Foreword

This manual contains safety precautions, operation instructions and lubrication and maintenance information.

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.

Operation

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.

Maintenance

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

Maintenance Intervals

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

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

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

Machine Description

Ver imagen

This machine is equipped with a direct-injection 3304 engine. It has spring-actuated/air pressure released brakes.

The machine is primarily used for moving material.

Safety

Warning Signs and Labels

These 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.

Ver imagen

Located in the cab.

WARNING

Structural damage, an overturn, modification, alteration, or improper repair can impair this structure's protection capability thereby voiding this certification. Consult a Caterpillar dealer to determine this structure's limitations without voiding its certification.

Ver imagen

Located on the ROPS.

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.)

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Located on the battery compartment access cover.

WARNING

Compressed Spring.

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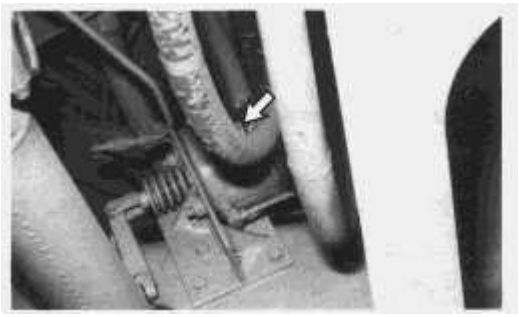

Located on the roto chamber.

WARNING

No clearance for man in this area when turning machine. When machine is to be lifted, transported on another machine or service work is being performed near center of machine: Connect steering frame lock

link between front and rear frames to keep machine in straight ahead position.

Before operation and when operating: Be sure steering frame lock link, located near lower center of machine, is disconnected and pinned to retaining plates.

Ver imagen

Located on the machine at the center pivot.

General Hazard Information

Ver imagen

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.

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

Never put maintenance fluids into glass containers.

Use all cleaning solutions with care.

Report all needed repairs.

Do not allow unauthorized personnel on the machine.

* Park the machine on level ground.
* Move the transmission control to NEUTRAL.
* Move all attachment controls to HOLD.
* The engine stopped.
* The start switch key off and the key removed.
* The parking/secondary brake engaged.
* The disconnect switch off and the key removed.

Pressure Air

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.

Fluid Penetration

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

Asbestos Information

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

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

* Never use compressed air for cleaning.
* Avoid brushing or grinding of asbestos containing materials.
* For clean up, use wet methods or a vacuum equipped with a high efficiency particulate air (HEPA) filter.
* Use exhaust ventilation on permanent machining jobs.
* Wear an approved respirator if there is no other way to control the dust.
* 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).
* Follow environmental rules and regulations for disposal of asbestos.
* Avoid areas where asbestos particles may be in the air.

Crushing or Cutting Prevention

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

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

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

Stay clear of all rotating and moving parts.

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

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

Retainer pins, when struck with force, can fly out and injure nearby persons. Make sure the area is clear of people when driving retainer pins.

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.

Rollover Protective Structure (ROPS)

This is an attached guard located above the operator's compartment and secured to the machine.

To avoid possible weakening of the Rollover Protective Structure (ROPS), consult a Caterpillar dealer before altering the 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.

Burn Prevention

Coolant

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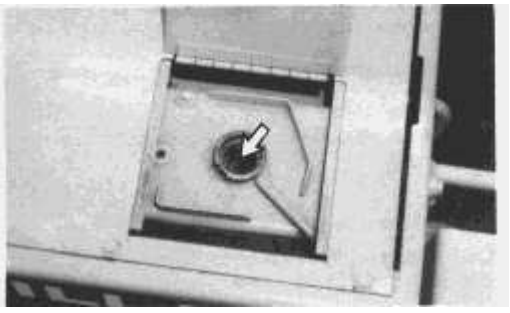

At operating temperature, the engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot water or steam. Any contact can cause severe burns.

Steam can cause personal injury.

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

Remove the cooling system filler cap slowly to relieve pressure.

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

Allow cooling system components to cool before draining.

Oils

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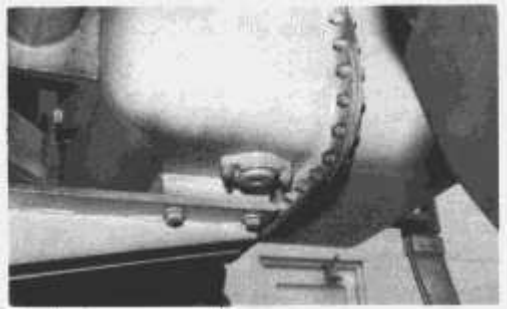

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact the skin.

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

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

Remove the hydraulic tank filler cap slowly to relieve pressure.

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

Batteries

Ver imagen

Batteries give off flammable fumes which 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.

Fire or Explosion Prevention

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

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

Do not smoke while refueling or in a refueling area.

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

Batteries in series may be located in separate compartments. When using jumper cables always connect positive (+) cable to positive (+) terminal of battery connected to starter solenoid and negative (-) cable from external source to starter negative (-) terminal. (If not equipped with starter negative terminal, connect to engine block.)

See the "Operation Section" of this manual for specific 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.

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

Ether

Ether is poisonous and flammable.

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

Use ether only in well ventilated areas.

Do not smoke while changing ether cylinders.

Use ether with care to avoid fires.

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

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

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

Keep ether cylinders out of the reach of unauthorized personnel.

Lines, Tubes and Hoses

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

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

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

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

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

Tire Information

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

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

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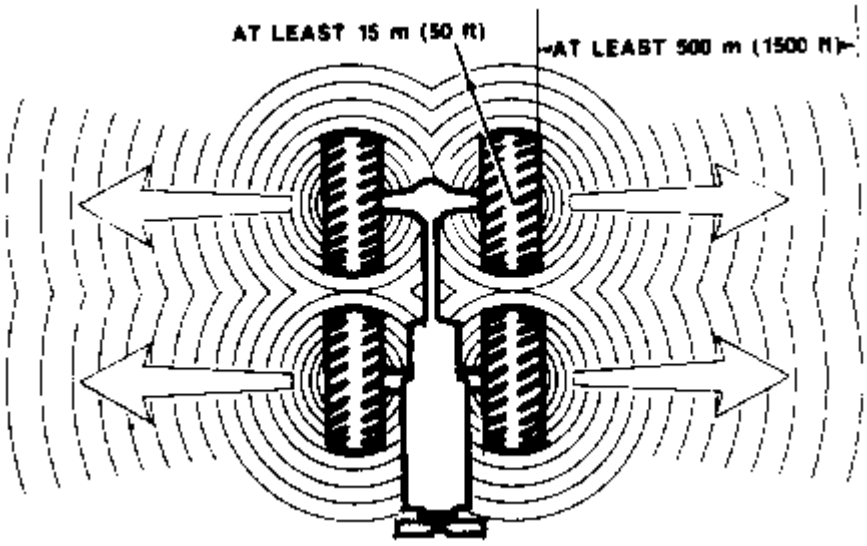

Do not approach a tire closer than the outside of the area represented by the shaded area in the above drawing.

Dry nitrogen (N^2) gas is recommended for inflation of tires. If the tires were originally inflated with air, nitrogen is still preferred for adjusting the pressure. Nitrogen mixes properly with air.

Nitrogen inflated tires reduce the potential of a tire explosion, because nitrogen does not support combustion. Also, nitrogen helps prevent oxidation and the resulting deterioration of rubber and corrosion of rim components.

corrosion of rim components.

Proper nitrogen inflation equipment and training in its use are necessary to avoid overinflation. A tire blowout or rim failure can result from improper or misused equipment.

Ver imagen

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

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

Mounting and Dismounting

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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.

Before Starting the Engine

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

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

Adjust the seat so that full 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.

Engine Starting

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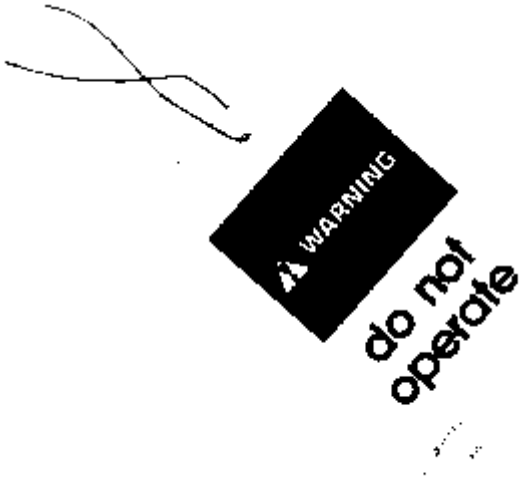

Do not start the engine or move any of the controls if there is a "DO NOT OPERATE" or similar warning tag attached to the start switch or controls.

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

Move the transmission control lever to NEUTRAL.

Engage the parking/secondary brake.

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

Before Operating the Machine

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.

Adjust the rear view mirrors (if equipped) for best vision, especially close to the machine.

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

Fasten the seat belt securely.

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

Machine Operation

Operate the machine only while seated

Operate the machine only while seated.

Operate the controls only with the engine running.

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

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

Report any needed repairs noted during operation.

Carry attachments 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.

Know the maximum height and reach of your machine.

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

Machine Parking

Ver imagen

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 control lever to NEUTRAL.

Engage the parking/secondary brake control.

Lower all attachments to the ground.

Stop the engine.

Turn the start switch key to OFF and remove.

Turn the disconnect switch key to OFF and remove.

Specifications and Model Views

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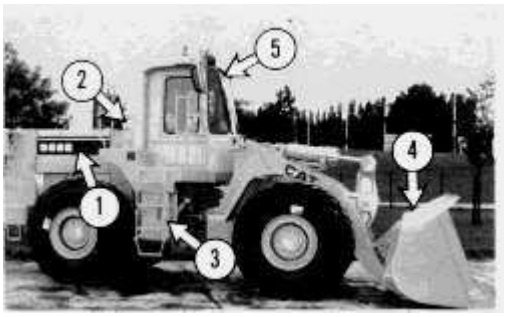

Engine (1), fuel tank (2), hydraulic tank (3), bucket or other implement (4), and cab or canopy (5).

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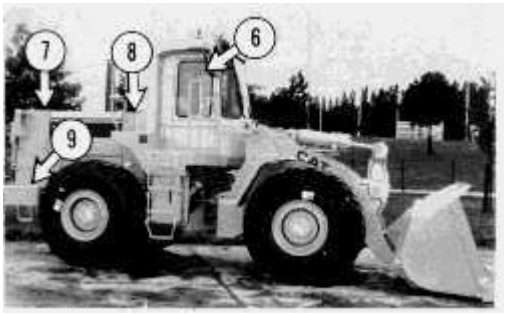

Operator's compartment (6), radiator (7), transmission (8), and battery (9).

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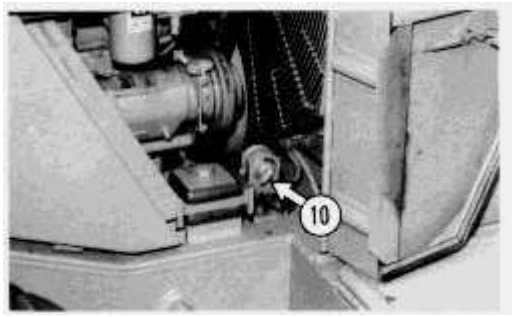

Key disconnect switch (10).

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Basic machine shipping specifications are listed below.

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966E Wheel Loader	
Weight (approximate)	18 350 kg (40,420 lb)
Length (maximum)	7 820 mm (25 ft 8 in)
Width (across tires)	2 870 mm (9 ft 5 in)
Height	3 560 mm (11 ft 8 in)

Product Identification and Serial Number Locations

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

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

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

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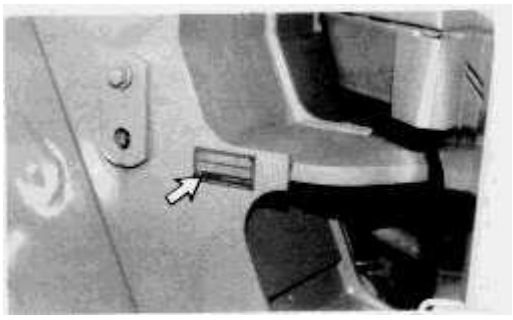

Machine PIN _____

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Service Information Number Plate (SIN)

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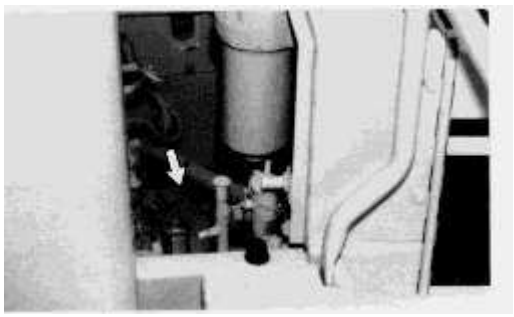

Transmission Serial Number _____

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Engine Serial Number _____

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Bucket Serial Number _____

Monitoring System and Cab Features

Battery Disconnect Switch

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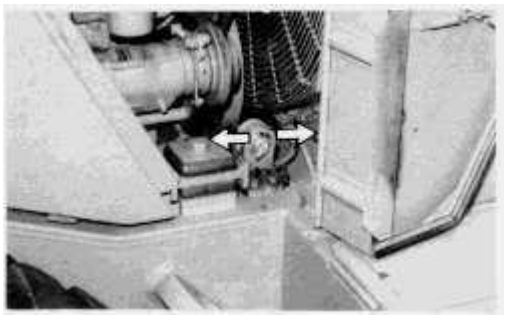
Ver imagen



Disconnect Switch ON - Insert the key, and turn it to the right, to turn ON the electrical system.

Disconnect Switch OFF - Turn the key to the left to turn OFF the electrical system.

Remove the key when leaving the machine. Also, remove the key when servicing the electrical system.

NOTICE

Never turn the disconnect key off with the engine running. Engine damage could result.

Engine Start Switch

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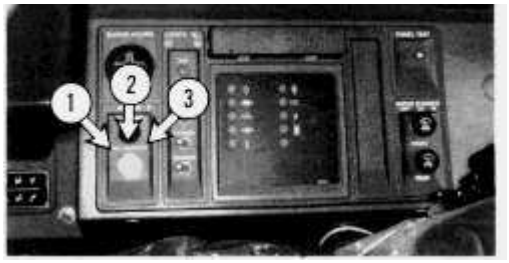

OFF (1) - No power to most electrical circuits in the cab. The cab lights, panel lights, tail lights and the fuel gauge light are operational even with the switch in the OFF position.

ON (2) - Turn the switch clockwise and all circuits in the cab are operational.

START (3) - Starts the engine, key returns to the ON (2) position when released.

Starting Aid

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Starting Aid (If Equipped) - Depress the knob, while cranking only, when starting aid is required during cold weather. This releases a premeasured amount of ether into the air intake.

Electronic Monitoring System (EMS)

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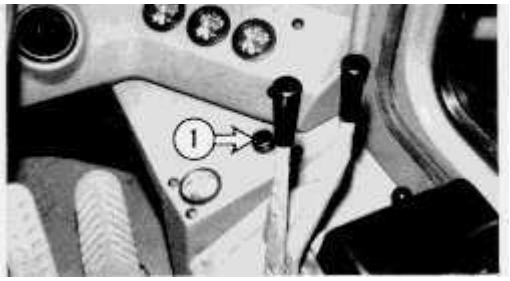

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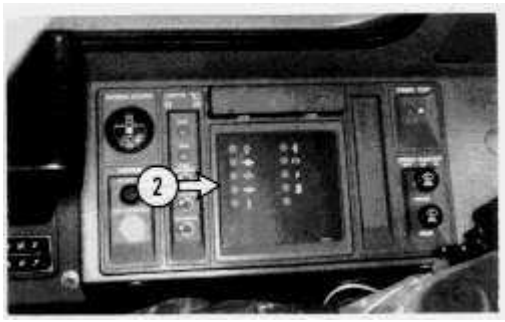

The Electronic Monitoring System (EMS) consists of a fault alarm, a fault light (1) and a monitoring panel (2) with individual indicators for each machine system listed on the panel.

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.

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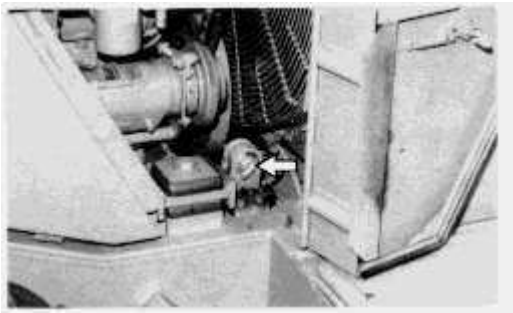

The disconnect switch must be turned to ON to supply electrical power to the operator's compartment for the EMS to function.

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 Categories

The EMS provides three warning categories. The first category requires only operator awareness. The second warning category needs operator response. The third warning level requires immediate shutdown of the machine systems.

Warning Category 1

At this category, 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.

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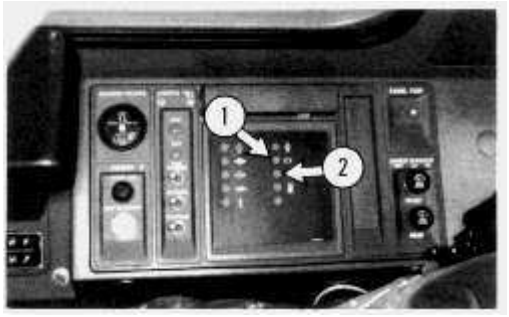

Parking/Secondary Brake (1) - Indicates parking/secondary brake is engaged and transmission is in NEUTRAL. The indicator should come on during start-up. It should go out when the parking/secondary brake is released.

Alternator (2) - 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 Category 2

At this category, 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.

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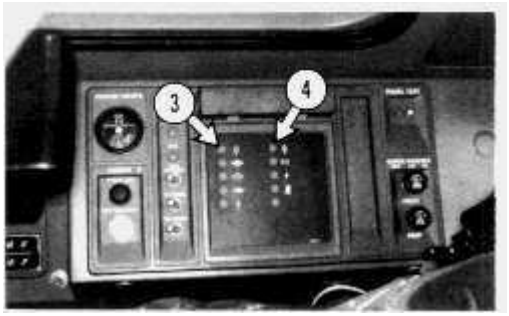


Coolant Temperature (3) - Indicates excessive coolant temperature. If this indicator comes on, pull the machine to a convenient stop. Investigate the cause.

Do not operate the machine if the indicator stays on, and the fault light blinks.

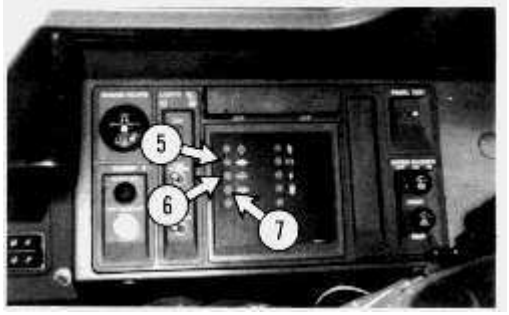
Transmission Oil Temperature (4) - Indicates excessive converter/transmission oil temperature. If this indicator comes on, reduce load on the machine. If the indicator stays on, pull to a convenient stop. Investigate the cause.

Do not operate the machine if the indicator stays on and the fault light blinks.

Warning Category 3

At this category, 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.

Ver imagen



Brake Oil Pressure (5) - Indicates low oil pressure to the brakes. If the indicator comes on, stop the machine immediately. Engage the parking/secondary and stop the engine. Investigate the cause.

Do not operate the machine until the cause has been corrected.

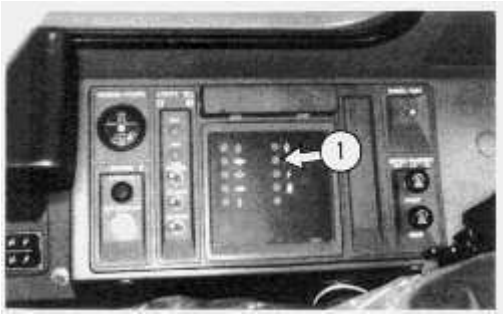
Engine Oil Pressure (6) - Indicates low oil pressure. If this indicator comes on, the fault alarm should sound and the fault light should blink. Stop the machine immediately. Stop the engine and investigate the cause.

Do not operate the machine until the cause has been corrected.

Brake Air Pressure (7) - Indicates low air pressure to the brakes. If the indicator comes on, stop the machine immediately. Engage the parking/secondary brake and stop the engine. Investigate the cause.

Do not operate the machine until the cause has been corrected.

Ver imagen

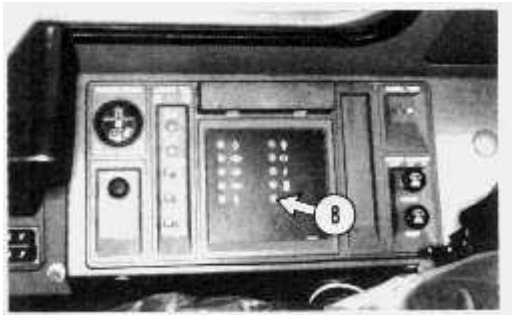


Parking/Secondary Brake (1) - Indicates parking/secondary brake is engaged. If the indicator comes on during operation, stop the machine immediately. Stop the engine. Investigate the cause.

Do not operate the machine until the cause has been corrected.

If the parking/secondary brake and the transmission is engaged during engine start-up, the indicator will come on, the fault light will blink and the fault alarm will sound. Shift the transmission lever to NEUTRAL to stop the fault alarm.

Ver imagen



Supplemental Steering (8) - Indicates steering failure. If the indicator comes on during operation, the fault light should blink and the fault alarm should sound. Steer the machine immediately to a safe location and stop. Stop the engine and investigate the cause.

Do not operate the machine until the cause has been corrected.

Supplemental steering works only while the machine is moving. When the machine operates under supplemental steering, no directional changes can be made.

Gauges (Standard)

Air Pressure (1) - Shows the air pressure in the air reservoir in kPa (psi).

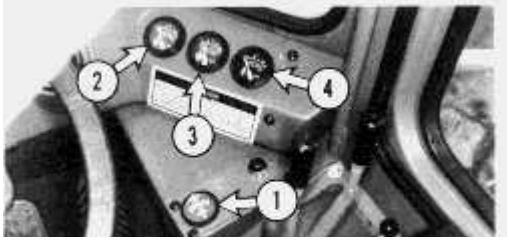
The operating pressure is above 450 kPa (65 psi). When air pressure falls below 450 kPa (65 psi), the Brake Air Pressure indicator and the fault light will come on and the fault alarm will sound.

If the air pressure falls below 275 kPa (40 psi), the parking/secondary brake indicator will also come on and the parking/secondary brake will engage automatically.

Fuel Level - Shows the amount of fuel in the fuel tank.

Gauges (If Equipped)

Ver imagen



Engine Coolant Temperature (2) - Indicates the temperature of the engine coolant. GREEN RANGE is normal operating temperature. RED RANGE is excessive coolant temperature. WHITE RANGE is cold coolant temperature.

Torque Converter Oil Temperature (3) - Indicates the temperature of the torque converter oil. GREEN RANGE is the normal operating temperature. RED RANGE is excessive oil temperature.

Hydraulic Oil Temperature (4) - Indicates the temperature of the hydraulic oil. GREEN RANGE is the normal operating temperature. RED RANGE is excessive oil temperature.

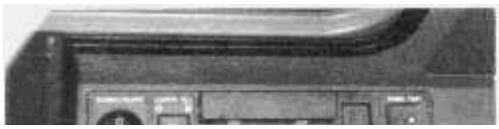
Service Hour Meter

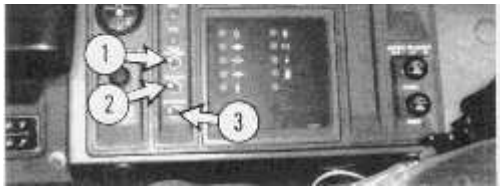
Ver imagen

Service Hour Meter - Indicates the total operating hours of the engine. It should be used to determine service intervals.

Light Switches

Ver imagen





Panel and Tail Lights (1) - Move the switch to the center position to turn on the panel lights and the tail lights.

Running Lights - Move the panel lights switch (1) to the right position to turn on the running lights.

Flood Lights (2) - Move the switch to the right position to turn on the flood lights for illumination of the work area.

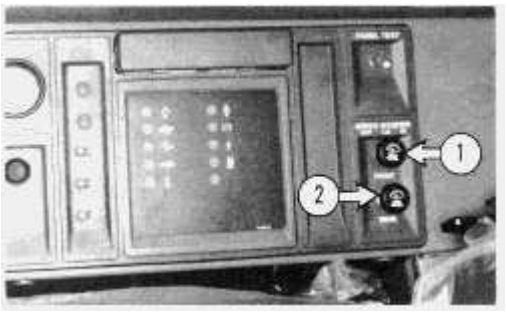
Auxiliary Lights (3) - Two additional locations are available for installation of additional switches for optional lighting (auxiliary flood lights, rotation beacon, etc).

Ver imagen

Interior Dome Light - Move the switch back to turn the light on.

