

Product: BACKHOE LOADER

Model: 446 BACKHOE LOADER 6XF

Configuration: 446 BACKHOE LOADER 6XF00001-UP (MACHINE) POWERED BY 3114 ENGINE

Operation and Maintenance Manual

446 BACKHOE LOADER

Media Number -SEBU6262-01

Publication Date -01/01/1990

Date Updated -11/10/2001

Foreword

SMCS - 7606

This manual contains safety, operation, transportation, lubrication and maintenance information.

Some photographs or illustrations in this publication show details or attachments that may be different from your machine. Guards and covers may have been removed for illustrative purposes.

Continuing improvement and advancement of product design may have caused changes to your machine which are not included in this publication.

Read-study-and keep the "Operation and Maintenance Manual" with the machine.

Whenever a question arises regarding your machine, or this publication, please consult your Caterpillar dealer for the latest available information.

Safety

The safety section lists basic safety precautions. In addition, this section identifies the text and locations of warning labels used on the machine.

Read and understand the basic precautions listed in the safety section before operating or performing lubrication, maintenance and repair on this product.

Operation

The operation section is a reference for the new operator and a refresher for the experienced one. This section includes a discussion of gauges, switches, machine controls, implement controls, transportation and towing information.

Photographs and illustrations guide the operator through correct procedures of checking, starting, operating and stopping the machine.

Operating techniques outlined in this publication are basic. Skill and techniques develop as the operator gains knowledge of the machine and its capabilities.

Maintenance

The maintenance section is a guide to equipment care. The illustrated, step-by-step instructions are grouped by servicing intervals. Items without specific intervals are listed under "When Required" topics. Items in the "Maintenance Intervals" chart are referenced to detailed instructions that follow.

Maintenance Intervals

Use the service hour meter to determine servicing intervals. Calendar intervals shown (daily, weekly, monthly, etc.) may be used instead of service hour meter intervals if they provide more convenient servicing schedules and approximate the indicated service hour meter reading. Recommended service should always be performed at the interval that occurs first.

Under extremely severe, dusty or wet operating conditions, more frequent lubrication than is specified in the "Maintenance Interval" chart may be necessary.

Perform service on items at multiples of the original requirement. For example, at "Every 500 Service Hours or 3 Months", also service those items listed under "Every 250 Service Hours or Monthly", "Every 50 Service Hours or Weekly" and "Every 10 Service Hours or Daily."

Machine Description



This machine is equipped with a four cylinder, direct injection diesel 3114 engine. It has a 4 speed countershaft transmission and hydrostatic power steering. The machine is primarily used for excavating and moving material.

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Safety

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Warning Signs and Labels

There are several specific safety signs on your machine. Their exact location and description of the hazard are reviewed in this section. Please take the time to familiarize yourself with these safety signs.

Make sure that you can read all safety signs. Clean or replace these if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasoline, etc.

You must replace a label if it is damaged, missing or cannot be read. If a label is on a part that is replaced, make sure a new label is installed on the replaced part. See your Caterpillar dealer for new labels.



Do not operate or work on the machine unless you have read and understand the instructions and warnings in the Operations and Maintenance Manual. Failure to follow the instructions or heed the warnings could result in injury or death. Contact any Caterpillar dealer for replacement manuals. Proper care is your responsibility.



Located in the cab.



Stay clear of this area when machine is operating. You can be crushed by swinging boom.



Located on rear of machine.

General Hazard Information

Attach "DO NOT OPERATE" or similar warning tag to start switch or controls before servicing or repairing the machine. These tags, Form SEHS7332, are available from your Caterpillar dealer.

Wear a hard hat, protective glasses and other protective equipment as required by job conditions.

Do not wear loose clothing or jewelry that can catch on controls or other parts of the machine.

Make certain all protective guards and covers are secured in place on the machine.

Keep the machine, especially the platform doorways and steps, free of foreign material, such as debris, oil, tools and other items which are not part of the machine.

Secure all loose items such as lunch boxes, tools and other items which are not part of the machine.

Know the appropriate work-site hand signals and who gives them. Accept signals from one person only.

Never put maintenance fluids into glass containers.

Use all cleaning solutions with care.

Report all needed repairs.

Do not allow unauthorized personnel on the machine.

- * The parking brake engaged.
- * The loader bucket lowered to the ground.
- * The backhoe in transport position.

- * The transmission levers in neutral and forward-reverse (neutral) lock engaged.
- * The engine stopped.
- * The start switch key removed.

