CATERPILLAR®

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Operation & Maintenance Manual

D8N
Track-Type Tractor

9TC1-UP
8WC1-UP

Table of Contents

Foreword

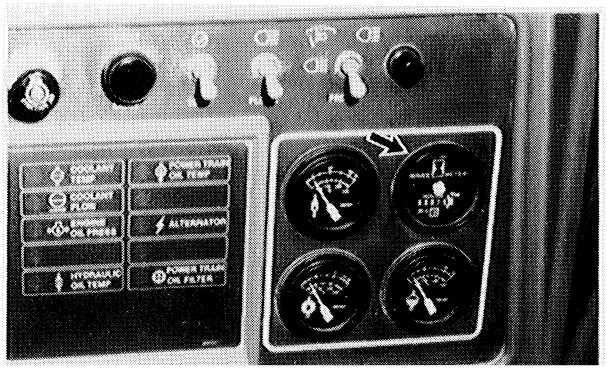
This guide contains operation instructions and lubrication and maintenance information.

The operation section is a reference for the new operator and a refresher for the experienced one. Read – study – and keep it handy.

Photographs or 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.

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." Items in the "Lubrication and Maintenance Interval Chart" are referenced to detailed instructions that follow.



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 "Lubrication and 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.

Some photographs or illustrations in this publication show details or attachments that may be different from your machine. Also, 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.

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

Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "WARNING" as shown below.

⚠ WARNING

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning, explaining the hazard, can be either written or pictorially presented.

Operations that may cause product damage are identified by NOTICE labels on the product and in this publication.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance or repair procedures you choose.

The information, specifications, and illustrations in this publication are on the basis of information available at the time it was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service given to the product. Obtain the complete and most current information before starting any job. Caterpillar dealers have the most current information available. For a list of the most current publication form numbers available, see the Service Manual Contents Microfiche, REG1139F.

Safety

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.

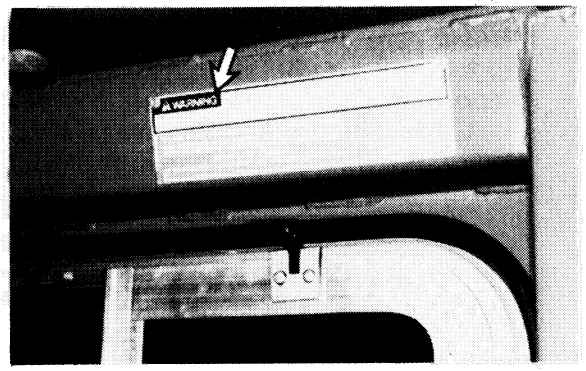
Make sure that you can read all safety signs. Clean or replace these if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasoline, etc.

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.

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

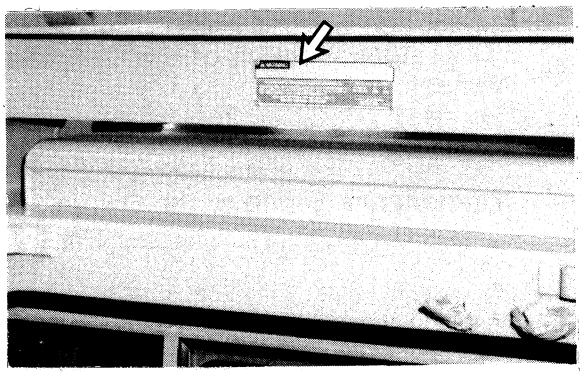
Located in the operator's compartment.

WARNING: To avoid possible weakening of the Falling Object Protective Structure (FOPS), consult a Caterpillar dealer before altering the FOPS in any way. The protection offered by the FOPS will be reduced if it has been subjected to structural damage.



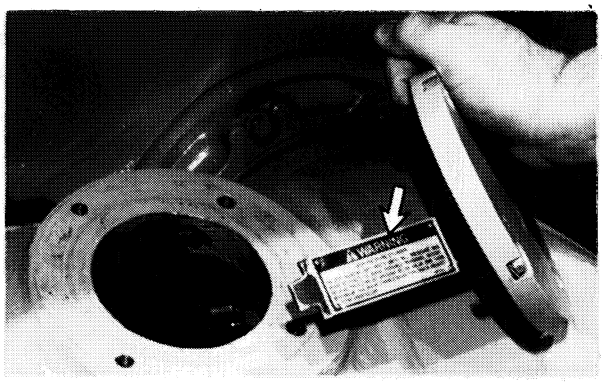
Located inside the cab.

WARNING: To avoid possible weakening of this ROPS, consult a Caterpillar dealer before altering this ROPS in any way. The protection offered by this ROPS will be impaired if it has been subjected to structural damage or has been involved in an overturn incident.



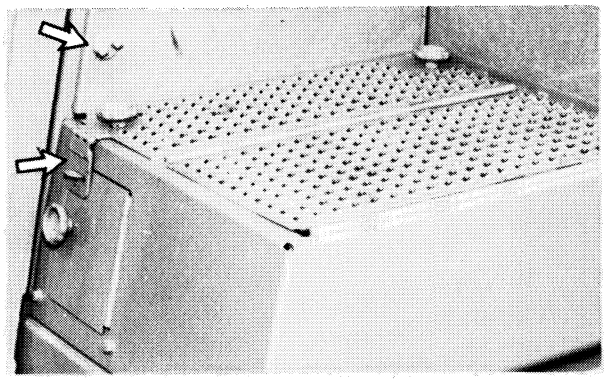
Located on the ROPS.

WARNING: High Pressure Cylinder Do not remove any parts until all pressure has been relieved. Relieve pressure by opening relief valve one turn maximum. See the "Operation and Maintenance" Guide for correct procedure.



Located on both track roller frames.

WARNING: Improper jumper cable connections can cause an explosion resulting in personal injury. 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.



Located on the battery access cover.

General

Attach a "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.

Perform all maintenance unless otherwise specified as follows:

Park the machine on level ground.

The transmission lever in NEUTRAL.

The parking brake engaged.

The engine stopped.

The start switch key removed.

The disconnect switch off and the key removed.

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 deck, walkways 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 hand signals and who gives them. Accept signals from one person only.

Never put maintenance fluids into glass containers.

Report all needed repairs.

Do not allow unauthorized personnel on the machine.

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

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 airborn 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

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

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

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.

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.

Track adjusting grease and oil are under high pressure. Grease or oil coming out of the relief valve under pressure can penetrate the body causing injury or death.

Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened. Loosen the relief valve one turn only.

Rollover Protective Structure (ROPS)

A ROPS is designed to provide operator crush protection in a rollover by controlled bending of its structural menbers.

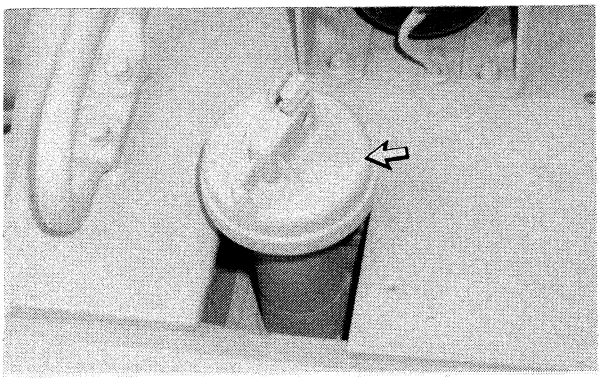
ROPS performance requirements in rollovers are specified by regulations in several countries. Any modification to ROPS such as welding on or drilling holes in the structural members for the purpose of mounting brackets or installing other devices will affect the ROPS capability to provide the required crush protection.

Therefore, any modification or repair without Caterpillar's specific approval will void the ROPS certification. The certifiction cannot be renewed by repair of the ROPS, since certification requires a destructive test.

Certain repairs and modifications can be made without voiding the ROPS if correctly done. Contact your Caterpillar dealer before making any modifications or repairs to ensure that such will not void the ROPS certification.

Burn Prevention

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.



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.

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

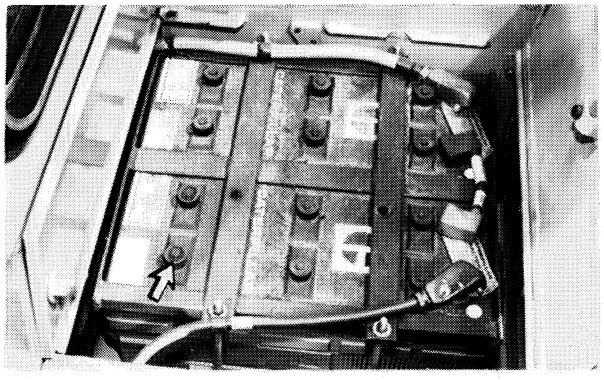
At operating temperature, the hydraulic tank is hot and can be under pressure.

The pins and bushings in a dry track pin joint can become very hot. It is possible to burn the fingers if there is more than brief contact with these components.

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 air, oil, fuel or cooling systems before any lines, fittings or related items are disconnected or removed.



Battery electrolyte contains acid that can cause injury. Avoid contact with the skin and eyes.

Fire or Explosion Prevention

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

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 guide for specific 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 and 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., if at all possible.

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.

Ether

Ether is flammable. Do not smoke while changing ether cylinders.

Use ether only in well ventilated areas.

Keep ether cylinders out of the reach of unauthorized persons.

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

Do not store ether cylinders in direct sunlight. Discard cylinders in a safe place. Do not puncture or burn cylinders.

Lines, Tubes and Hoses

Do not operate machine without floor plate in place. Steering motor and pump are located immediately below operator station. For safe operation, operate this machine only with floor plate in place.

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.

Check lines, tubes and hoses carefully. Do not use your bare hand to check for leaks. Tighten all connections to the recommended torque. Replace if any of the following conditions are found.

1. End fittings damaged, displaced or leaking.

2. Outer hose covering chafed or cut and wire reinforcing exposed.

3. Outer hose covering ballooning.

4. Evidence of kinking or crushing of the flexible part of the hose.

5. Armouring embedded in the outer hose cover.

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

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.

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. Use a hand line to pull equipment up onto the platform.

Preparing to Start 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.

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

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

Make sure all lights are working properly.

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.

Starting the Engine

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.

Move the transmission speed and directional control levers to NEUTRAL.

Engage the parking brake.

Start the engine from the operator's seat only. Operate the engine in a well ventilated area only. In an enclosed area, vent the exhaust to the outside.

Preparing to Operate the Machine

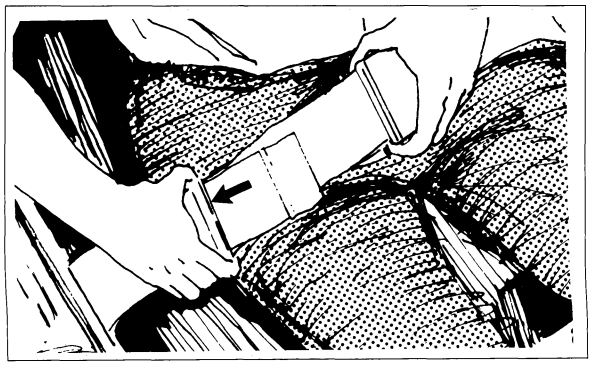
Clear all personnel from the machine and the area.

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

Be sure all windows are clean. Secure the doors and windows in either the open or shut position.

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

Make sure the machine horn, the backup alarm 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.

Operating the Machine

Operate the machine only while seated.

Operate the controls only with the engine running.

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

Do not allow riders on the machine unless additional seat, seat belt and rollover protection are provided.

Report any needed repairs noted during operation.

Carry implements close to the ground, approximately 40 cm (15 in) above ground level.

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.

Be careful to avoid the condition 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.

No personnel should be between the machine and trailing equipment when maneuvering to connect them. Block the tongue or hitch of trailing equipment to align it with the drawbar or hitch.

Parking the Machine

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

Apply the service brake to stop the machine.

Move the transmission speed and directional control levers to NEUTRAL.

Engage the parking brake.

Lower all implements to the ground and apply slight down pressure.

Stop the engine.

Turn the start switch key to OFF and remove the key to service the machine.

Turn the disconnect switch key to OFF and remove the key when servicing the machine. Also, When leaving the machine for an extended period, lock all protected compartments.

Towing

⚠ WARNING

Personal injury or death could result when towing a disabled machine incorrectly.

Block the machine to prevent movement before releasing the brakes. The machine can roll free if it is not blocked.

Follow the recommendations below, to properly perform the towing procedure.

This machine is equipped with spring applied, hydraulic pressure released brakes. If the engine or power train hydraulics are inoperable, the brakes are applied and the machine can not be moved. Unless, a brake release pump is used.

These towing instructions are for moving a disabled machine a short distance, only a few feet at low speed, no faster than 2 km/h (1.2 mph), to a convenient location for repair. These instructions are for emergencies only. Always haul the machine if long distance moving is required.

This machine can be towed by removing the axle shafts from the final drives, but the machine brakes are inoperable and the machine is free to roll. See the service manual or contact your Caterpillar dealer for axle shaft removal.

Shielding must be provided on the towing machine, to protect the operator if the tow line or bar should break.

Do not allow operator on the machine being towed, unless the operator can control the steering and/or braking.

Before towing, make sure the tow line or bar is in good condition and has enough strength for the towing situation involved. Use a towing line or bar with a strength of at least 1.5 times the gross weight of the towing machine, for a disabled machine stuck in mud or when towing on a grade.

Attach cable to towing eye on front if pulling forward, or attach to drawbar pin or ripper if pulling to the rear.

Do not use a chain for pulling. A chain link may break causing possible personal injury. Use a wire rope cable with loop or ring ends. Use an observer in a safe position to stop the pulling procedure if cable starts to break or unravel. Stop pulling whenever the pulling machine moves without moving the towed machine.

Keep the tow line angle to a minimum. Do not exceed a 30° angle from the straight ahead position.

Quick machine movement could overload the tow line or bar and cause it to break. Gradual and smooth machine movement will work better.

Normally, the towing machine should be as large as the disabled machine. Satisfy yourself that the towing machine has enough brake capacity, weight and power, to control both machines for the grade and distance involved.

To provide sufficient control and braking when moving a disabled machine downhill, a larger towing machine or additional machines connected to the rear could be required. This will prevent it from rolling uncontrolled.

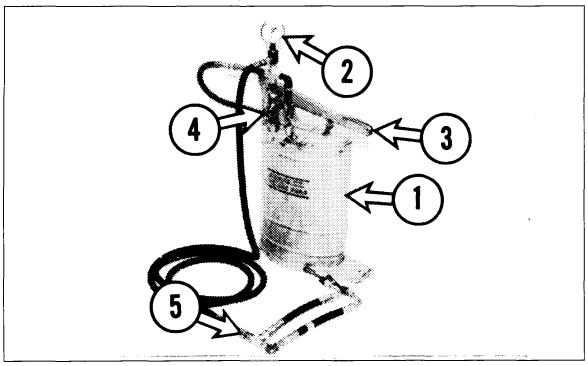
The different situation requirements cannot be given, as minimal towing machine capacity is required on smooth level surfaces to maximum on inclines or poor surface conditions.

To move the machine when the engine is not operable, a provision has been made to attach a brake release pump.

The pressure hose from the pump connects to the brake valve. The pump takes oil from the sump of the pump and pressurizes the brake valve to release the brakes.

Note: This machine is free to roll and has no braking ability when both tracks have been separated.

Brake Release Pump – Connecting



Machine brakes can be released for towing by use of FT1973 Adapter Group ⑤ and FT1845 Pump Group ①.

Before Connection Pump Test

NOTICE

Possible brake piston seal damage could result without checking relief valve. Opening pressure must be checked and adjusted before connection is made.

1. Plug the main pressure hose where it connects to the FT1973 Adapter Group ⑤.

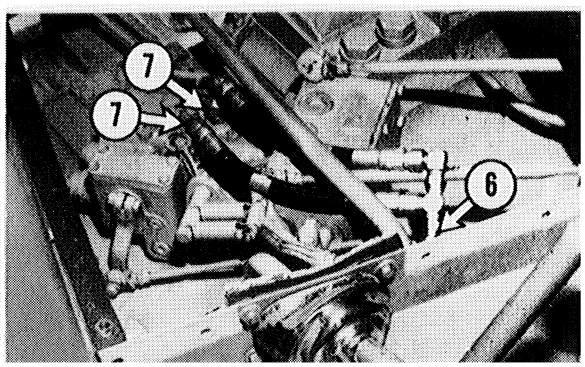
2. Turn bypass valve handle ④ to the closed position.

3. Observe relief valve ② opening pressure while pumping handle ③.

4. Adjust relief valve opening to 3030 ± 70 kPa (440 ± 10 psi).

Tractor Pump Connection

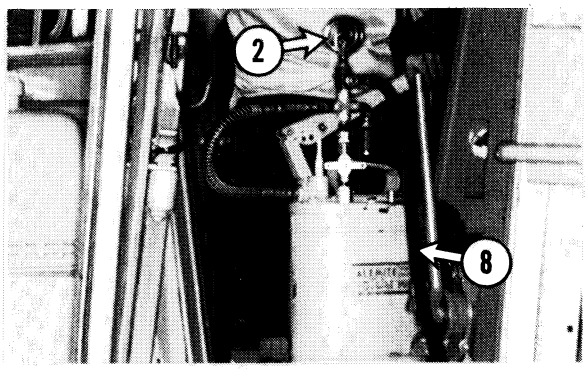
Remove the floor plate before proceding.



Typical Example

1. Remove the quick disconnect fittings from top of brake valve ports ⑦.

2. Install the 8T2857 Adapters ⑥ in the ports. Connect remainder of FT1973 Adapter Group ⑤ to the pump pressure hose.



3. Route the pressure hose ⑧ under floor plate to pump which should temporarily be placed on platform.

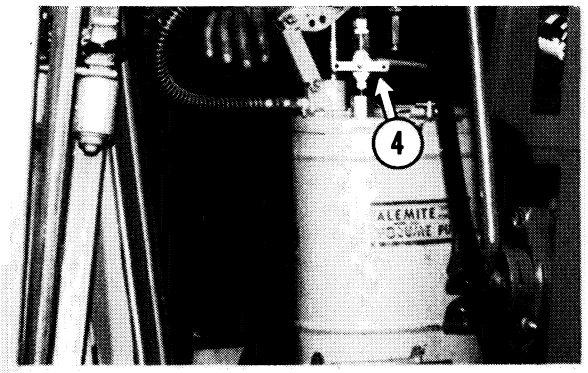
4. Replace the floor plate. Leave bolt out on one side to allow space for hose.

5. Place pump group in front of operator.

6. Move parking brake control to the UNLOCKED position.

7. Fasten the seat belt and continue with next topic.

Brake Release/Brake Engagement



Brake Release

1. Turn bypass valve handle ④ to the closed position.

2. Move pump handle rapidly at first, to produce a large volume of oil flow.

3. Brake piston seal must be fully seated. Seating of the seal will be evident by a sudden rise in oil pressure.

When the seal seats properly, pressure will rise to maximum.

NOTICE

Do not allow pressure to drop below 2750 kPa (400 psi) while towing. Partial brake engagement could occur and can result in brake damage. Brakes must be fully released when towed machine is moving.

4. Machine can now be towed.

Brake Engagement

NOTICE

Do not use the machine brakes to slow or stop the machine. Extensive brake damage and system contamination can result.

To apply the brakes, turn bypass valve ④ 90° to fully dump the oil.

Brake system can only be applied by turning bypass valve. Brake pedal and steering lever will not function.

After towing, remove the pump group. Repair machine and install the floor plate.

Consult your Caterpillar dealer for the equipment necessary for towing a disabled machine.

Fire Suppression System (If Equipped)

System Description

⚠ WARNING

Fire suppression agents may create hazards to people if discharged on them.

Halon Agent can cause dizziness, reduced coordination and reduced vision after exposure. If symptoms persist after exposure, consult a physician.

Dry chemical agent will reduce vision and can irritate eyes, skin and nasal passages. If the agent gets into eyes, flush thoroughly with water, then consult a physician. In case of skin contact, wash all exposed areas with soap and water. If irritation persists, after inhalation or skin contact, consult a physician.

The fire suppression system will not be able to suppress a fire unless the nitrogen actuators and agent cylinders are fully charged.

The nitrogen and agent cylinders must be recharged if the system has been activated.

Consult your Caterpillar dealer for recharging information.

NOTE: To prevent vandalism or accidental discharge of the system during shipping, a cable and a padlock are installed to secure the lock pin in each nitrogen actuator. These two parts must be removed to permit manual actuation. A small plastic flag seal must stay on the lock pin. This seal is broken by the operator when pulling the lock pin to manually discharge the system.

The purpose of the fire suppression system is to suppress an oil, fuel or debris fire long enough to allow access to back-up fire fighting equipment.

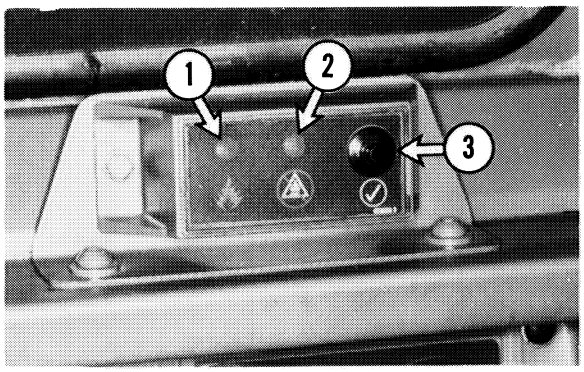
Do not expect the system to put out the fire completely. Back-up fire fighting equipment should be available.

The fire suppression system will not suppress fires outside the machine. It will not suppress fires in the operator's compartment.

The fire suppression system includes a detection circuit, an operator warning system, automatic discharge of agent, and engine shutdown when the machine is stopped with the parking brake engaged. The system has a built-in diagnostic capability. This allows the system to continuously monitor the fire detection circuitry, the discharge electrical circuit, the engine shutdown wiring, and the electronic control itself.

The operator's compartment contains a system monitor and a manual system acutator. The system monitor is located above the dash within the operator's vision. The manual actuator is located on the right side of the operator's seat.

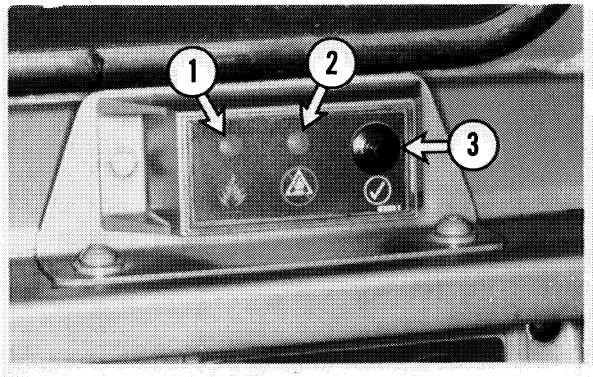
System Monitor



The monitor has two lights ① and ② and a push-type switch ③ mounted on the face of the unit. The warning light ① is red and is activated when the system detects a fire. The system fault light ② is yellow. It is activated whenever the system control module detects a fault with the system. A fault can include such things as low actuator cylinder pressure, a broken lead in the detection circuit, a defective release solenoid, low agent cylinder pressure, or a number of other system problems.

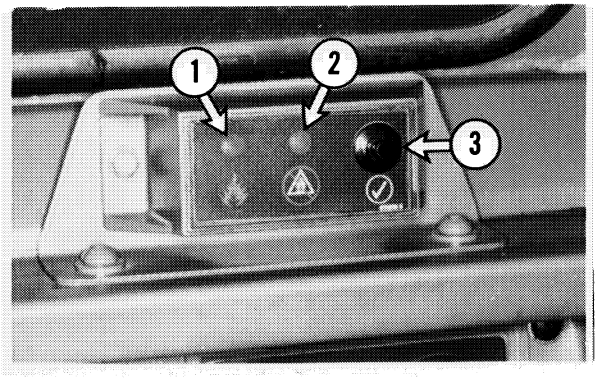
Whenever the system fault light ② comes on, the machine and engine should be stopped and the system fault found and repaired. Otherwise, the fire suppression system may not function if a fire should occur.

The test switch ③ on the monitor is used to test the operator warning system and the engine shutdown circuit. The following test should be conducted at the start of each shift.



1. Disengage the parking brake.
2. Start the engine.
3. Push test switch ③.

The red warning light will flash and the warning horn will sound as long as the switch is pushed. The engine should continue to run. If the engine stops, there is a defective (shorted out) parking brake switch. The machine should not be operated until the system is repaired and a successful test of the system is made.



1. Engage the parking brake.
2. Start the engine.
3. Push test switch ③.

The red warning light will flash and the warning horn will sound as long as the switch is pushed. The engine should shut down. If the engine does not shut down, the parking brake switch circuit is open. The machine should not be operated until the system is repaired and a successful test of the system is made.

NOTICE

The heat detecting ability will be impaired if the heat sensors are covered, painted, dirty, or damaged.

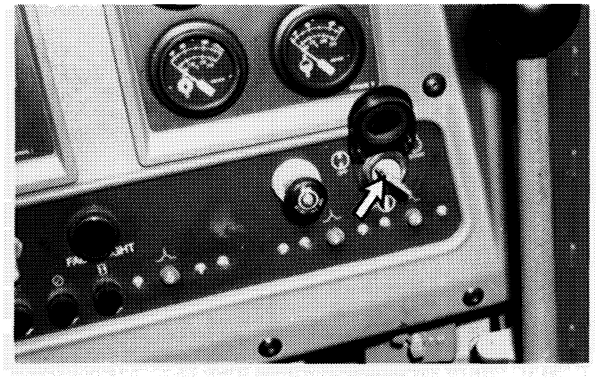
Cover the heat sensors while painting the machine. Be sure any paint protection covers are removed from the sensors before first operating a new or repainted machine.

Clean the sensors monthly to remove dirt and debris. Replace them if they are dented or damaged.

Fire heat sensors are located on the machine at the following locations: One sensor in the manhole and one sensor above the engine. They signal the fire detection monitor in the operator's compartment whenever a temperature above 193°C (380°F) is sensed.

System Operation

The system will operate at any time, even when the machine is not being operated or not even running. When the key switch is off, the operator warning will not occur because power is not supplied to the monitor panel. However, the rest of the system will function properly as long as the service disconnect switch is turned to ON.



With the key start switch in the ON position, the monitor panel is activated. The fire warning light will flash and the warning horn will sound intermittently should a fire occur.

The control module will operate a solenoid on the cab actuator. This releases stored nitrogen which is carried to the agent cylinder. It acts on a piston in the agent cylinder valve which causes a burst disc to be ruptured. This releases the agent, causing it to be dispersed through the nozzles located in the engine compartment and under the operator's compartment floorplate.

At the time the cab acutator is energized, the fire suppression control will also activate the engine shutdown solenoid to stop the engine.

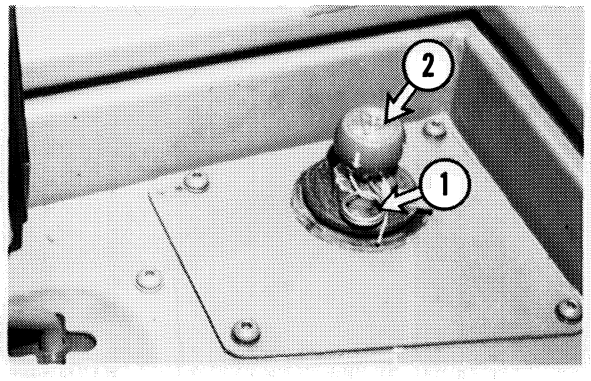
NOTE: The engine will shut down only if the parking brake is engaged.

The fire warning horn will sound intermittently and the fire indicator will flash until ten seconds after the last heat sensor opens. The parking brake must be engaged, if not done so when the warning first started.

Actuation from the Operator's Station

1. Stop the machine and engage parking brake.

2. Stop the engine to stop the fan and fuel and hydraulic pumps.



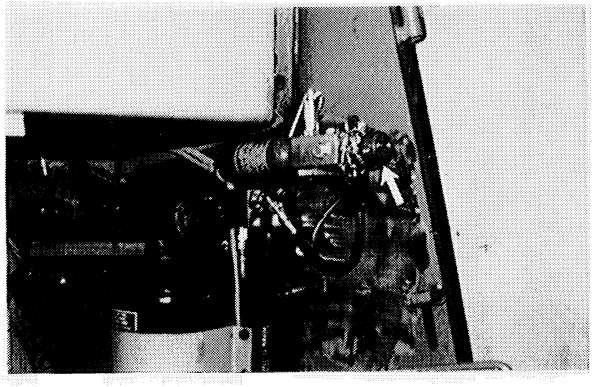
3. Remove pin ① in the actuator assembly. Push knob ② in to actuate the system. The agent should discharge.

4. Dismount and move away from the machine to protect against possible personnel injury due to the fire. Use follow-up fire fighting equipment.

5. If the system did not discharge the agent when actuated from the operator's station, actuate the system on the right front side of the engine, using the same procedure.

The engine may be restarted immediately after agent discharge if it is necessary to move the machine.

Manual Actuation Outside Cab



The actuator is located inside the rear striker bar enclosure area on the right side.

Remove the pin in the actuator assembly. Push the knob in to actuate the system. The agent should discharge.

Pressurized nitrogen from either actuator is used to trigger the discharge of the fire suppression agent cylinders.

After Discharging the System

The engine may be restarted immediately after agent discharge, if it is necessary to move the machine.

Before returning the machine to normal service, have needed repairs made. Find and correct the cause of the fire. Have the fire suppression system nitrogen actuator cylinders and the agent cylinders recharged.

The yellow fault indicator light will flash to indicate low or no pressure in the actuator and agent cylinders. If the yellow light continues to flash after the cylinders have been recharged, this indicates that a second fault exists. The system should be repaired as necessary to insure that an operable system is in place before operating the machine.

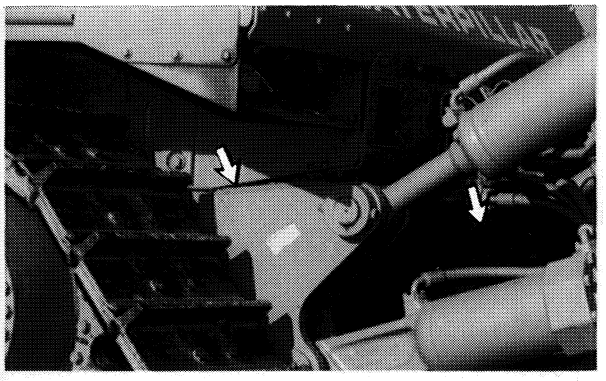
Product Identification and Serial Number Locations

The Product Identification Number (PIN) will be used to identify powered earthmoving equipment that is designed for an operator to ride. The PIN will have the same prefixes and continue in the sequence as the current Serial Numbers.

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

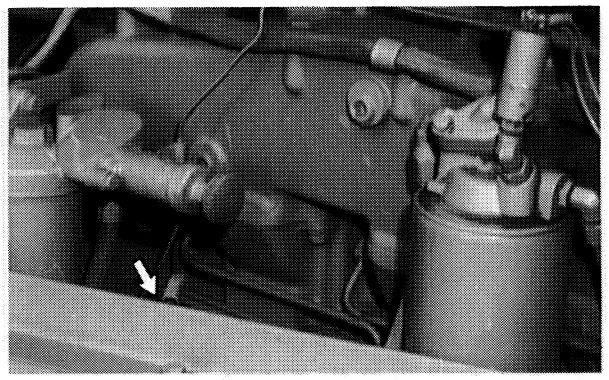
For quick reference, record the identification numbers in the spaces provided below the photographs.

Combined Number Plate

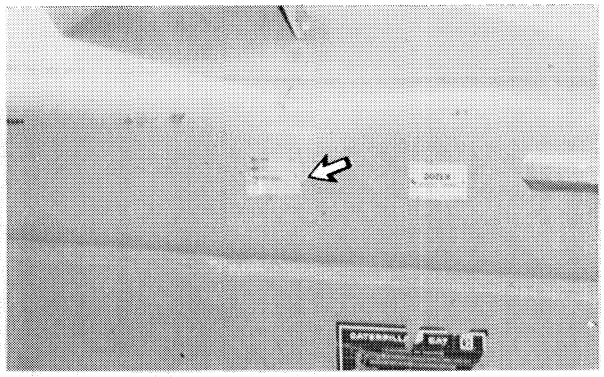


Product Identification Number (PIN)_____

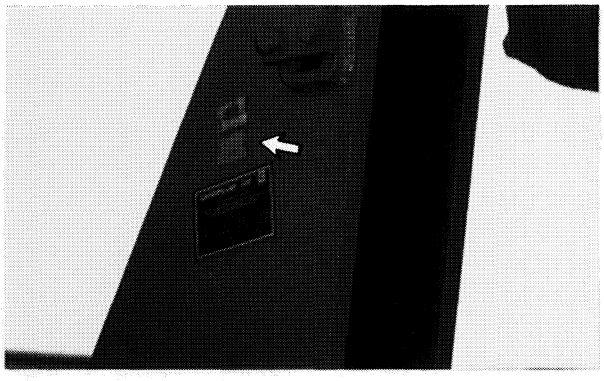
Transmission Serial Number_____



Engine Serial Number_____



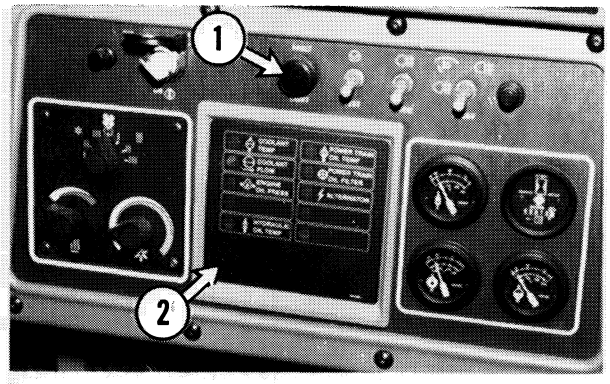
Dozer Blade Serial Number_____



Ripper Serial Number_____

Operator's Compartment

Electronic Monitoring System (EMS)

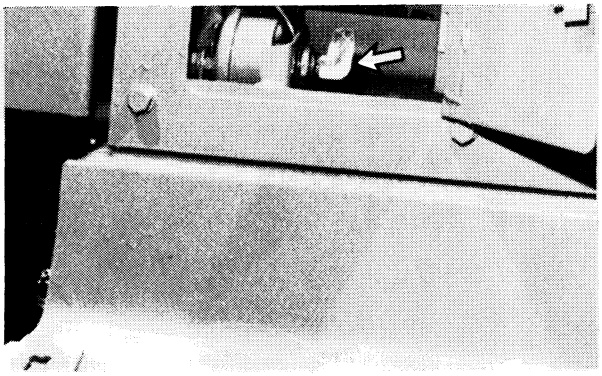


The Electronic Monitoring System (EMS) consists of a fault alarm, a fault light ① and a monitoring panel ② with individual indicators for each machine system listed on the panel.

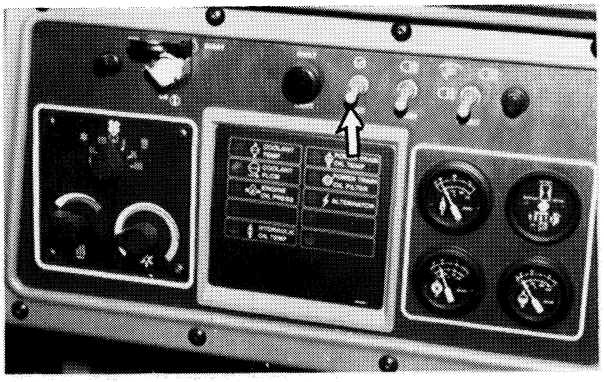
The EMS is designed to alert the operator of an immediate or impending problem in one or more of the machine systems covered.

EMS Functional Test

To ensure the proper operation of the EMS, check the system daily.



The disconnect switch must be ON to supply electrical power to the operator's compartment for the EMS to function. The switch can be turned to ON and remain in day to day operation. Turn the switch to OFF and remove the key when servicing machine.



Panel Test Switch – With the engine stopped, move test switch UP. All indicators should come on and the fault light should blink until the switch is released. Release the switch. It will return to the off position.

If any of the indicators or the fault light do not come on, have the electrical system checked and all necessary repairs made before starting the engine.