Windshield Wiper/Washer

Ver imagen

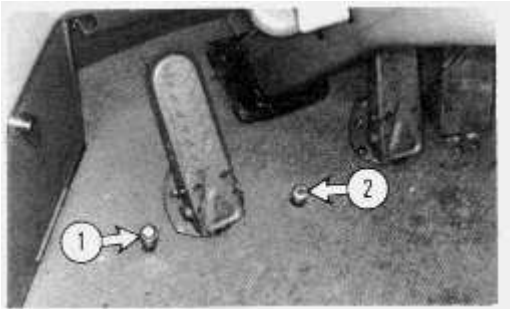


Front Windshield Wiper and Washer (1) - Turn the knob clockwise to turn on the windshield wiper. Push the knob to activate the windshield washer. Spring force will return the knob when released.

Rear Windshield Wiper and Washer (2) (If Equipped) - Turn the knob clockwise to turn on the windshield wiper. Push the knob to activate the windshield washer. Spring force will return the knob when released.

Horn-Headlight Dimmer

Ver imagen



Horn - Push knob (1) down to sound the horn. Use the horn to alert or to signal personnel.

Headlight Dimmer - Depress switch (2) to change the headlights from dim to bright.

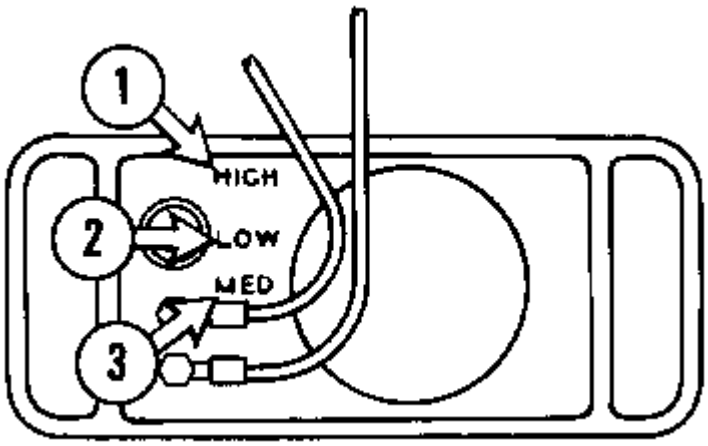
Depress the switch again to change the headlight from bright to dim.

Back-up Alarm

Ver imagen

Back-up Alarm - The alarm will sound when the transmission control lever is in the reverse position. It is used to alert people behind the machine that it is backing up.

Ver imagen



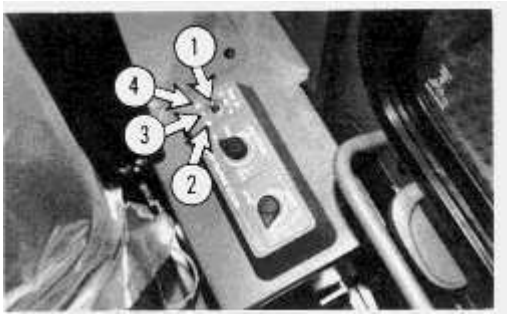
A three position switch at the rear of the back-up alarm regulates its volume. (1) is High, (2) is Low and (3) is Medium.

The alarm is set at the highest sound level when shipped from the factory. The setting should remain on high, unless the job-site requires a lower level.

Heating and Air Conditioning Controls

Fan Control

Ver imagen



Fan Speed Switch (1) - This switch controls the air flow speed.

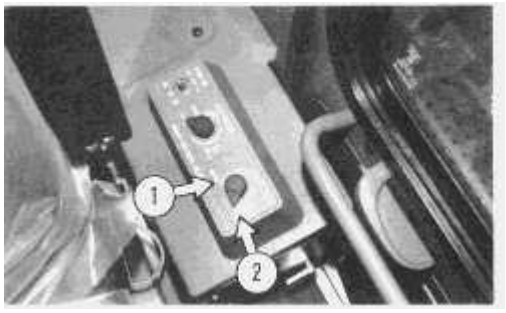
High Speed (2) - Move the switch to the right to turn the fan at high speed.

Off (3) - Move the switch to the center to turn off the fan speed.

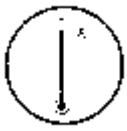
Low Speed (4) - Move the switch to the left to run the fan at low speed.

Heating Control

Ver imagen



Off (1) - Turn the knob all the way to the left (counterclockwise).

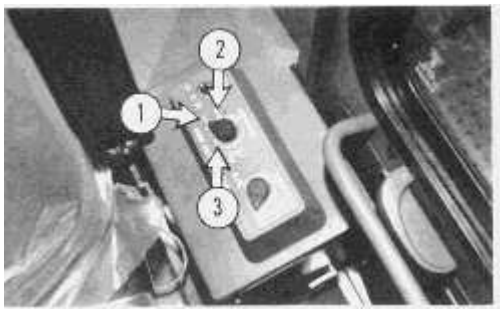


Warm (2) - Turn the knob to the right (clockwise towards hot) until the desired amount of heating is achieved.

The knob can be set at any position to obtain the desired amount of heating.

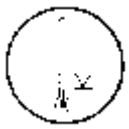
Air Conditioning Control

Ver imagen



Off (1) - Turn the knob all the way to the left (counterclockwise.)

On (2) - Turn the knob to ON to activate the air conditioning control system.



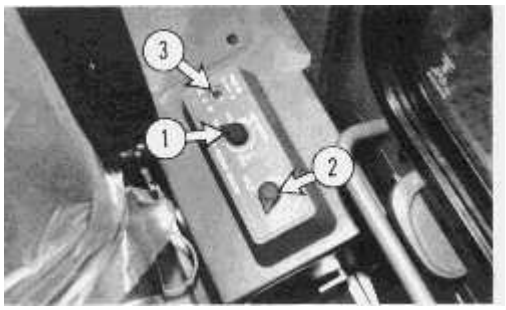
Cool (3) - Turn the knob to the right (clockwise towards cold) until the desired amount of cooling is achieved.

The knob can be set at any position to obtain the desired amount of cooling.

Heating and Air Conditioning System Operation

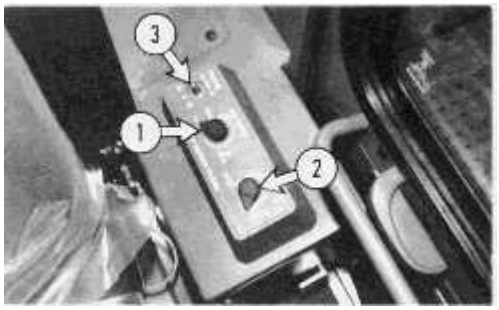
The heating and air conditioning system can perform four functions. They are as follows.

Ver imagen



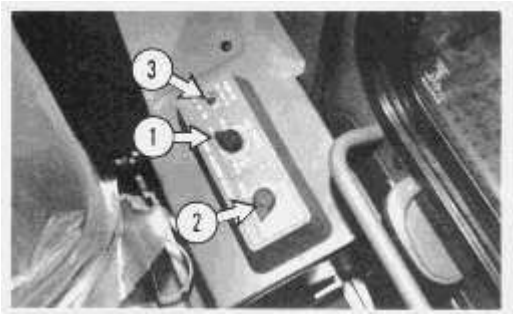
Cooling - Turn heater knob (2) to OFF. move the fan switch (3) to low or high. Adjust air conditioner control (1) for the desired temperature.

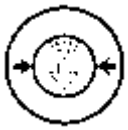
Ver imagen



Heating - Turn air conditioner control knob (1) to OFF. move fan switch (3) to low or high. Adjust heating control (2) for the desired temperature.

Ver imagen



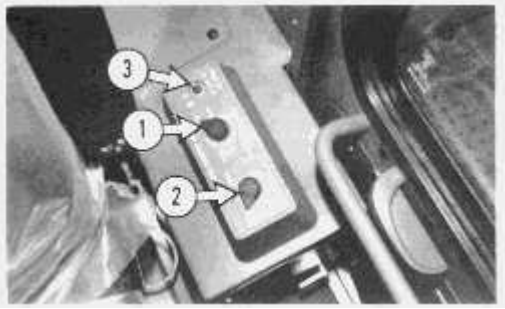


Pressurizing- Higher air pressure inside the cab will keep dust out when heating or air conditioning is not desired.

Turn air conditioner (1) and heating control (2) OFF, move fan switch (3) to low or high, depending on

Turn air conditioner (1) and heating control (2) OFF. Move fan switch (3) to low or high, depending on the volume of air needed to keep out dust. The fan control can be turned to the air conditioner or heating side when pressurizing the cab.

Ver imagen



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

Turn air conditioner control (1) to maximum cooling.

Turn heating control (2) CLOCKWISE until the moisture level is lowered and the temperature is comfortable.

Move fan control (3) to HIGH.

Seat Adjustment

NOTE: Adjust the seat at the beginning of each shift or when changing operators.

Adjust the seat to allow full travel of the pedals when the operator is seated against the seat back.

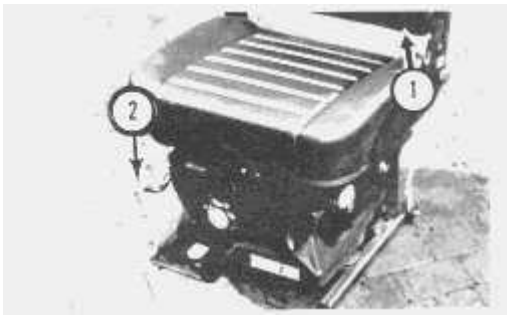
Static Seat

Ver imagen

Push the lever to the operator's left, to allow moving the seat forward or backward.

Suspension Seat

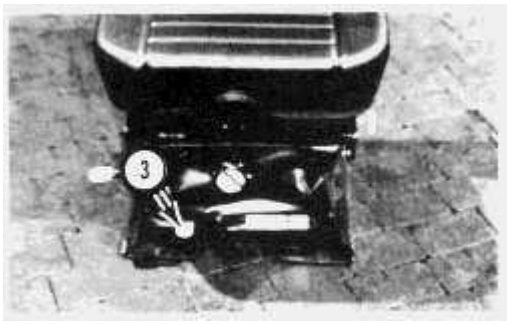
Ver imagen



Pull the backrest (1) UP and move to the desired position. Lower the backrest to lock in position.

Hold down on the seat height level lever (2) to release the seat height lock. Push the seat to the desired height. Release the lever to lock seat in place.

Ver imagen

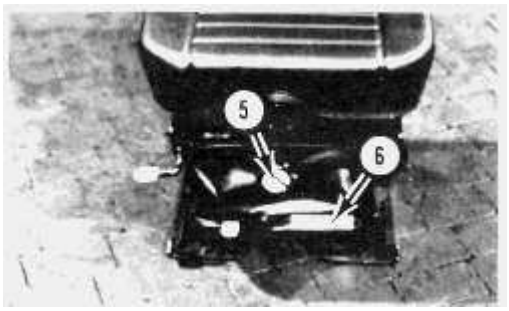


Pull UP the fore-aft lever (3). Hold the lever UP, slide the seat forward or back to the desired position. Release the lever to lock the seat in place.

Ver imagen

Pull UP the seat angle lever (4). Hold the lever UP, Adjust the seat cushion to the desired angle. Release the lever to lock the seat cushion.

Ver imagen



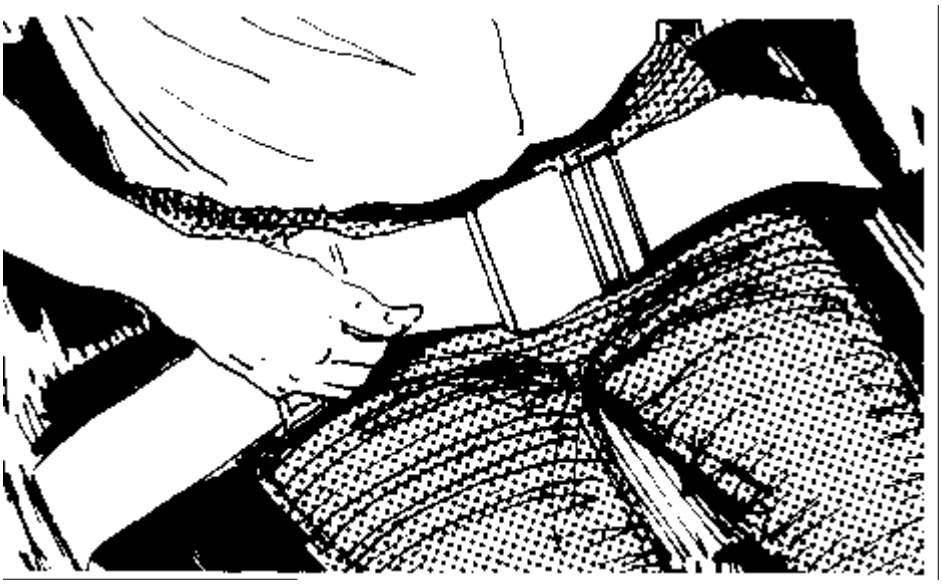
Turn the knob (5) clockwise to increase or counterclockwise to decrease the stiffness of the suspension until the yellow rod in the indicator (6) is just visable.

Seat Belt

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.

Ver imagen

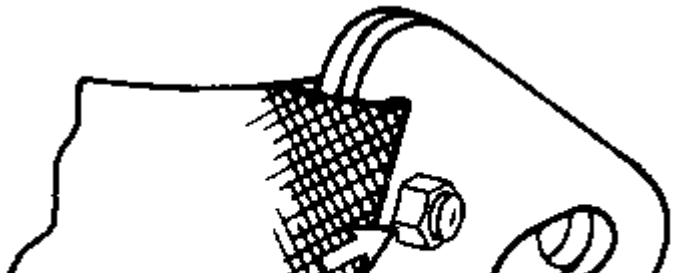


Inspect for worn or frayed webbing.

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.

Ver imagen



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.

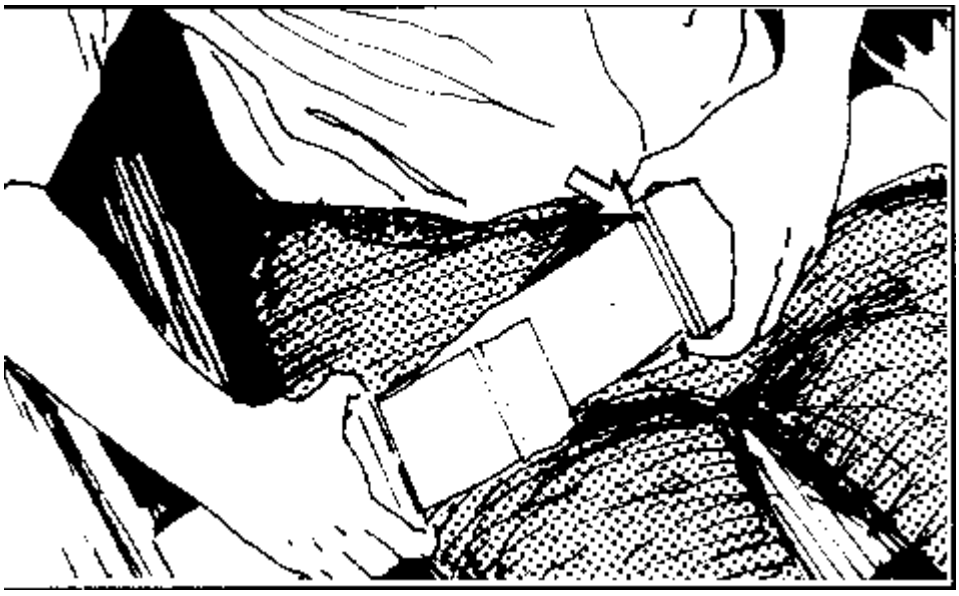
If the bolt and nut are not correctly installed, remove them. Install a new bolt and nut.

Seat Belt Adjustment

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

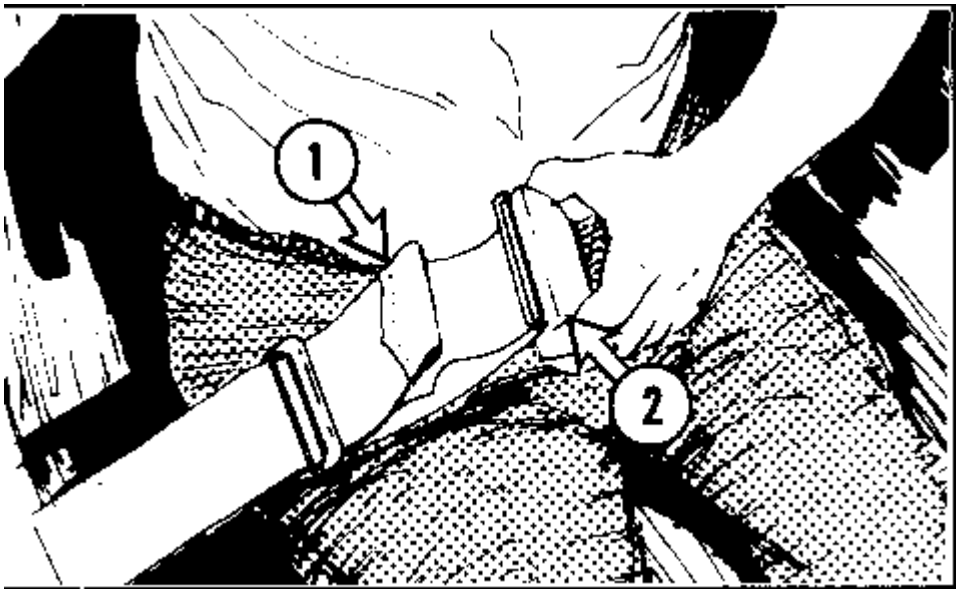
To Lengthen the Belt

Ver imagen



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

Ver imagen



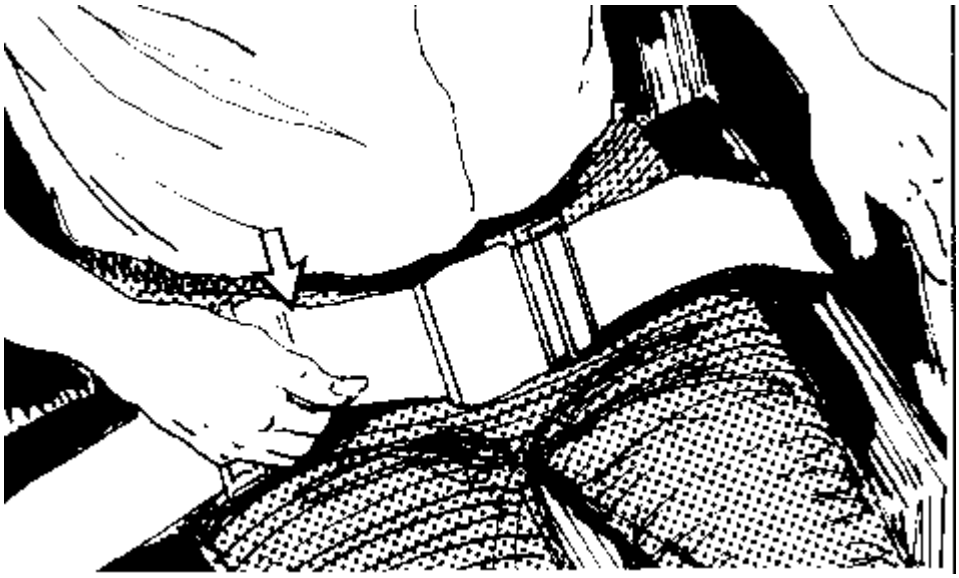
2. To remove the slack in outer loop (1), rotate buckle (2) to free the lock bar. This permits the belt to move through the buckle.

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.

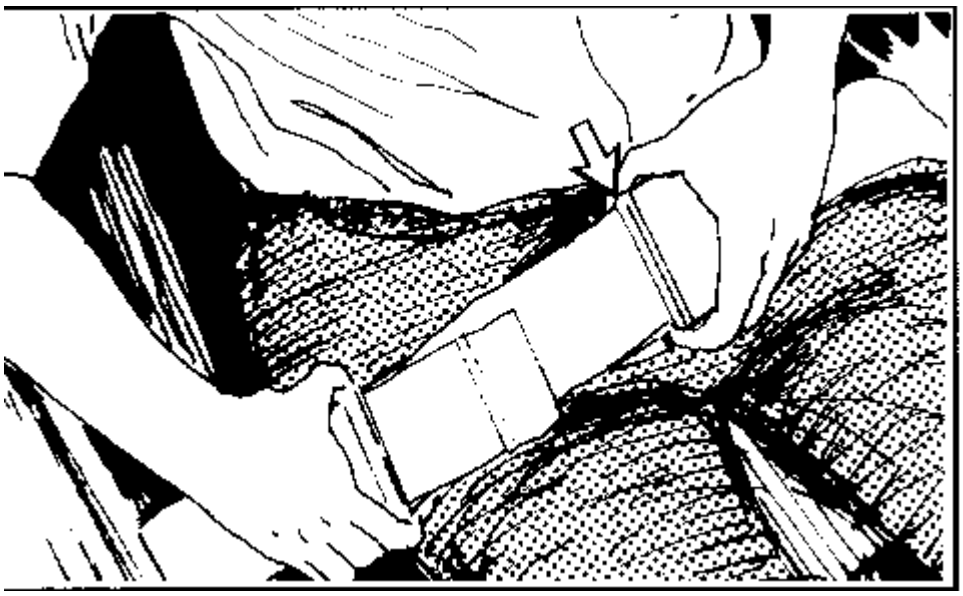
To Shorten the Belt

Ver imagen



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

Ver imagen



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.

Right Side Window

Right Side Window

Ver imagen

The window on the right side serves as an emergency exit. It can be opened from the inside only. Release the latch and open the window.

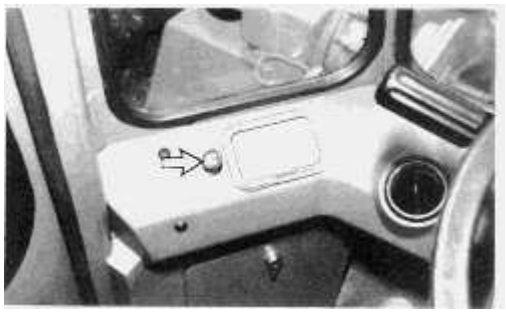
Ver imagen

The door on the left can be secured in two partially open positions and the fully open position with a lock pin.

To release the left cab door from a partially open position, push down on the clip and pull down the lock pin.

Lighter

Ver imagen



Lighter - Push the lighter in and release. The lighter will pop out when ready for use.

Machine Controls

Parking/Secondary Brake

NOTICE

Do not engage the parking/secondary brake while the machine is moving unless an emergency exists. The use of the parking/secondary as a service brake in regular operation will cause severe damage to the parking/secondary brake system.

Ver imagen

Parking/Secondary Brake - The parking/secondary brake is located on the steering column.

Parking/Secondary Brake Engaged - Pull UP on the knob to engage the parking/secondary brake.

Parking/Secondary Brake Disengaged - Push DOWN on the knob to release the parking/secondary brake.

Brake Pedals

Ver imagen

Left Brake Pedal (1) - The left brake pedal disengages the transmission and brakes the machine. This permits higher engine speed for better hydraulic response.

Depress the left brake pedal when positioning and raising the bucket at the same time.

Release the pedal to re-engage the transmission and to release the brake.

Right Brake Pedal (2) - The right brake pedal slows down the machine ground speed for normal braking.

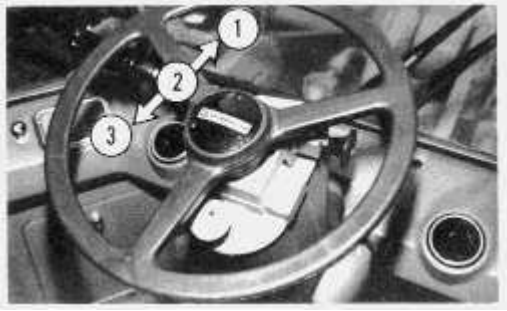
Depress the right brake pedal for normal machine braking.

Release the pedal to release the brake.

Transmission Direction and Speed Control

Direction Selector

Ver imagen



Forward (1) - Push the transmission lever forward. The machine will move forward.

Neutral (2) - The machine should not move when transmission lever is in neutral.

Reverse (3) - Pull the transmission lever toward the operator. The machine will move in reverse.

Speed Selector

Ver imagen

Rotate the transmission lever to the desired gear speed:

1 - First Speed

2 - Second Speed

3 - Third Speed

4 - Fourth Speed

Transmission Neutral Lock

Ver imagen

The transmission neutral lock is located on the steering column.

Unlocked - Pull out on the knob to release the transmission neutral lock.

Locked - Push in on the knob to engage the transmission neutral lock.

Steering Controls

Directional Steering

Ver imagen

The directional steering, of the machine, is controlled by the steering wheel. The direction the steering wheel is turned, is the direction that the machine will turn.

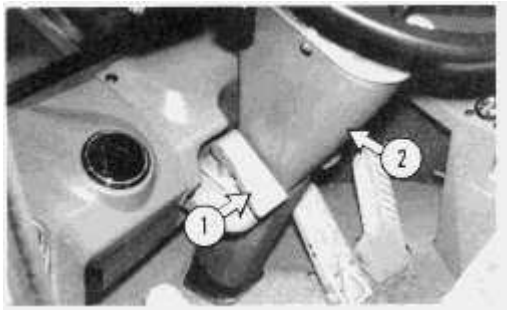
Left Turn - Move the steering wheel in a counterclockwise direction to steer the machine, to the left. The further the steering wheel is turned in a counterclockwise direction the sharper the left turn.