Pressure Air

Pressure air can cause personal injury. When using pressure air for cleaning, wear a protective face shield and protective clothing.

The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Fluid Penetration

Always use a board or cardboard when checking for a leak. Escaping fluid under pressure, even a pin-hole size leak, can penetrate body tissue, causing serious injury, and possible death. If fluid is injected into your skin, it must be removed surgically by a doctor familiar with this kind of injury within a few hours.

Asbestos Information

Caution should be used to avoid breathing dust that may be generated when handling components containing asbestos fibers. If this dust is inhaled, it can be hazardous to your health. Components in Caterpillar products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates and some gaskets. The asbestos used in these components is usually bound in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust which contains asbestos is not generated.

If dust which may contain asbestos is present, there are several common sense guidelines that should be followed.

1. Never use compressed air for cleaning.
2. Avoid brushing or grinding of asbestos containing materials.
3. For clean up, use wet methods or a vacuum equipped with a high efficiency particulate air (HEPA) filter.
4. Use exhaust ventilation on permanent machining jobs.
5. Wear an approved respirator if there is no other way to control the dust.
6. Comply with applicable rules and regulations for the work place (for example in the U.S.A., OSHA requirements as set forth in 29 CFR 1910.1001).
7. Follow environmental rules and regulations for disposal of asbestos.
8. Avoid areas where asbestos particles may be in the air.

Crushing or Cutting Prevention

Support loader and backhoe buckets and linkages properly when working beneath them. Do not depend on hydraulic cylinders to hold them up. Any implement can fall if a control is moved, or a hydraulic line breaks.

Never attempt adjustments while the machine is moving or the engine is running unless otherwise specified.

Where there are implement linkages, the clearance in the linkage area will increase or decrease with movement of the implement.

Stay clear of all rotating and moving parts.

Keep objects away from moving fan blades. They will throw or cut any object or tool that falls or is pushed into them.

Do not use a kinked or frayed wire rope cable. Wear gloves when handling the wire rope cable.

Retainer pins, when struck with force, can fly out and injure nearby persons. Keep personnel away from area.

Wear protective glasses when striking a retainer pin to avoid injury to your eyes.

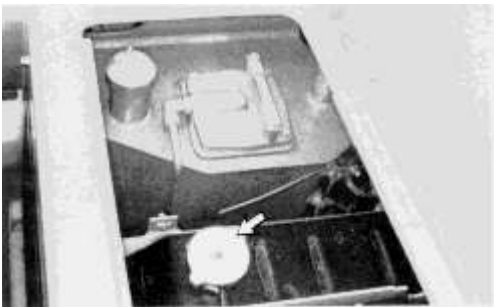
Chips or other debris can fly off objects when struck. Make sure no one can be injured by flying debris before striking any object.

Burn Prevention

Coolant

At operating temperature, the engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot water or steam. Any contact can cause severe burns.

Steam can cause personal injury.



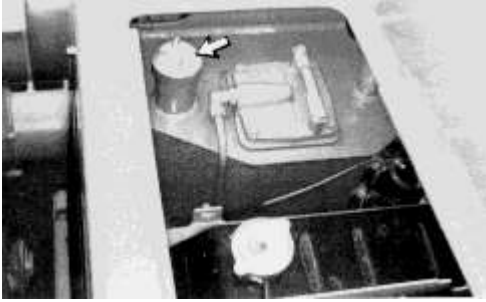
Check the coolant level only after the engine has been stopped and the filler cap is cool enough to remove with your bare hand.

Remove the cooling system filler cap slowly to relieve pressure.

Cooling system conditioner contains alkali that can cause personal injury. Avoid contact with the skin and eyes and do not drink.

Allow cooling system components to cool before draining.

Oils



Hot oil and components can cause personal injury. Do not allow hot oil or components to contact the skin.

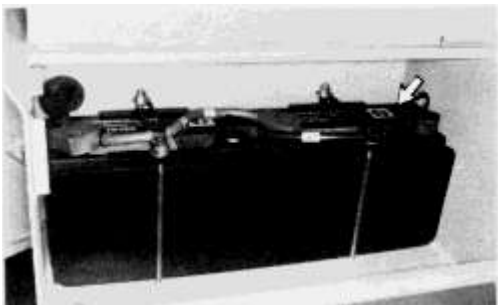
At operating temperature, the hydraulic tank is hot and can be under pressure.

Remove the hydraulic tank filler cap only after the engine has been stopped and the filler cap is cool enough to remove with your bare hand.