If all the indicators and the fault light did come on, start the engine. Repeat the panel test with the engine running. Move the test switch UP. All indicators and the fault light should come on again. The fault alarm should also sound.

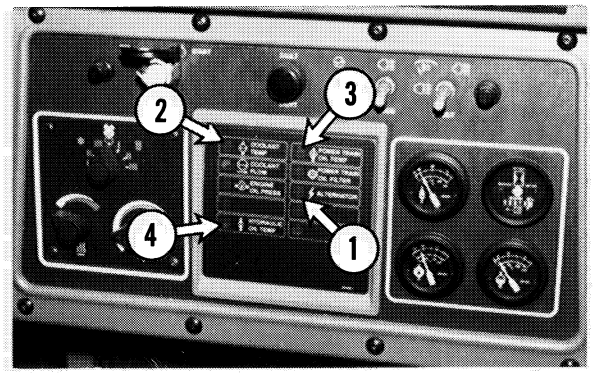
If any of the indicators or the fault light do not come on or the fault alarm does not sound, stop the engine. Have the electrical system and any machine system for which the indicator did not come on, inspected. Have all necessary repairs made before starting the engine again.

EMS Warning Levels

The EMS provides three warning levels. The first level requires only operator awareness. The second warning level needs operator response. The third warning level requires immediate shutdown of the machine. The following topics group the machine systems by EMS warning levels.

Warning Level 1

At this level, only the indicator will come on. It requires that the operator is aware that a machine system needs attention. Failure of these systems will not endanger the operator or cause serious damage to machine components.



1. Alternator – Indicates the alternator is malfunctioning. If this indicator comes on, pull to a convenient stop. Investigate the cause (loose or broken belt, etc.). Do not operate the machine until the cause has been corrected.

Warning Level 2

At this level, the indicator and the fault light will come on. It requires a change in machine operation to reduce excessive temperature in one or more of the systems.

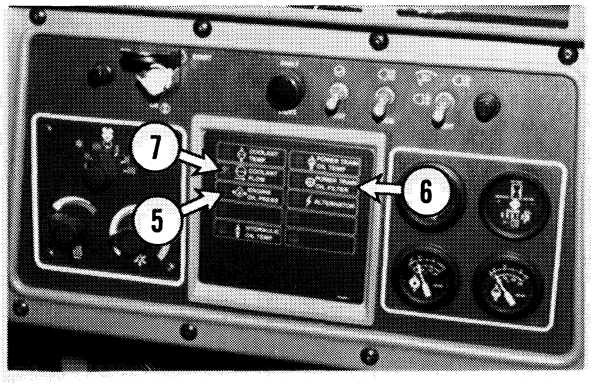
2. Coolant Temperature – Indicates excessive coolant temperature. If this indicator comes on, pull the machine to a convenient stop. Investigate the cause. Do not operate the machine if the indicator stays on, and the fault light blinks.

3. Power Train Oil Temperature – Indicates excessive converter or transmission oil temperature. If this indicator comes on, reduce load on the machine. If the indicator stays on, pull to a convenient stop. Investigate the cause. Do not operate the machine if the indicator stays on and the fault light blinks.

4. Hydraulic Oil Temperature – Indicates excessive hydraulic oil temperature. If this indicator comes on, reduce load on the machine. If the indicator stays on, pull to a convenient stop. Investigate the cause. Do not operate the machine if the indicator stays on and the fault light blinks.

Warning Level 3

At this level, the indicator and the fault light will come on and the fault alarm will sound. It requires immediate shutdown of operation to prevent injury to the operator and/or severe damage to the system and/or the machine.

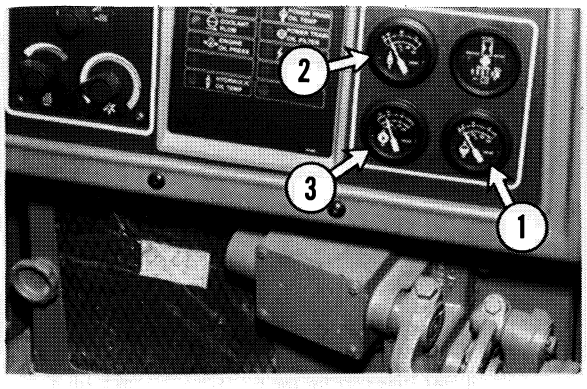


5. Engine Oil Pressure – Indicates low oil pressure. If this indicator comes on, the fault alarm should sound and the fault light should blink. Stop the machine immediately. Stop the engine and investigate the cause. Do not operate the machine until the cause has been corrected.

6. Power Train Oil Filter – Indicates the oil filter is clogged. If this indicator comes on, the fault alarm should sound and the fault light should blink. Stop the machine immediately. Stop the engine and investigate the cause. Do not operate the machine until the cause has been corrected.

7. Coolant Flow – When this light comes ON, STOP the engine. It indicates a FAILURE, water pump, hose, radiator, etc. The fault light will FLASH and the fault alarm will SOUND.

Gauges



If temperatures are excessive, stop operation of the machine. Slow the engine to 3/4 of high idle, to reduce the excessive temperature.

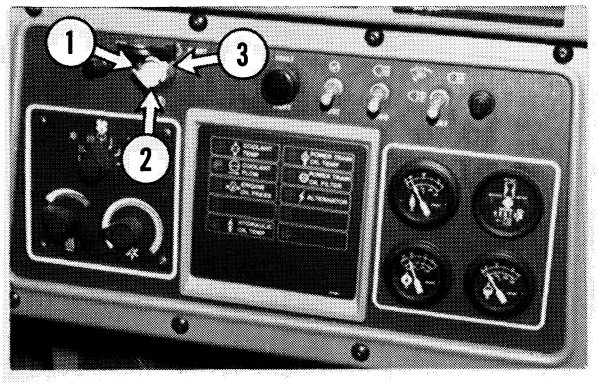
The EMS panel lights should come on when the temperatures are excessive.

1. Engine Coolant Temperature – If the gauge indicator reaches 107°C (225°F), it indicates the temperature is too high.

2. Hydraulic Oil Temperature – If the gauge indicator reaches 110°C (230°F), it indicates the temperature is too high. Move the cylinders without a load on them, to reduce excessive temperature.

3. Power Train Oil Temperature – If the gauge indicator reaches 129°C (265°F), it indicates the temperature is too high.

Engine OFF-ON START Switch



NOTICE

Do not turn the switch key to OFF when the engine is running to avoid electrical system damage.

Governor lever must be pushed forward to stop the engine. If the engine does not start, return the key to OFF, before returning it to START.

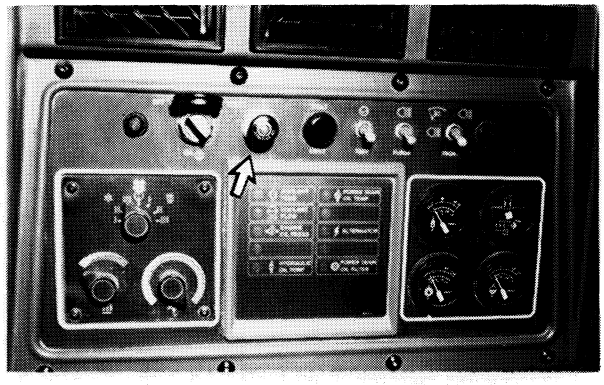
1. OFF – Turn the key to OFF to disconnect the electrical circuits, except for the dash, front lights, dome light, and back-up alarm (when lever is in reverse).

2. ON – Turn the key to ON to connect the electrical circuits.

3. START – Turn the key to START to start or crank the engine. Release the key after the engine starts. It will return to ON.

The disconnect switch key must be turned to ON, to start the engine.

Starting Aid – Ether

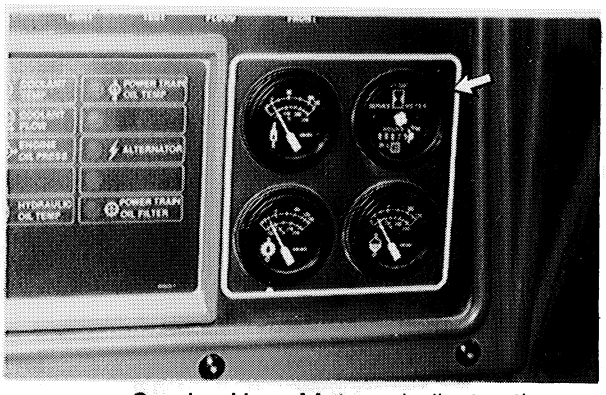


Starting Aid – Push the knob in to inject a metered amount of ether. See "Starting the Engine" section under "Below 0°C (32°F)" for operating instructions.

NOTICE

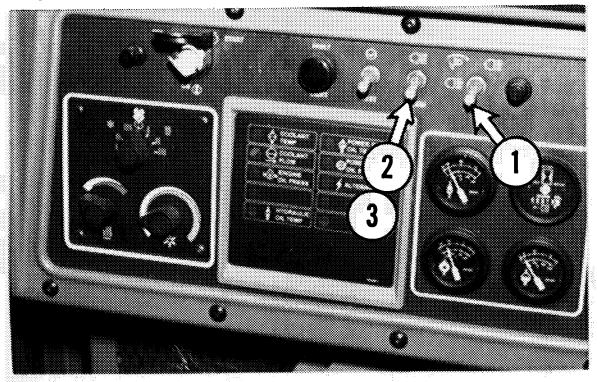
Inject ether ONLY while cranking the engine. Use the ether sparingly. Excessive ether can cause piston and ring damage. Use ONLY when temperatures are below 0°C (32°F) for cold weather starting purposes.

Service Hour Meter



Service Hour Meter – Indicates the total number of hours the engine has operated. Use it to determine service intervals.

Light Switches

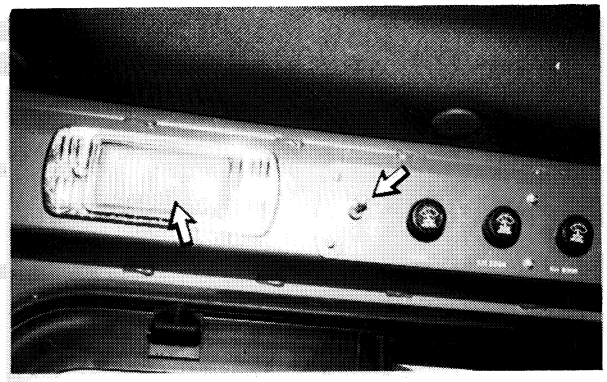


Front Lights and Dash Panel Lights ① – Move the switch up to the first click to turn the front lights on. This also turns the gauge lights on. Move the switch all the way up to turn the dash panel lights on.

Rear Lights ② **and Side Lights** ③ – Move the switch up to turn the lights on.

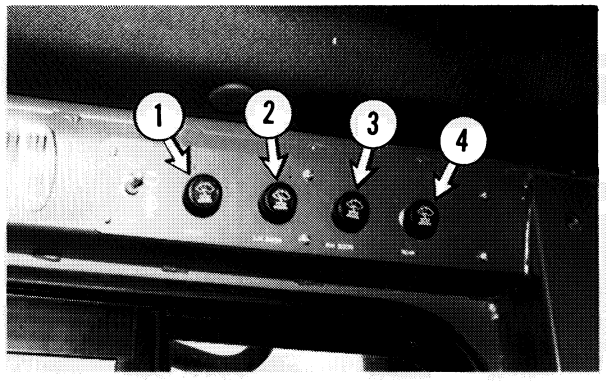
A separate switch on right side rear console, next to fuses, can be used to add additional lights, etc.

Dome Light



Interior Dome Light – Move the switch down to turn the light on.

Windshield Wiper/Washer



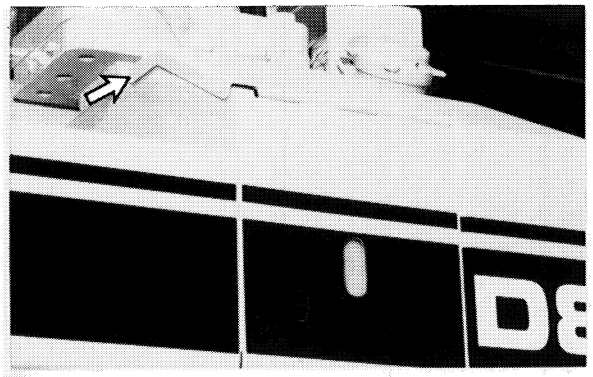
Front Windshield Wiper/Washer ① – Turn the knob to the right to turn on the wiper. First click is low speed. Second click is high speed.

Left Hand Door Windshield Wiper/Washer ②, **Right Hand Door Windshield Wiper/Washer** ③ **or Rear Windshield Wiper/Washer** ④ – Operates the same as item 1.

Rotate the windshield washer pointer to the window that requires washing.

Push ①, ②, ③ or ④ knob to spray the windshield. Pointer is located on cab ceiling.

Windshield Washer Fluid Bottle

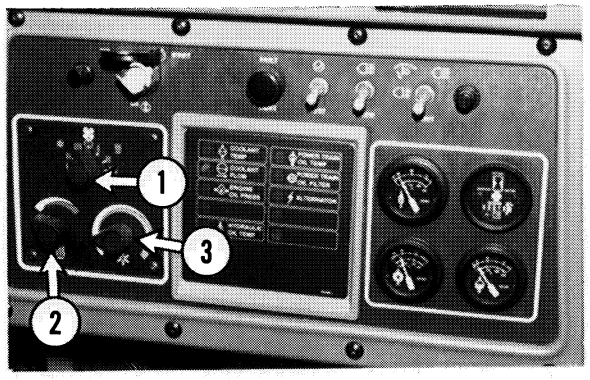


The washer fluid bottle is located on the left rear side of the machine next to the cab. Look at the bottle to check quantity.

Remove the bottle cap to add fluid.

Use Caterpillar windshield washer fluid or a commercially available windshield washer fluid to prevent system from freezing.

Heating and Air Conditioning Controls



1. This switch activates the heat or air conditioning and controls the three speed blower fan motor.

Off – Turn the knob to this symbol to turn off all controls.

Heating – Turn the knob clockwise from OFF to activate.

Air Conditioning – Turn the knob counterclockwise from OFF to activate.

First Speed (I) – Move the knob to this symbol for lowest fan speed.

Second Speed (II) – Move the knob to this symbol for a medium fan speed.

Third Speed (III) – Move the knob to this symbol for highest fan speed.

2. Heating Variable – Turn the knob anywhere between LOW (left) and MAXIMUM heat (right.)

3. Air Conditioning Variable – Turn the knob anywhere between LOW (left) and MAXIMUM cool (right).

Heating and Air Conditioning System Operation

The Heating and Air Conditioning system can perform four functions:

1. Heating – Turn the blower fan switch to FIRST, SECOND or THIRD speed clockwise from OFF. Adjust the heating control for the desired temperature.

2. Cooling – Turn the blower fan switch to FIRST, SECOND or THIRD speed counterclockwise from OFF. Adjust the cooling control for the desired temperature.

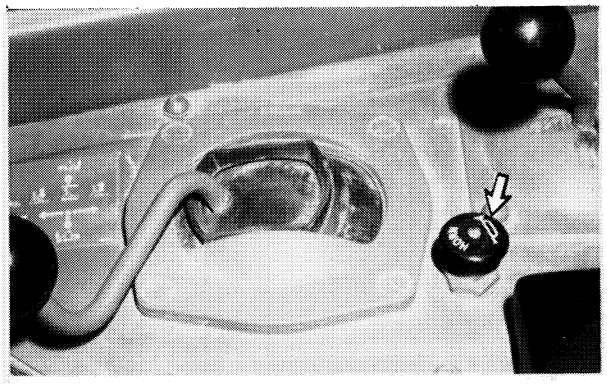
3. Pressurizing – Pressure inside of the cab will help keep dust out, when heating or cooling is not desired.

Turn blower fan to either FIRST, SECOND or THIRD speed clockwise from OFF, depending on the volume of air needed to keep out dust. Turn the heating control to LOW (left).

4. Defogging – It is possible to use the heating system, with the air conditioning system, to remove moisture from the air in the cab. This will prevent moisture from forming on the windshield and windows.

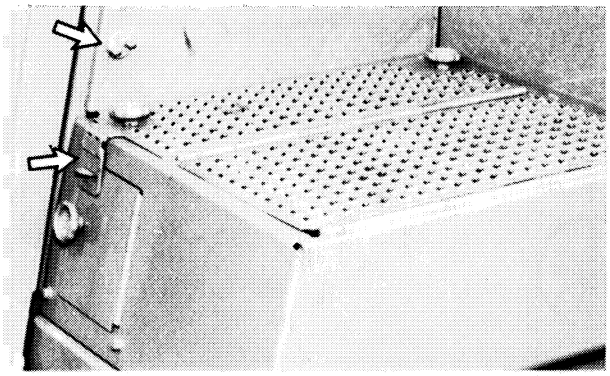
Turn on the blower fan and the air conditioning. Adjust both the heating and cooling knob controls until moisture level is lowered, the temperature is comfortable and windshield and side windows are free of moisture.

Horn

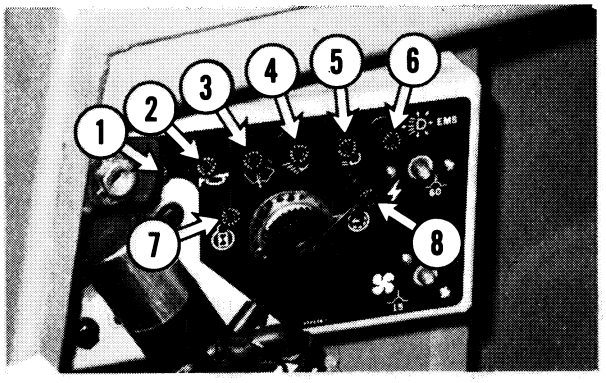


Horn – Push the knob down to sound the front horn. The horn is used to alert people in front of the machine.

Fuses and Circuit Breakers



Raise the battery box cover and open the fuse cover.



NOTICE

Always replace fuses with ones of the correct ampere rating to avoid electrical system damage.

Fuse – Replace any fuse if the element is broken and/or the circuit it is in does not function. Fuses and their ampere ratings are listed below.

1. Back-up Alarm Fuse – 10A

2. Horn Fuse – 10A

3. Windshield Wiper/Washer Fuse – 15A

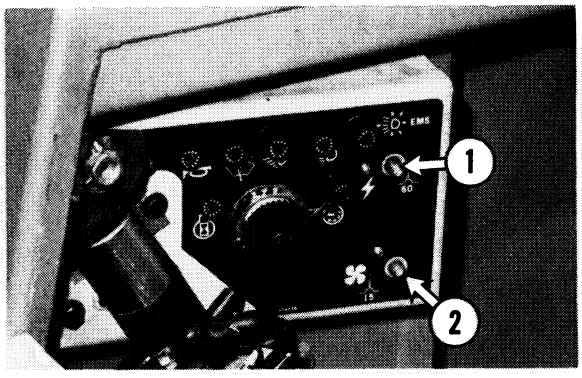
4. Side and Rear Light Fuse – 10A

5. Front Light Fuse – 10A

6. EMS Panel/Gauges Fuse – 10A

7. Hour Meter Gauges Fuse – 10A

8. Engine Starting Fuse – 10A

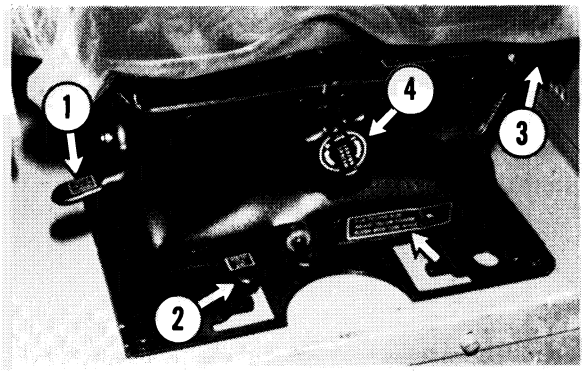


Circuit Breaker Reset – Push the button in to reset the circuit breaker. If working properly, button will remain depressed. If button does not stay in, or comes out shortly after being reset, have appropriate electrical circuit checked.

1. Main Electrical System Reset

2. Heater and Air Blower Motor Reset

Seat Adjustment



1. Push down on the seat height level lever to release the lock. Move the seat down, or allow it to rise to the desired height. Release the lever to lock the seat.

2. Pull up the fore-aft lever. Slide the seat forward or back to the desired position. Release the lever to lock the seat.

3. Pull up the seat angle lever. Adjust the seat cushion to the desired angle. Release the lever to lock the seat cushion.

4. Turn the knob clockwise while seated to increase or counterclockwise to decrease the stiffness of suspension. Adjust so that the yellow rod in the indicator is just flush with tube while seated. Bounce on the seat a few times and check rod again.

Adjust the seat belt buckle to fit the operator. See "Adjust Seat Belt."

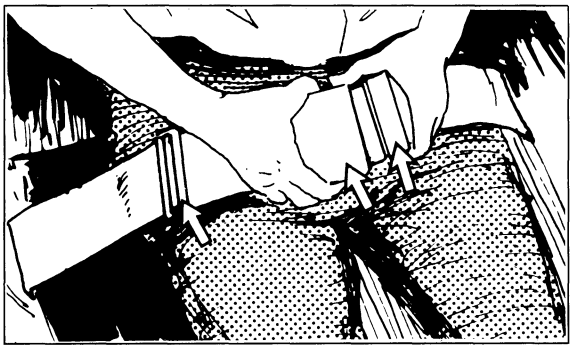
5. Raise the backrest up and move it to the desired position. Lower it to lock it into position.

Seat Belt

⚠ WARNING

Always check the condition of the seat belt and mounting hardware before operating the machine.

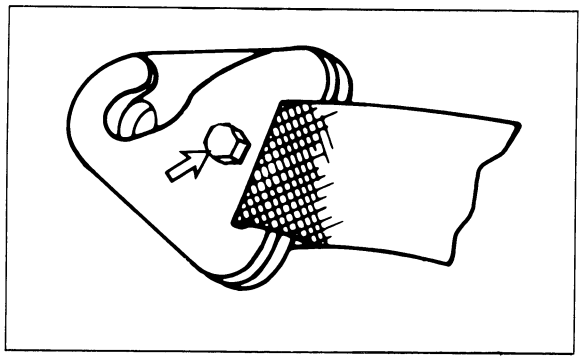
Replace the seat belt at least once every three years, regardless of appearance. A date label, to determine the age of the belt, is sewn onto each belt.



Inspect for worn or frayed webbing.

Check for worn or damaged buckle or anticreep slide on each half of the belt. Replace the belt, buckle or slides if they are worn or damaged.

Inspect the belt mounting hardware. Replace any damaged or worn hardware. Keep the mounting bolts tight.



If the bolt and nut that holds the two parts of the seat belt mounting hooks together are not correctly installed, the hooks can separate. This will allow the seat belt to separate from its mounting.

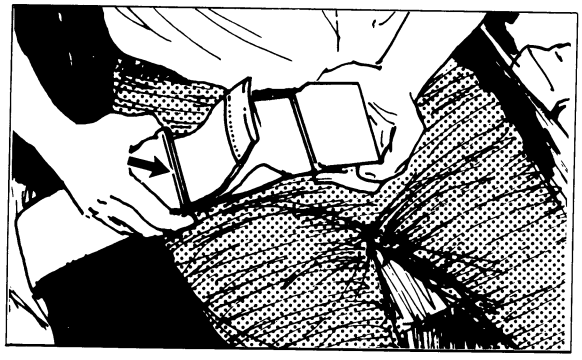
Inspect the hooks of each half of the belt to make certain the bolt and nut are correctly installed.

If the bolt and nut are not correctly installed, remove them. Install a new bolt and nut.

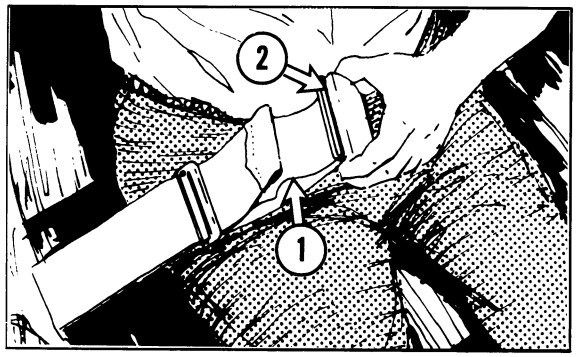
Adjust Seat Belt

Adjust both ends of the belt. The belt should be snug but comfortable.

To Lengthen the Belt



1. With the belt unfastened, move the anticreep slide toward the buckle.

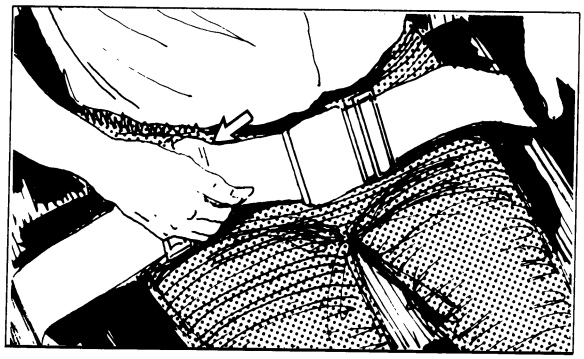


2. To remove the slack in outer loop ①, rotate buckle ② to free the lock bar. This permits the belt to move through the buckle.

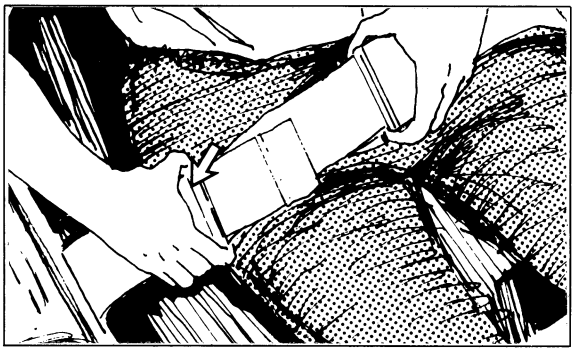
3. Pull on the buckle until the slack is removed from the outer belt loop.

4. Loosen the other half of the belt in the same manner. Readjust the belt if it does not fit snugly with the buckle in the center.

To Shorten the Belt



1. With the belt fastened, pull on the outer loop to tighten the belt.

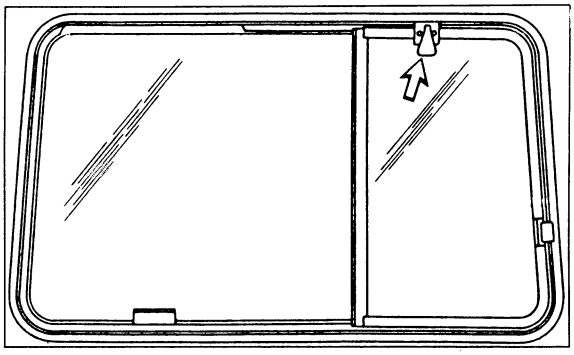


2. Move the anticreep slide toward the anchor end of the belt to take up the slack in the outer loop.

3. Adjust the other half of the belt in the same manner.

4. Readjust the belt if it does not fit snugly with the buckle in the center.

Windows and Doors

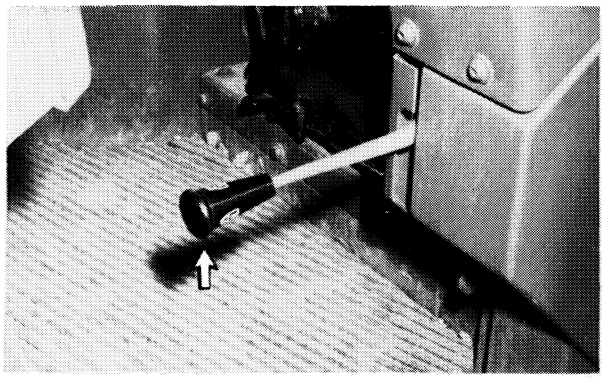


Lift the latch to slide the windows.

Move the lock to lock or unlock the cab door from inside.

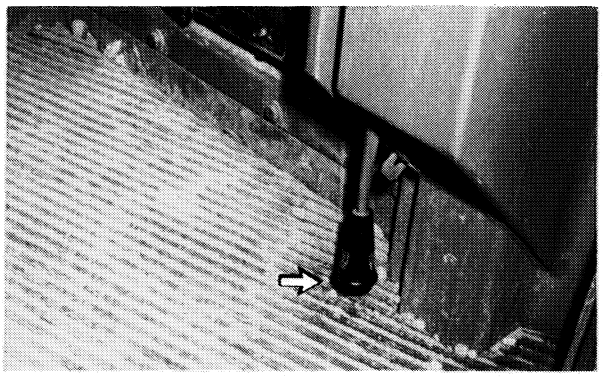
Machine Controls

Parking Brake



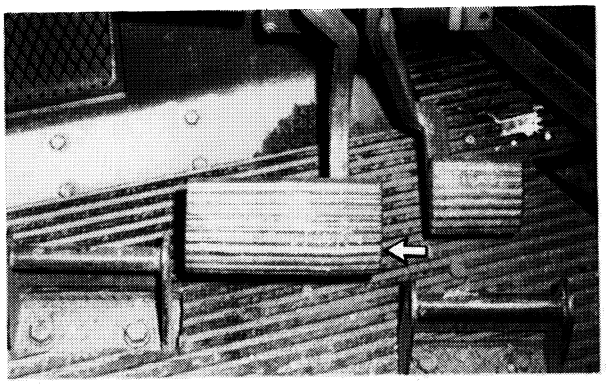
Parking Brake – This lever engages the parking brake and locks the transmission and steering levers in NEUTRAL. The machine should not move when engaged. Do not use for stopping the machine.

Unlocked – Pull the lever up to release the parking brake. The machine can turn if the steering lever is moved.



Locked – Push the lever down to engage the parking brake. This will also lock the transmission and steering lever in NEUTRAL.

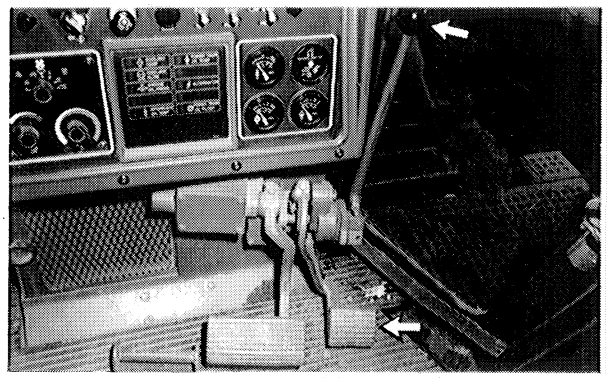
Brake Pedal



Brake Pedal Applied – Push the brake pedal down to apply the brakes, to slow or stop the machine. Use the brakes on a downgrade to keep the engine from overspeeding.

Brake Pedal Released – Release the brake pedal to allow the machine to move, or increase ground speed.

Governor and Decelerator



Governor Lever – Pull the lever back for higher engine rpm. Push the lever forward to slow the engine. Push the lever forward to the detent position for low idle. Push the lever all the way forward through the detent to stop the engine.

Decelerator Pedal – Push down on the pedal to override the governor control and reduce the engine speed. Use the pedal to reduce engine rpm when making directional shifts.

Steering and Directional Lever

NOTICE

Machine will turn, if the engine is running, when the steering lever is moved with the transmission in NEUTRAL or in gear. Engage the steering control lock by applying the parking brake to prevent machine movement.

This machine must be operated with the floor plate securely in place at all times. There are lines and components located below the operator station which contain fluids under high pressure.

Moving the lever forward results in a left turn when moving forward and a right turn when moving in reverse.

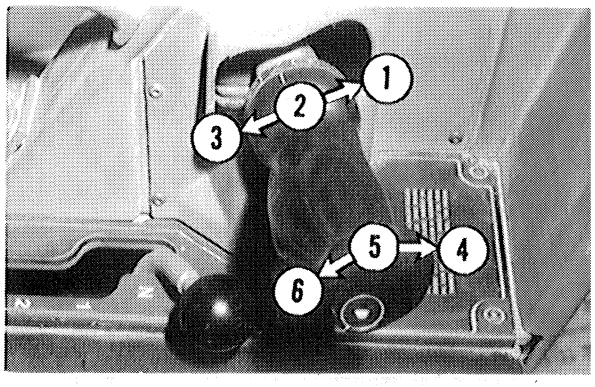
Moving the lever towards the operator results in a right turn when moving forward and a left turn when moving in reverse.

With the transmission in neutral, moving the lever results in machine rotation in the same direction as in forward gear.

If the speed selector is moved to neutral, the transmission will not re-engage until the dirctional lever is returned to NEUTRAL.

Directional control lever must be shifted from NEUTRAL into gear after the speed lever is in gear to re-engage the transmission.

Pull the parking brake lever up to allow steering and directional lever movement.



1. Left Turn (Counterclockwise) – Move the lever forward to turn the machine left (counterclockwise). The farther the lever is moved forward, the faster the machine will turn.

2. No Steer (Straight) – Move the lever to this position to allow the machine to go straight in either direction. Release the lever from position ① or ③ and it will return to NO STEER.

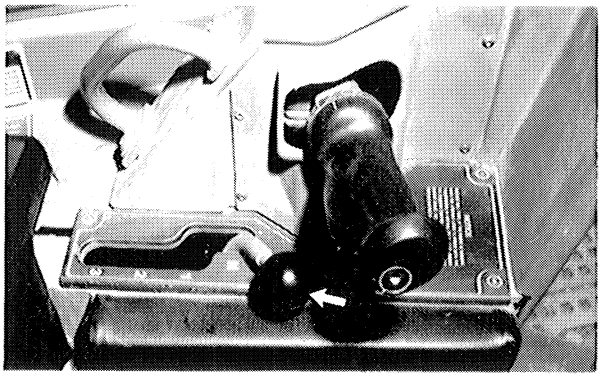
3. Right Turn (Clockwise) – Move the lever back to turn the machine right (clockwise). The farther the lever is moved back, the faster the machine will turn.

4. Forward – Rotate the twist handle on the lever forward to this position to move the transmission to the forward direction.

5. Neutral – Rotate the twist handle on the lever to this position to move the transmission to NEUTRAL.

6. Reverse – Rotate the twist handle on the lever back to this position to move the transmission to the reverse direction.

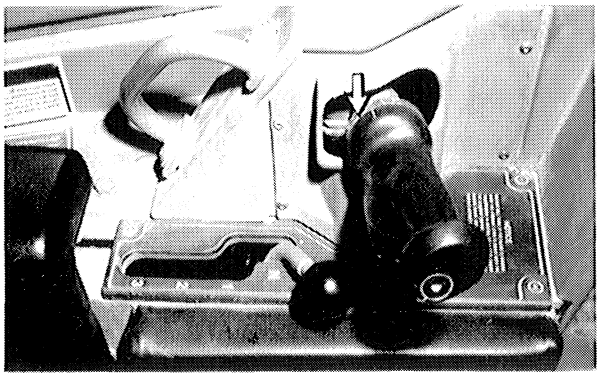
Transmission Speed Selector



Transmission Speed Selector – This lever controls transmission NEUTRAL (N), and three speeds. Move the lever to the desired speed.

The parking brake lever must be up to allow speed selector movement.

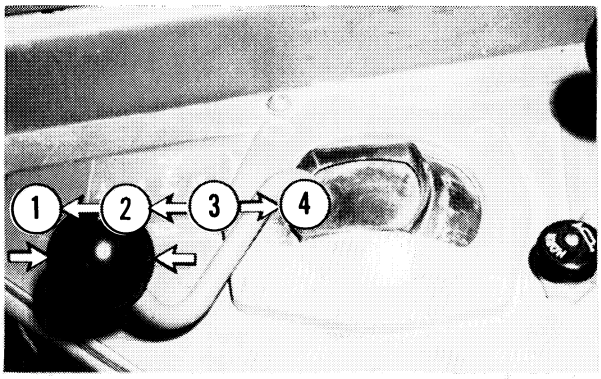
Back-up Alarm



Back-up Alarm – The alarm will sound when the directional control is in the reverse position. It is used to alert people behind the machine that it is backing up. The alarm will sound anytime the disconnect is turned to ON, and transmission control is in reverse position.

Implement Controls

Dozer Blade Height



1. Float – Push the lever all the way forward into detent for blade float. In this position, the blade will move up and down following the ground contour.