Right Turn - Move the steering wheel in a clockwise direction to steer the machine, to the right. The further the steering wheel is turned in a clockwise direction the sharper the right turn.

Steering Column Tilting

Ver imagen

Ver imagen



To adjust the steering column, pull up on the latch (1) and move the steering column (2) to the desired position. Release the latch and the steering column will remain in the desired position.

Supplemental Steering (If Equipped)

Ver imagen

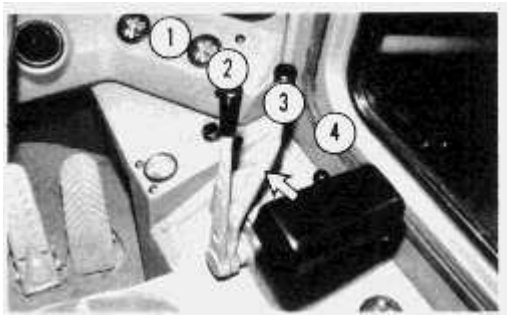
Supplemental steering will function when the machine steering fails. It is only to be used to steer the machine to a safe location. Stop the machine immediately.

Supplemental steering works only while the machine is moving. When the machine operates under supplemental steering, no directional changes can be made.

Attachment Controls

Bucket Lift Lever

Ver imagen



Float (1) - Push the lever all the way forward into detent, for FLOAT. The bucket will lower to the ground, and move up and down, follow ground contour.

The lever will remain in FLOAT until pulled out of detent. The lever will then return to HOLD when released.

NOTICE

NEVER use FLOAT position to lower a loaded bucket.

Machine damage can result.

Lower (2) - Push the lever forward to lower the bucket. The lever will return to HOLD when released.

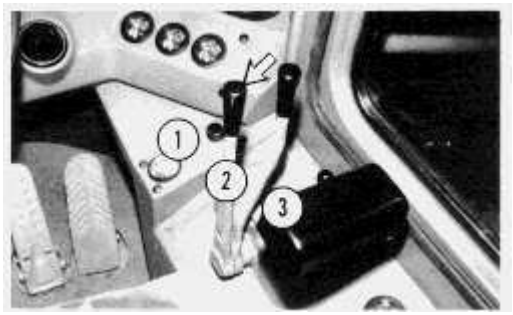
Hold (3) - The lever will return to HOLD when released from either RAISE or LOWER. The bucket will remain in the position it is in.

Raise (4) - Pull the lever back to raise the bucket. Release the lever to stop lifting the bucket. The lever will return to HOLD when released.

The lever is detented in the full raise position. It will stay in detent until the bucket reaches height set by the lift kickout. Then it returns to HOLD.

Bucket Tilt Lever

Ver imagen



Dump (1) - Push the lever forward to dump the bucket.

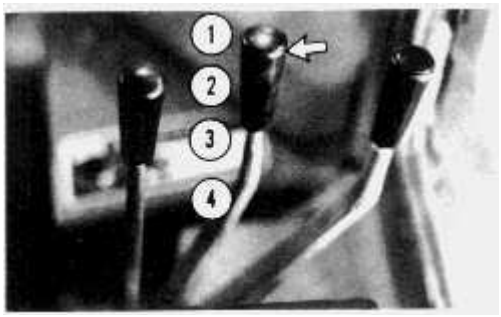
Hold (2) - Release the tilt lever. The bucket will remain in the position it is in.

Tilt Back (3) - Pull the lever back to tilt the bucket back.

The lever is detented in full tilt back position. It will stay in detent until the bucket reaches the bucket angle preset by the bucket positioner. Then it returns to HOLD.

Multipurpose Bucket Lift Lever

Ver imagen



Float (1) - Push the lever all the way forward into detent, for FLOAT. The bucket will lower to the ground and move up and down, following ground contour.

The lever will remain in FLOAT until pulled out of detent. The lever will then return to HOLD when released.

NOTICE

NEVER use FLOAT position to lower a loaded bucket.

Machine damage can result.

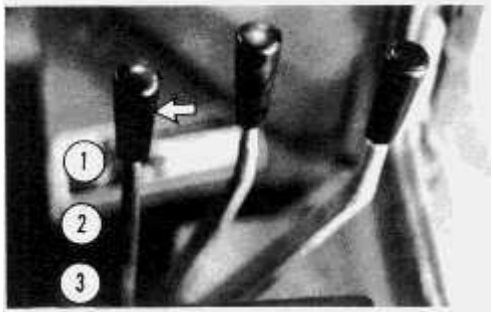
Lower (2) - Push the lever to forward to lower the bucket. The lever will return to HOLD when released.

Hold (3) - The lever will return to HOLD when released from either RAISE or LOWER. The bucket will remain in the position it is in.

Raise (4) - Pull the lever back to raise the bucket. Release the lever to stop lifting the bucket. The lever will return to HOLD when released.

Multipurpose Bucket Tilt Lever

Ver imagen



Dump (1) - Push the lever forward to tilt the bucket forward. The lever will return to HOLD when released. The bucket will remain in the position it is in.

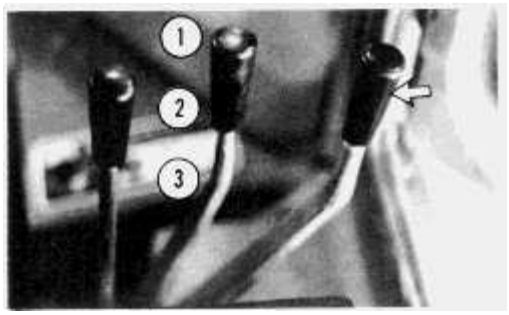
Hold (2) - Release the tilt lever and the bucket will remain in the position it is in.

Tilt Back (3) - Pull the lever back to tilt the bucket back. Release the lever and it will return to HOLD. The bucket will remain in the position it is in.

The lever is detented in full tilt back position. It will stay in detent until the bucket reaches the bucket angle preset by the bucket positioner. Then it returns to HOLD.

Multipurpose Bucket Bowl Lever

Ver imagen



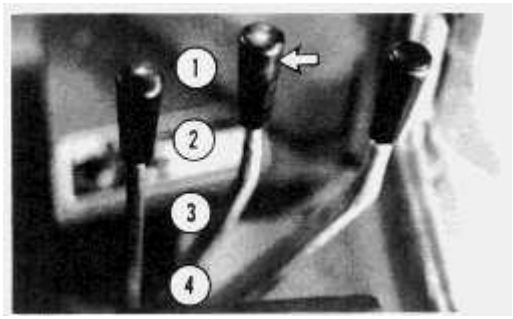
Close (1) - Push the lever forward to close the bowl. Release the lever and it will return to HOLD.

Hold (2) - Release the tilt lever. The bowl will remain in the position it is in.

Open (3) - Pull the lever back and the bowl will open. Release the lever and it will return to HOLD.

Side Dump Bucket Lift Lever

Ver imagen



Float (1) - Push the lever all the way forward into detent, for side dump bucket float. The side dump bucket will lower to the ground, and move up and down, following ground contour.

The lever will remain in FLOAT until pulled out of detent. The lever will then return to HOLD when released.

NOTICE

NEVER use FLOAT position to lower a loaded side dump bucket.

Machine damage can result.

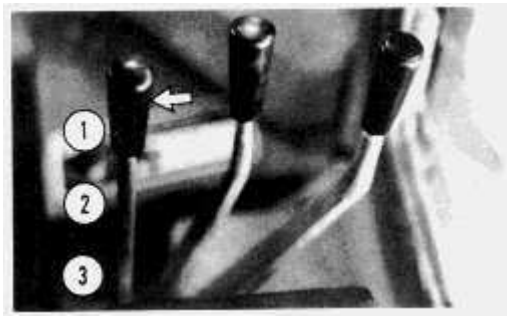
Lower (2) - Push the lever forward to LOWER the side dump bucket. The lever will return to HOLD when released.

Hold (3) - The lever will return to HOLD when released from either RAISE or LOWER. The side dump bucket will remain in the position it is in.

Raise (4) - Pull the lever back to raise the side dump bucket. Release the lever to stop lifting the side dump bucket. The lever will return to HOLD when released.

Side Dump Bucket Tilt Lever

Ver imagen



Dump (1) - Push the lever forward to tilt the side dump bucket FORWARD. The lever will return to HOLD when released. The side dump bucket will remain in the position it is in.

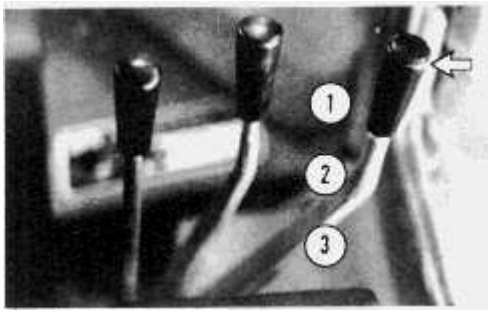
Hold (2) - Release the tilt lever and the side dump bucket will remain inthe position it is in.

Tilt Back (3) - Pull the lever back to tilt the side dump bucket back. Release the lever and it will return to HOLD. The side dump bucket will remain in the position it is in.

The lever is detented in full tilt back position. It will stay in detent until the side dump bucket reaches the side dump bucket angle preset by the bucket positioner. Then it returns to HOLD.

Side Dump Lever

Ver imagen



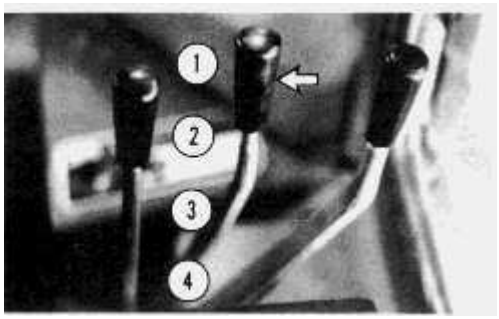
Dump (1) - Push the lever forward to side dump the bucket. Release the lever and it will return to HOLD.

Hold (2) - Release the tilt lever. The bucket will remain in the position it is in.

Return (3) - Pull the lever back and the bucket will RETURN. Release the lever and it will return to HOLD.

Log or Lumber Fork Lift Lever

Ver imagen



Float (1) - Push the lever all the way forward into detent, for fork FLOAT. The fork will lower to the ground, and move up and down, following ground contour.

The lever will remain in FLOAT until pulled out of detent. The lever will then return to HOLD when released.

NOTICE

NEVER use FLOAT position to lower a loaded fork.

Machine damage can result.

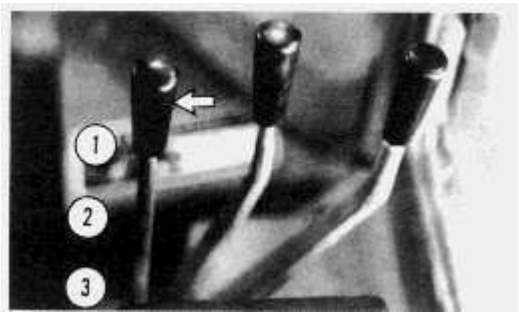
Lower (2) - Push the lever forward to lower the fork. The lever will return to HOLD when released.

Hold (3) - The lever will return to HOLD when released from either RAISE or LOWER. The fork will remain in the position it is in.

Raise (4) - Pull the lever back to raise the fork. Release the lever to stop lifting the fork. The lever will return to HOLD when released.

Fork Tilt Lever

Ver imagen



Dump (1) - Push the lever forward to tilt the fork FORWARD. The lever will return to HOLD when released. The fork will remain in the position it is in.

Hold (2) - Release the tilt lever and the fork will remain in the position it is in.

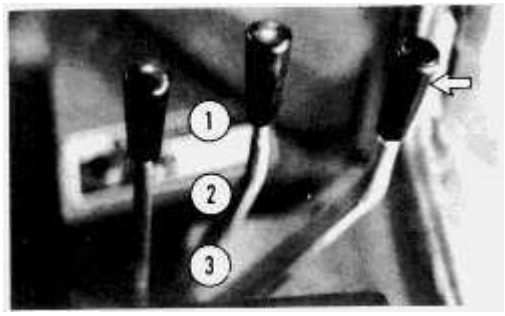
Tilt Back (3) - Pull the lever back to tilt the fork BACK. Release the lever and it will return to HOLD.

The fork will remain in the position it is in.

The lever is detented in full tilt back position. It will stay in detent until the fork reaches the fork angle preset by the fork positioner. Then it returns to HOLD.

Top Clamp Lever

Ver imagen



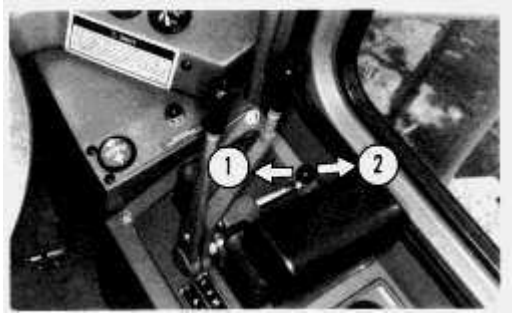
Close (1) - Push the lever forward to close the clamp. Release the lever and it will return to HOLD.

Hold (2) - Release the tilt lever. The clamp will remain in the position it is in.

Open (3) - Pull the lever back and the clamp will open. Release the lever and it will return to HOLD.

Hydraulic Control Lever Lock

Ver imagen



Locked (1) - Pull the knob toward the operator to lock the hydraulic control lever lock and lock the hydraulic control levers.

Unlocked (2) - Push the knob away from the operator to unlock the hydraulic control lever lock and release the hydraulic control levers.

Before Starting the Engine

Walk-Around Inspection

Ver imagen

Remove steering frame lock and store in unlocked position. The steering frame lock must be removed to steer the machine.

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 attachments and the hydraulic components.

Refer to "Walk-Around Inspection" in the "Maintenance Section" for detailed walk-around inspection information.

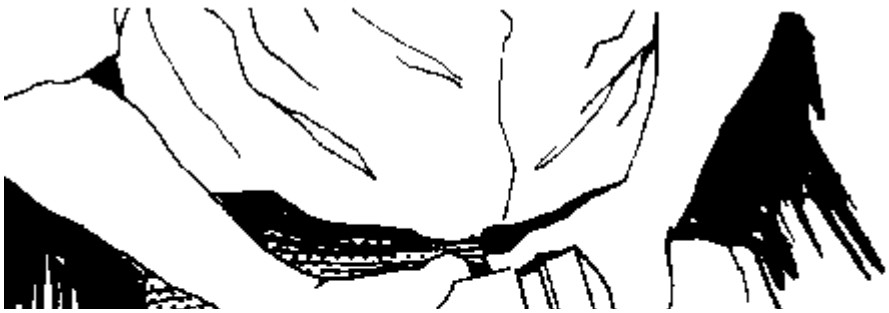
Pre-Start Checks

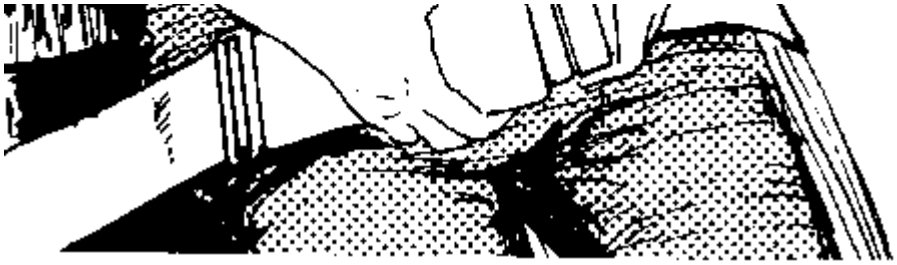
Ver imagen

Check all of the oil, coolant and fuel levels.

Refer to the "Every 10 Service Hours or Daily" in the "Maintenance Section" for more detailed information.

Ver imagen





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

Adjust the seat belt to fit snug.

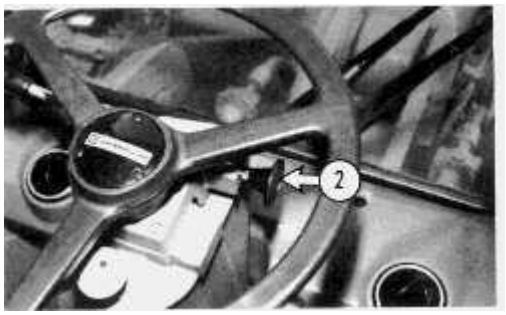
Engine Starting

Starting Above 0°C (32°F)

Ver imagen

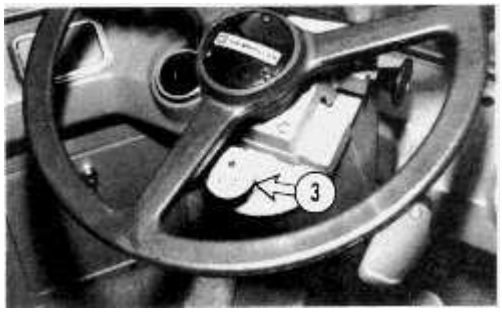
1. Move the transmission directional control lever (1) to NEUTRAL.

Ver imagen



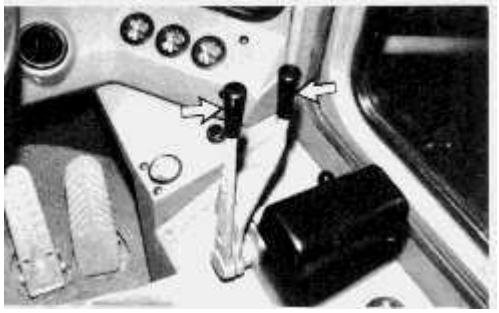
2. Engage the transmission neutral lock lever (2).

Ver imagen



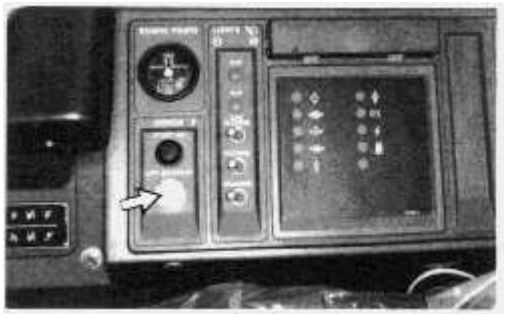
3. Pull the parking/secondary brake knob (3) out to engage the brake.

Ver imagen



4. Move the attachment control levers to the HOLD position.

Ver imagen



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

NOTICE

Do not crank the engine for more than 30 seconds. Allow the starter to cool for 2 minutes before cranking again.

The low air pressure buzzer should sound until air pressure is normal and the parking/secondary brake is released, or until the transmission is shifted into NEUTRAL.

Starting Below 0°C (32°F) (If Equipped with Ether Starting Aid)

NOTICE

Inject starting aid (ether), only while cranking the engine, or after initial startup, until the engine is running smoothly.

Use sparingly, excessive ether without cranking can cause piston and ring damage.

Wait approximately two seconds before injecting again.

Use ether for cold starting purposes only.

After every 30 seconds of engine cranking, allow 2 minutes for starting motor to cool before cranking again.

Ver imagen

1. Move the transmission directional control lever into NEUTRAL.

Ver imagen

2. Engage the transmission neutral lock lever.

3. Pull the parking/secondary brake knob out to engage the brake.

4. Move the attachment control levers to HOLD.

Ver imagen

5. Turn the start key switch to start the engine.

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

7. Operate the start aid switch every two seconds while cranking the engine. Continue use until the engine starts and is running smoothly.

8. Release the key switch when engine starts.

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

At temperatures below -23°C (-10°F), consult your Caterpillar dealer, or refer to the "Operation & Maintenance Guide" for "Cold Weather Recommendations", 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

Ver imagen

Located inside right engine access cover of the machine.

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 controls 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 for 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 "Engine Starting" 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. Conclude failure analysis on starting/charging system of the stalled machine as required, now that engine is running and charging system in operation.

Use of Jumper Cables

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 controls 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.

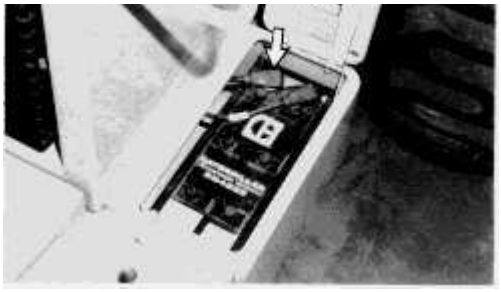
4. On stalled machine, turn on (close) the disconnect switch (if equipped).

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. Make sure battery caps are all in place and tight on both machines.

Ver imagen



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 other terminal (negative) of the boost battery.

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 "Engine Starting".

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

16. Conclude failure analysis on starting/charging system of stalled machine as required now that engine is running and charging system in operation.

After Starting the Engine

Ver imagen

NOTICE

Keep engine speed low until the engine oil pressure registers on the gauge. If it does not register within 10 seconds, stop the engine and investigate the cause before starting again. Failure to do so, can cause engine damage.

---

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

Ver imagen

2. Look at the gauges frequently during operation.

Also, to speed hydraulic oil warm-up, hold the bucket control in the CLOSE position for short periods, not more than 10 seconds.

This will allow the oil to reach relief pressure, which causes it to warm more rapidly.

Cycle all controls to allow warm oil to circulate through all cylinders and lines.

When idling the engine for warm-up, observe the following recommendations:

* In temperatures above 0°C (32°F), warm-up requires approximately 15 minutes.
* In temperatures below 0°C (32°F), warm-up requires approximately 30 minutes or more.
* In temperatures below -18°C (0°F) or if hydraulic functions are sluggish, more time may be required.

Machine Operation

Be sure no one is working on or near the machine to prevent injury. Keep the machine under control at all times to prevent injury.

Reduce engine speed when maneuvering in tight quarters or when breaking over a rise.

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 service brake pedal to reduce engine overspeed going downhill.

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

1. Adjust the operator's seat.

2. Fasten and adjust the seat belt.

Ver imagen

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

Ver imagen

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

Ver imagen

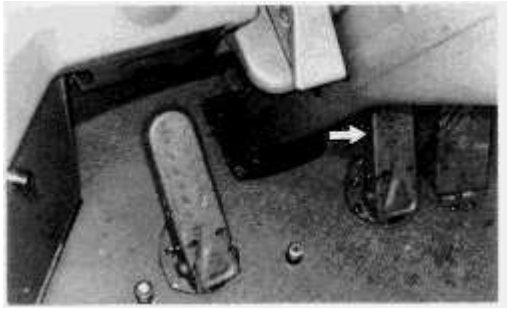
5. Push in the parking/secondary brake knob to release the parking/secondary brake.

6. Pull the transmission neutral lock lever out to disengage the transmission neutral lock.

Ver imagen

7. Move the transmission control lever to the desired direction and speed.

Ver imagen



8. Release the service brake pedal.

9. Push down on the accelerator pedal to the desired engine speed.

10. Drive the machine forward for best visibility and control.

NOTICE

For operator comfort and maximum service life of power train components, deceleration and/or braking is recommended before any directional shifts are made.

Parking/Secondary Brake System

WARNING

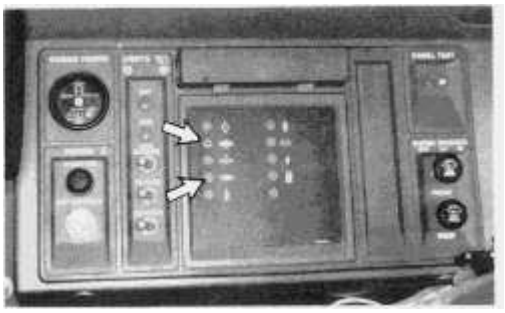
If the brake system air pressure drops below normal operating pressure, a warning horn will sound. The low brake pressure and the parking/secondary brake indicators on the operator's panel will come on. The fault light will start flashing.

If the pressure drops further, the parking/secondary brake will engage

automatically.

Be prepared for a sudden stop. Correct the reason for the loss of air pressure. Do not move the machine without normal air pressure.

Ver imagen



Loss of brake oil or air pressure will cause the brake indicators on the operator panel to come on. Loss of air pressure will cause the parking/secondary brake to automatically engage and stop the machine.

Ver imagen

The fault light will also flash when the monitor system lights go on.

NOTICE

Moving the machine with the parking/secondary brake applied can cause excessive wear or damage to the brake. If necessary, have the brake repaired before operating the machine.

Test Parking/Secondary Braking System:

WARNING

Be sure that the area around the machine is clear of personnel and obstructions.

Be sure the steering frame lock link is in the carry position.

Test the brakes on a dry, level surface.

Fasten the seat belt before testing the brakes.

The following tests are to determine if the parking/secondary brake is functional. These tests are intended to measure maximum brake holding effort.

Brake holding effort required to hold a machine at a specific engine rpm will vary from machine to machine due to differences in engine setting, power train efficiency, etc., as well as differences in brake holding ability.

Ver imagen

Start the engine and raise the bucket slightly.