Remove the hydraulic tank filler cap slowly to relieve pressure.

Relieve all pressure in oil, fuel or cooling systems before any lines, fittings or related items are disconnected or removed.

Batteries



Batteries give off flammable fumes which can explode.

Do not smoke when observing the battery electrolyte levels.

Electrolyte is an acid and cause personal injury if it contacts skin or eyes.

Always wear protective glasses when working with batteries.

Fire or Explosion Prevention

All fuels, most lubricants and some coolant mixtures are flammable.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Do not smoke while refueling or in a refueling area.

Do not smoke in areas where batteries are charged, or where flammable materials are stored.

Batteries in series may be located in separate compartments. When using jumper cables always connect positive (+) cable to positive (+) terminal of battery connected to starter solenoid and

negative (-) cable from external source to starter negative (-) terminal. (If not equipped with starter negative terminal, connect to engine block.)

See the "Operation Section" of this manual for specific jump starting instructions.

Clean and tighten all electrical connections. Check daily for loose or frayed electrical wires. Have all loose or frayed electrical wires tightened, repaired or replaced before operating the machine.

Keep all fuels and lubricants stored in properly marked containers. Store and lock them away from all unauthorized persons.

Store all oily rags or other flammable material in a protective container, in a safe place.

Do not weld or flame cut on pipes or tubes that contain flammable fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them.

Remove all flammable materials such as fuel, oil and other debris before they accumulate on the machine.

Do not expose the machine to flames, burning brush, etc.

Shields, which protect hot exhaust components from oil or fuel spray in the event of a line, tube or seal failure, must be installed correctly.

Have a fire extinguisher available and know how to use it. Inspect and have it serviced as recommended on its instruction plate.

Ether

Ether is poisonous and flammable.

Breathing ether vapors or repeated contact of ether with skin can cause personal injury.

Use ether only in well ventilated areas.

Do not smoke while changing ether cylinders.

Use ether with care to avoid fires.

Do not store replacement ether cylinders in living areas or in the operator's compartment.

Do not store ether cylinders in direct sunlight or at temperatures above 39°C (102°F).

Discard cylinders in a safe container. Do not puncture or burn cylinders.

Keep ether cylinders out of the reach of unauthorized personnel.

Lines, Tubes and Hoses

Do not bend or strike high pressure lines. Do not install bent or damaged lines, tubes or hoses.

Repair any loose or damaged fuel and oil lines, tubes and hoses. Leaks can cause fires. Contact your Caterpillar dealer for repair or replacement.

Inspect all lines, tubes and hoses carefully. Do not use your bare hand to check for leaks. Use a board or cardboard to check for leaks. See "Fluid Penetration" in the "Safety" section for more details. Check and tighten all connections to the recommended torque periodically. Replace if any of the following conditions are found.

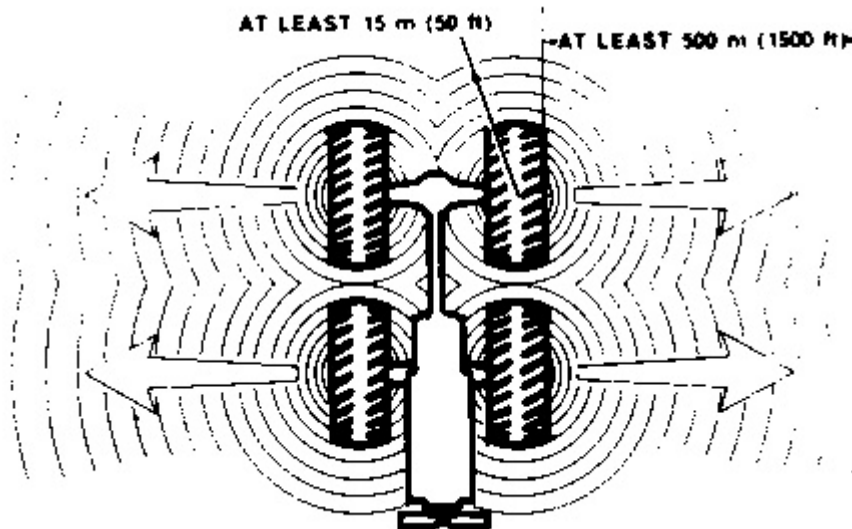
1. End fittings damaged or leaking.
2. Outer covering chafed or cut and wire reinforcing exposed.
3. Outer covering ballooning locally.
4. Evidence of kinking or crushing of the flexible part of hose.
5. Armouring embedded in the outer cover.
6. End fittings displaced.