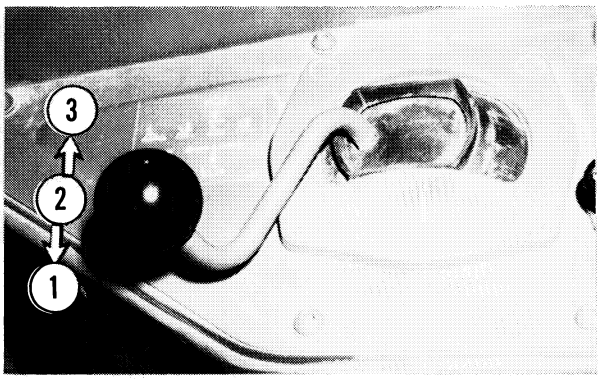
The lever will remain in the float position (detent) until manually pulled out of detent position. The lever will then return to HOLD.

2. Lower – Push the lever forward to lower the blade. Release the lever and it will return to HOLD.

3. Hold – Release the lever from raise or lower, and it will return to HOLD. The blade movement will stop.

4. Raise – Pull the lever back to raise the blade. Release the lever and it will return to HOLD.

Dozer Blade Tilt

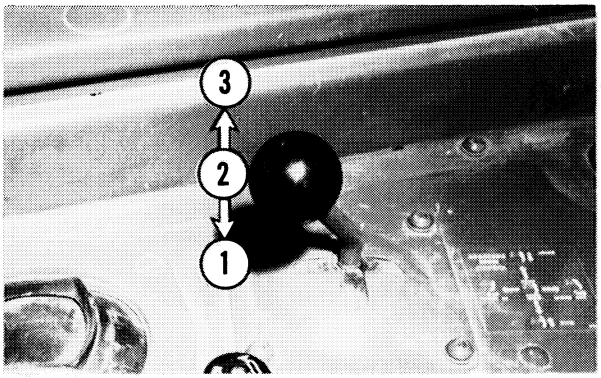


1. Tilt Left – Pull the lever to the left to lower the blade to the left. Release the lever and it will return to HOLD.

2. Tilt Hold – Release the lever and it will return to HOLD. The blade movement will stop.

3. Tilt Right – Push the lever to the right to lower the blade to the right. Release the lever and it will return to HOLD.

Ripper Height

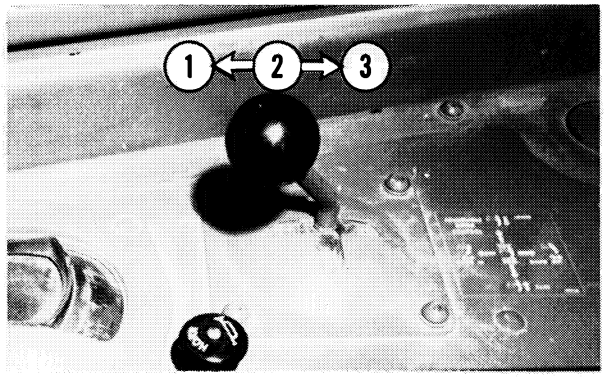


1. Raise – Move the lever to the left to raise the ripper. Release the lever and it will return to HOLD.

2. Hold – Release the lever and it will return to HOLD. The ripper movement will stop.

3. Lower – Move the lever to the right to lower the ripper. Release the lever and it will return to HOLD.

Ripper Shank Adjustment

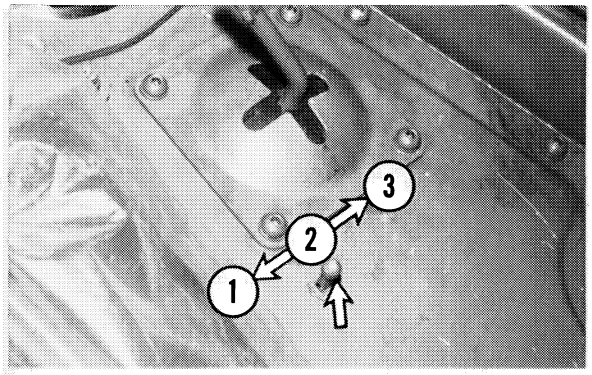


1. Shank In – Move the lever forward to move the shank in closer to the machine. Release the lever and it will return to HOLD.

2. Hold – Release the lever and it will return to HOLD. The ripper movement will stop.

3. Shank Out – Move the lever rearward to move the shank out away from the machine. Release the lever and it will return to HOLD.

Ripper Pin Puller



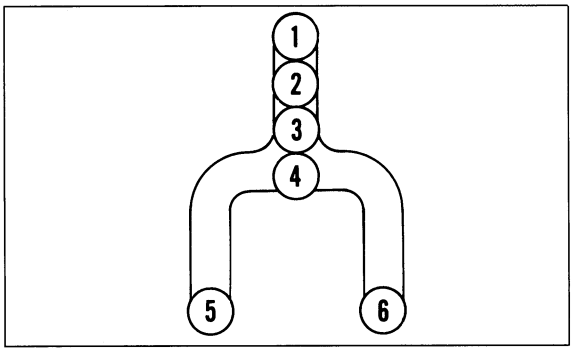
1. Shank Pin In – Pull the toggle up and toward you to engage the ripper shank pin. Move the toggle to HOLD, to stop the ripper shank pin movement.

2. Shank Pin Hold – Move the toggle to the center, and ripper shank pin movement will stop.

3. Shank Pin Out – Pull the toggle up and push it away from you to disengage the ripper shank pin. Move the toggle to HOLD, to stop the ripper shank pin movement.

Use the toggle to move the pin in the ripper shank from inside the cab. Use for adjusting the shank height.

Winch



⚠ WARNING

Do not move the control lever to FREE SPOOL position with a load on the line. The load will be released uncontrolled and can result in personal injury or death.

1. Free Spool (If Equipped) – Push the button on top of control. Move the lever to this position to free the spool. Cable can now be pulled out by hand.

2. Brake Off Detent – The lever will remain in this position until moved manually. The resistance of the winch mechanism makes it impossible to unreel the cable by hand.

3. Brake Off – Move the lever to this position to release the winch brake. Release the lever and it will return to BRAKE ON. The cable will unreel by the weight of the load, or when the machine moves away from load, if it is heavy enough.

4. Brake On – The cable should not move. Use this position when towing, holding load or when winch is not in use.

5. Reel In – Move the lever to this position to reel in the cable. The cable should move toward the winch under power. Release the lever and it will return to BRAKE ON.

6. Reel Out – Pull the lever to this position to reel out the cable. The cable will reel out under power. Release the lever and it will return to BRAKE ON.

Inching (Fine Control Operation)

The winch control valve, located inside the winch case, can be adjusted to suit operational needs. A two-position sequence valve is contained within the winch control valve group. This valve provides "no-inch" position for general winching, and an "inch" position for more severe reel out line control applications.

The inching sequence valve affects the reel-out function only. It has no effect on reel-in modulation capabilities.

All winches are set at the "no-inch" position when shipped from the factory.

See "Winching" in the "Operating Adjustments" section of this guide.

Reel Out (inching) – Pull the lever slowly into position ⑥ at low engine rpm. Control the cable line speed with the engine governor control.

Before Starting the Engine

Walk-Around Inspection

⚠ WARNING

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

At operating temperature, the engine coolant is hot and under pressure.

Steam can cause personal injury.

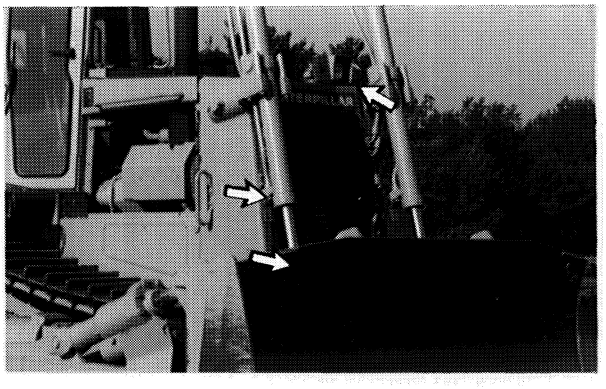
Check the coolant level only after the engine has been stopped and the fill cap is cool enough to touch with your bare hand.

Remove the fill cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes to prevent personal injury.

For your own safety and maximum service life of the machine, make a thorough walk-around inspection before mounting the machine to start the engine.

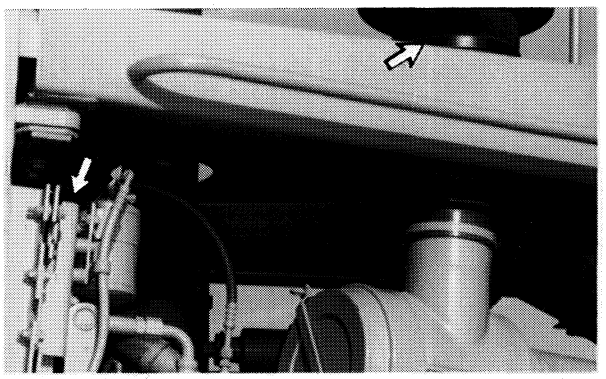
Look around and under the machine for such items as loose bolts, trash build-up, oil or coolant leaks, broken or worn parts. Inspect the condition of the implements and the hydraulic components.



1. Inspect the implements for damage or excessive wear. Repair if damaged.

2. Inspect implement cylinders and linkage for damage or excessive wear. Repair if damaged.

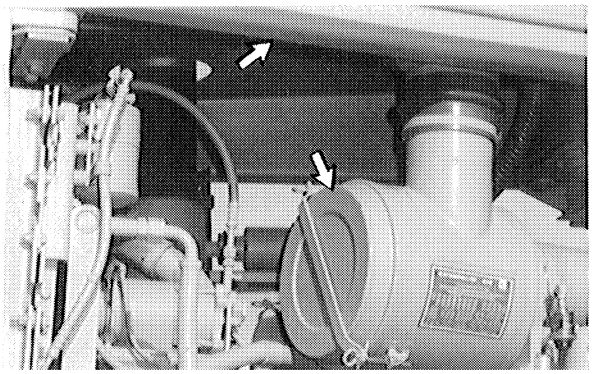
3. Inspect and replace lights, broken bulbs and lenses.



4. Remove trash build-up in and around the engine and under the floorplate. Also remove any dirt build-up on top of the crankcase guard.

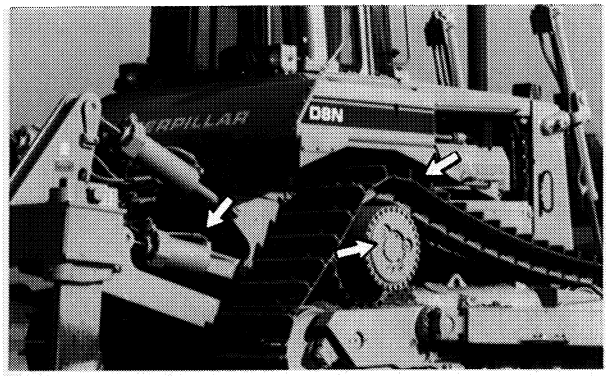
5. Inspect and repair any cooling system leaks. Check the hoses, radiator fins, radiator cap and the drain area.

6. Inspect the engine precleaner screen for dirt build-up. Remove any dirt or debris.



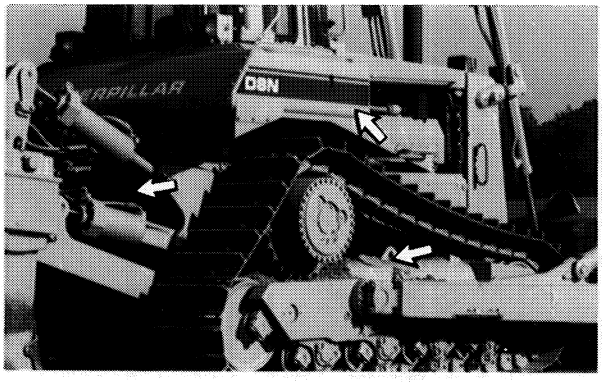
7. Inspect and repair any engine compartment leaks. Check around all seals and covers.

8. Inspect steps and handholds for condition and cleanliness. Repair or clean if necessary. Inspect the Rollover Protective Structure (ROPS) for damage. See your Caterpillar dealer for repairs if necessary.



9. Inspect and repair any hydraulic system leaks. Inspect hoses, seals and around flanges.

10. Inspect and repair any final drive leaks.



11. Be sure covers and guards are firmly in place. Inspect for damage or for loose and missing bolts.

12. Inspect and repair any transmission leaks. Check around the seals and covers. Also, check the hoses around the transmission.

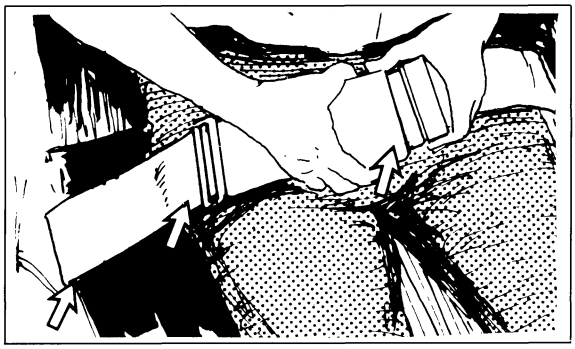
13. Inspect and repair damaged and excessively worn tracks. Tighten any loose bolts and replace any that are missing.

Look for leaks between the major and minor bogies, bogie shafts and the roller frames.

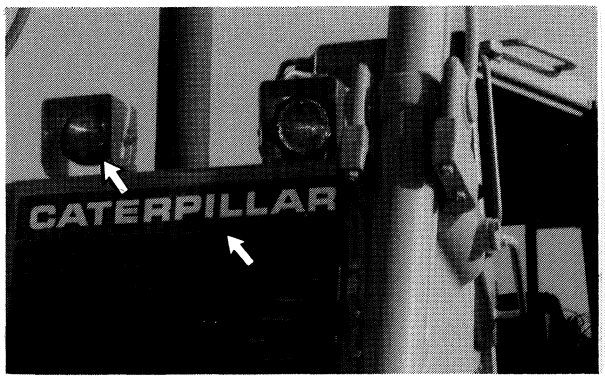
If leakage exists consult your Caterpillar dealer for inspection, lubrication and, if necessary, repair instructions.

14. Inspect operator's compartment for cleanliness and remove all trash and dirt build-up.

15. Inspect and repair the instrument panel when broken gauges and lights are found.



16. Inspect the seat belt and mounting for excessive wear and damage. Replace if damaged.



17. Make sure the horn, back-up alarm, lights, guards, etc., are in proper working order.

18. Inspect the equalizer pads for condition of rubber.

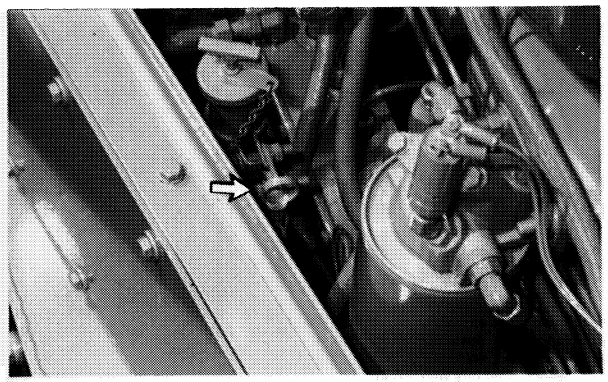
Contact your Caterpillar dealer for service or replacement instructions.

Lines, Tubes and Hoses

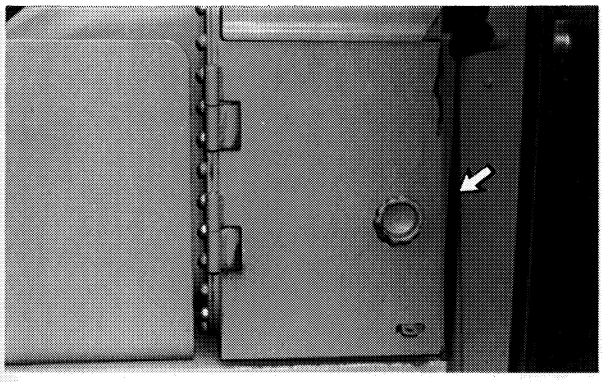
Inspect all hydraulic, pressure oil, fuel, high temperature water, etc., lines, tubes and hoses for damage, excessive wear and recommended torques. Do not use your bare hands to check for leaks.

Replace damaged, worn, etc., lines, tubes and hoses. Contact your Caterpillar dealer for repair or replacement.

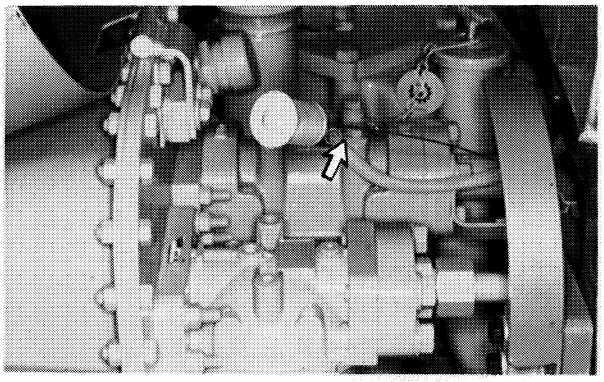
Pre-Start Checks



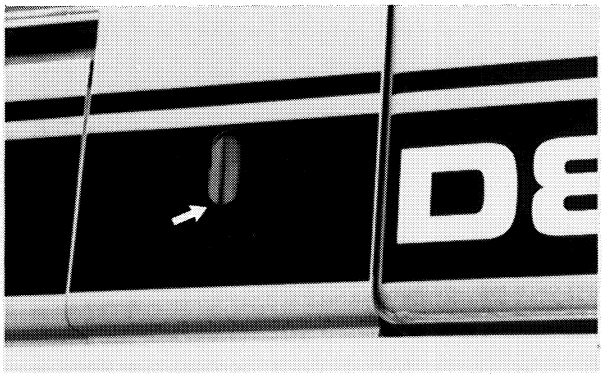
1. Maintain the engine oil level between the ADD and the FULL marks on the dipstick.



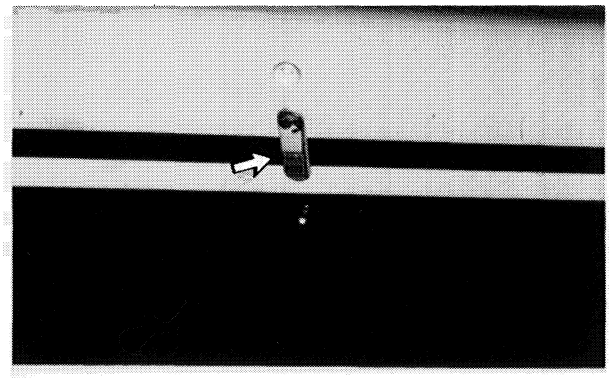
2. Open the right side access cover.



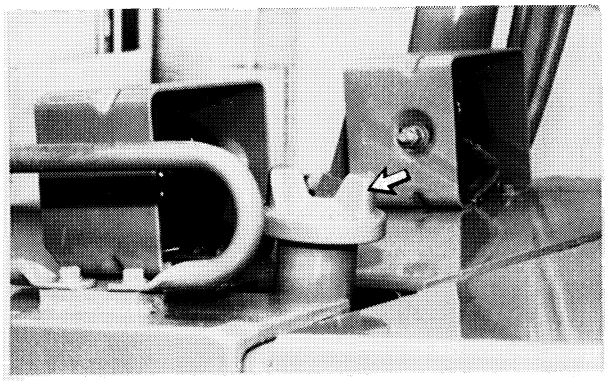
3. Maintain the power train system oil level between the ADD and the FULL marks on the dipstick. Close the cover.



4. Maintain the pivot shaft oil level between the ADD and FULL marks in the reservoir. Do not add oil above FULL mark to avoid oil overflow as oil warms. Check for leaks if frequently low. Open the top cover for access to the reservoir fill cap.

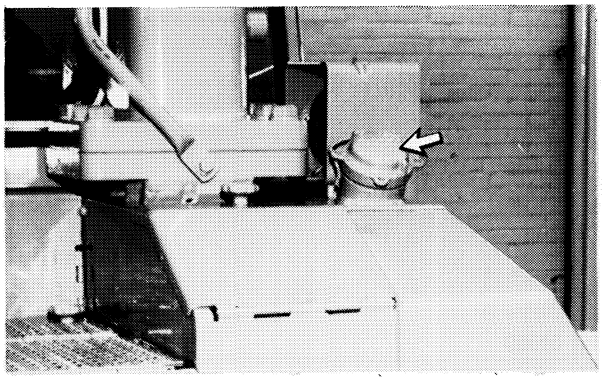


5. Maintain the hydraulic implement oil level between the ADD and the FULL marks in the sight gauge. Open the cover for fill cap access.



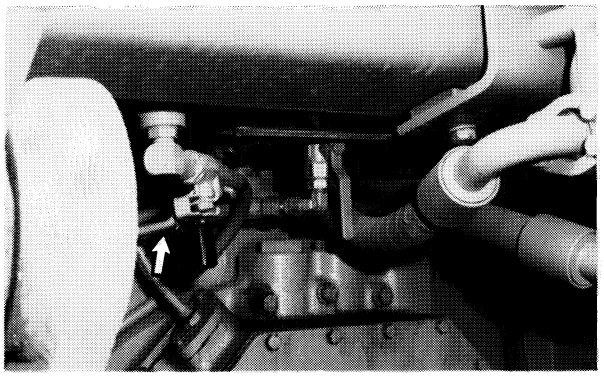
6. Remove the engine coolant fill cap.

7. Maintain the engine coolant above the low level plate. Install the cap.

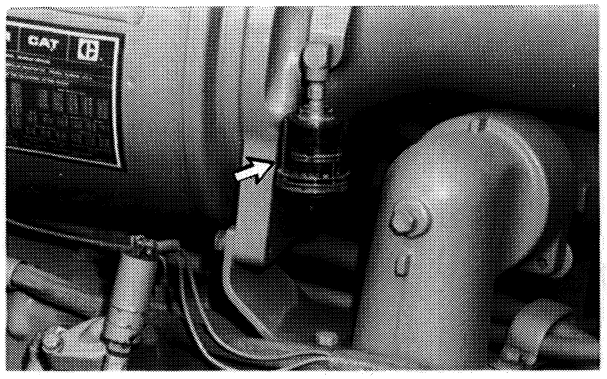


8. Remove the fuel fill cap.

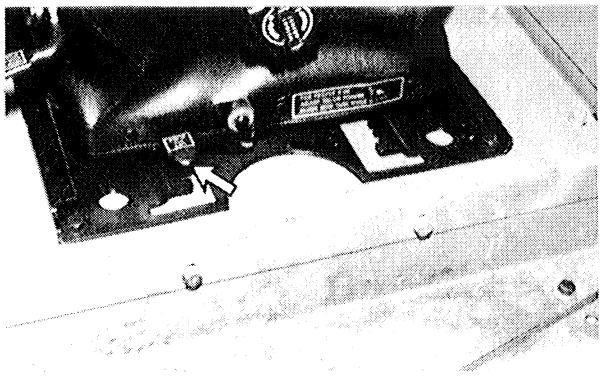
9. Maintain the fuel level to the FULL mark on the dipstick.



10. Open the fuel drain valve. Drain moisture and sediment, as required, from the fuel tank.

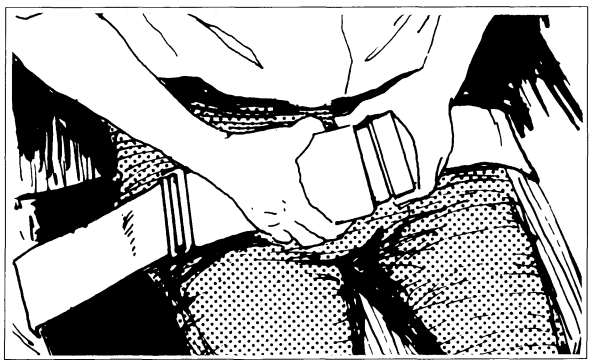


11. Service the air filter element when the yellow piston enters the red area in the indicator.



12. Adjust the seat to allow full brake pedal travel with the operator's back against seat back.

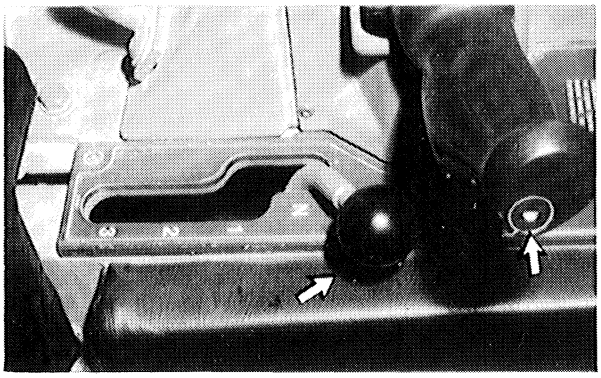
13. Adjust the mirror to allow proper viewing from the seat to see close behind the machine.



14. Adjust the seat belt to fit snug.

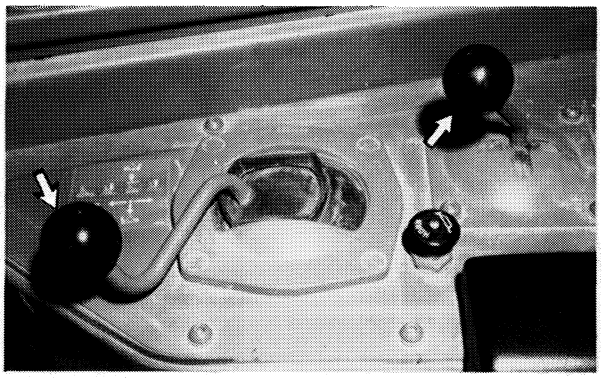
Starting the Engine

Above 0°C (32°F)

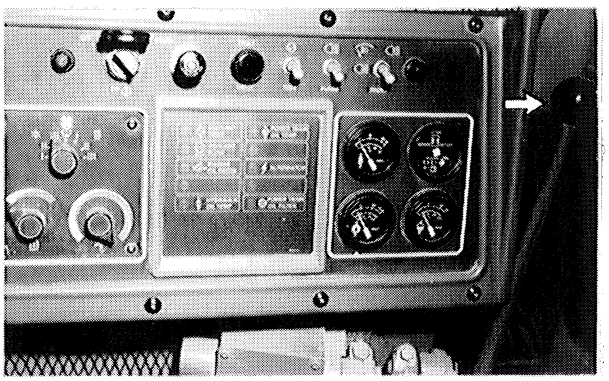


1. Move the transmission control lever into NEUTRAL. Move the steering control lever to NO STEER.

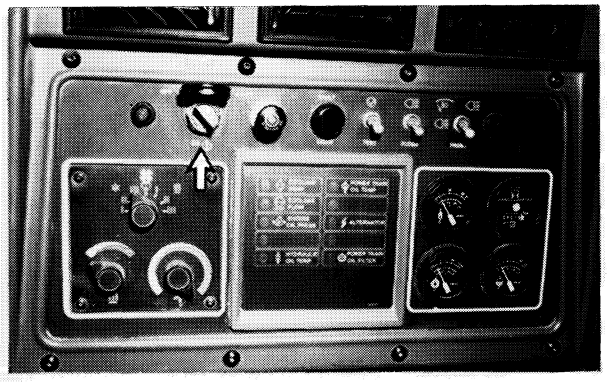
2. Engage the parking brake.



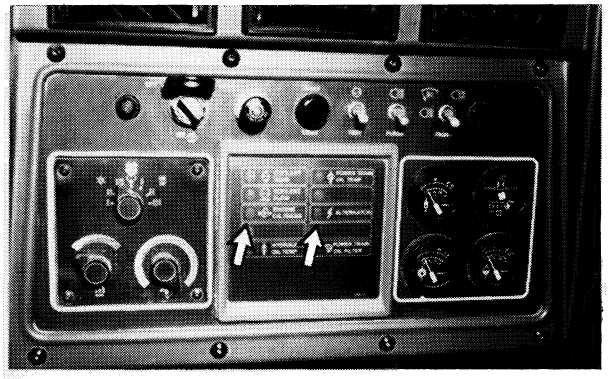
3. Move the implement control levers to the HOLD position.



4. Pull the governor control lever back through the stop engine detent. Then return it to the LOW IDLE position.



5. Turn the start switch key to the ON position.



6. The engine oil pressure, coolant flow and the alternator lights should come on.

7. Turn the start switch key to START. Release the switch key when the engine starts.

Below 0°C (32°F)

1. Follow steps 1 through 6 for "Above 0°C (32°F)."

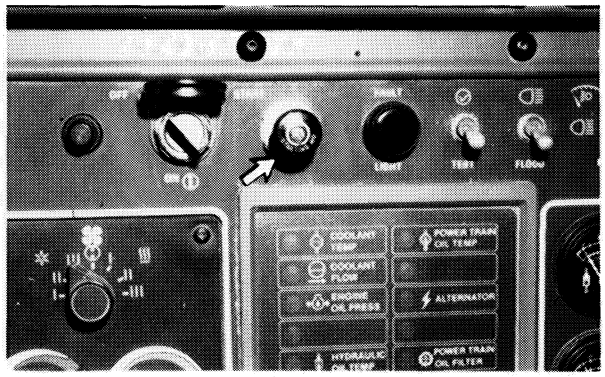
2. Turn the start switch key to START.

NOTICE

Inject starting aid (ether), ONLY while cranking the engine to avoid engine damage.

Use sparingly, excessive ether can cause piston and ring damage.

Use ether for cold starting purposes only.



3. Push the starting aid (ether) knob and release.

4. Use additional starting fluid every two seconds until engine starts.

5. Release the start switch key when the engine starts.

6. Use starting aid every two seconds after the engine starts, until the engine is running smoothly.

NOTICE

After every 30 seconds of engine cranking, allow two minutes for the starting motor to cool before cranking again to prevent starting motor damage.

For starting below −18°C (0°F), use of additional cold weather starting aids is recommended. A coolant heater, fuel heater or extra battery capacity may be required.

At temperatures below −23°C (−10°F), consult your Caterpillar dealer, or refer to the "Cold Weather Recommendations Operation & Maintenance Guide," Form SEBU5898, available from your Caterpillar dealer.

Starting With Jumper Cables

⚠ WARNING

Batteries give off flammable fumes that can explode.

Prevent sparks near the batteries. They could cause vapors to explode. Do not allow jump cable ends to contact each other or the machine.

Do not smoke when checking battery electrolyte levels.

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

Always wear eye protection when starting a machine with jump cables.

Improper jump procedures can cause an explosion resulting in personal injury.

Always connect battery positive (+) to battery positive (+) and battery negative (−) to battery negative (−).

Jump only with a battery source and with the same voltage as the stalled machine.

Turn off all lights and accessories on the stalled machine. Otherwise, they will operate when the jump source is connected.

NOTICE

When starting from another machine, make sure the machines do not touch. This could prevent damage to engine bearings and electrical circuits.

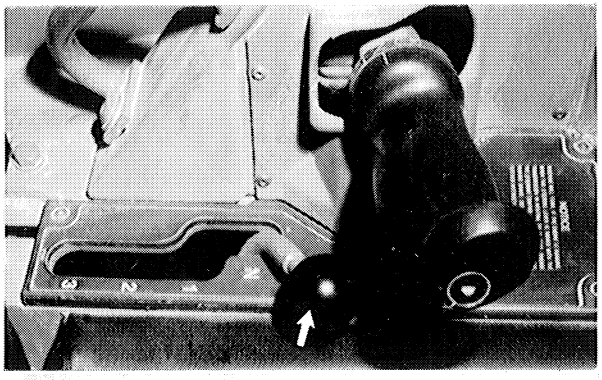
Turn on (close) the disconnect switch prior to the boost connection to prevent damage to electrical components on the stalled machine.

Machines with Auxiliary Start Receptacles

Some Caterpillar products may be equipped with auxiliary start receptacles as standard. All other machines can be equipped with a parts service receptacle. A permanent receptacle is then always available for jump starting.

Two mating cable assemblies are also available to jump the stalled machine from another machine also equipped with this receptacle or an auxiliary power pack. Your Caterpillar dealer can provide the correct cables in lengths for your application.

1. Make initial determination as to failure of the stalled machine to crank. Refer to special instruction SEHS7768 on use of 6V2150 Starting/Charging Analyzer Group. Procedure applies even if machine does not have diagnostic connector.



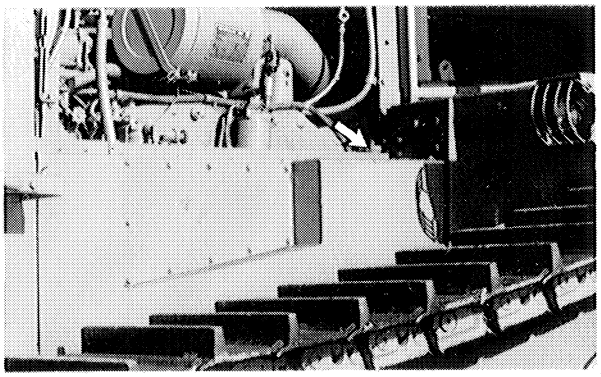
2. Place the transmission control lever in NEUTRAL on the stalled machine. Engage the parking brake. Lower all equipment to the ground. Move all controls to HOLD.

3. Turn the start switch to OFF on the stalled machine. Turn off all accessories.

4. Turn on (close) the disconnect switch (if equipped) on the stalled machine.

5. Move the boost start machine near enough to the stalled machine for cables to reach, but DO NOT ALLOW MACHINES TO TOUCH.

6. Stop the engine on the boost machine, or if using an auxiliary power source, turn off the charging system.



7. On the stalled machine connect the appropriate jump start cable to the auxiliary start receptacle.

8. Connect the other end of this cable to the auxiliary start receptacle of the boost source.

9. Start the engine on the boost machine. Or, energize the charging system on the auxiliary power source.

10. Wait a minimum of two minutes for the batteries in the stalled machine to partially charge.

11. Attempt to start the stalled engine. Refer to the beginning of "Starting the Engine" in this section.

12. Immediately after starting the stalled engine, disconnect the jump start cable from the BOOST SOURCE.

13. Disconnect the other end of this cable from the stalled machine.

14. Now that engine is running and charging system in operation, conclude failure analysis on starting/charging system of the stalled machine as required.

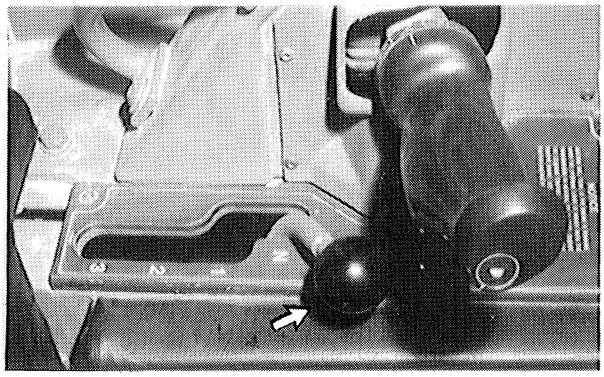
Use of Jumper Cables

NOTICE

This machine has a 24 volt starting system. Use only equal voltage for jump starting. Use of welder or higher voltage will damage electrical system.

When auxiliary start receptacles are not available, use the following procedure.

1. Make initial determination as to failure of machine to crank. Refer to special instruction SEHS7768 on use of 6V2150 Starting/Charging Analyzer Group. Procedure applies even if machine does not have diagnostic connector.



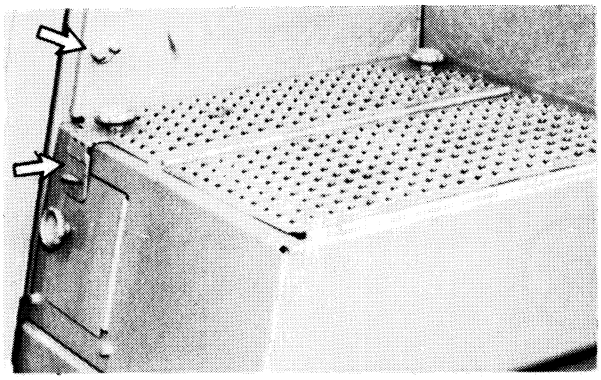
2. Place the transmission control lever in NEUTRAL on the stalled machine. Engage the parking brake. Lower all equipment to the ground. Move all controls to HOLD.