Ver imagen

1. Engage the parking/secondary brake. Move the transmission control lever to 3rd speed forward.

Ver imagen

2. Gradually increase the engine speed to HIGH IDLE. The machine must not move.

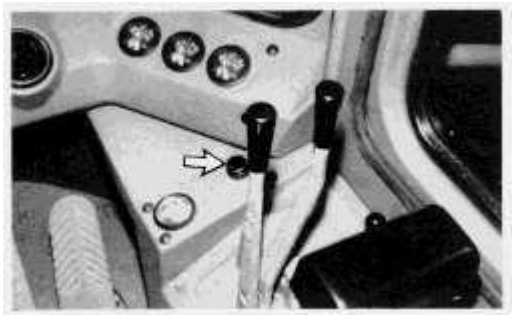
WARNING

If the machine begins to move, reduce the engine speed immediately and engage the service brakes.

Ver imagen

The parking/secondary brake light must come on.

Ver imagen



The main fault light must flash and the warning horn must sound.

NOTICE

If the machine moved while testing, have your Caterpillar dealer inspect the brake. If necessary, repair the parking/secondary brake before returning the machine to operation.

---

3. Reduce the engine speed. Move the transmission control lever to NEUTRAL. Lower the bucket to the ground. Stop the engine.

Manual Release of Parking/Secondary Brake

WARNING

Do not operate the machine if the brake was applied due to a malfunction of the air system or the brake.

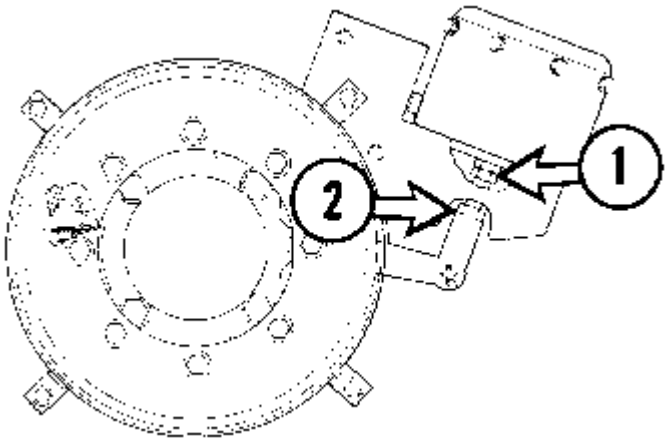
Correct any problem before attempting to operate the machine.

Block the wheels securely so that the machine cannot move.

Ver imagen

1. Connect the steering frame lock link.

Ver imagen



2. Loosen locknut (1). Turn locknut (1) up to bracket (2) and continue to turn locknut (1) against bracket (2) until the rod moves out enough to totally release the parking/secondary brake.

WARNING

The machine can be moved a short distance only.

Have the brake system repaired and the parking/secondary brake linkage adjusted before the machine is operated.

Supplemental Steering (If Equipped)

WARNING

If the supplemental steering warning light comes on, steer the machine IMMEDIATELY to a safe location and stop.

Have any necessary repairs made before returning the machine to operation.

Steering and braking effort will increase with the engine stopped.

Supplemental steering works only while the machine is in motion.

Ver imagen

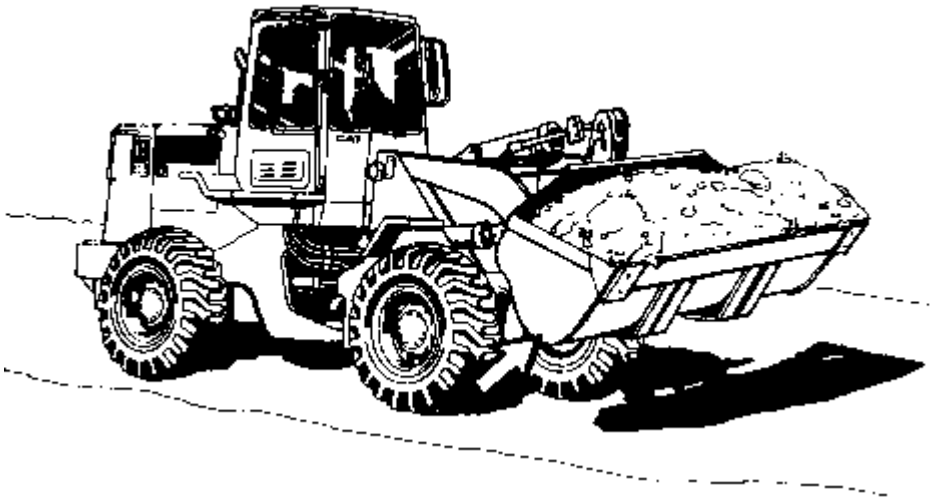
If the machine is equipped with supplemental steering and the standard steering malfunctions or the engine stops, the indicator light will go on.

NOTE: The indicator light may come on momentarily, if the hydraulic system functions are used at low engine speeds.

Operating Techniques

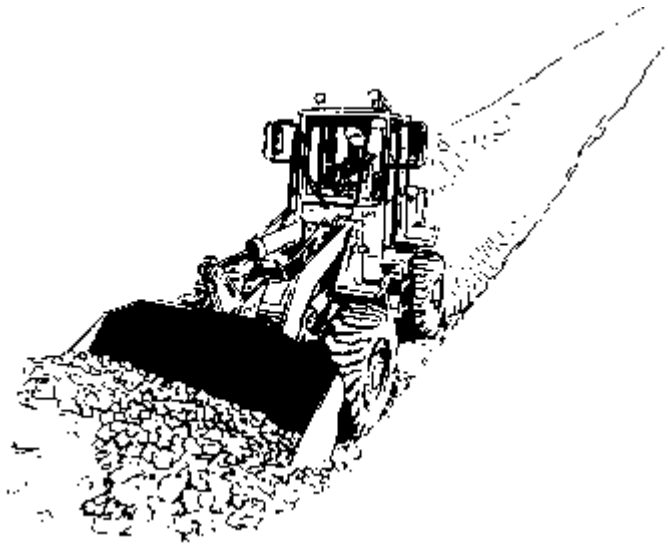
General

Ver imagen



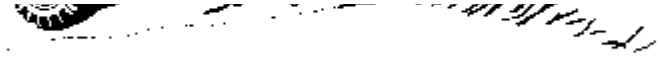
For good operator vision and loader stability, carry the loaded bucket low, approximately 40 cm (15 inches) above the ground.

Ver imagen



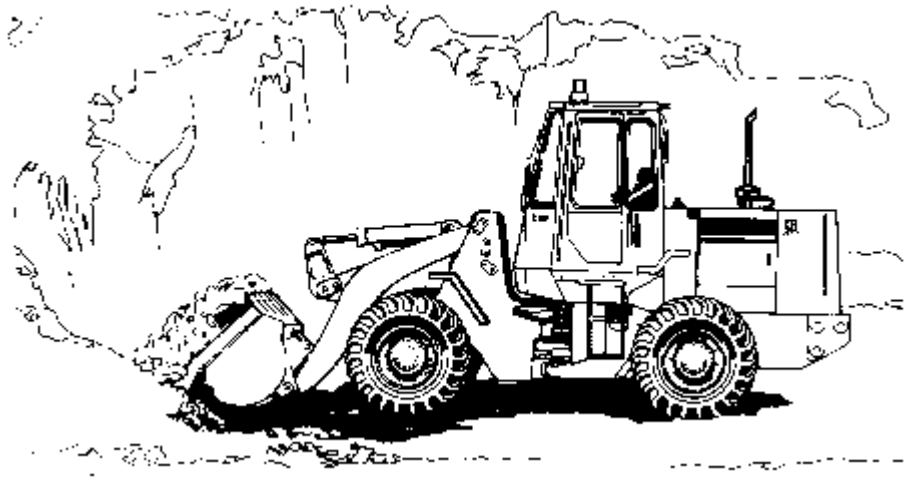
Utilize wait time to clean and level the work area.

Ver imagen



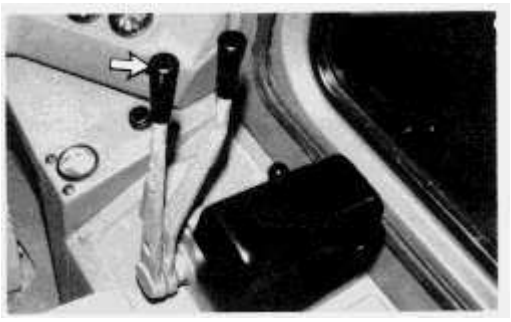
Maintain traction by avoiding excessive down pressure on the bucket.

Ver imagen



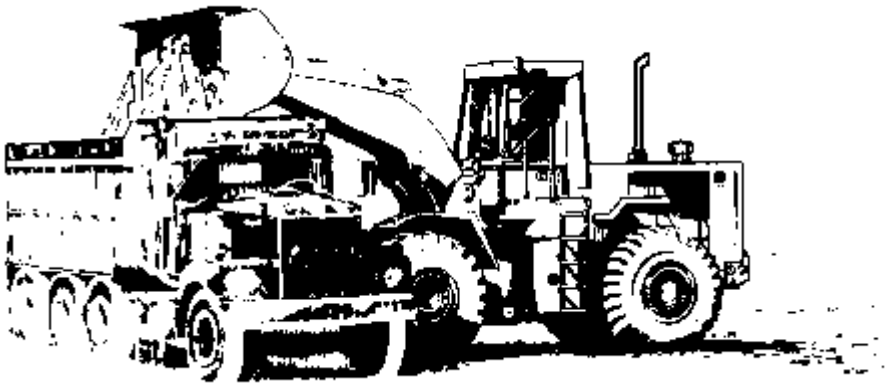
When working in hard material use bucket teeth or bolt-on cutting edges.

Ver imagen



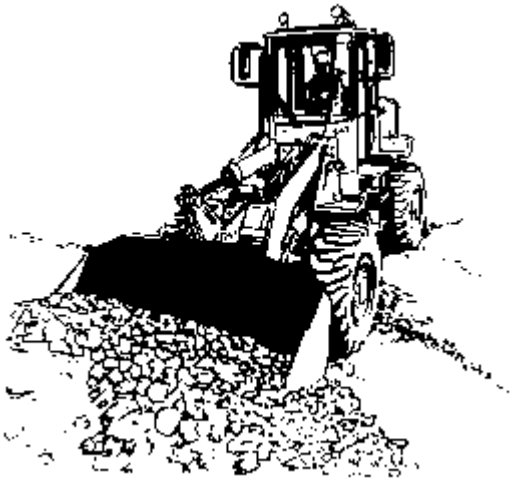
To control dumping, move the tilt control lever to the DUMP position. Then return to the HOLD position. Repeat until the bucket is empty.

Ver imagen



To keep dust away from the engine and maintain visibility, dump with the wind to your back.

Ver imagen



Be certain that the bucket used is appropriate for the work performed. Exceeding the machine limits will reduce the service life of the machine.

Dozing

NOTICE

Do not doze with the bucket in the tilt forward position to avoid bucket damage.

Ver imagen

When dozing, keep the bucket bottom parallel to the ground.

Dumping

Ver imagen

Use the bucket stops for maximum dumping angle.

NOTICE

Striking the stops unnecessarily and repetitively can result in accelerated wear and high maintenance cost of the loader linkage.

Loading from a Stockpile With Bucket

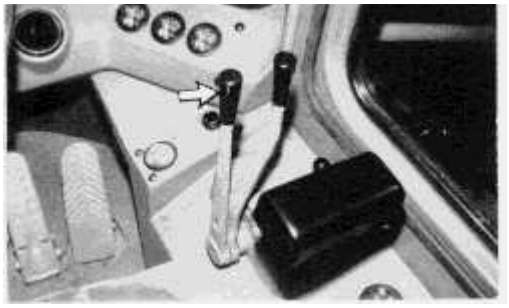
Ver imagen

1. Position the bucket parallel to, and just skimming, the ground. Drive the bucket straight into the pile.

Ver imagen

2. Move the control to the RAISE detent position as forward movement slows. Return to the HOLD position for additional crowding power.

Ver imagen



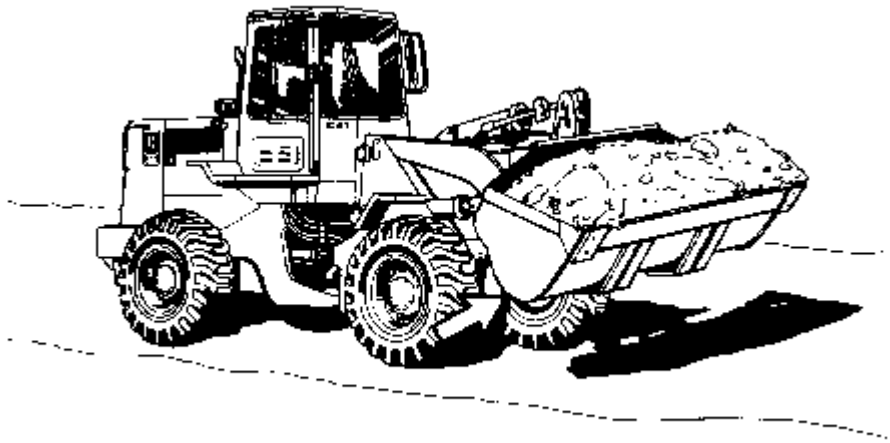
3. To "pump" in a heaped load, work the tilt control lever back and forth.

Ver imagen

4. When the bucket is loaded, move the tilt control to the TILT BACK position.

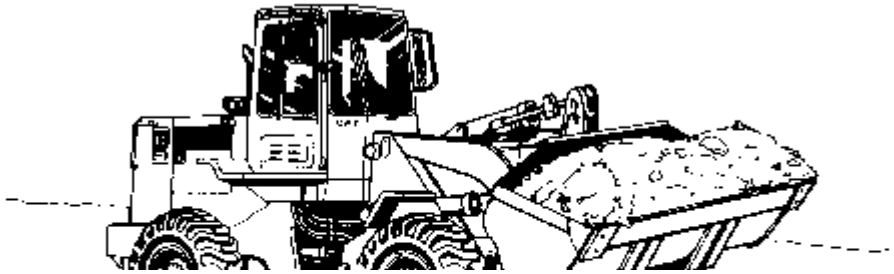
5. When the tilt control lever is released to the HOLD position, the bucket will rise.

Ver imagen



6. Raise the bucket high enough to clear the material being loaded. Shift the transmission control to REVERSE.

Ver imagen



7. Carry the loaded bucket approximately 40 cm (15 inches) above the ground level.

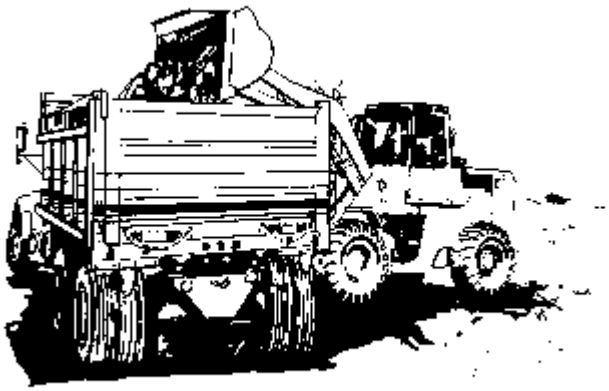
8. When reaching the dump area, move the lift control to the RAISE detent. The lift kickout will automatically return the lift control to HOLD.

Loading Hauling Units With Bucket

Ver imagen

1. To reduce the loader turning and travel, position the hauling unit at an angle to the material being loaded.

Ver imagen

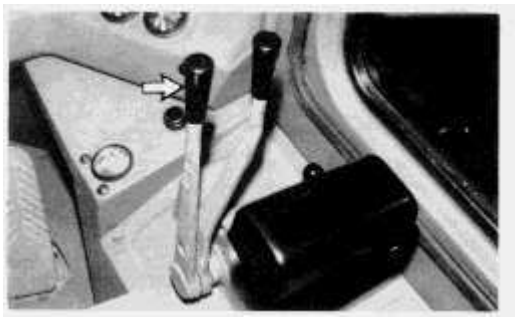


2. The travel distance should be long enough for the bucket to reach the lift height without slowing loader movement.

Ver imagen

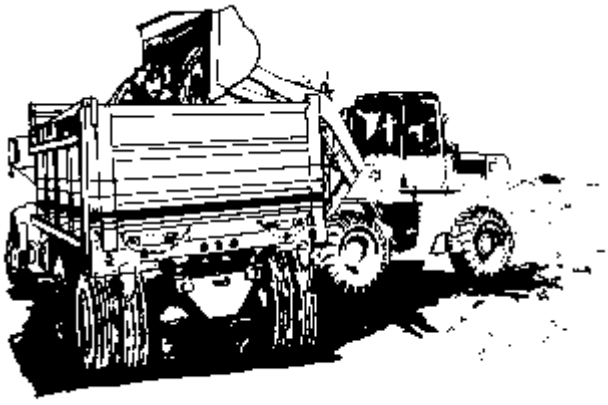
3. Position the loader to dump the load in the center of the hauler body. If the hauler body is two bucket widths or more in length, dump from the front to the rear.

Ver imagen



4. Push the tilt lever forward to dump the bucket.

Ver imagen



5. Shake the bucket to loosen sticky material. Move the tilt lever back and forth quickly, allowing the tilt arms to strike the stops.

NOTICE

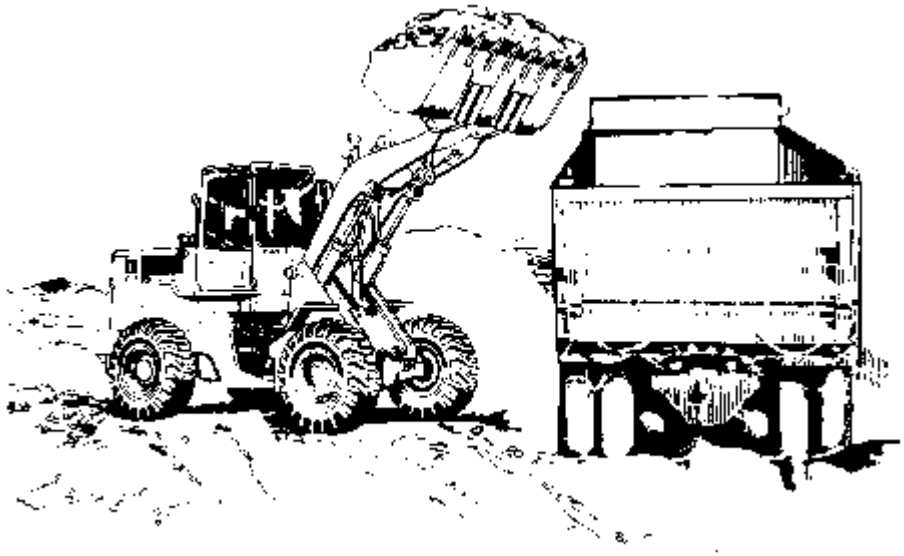
Striking the stops unnecessarily and repetitively can result in

accelerated wear and high maintenance cost of the loader linkage.

Ver imagen

6. Put the tilt lever in the TILT BACK detent.

Ver imagen



7. Before lowering the bucket, make sure the hauling unit is out from under the bucket.

8. Lower the bucket while positioning the loader for the next load.

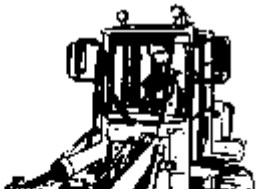
Loading From A Bank With Bucket

WARNING

Personnel injury or death can result from falling material.

Remove any overhang and watch for sliding material.

Ver imagen



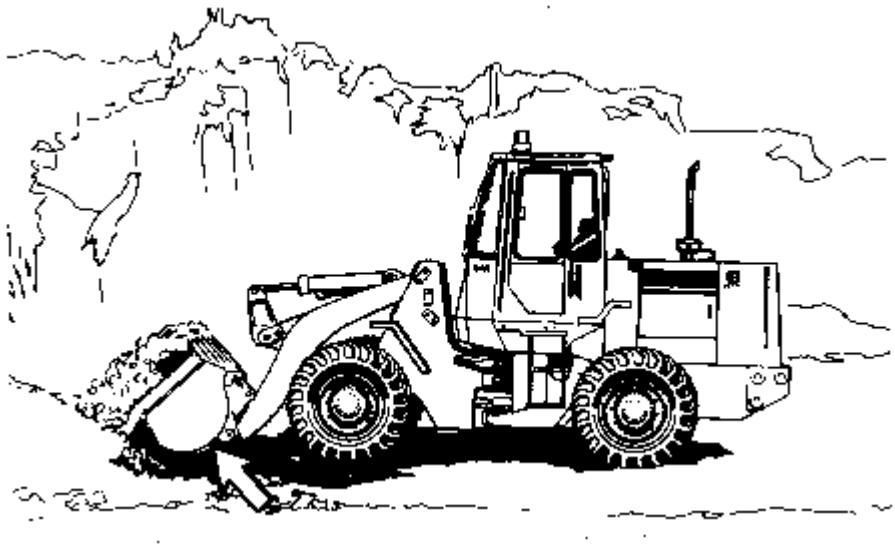
1. Start to load at the base of the bank and follow up the face.

Ver imagen

2. Raise the bucket slightly and move away from the bank.

Excavating With Bucket

Ver imagen

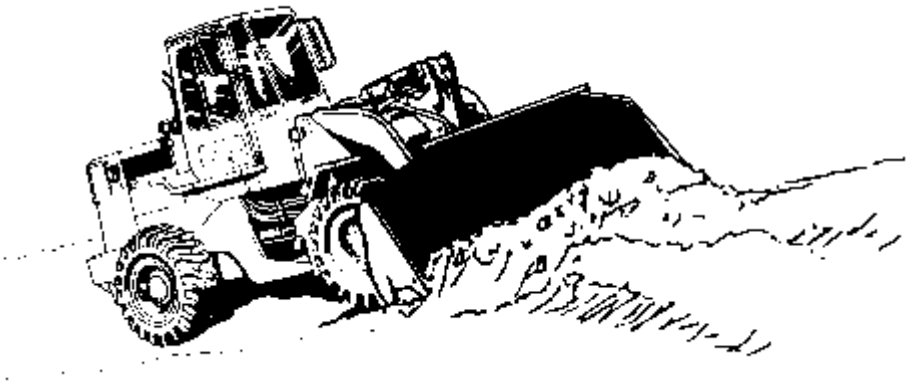


1. Lower the bucket to the ground and position for a slight digging angle.

Ver imagen

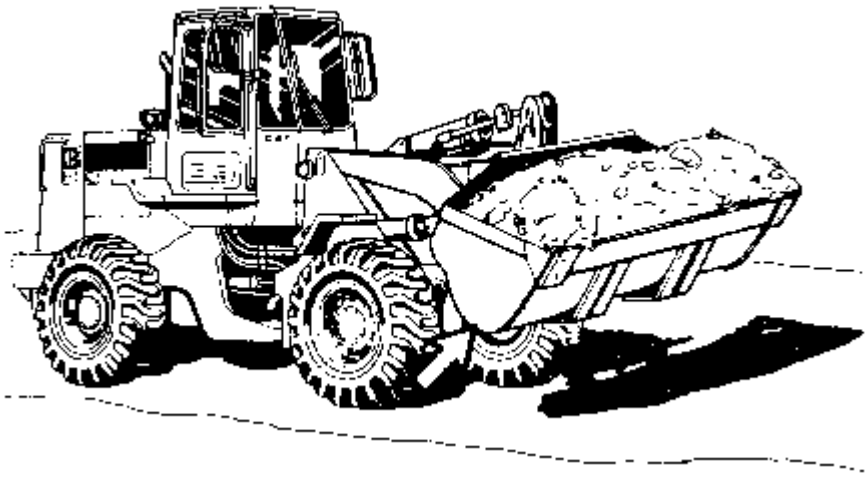
2. Apply down pressure to the bucket as the loader starts forward. Return the lift control to HOLD when sufficient penetration is obtained.

Ver imagen



3. Maintain level cuts while moving forward, by raising and lowering the bucket.

Ver imagen



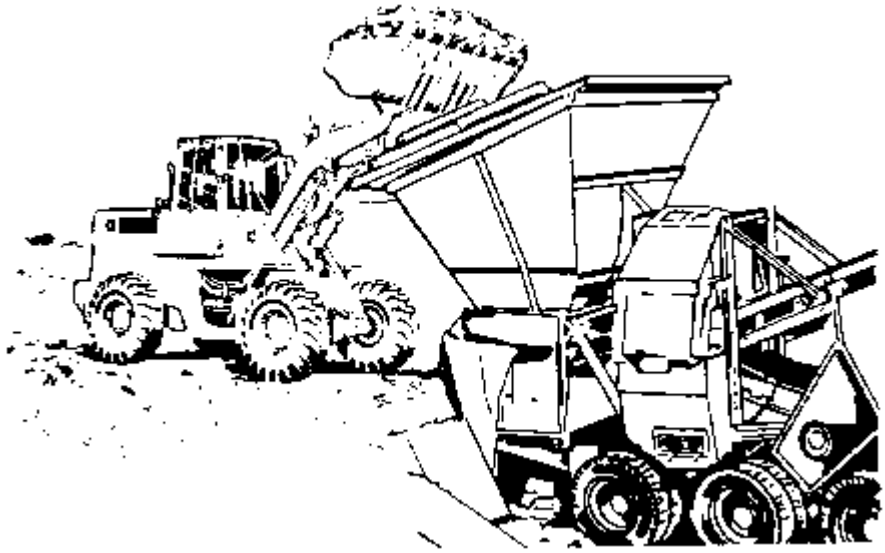
4. When the bucket is loaded, tilt it back against the stops. Carry the loaded bucket approximately 40 cm (15 inches) above the ground when moving to the dump area.