Make sure that all clamps, guards and heat shields, are installed correctly to prevent vibration, rubbing against other parts and excessive heat during operation.

Tire Information

Explosions of air-inflated machine tires have resulted from heat-induced gas combustion inside the tires. The heat, generated by welding or heating rim components or external fire can cause gaseous combustion.

A tire explosion is much more violent than a blowout. The explosion can propel the tire, rim and final drive components as far as 500 m (1500 ft) or more from the machine. Both the force of the explosion and the flying debris can cause personal injury or death, and property damage.



Do not approach a tire closer than the outside of the area represented by the shaded area in the above drawing.

Stand behind the tread and use a self-attaching chuck when inflating a tire.

Servicing and changing tires and rims can be dangerous and should be done only by trained personnel using proper tools and procedures. If correct procedures are not followed while servicing tires and rims, the assemblies could burst with explosive force and cause serious personal injury or death. Follow carefully the specific information provided by your tire or rim servicing man or dealer.

Mounting and Dismounting



Mount and dismount the machine only where steps and/or handholds are provided.

Use both hands and face the machine, when mounting and dismounting. Maintain a three point hand and/or feet contact on mounting hardware.

Never get on or off a moving machine. Never jump off the machine.

Do not try to climb on or off the machine when carrying tools or supplies.

Before Starting the Engine

Start the engine only from the operator's station. Never short across the starter terminals or across the batteries, as this could bypass the engine neutral-start system as well as damage the electrical system.

Inspect the condition of the seat belt and mounting hardware. Replace any damaged or worn parts. Replace the seat belt regardless of appearance after three years of use, because of deterioration of material.

Adjust the seat so that full brake pedal travel can be obtained with the operator's back against the seat back.

Make sure the pedal lock bar is in locked position above 1st gear to prevent sudden turning.

Make sure the machine is equipped with a lighting system as required by conditions.

Make sure all lights are working properly.

Check for leaks, cracks, loose or missing bolts, tire or machine damage.

Make sure no one is working on, underneath or close to the machine before starting the engine or beginning to move the machine. Make sure the area is free of personnel.

Engine Starting



Do not start the engine or move any of the controls if there is a "DO NOT OPERATE" or similar warning tag attached to the start switch or controls.

Move all implement controls to the HOLD position before starting the engine.

Engage the parking brake. Shift the transmission control levers to NEUTRAL and engage the Forward-Reverse (Neutral) lock.

Avoid possible injury or death from a runaway machine. Start the engine only while facing forward and seated in the operator's seat. Turn seat to backhoe operation after starting.

Start and operate the engine in a well ventilated area only. In an enclosed area, vent the exhaust to the outside.

Before Operating the Machine

Stabilizers must be in the correct position, before operating the machine. Raise stabilizers completely for transport or for loader operation. Lower stabilizers before operating backhoe. DO NOT DIG UNDER THE STABILIZERS.

Clear all personnel from the machine and the area. Make sure personnel are not in reach of backhoe or in path of loader.

Clear all obstacles from the path of the machine. Beware of hazards such as wires, power lines, ditches, etc.

On cab equipped machines, be sure all windows are clean. Secure the doors and windows in either the open or shut position while operating.

For best vision, especially close to the machine, adjust the rear view mirrors.

Make sure the machine horn, the back-up alarm (if equipped) and all other warning devices are working properly.

Fasten the seat belt securely.

Check for proper operation of all controls and protective devices while moving slowly in an open area.

Machine Operation

When operating the backhoe, engage the parking brake, put transmission in neutral, and ENGAGE FORWARD-REVERSE LOCK.

Operate the machine only while seated.

Operate the controls only with the engine running unless servicing machine.

The operator must satisfy himself that no one will be endangered before moving or operating the machine.

Do not allow riders on the machine unless additional seat, seat belt and Rollover Protective Structure (ROPS) are provided.

Report any needed repairs noted during operation.

Carry loader bucket close to the ground. Backhoe should be in transport position.

Stay a safe distance from the edge of cliffs, overhangs and slide areas.

If the machine begins to sideslip on a grade, immediately dispose of the load and turn the machine downhill.

Avoid conditions which could lead to tipping when working on hills, banks or slopes, and when crossing ditches, ridges or other obstructions.

Work up and down slopes, rather than sideways, whenever possible.

Keep the machine under control and do not work it over its capacity.

Be sure hitch points and the towing device are adequate.

Connect trailing equipment to a drawbar or hitch only.