3. On stalled machine, turn the start switch to OFF. Turn off all accessories.

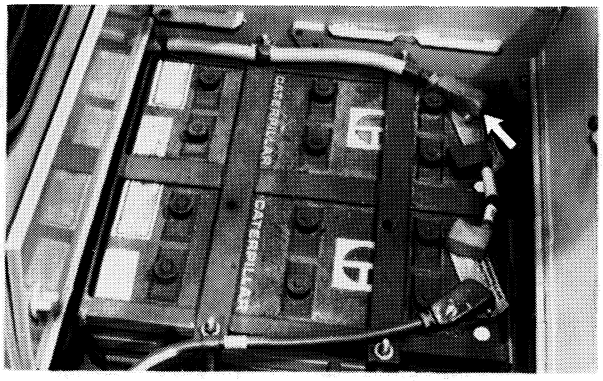
4. On stalled machine, turn on (close) the disconnect switch (if equipped).

5. Move boost start machine near enough to stalled machine for cables to reach, but DO NOT ALLOW MACHINES TO TOUCH.

6. Stop the engine on the boost machine. Or, if using an auxiliary power source, turn off the charging system.



7. Open the left side battery cover. Make sure battery caps are all in place and tight on both machines.



8. Connect positive (+) jumper cable (red) to positive (+) cable terminal of discharged battery, or battery set on stalled machine.

NOTE: Batteries in series may be located in separate compartments. Use terminal that is connected to starter solenoid. This battery, or battery set, is normally on the same side of the machine as the starter.

Do not allow positive cable clamps to touch any metal other than battery terminals.

NOTE: On machines with two sets (two in each fender) of two batteries (4 total), connect to either set as per above procedure.

9. Connect the other end of this positive jumper cable (red) to positive (+) terminal of boost battery. Use procedure of Step 8 to determine correct terminal.

10. Connect one end of the negative (–) jumper cable to the negative (–) boost battery terminal (connected to the disconnect switch) in the same battery set as used in Step 9.

11. Make final connection of negative (–) cable to frame (not battery negative post) away from battery, fuel or hydraulic lines, or moving parts.

12. Start the engine on the boost machine. Or, energize the charging system on the auxiliary power source.

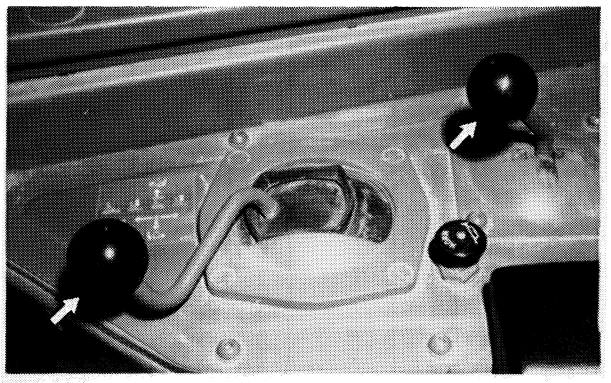
13. Wait a minimum of two minutes for the batteries in the stalled machine to partially charge.

14. Attempt to start the stalled engine. Refer to section on “Starting the Engine”.

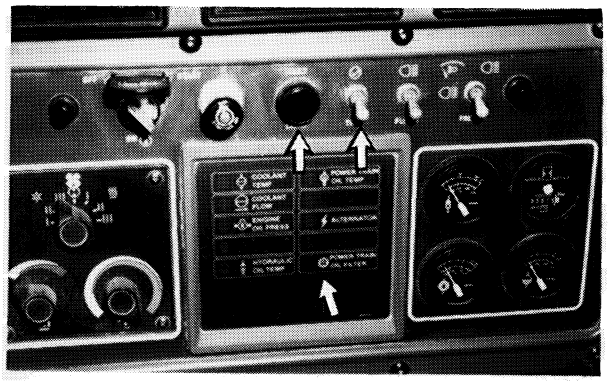
15. Immediately after starting the stalled engine, disconnect the jumper cables in reverse order.

16. Now that engine is running and charging system in operation, conclude failure analysis on starting/charging system of the stalled machine as required.

After Starting the Engine



1. Allow the engine to warm up at LOW IDLE for five minutes. Engage and disengage all implement controls to help speed warm-up of hydraulic components.



2. Move the EMS test switch up. The fault alarm should sound. The fault lights should come on. The master fault light should flash.

3. Release the EMS test switch. All fault lights and the fault alarm, should go off. If the lights do not go off, stop the engine. Have any necessary repairs made before starting again.

4. Look at the fault lights and gauges frequently during operation.

5. Look at the hydraulic oil tank and power train oil levels. Maintain the oil levels to the FULL marks.

Moving and Stopping the Machine

Keep the machine under control at all times.

Do not move the transmission or directional levers to NEUTRAL to allow the machine to coast.

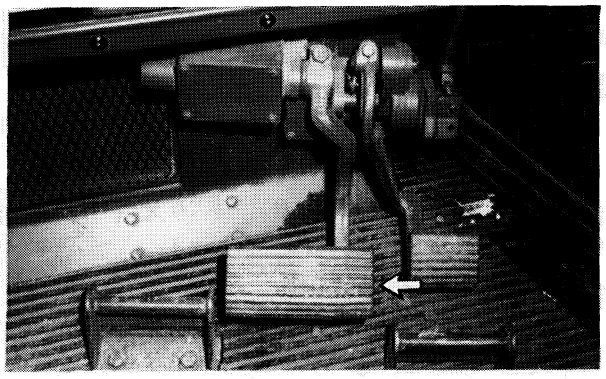
Select the gear range necessary before starting downgrade. Do not change gears while going downhill.

A good practice is to use the same gear range going downgrade that would be used to go up the grade.

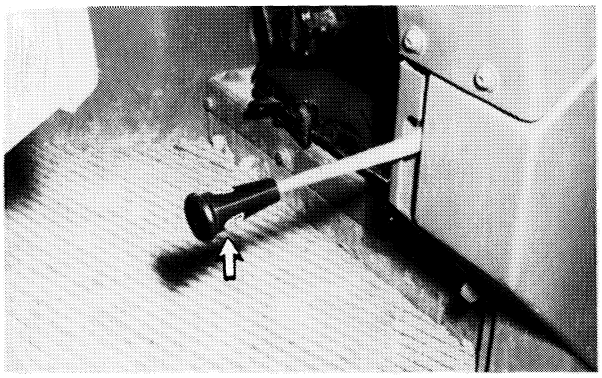
Do not allow the engine to overspeed downhill. Use the brake pedal to reduce engine overspeed going downhill.

When the load will be pushing the machine, put the transmission speed selector lever in FIRST speed before starting downhill.

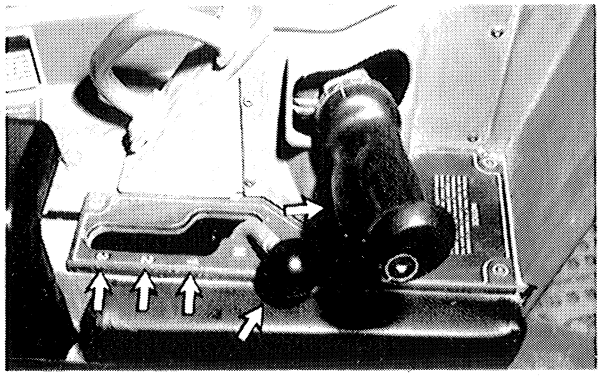
1. Raise all lowered implements enough to clear any obstructions.



2. Push down on the brake pedal to keep the machine from moving.



3. Pull the lock lever up to disengage the parking brake and to unlock the transmission and steering levers.

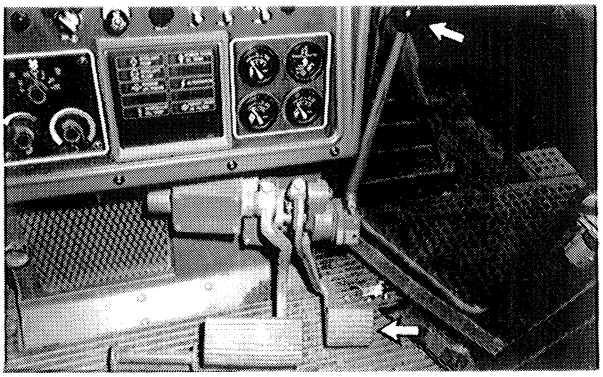


4. Move the transmission control lever to the desired speed. Move the directional control to the desired direction.

5. Release the brake pedal.

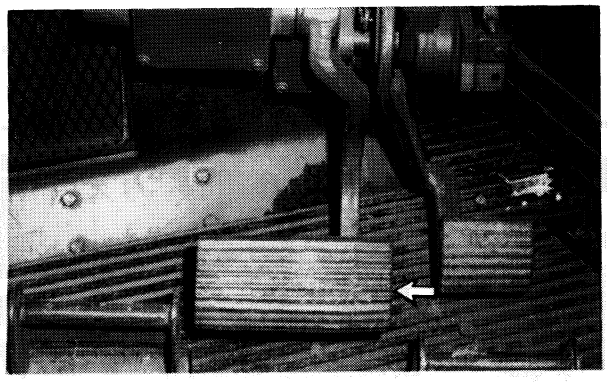
6. Move the governor control lever to the desired engine speed.

Changing Speed and Direction

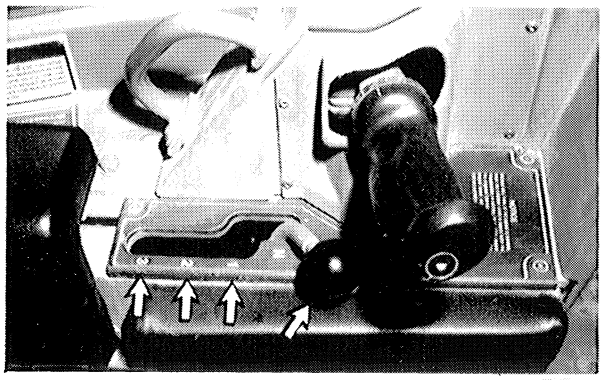


Speed and directional changes at full engine speed are possible. However, for operator comfort and maximum service life of power train components, decelerating and or braking, when changing directions is recommended.

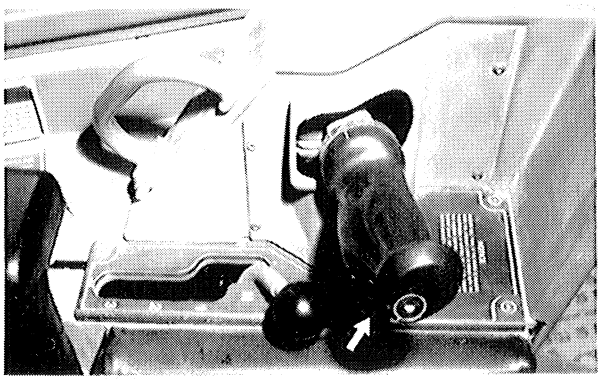
1. Decrease the engine speed by pushing the governor control in, or by pushing the decelerator pedal down.



2. Push the brake pedal down to stop the machine for a directional change.



3. Move the transmission control lever to the desired speed.



4. Move the directional control to the desired direction.

5. Release the brake pedal.

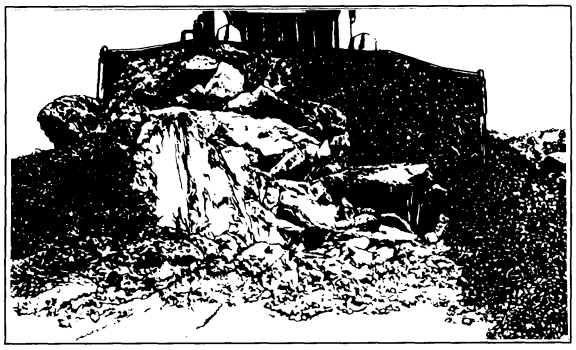
6. Increase the engine speed by releasing the decelerator pedal, or pulling back on the governor control lever.

Operating Techniques

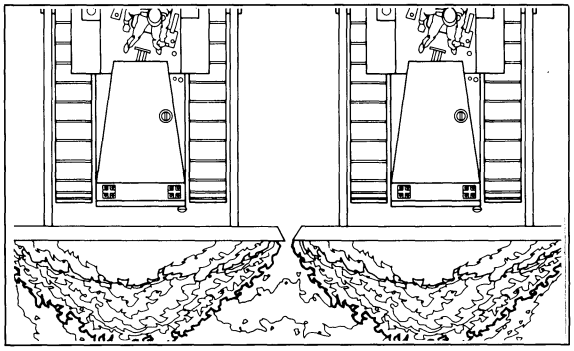
Dozing

Straight Dozing: If the blade digs in and the rear of the machine rises, raise the blade to continue even cut. When moving a heavy load causes travel speed to drop, shift to a lower speed and/or raise the blade slightly.

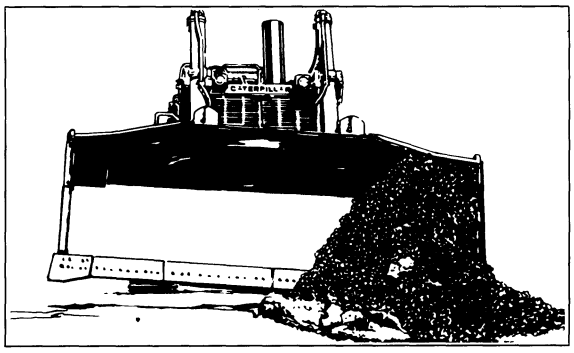
When doing finishing or leveling work, a full blade handles easier than a partially loaded blade.



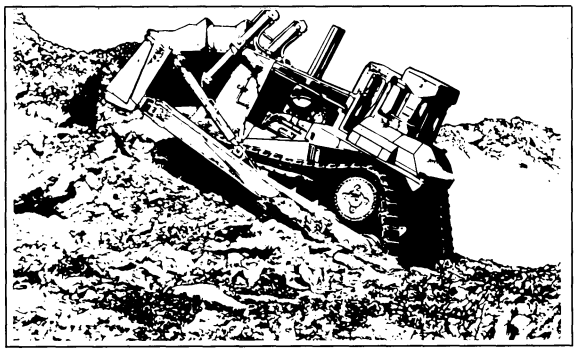
Slot Dozing: This allows larger loads to be carried in front of the blade. It is used in stockpiling and high production bulldozing.



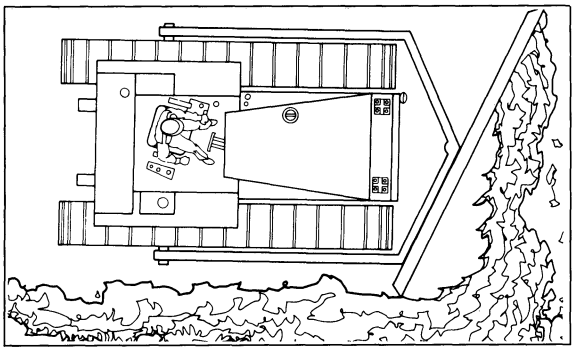
Side-by-Side Dozing: Use when moving large quantities of loose material. Keep the blades close together and the machines parallel.



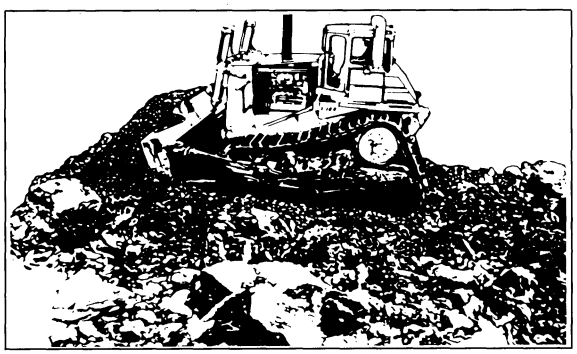
Tilt Dozer Ditching: Tilt the blade and work with the low side in the ditch center. Level the blade when the required depth and slope are reached.



Straight Dozer Ditching: Tilt the blade to cut shallow "V" ditches. For larger ditches, doze at right angles to the center line of the ditch. When the desired depth is reached, doze the length of ditch to smooth the sides and bottom.



Angle Dozer Backfilling: Travel parallel to the ditch.



Straight Dozer Backfilling: Push at a 90° angle to ditch.

Land Clearing

1. Remove all dead limbs. Cut roots on side opposite direction of fall.

2. Cut roots on sides parallel to direction of fall.

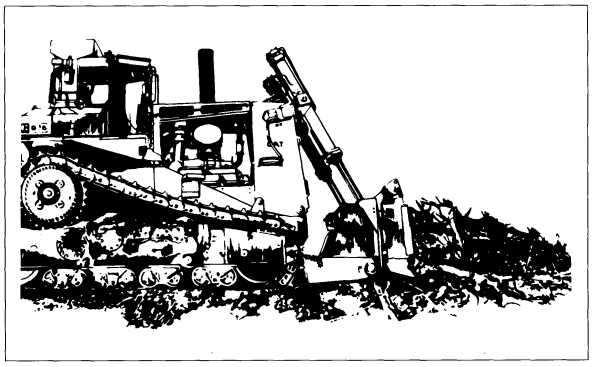
3. Ease into the tree. Push in direction of fall with blade high. Build a earth ramp if higher contact is needed.

4. Do not drive onto stump while tree is falling.

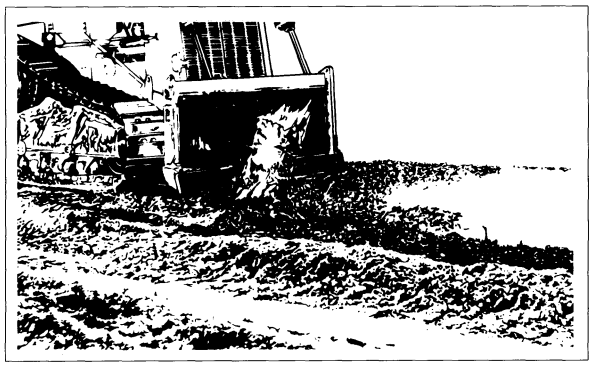
⚠ WARNING

Back away immediately when tree starts to fall, to prevent possible injury.

Large Brush and Medium Size Trees: Contact the tree 300 to 400 mm (12 to 16 inches) above the ground. Move forward while lifting the blade.

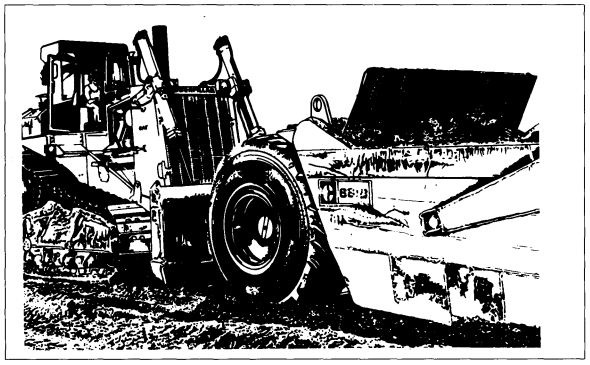


Brush Clearing: Lower the blade slightly into the ground and move forward. Lift the blade when the brush is out, to loosen the earth from the roots.

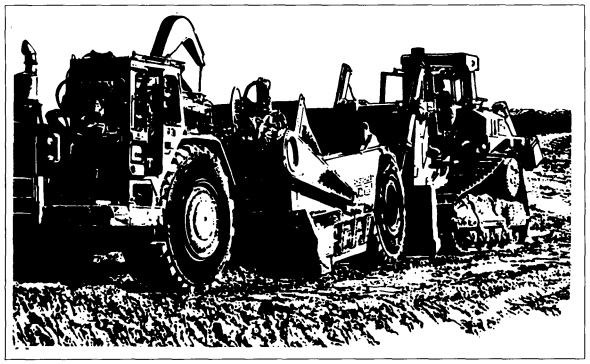


Stump Removal: Lift the blade while pushing.

Push Loading



1. Position the dozer blade edge slightly above the ground level.



2. The tractor should not be traveling more than 5 km/h (3 miles per hour) faster than the scraper when contact is made.

3. Contact the push block squarely. Do not allow the blade or push block to contact the scraper tires.

4. Do not lift the rear of the scraper off the ground.

5. Upshift the tractor, when the cut is complete, to help scraper get out of cut.

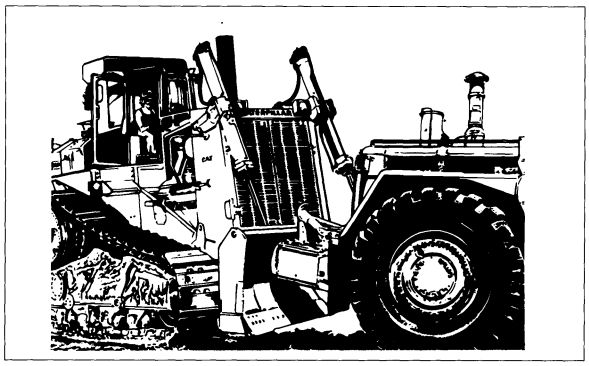
NOTICE

Blade in float may drop. Put blade control lever in a slight raise position before leaving scraper.

Follow advice of the Caterpillar dealer's Sales Department on use of tandem pushing.

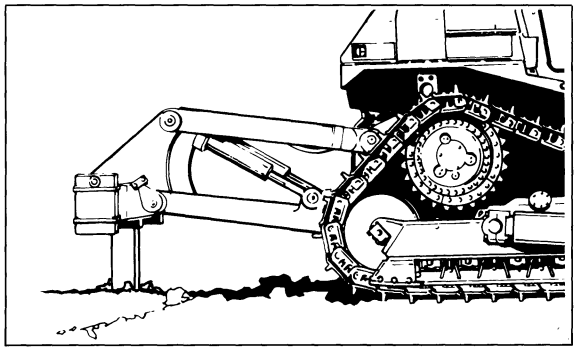
In the wrong soil conditions, the tremendous available power could cause very extensive damage to the bowl, or shank of the tractor being pushed.

Equip the tractors properly for tandem pushing.



6. When tandem pushing, the front tractor must be equipped with a case mounted tandem push block.

Ripping



Use FIRST speed for most ripping operations. It is better to use additional shanks, where practical, rather than to increase speed.

Always use center shank when ripping with one shank. If material breaks up satisfactorily, more shanks may be used.

Cross rip only when necessary.

When ripping for scraper loading, rip in same direction that scrapers will load.

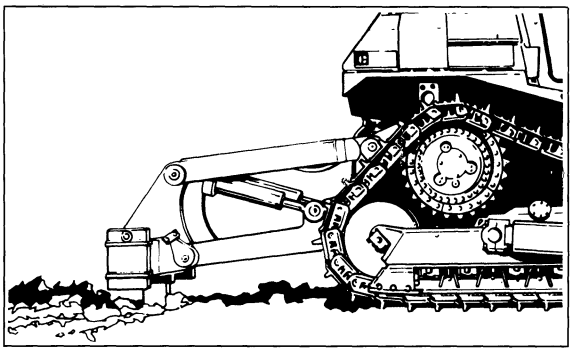
Rip downhill whenever possible.

NOTICE

Do not turn or back the machine while shanks are in the ground. Twisting strain on the shanks and tips may cause failure.

Inspect the ripper tips frequently for excessive wear.

Ripper Operating Hints

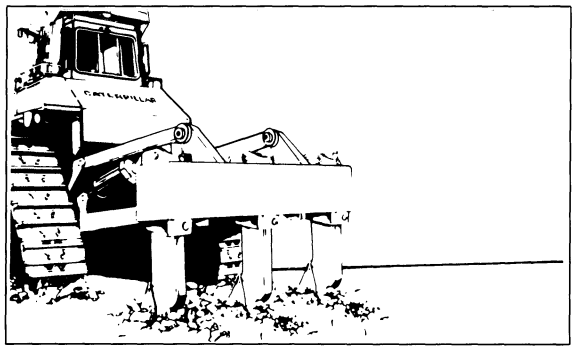


In most cases it is desirable to rip as deep as possible. Sometimes it is better to rip at partial depth and remove the material in its natural layers.

Keep material on top of the unripped formation to cushion the machine and provide traction.

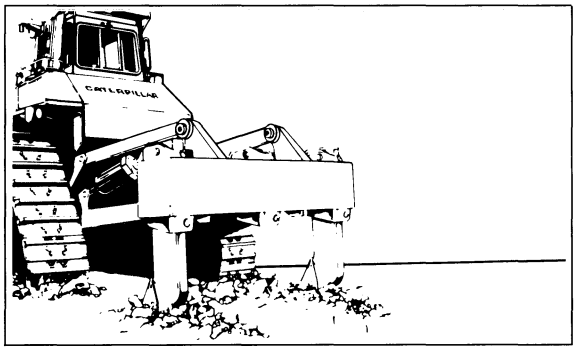
When final material size must be relatively small, close spacing of passes is recommended.

Packed Soil, Hard Pan, Clay, Shale or Cemented Gravel



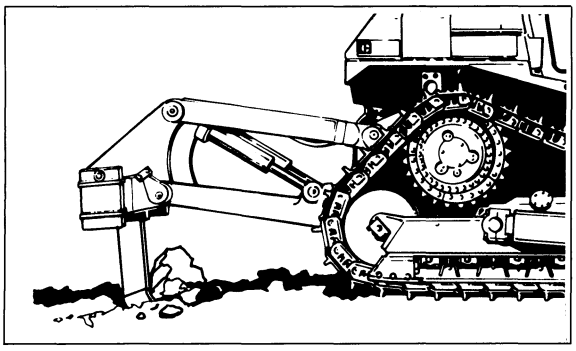
Three shanks work well in these materials. Use as many shanks as possible to break material to desired size, without stalling or hanging up the machine.

Rock with Fractures, Faults and Planes of Weakness



Use two shanks where rocks break out in small pieces, and the machine can handle the job easily. When the machine begins to stall or tracks spin, use only the center shank.

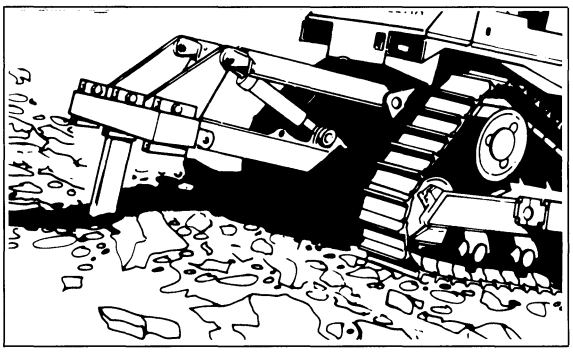
Solid Rock, Granite or Hard-to-Rip Material



Use one shank in tough-to-rip material or material that tends to break out in large slabs or pieces.

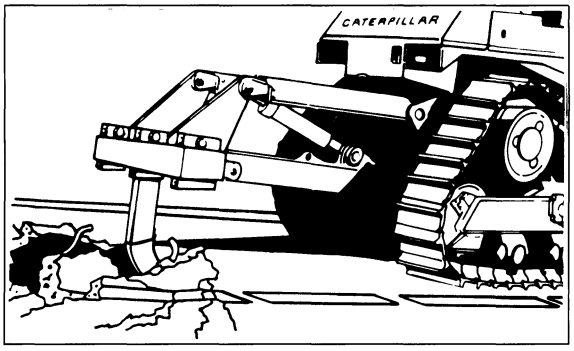
Always use the center shank when one-shank ripping.

Asphalt Road Surfaces



Raise the ripper shanks to lift out and break material.

Concrete Road Surfaces

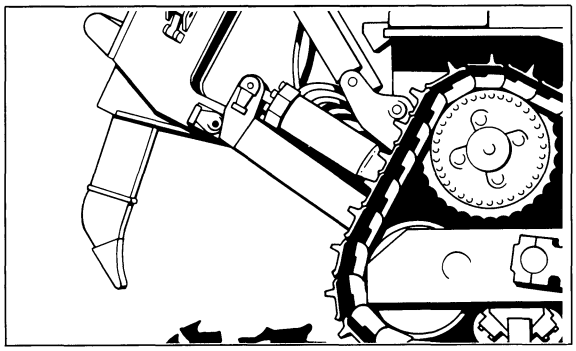


Use a single ripper shank. Ripper is especially effective in severing reinforcing rods or mesh.

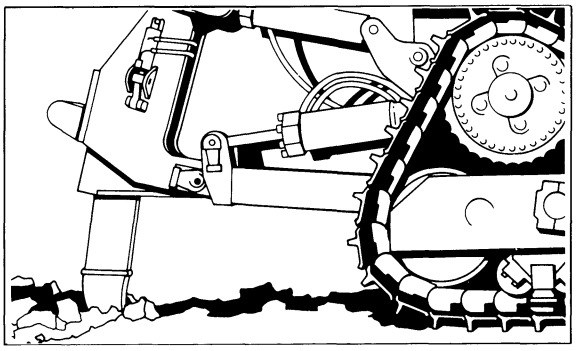
Adjustable Ripper

The shank on the ripper has angle and length adjustment features.

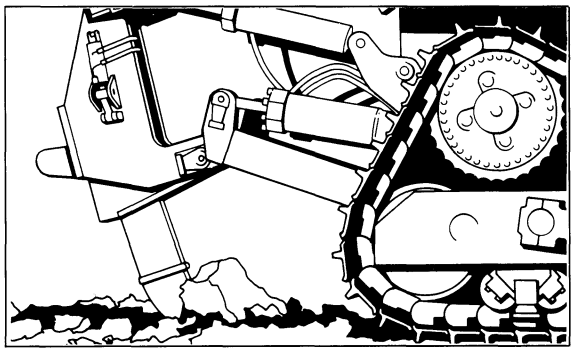
To achieve the maximum performance throughout each ripping pass, the angle of the shank must be varied, as described below.



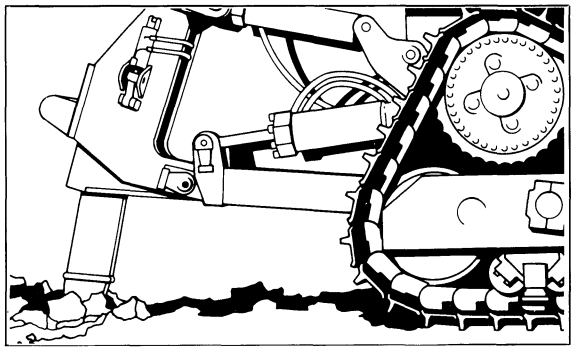
To insert the ripper into the material to be ripped, adjust the angle of the shank back vertical position. This will give the correct tip angle for easy entry into the material. The angle will differ depending upon the material being ripped.



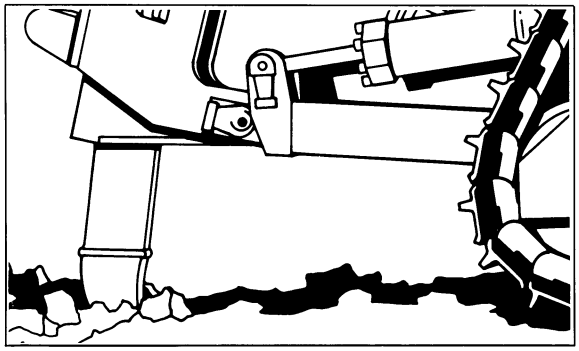
Lower the ripper into the material while moving forward. When desired ripping depth is reached, move the shank forward to obtain the correct angle for best performance. This is usually between vertical and forward positions of shank.



Move the ripper shank forward ("shank in" position) when prying out lodged material.

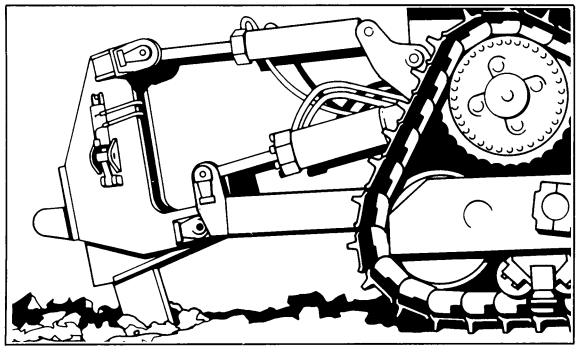


Move the ripper to the rear ("shank out" position), but only as much as necessary, for additional clearance between ripper and track.



Shallow ripping is recommended when material is to be removed by a scraper or loader.

Deep ripping is recommended when material is to be removed by an excavator or dozer.



Adjust the length of the shank according to clearance required between the ground and the beam.

Winch

⚠ WARNING

Make certain personnel are clear of cable when there is a load on it. Cable can break and cause personal injury.

NOTICE

Always winch with cable in as straight a line behind machine as possible.

For safety and maximum service life of winch components, engine decelerating is recommended before moving the winch control lever.

Control cable line speed after shifting, by varying the engine speed.

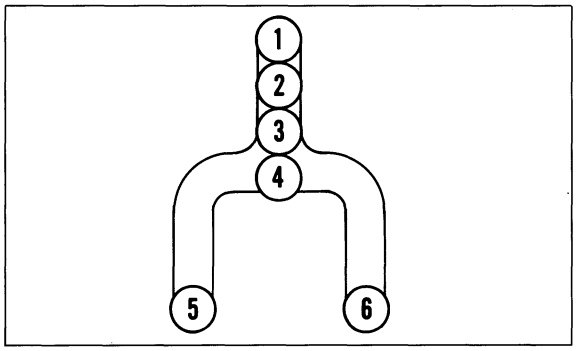
Do not leave in the BRAKE OFF position for extended periods.

When moving away from a load, operate the machine in low gear speeds to prevent overspeeding of winch components.

Inch loads with engine speed low and machine stationary Do not operate winch for extended periods of time while inching.

Engine or torque converter may stall if line load and/or engine load is too high when winch is engaged.

To reel in or out slowly, engage and disengage control lever and/or decelerate and accelerate engine as necessary.



1. Free Spool (If Equipped) – Use this position to allow cable to be pulled out manually by hand.

2. Brake Off Detent – Use the detent position, when needed to have hand free from control.

3. Brake Off – Used to move the machine away from loads, or to lower load by its own weight. In most applications, sufficient cable tension will be maintained with the lever fully engaged. However, holding a load on a slope, with the machine moving forward, may require some braking action. Brake only as much as necessary to maintain the minimum cable tension required.

4. Brake On – For towing, holding loads or when winch is not in use.

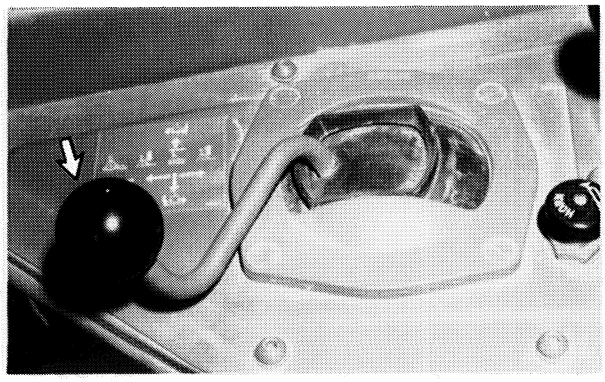
5. Reel In – At low engine rpm, pull the lever slowly into the reel in position, until load starts to move. Increase engine speed, if necessary, to control the cable line speed.

6. Reel Out – At low engine rpm, pull the lever slowly into reel out position until the load starts to move. Increase the engine rpm speed if necessary, to control the cable line speed.

NOTE: The reel out position can be used for inching operations.

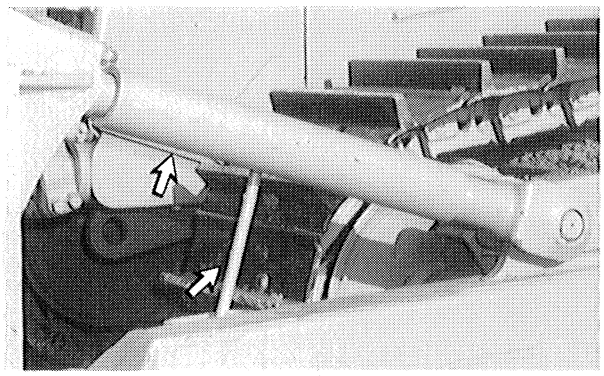
Operating Adjustments

Dozer Blade Tilt



1. Pull the tilt lever toward you to lower the left side of the blade.

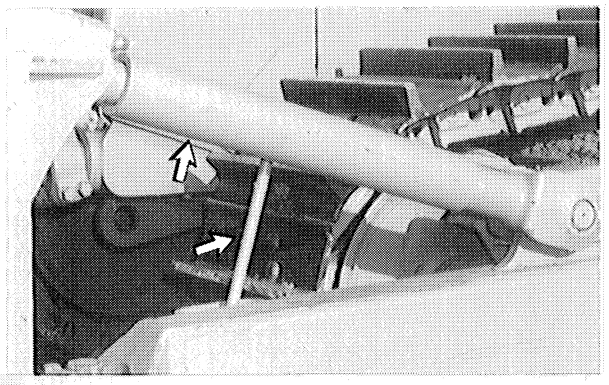
2. Push the tilt lever away from you to lower the right side of the blade.



