h (21.7 mph)	34.2 km/h (21.3 mph)	34.9 km/h (21.7 mph)
Reverse 1st	7.8 km/h (4.8 mph)	8.2 km/h (5.1 mph)	7.8 km/h (4.8 mph)	8.2 km/h (5.1 mph)	7.8 km/h (4.8 mph)	8.2 km/h (5.1 mph)
Reverse 2nd	13.4 km/h (8.3 mph)	14.0 km/h (8.7 mph)	13.4 km/h (8.3 mph)	14.0 km/h (8.7 mph)	13.4 km/h (8.3 mph)	14.0 km/h (8.7 mph)
Reverse 3rd	22.5 km/h (14.0 mph)	23.6 km/h (14.7 mph)	22.5 km/h (14.0 mph)	23.6 km/h (14.7 mph)	22.5 km/h (14.0 mph)	23.6 km/h (14.7 mph)
Reverse 4th	36.4 km/h (22.6 mph)	37.5 km/h (23.3 mph)	36.4 km/h (22.6 mph)	37.5 km/h (23.3 mph)	36.4 km/h (22.6 mph)	37.5 km/h (23.3 mph)

ENGINE

• Make and Model	Cummins NTA14C diesel engine
• Type	4-cycle, water cooled, direct injection, turbocharged
• Displacement	14 liter (855 in ³)
• Number of cylinders	Six (6)
• Bore and stroke	140 mm x 152 mm (5.5 in x 5.9 in)
• Gross horsepower @ 2100 rpm	235 kW (315 HP)