Never straddle a wire rope cable or similar device, nor allow others to do so.

Personnel should not be between the machine and equipment when maneuvering to connect them. Block the tongue or hitch of trailing equipment to align it with the drawbar or hitch.

Know the maximum height and reach of your machine.

Always keep the Rollover Protective Structure (ROPS) (if equipped) installed when operating the machine.

Do not operate the machine above 2nd gear with a loaded bucket.

Do not negotiate turns at higher machine speeds with a loaded bucket more than 380 mm (15 in) off the ground to avoid possible tipping.

Raise the loader bucket to maximum height only for loading a hauling unit.

Machine Parking

Park on a level surface if possible. If necessary to park on a grade, block the machine.

Apply the service brakes to stop the machine. Engage the parking brake.

Shift the transmission control lever to NEUTRAL. Apply the neutral lock.

Lower the loader bucket to the ground and apply slight down pressure.

Put the backhoe in the "transport position". Install the swing lock pin in backhoe.

Stop the engine.

Turn the start switch key to the OFF position.

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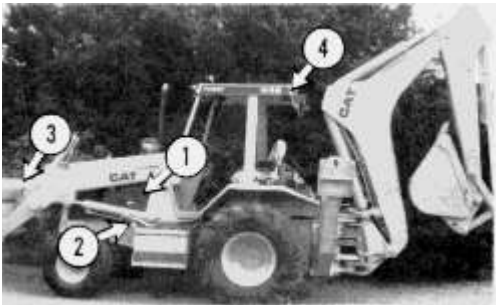
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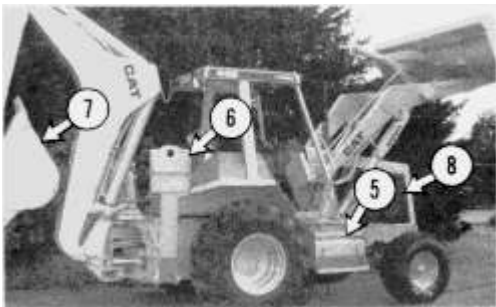
Specifications and Model Views

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Model Views



Engine (1), fuel tank (2), loader bucket (3), cab or canopy (4).



Battery compartment (5), stabilizer (6), backhoe bucket (7) and radiator (8).

446 Backhoe Loader	
Weight (approximate)	8785 kg (19,350 lb)
Length (maximum)	7623 mm (25 ft)
Width (across tires)	2342 mm (7 ft 8 in)
Height	4157 mm (13 ft 7 in)

Machine Specifications

Transmission 4-speed forward and reverse - full powershift Caterpillar countershaft electric shift. Constant mesh gears on all ratios permits on-the-go shifting 1st through 4th and down 4th through 1st. Neutral start provision prevents starting machine in gear.

Transmission Disconnect

Hand operated power disconnect for on-the-go shifting and fast loader lift, dump and lower with engine running at high rpm.

Reversing Shuttle

Conveniently placed, hand operated lever provides instant direction changes from forward to reverse with power hydraulic clutches.

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Product Identification and Serial Number Locations

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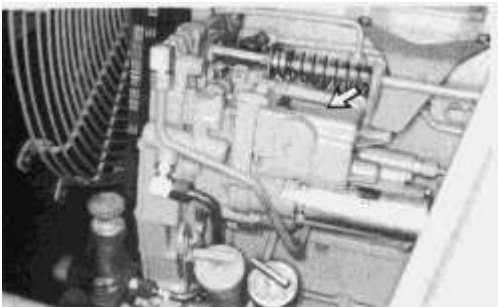
The Product Identification Number (PIN) will be used to identify powered earthmoving equipment that is designed for an operator to ride.

Caterpillar products such as earthmoving equipment not designed for an operator to ride (engines, transmissions, etc.) are identified by Serial numbers. Also, most major Caterpillar attachments are identified by Serial Numbers.

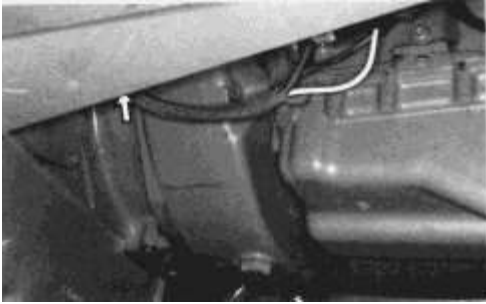
For quick reference, record the identification numbers in the spaces provided below the photographs.