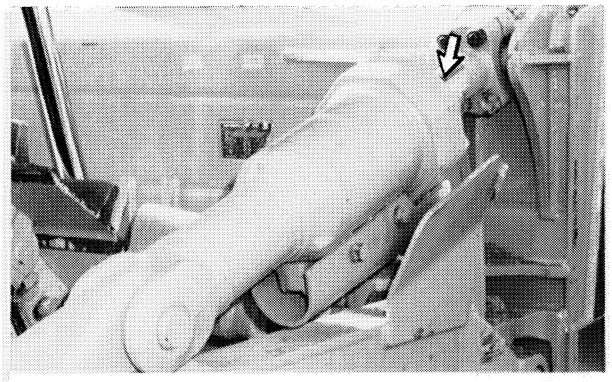
3. If additional tilt is required, the left brace may be adjusted. Shorten the brace to make left side of blade lower. Lengthen the brace to make the left side of blade higher.

If the tilt brace length needs alteration, turn the handle to the left (counterclockwise), to lengthen it. Turn the handle to the right (clockwise), to shorten the brace.

Dozer Blade Tip

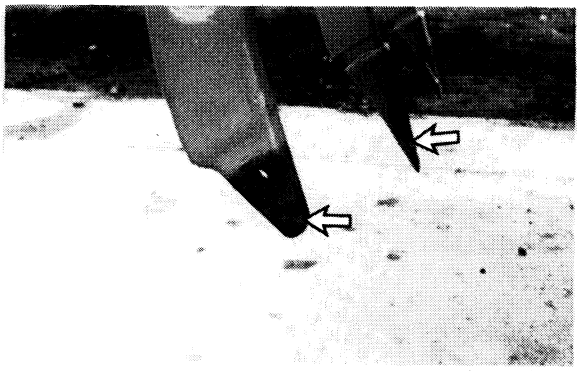


Lengthen the left brace and extend the right cylinder to tip the blade forward.



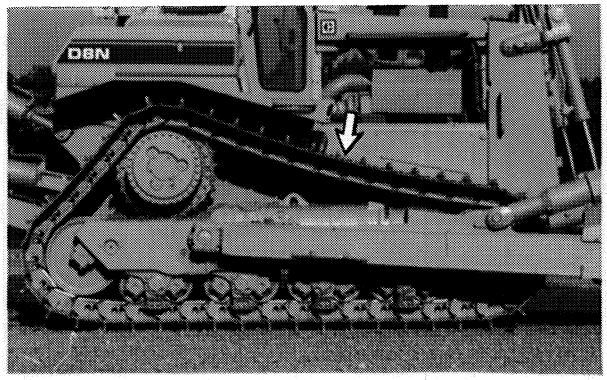
Shorten the left brace and retract the right cylinder to tip the blade back.

Ripper Tips



Replace ripper tips before wear occurs on the shank. Follow the procedures in the "Maintenance Section" for replacement.

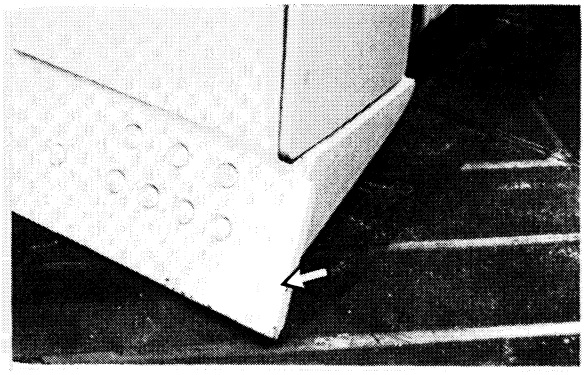
Tracks



NOTICE

If tracks are too tight or loose, wear of components is accelerated. If they appear too tight or too loose, adjust the track. Follow the procedures in the "Maintenance Section" for adjustment.

Cutting Edges and End Bits



Replace or reverse the cutting edges or end bits, before wear occurs on the blade base. Follow the procedures in the "Maintenance Section" for replacement.

Winching

The winch has an adjustable sequence valve, which permits the selection of either "no inch" or "inching" characteristics, during reel out operations.

Inching is the controlled movement of the cable during a reel out operation. The "inching" setting is generally used when the machine and winch are used for construction and pipeline work. This setting gives the operator the control necessary to put an object in an exact position.

Where precise control is not necessary, as when logs are moved, the "no inch" setting may be used.

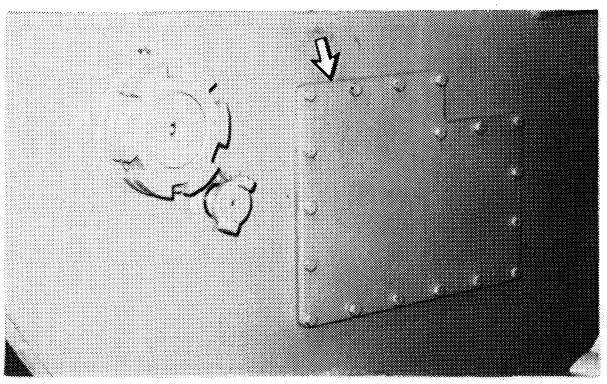
When using the inching setting, move the winch control lever to the reel out channel. Move the lever into the channel to start drum rotation. Use the engine speed to control the inching rate. Always use a slower engine speed for better control when inching.

The adjustable sequence valve, is set on the "no inch" setting at the factory.

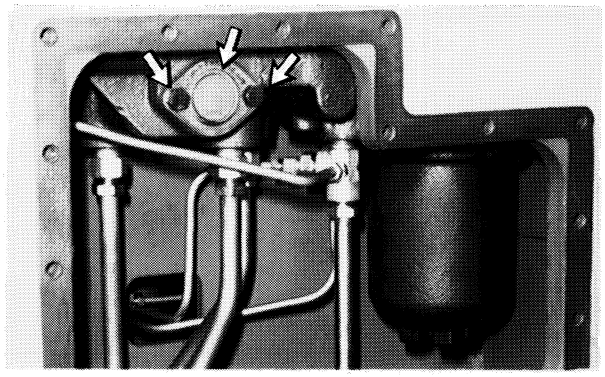
To Adjust:

NOTICE

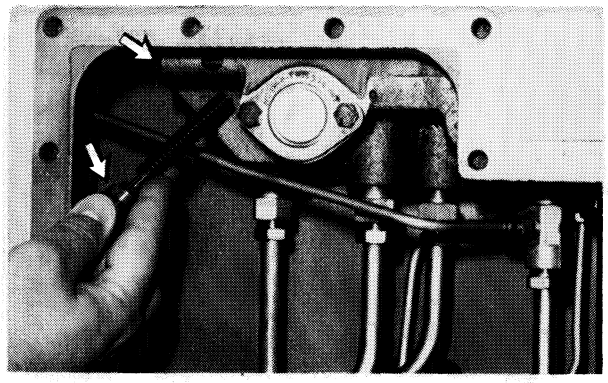
Use valve in inching position only when needed for inching out. Otherwise, possible winch damage could result.



1. Remove the winch valve access cover on right side of winch.



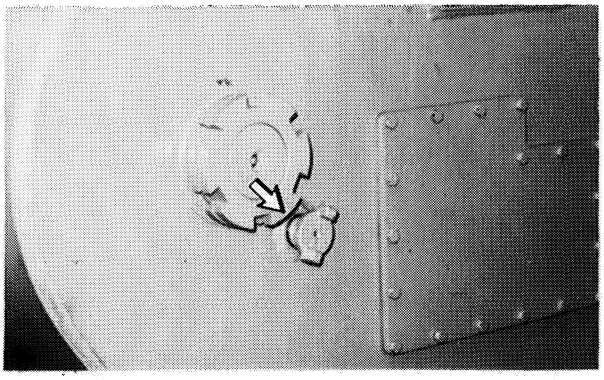
2. Remove the two bolts and reverse the cover. Install the bolts.



3. Remove the nut from the end of the valve . Reverse the position of the valve. Install the nut.

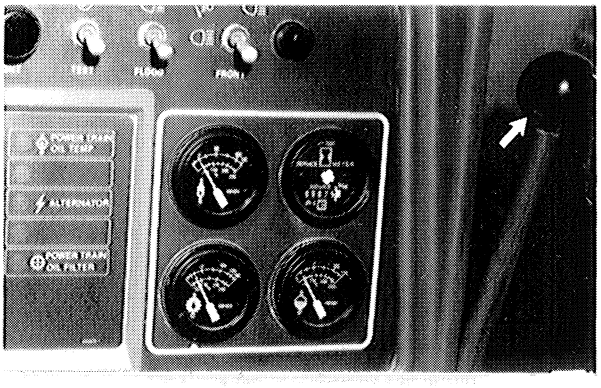
4. Install the access cover.

Winch Drum Drag



Turn the knob left or right to adjust the drum cable drag.

Parking the Machine



1. Stop the machine on level ground. Push the governor control forward slightly to reduce the engine speed.

NOTICE

Stopping the engine immediately after it has been working under load, can result in overheating and accelerated wear of the engine components. Follow the stopping procedure, outlined below, to allow the engine to cool, and to prevent excessive temperatures in the turbocharger centerhousing which will cause oil coking problems.

2. Move the transmission control lever to NEUTRAL.

3. Move the steering lever to NO STEER.

4. Engage the parking brake.

5. Lower all raised equipment to the ground. Apply a slight down pressure.

6. Before stopping the engine, operate at LOW IDLE for five minutes. This allows hot areas in the engine to cool gradually, extending engine life.

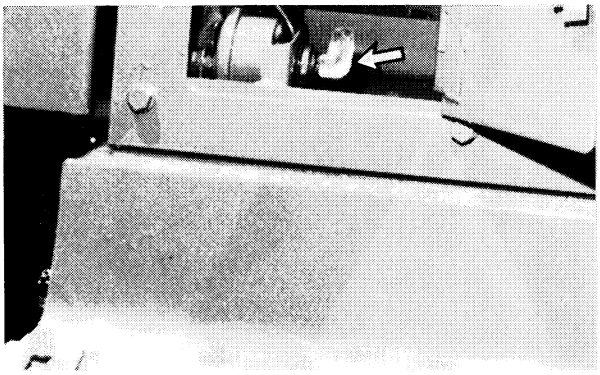
Transportation Hints

7. Push the governor control lever past detent (all the way forward), to stop the engine.

8. Turn the start switch key to OFF. Remove the key.

9. Install the vandalism guards (if equipped) when leaving the machine for an extended period.

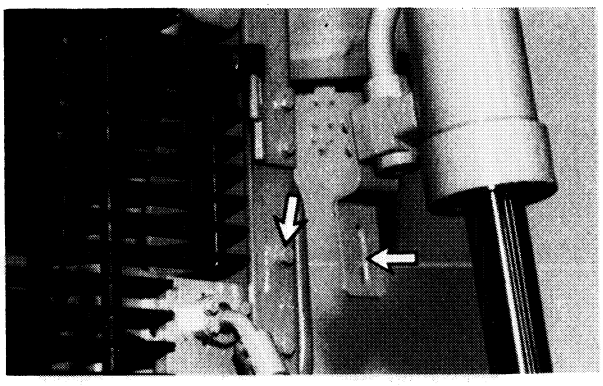
Electrical Disconnect Switch



The switch is located on the left side of the machine behind the access cover.

Turn the key off and remove the key, if parking for an extended period of time, to prevent battery drain by vandalism, or when servicing the machine.

This will also prevent the engine from being started or lights being turned on by unauthorized people.



Secure the lift cylinders to the radiator guard using the following steps when blade is not attached.

1. Remove one bolt from each side.

2. Align the lift cylinder brackets with the tapped hole in face of guard.

3. Install the bolts.

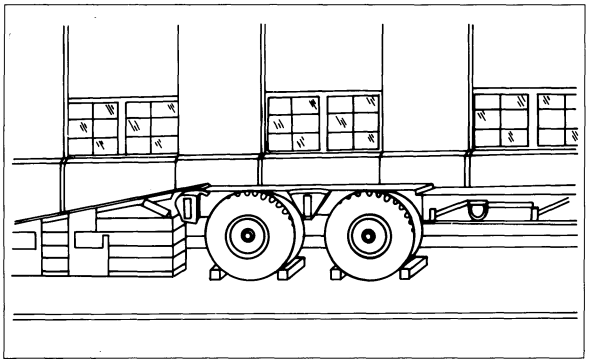
Check the travel route for overpass clearances. Make sure there will be adequate clearance, if the machine being transported is equipped with ROPS, cab or canopy.

Basic standard machine shipping specifications are listed below.

Weight (approximate)	25 026 kg (55,057 lb)
Length (maximum)	4933 mm (16.2 ft)
Width (across track)	2642 mm (8.7 ft)
Height (with ROPS)	3427 mm (11.2 ft)

NOTICE

Remove ice, snow or other slippery material from shipping machine and loading dock, before loading the machine.



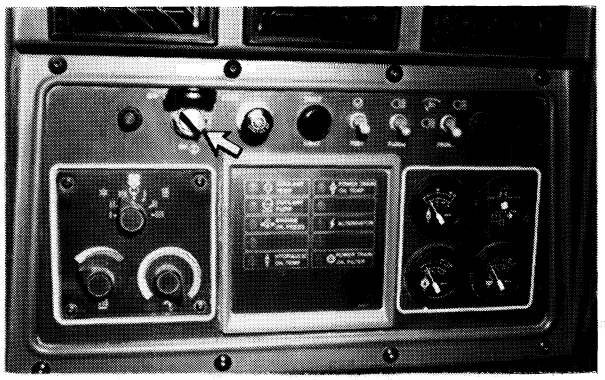
Always block the trailer or rail car wheels before loading the machine.

Move the transmission selector lever to NEUTRAL.

Move the steering lever to NO STEER.

Engage the parking brake.

Stop the engine.



Turn the start switch and the disconnect switch key to OFF and remove the keys.

Install tie-downs at several locations, and block tracks, front and rear.

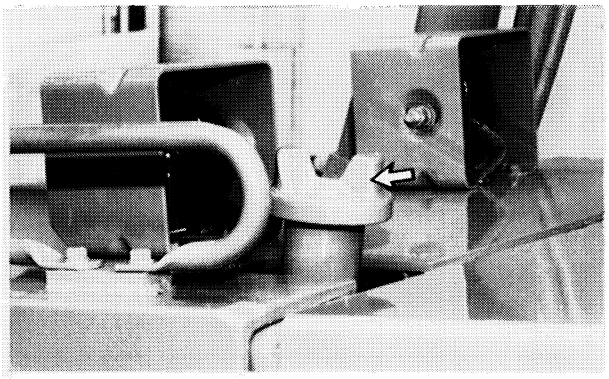
Cover the engine exhaust opening to prevent turbocharger windmilling in transit.

Check state and local laws governing weight, width and length or load.

Contact your Caterpillar dealer for shipping instructions for your machine.

Maintenance Recommendations

Cooling System



NOTICE

Never add coolant to an overheated engine; allow the engine to cool first.

Check the specific gravity of the coolant solution frequently in cold weather to ensure adequate protection.

If the machine is to be stored in, or shipped to, an area with freezing temperatures the cooling system must be protected to the lowest expected outside temperature.

All water is corrosive at engine operating temperature. The cooling system should be protected with a 3% to 6% concentration of cooling system conditioner at all times, regardless of the concentration of antifreeze.

Excessive coolant conditioner (greater than the recommended 6% initial fill) together with concentrations of antifreeze greater than 65%, cause a mud-like deposit to form. This may result in radiator tube blockage and overheating.

Do not use liquid Caterpillar cooling system conditioner with Dowtherm 209 Full-Fill coolant. Follow recommendations provided with Dowtherm 209 Full-Fill coolant.

Coolant should be drained and replaced every 2000 service hours or 1 year. However, when adding liquid Caterpillar cooling system conditioner, or equivalent, every 250 service hours as recommended, the drain period can be extended to 4000 service hours or 2 years.

Clean the cooling system if it is contaminated, if the engine overheats or if foaming is observed in the radiator.

Premix coolant solution to provide protection to the lowest expected outside temperature. Pure undiluted antifreeze will freeze at −23°C (−10°F).

Use clean water that is low in scale forming mineral. Do not use softened water.

Filling at over 20 liters (5 U.S. gallons) per minute can cause air pockets in the cooling system.

After draining and refilling the cooling system, always operate the engine with the radiator cap removed until the coolant level stabilizes. Recheck the coolant level and add coolant as necessary to fill the system.

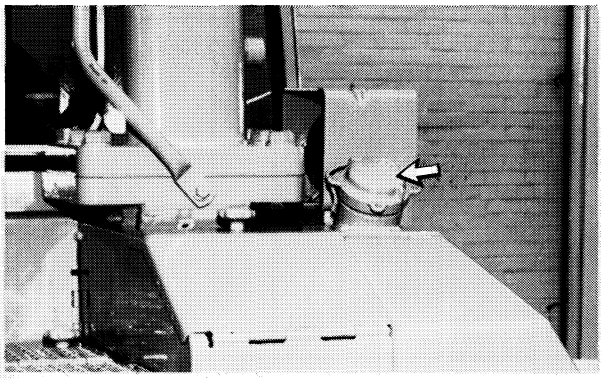
The engine cooling system is protected to −28°C (−20°F) with a permanent-type antifreeze, when shipped from the factory.

Operate with a thermostat in the cooling system year-round. Overheating will occur without a thermostat.

Cooling System Conditioner Liquid

A 3% to 6% concentration of liquid Caterpillar cooling system conditioner, or equivalent, can be maintained by adding conditioner every 250 service hours of operation.

Fuel System



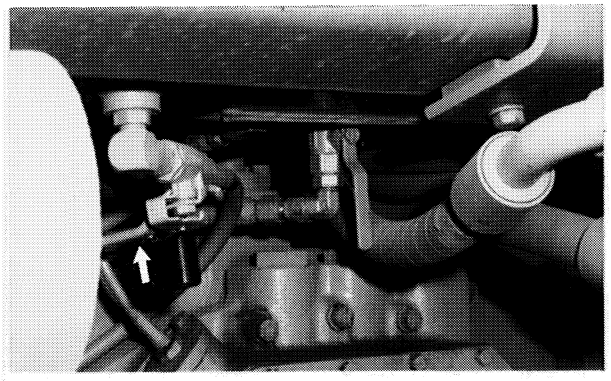
NOTICE

Fill the fuel tank at the end of each day of operation to drive out moist air and to prevent condensation.

Do not fill the tank to the top. Fuel expands as it gets warm and may overflow.

Do not fill the fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to the fuel system parts.

Check the fuel level with the dipstick in the filler opening.



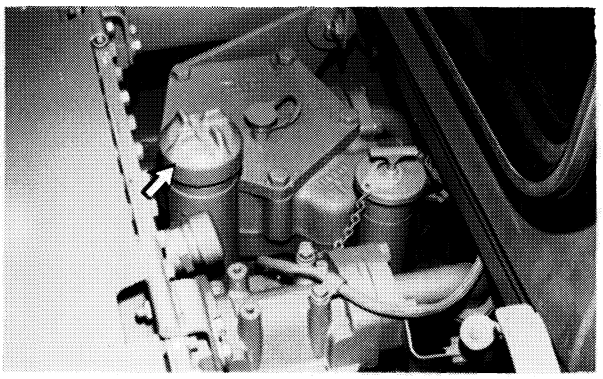
Drain the water and sediment from the fuel tank at the start of a shift or after the fuel tank has been filled and allowed to stand for 5 to 10 minutes.

After changing the fuel filters, always prime the fuel system to remove air bubbles from the system.

Drain water and sediment from any fuel storage tank weekly, and before the tank is refilled. This will help prevent water or sediment being pumped from the storage tank into the machine fuel tank.

Use only fuel as recommended in the "Coolant, Fuel and Lubricant Specifications" section of this guide.

Hydraulic System



NOTICE

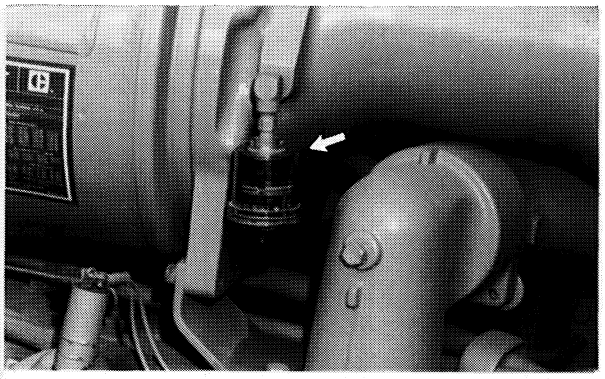
Make-up oil added to the hydraulic tank must mix with the oil already in the system. Use only petroleum products unless the system is equipped for use with special products.

If the hydraulic oil becomes cloudy, water or air is entering the system. Water or air in the system will cause pump failure. Drain the fluid, retighten all hydraulic suction line clamps, purge and refill the system. Consult your Caterpillar dealer for purging instructions.

Air Inlet System

Check the precleaner screen daily for accumulation of dust and debris.

Remove any dust and debris as needed.



If the indicator shows red shortly after installing a cleaned primary element, install another clean element, or a new element.

The primary element can be cleaned up to six times before replacement. The element, when cleaned, should be thoroughly checked for rips or tears in the filter material. Replace the primary element every year, even though it has not been cleaned six times.

The secondary filter element should be replaced at the time the primary filter element is serviced for the third time.

If the indicator shows red after installation of a clean primary element, or if the exhaust smoke is black, install a new secondary element.

NOTICE

Do not try to reuse the secondary element by cleaning it. Always use a new element.

Electrical System

NOTICE

When jump starting the machine, follow the instructions in the Operation Section to properly start the machine.

When using an external power source to start the machine, turn the disconnect switch off and remove the key before attaching the jumper cables.

This machine has a 24 volt starting system. Use only equal voltage for jump starting. Use of a welder or higher voltage will damage the electrical system.

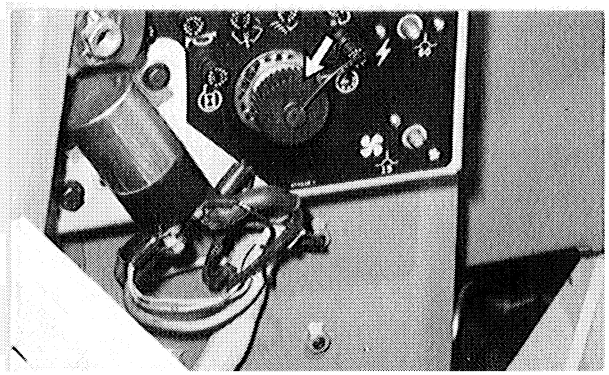
An emergency starting kit is available for starting from an external power source.

Two different cable assemblies are available for auxiliary starting. One for starting from an operating machine (with a receptacle) and one for starting from an auxiliary power pack. Your Caterpillar dealer can provide you with the correct cable assemblies for your operation.

Engines installed without engine-to-frame ground straps can be damaged by electrical discharge.

To prevent electrical discharge damage, check to make sure the machine's electrical system has an engine-to-frame ground strap. For machines which have the alternator connected to an engine component, the ground strap must connect that component to the frame.

Some machines have starter-to-frame ground straps. But, many of these starters are not electrically grounded to the engine. They have electrical insulation systems. For this reason, the starter-to-frame ground strap may not be an acceptable ground.



The machine is equipped with a diagnostic connector, shown above, for use in preventive maintenance and test analysis of the starting and charging circuits.

A 6V2150 Starting/Charging Analyzer Group is available from your Caterpillar dealer.

The 6V2150 Group is a diagnostic tool that mates with the diagnostic connector on the machine. This connector locates all pertinent test points in the starting and charging circuits in one location.

This one-man test requires no electrical circuit experience. When the analyzer is plugged into the diagnostic connector, the multi-channel voltmeter lights simply read out a "GO," "NO GO" indication.

Consult your Caterpillar dealer for more complete information.

Scheduled Oil Sampling (S•O•S)

Use Scheduled Oil Sampling (S•O•S) to monitor the condition and maintenance requirements of your equipment. Each oil sample should be taken when the oil is warm and well mixed, to ensure that the sample is representative of the oil in the compartment.

NOTE: When using the drain stream to obtain the oil sample, do not collect the sample from the first or final draining.

S•O•S Interval Chart	
Compartment	**Interval**
Engine Oil	250 Hours
Transmission Oil	500 Hours
Hydraulic Oil	500 Hours
Final Drive Oil	500 Hours

Consult your Caterpillar dealer for complete information and assistance in establishing a Scheduled Oil Sampling program for your equipment.

General

NOTICE

Accumulated grease and oil on a machine is a fire hazard. Remove this debris with steam cleaning or high pressure water, at least every 1000 hours or each time any significant quantity of oil is spilled on a machine.

Wipe all fittings, caps and plugs before servicing.

Keep a close watch for leaks. If leaking is observed, find the source and correct the leak.

Check the fluid levels more frequently than the recommended periods if leaking is suspected or observed.

Bolt Torques for Ground Engaging Tools

Bolt Size	Recommended Torque*	
Inch	N·m	lb ft
5/8	265 ± 35	195 ± 25
3/4	475 ± 70	350 ± 50
7/8	765 ± 115	565 ± 85
1	1220 ± 150	900 ± 110
1 1/4	2000 ± 200	1480 ± 150

*These values are applicable only to Caterpillar cutting edge bolts.

General Torque for Standard Bolts, Nuts and Taperlock Studs

NOTICE

The following charts give general torques for bolts, nuts and taperlock studs of SAE Grade 5 or better quality.

Torques for Bolts and Nuts With Standard Threads

Thread Size	Standard Torque	
Inch	N·m*	lb ft
1/4	12 ± 4	9 ± 3
5/16	25 ± 7	18 ± 5
3/8	45 ± 7	32 ± 5
7/16	70 ± 15	50 ± 10
1/2	100 ± 15	75 ± 10
9/16	150 ± 20	110 ± 15
5/8	200 ± 25	150 ± 20
3/4	360 ± 50	265 ± 35
7/8	570 ± 80	420 ± 60
1	875 ± 100	640 ± 80
1 1/8	1100 ± 150	800 ± 100
1 1/4	1350 ± 175	1000 ± 120
1 3/8	1600 ± 200	1200 ± 150
1 1/2	2000 ± 275	1480 ± 200

*1 Newton meter (N·m) is approximately the same as 0.1 mkg.

Torques for Taperlock Studs

Thread Size	Standard Torque	
Inch	N·m*	lb ft
1/4	7 ± 3	5 ± 2
5/16	15 ± 5	10 ± 3
3/8	30 ± 5	20 ± 3
7/16	40 ± 10	30 ± 5
1/2	55 ± 10	40 ± 5
9/16	80 ± 15	60 ± 10
5/8	100 ± 15	75 ± 10
3/4	150 ± 20	110 ± 15
7/8	230 ± 30	170 ± 20
1	350 ± 40	260 ± 30
1 1/8	400 ± 40	320 ± 30
1 1/4	550 ± 50	400 ± 40
1 3/8	650 ± 50	480 ± 40
1 1/2	750 ± 70	550 ± 50

*1 Newton meter (N·m) is approximately the same as 0.1 mkg.

General Torque for Metric Fasteners

NOTICE

Be very careful never to mix metric with U.S. customary (standard) fasteners. Mismatched or incorrect fasteners will cause machine damage or malfunction and may even result in personal injury.

Original fasteners removed from the machine should be saved for reassembly whenever possible. If new fasteners are needed, they must be of the same size and grade as the ones that are being replaced.

The material strength identification is usually shown on the bolt head by numbers (8.8, 10.9, etc.). The following chart gives standard torques for bolts and nuts with Grade 8.8.

Metric ISO* Thread		
Thread Size	Standard Torque	
	N·m**	lb ft
M6	12 ± 4	9 ± 3
M8	25 ± 7	18 ± 5
M10	55 ± 10	40 ± 7
M12	95 ± 15	70 ± 10
M14	150 ± 20	110 ± 15
M16	220 ± 30	160 ± 20
M18	325 ± 50	240 ± 35
M20	450 ± 70	330 ± 50
M22	600 ± 90	440 ± 65
M24	775 ± 100	570 ± 75
M27	1150 ± 150	840 ± 110
M30	1600 ± 200	1175 ± 150
M33	2000 ± 275	1480 ± 200
M36	2700 ± 400	2000 ± 300

*ISO–International Standard Organization.
**1 Newton meter (N·m) is approximately the same as 0.1 mkg.

Standard Torque for Hose Clamps – Worm Drive Band Type

NOTICE

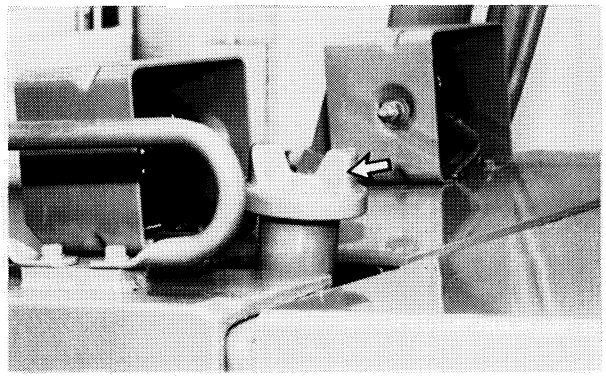
The following chart gives the torques for initial installation of hose clamps on new hose and for reassembly or retightening of hose clamps on existing hose.

	Initial Installation Torque on New Hose	
Clamp Width	N·m*	lb in.
16 mm (.625 inch)	7.5 ± 0.5	65 ± 5
13.5 mm (.531 inch)	4.5 ± 0.5	40 ± 5
8 mm (.312 inch)	0.9 ± 0.2	8 ± 2
	Reassembly or Retightening Torque	
Clamp Width	**N·m***	**lb in.**
16 mm (.625 inch)	4.5 ± 0.5	40 ± 5
13.5 mm (.531 inch)	3.0 ± 0.5	25 ± 5
8 mm (.312 inch)	0.7 ± 0.2	6 ± 2

*1 Newton meter (N·m) is approximately the same as 0.1 mkg.

Coolant, Fuel and Lubricant Specifications

Coolant Specifications



NOTICE

Use a mixture of water, ethylene glycol (antifreeze) and cooling system conditioner. Pure, undiluted antifreeze will freeze at –23°C (–10°F).

Do not use Caterpillar liquid cooling system conditioner or coolant conditioner elements with Dowtherm 209 Full-Fill coolant. Follow the instructions provided with the Dowtherm 209 Full-Fill coolant.

Coolant mixtures in excess of 50% antifreeze should not be used unless temperatures below –34°C (–30°F) are expected. Increase to 60% antifreeze in this case but as the outside air temperatures start to be consistently above 0°C (32°F), switch back to the 50/50 mixture.

Antifreeze concentrations in excess of 63% provide less rather than more freeze protection.

A good practice to follow after operating an engine is to return the engine speed to LOW IDLE for 5 minutes before shutting the engine down. This reduces the surface temperature of the prechambers, heads and liners minimizing localized boiling at these areas. This will also reduce the plating effect of the compounds in the coolant.

Refer to "Know Your Cooling System," Form SEBD0518, for more detailed specifications.

Water

Acceptable water for use in the ethylene glycol and water mixture is shown in the chart below:

Acceptable Water		
Water Content	**50% Antifreeze 50% Water**	**Without Antifreeze**
Chlorides	100 ppm or less	50 ppm or less
Sulfates	100 ppm or less	50 ppm or less
Hardness as $CaCO_3$	200 ppm or less	100 ppm or less
Dissolved Solids	500 ppm or less	250 ppm or less
pH	6.5 or higher	6.5 or higher

ppm = parts per million

Antifreeze

Use the correct amount of ethylene glycol mixed with water, to provide freeze protection to the lowest expected outside temperature.

Conditioner Element

NOTICE

Always add Caterpillar liquid cooling system conditioner or a coolant conditioner element to water. Never use water only.

Excess coolant conditioner (greater than the recommended 6% initial fill) together with concentrations of antifreeze greater than 65% cause a mud-like deposit to form and may result in radiator tube blockage and overheating.

Use Caterpillar liquid cooling system conditioner or a coolant conditioner element. This will provide a 3% to 6% concentration of conditioner in the cooling system to help prevent corrosion.

Conditioner can be purchased from your Caterpillar dealer.

Fuel Specifications and Information

Types of Fuel

Caterpillar diesel engines have the ability to burn a wide variety of fuels. These fuels are divided into two general groups, preferred and permissible.

The preferred fuels provide maximum engine service life and performance. They are distillate fuels. They are commonly called diesel fuel, furnace oil, gas oil or kerosene.

The permissible fuels are crude oils or blended fuels. Use of these fuels can result in higher maintenance costs and reduced engine service life.

Refer to "Fuels for Caterpillar Diesel Engines," Form SEHS7067, for a detailed summary of preferred and permissible fuels and their specifications.

Refer to S.A.E. J313 Diesel Fuels for information about better quality fuels, such as ignition quality, gravity/density, viscosity, cloud point, sulfur content, etc.

Fuel Sulfur Content

The percentage of sulfur in the fuel will affect the engine oil recommendations (see "Engine Oils" under "Lubricant Specifications).

Fuel sulfur is chemically changed during combustion to form sulfuric acid. The acid chemically attacks metal surfaces and causes corrosive wear. Higher engine oil TBN (total base number) values are essential to minimize corrosive wear.

Periodically request fuel sulfur content information from your fuel supplier. Fuel sulfur content can change with each bulk delivery.

Fuel Cetane Requirement

The minimum fuel cetane number recommended for the direct injection engine is 40.

Fuel Cloud Point

Fuel waxing can plug the fuel filters in cold weather. The fuel cloud point must be below the temperature of the surrounding air to prevent filter waxing and power loss. Fuel heating attachments are available from your Caterpillar dealer to minimize fuel filter waxing.

Lubricant Specifications

Certain abbreviations listed below follow S.A.E. J754 nomenclature. Some classifications follow S.A.E. J183 abbreviations. The MIL specifications are U.S.A. Military Specifications. The definitions other than Caterpillar's will be of assistance in purchasing lubricants. The recommended oil viscosities can be found in the "Lubricant Viscosities" chart in this publication.
The prefix "SPC" is a general abbreviation used by Caterpillar to identify special oils such as synthetic or semi-synthetic oils.

Diesel Engine Oils (DEO)

Caterpillar has two engine oils. To achieve the maximum engine life and performance in your diesel engines, Caterpillar's first recommendation is:

- CAT Diesel Engine Oil (DEO)

CAT Diesel Engine Oil is specially formulated for Caterpillar diesel engines to reduce piston and ring deposits and thus provide longer engine life and stable oil control.

Engine Oil (EO)

CAT Engine Oil is Caterpillar's second recommendation for an engine oil specifically intended for use in mixed fleets. This oil is only for the convenience of having the same oil for gasoline and diesel engines.

For mixed fleet convenience, use Caterpillar's:

- CAT Engine Oil (EO)

If circumstances require the use of an oil other than the CAT Diesel Engine Oil or CAT Engine Oil, the following oil specifications can be used: European Oil Specification CCMC D3, API Specification CD, CD/SF, CE, or Military Specifications MIL-L-2104C or MIL-L-2104D.

Oil with these specifications may require shortened oil change periods as determined by close monitoring of oil condition with Scheduled Oil Sampling (S•O•S) and infrared analysis.

NOTE: The percentage of sulfur in the fuel will affect the engine oil recommendations. See "Fuel Sulfur Content" in the "Fuel Specifications" section of this publication.

Higher TBN values are essential to neutralize the corrosive acids formed during combustion. These corrosive acids could damage internal engine parts. Consult your Caterpillar dealer for correct engine oil recommendations.

For more information on oil, fuel sulfur content, etc., refer to "Oil and Your Engines," Form SEBD0640.