Loading Hoppers

1. Load the bucket (see "Loading from a Stockpile" steps 1 through 8).

1. Load the bucket (see "Loading from a Stockpile" steps 1 through 8).

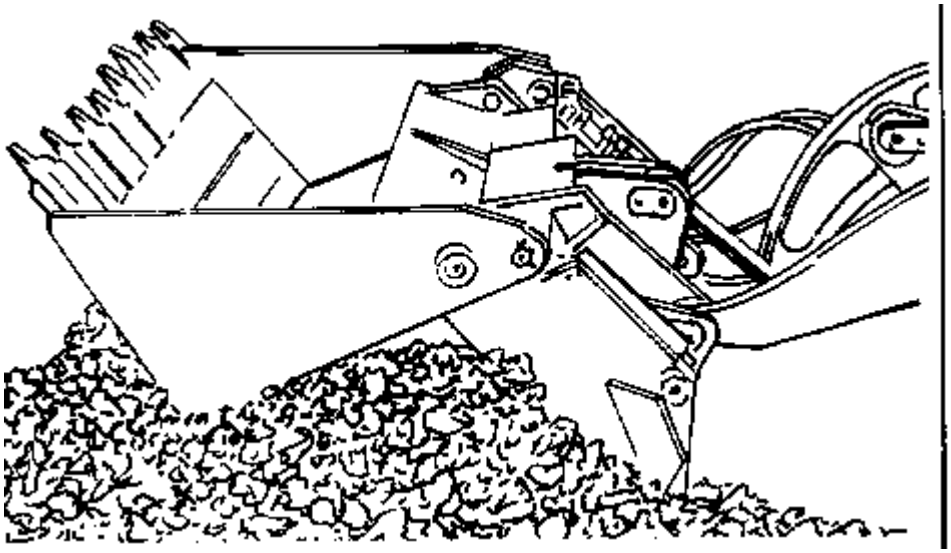
Ver imagen



2. When the lift kickout height is reached, dump the load into the hopper. If possible, dump with the wind to your back.

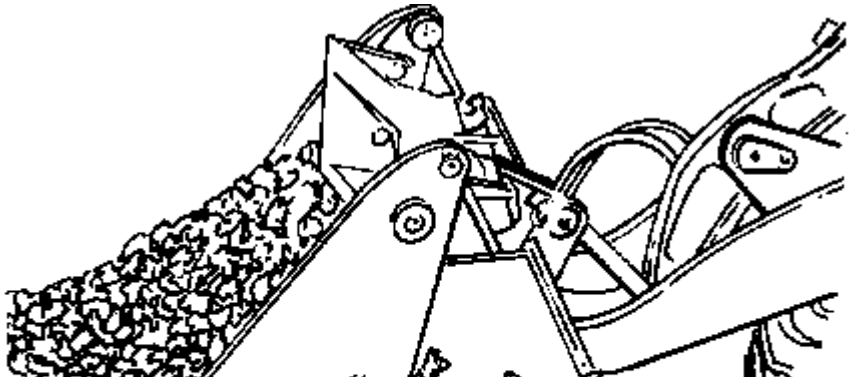
Multipurpose Bucket (typical application shown)

Ver imagen



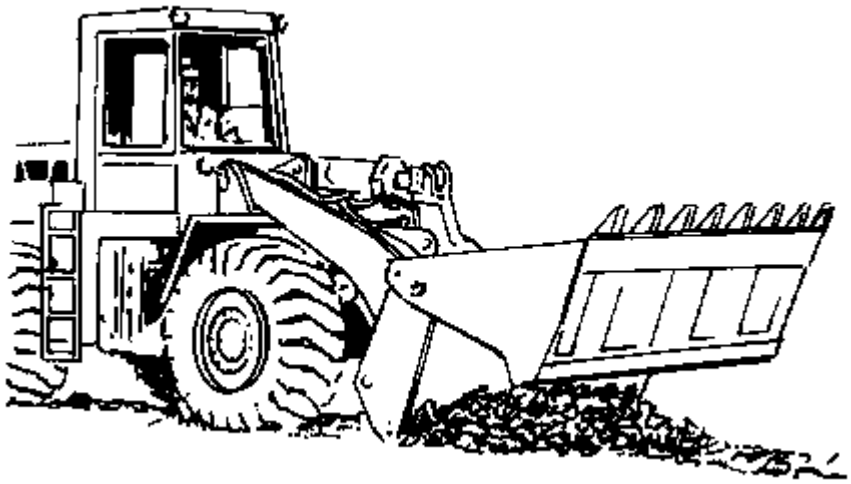
1. Bucket used as a clamp. Open the bowl and lower the open bucket over the loading material.

Ver imagen



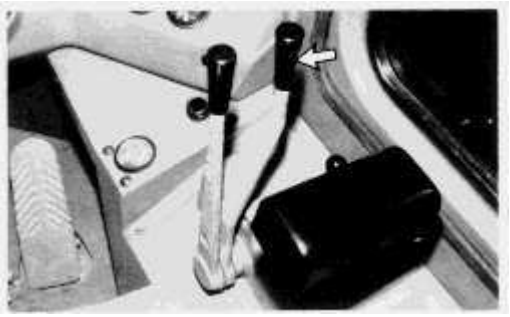
2. Close the bowl to load the material.

Ver imagen



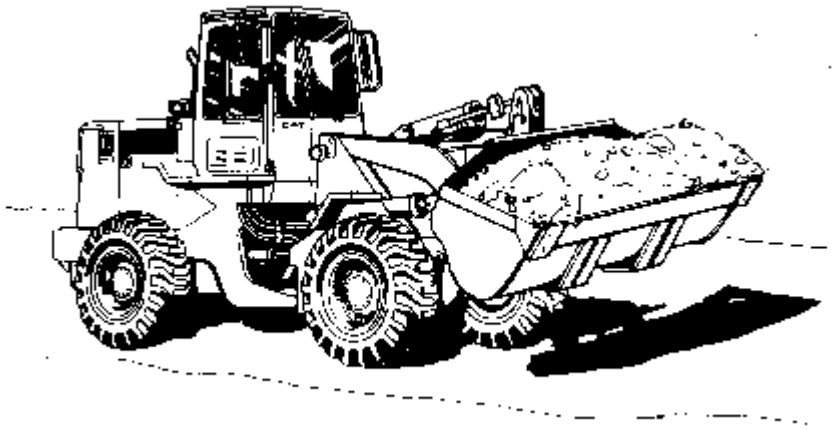
3. Bucket used for dozing. Open the bowl to use the blade for dozing.

Ver imagen



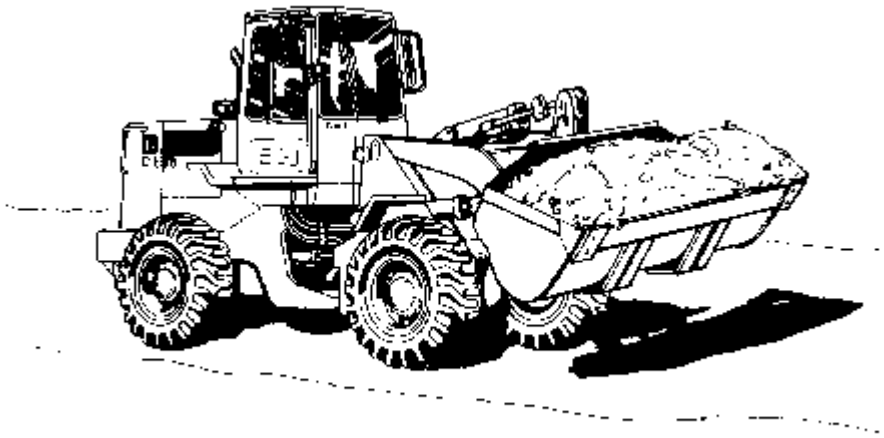
4. Maintain a level cut with the bucket lift control.

Ver imagen



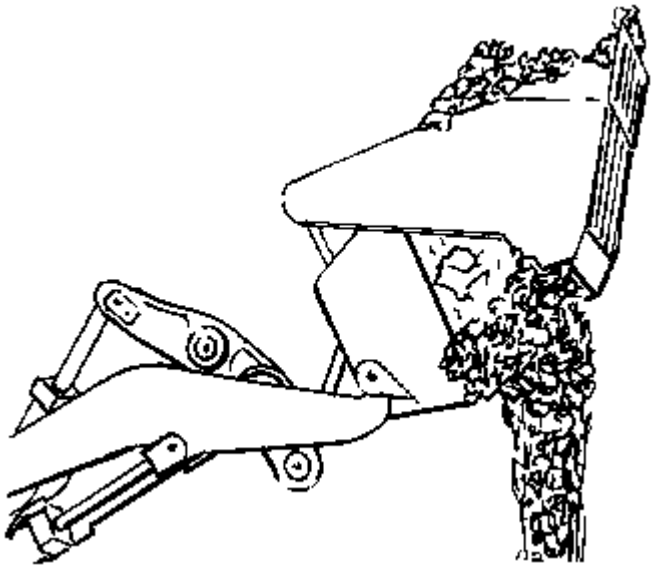
5. Use the bucket as a scraper for leveling, stripping or spreading fill.

Ver imagen



6. When loaded, close the bowl and tilt the bucket back.

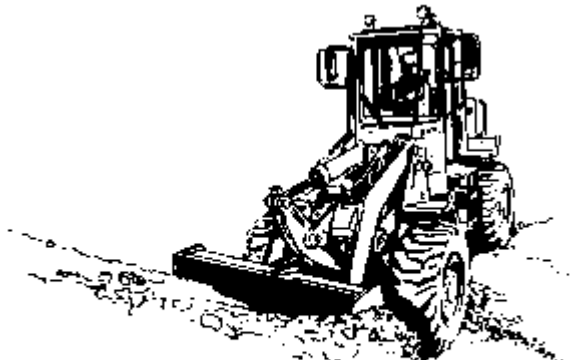
Ver imagen



7. For maximum dumping height or when unloading sticky material, position the bucket over the dump area. Open the bowl to dump the load.

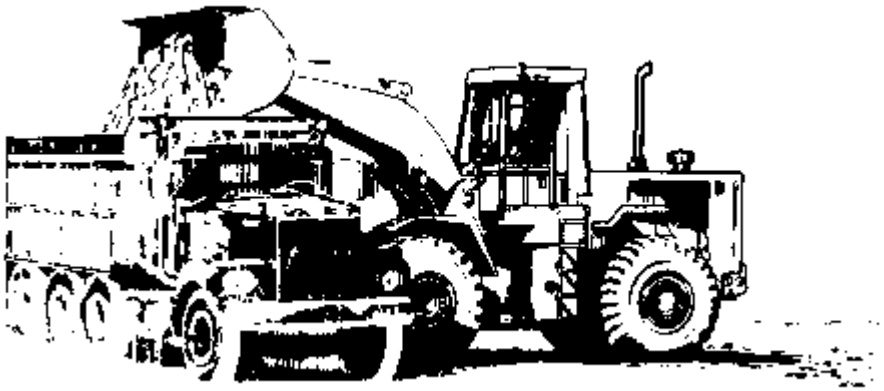
Side Dump Bucket (typical application shown)

Ver imagen



1. The bucket is loaded the same as the General Purpose Bucket (see "Loading from a Stockpile" steps 1 through 8).

Ver imagen



2. When loading a hauling unit, the side dump bucket can be used like a General Purpose Bucket for dumping...

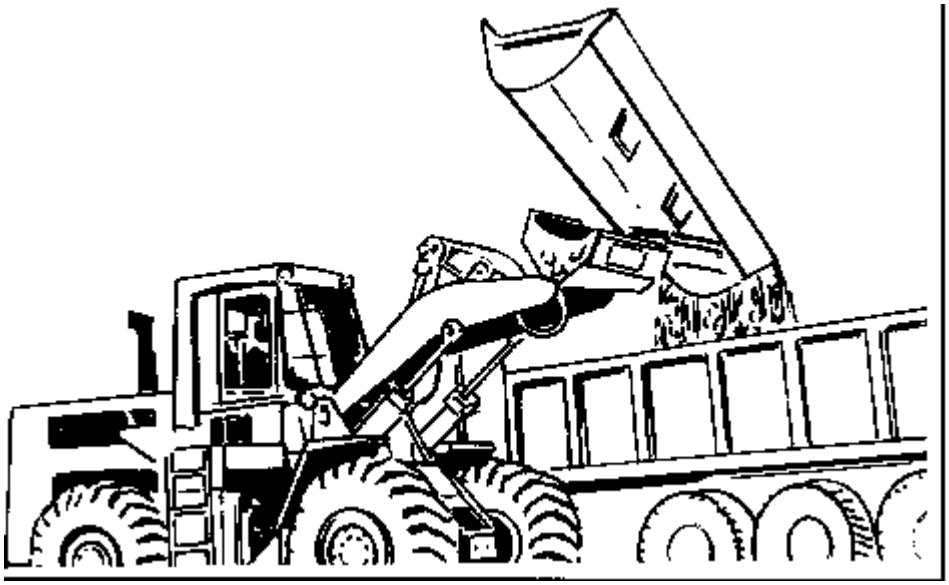
Ver imagen

3. ... Or can be dumped to the left, which is helpful in restricted loading space or when a side approach can reduce loader cycle time.

Ver imagen

4. The Side Dump Bucket also allows even distribution of loading material in the hauling unit body.

Ver imagen



5. Raise the bucket and side dump as the loader moves alongside the hauling unit.

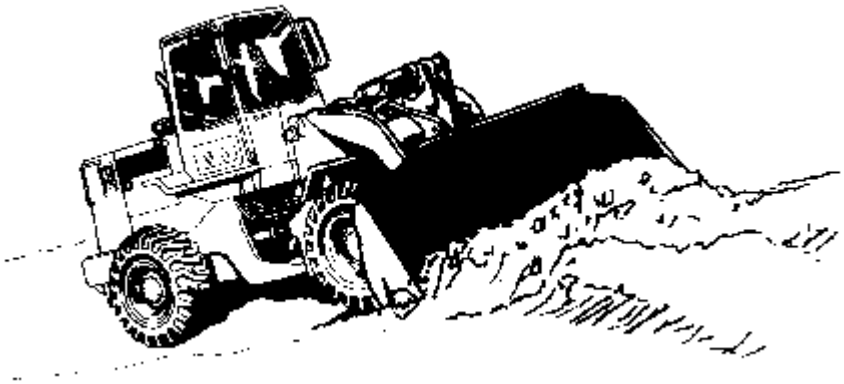
Ver imagen

6. The Side Dump Bucket can also be used for backfilling or windrowing.

Ver imagen

7. Side dump the bucket slowly to deposit backfill or windrow material.

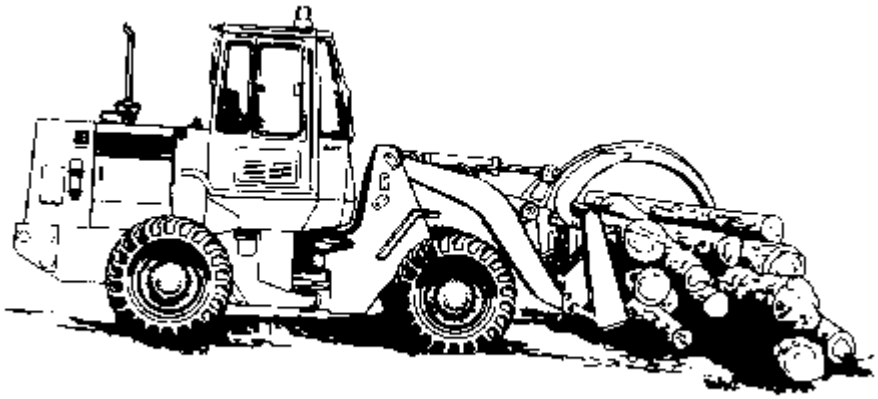
Ver imagen



8. Distribute or doze the material the same as with a General Purpose Bucket.

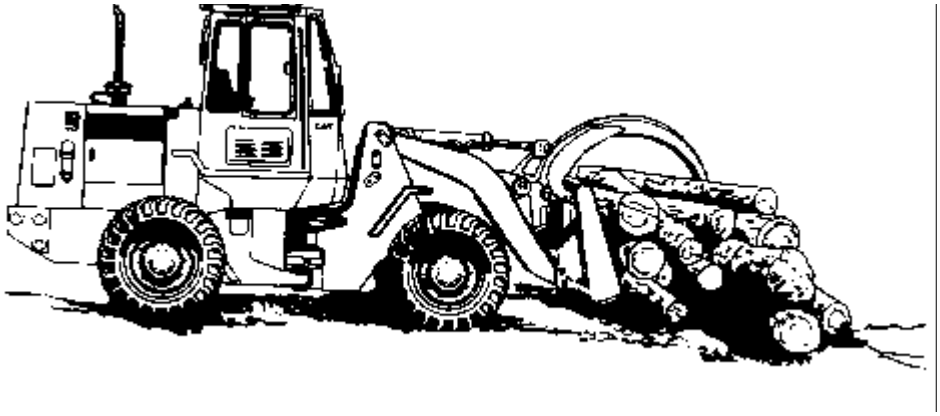
Log Fork with Top Clamp (typical application shown)

Ver imagen



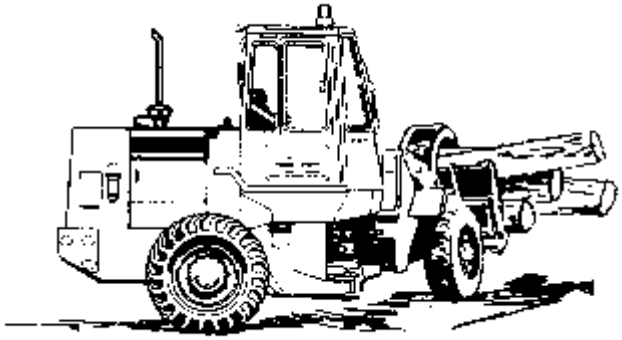
1. Position the fork in the center of the load, with the top clamp open.

Ver imagen



2. Close the top clamp and tilt the fork back to hold the load against the fork uprights.

Ver imagen



3. For best operator vision and loader stability, carry the load as low as possible.

Ver imagen

4. Position the load over the stacking area. Tilt the fork down and raise the clamp to release the load.

Machine Adjustments

Bucket Positioner - Tilt Adjustment

WARNING

Use caution to avoid possible personal injury when adjusting the bucket positioner.

Stop the engine and lower all equipment to relieve the hydraulic pressure.

Engage the parking/secondary brake and block the tires to prevent sudden movement of the machine.

Keep unauthorized personnel off the machine.

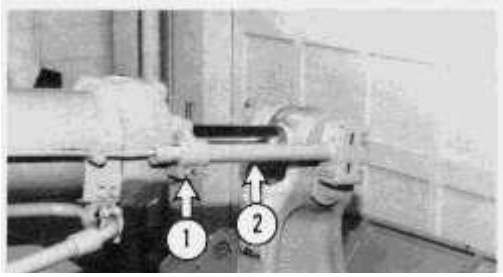
Ver imagen

1. Start the engine. Lower the bucket to the ground.

Ver imagen

2. Position the bucket at the desired angle to the ground. Stop the engine and turn the start key switch to ON. Move the tilt control to TILT BACK detent.

Ver imagen



3. Loosen two bracket bolts (1). Move the tube assembly (2) toward the bucket. When the switch aligns with the magnet, the tilt lever should move from the TILT BACK to the HOLD position.

Ver imagen

4. To test the adjustment, start the engine. Raise and dump the bucket. Move the tilt control lever to TILT BACK detent.

5. When the pre-set angle is reached, the tilt control lever should return to HOLD.

Bucket Lift Kickout

WARNING

Use caution to avoid possible personal injury when adjusting the implement lift kickout.

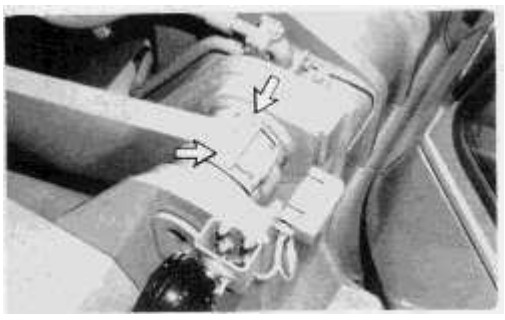
Keep personnel off the machine. Clear the area when working under or around the implement linkage.

With the implement raised, proper support must be provided for the implement and/or the linkage.

1. Start the engine. Raise the implement to the desired height and stop the engine.

2. Block the attachment and the linkage.

Ver imagen



3. Loosen the magnet clamp. Align the magnet with the switch assembly.

Ver imagen

4. Move the switch away from the magnet to increase, or towards the magnet to decrease the attachment lift kickout height.

5. Tighten the clamp.

Ver imagen

6. To check the adjustment, start the engine and move the attachment lift control to the RAISE detent.

7. At the pre-set lift height, the control lever should return to HOLD.

Machine Adjustments

Bucket Positioner - Tilt Adjustment

WARNING

Use caution to avoid possible personal injury when adjusting the bucket positioner.

Stop the engine and lower all equipment to relieve the hydraulic pressure.

Engage the parking/secondary brake and block the tires to prevent sudden movement of the machine.

Keep unauthorized personnel off the machine.

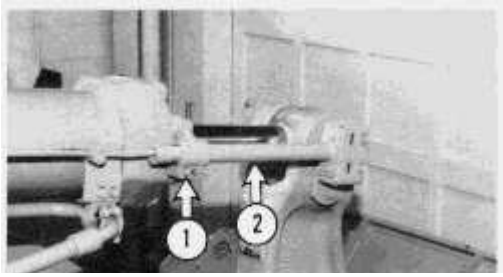
Ver imagen

1. Start the engine. Lower the bucket to the ground.

Ver imagen

2. Position the bucket at the desired angle to the ground. Stop the engine and turn the start key switch to ON. Move the tilt control to TILT BACK detent.

Ver imagen



3. Loosen two bracket bolts (1). Move the tube assembly (2) toward the bucket. When the switch aligns with the magnet, the tilt lever should move from the TILT BACK to the HOLD position.

Ver imagen

4. To test the adjustment, start the engine. Raise and dump the bucket. Move the tilt control lever to TILT BACK detent.

5. When the pre-set angle is reached, the tilt control lever should return to HOLD.

Bucket Lift Kickout

WARNING

Use caution to avoid possible personal injury when adjusting the implement lift kickout.

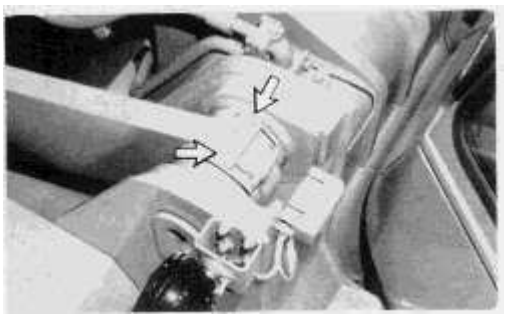
Keep personnel off the machine. Clear the area when working under or around the implement linkage.

With the implement raised, proper support must be provided for the implement and/or the linkage.

1. Start the engine. Raise the implement to the desired height and stop the engine.

2. Block the attachment and the linkage.

Ver imagen



3. Loosen the magnet clamp. Align the magnet with the switch assembly.

Ver imagen

4. Move the switch away from the magnet to increase, or towards the magnet to decrease the attachment lift kickout height.

5. Tighten the clamp.

Ver imagen

6. To check the adjustment, start the engine and move the attachment lift control to the RAISE detent.

7. At the pre-set lift height, the control lever should return to HOLD.

Machine Parking

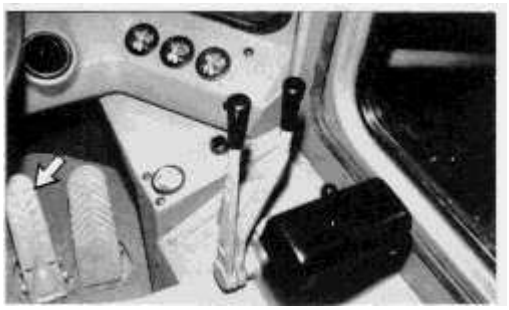
Machine Stopping

NOTICE

Park on a level surface. If it is necessary to park on a grade, block the wheels securely.

Do not engage the parking/secondary brake while the machine is moving unless an emergency exists.

Ver imagen



1. Apply the service brakes to stop the machine.

Ver imagen

2. Move the transmission control lever to NEUTRAL.

Ver imagen

3. Push the knob in to engage the transmission neutral lock.

Ver imagen

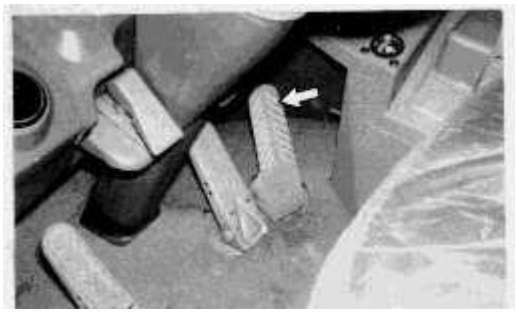
4. Push the knob in to engage the parking/secondary brake.