SPECIFICATIONS

DIMENSIONS

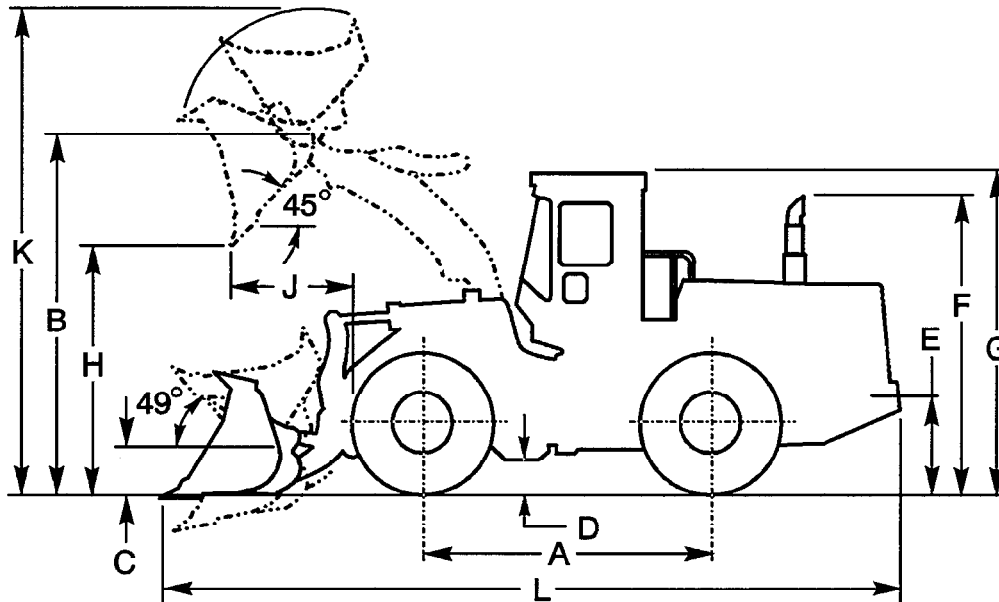


L01AD009

	With General Purpose Bucket 4.3 m ³ (5.6 yd ³)		With Excavating Bucket 4.0 m ³ (5.2 yd ³)		With Spade Nose Rock Bucket 4.0 m ³ (5.2 yd ³)	
	26.5 x 25 Tires	29.5 x 25 Tires	26.5 x 25 Tires	29.5 x 25 Tires	26.5 x 25 Tires	29.5 x 25 Tires
Tread	2.4 m (7 ft 10 in)	2.4 m (7 ft 10 in)	2.4 m (7 ft 10 in)	2.4 m (7 ft 10 in)	2.4 m (7 ft 10 in)	2.4 m (7 ft 10 in)
Width over tires	3.1 m (10 ft 2 in)	3.2 m (10 ft 6 in)	3.1 m (10 ft 2 in)	3.2 m (10 ft 6 in)	3.1 m (10 ft 2 in)	3.2 m (10 ft 6 in)
A Wheelbase	3.5 m (11 ft 8 in)	3.5 m (11 ft 8 in)	3.5 m (11 ft 8 in)	3.5 m (11 ft 8 in)	3.5 m (11 ft 8 in)	3.5 m (11 ft 8 in)
B Hinge pin height - maximum	4.3 m (14 ft 5 in)	4.4 m (14 ft 7 in)	4.3 m (14 ft 5 in)	4.4 m (14 ft 7 in)	4.3 m (14 ft 5 in)	4.4 m (14 ft 7 in)
C Hinge pin height - carry position	0.54 m (1 ft 9 in)	0.59 m (1 ft 11 in)	0.54 m (1 ft 9 in)	0.59 m (1 ft 11 in)	0.54 m (1 ft 9 in)	0.59 m (1 ft 11 in)
D Ground clearance	0.44 m (1 ft 5 in)	0.49 m (1 ft 7 in)	0.44 m (1 ft 5 in)	0.49 m (1 ft 7 in)	0.44 m (1 ft 5 in)	0.49 m (1 ft 7 in)
E Hitch height	1.13 m (3 ft 9 in)	1.18 m (3 ft 11 in)	1.13 m (3 ft 9 in)	1.18 m (3 ft 11 in)	1.13 m (3 ft 9 in)	1.18 m (3 ft 11 in)

SPECIFICATIONS

DIMENSIONS



L01AD009

	With General Purpose Bucket 4.3 m ³ (5.6 yd ³)		With Excavating Bucket 4.0 m ³ (5.2 yd ³)		With Spade Nose Rock Bucket 4.0 m ³ (5.2 yd ³)	
	26.5 x 25 Tires	29.5 x 25 Tires	26.5 x 25 Tires	29.5 x 25 Tires	26.5 x 25 Tires	29.5 x 25 Tires
F Overall height to top of exhaust pipe	3.63 m (11 ft 11 in)	3.68 m (12 ft 1 in)	3.63 m (11 ft 11 in)	3.68 m (12 ft 1 in)	3.63 m (11 ft 11 in)	3.68 m (12 ft 1 in)
G Overall height to top of ROPS canopy	3.89 m (12 ft 9 in)	3.94 m (12 ft 11 in)	3.89 m (12 ft 9 in)	3.94 m (12 ft 11 in)	3.89 m (12 ft 9 in)	3.94 m (12 ft 11 in)
H Dumping clearance at maximum height & 45° dump angle	3.21 m (10 ft 7 in)	3.27 m (10 ft 9 in)	3.27 m (10 ft 9 in)	3.32 m (10 ft 11 in)	3.11 m (10 ft 2 in)	3.16 m (10 ft 4 in)
Reach @ 2.13 m (7 ft) cutting edge clearance & 45° dump angle	2.03 m (6 ft 8 in)	1.98 m (6 ft 6 in)	1.99 m (6 ft 7 in)	1.94 m (6 ft 5 in)	2.08 m (6 ft 10 in)	2.03 m (6 ft 8 in)
J Reach @ maximum height & 45° dump angle	1.37 m (4 ft 6 in)	1.32 m (4 ft 4 in)	1.32 m (4 ft 4 in)	1.27 m (4 ft 2 in)	1.46 m (4 ft 10 in)	1.41 m (4 ft 8 in)
Reach with lift arm horizontal & bucket level	2.81 m (9 ft 3 in)	2.76 m (9 ft 1 in)	2.73 m (8 ft 11 in)	2.68 m (8 ft 10 in)	2.95 m (9 ft 8 in)	2.90 m (9 ft 6 in)