NOTICE

Failure to follow these recommendations can cause shortened engine life due to carbon deposits or excessive wear.

Always consult with your Caterpillar dealer for the latest lubrication recommendations.

Transmission Oil (TDTO)

NOTICE

This oil is formulated for transmissions and drive trains only and should not be used in engines. Shortened engine life will result.

Maximum transmission life and performance can be achieved by using Caterpillar's:

- CAT Transmission/Drive Train Oil (TDTO)

NOTICE

Failure to follow this recommendation can cause shortened transmission/drive train life due to material incapability and inadequate frictional requirements for disk material.

If circumstances require the use of an oil other than CAT Transmission/Drive Train Oil, use an oil that meets API CD/TO-2 or Military Specification MIL-L-2104D.

Final Drive Oil (TDTO)

NOTICE

This oil is formulated for transmissions and drive trains only and should not be used in engines. Shortened engine life will result.

NOTE: DO NOT use CAT Gear Oil in the above compartments. Gear Oil can cause seal material to fail and result in oil leaks.

For maximum life and performance of the final drives, select the correct viscosity of Caterpillar's:

- **CAT Transmission/Drive Train Oil (TDTO)**

If circumstances require the use of an oil other than CAT, use an API classification CC or CD engine oil (MIL-L-2104B or MIL-L-2104C).

Hydraulic Oil (HYDO)

CAT Hydraulic Oil should be used to achieve maximum life and performance from hydraulic system components and hydrostatic transmissions Use of CAT Hydraulic Oil is recommended for use in most hydraulic hydrostatic systems. Use Caterpillar's:

- **CAT Hydraulic Oil (HYDO)**

If different viscosities are required because of extreme ambient temperatures, use the following Caterpillar oils:

- **CAT Engine Oil (EO)**
- **CAT Diesel Engine Oil (DEO)**

If CAT Hydraulic Oil, Engine Oil, or Diesel Engine Oil is not available, use an engine oil that meets one of these API service classifications: CC, CC/SF, CD, or CE. Any Military Specification MIL-L-2104 oils can also be used.

Industrial type hydraulic oils that are certified by the oil supplier to have antiwear, antifoam, antirust, and antioxidation additives for heavy duty use are also acceptable, if CAT oils are not available.

NOTICE

Make-up oil added to the hydraulic tanks must mix with the oil already in the systems. Use only petroleum products unless the systems are equipped for use with special products.

If the hydraulic oil becomes cloudy, water or air is entering the system. Water or air in the system will cause pump failure. Drain the fluid, retighten all hydraulic suction line clamps, purge and refill the system. Consult your Caterpillar dealer for purging instructions.

Lubricating Grease (MPGM)

Use Multipurpose-type Grease (MPGM) which contains 3% to 5% molybdenum disulfide. NLGI No. 2 Grade is suitable for most temperatures. Use NLGI No. 1 or No. 0 Grade for extremely low temperatures. If MPGM is not available, use a multipurpose type grease which contains 3 to 5% molybdenum.

- Cat Special Purpose Grease (SPG)

This grease is recommended for high temperature anti-friction bearings in such applications as electric motors, alternators, starters and generators. The grease is a NLGI No. 2 grade. If this grease is not available, use a similar multipurpose grease suitable for anti-friction bearings.

Refill Capacities – (Approximate)

Compartment or System	Liters	U.S. Gal.	Imperial Gal.
Fuel Tank	480	127	106
Engine Oil with Filter	38	10	8.4
Hydraulic Oil Tank	98	25.9	21.6
Power Train Oil	184	48.6	40.5
Final Drives (ea.)	13.5	3.6	3
Recoil Spring Compartments (ea.)	65	17.2	14.3
Cooling System	81	21.4	17.8
Winch Sump	82	22	18.3

NOTE: Quantity of oil in the power train system may be increased up to 10% when operating on severe slopes. When operating with the increased oil quantity, prolonged operation in some machine positions may result in an increase in power train oil temperature.

Lubricant Viscosity Recommendations

For Temperature Ranges °C and °F*					
Compartment or System	Oil Viscosities	°C		°F	
		Min	Max	Min	Max
Diesel Engine Oil **DEO**	SAE 10W	–20	+10	–4	+50
	SAE 10W30	–20	+40	–4	+104
	SAE 15W40	–15	+50	+5	+122
	SAE 30	0	+40	+32	+104
	SAE 40	+5	+50	+41	+122
Engine Oil **EO**	SAE 10W30	–20	+40	–4	+104
	SAE 15W40	–15	+50	+5	+122
	SAE 30	0	+40	+32	+104
Power Train and Winch **TDTO**	SAE 10W	–20	+10	–4	+50
	SAE 10W30	–20	+40	–4	+104
	SAE 15W40	–15	+50	+5	+122
	SAE 30	0	+40	+32	+104
	SAE 40	+5	+50	+41	+122
Hydraulic System **HYDO, DEO or EO**	HYDO SAE 10	–20	+40	–4	+104
	DEO SAE 30	+10	+50	+50	+122
	EO SAE 50	+10	+50	+50	+122
Final Drives **TDTO**	SAE 10W	–30	0	–22	+32
	SAE 30	–20	+25	–4	+77
	SAE 50	0	+50	+32	+122
Recoil Spring, Pivot Shaft **TDTO**	SAE 30	–30	+50	–22	+122

* When operating below –30°C (–22°F) refer to the Operation and Maintenance Guide, for Cold Weather Recommendations, Form SEBU5898, available from your Caterpillar dealer.

Lubrication and Maintenance Interval Chart

Item	Service	Lube.	Page
When Required			
Engine Air Intake System	Change filters when yellow diaphragm enters red zone in the indicator or excessive black smoke is observed.		74
Fuel Filter Elements	Wash primary, change secondary filters when engine shows an obvious loss of power. Normal change period is 500 Service Hours.		98
Ether Starting Aid Cylinder (If Equipped)	Change ether cylinder when empty.		76
Batteries	Inspect.		76
Cutting Edges and End Bits	Change if damaged or excessively worn.		77
Ripper Tip	Change if damaged or excessively worn.		78
Power Train Oil System	Clean scavenge line screens at time of repair of transmission, torque converter, etc.	TDTO	78
Winch	Inspect for frayed or worn cable. Installing new cable.		79
Every 10 Service Hours or Daily			
Engine Crankcase Oil	Measure oil level.	DEO or EO	80
Power Train Oil System	Look at oil level and check for leaks.	TDTO	80
Engine Cooling System	Look at coolant level.		81
Hydraulic System Oil	Look at oil level and check for leaks.	HYDO	82
Pivot Shaft	Look at oil level and check for leaks.	TDTO	83
Fuel Tank	Drain water and sediment.		83
Tracks	Inspect for proper adjustment.		84
Walk-Around Inspection	Inspect machine.		84
Indicators and Lights	Check for broken or inoperative components.		85
Seat Belt	Inspect for damage and wear.		85
Winch (If Equipped)	Look at oil level and check for leaks.	TDTO	86
Every 50 Service Hours or Weekly			
Ripper Linkage and Cylinder Bearings	Lubricate fittings.	MPGM	87
Tracks	Inspect the tracks weekly.		87
Cab Air Filter Elements	Clean the filter elements.		88

Lubrication and Maintenance Interval Chart

Item	Service	Lube.	Page
Every 250 Service Hours or Monthly			
Engine Crankcase Oil and Filter	Change oil and filter element.	**DEO or EO**	89
Alternator and Air Conditioner Belts	Measure – replace and/or adjust.		90
Brakes	Test.		90
Tracks	Adjust the tracks if necessary.	**MPGM**	91
Equalizer Bar End Pins	Lubricate fittings.	**MPGM**	92
Fan Drive Pulley	Lubricate fittings.	**SPG**	92
Coolant Conditioner	Change conditioner element.		93
Bulldozer Tilt Brace	Lubricate fittings.	**MPGM**	94
Final Drive Oil	Look at oil level.	**TDTO**	94
Engine Valve Lash	Adjust – On new or reconditioned engines at first engine oil change. Normal service interval is Every 2000 ServiceHours or I Year.		105
Every 500 Service Hours or 3 Months			
Power Train Oil Filter	Change the filter element.	**TDTO**	95
Hydraulic System Filters	Change the filter elements.	**HYDO**	96
Engine Crankcase Oil Breather	Wash the breather.		97
Recoil Spring Oil Compartment	Look at the oil level.	**TDTO**	97
Fuel Tank Cap and Screen	Wash the cap element and screen.		98
Fuel Filter Elements	Wash primary – change secondary.		98
Winch Filter and Magnetic Strainer (If Equipped)	Change filter element. Wash strainer.		100
Every 1000 Service Hours or 6 Months			
Rollover Protective Structure (ROPS)	Retighten the mounting bolts.		102
Power Train Oil System	Change the oil and wash breather.	**TDTO**	102
Winch (If Equipped)	Change the oil and wash breather.	**TDTO**	103
Lift Cylinder Yoke Bearings	Lubricate fittings.	**MPGM**	104
Every 2000 Service Hours or 1 Year			
Engine Valve Lash	Adjust.		105
Engine Valve Rotators	Observe rotation.		105
Final Drive Oil	Change the oil.	**TDTO**	106
Hydraulic System Oil	Change the oil.	**HYDO**	106
Cooling System Coolant	Change the coolant.		107
Track Roller Frame Guides	Inspect for wear.		109

Engine Air Intake System

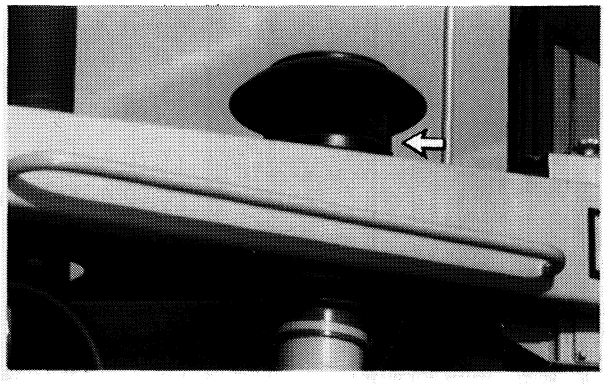
Clean the Air Intake

⚠ WARNING

Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

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

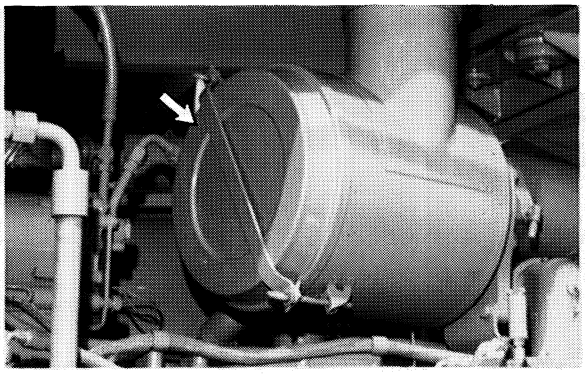


Check the air inlet screen for accumulation of trash and dirt.

1. Remove the screen and clean.

2. Inspect the precleaner tubes for accumulation of dust and dirt. Clean with pressure air if dirty.

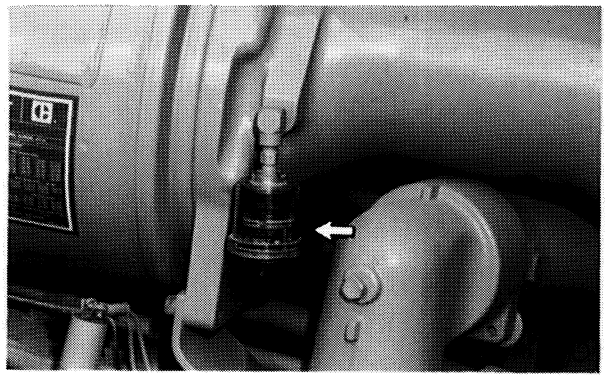
Change the Primary Element



1. Remove the cover and clean the primary filter element. Change element if damaged.

2. Clean the inside of the air cleaner housing.

3. Install the cover. Tighten the retaining bolts finger tight. Do not use a tool to tighten the bolts.



4. Reset the filter indicator by pushing in the reset button.

5. If the yellow piston in the filter element indicator moves into the red zone after starting the engine, or the exhaust smoke is still black after installation of a primary filter element that has been cleaned up to 6 times, change to another clean filter element.

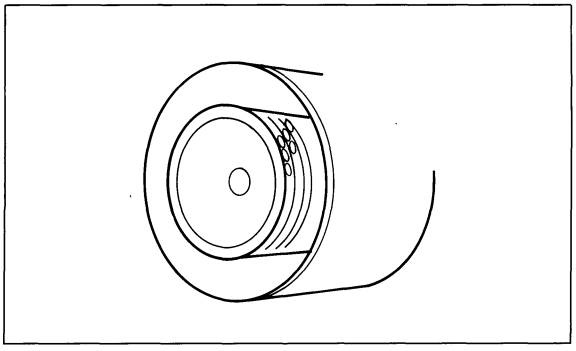
Change the Secondary Element

NOTICE

The secondary filter element should be replaced at the time the primary element is serviced, for the third time.

The secondary filter element should also be replaced if the yellow piston in the filter element indicator enters the red zone after installation of a clean primary element, or if the exhaust smoke is still black.

Remove the cover and the primary filter element.



1. Remove the nuts that hold the secondary filter element to the housing. Do not remove the two nuts that hold the housing to the inlet manifold.

2. Inspect the gasket between the housing and the inlet manifold. Replace it if damaged.

3. Install a new secondary filter element. Tighten the nuts to 27 ± 7 N•m (20 ± 5 lb ft).

4. Install the primary filter element and the cover. Tighten cover bolts finger tight only.

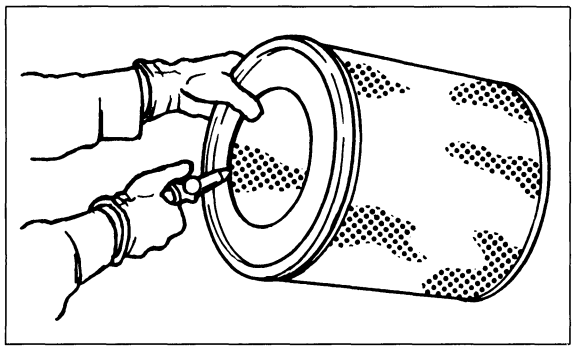
5. Reset the filter indicator.

Cleaning Primary Elements

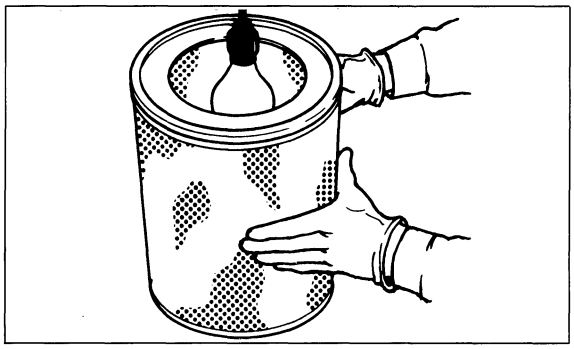
NOTICE

Do not clean the filter elements by bumping or tapping them.

Filter elements can be cleaned with pressure air, pressure water, or detergent washing.



Direct air or water along pleats inside and outside of filter element.



Inspect the filter elements after cleaning. Do not use a filter element with damaged pleats, gaskets or seals.

Ether Starting Aid Cylinder (If Equipped)

Installing the Cylinder

⚠ WARNING

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 and with care to avoid fires.

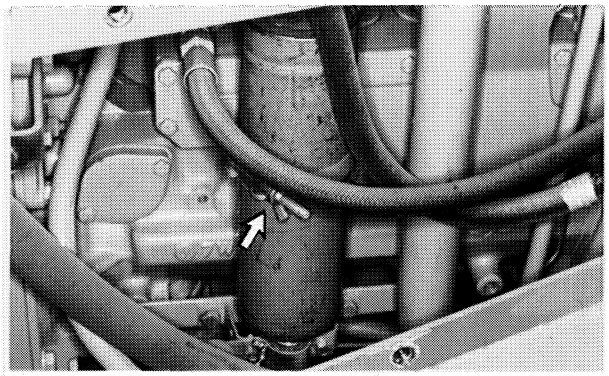
Do not smoke while changing ether cylinders.

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

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

Discard ether cylinders properly. Do not puncture or burn ether cylinders.

Keep ether cylinders out of the reach of unauthorized personnel.



1. Loosen the cylinder retaining clamp.

2. Unscrew and remove the empty ether cylinder. Remove the used gasket. Install the new gasket provided with each new cylinder.

3. Install the new cylinder. Tighten the cylinder hand tight. Refasten the cylinder clamp securely.

Batteries

Check Electrolyte Level

⚠ WARNING

Batteries give off flammable fumes that can explode.

Do not smoke when observing the battery electrolyte levels.

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

Always wear protective glasses when working with batteries.

Battery Electrolyte Chart	
Battery	**Interval**
Conventional	100 Hours
Low Maintenance	250 Hours
Maintenance Free	None Required

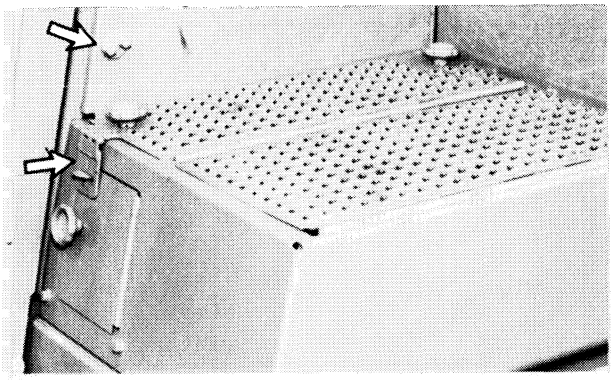
Tighten the battery retainers every 1000 hours on all batteries.

Check the following at least every 1000 hours, and more often as conditions require:

Clean the top of the batteries with a clean cloth.

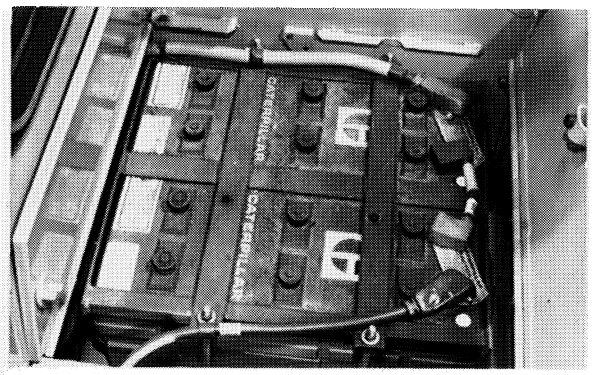
Keep the terminals clean and coated with petroleum jelly.

At the proper charging rate, in a moderate climate, a battery should not require more than 30 cc (1 ounce) of water per cell per week. Check the cells weekly in extreme temperatures, cell water usage could be higher.



1. Open the battery access cover.

2. Clean the battery surface with a clean cloth. Keep the terminals clean and coated with petroleum jelly. Install the post cover after coating.

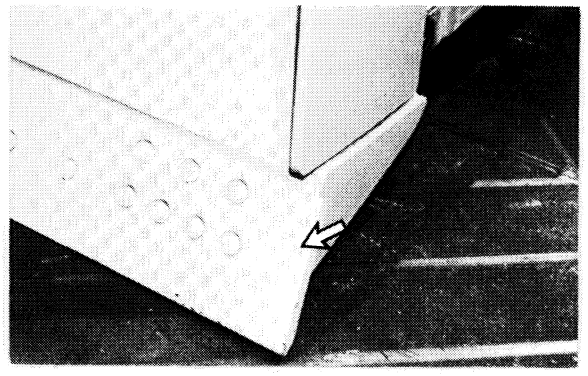


3. Inspect the electrolyte level in each battery cell, except maintenance free. Maintain the level to the bottom of the fill openings with distilled water. If distilled water is not available, use clean drinking water.

4. Close and secure the access cover.

Cutting Edges and End Bits

Change the Edges and End Bits



1. Raise the blade and place blocking under it.

2. Lower the blade to the blocking.

Do not block the blade any higher than necessary to remove cutting edge or end bits.

3. Remove the bolts and remove cutting edge and end bits.

4. Clean the contact surfaces.

5. Use the opposite cutting edge if it is not worn.

6. Install a new section if both edges are worn.

7. Install the new end bits.

8. Install the bolts and tighten to the specified torque. See ("Bolt Torques for Ground Engaging Tools") chart.

9. Raise the blade and remove the blocks.

10. Lower the blade to the ground.

11. After a few hours of operation, check the bolts for proper torque.

Ripper Tip

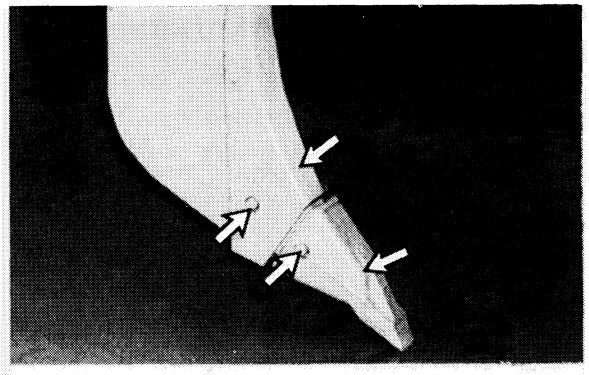
Change the Tip

⚠ WARNING

Retainer pins, when struck with force, can fly out and cause injury to nearby people.

Make sure the area is clear of people when driving retainer pins.

To avoid injury to your eyes, wear protective glasses when striking a retainer pin.



Replace the ripper tip when worn close to shank. Too blunt of a tip will not penetrate properly.

1. Raise and support the ripper.

2. If the ripper tip is worn, drive the pin out. Remove the tip and the pin retainer.

3. Clean the shank pin retainer and pin.

4. Install the new tip and retainer.

5. Install the pin in from the side opposite of the retainer.

6. Raise the ripper and remove the support.

7. Lower the ripper to the ground.

Power Train Oil System

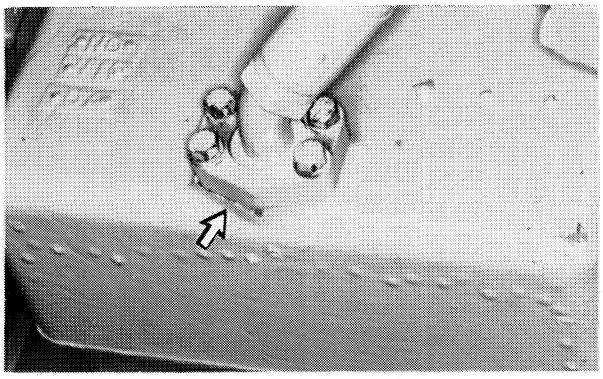
Clean the Scavenge Line Screens

⚠ WARNING

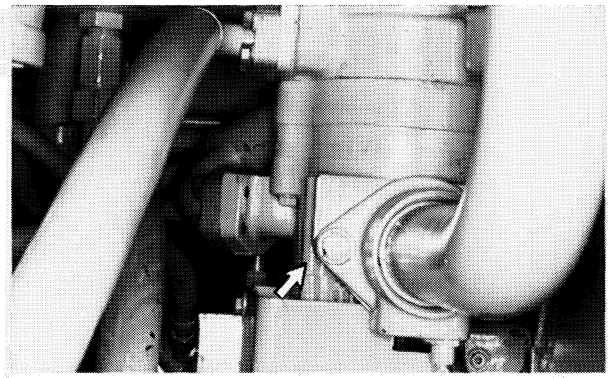
Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

The power train screens should be removed and cleaned if the power train oil pump fails, or if the transmission or torque converter are disassembled for any reason after all the oil has been drained.

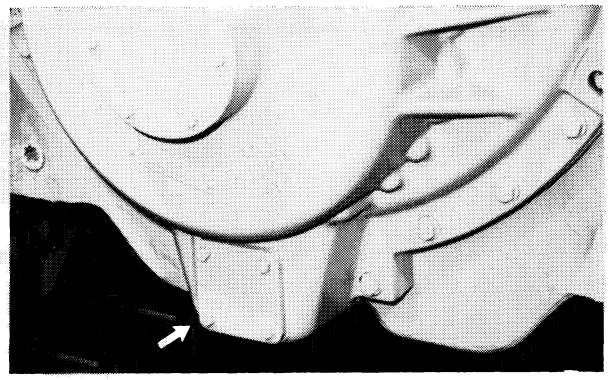
1. Remove the floor plate to gain access to the torque converter and power train oil pump.



2. Remove the torque converter scavenge line screen cover and screen.



3. Remove the power train oil pump suction cover and screen.



4. Remove the transmission scavenge line screen cover and screen.

5. Wash the screens, and magnet if equipped, in clean, nonflammable solvent.

6. Install the screens and covers.

7. Install the floor plate.

Winch

Installing the Wire Rope Cable

⚠ WARNING

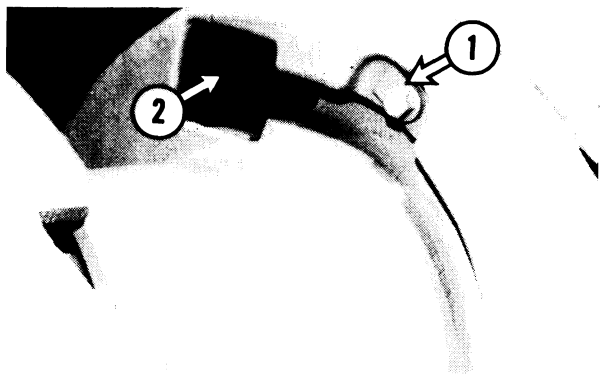
Check the cable. If cable is worn or frayed install a new cable. Worn or frayed cable could cause personal injury or death.

Cable is attached to the drum on the winch with a standard cable ferrule. The ferrule is fitted into a socket on the drum and secured with a bolt-down clamp.

Ferrules are made in various diameters and lengths. When ordering the cable, use the following guide to specify the correct ferrule.

Cable Diameter mm (in.)	Cable	Ferrules mm (in.)	
	Number	Outside Diameter	Length
22.4 (.88)	L-7	53.8 (2.12)	66.5 (2.62)
25.4 (1.0)	L-8	53.8 (2.12)	66.5 (2.62)

1. Put the cable in a straight line behind the machine.



2. Remove the clamp ① and install the ferrule end into the socket ②.

3. Install the clamp ①.

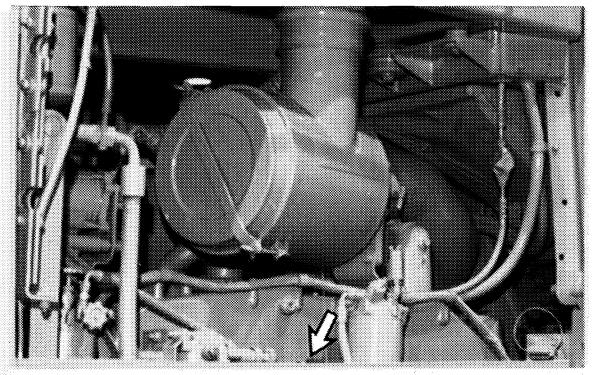
4. Reel in the cable.

Engine Crankcase Oil

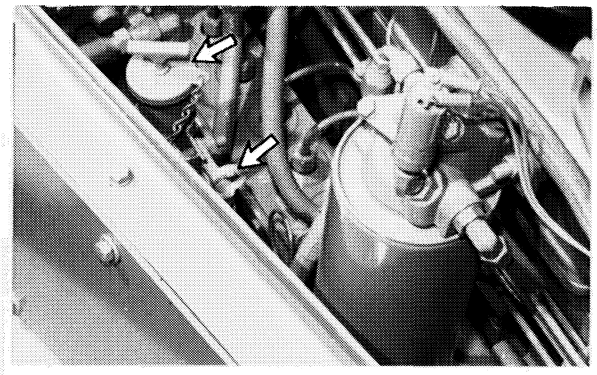
Measure the Oil Level

⚠ WARNING

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



The crankcase oil level dipstick is located on the left side of the engine.



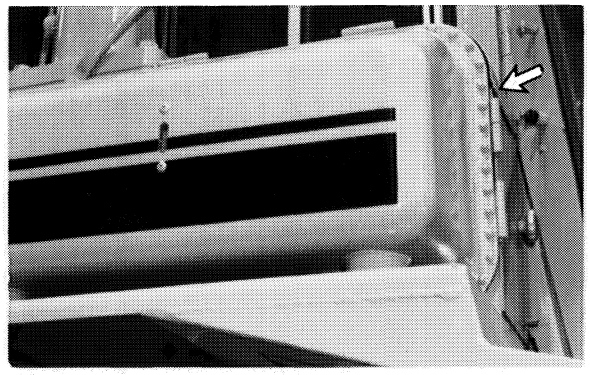
Maintain the oil between the marks on dipstick. Add oil through fill tube if necessary.

Power Train Oil System

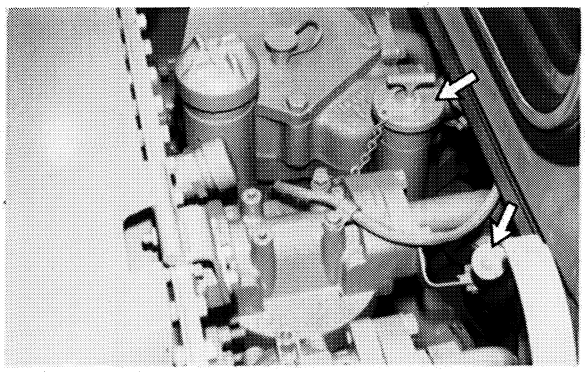
Measure the Oil Level

⚠ WARNING

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



The power train oil dipstick is located on the right side of the machine behind cover.



Maintain the oil between the marks on dipstick at LOW IDLE, at operating temperature. Add oil through fill tube if necessary.

Engine Cooling System

Look at the Coolant Level

⚠ WARNING

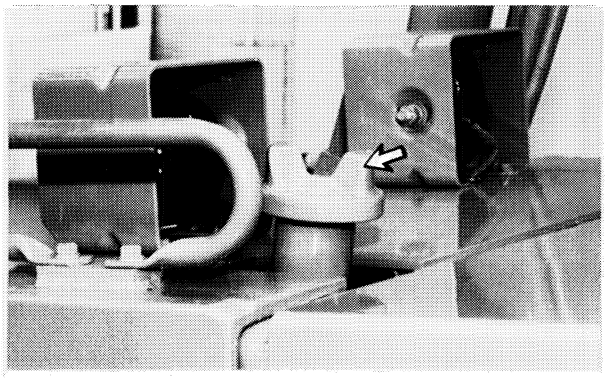
At operating temperature, the engine coolant is hot and under pressure.

Steam can cause personal injury.

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

Remove the fill cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes to prevent personal injury.



1. Remove the coolant fill cap slowly to relieve any pressure.

2. Inspect the condition of the cap gasket. Replace the cap gasket if necessary.

3. Maintain the coolant above the low level plate.

4. Install the radiator cap.

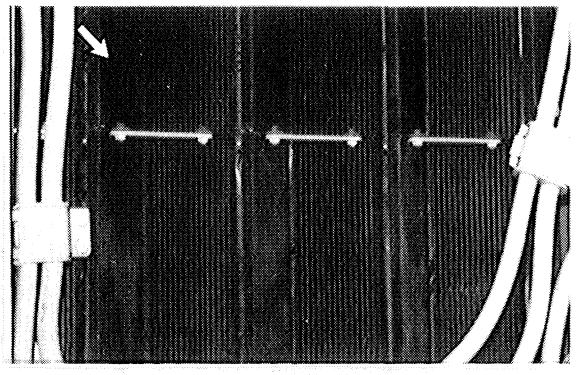
Clean Outside of Folded Core Radiator

⚠ WARNING

Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

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



Compressed air, high pressure water or steam can be used to remove dust, leaves and general debris from a folded core radiator. Clean as required by condition of radiator.

The use of compressed air is preferred.

Refer to "Know Your Cooling System," Form SEBD0518, for the complete procedure and instructions.

Hydraulic System Oil

Look at the Oil Level

⚠ WARNING

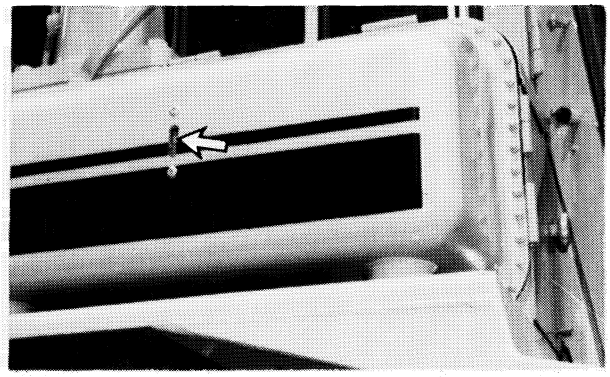
At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil can cause burns.

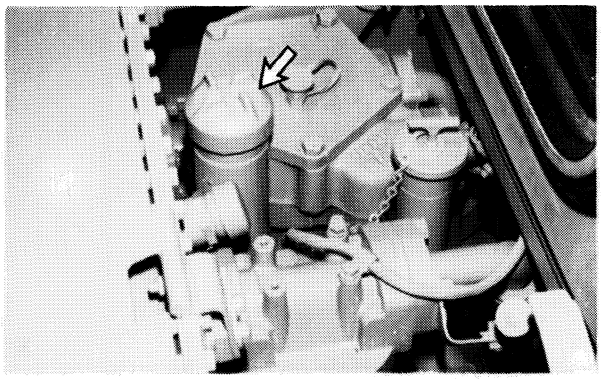
Remove the fill cap only when the engine is stopped, and the cap is cool enough to touch with your bare hand. Remove the fill cap slowly to relieve pressure.

NOTICE

Never remove the cap from the implement hydraulic tank if oil is hot. Air can enter system and cause pump damage.



The hydraulic oil tank is located on the right side of the machine. Open the top access cover for fill tube access.



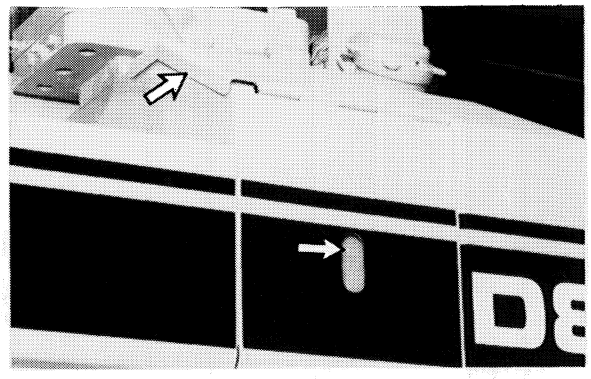
Add oil through the fill tube to maintain the oil level to the FULL mark in the sight gauge.

Pivot Shaft

Look at the Oil Level

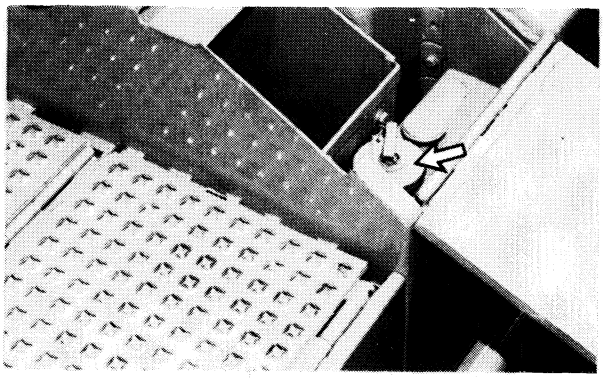
⚠ WARNING

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



Maintain the oil within the limits of the sight gauge. Overfilling can cause hot oil to overflow the reservoir.

Open the access cover to add oil.



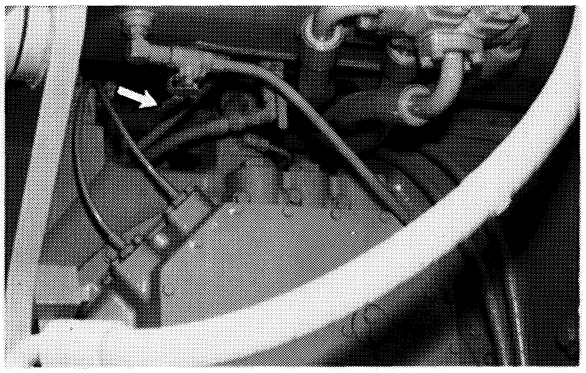
Remove the oil fill cap to add oil to the oil reservoir.