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

Engine Stopping

1. With the machine stopped, run the engine for 5 minutes at low idle.

Ver imagen

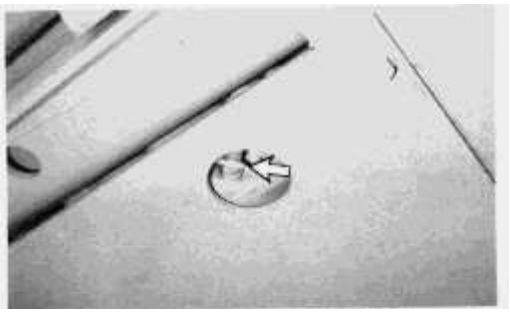


2. Pull the accelerator pedal back past the detent to stop the engine. Turn the start key switch to OFF. Remove the key.

Ver imagen

3. Use the steps and handholds, use both hands and face the machine, when dismounting.

Ver imagen



4. Drain the moisture from the air tank daily.

Ver imagen

5. Inspect the engine compartment for debris. Clean out any debris and paper to avoid a fire.

6. Remove all flammable debris from front bottom guard through the access doors to reduce fire hazard.

7. If the machine is being parked for an extended period (overnight, etc.), turn off the disconnect switch and remove the key.

8. Install all vandalism protection locks and covers.

Transportation Hints

Machine Shipping

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

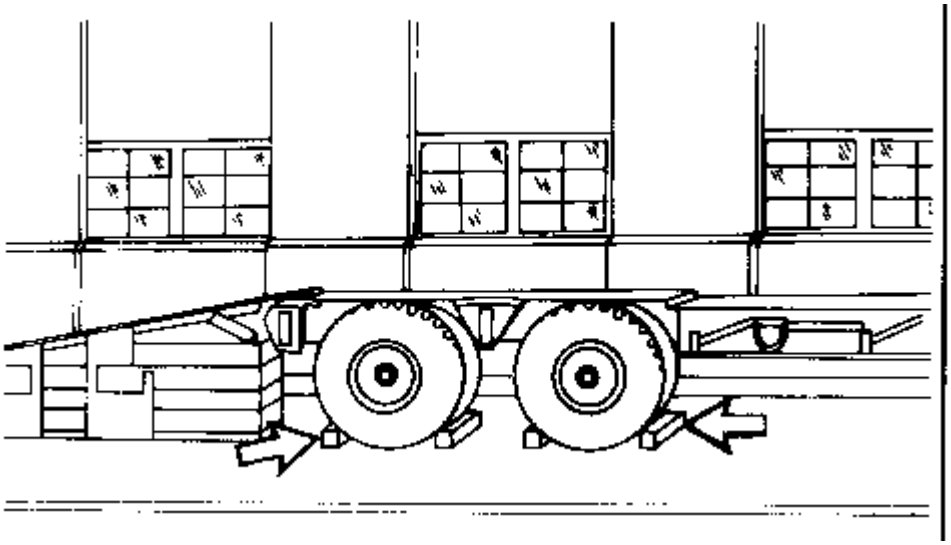
To prevent the machine from slipping while loading, or shifting in transit, remove ice, snow or other slippery material from the loading dock and the truck bed before loading.

NOTICE

Obey all state and local laws governing the weight, width and length of a load.

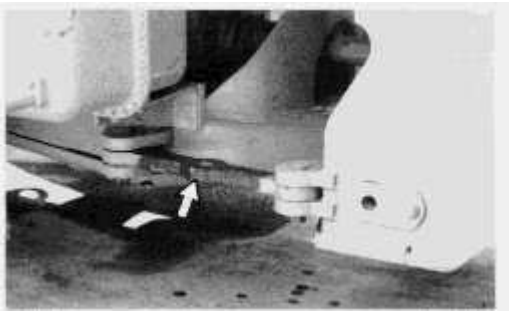
Observe all regulations governing wide loads.

Ver imagen



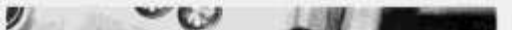
1. Block the trailer or rail car wheels before loading (trailer shown).

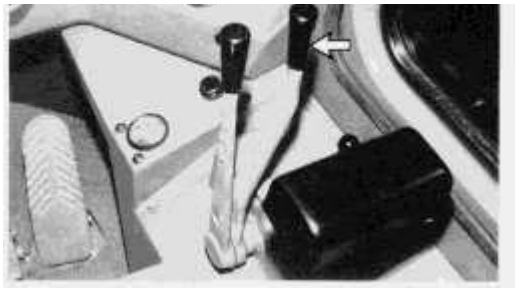
Ver imagen



2. After the machine is in position, connect the steering frame lock link to hold the front and rear frames rigid.

Ver imagen





3. Lower the bucket to the floor of the transport machine. Move the transmission control lever to NEUTRAL.

Ver imagen

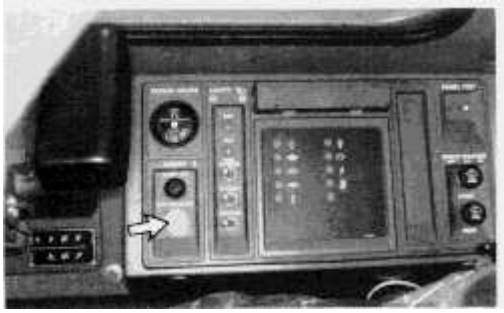
4. Engage the transmission neutral lock.

Ver imagen

5. Engage the parking/secondary brake.

6. Stop the engine.

Ver imagen

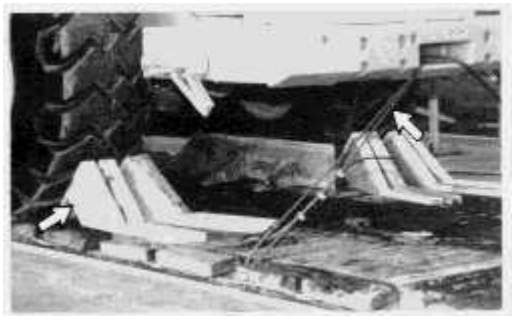


7. Turn the start key switch to off and remove the key.

Ver imagen

8. Turn the disconnect key switch off and remove the key.

Ver imagen



9. Block the tires and secure the machine with tie-downs when transporting on a rail car or a tractor-trailer.

Ver imagen

10. Cover the exhaust opening or secure the rain cap to prevent the turbocharger from "windmilling" in transit.

Machine Roading

Before roading a machine, consult your tire dealer for recommended tire pressures and speed limitations.

"TON km/h" (TON MPH) limitations must be observed. Consult your tire dealer for the speed limit of the tires involved.

When traveling long distances, stop every 40 km (25 miles) or 1 hour for 30 minutes to allow the tires and components to cool.

Inflate the tires to the correct pressure.

Ver imagen

Use a self-attaching inflation chuck and stand behind the tire tread while inflating the tire. See "Tire Inflation Information."

Ver imagen

Bring the engine coolant, the crankcase oil and the transmission oil up to the correct levels.

Check with the proper officials to obtain the required permits, etc.

Travel at a moderate speed. Observe all speed limitations when roading the machine.

Perform a "Walk-Around Inspection" and measure the fluid levels in the various compartments.

Machine Tiedown Information

Ver imagen

NOTICE

Improper lifting or tiedowns can allow load to shift and cause injury or damage.

1. Weight and instructions given herein apply to units manufactured by Caterpillar Inc.

966E Weight 18 350 kg (40,420 lb)

2. Use proper rated cables and slings for lifting. Position crane for level machine lift.

3. Spreader bar widths should be sufficient to prevent contact with

machine.

4. Use two rear and two front holes provided for tiedown.

Install tiedowns at several locations, and block wheels front and rear.

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

Contact your Caterpillar dealer for shipping instructions for your machine.

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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, air pressure released brakes. If the engine or pressure air system are inoperable, the brakes are applied and the machine cannot be moved.

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.

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

Do not allow riders 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.

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.

Consult your Caterpillar dealer for towing a disabled machine.

Engine Running

NOTICE

If the power train and the steering system are operable, and the engine is running, the machine can be towed a SHORT DISTANCE, pulled out of mud or to the side of the road.

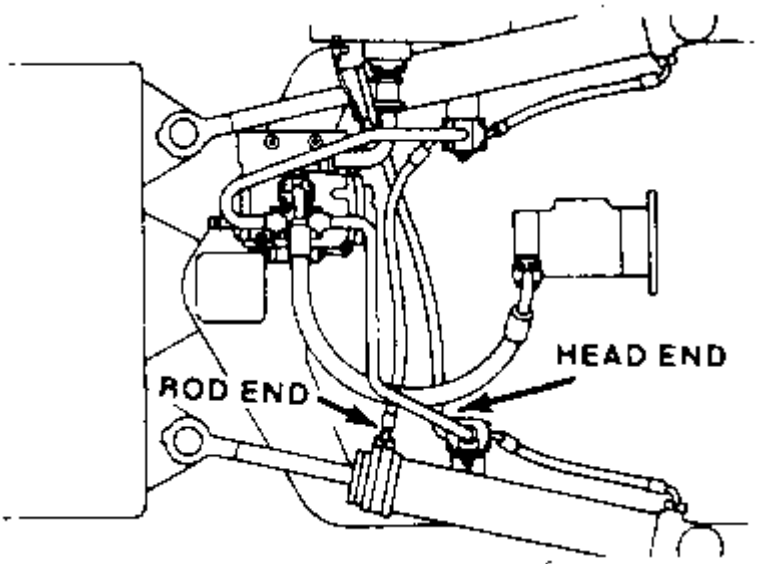
The operator on the towed machine MUST steer in the direction of the tow line.

Make certain, that all instructions outlined in this topic "Towing" are carefully and exactly followed.

Engine Stopped

Perform the following steps before towing the machine with the engine stopped.

Ver imagen



1. Reverse the hydraulic steering hose connections ON ONE CYLINDER ONLY, so the steering cylinders can move freely.

NOTICE

Be sure the cylinder hoses are connected correctly before operating the machine. With the hoses reversed, the steering system will not function.

Ver imagen

2. If internal transmission or drive line failure is suspected, remove the axle shafts.

Refer to your Caterpillar dealer or to the Service Manual for your machine for axle shaft removal and installation procedures.

WARNING

When the axle shafts are removed, the machine has NO parking/secondary brakes. The machine can roll and cause personal injury or death.

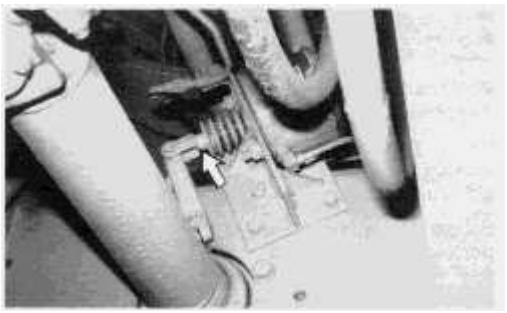
Block the wheels securely so that the machine cannot move.

If the brakes are in good operating condition, the machine has limited wheel brake ability. The pedal effort is high due to the lack of the hydraulic boost.

The towing connection must be rigid, or towing must be done by two machines of the same size or larger than the towed machine. Connect a machine on each end of towed machine.

Be sure all necessary repairs and adjustments have been made before a machine that has been towed to a service area, is put back into operation.

Ver imagen



3. Release the parking/secondary brake.

NOTICE

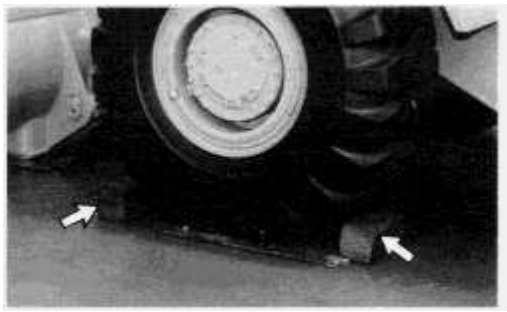
Release the parking/secondary brake to prevent excessive wear and damage to the parking/secondary brake system, when towing without brake air pressure.

The procedure for manual release of the parking/secondary brake is outline in the next topic, "Manual Release of the Parking/Secondary Brake.".

4. Inspect the machine for power train damage. Remove all four axle shafts if damaged is suspected. See "Remove and Install Drive Axles," if necessary.

5. Fasten the tow bar.

Ver imagen



6. Remove the wheel blocks. Tow the machine slowly. Do not tow any faster than 2 km/h (1.2 mph).

Manual Release of Parking/Secondary Brake

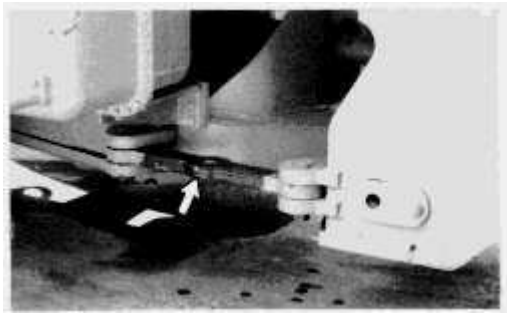
WARNING

Do not operate the machine if the brake was applied due to a malfunction of the air system or the brake.

Correct any problem before attempting to operate the machine.

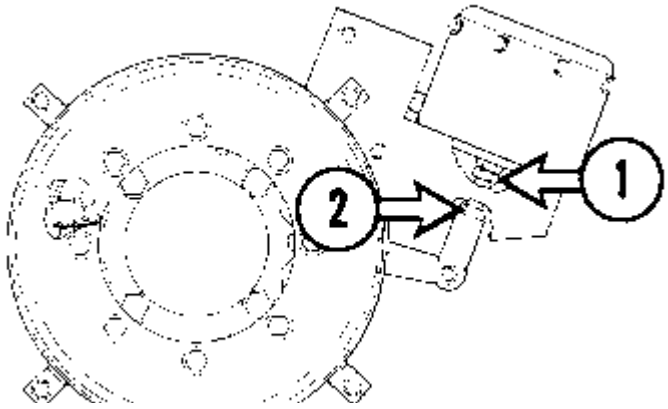
Block the wheels securely so that the machine cannot move.

Ver imagen



1. Connect the steering frame lock link.

Ver imagen



2. Loosen locknut (1). Turn locknut (1) up to bracket (2) and continue to turn locknut (1) against bracket (2) until the rod moves out enough to totally release the parking/secondary brake.

WARNING

The machine can be moved a short distance only.

Have the brake system repaired and the parking/secondary brake linkage adjusted before the machine is operated.

Remove and Install Drive Axles

WARNING

When the axle shafts are removed, the machine has NO parking/secondary brakes. The machine can roll and cause personal injury or death.

If the brakes are in good operating condition, the machine has limited wheel brake ability. High pedal effort is required, due to lack of hydraulic boost.

Block the wheels securely so that the machine cannot move.

The towing connection must be rigid, or towing must be done by two machines of the same size or larger than the towed machine. Connect a machine on each end of towed machine.

Ver imagen

If an internal transmission or drive line failure is suspected, remove the axle shafts. See your Caterpillar dealer or the Service Manual for your machine, for the removal and installation procedure.

Tire Inflation Information

2

Inflation of Tires with Nitrogen (N)

Caterpillar recommends using dry nitrogen (N_2) gas for both tire inflation, and tire pressure adjustments on all rubber tired machines. Nitrogen is an inert gas and will not support combustion inside the tire.

WARNING

Proper nitrogen inflation equipment, and training in using the equipment, are necessary to avoid over inflation. A tire blowout or rim failure can result from improper or misused equipment and serious personal injury or death can occur.

Because a fully charged nitrogen cylinder's pressure is approximately 15,000 kPa (2200 psi), a tire blowout and/or rim failure can occur if the inflation equipment is not used correctly.

In addition to reducing the risk of an explosion, using nitrogen to inflate tires lessens the slow oxidation of the rubber and the accompanying gradual tire deterioration. This is especially important for tires that have an expected long service life (four or more years). If also reduces the corrosion of rim components and the resultant disassembly problems.

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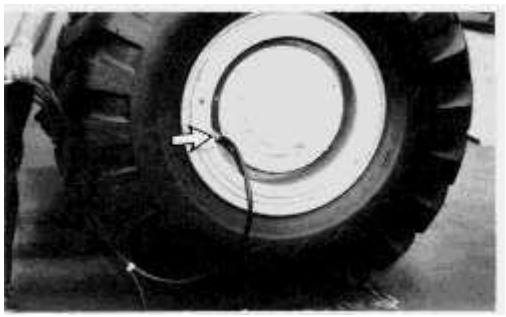

WARNING

Use a self-attaching inflation chuck and stand behind the tread when inflating a tire.

NOTICE

Set the tire inflation equipment regulator at no more than 140 kPa (20 psi) over the recommended tire pressure.

Use only Caterpillar Part 6V4040 Nitrogen Tire Inflation Group, or equivalent, to inflate tires from a nitrogen gas cylinder. Refer to Special Instruction, Form SMHS7867, for tire inflation instructions.

Use the same tire pressures for nitrogen inflation that are used for air inflation. Consult your tire dealer for operating pressures.

Shipping Pressures

The inflation pressures shown in the chart below are cold inflation operating and shipping pressures for tires on Caterpillar machines.

The inflation pressure is based on the weight of a ready-to-work machine without attachments, at rated payload, and in average operating conditions. Pressures for each application may need to be varied from those shown and should always be obtained from your tire supplier.

Ver imagen

Size	Ply Rating or Strength Index	Shipping Pressure	
		kPa	psi
LOADER			
23.50-25*	16*,20	345	50
23.50R25 (Front)	One Star	380	55
23.50R25 (Rear)	One Star	205	30
26.50-25	14, 20	240	35
26.50R25 (Front)	One Star	345	50
25.50R25 (Rear)	One Star	205	30
Logging			
23.50-25	24	480	70
23.50R25 (Front)	One Star	415	60
23.50R25 (Rear)	One Star	205	30
26.50-25	20	345	50
26.50R25 (Front)	One Star	380	55
26.50R25 (Rear)	One Star	205	30

* Standard tire, ply rating and inflation pressures.

NOTE: /the "R" in tire size denotes radial construction.

Adjusted Inflation Pressures

A tire inflation in a warm shop area, 18°C to 21°C (65°F to 70°F), will be underinflated if the machine works in freezing temperatures. Low pressure shortens the life of a tire.

When operating in freezing temperatures, consult the Cold Weather Recommendations Operation and

Maintenance Guide, Form SEBU5898, for adjusted inflation pressures.

General Torque Specifications

For additional torque specifications, not included in this section, refer to "Torque Specifications," Form SENR3130, available from your Caterpillar dealer.

Bolt Torques for Ground Engaging Tools

Ver imagen

Bolt Size Inch	Recommended Torque[1]	
	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

[1] These values are applicable only to Caterpillar cutting edge bolts.

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.

Ver imagen

Clamp Width	Initial Installation Torque on New Hose	
	N•m[1]	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
Clamp Width	**Reassembly or Retightening Torque**	
	N•m[1]	**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] 1 Newton meter (N•m) is approximately the same as 0.1 mkg.

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

Ver imagen

Thread Size Inch	Standard Bolt & Nut Torque	
	N•m[1]	lb ft
1/4	12 ± 4	9 ± 3
5/16	25 ± 7	18 ± 5
3/8	45 ± 7	33 ± 5
7/16	70 ± 15	50 ± 11
1/2	100 ± 15	75 ± 11
9/16	150 ± 20	110 ± 15
5/8	200 ± 25	150 ± 18
3/4	360 ± 50	270 ± 37
7/8	570 ± 80	420 ± 60
1	875 ± 100	640 ± 75
1 1/8	1100 ± 150	820 ± 110
1 1/4	1350 ± 175	1000 ± 130
1 3/8	1600 ± 200	1180 ± 150
1 1/2	2000 ± 275	1480 ± 200

[1] 1 Newton meter (N•m) is approximately the same as 0.1 mkg.

Torques for Taperlock Studs

Ver imagen

Thread Size Inch	Standard Taperlock Stud Torque	
	N•m[1]	lb ft
1/4	8 ± 3	6 ± 2
5/16	17 ± 5	13 ± 4
3/8	35 ± 5	26 ± 4
7/16	45 ± 10	33 ± 7
1/2	65 ± 10	48 ± 7

9/16	90 ± 15	65 ± 11
5/8	110 ± 15	80 ± 11
3/4	170 ± 20	125 ± 15
7/8	260 ± 30	190 ± 22
1	400 ± 40	300 ± 30
1 1/8	500 ± 40	370 ± 30
1 1/4	650 ± 50	480 ± 37
1 3/8	750 ± 50	550 ± 37
1 1/2	870 ± 50	640 ± 37

[1] 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.

NOTE: Metric hardware must be replaced with metric hardware. Check parts book for proper replacement.

Ver imagen

METRIC ISO[2] THREAD		
Thread Size Metric	Standard Torque	
	N•m[1]	lb ft
M6	12 ± 4	9 ± 3
M8	25 ± 7	18 ± 5
M10	55 ± 10	41 ± 7
M12	95 ± 15	70 ± 11
M14	150 ± 20	110 ± 15
M16	220 ± 30	160 ± 22
M20	450 ± 70	330 ± 50
M24	775 ± 100	570 ± 75

M30	1600 ± 200	1180 ± 150
M36	2700 ± 400	2000 ± 300

[1] 1 Newton meter (N•m) is approximately the same as 0.1 mkg.
[2] ISO–International Standard Organization.

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General Service Information

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.

Electrical System

NOTICE

When jump starting a machine, follow the instructions in "Engine Starting" in the "Operation Section" to properly start the engine.

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

Air Intake System

Ver imagen

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

Remove any dust and debris as needed.

If the indicator light comes on 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 light comes on 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. Engine damage can result.

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Fuel Specifications

General Fuel Information

Ver imagen

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.

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 filter, always prime the fuel system (if equipped with a priming pump) 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 this section.

Fuel Heaters

Use of a fuel heater can help eliminate some cold weather problems. A fuel heater should be installed so that the fuel is heated before it goes into the first or primary fuel filter.

Select a fuel heater that is mechanically simple, yet adequate for the application. The fuel heater should also prevent overheating of the fuel. Disconnect or deactivate the fuel heater in warm weather.

A loss of engine power will occur if the fuel supply temperature exceeds 30°C (85°F).

NOTE: Use only thermostatically controlled or self-regulating fuel heaters as recommended. Do not use fuel heaters in warm temperatures.

For further information on fuel heaters, contact your Caterpillar dealer.

Types of Fuel

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 SEBD0717 Diesel Fuel and your engine for information about fuel properties, such as ignition quality, gravity/density, viscosity, cloud point, sulfur content, etc.

Fuel Cetane Requirement

The minimum fuel cetaine 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.

Fuel Sulfur Content

The percentage of sulfur in the fuel will affect the engine oil recommendations. Fuel sulfur is chemically changed during combustion to form both sulfurous and sulfuric acid. These acids chemically attack metal surfaces and cause corrosive wear.

Certain additives used in lubricating oils contain alkaline compounds that are formulated to neutralize these acids. The measure of this reserve alkalinity in a lubricating oil is known as its Total Base Number (TBN).

Higher engine oil TBN values are essential to neutralize the acids from combustion gases and to minimize corrosive wear.

Any API classification engine oil should have sufficient TBN for fuels with less than 0.5% sulfur.

If the fuel has over 0.5% sulfur content, the engine oil must have a TBN of 20 times the percentage of fuel sulfur as measured by the ASTM (American Society of Testing Materials) D-2896 method. (ASTM D-2896 can normally be found at your local technological society, library or college.)

If the sulfur content in the fuel is greater than 1.5% by weight, use an oil with a TBN of 30 and reduce the oil change interval by one half.

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

For more information on oil, fuel sulfur content, etc., refer to "Oil and Your Engine," Form SEBD0640 or contact your Caterpillar dealer.

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.

Obtain S·O·S Samples

To compliment a good preventive maintenance program, Caterpillar recommends using S·O·S at regular scheduled intervals 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.

There are several methods used to obtain S·O·S samples.

* Use a sampling gun inserted into the sump.
* Use a valve installed for samples.
* Use the drain stream when changing oil.

NOTE: Caterpillar recommends using the first or second method. If these methods are not feasible, then use the drain stream.

When using the drain stream to obtain the oil sample, do not sample from the first or final draining. The oil at the beginning or end of the drain stream is not mixed well enough to be representative of the oil in the compartment.

S·O·S Analysis

S·O·S is composed of three basic tests:

* Wear Analysis
* Chemical and Physical Tests
* Oil Condition Analysis

Wear element analysis uses spectrophotometry to monitor component wear by identifying and measuring concentrations, in parts per million, of wear elements present in the oil. Impending failures can be identified when test results deviate from concentration levels established as acceptable, based on normal wear.

Chemical and physical tests detect the presence of water, fuel and glycol (antifreeze) in the oil.

Oil condition is evaluated with infrared analysis. This test determines the presence and measures the amount of soot, sulfur products, oxidation, and nitration products in the oil. Infrared analysis can also assist in customizing (reducing, maintaining or extending) oil change intervals for particular conditions and applications.

Infrared analysis should always be accompanied by wear element analysis and chemical and physical tests to assure accurate diagnosis.