Product Identification Number (PIN) _____



Engine Serial Number _____



Transmission Serial Number _____

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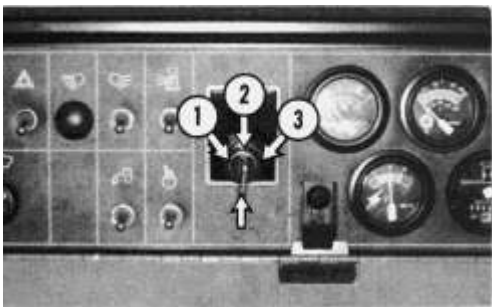
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Monitoring Systems and Cab Features

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Engine Off-On-Start Key Switch



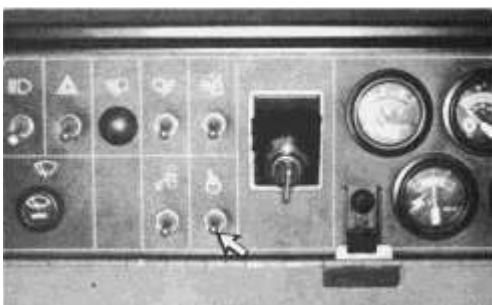
OFF (1) - Turn the key to OFF to stop the engine. To insert or remove the key, the key must be in this position. Also, to keep the fault alarm from sounding.

ON (2) - Key will return to this position after releasing from START position. Certain indicator lights and fault alarm will remain on when the key is in this position with the engine stopped, until key is turned to OFF.

START (3) - Release the key as soon as the engine starts. Fault alarm should shut off after engine oil pressure is up.

The transmission control levers must be in NEUTRAL and hydraulic control levers in HOLD before turning key and starting the engine.

Starting Aid -Ether



Starting Aid - Move the switch and release to inject a metered amount of ether.

NOTICE

Inject ether ONLY while cranking the engine. Use the ether sparingly. Excessive ether can cause piston and ring damage. Use when temperatures are below 0°C (32°F) for cold weather starting purposes. Refer to "Starting the Engine" for further information.

See "Starting Aid" in the "When Required" section for ether bottle changing.

Machine Monitoring System



Panel Test Switch (1) - With the engine stopped and the ignition on, move test switch UP. Indicator lights (2) and (3) should come on until the switch is released. Release the switch. It will return to the OFF position.

If the coolant temperature or engine oil pressure indicators and the fault alarm do not come on, have the electrical system checked and all necessary repairs made before starting the engine.

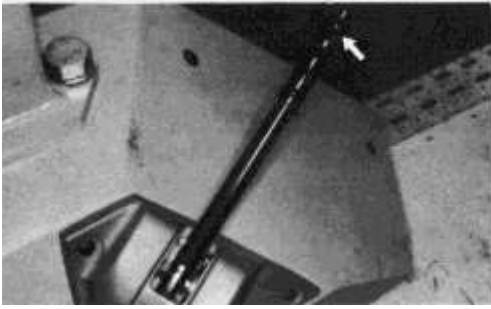
If the coolant temperature and engine oil pressure indicators come on, start the engine.

If the indicators (2) or (3) do not come on or the fault alarm does not sound, stop the engine. Have the electrical system and any machine system for which the indicator did not come on inspected. If indicators stay on after starting, stop the engine. Have all necessary repairs made before starting the engine again.

Engine Oil Pressure (2) - Indicates low oil pressure. If this indicator comes on, stop the machine immediately. Stop the engine and investigate the cause. Do not operate the machine until the cause has been corrected.

Coolant Temperature (3) - Indicates excessive coolant temperature. If this indicator comes on, stop the machine. Investigate the cause. Do not operate the machine if the indicator light stays on.

Parking Brake Indicator



Pull the parking brake lever up to activate indicator and engage parking brake.



Parking Brake - Indicates parking brake is engaged. If the indicator comes on during operation, stop the machine immediately. Stop the engine. Investigate the cause. Do not operate the machine until the cause has been corrected. If the parking brake is engaged and the transmission is in gear, an alarm horn will sound.

Gauges



Engine Coolant (1) - Indicates the coolant temperature. If the temperature is excessive, 107°C (225°F) or above, stop the machine. Investigate the cause and correct the problem before operating again.

Transmission/Converter Oil (2) - Indicates the oil temperature. If the pointer is in the red range, stop the machine. Investigate the cause and correct the problem before operating again.

Voltmeter (3) - Indicates the alternator is functioning. If the pointer is out of the green range, stop the machine. Investigate the cause; loose belt, broken belt, etc. Correct the problem before operating again.

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