Fuel Tank

Drain the Moisture and Sediment

⚠ WARNING

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

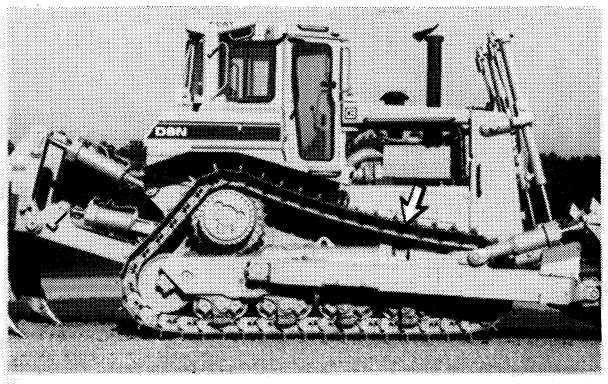


1. Open the drain valve and allow the moisture and sediment to drain.

2. Close the drain valve.

Tracks

Inspect for Proper Adjustment



Visually inspect the tracks. Check for wear and excessive dirt buildup on track components.

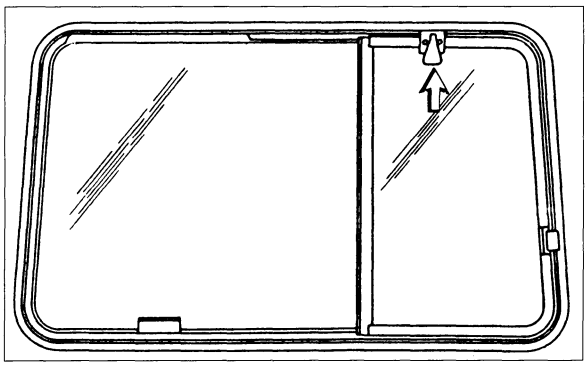
If track appears to be too tight or too loose, see "Tracks" under Every 250 Service Hours or Monthly.

Walk-Around Inspection

Inspect Machine

See "Walk-Around Inspection" in the 'Before Starting the Engine" section.

Cleaning Windows



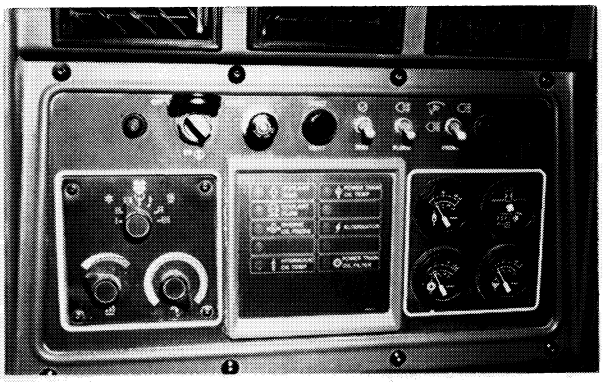
Use commercially available window cleaning solutions to clean the windows.

Remove the rear window by lifting the latch and sliding the window to the full open position. Lift the window out of track to remove.

NOTE: Cleaning of rear window should be done from inside of cab.

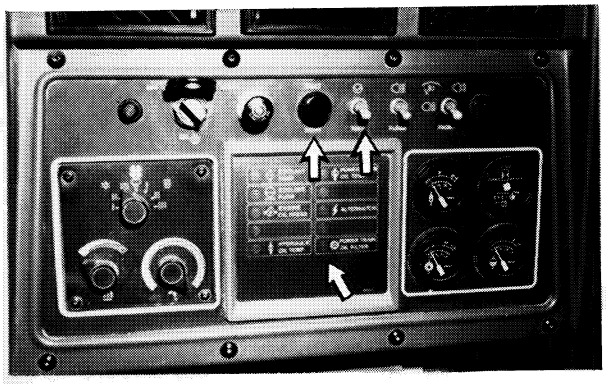
Indicators and Lights

Test and Inspect for Broken Gauges



1. Look for broken lights, indicator gauges or Electronic Monitor System (EMS) panel damage.

2. Allow the engine to warm up at LOW IDLE for five minutes. To help speed the warmup of hydraulic components, engage and disengage all hydraulic implement controls.

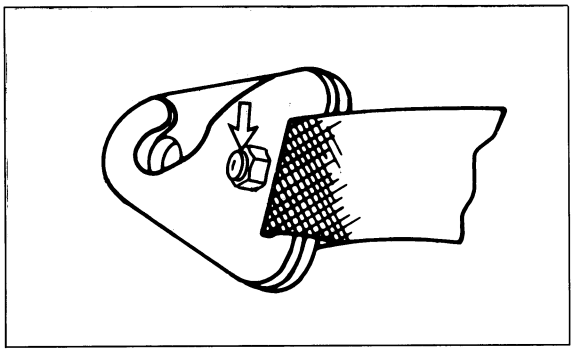


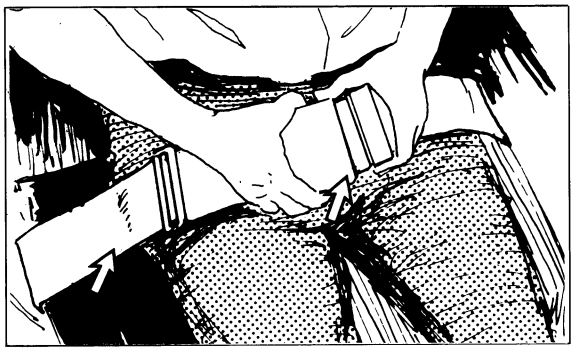
3. Push the EMS Fault Light test switch. The warning horn should sound. The fault light and the EMS panel should FLASH, until the EMS test switch is released.

4. If the lights or horn did not come on, have necessary repairs made.

Seat Belt

Inspect for Wear or Damage





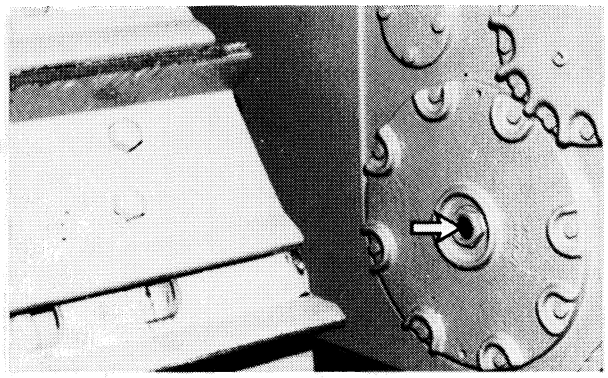
Seat belt and mounting hardware must be inspected for wear or damage. Replace the belt or mounting hardware if worn or damaged.

Winch (If Equipped)

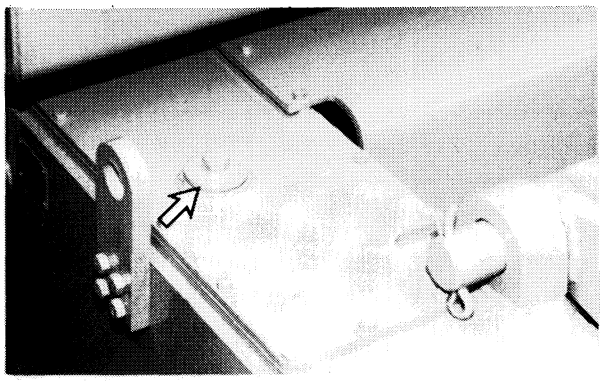
Look at the Oil Level

⚠ WARNING

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



With the engine at LOW IDLE, the oil must be visible in the sight gauge.

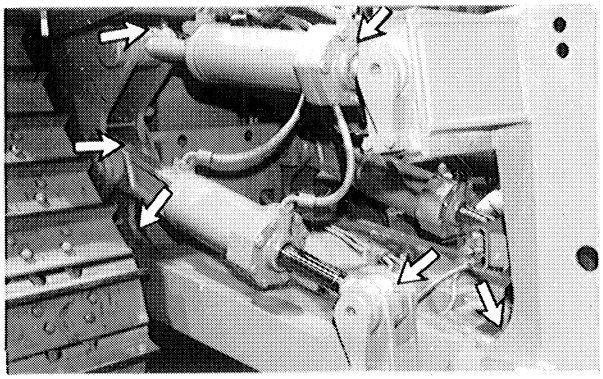


If necessary to add oil, remove the oil fill plug.

Check and repair any oil leaks around covers or hoses.

Ripper Linkage and Cylinder Bearings

Lubricate the Fittings



Lubricate twelve fittings. Six on each side.

Tracks

Inspect Weekly

⚠ WARNING

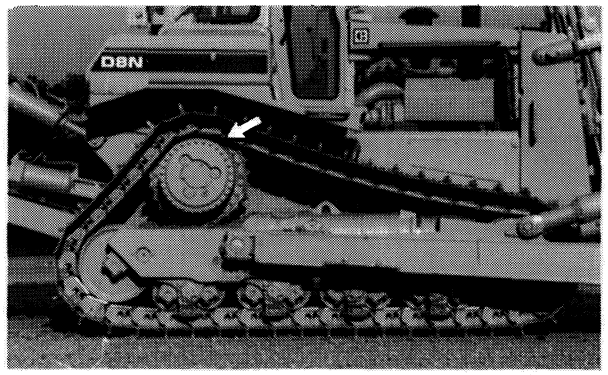
The pins and bushings in a dry joint can become very hot. It is possible to burn the fingers if there is more than brief contact with these components.

Grease is under High Pressure.

Grease coming out of the relief valve under pressure can penetrate the body causing injury or death.

Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened.

Loosen the relief valve one turn only.



Follow these hints to extend the undercarriage life and to avoid excessive downtime.

1. Listen for track squeak or squeal during machine operation. This can indicate a dry joint.

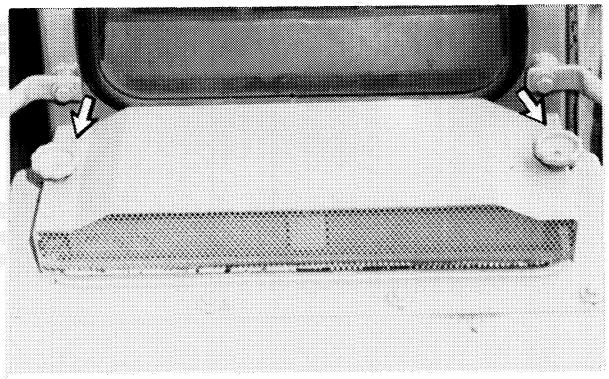
2. Check for dry joints once a week, immediately after machine operation. After machine operation, lightly touch the end of each track pin or bushing, with the back of your hand. Make a mark on any joint that is very hot to the touch.

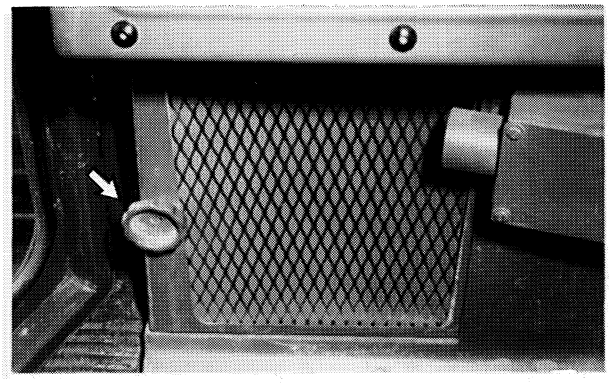
Consult your Caterpillar dealer's Custom Track Service expert upon detection of dry joints or leaks and/or for track inspection.

Cab Air Filter Elements

Clean the Filter Elements

Clean the filter elements daily when there is a reduction of air circulation.





1. Remove the covers.

2. Remove and clean the filter elements. See "Cleaning the Filter Elements."

3. Install the cleaned filter element.

4. Replace the cover and tighten the bolts.

Cleaning the Filter Elements

⚠ WARNING

Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

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

Elements can be cleaned with pressure air or pressure water.

1. Wash them in clean water and household detergent.

2. Rinse thoroughly with clear water, and blow dry with pressure air.

NOTICE

Do not clean the elements by bumping or tapping them.

Inspect the elements after cleaning. Do not use an element with damaged pleats, gaskets or seals.

When cleaning with pressure water, use 280 kPa (40 psi) maximum pressure to prevent element damage.

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3. Direct air or water along pleats inside and outside of the element.

4. Air dry and inspect the element to see if any debris remains visible.

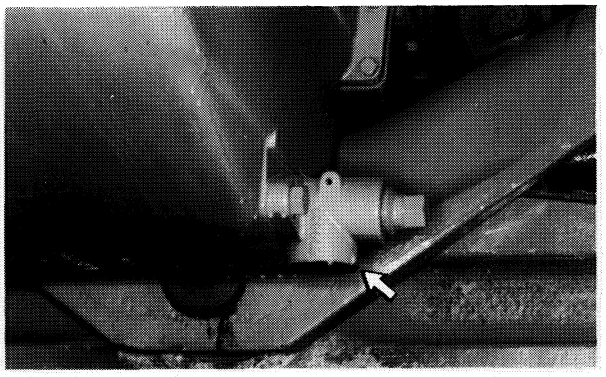
Engine Crankcase Oil and Filter

Change the Oil and Filter

⚠ WARNING

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

1. Crankcase drain valve access cover located in the crankcase guard.



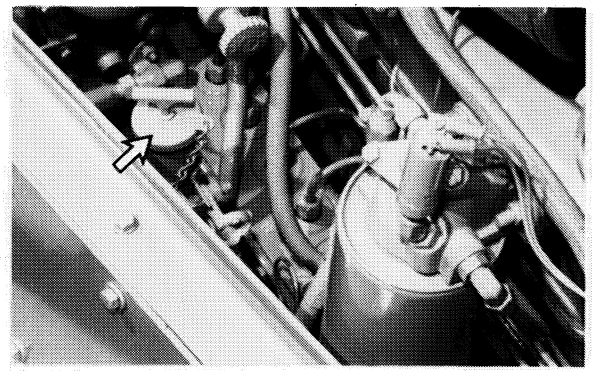
2. Drain port can be used to install a drain hose to avoid splashing oil. Open the drain valve to allow the oil to drain.

3. After all of the oil has drained, close the drain valve and remove the hose.

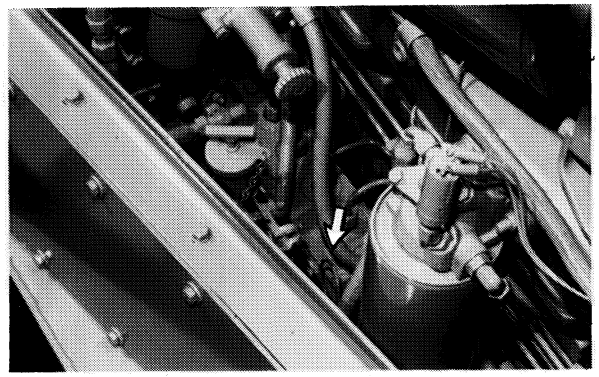
4. Remove and discard the crankcase oil filter element. Make sure all of the old filter seal is removed from the filter base.

Apply a thin coat of oil to the seal on the new filter.

5. Install the filter by hand until the filter contacts the base. Tighten 3/4 turn more. There are rotation index marks on each new filter spaced 90° apart, to be used as a guide for tightening.



6. Remove cap to add the oil. See "Refill Capacities."

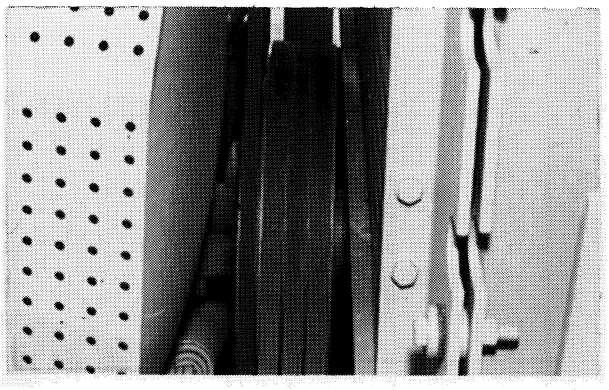


7. Always measure the oil with the dipstick to make certain the quantity of oil added is correct.

8. Maintain the oil between the marks on the dipstick.

Alternator and Air Conditioner Belts

Adjust Belts



Measure the deflection of the belts. Apply approximately 110 N (25 lb.) force midway between the drive pulley and the alternator and air conditioning compressor pulley. Deflection should be 14 to 20 mm (9/16 to 13/16 inch).

If deflection is not correct, loosen the mounting bolts and adjust the belt.

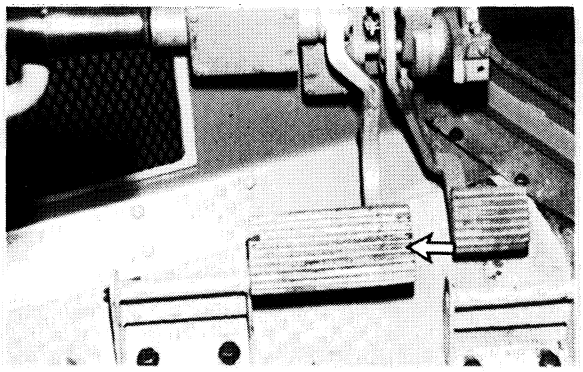
Look at the condition of the belt. Replace if cracked or frayed.

Brakes

Test the Brakes

1. Start the engine.

2. Raise all lowered equipment.



3. Depress the brake pedal.

4. Release the parking brake.

5. With the brake pedal applied, engage the transmission into 2nd speed forward.

6. Gradually increase the engine speed to full load speed. The machine must not move.

⚠ WARNING

If the machine moves during the test, reduce the engine speed immediately, and apply the parking brake.

If the machine moved while testing the brakes, consult your Caterpillar dealer for brake inspection and repair. Damaged brakes must be repaired before returning the machine to operation.

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7. Reduce the engine speed to LOW IDLE. Shift the transmission to NEUTRAL, apply the parking brake. Lower the implements to the ground. Apply a slight down pressure. Stop the engine.

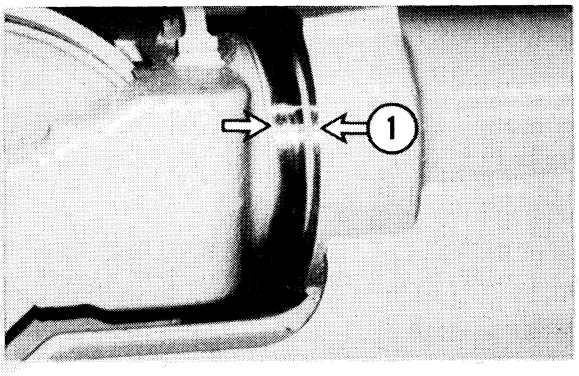
Tracks

Adjust the Tracks

Move the machine forward and allow it to stop without applying the brake pedal.

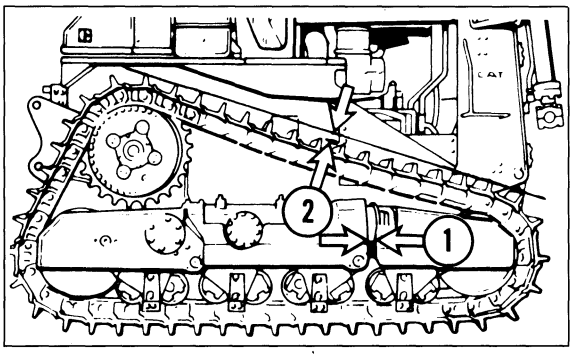
Machine level, all equipment lowered with slight down pressure. Transmission in neutral. Parking brake engaged. Engine stopped.

Tracks should be adjusted under the same conditions in which the machine will be used. If packing conditions prevail on the job, the tracks should be adjusted with packing present.



NOTICE

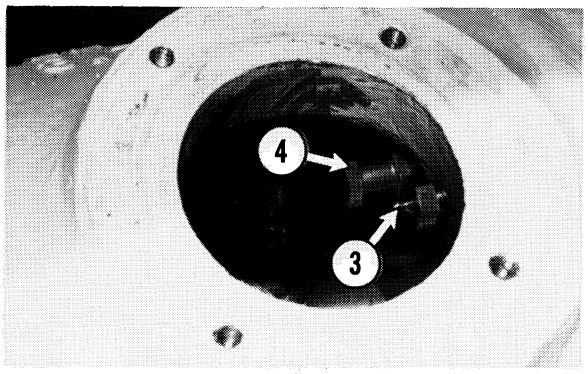
Do not attempt to tighten track when dimension ① is 125 mm (4.9 inches) or more. Contact your Caterpillar dealer for track service or instructions.



The sag in the track is measured between the sprocket and the front idler. Correct adjustment for standard machine gives a dimension ② of 115 ± 10 mm (4.50 ± .40 inches).

If Track is Too Loose:

1. Remove the adjusting valve cover plate.



2. Add multipurpose grease (MPGM) through the adjusting valve ③ until dimension ② is correct.

3. Operate the machine back and forth to equalize the pressure. Allow the machine to coast to a stop. Do not use the brakes.

4. Remeasure dimension ②.

If Track is too Tight:

1. Loosen the relief valve ④ one turn only, and allow the grease to escape.

2. Close the relief valve.

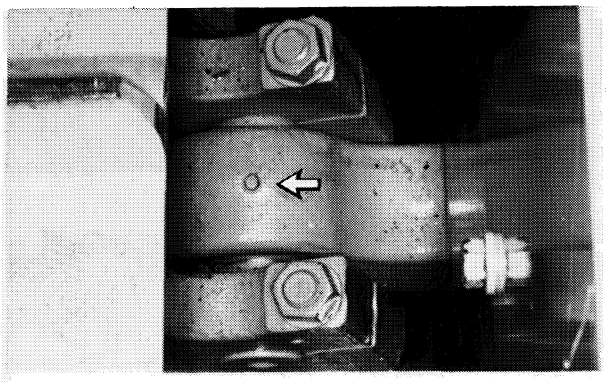
3. Add multipurpose grease (MPGM) through the adjusting valve ③ until dimension ② is correct.

4. Install the valve cover plate.

5. Repeat procedure on other track.

Equalizer Bar End Pins

Lubricate the Fittings



1. Clean area around grease fitting plug. Remove the plug and install a zerk grease fitting.

2. Lubricate fitting with a hand operated grease gun.

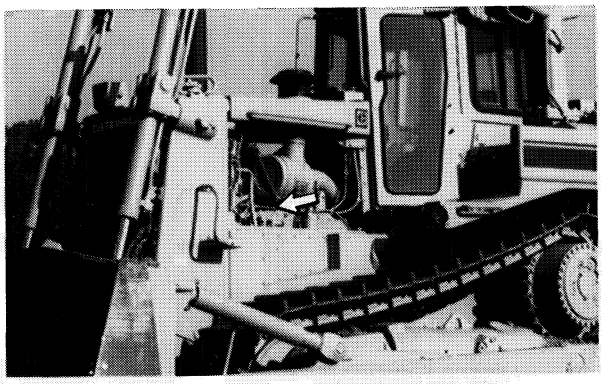
NOTE: Use as many pumps as necessary to cause grease to escape through the relief slots or cause the seals to show evidence of bulging.

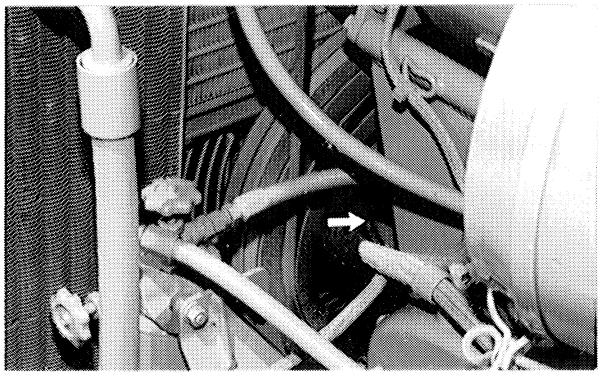
3. Remove the grease fitting. Clean and install the plug.

4. Repeat the procedure on the other side of the machine.

Fan Drive Pulley

Lubricate Fitting





Lubricate the fitting.

Coolant Conditioner

Change Conditioner Element

⚠ WARNING

At operating temperature, the engine coolant is hot and under pressure.

Steam can cause personal injury.

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

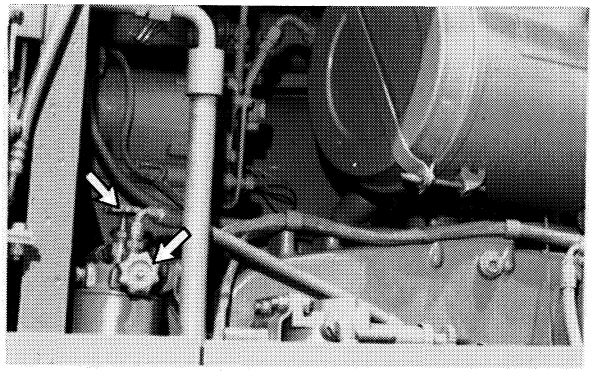
Remove the fill cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes to prevent personal injury.

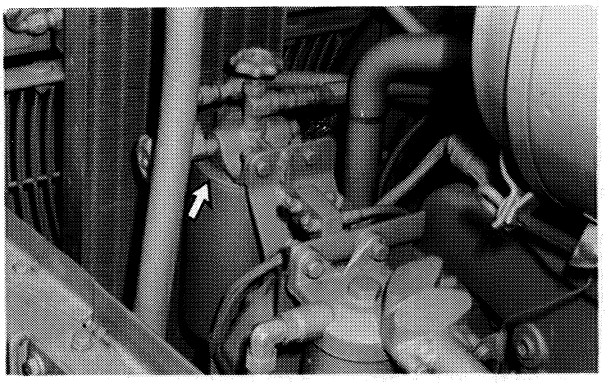
NOTICE

All water is corrosive at engine operating temperature. Use Caterpillar coolant conditioner or a coolant element to treat either plain water or ethylene glycol antifreeze solution.

Excessive coolant conditioner (greater than the recommended 6% initial fill) together with concenrations of antifreeze greater than 65%, cause a mud-like deposit to form. This may result in radiator tube blockage and overheating.



1. Close the valves by turning.



2. Remove and discard the element. Make sure all of the old element seal is removed from the element base.

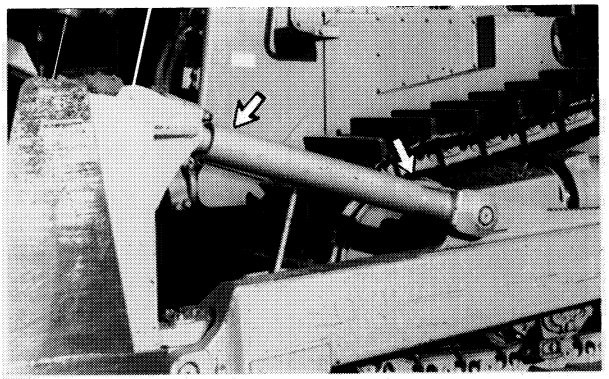
Apply a thin coat of oil to the seal on the new element.

3. Install the element by hand until the element contacts the base. Tighten 3/4 turn more. There are rotation index marks on each new element spaced 90° apart, to be used as a guide for tightening.

4. Open the closed valves.

Bulldozer Tilt Brace

Lubricate the Fittings



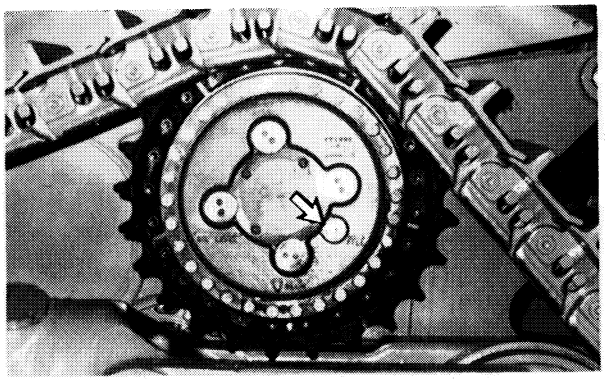
Lubricate two fittings, one on each end of tilt brace.

Final Drive Oil

Look at the Oil Level

⚠ WARNING

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



1. Position one final drive so that the oil fill plug is level with ground as shown.

2. Remove the fill plug. Use care to avoid damage to the magnet.

3. Oil should be to the bottom of the fill plug opening. Add oil if necessary.

4. Clean the magnet on the fill plug.

Clean the magnet with a cloth or brush. Replace any damaged magnet or seal.

5. Install the fill plug.

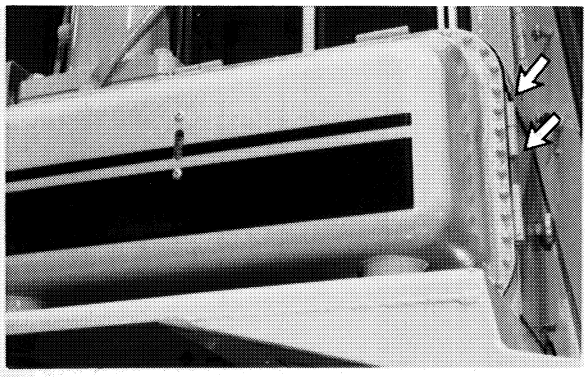
6. Position the other final drive drain plug at the bottom and repeat procedure.

Power Train Oil Filter

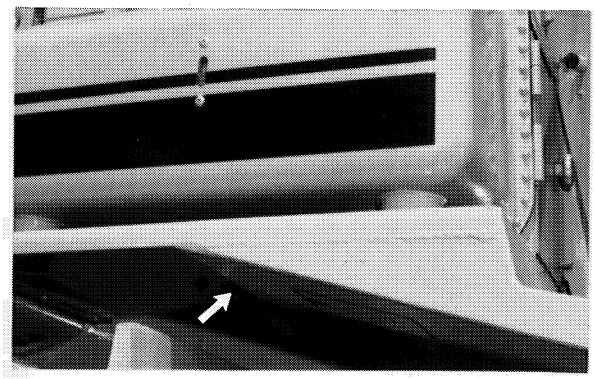
Change the Filter Element

⚠ WARNING

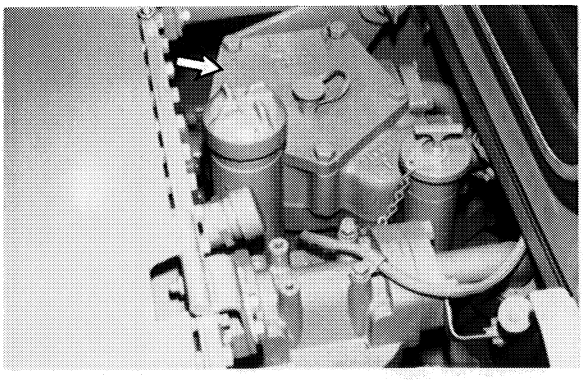
Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.



1. Open the access covers.



2. Remove the oil drain plug cover under filter for access. Remove the oil drain plug and allow the oil to drain.



3. Remove the filter element cover assembly.

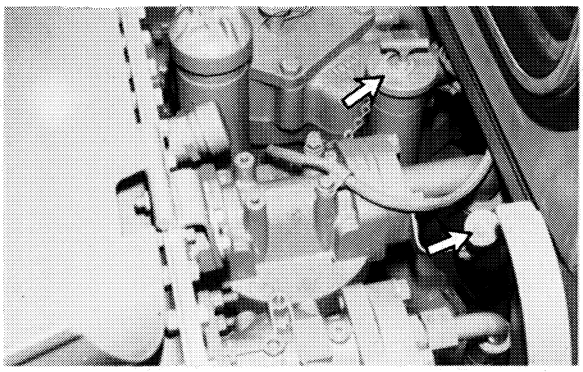
4. Remove and discard the filter element.

5. Clean the housing with a clean cloth. Install the plug.

6. Inspect the seal. Replace it if damaged.

7. Install the new filter element and cover assembly.

8. Start the engine.



9. Maintain the oil level to the FULL mark on the dipstick. Add the oil through fill tube if necessary.

10. Stop the engine.

11. Close the access covers.

Hydraulic System Filters

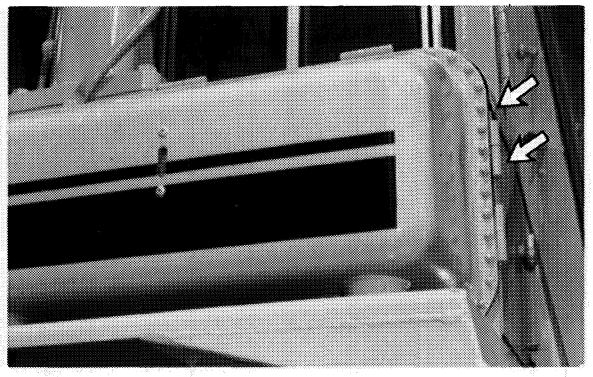
Change the Filter Elements

⚠ WARNING

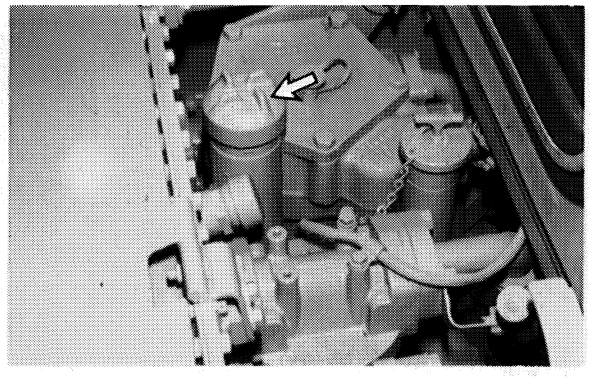
At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil can cause burns.

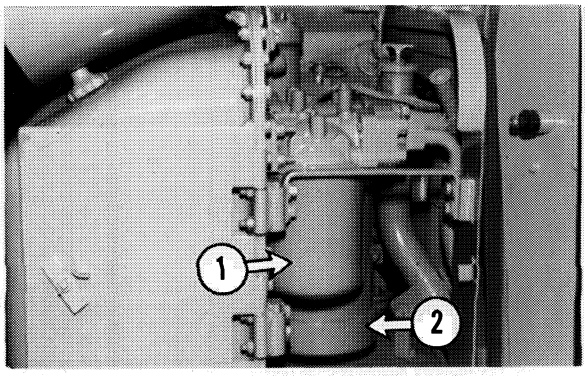
Remove the fill cap only when the engine is stopped, and the cap is cool enough to touch with your bare hand. Remove the fill cap slowly to relieve pressure.



1. Open the hydraulic tank access covers.



2. Remove the oil fill cap and strainer.



3. Remove the filter element ① and discard.

4. Remove filter element housing ②. Use a wrench on housing nut.

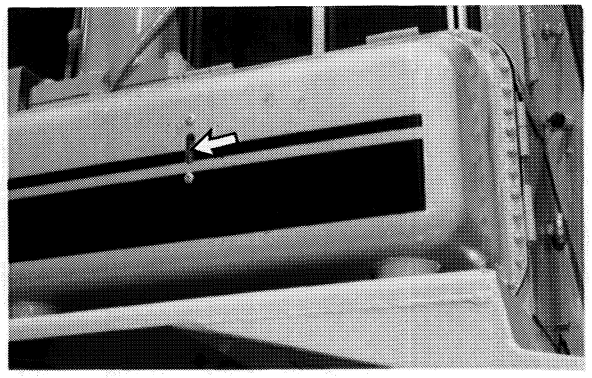
5. Remove the element from the housing.

6. Wash the strainer, cap and housing in clean, nonflammable solvent. Clean the filter bases with a clean cloth.

7. Install a new filter element into housing ②. Install the housing onto the base.

8. Install the new filter element ①.

9. Install the strainer and cap.



10. Maintain the hydraulic oil to the FULL mark in the sight gauge.

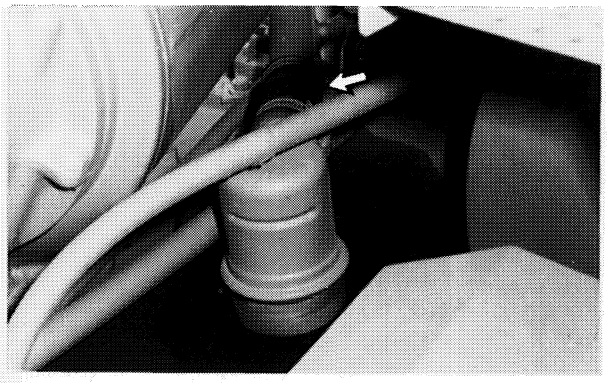
11. Close the access covers.