Ver imagen

S·O·S INTERVAL CHART	
Compartment	**Interval**
Engine Oil	250 Hours

Hydraulic Oil	500 Hours
Differential/Final Drives	500 Hours
Transmission Oil	500 Hours

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

Lubricant Specifications

Lubricant Information

Certain abbreviations follow S.A.E. J754 nomenclature and 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.

Diesel Engine Oil (DEO)

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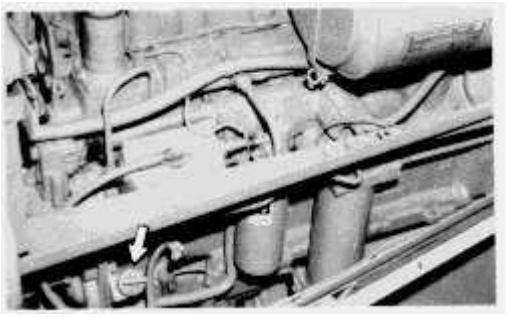


Caterpillar has two oil formulations to provide maximum performance and life in your engine.

* 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.

If an oil other than DEO is to be used, use the following guideline:

* API specifications CD/SD, CD/SE, CD/SF, CD/SG or CD
* European specification CCMC D4 or D5
* Military specifications MIL-L-2104E or MIL-L-2104D

CAT Diesel Engine Oil (DEO) is blended with a diesel engine type additive with 14 TBN (Total Base Number) and 1.8% sulfated ash level.

Engine Oil (EO)

* Cat Engine Oil (EO)

If an oil other than EO is to be used, use the following guideline:

* API specifications CE, CE/SF, or CE/SG

CAT Engine Oil (EO) is a lubricant meeting the industry standards for both gasoline and diesel requirements. This oil has 10 TBN and a 1.2% sulfated ash level.

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. For fuel sulfur effects, the Infrared Analysis and the ASTM D2896 procedure can be used to evaluate the residual neutralization properties of and engine oil. The sulfur products formation depends on the fuel sulfur content, oil formulation, crankcase blowby, engine operating conditions and ambient temperature.

content, oil formulation, crankcase blowby, engine operating conditions and ambient temperature.

The Caterpillar 20 times rule for TBN versus fuel sulfur is a general requirement, but it can be modified by used oil analysis. The effectiveness of an oil formulation will depend on the additive package. A balanced additive package oil of a lower TBN can be as effective in fuel sulfur neutralization and overall performance as some oils with higher TBN values which have additives just for increased TBN. The used oil analysis can show these results.

For more information on oil and fuel sulfur content, refer to "Oil and Your Engine", form SEBD0640 and "EMA Lubricating Oils Data Book", form SEBU6310.

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.

Hydraulic Oil (HYDO)

Ver imagen

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 in most hydraulic and hydrostatic systems.

* Cat Hydraulic Oil (HYDO)

If different viscosities are required because of extreme ambient temperatures, the following oils can be used, use Caterpillar's:

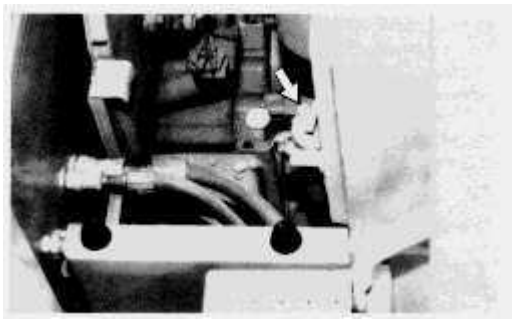
* Cat Engine Oil (EO)
* Cat Diesel Engine Oil (DEO)

If Cat Hydraulic Oil or Engine Oil is not available, use an engine oil that meets one of these API service classifications; CC, CC/SF, CD/SF, CD/SG, CD, CE/SF, CE/SG or CE. Any military specification of 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.

Transmission Oil (TDTO)

Ver imagen



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

* Cat Transmission/Drive Train Oil (TDTO)

NOTE: Failure to follow this recommendation can cause shortened transmission life due to material incapability and inadequate frictional requirements for disk materials.

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.

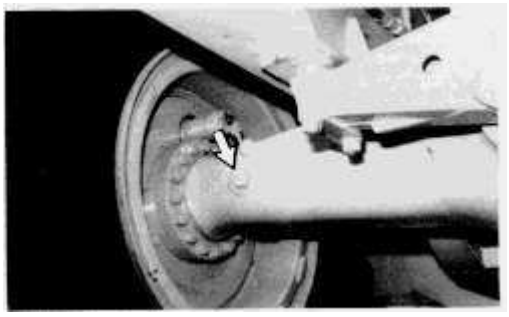
NOTE: Multi-grade oils are not blended for use in transmissions. Multi-grade oils which use high molecular weight polymers as viscosity index improvers lose their viscosity effectiveness by permanent and temporary shear of the VI improver.

NOTICE

This oil is formulated for transmission and Drive Trains only, and should not be used in engines. Shortened engine life will result.

Differential and Final Drive Oil (TDTO)

Ver imagen



For maximum life and performance of the front and rear axle components, 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 CD/TO-2 (MIL-L-2104D).

Cat Lubricating Grease

Caterpillar has greases for all applications.

* Cat Multipurpose Molybdenum Grease (MPGM)

Use MPGM for heavily loaded bearings and joints where an extreme pressure grease will maximize the life of Caterpillar equipment. This NLGI No. 2 grade is suitable for most temperatures.

If MPGM is not available, use a multipurpose type grease which contains 3 to 5% molybdenum.

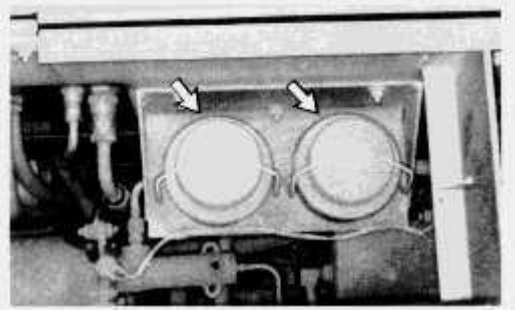
* Cat Multipurpose Lithium Grease (MPGL) (non-extreme pressure)

This NLGI No. 2 grade is recommended for light duty automotive type applications where a high temperature [up to 175°C (350°F)] is required. This grease offers excellent mechanical stability, high resistance to oxidation, good rust protection and excellent breakaway torque.

If this grease is not available, use a similar multipurpose grease.

Hydraulic Brake Fluid (BF)

Ver imagen



Use heavy duty hydraulic brake fluid certified by the oil supplier to meet SAE J1703f, DOT-3 or DOT-4 specifications.

Lubricant Viscosities and Refill Capacities

Lubricant Viscosities

Ver imagen

LUBRICANT VISCOSITIES[1] 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	+10	−4	+50
	SAE 15W40	−15	+50	+5	+122
	SAE 30	0	+40	+32	+104
Transmission **TDTO**	SAE 10W	−20	0	−4	+32
	SAE 30	−10	+40	+14	+104
	SAE 50	0	+50	+32	+122
Hydraulic Implement System **HYDO, DEO OR EO**	HYDO SAE 10W	−20	+40	−4	+104
	EO SAE 30	+10	+50	+50	+122
	DEO SAE 30	+10	+50	+50	+122
Differentials and Final Drives **TDTO**	SAE 10W	−30	0	−22	+32
	SAE 30	−20	+25	−4	+77
	SAE 50	0	+50	+32	+122
Brakes **BF**	SAE J1703f DOT-3 or DOT-4	−30	+50	−22	+122

[1] When operating below −18°C (0°F) refer to the Operation and Maintenance Manual, for Cold Weather Recommendations, Form SEBU5898, available from your Caterpillar dealer.

Refill Capacities

Ver imagen

REFILL CAPACITIES – (APPROXIMATE)			
Compartment or System	Liters	U.S. Gal.	Imperial Gal.
Cooling System	44	12	9.6

Fuel Tank	308	81	67.7
Engine Oil	29	7.5	6.4
Transmission Oil	46	12	10
Front Differential and Final Drives	47	12.5	10.4
Rear Differential and Final Drives	53	14	11.7
Hydraulic Tank	140	37	30.8
Brakes	6	1.5	1.25

Maintenance Intervals

When Required

Engine Air Intake System - Service filters

Ether Starting Aid - Replace empty cylinders

Batteries - Inspect

Radiator - Replace cap, clean core

Cooling System - Replace coolant if dirty

Fuses - Replace

Windshield Wipers and Washer - Inspect

Bucket Edge - Replace if damaged

Bucket Teeth - Replace if damaged

Seat Belts - Inspect/Replace if necessary

Every 10 Service Hours or Daily

Engine Oil (EO) - Check oil level

Transmission Oil (TDTO) - Check oil level

Hydraulic Oil (HYDO) - Check oil level

Cooling System - Check coolant level

Fuel Tank - Drain water and sediment

Air Reservoirs - Drain water and sediment

Walk-Around Inspection - Inspect machine

Seat Belt - Inspect

Indicators and Gauges - Test

Back-up Alarm - Test

Every 50 Service Hours or Weekly

First Perform Previous Service Hours Items

Cab Air System - Clean/change filters

Bucket Lower Pivot Pins (MPGM) - Lubricate 2 fittings

Every 100 Service Hours or 2 Weeks

First Perform Previous Service Hours Items

First Perform Previous Service Hours Items

Rear Axle Trunnion (MPGM) - Lubricate 2 fittings

Bucket Cylinder and Linkage Bearings (MPGM) - Lubricate 10 fittings

Steering Cylinder Bearings (MPGM) - Lubricate 4 fittings

Logging Fork Clamp (MPGM) - Lubricate 6 fittings

Bucket Upper Pivot Pin (MPGM) - Lubricate 1 fitting

Every 250 Service Hours or Monthly

First Perform Previous Service Hours Items

Engine Oil and Filter (EO) - Change oil and filter. If the sulfur content in the fuel is greater than 1.5% by weight, use an oil with a TBN of 30 and reduce the oil change interval by one half

Engine Valve Lash - Adjust on new or reconditioned engines at first oil change only

Brake Fluid Reservoirs (BF) - Check level

Brakes - Test

Cooling System - Add coolant additive

Drive Shaft Spline (MPGM) - Lubricate fitting

Air Conditioner - Test/Adjust belt

Fan and Alternator Belts - Inspect/Adjust

Fan Bearing (MPL) - Lubricate

Every 500 Service Hours or 3 Months

First Perform Previous Service Hours Items

Engine Crankcase Breather - Clean

Transmission - Change filter

Hydraulic System - Service elements/cap

Fuel System - Clean/change filters

Fuel Tank Cap and Fill Screen - Clean

Every 1000 Service Hours or 6 Months

First Perform Previous Service Hours Items

Transmission Oil (TDTO) - Change oil

Drive Shaft Support Bearing (MPGM) - Lubricate fitting

Drive Shaft Universal Joints (MPGM) - Lubricate 5 fittings

Frame Pivot Bearings (MPGM) - Lubricate 2 fittings

Rollover Protective Structure (ROPS) - Inspect

Every 2000 Service Hours or 1 Year

First Perform Previous Service Hours Items

Hydraulic Tank Oil (HYDO) - Change oil

Differentials and Final Drives (TDTO) - Change oil

Engine Valve Lash - Adjust

Engine Valve Rotators - Observe rotation

Every 3000 Service Hours or 2 Years

First Perform Previous Service Hour Items

Cooling System Coolant - Change coolant

When Required

You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

Engine Air Intake System

Clean the Air Intake

Ver imagen

1. Empty the bowl whenever the dirt reaches the full mark.

2. Loosen the wing nut on top and remove, empty and wash the bowl.

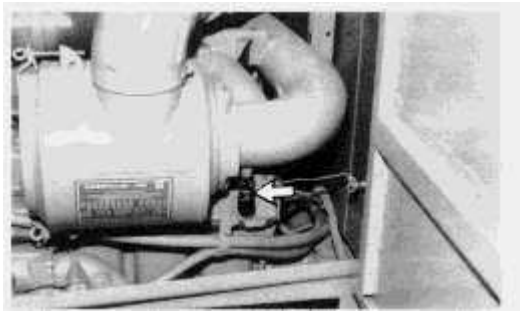
3. Install the bowl and cap. Tighten the wing nut finger tight only. Do not use a tool.

Service the Filter Elements

NOTICE

Service the air cleaner only with the engine stopped to prevent engine damage.

Ver imagen



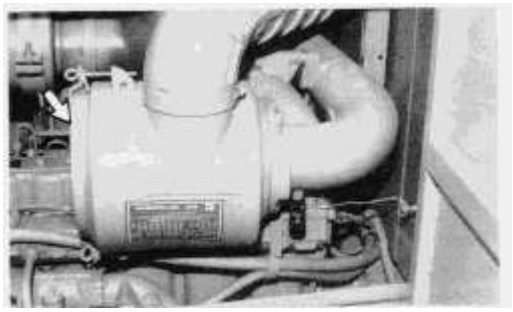
Service the air cleaner if the yellow piston in the filter element indicator moves into the red zone with the engine running at high idle. Stop the engine.

Ver imagen

Open the access cover.

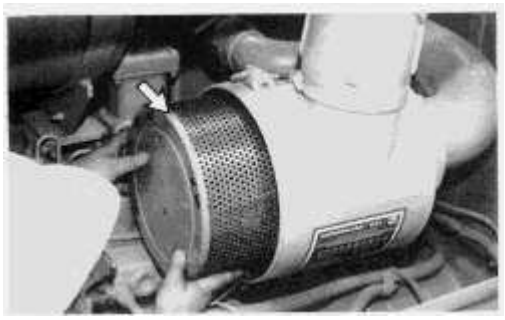
Change/Wash the Primary Element

Ver imagen



1. Remove the air cleaner cover.

Ver imagen



2. Remove the primary filter element from the air cleaner housing.

Ver imagen

3. Clean the inside of the air cleaner housing.

4. Clean and inspect the primary element. See "Cleaning Primary Elements."

5. Install a clean primary element.

6. Clean and install the cover. Tighten the cover bolts finger tight. Do not use a tool to tighten the bolts.

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 clean primary filter element. Install a new primary filter element.

The primary element should be replaced after being cleaned a maximum of six times. Replace the element once a year even though it has not been cleaned six times.

Change the Secondary Element

NOTICE

Always replace the secondary filter element. Never attempt to reuse it by cleaning.

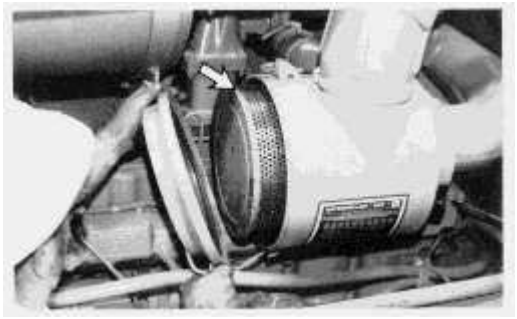
The secondary filter element should be replaced at the time the primary element is serviced for the third time.

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.

---

1. Open the access cover.

Ver imagen



2. Remove the housing cover and the primary element.

Ver imagen

3. Remove the bolts that hold the secondary filter element to the housing. Remove the secondary element.

4. Cover the air inlet opening. Clean the inside of the air cleaner housing.

5. Inspect the gasket between the air inlet pipe and the housing. Replace it if is damaged.

6. Uncover the air inlet opening. Install a new secondary element.

7. Install the nuts and washers on the studs. Torque the nuts to 27 ± 7 N·m (20 ± 5 lb ft).

8. Install the primary element. Install the cover. Tighten the cover bolts finger tight only. Do not use a tool to tighten the cover bolts.

9. Close the access doors.

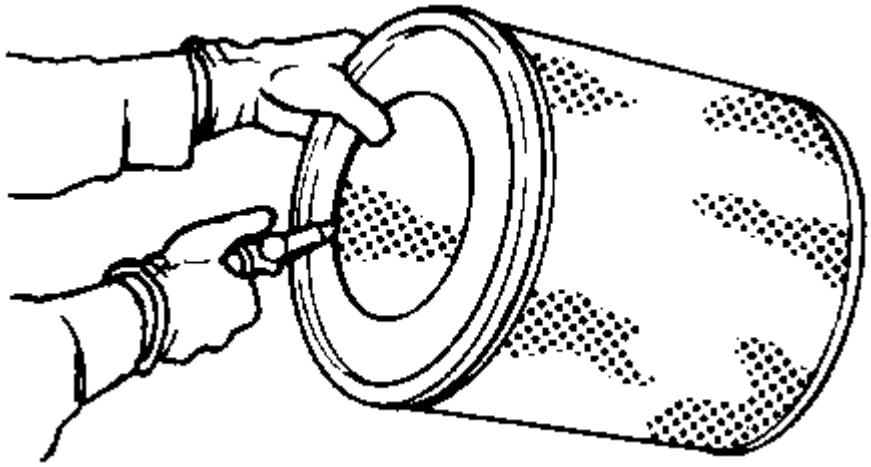
Cleaning Primary Elements

NOTICE

Do not clean the filter elements by bumping or tapping them. Engine damage could result.

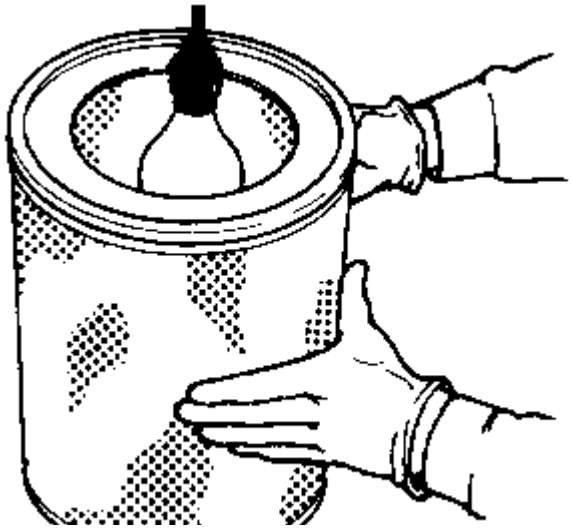
Filter elements can be cleaned with pressure air, pressure water, or detergent washing.

Ver imagen



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

Ver imagen



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

3. Wrap and store the clean filter elements in a clean, dry place.

Ether Starting Aid

Installing the Cylinder

Ver imagen

1. Open the right access cover on the rear of the machine. The ether cylinder is mounted on the right side of the engine compartment.

Ver imagen

2. Loosen the cylinder retaining clamp, unscrew and remove the empty ether cylinder.

3. Remove the used gasket. Install the new gasket provided with each new cylinder.

4. Install the new cylinder. Tighten the cylinder hand tight. Tighten the cylinder clamp securely.

5. Close the access door.

Batteries

Check Electrolyte Level

Ver imagen

BATTERY ELECTROLYTE CHART	
Battery	**Interval**
Conventional	100 Hour
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.

Ver imagen

1. Open the access panel.

Ver imagen

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 the access cover.

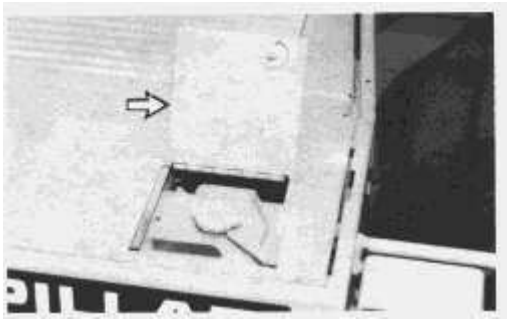
Radiator

Clean or Replace Pressure Cap

Ver imagen

The radiator cap access door is located on the top rear of the machine.

Ver imagen



1. Open the radiator cap access door.

Ver imagen

2. Remove the radiator cap slowly to relieve pressure.

3. Inspect the cap for damage, deposits or foreign material. Clean the cap with a clean cloth or replace the cap as necessary.

4. Install the cap.

5. Close the access door.

Clean Outside of Radiator Core

Ver imagen

Open the radiator guard on the rear of the machine.

Ver imagen

Compressed air, high pressure water or steam can be used to remove dust, leaves and general debris from a 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.

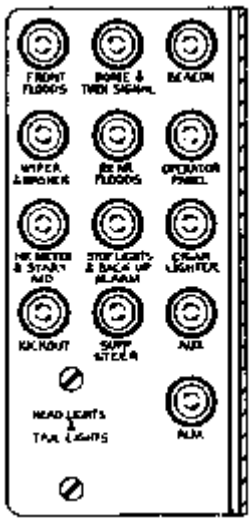
Fuses

Replace

Ver imagen

The fuse panel is located on the right side of the operator's compartment.

Ver imagen



Fuses - They protect the electrical system from damage caused by overloaded circuits. Change a fuse if the element separates. If the element of a new fuse separates, have the circuit checked and repaired.

NOTICE

Replace fuses with the same type and size only. Otherwise, electrical damage can result.

If it is necessary to replace fuses frequently, a electrical problem may exist. Contact your Caterpillar dealer.

Windshield Wipers and Washer

Inspect/Replace

Ver imagen

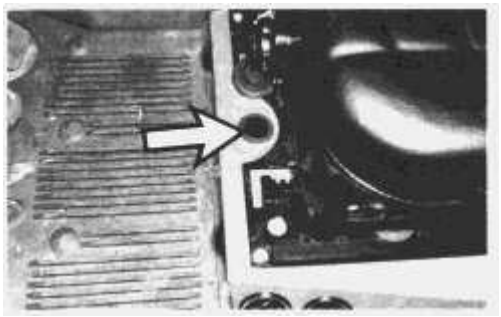
Inspect the windshield wiper blade. Replace if it is worn or damaged, or if streaking occurs.

Fill Washer Bottle

NOTICE

When operating in freezing temperatures, use Caterpillar nonfreezing window washer solvent. Any commercially available nonfreezing window washer solvent can also be used.

Ver imagen



The windshield washer fluid bottle is located on the left outside of the operator's compartment. The bottle can be filled through the filler neck located on the right side of the operator's seat.

Bucket Edge

Replace if Damaged

WARNING

Personal injury or death can result, if the bucket is not blocked up.
Block the bucket before changing cutting edge.

Change the edge if damaged or worn excessively.

Ver imagen

1. Raise the bucket and place blocking under it.

2. Lower the bucket to the blocking.

Do not block the bucket 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 side of the cutting edge if it is not worn.

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

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

8. Raise the bucket and remove the blocks.

9. Lower the bucket to the ground.

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

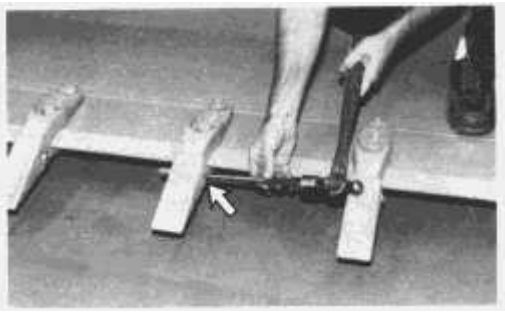
Bucket Teeth

Replace if Damaged

WARNING

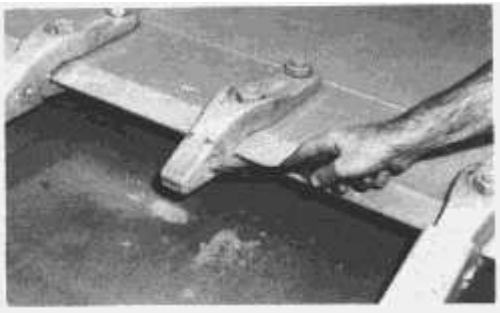
Personal injury or death can result, if the bucket is not blocked up.
Block the bucket before changing bucket teeth.

Ver imagen



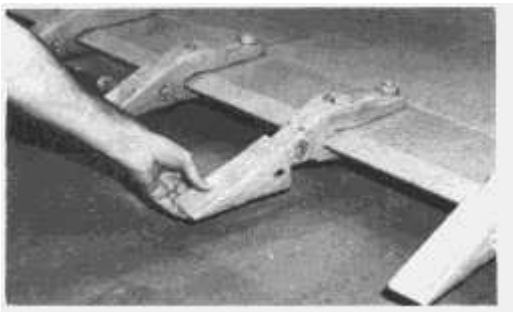
1. Drive the pin out of the tip from the retainer side of tip. Remove the tip and the retainer.