SPECIFICATIONS

DIMENSIONS

	With General Purpose Bucket 4.3 m ³ (5.6 yd ³)		With Excavating Bucket 4.0 m ³ (5.2 yd ³)		With Spade Nose Rock Bucket 4.0 m ³ (5.2 yd ³)	
	26.5 x 25 Tires	29.5 x 25 Tires	26.5 x 25 Tires	29.5 x 25 Tires	26.5 x 25 Tires	29.5 x 25 Tires
K Operating height - fully raised	6.02 m (19 ft 9 in)	6.07 m (19 ft 11 in)	6.13 m (20 ft 2 in)	6.18 m (20 ft 4 in)	6.21 m (20 ft 5 in)	6.26 m (20 ft 7 in)
L Overall length	8.97 m (29 ft 5 in)	8.93 m (29 ft 4 in)	8.89 m (29 ft 2 in)	8.85 m (29 ft 1 in)	9.12 m (29 ft 11 in)	9.08 m (29 ft 10 in)
Loader clearance circle at outside corner of bucket & bucket in carry position	14.39 m (47 ft 3 in)	14.39 m (47 ft 3 in)	14.35 m (47 ft 1 in)	14.35 m (47 ft 1 in)	14.35 m (47 ft 1 in)	14.35 m (47 ft 1 in)
Digging depth at 0°	0.175 m (6.9 in)	0.125 m (4.9 in)	0.115 m (4.5 in)	0.065 m (2.6 in)	0.125 m (4.9 in)	0.075 m (3.0 in)
Digging depth at 10°	0.460 m (1 ft 6 in)	0.410 m (1 ft 4 in)	0.330 m (1 ft 1 in)	0.290 m (11.4 in)	0.385 m (1 ft 3 in)	0.330 m (1 ft 1 in)

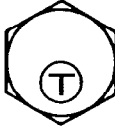
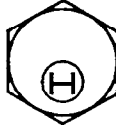
NOTICE: All specifications are subject to change without notice.

SPECIFICATIONS

STANDARD TIGHTENING TORQUES

STANDARD TIGHTENING TORQUE OF BOLTS AND NUTS

The following charts give the standard tightening torques of bolts and nuts. Exceptions are given in sections of this manual.

Thread diameter of bolt (mm)	Width across flat (mm)		
		kgm	N•m
6	10	1.35±0.15	13.2±1.4
8	13	3.2±0.3	31.4±2.9
10	17	6.7±0.7	65.7±6.8
12	19	11.5±1.0	112±9.8
14	22	18.0±2.0	177±19
16	24	28.5±3	279±29
18	27	39±4	383±39
20	30	56±6	549±58
22	32	76±8	745±78
24	36	94.5±10	927±98
27	41	135±15	1320±140
30	46	175±20	1720±190
33	50	225±25	2210±240
36	55	280±30	2750±290
39	60	335±35	3280±340

This torque table does not apply to the bolts with which nylon packings or other non-ferrous metal washers are to be used, or which require tightening to otherwise specified torque.

★ N•m (newton meter): 1 N•m ≈ 0.1 kgm

TIGHTENING TORQUE OF SPLIT FLANGE BOLTS

Use these torques for split flange bolts.

Thread diameter of bolt (mm)	Width across flats (mm)	Tightening torque	
		kgm	N•m
10	14	6.7±0.7	65.7±6.8
12	17	11.5±1	112±9.8
16	22	28.5±3	279±29

SPECIFICATIONS

TIGHTENING TORQUE FOR NUTS OF FLARED FITTINGS

Use these torques for nut part of flared fittings.

Thread diameter of nut part (mm)	Width across flats of nut part (mm)	Tightening torque	
		kgm	N•m
14	19	2.5±0.5	24.5±4.9
18	24	5±2	49±19.6
22	27	8±2	78.5±19.6
24	32	14±3	137.3±29.4
30	36	18±3	176.5±29.4
33	41	20±5	196.1±49
36	46	25±5	245.2±49
42	55	30±5	294.2±49

SPECIFICATIONS

MEMORANDA

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 Attn: Technical Publications
 Fax No. (847) 970-4186

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			PHONE NO:	
	DEPARTMENT:		DATE:	
	NAME:			
MANUAL NAME:				
MANUAL NO:				
MACHINE MODEL: S/N IF APPLICABLE:				

PAGE NO:

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