Engine Crankcase Oil Breather

Remove and Wash the Breather

⚠ WARNING

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



1. Loosen the breather outlet hose clamp and remove the hose from the breather cover.

2. Remove the breather.

3. Check the condition of cover seal. Replace with new seal if the used one is damaged.

4. Wash the element and cover assembly in clean, nonflammable solvent.

5. Shake, or use pressure air, to dry the element.

6. Install the clean breather element cover assembly.

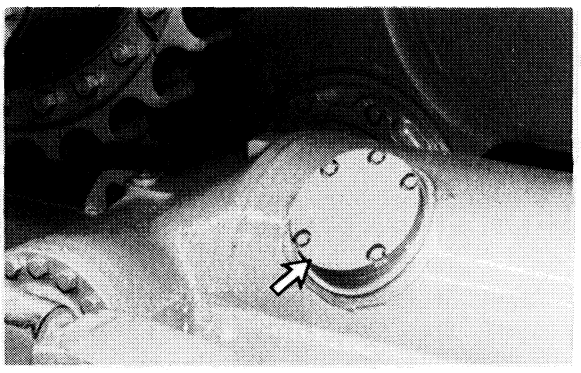
7. Install the hose and clamp.

Recoil Spring Oil Compartment

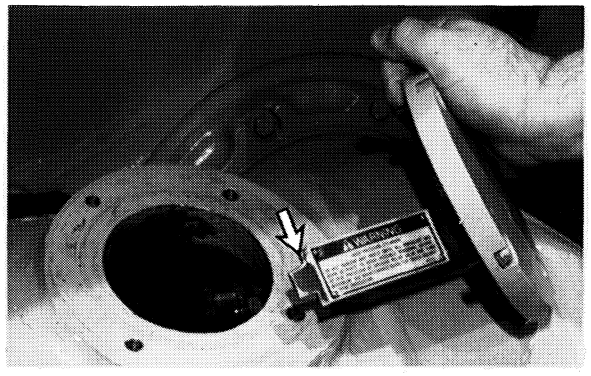
Measure the Oil Level

⚠ WARNING

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



1. Remove the oil fill combination cover plate and dipstick.



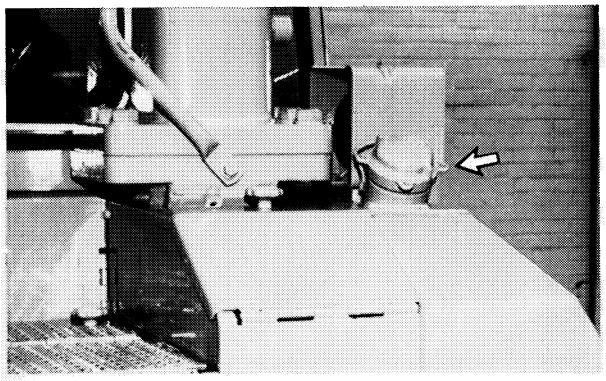
2. Maintain the oil level to the FULL mark (first step) on the dipstick.

3. Install the cover plate.

4. Repeat the procedure on the other recoil compartment.

Fuel Tank Cap and Screen

Clean the Cap and Strainer



1. Remove the fuel tank fill cap and strainer.

2. Disassemble the fuel cap. Wash cap and strainer in clean, nonflammable solvent.

3. Inspect the tank cap seal. Replace it if it is damaged.

4. Put a light coat of oil on the cap components.

5. Assemble the cap and install.

Fuel Filter Elements

Wash Primary Filter Element

⚠ WARNING

Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

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

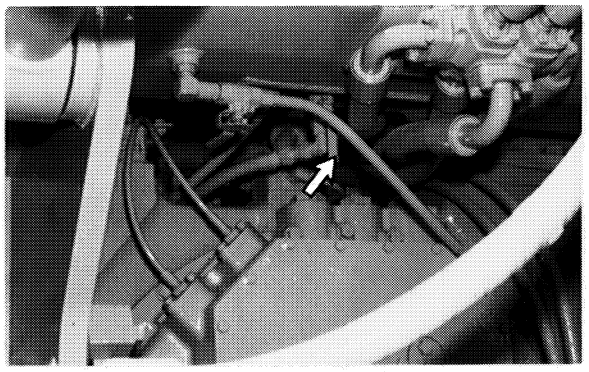
Use all cleaning solutions with care.

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

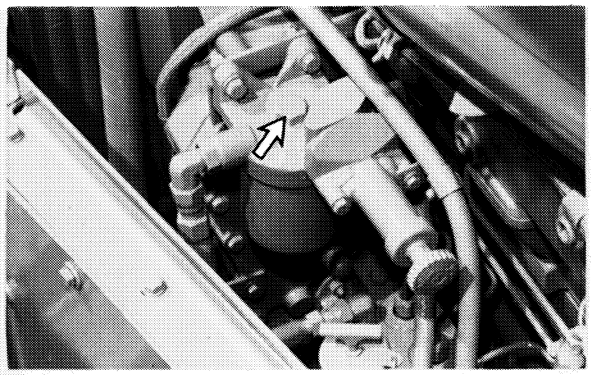
Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.

NOTICE

Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts.



1. Turn the red handled fuel supply valve to shut off the fuel to the engine.



2. Loosen the filter housing retaining bolt.

3. Remove the housing and element.

4. Remove the element from the case.

5. Wash the element and housing in clean, nonflammable solvent.

6. Dry the element using pressure air.

7. Clean the filter case base.

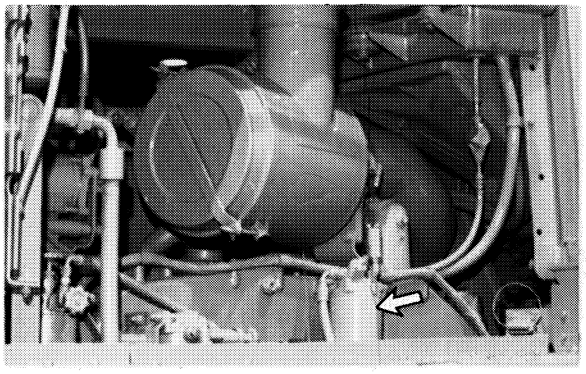
8. Inspect the seal. Replace it if it is damaged.

9. Insert the clean element.

10. Install the element and case into housing.

11. Retighten the retaining bolt to a torque of 24 ± 4 N•m (18 ± 3 lb ft).

Change Secondary Fuel Filter



1. Remove and discard the filter element.

2. Clean the filter element mounting base. Be sure all of the old seal is removed.

3. Coat the seal of the new filter element with clean diesel fuel.

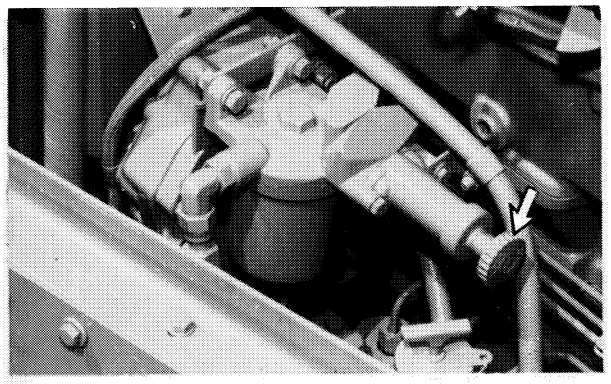
4. Install the new filter element by hand. When the seal contacts the base, tighten 3/4 turn more.

There are rotation-index marks 90° apart on the filter. Use them as a guide for proper tightening.

5. Open the fuel supply valve.

6. Prime the fuel system. (See next topic.)

Priming the Fuel System



1. Pull the priming pump plunger out.

2. Operate the pump to fill the new filter elements with fuel. Continue pumping until resistance is felt, indicating the elements are full of fuel.

3. Push the priming pump plunger down.

4. Start the engine and look for leaks around the filter elements.

5. Close the access door.

If the engine does not start, air is trapped in the fuel lines to the engine.

6. Loosen all fuel injection lines at the cylinder head of the engine. Use two wrenches to avoid breaking fuel line.

7. Move the governor control lever to the LOW IDLE position.

8. Turn the start switch key to START. Crank the engine, until the fuel flows free of air bubbles, from all fuel lines.

9. Stop the engine.

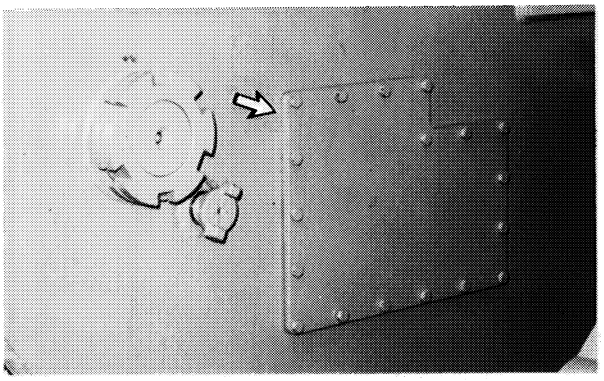
10. Tighten the fuel line nuts to a torque of 40 ± 7 N•m (30 ± 5 lb ft).

Winch Filter and Magnetic Strainer (If Equipped)

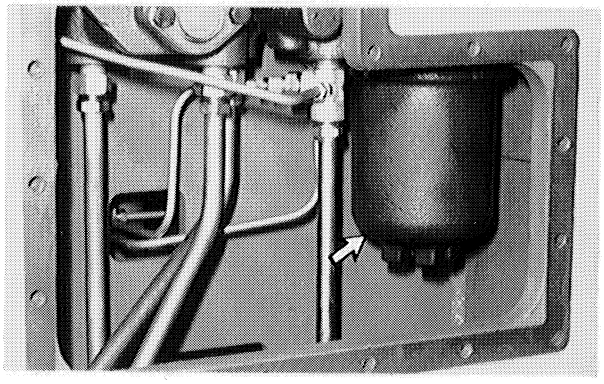
Change Filter - Wash Strainer

⚠ WARNING

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



1. Remove the cover and gasket.



2. Remove the filter element housing with a wrench.

3. Remove the filter element from the housing.

4. Clean the housing with a clean cloth.

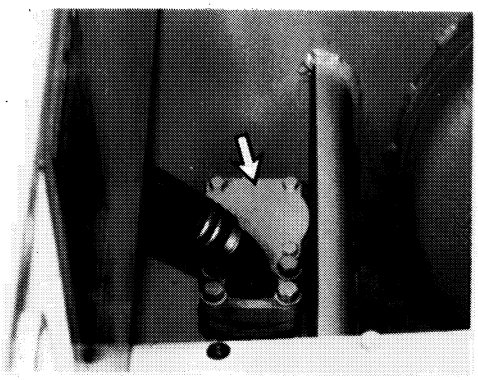
5. Replace the seal if damaged. Lubricate the seals with clean winch oil.

6. Install a new filter element into the housing.

7. Tighten the housing to 27 ± 4 N•m (20 ± 3 lb ft).

8. Install the cover and gasket.

Wash the Magnet and Strainer



1. Remove the cover, magnet and strainer.

2. Wash them in clean, nonflammable solvent.

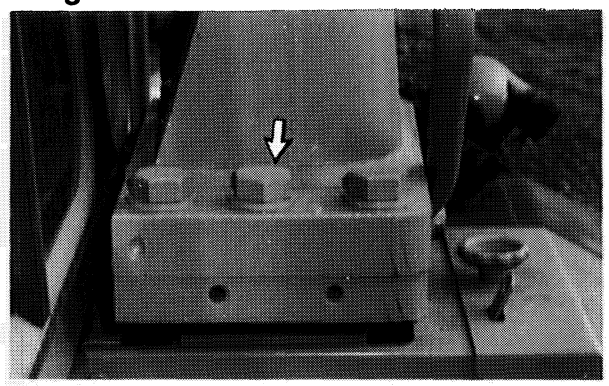
3. Install the clean strainer and magnet.

4. Inspect the cover seal and replace if damaged.

5. Install the cover.

Rollover Protective Structure (ROPS)

Retighten the Bolts



Look for any loose or damaged bolts. Replace damaged bolts or missing bolts with original equipment parts only. Retighten bolts to a torque of 875 ± 100 N•m (645 ± 75 lb ft).

Do not straighten or repair by welding reinforcement plates to the ROPS.

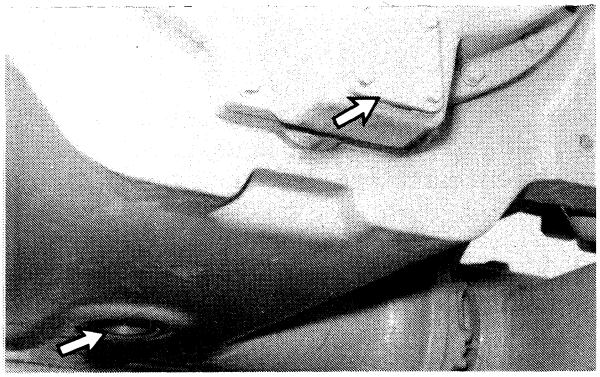
Contact your Caterpillar dealer for repair of cracks in welds, castings or any metal section on the ROPS.

Power Train Oil System

Change Oil and Wash Breather

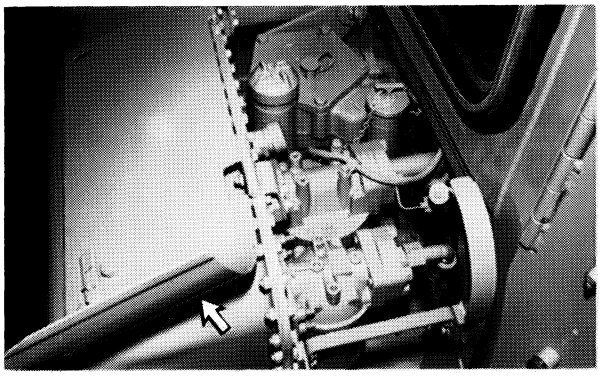
⚠ WARNING

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

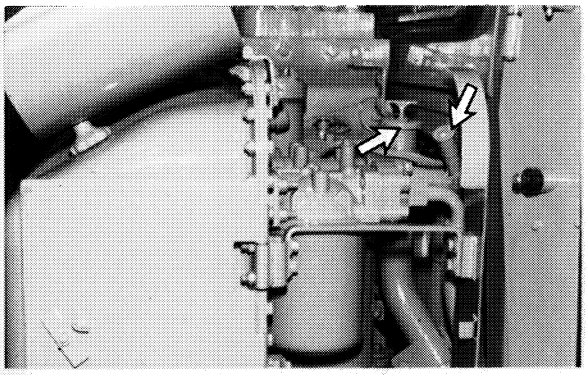


1. Remove the power train oil drain plug, cover and screen.

2. Clean and install the screen, cover and drain plug.



3. Open the oil fill cap access cover.

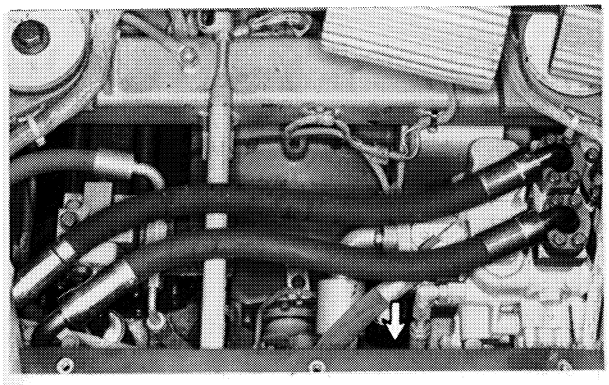


4. Remove the oil fill cap.

5. Add the oil. See "Refill Capacities."

6. Clean and install the oil fill cap.

7. Maintain the oil level to the FULL mark on the dipstick.



8. Unscrew and remove the breather below the floor plate.

9. Wash the breather in clean, nonflammable solvent.

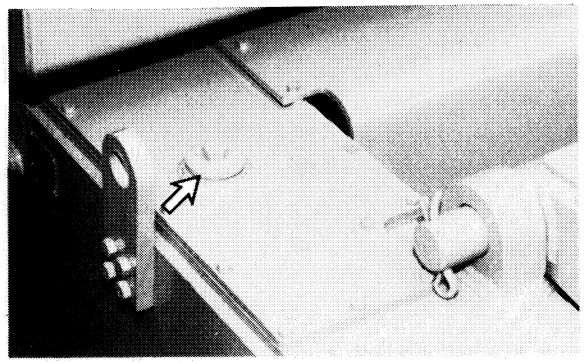
10. Install breather and floor plate.

Winch (If Equipped)

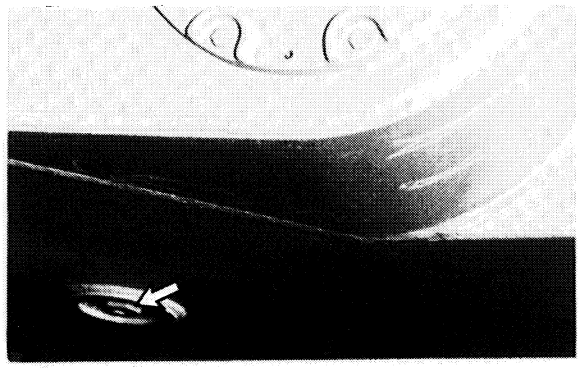
Change Oil and Wash Breather

⚠ WARNING

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



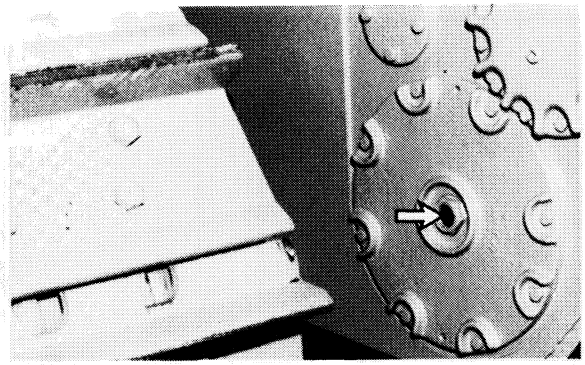
1. Remove the oil fill plug.



2. Remove the drain plug. Allow the oil to drain.

3. Inspect the plug seal and replace if necessary.

4. Clean and install the drain plug.



5. Fill the oil compartment until oil is visible in the sight gauge. See "Refill Capacities."

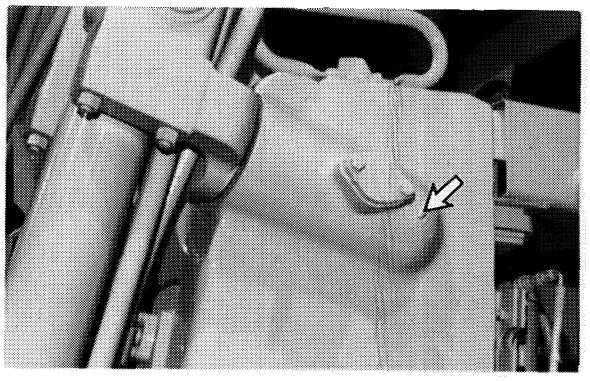
6. Clean and install the fill plug.

7. With the engine running at LOW IDLE, maintain the oil level so that it is visible in the sight gauge.

8. Remove the breather on top of winch case. Wash it in clean, nonflammable solvent and install.

Lift Cylinder Yoke Bearings

Lubricate the Fittings



1. Remove the plug on both sides of the machine.

2. Install a fitting and give five pumps of grease.

3. Remove the fitting and install the plug.

Engine Valve Lash

Adjust Valve Lash

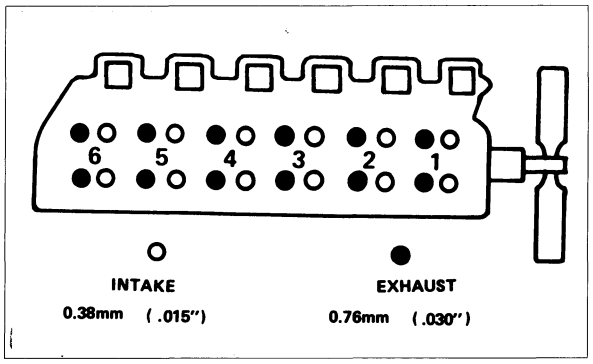
⚠ WARNING

To prevent possible injury, do not use the starter motor to turn the flywheel.

Hot engine components can cause burns. Allow additional time for the engine to cool before measuring valve clearance.

NOTICE

Measure the valve lash with the engine stopped. To obtain an accurate measurement, allow at least 20 minutes for the valves to cool to engine cylinder head and block temperature.



Adjust the valve clearance to within ± 0.08 mm (.003 in) of the valve clearance setting given.

Valve Clearance Setting	
Intake	0.38 mm (.015 in) o
Exhaust	0.76 mm (.030 in) •

Refer to the Service Manual or your Caterpillar dealer for the complete valve adjustment procedure.

After setting valve clearances and before installing the valve cover check valve rotators. See next topic.

Engine Valve Rotators

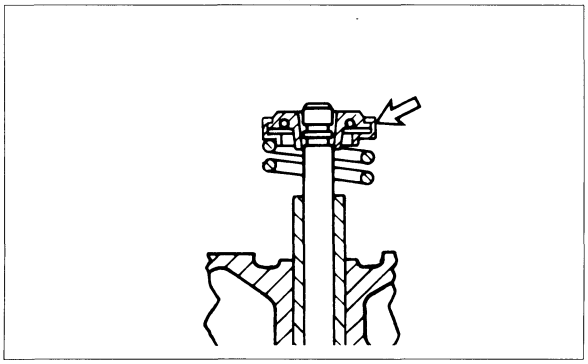
Observe Rotation of Valves With Engine Idling After Setting the Valve Clearances

⚠ WARNING

When inspecting the valve rotators, protective glasses or face shield and protective clothing must be worn, to prevent being burned by hot oil spray.

1. Start the engine.

2. Move the governor control to LOW IDLE position.



3. Watch the top surface on each valve rotator. Each valve rotator should turn slightly each time the valve closes.

4. Stop the engine

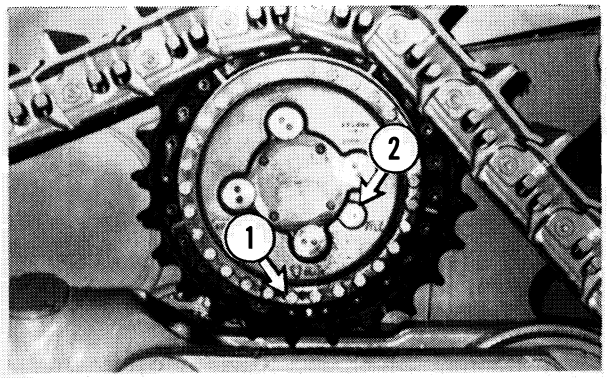
If a valve fails to rotate, contact your Caterpillar dealer.

Final Drive Oil

Change the Oil

⚠ WARNING

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



1. Position one final drive with the oil drain plug at the bottom.

2. Remove the drain plug ①. Allow the oil to drain.

3. Inspect the drain plug seal. Replace the seal if damaged.

4. Clean and install the drain plug.

5. Remove the oil fill plug ②.

6. Fill the final drive to bottom of fill plug opening. See "Refill Capacities."

7. Inspect the condition of oil fill plug seal. Replace the seal if damaged.

8. Clean the fill plug and magnet assembly in clean, nonflammable solvent and install.

9. Repeat steps on the other side of machine.

Hydraulic System Oil

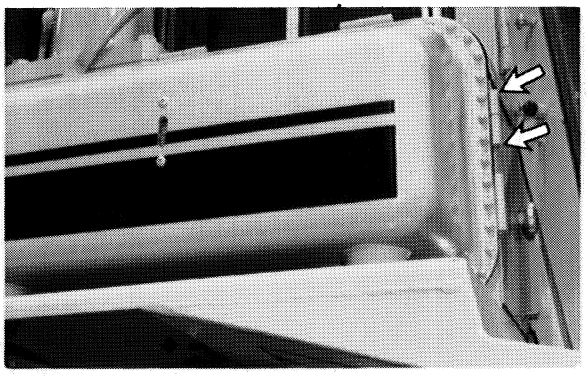
Change the Oil

⚠ WARNING

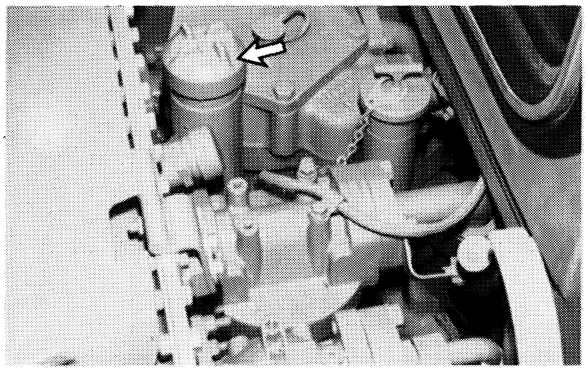
At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil can cause burns.

Remove the fill cap only when the engine is stopped, and the cap is cool enough to touch with your bare hand. Remove the fill cap slowly to relieve pressure.

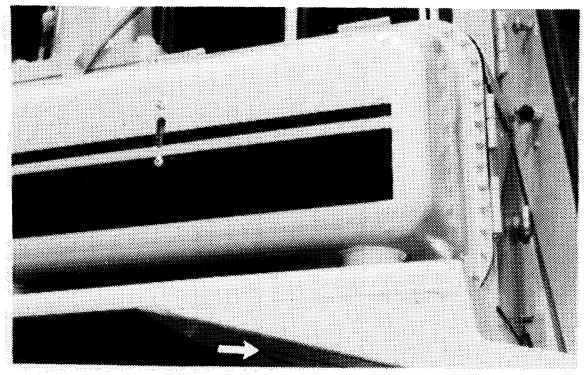


1. Open the access covers.



2. Remove the hydraulic system oil tank filler cap and strainer.

3. Wash the filler strainer and filler cap in clean, nonflammable solvent.



4. Attach a hose to a 1 inch NPT pipe nipple, 10 cm (4 inch) long.

5. Install the pipe nipple and hose into the drain plug opening. Turn the pipe nipple clockwise to open the internal drain valve. Allow the oil to drain.

6. Remove the pipe nipple. This will close the hydraulic oil tank drain valve.

7. Clean and install the drain plug. Tighten the plug to 68 ± 7 N•m (50 ± 5 lb ft).

8. Change the hydraulic system filter. See "Hydraulic System Filter" in the "Every 500 Service Hours or 3 Months" section.

9. Fill the hydraulic system oil tank. See "Refill Capacities."

10. Inspect the filler cap gasket. Replace the gasket if damaged.

11. Install the oil filler cap and close access covers.

12. Start and run the engine for a few minutes.

13. Maintain the oil level to the FULL mark in the sight gauge.

14. Stop the engine.

Cooling System Coolant

Change the Coolant

⚠ WARNING

At operating temperature, the engine coolant is hot and under pressure.

Steam can cause personal injury.

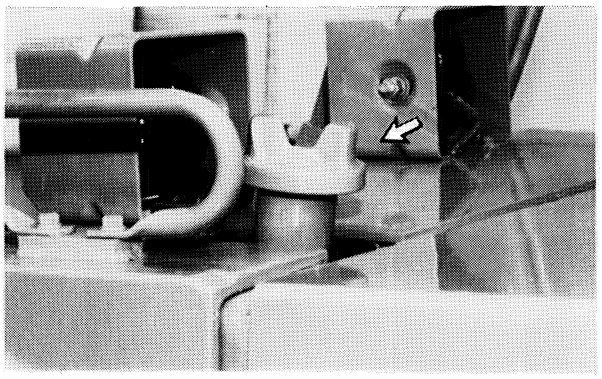
Check the coolant level only after the engine has been stopped and the fill cap is cool enough to touch with your bare hand.

Remove the fill cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes to prevent personal injury.

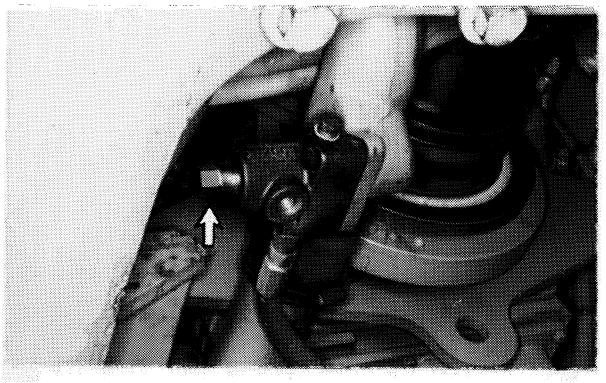
Coolant should be drained and replaced every 2000 service hours or 1 year. However, when adding liquid Caterpillar cooling system conditioner, or equivalent, every 250 service hours as recommended, the drain period can be extended to 4000 service hours or 2 years.

Drain the coolant earlier whenever the coolant is dirty or foaming is observed.



1. Loosen the radiator coolant cap slowly to release pressure, and remove the cap.

2. Remove the access cover located in the engine guard under the engine.



3. Open the valve and allow the coolant to drain. Close the coolant drain valve.

4. Fill the cooling system with a cleaning solution. Use a commercially available cleaner or 1 kg (2 lbs) sodium bisulfate per 38 liters (10 gal) water as a cleaner.

5. Start and operate the engine for 1/2 hour. Stop the engine and drain the cleaning solution.

6. Flush the system with water with the engine stopped, until the draining water is clear.

7. Close the drain valve. Fill the system with a neutralizer. Use a commercially available neutralizer.

8. Operate the engine for ten minutes. Stop the engine and drain the neutralizer.

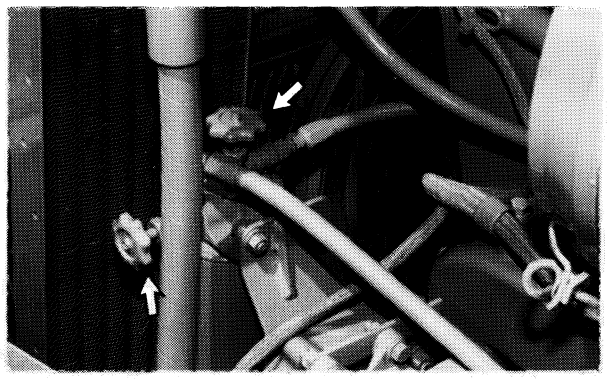
9. Flush the system with water with the engine stopped, until the draining water is clear. Close the drain valve.

10. Fill the system with clean water and operate the engine for five minutes.

11. Drain the cooling system and close the drain valve. Repeat the flushing procedure until the draining water is clear.

NOTICE

Do not change element when using Caterpillar antifreeze. Change element only when using other than Caterpillar antifreeze.



12. Turn and close the coolant element valves.

13. Remove and discard the element. Make sure all of the old element seal is removed from the element base.

14. Apply a thin coat of oil to the seal on the new element.

15. Install the element by hand until the element contacts the base. Tighten 3/4 turn more. There are rotation index marks on each new element spaced 90° apart, to be used as a guide for tightening. Open the closed valves.

16. Add the coolant solution. See "Refill Capacities."

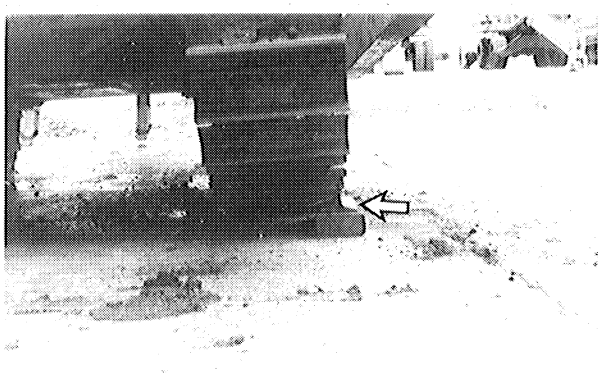
17. Start the engine and operate it with the radiator cap off, until the thermostat opens and the level stabilizes.

18. Maintain the coolant level above the low level plate. Install the radiator cap and stop the engine.

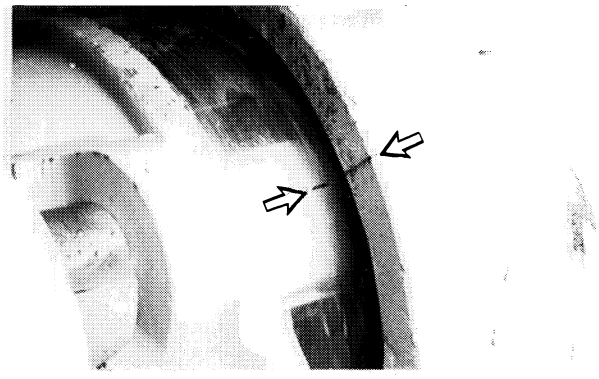
Track Roller Frame Guides

Measure Wear

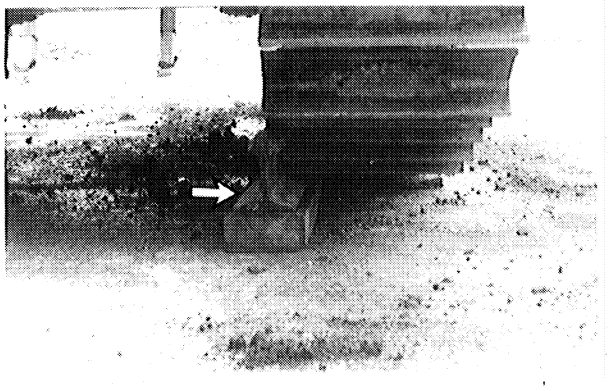
Measure the rotational movement of the front roller frame relative to the rear roller frame.



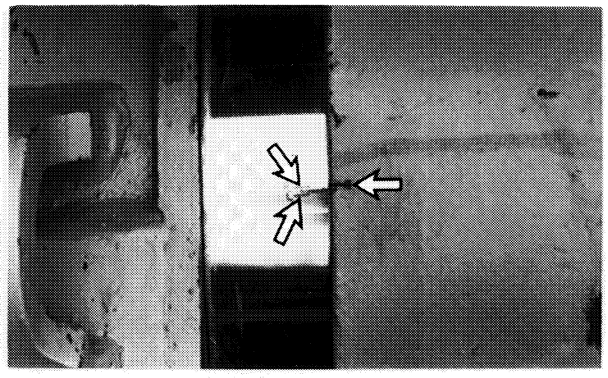
1. Raise the front of the machine with the dozer hydraulics. Place a 100 mm (4 inch) block under the outside end of a track grouser near the idler. Lower the machine onto the block.



2. Use a grease pencil to make a mark on the tubular section of the front roller frame and a corresponding mark on the rear roller frame.



3. Raise the front of the machine with the dozer hydraulics. Place the block under the inside edge of the same track grouser. Lower the machine onto the block.



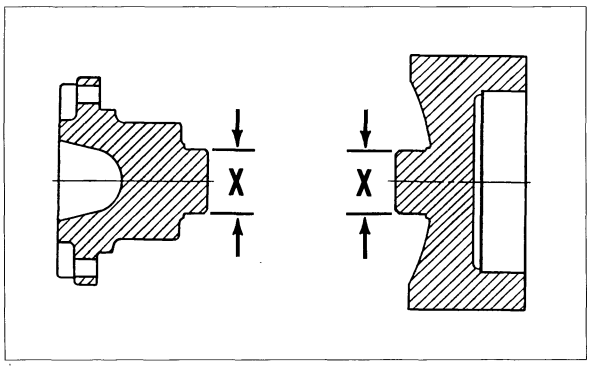
4. Put a mark on the tubular section of the front roller frame corresponding with the mark on the rear roller frame. Measure the distance of the two marks on the front roller frame.

If the distance between the two marks is more than 4.5 mm (0.18 inch), inspect the track roller frame guides for wear.

Repeat the entire procedure on the other side of the machine.

NOTICE

NEVER build up the track roller frame guides with hard-face welding. This will cause serious wear damage to the guide slots in the front track roller frame.



If the dimension (X) is less than 45.3 mm (1.78 inch), replace the track roller frame guides. See your nearest Caterpillar dealer for information or service.

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