Ver imagen



2. Clean the adapter, pin and retainer. Install retainer in the groove in the side opposite of the adapter.

Ver imagen



3. Install a new tip over the retainer in either the runner or the digger position.

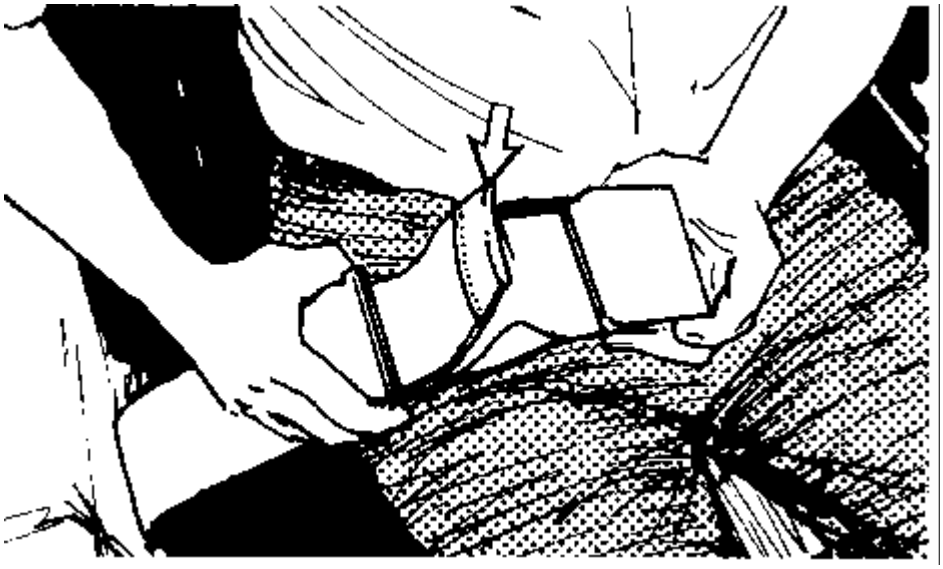
Ver imagen

4. Drive the pin through the retainer, adapter, and tip from the side opposite of the retainer.

Seat Belts

Inspect-Replace If Necessary

Ver imagen

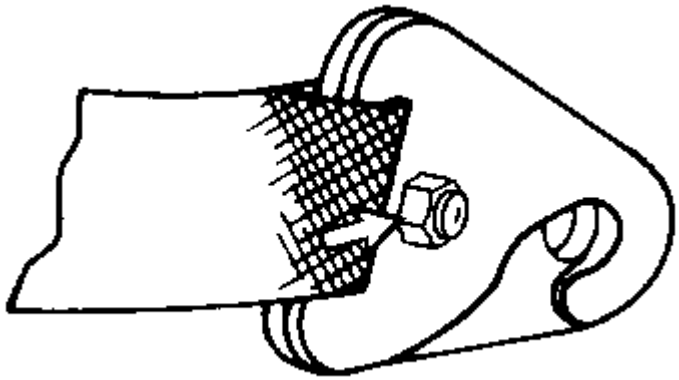


Inspect for worn or frayed webbing.

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.

Ver imagen



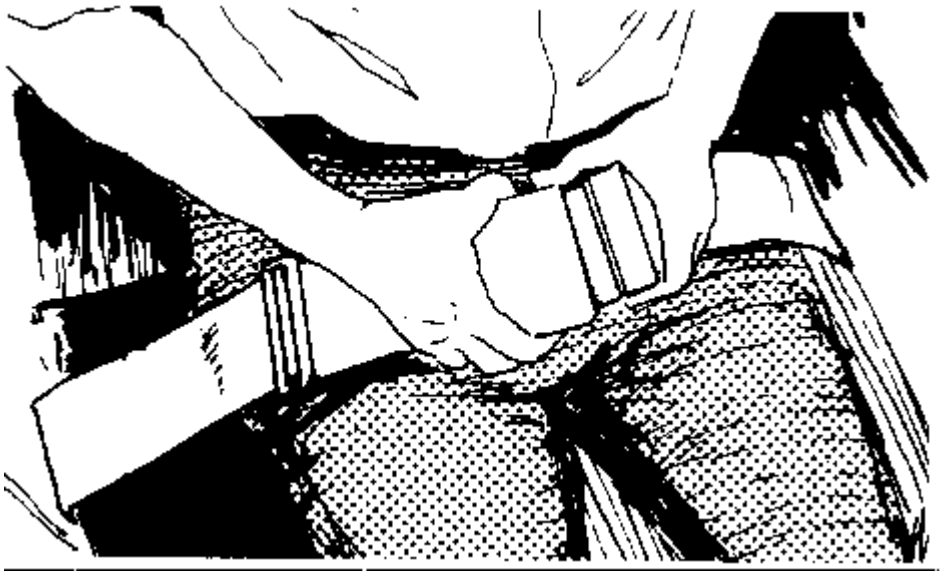
If the bolt and nut that holds the two parts of the seat belt mounting hooks together are not correctly installed, the hooks can separate. This will allow the seat belt to separate from its mounting.

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

Ver imagen



Adjust both ends of the seat belt. The belt should be snug but confortable. For adjustment procedures, see topic "Seat Adjustment" in the operator's Compartment section of this guide.

Every 10 Service Hours or Daily

You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

Engine Oil

Check Oil Level

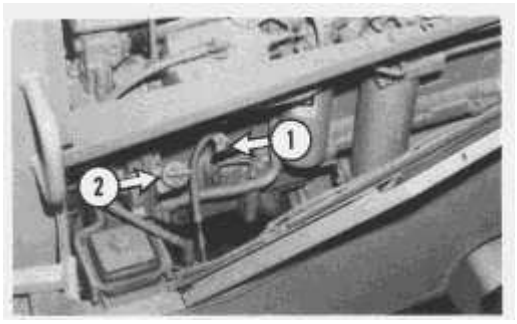
NOTICE

Do not overfill the crankcase to avoid engine damage.

Ver imagen

1. Open the access cover on the right side of the machine.

Ver imagen



2. Maintain the oil level between the ADD and FULL marks on the dipstick (1).

3. Remove the oil fill plug (2) and add oil if necessary.

4. Clean and install the fill plug.

5. Close the access cover.

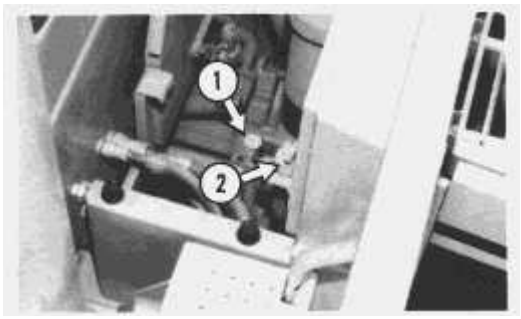
Transmission Oil

Check the Oil Level

Ver imagen

The transmission oil dipstick is located on the left side of the machine.

Ver imagen



1. Maintain the oil between the ADD and FULL marks on the dipstick (1) at LOW IDLE.

2. Remove the oil fill cap (2) and add oil if necessary.

3. Clean and install the fill cap.

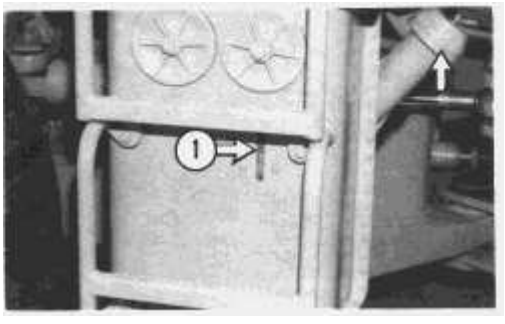
Hydraulic Oil

Check the Oil Level

Ver imagen

The hydraulic oil tank is located on the left side of the machine.

Ver imagen



1. Maintain the oil level to the FULL mark on the sight gauge (1).

2. Remove the oil fill cap (2) and add oil, if necessary, through the fill tube.

3. Clean and install the fill cap.

All attachments to be level and on the ground during filling.

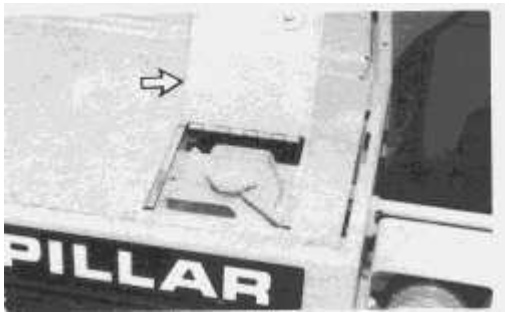
Cooling System

Look at the Coolant Level

Ver imagen

The radiator cap is located in the hood of the machine at the right rear.

Ver imagen

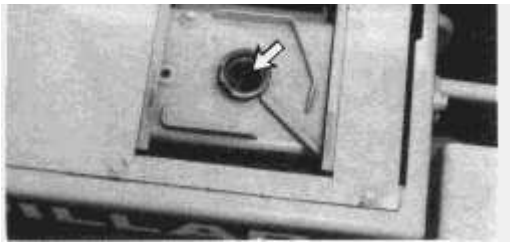


1. Open the access cover in the hood.

Ver imagen

2. Remove the radiator cap slowly to relieve pressure.

Ver imagen



3. Maintain the coolant level to within 1 cm (1/2 in) of the bottom of the fill pipe. If it is necessary to add coolant daily, check for leaks.

4. Inspect the cap seal. Replace the cap if it is damaged.

5. Install the cap. Close the access cover.

Fuel Tank

Drain the Water and Sediment

Ver imagen

Drain valve is located under the fuel tank.

Ver imagen

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

2. Close the drain valve.

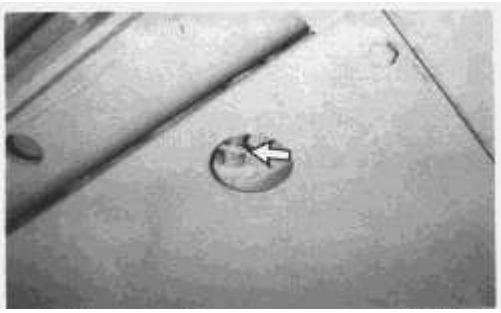
Air Reservoir

Drain Moisture and Sediment

Ver imagen

The drain valve is located under the rear of the machine.

Ver imagen



Open the drain valve. Allow all condensation to drain. Close the drain valve. If the machine is equipped with an air dryer, this maintenance can be done every 50 service hours or once a week.

Walk-Around Inspection

Inspect Machine

Ver imagen

1. Inspect the engine precleaner bowl for dirt buildup. Remove dirt from bowl when any dirt has accumulated close to the full line on bowl.

Ver imagen

2. Inspect the attachments and linkage for damage or excessive wear. Repair if damaged.

Ver imagen

3. Inspect the lights for broken bulbs and lenses. Replace if broken.

Ver imagen

4. Inspect and remove any trash build-up in the engine compartment.

5. Inspect the cooling system for leaks, faulty hoses and trash buildup. Correct any leaks and remove any trash from radiator.

Ver imagen

6. Inspect the hydraulic system for leaks. Inspect the tank, hoses, tubes, plugs, joints and fittings. Correct any leaks.

Ver imagen

7. Inspect differentials (front and rear) under machine for leaks.

Ver imagen

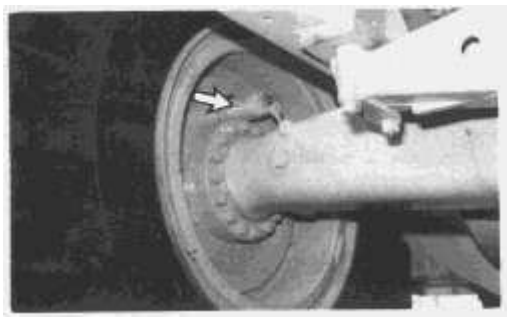
8. Inspect final drives (front and rear) for leaks.

9. Inspect transmission for leaks.

Ver imagen

10. Inspect tires (front and rear) for damage and proper inflation.

Ver imagen



11. Inspect the wheel brakes for oil leaks.

Ver imagen

12. Be sure the covers and guards are firmly in place. Inspect for damage.

Ver imagen

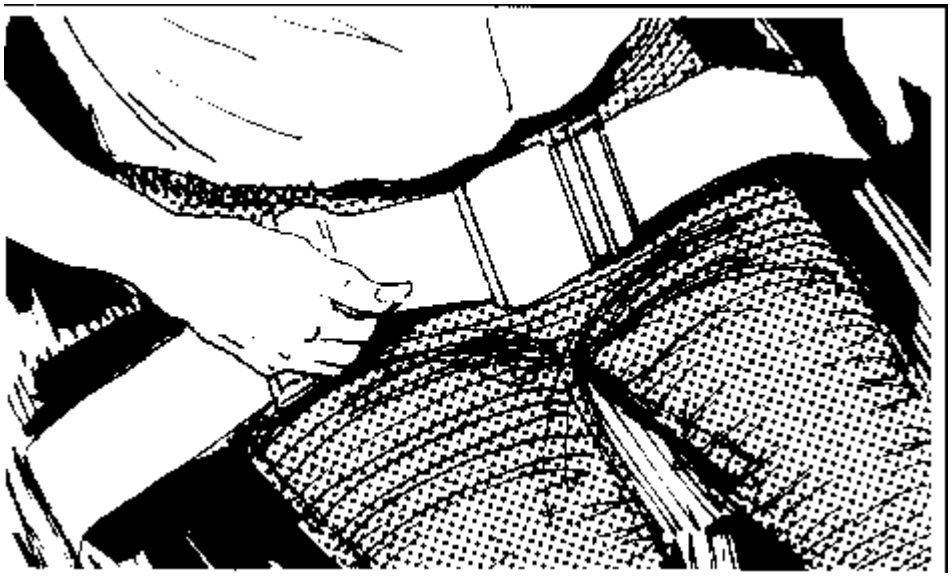
13. Inspect the steps, walkways and handholds for their condition and cleanliness. Inspect the Rollover Protective Structure (ROPS) (if equipped) for damage. If repair is necessary contact your Caterpillar dealer. Tighten any loose ROPS bolts.

Ver imagen

14. Inspect the operator's compartment for cleanliness. Keep it clean.

15. Inspect the instrument panel for broken gauges and indicator lights. Replace if broken.

Ver imagen



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

17. Adjust the rear view mirrors for best vision.

Cleaning Windows

Ver imagen

Use commercially available window cleaning solutions to clean the windows.

Lift the latch to slide the window open.

Seat Belt

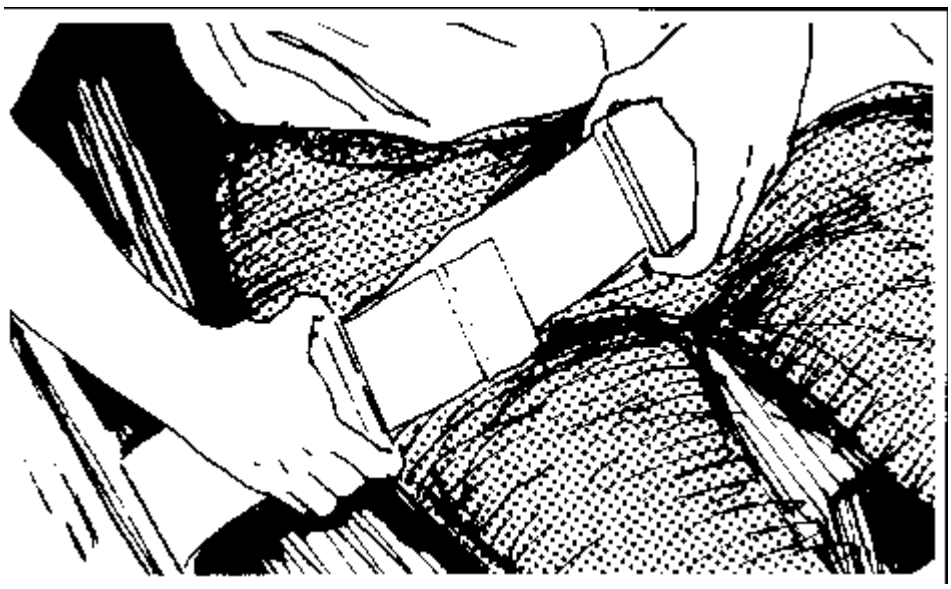
Inspect for Wear or Damage

Always check condition of seat belt and mounting hardware before operating machine. Replace any damaged or worn parts.

Replace the seat belt after three years of usage, regardless of appearance.

Ver imagen

Ver imagen



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

Indicators and Gauges

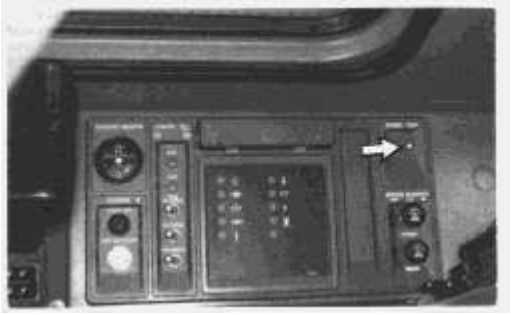
Test for Proper Function

Ver imagen

Look for broken gauge lenses or indicator lights, switches, etc.

Start the engine.

Ver imagen

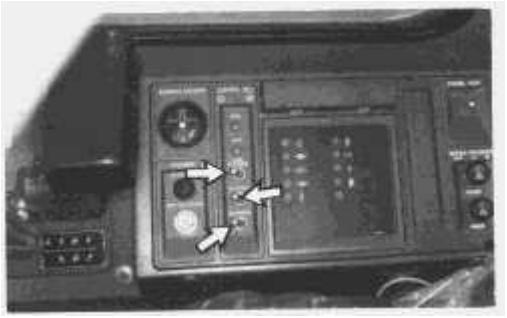


With the engine running move the test switch to the TEST position. All indicator lights should come on and the warning horn should sound.

Ver imagen

Look for inoperative gauges.

Ver imagen



Turn all machine lights on. Check for proper operation.

Ver imagen

Sound the forward horn.

Stop the engine.

Make any needed repairs before operating.

Back-up Alarm

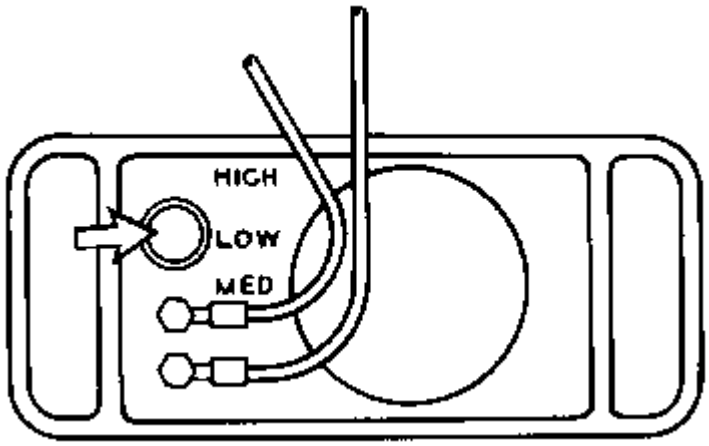
Test

Ver imagen

With the key switch on, apply the service brake and place the transmission control lever in REVERSE.

The alarm should start to sound immediately. It will continue to sound until the transmission control lever is moved to NEUTRAL or FORWARD.

Ver imagen



The sound level can be adjusted by moving the adjustment on back of alarm to meet operating requirements.

Every 50 Service Hours or Weekly

You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

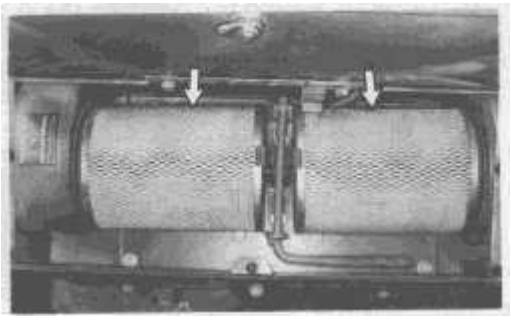
Cab Air System

Clean Filters

Ver imagen

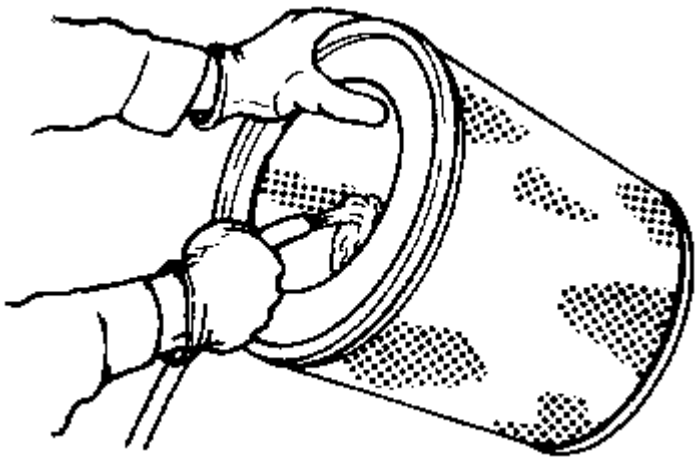
1. Remove the cover in the rear of the cab.

Ver imagen



2. Remove the filter element. Clean the filter element with pressure air or wash the element in warm water and a nonsudsing household detergent.

Ver imagen



3. Rinse in clean water and air dry thoroughly.

Ver imagen

Ver imagen

4. Install the filter element. Install the cover.

Bucket Lower Pivot Pins

Lubricate the Fittings

Ver imagen

Ver imagen

Lubricate one fitting on each side of the bucket. Total of two fittings.

Every 100 Service Hours or 2 Weeks

You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

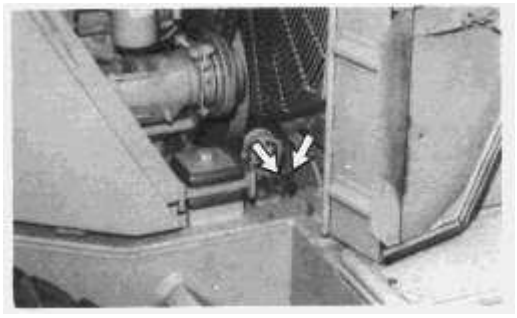
Rear Axle Trunnion

Lubricate the Fittings

Ver imagen

1. Open the left rear door for access.

Ver imagen



2. Lubricate 2 fittings in the lube fitting block of the rear frame

Total two fittings.

Bucket Cylinder and Linkage Bearings

Lubricate the Fittings

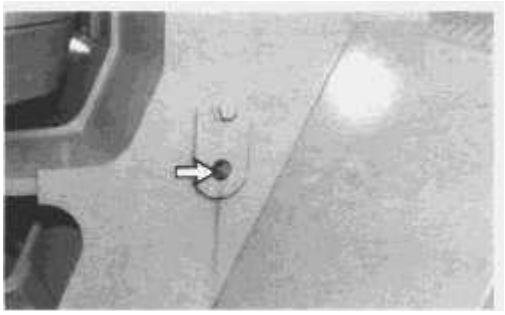
Ver imagen

1. Lubricate three fittings on the left side of the machine.

Ver imagen

2. Lubricate two fittings on the right side of the machine.

Ver imagen



3. Lubricate one fitting on eachside of the machine.

Ver imagen

4. Lubricate one fitting on the lower bucket link.

Ver imagen

5. Lubricate two fittings on the bucket tilt link.

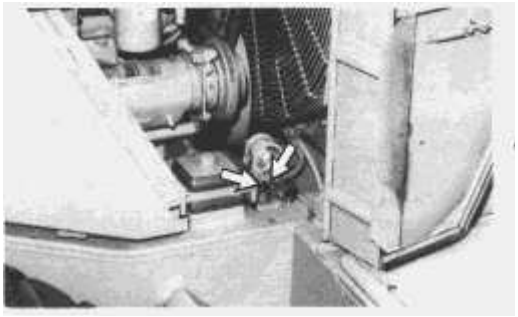
Total of 10 fittings.

Steering Cylinder Bearings

Lubricate Fittings

Ver imagen

Ver imagen

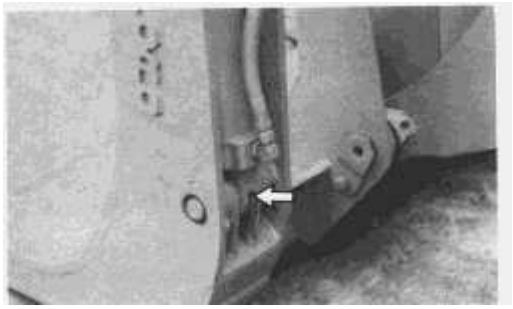


Lubricate two fittings in the head end of the lube block. Total two fittings.

Logging Fork Clamp

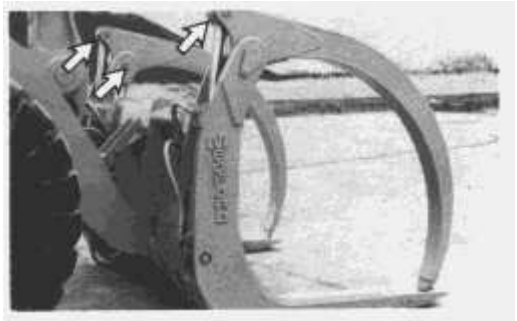
Lubricate Fittings

Ver imagen



Lubricate one fitting at the bottom of the clamp cylinder on each side of the machine.

Ver imagen



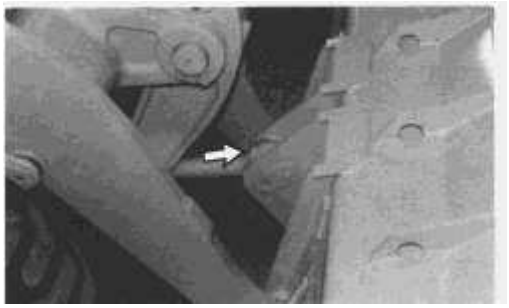
Lubricate one fitting each at the top of the clamp cylinder and on the clamp pivot pin on each side of

Lubricate one fitting each at the top of the clamp cylinder and on the clamp pivot pin on each side of the machine. Total six fittings.

Bucket Upper Pivot Pin

Lubricate Fitting

Ver imagen



Lubricate one fitting on the upper pivot pin of the bucket.

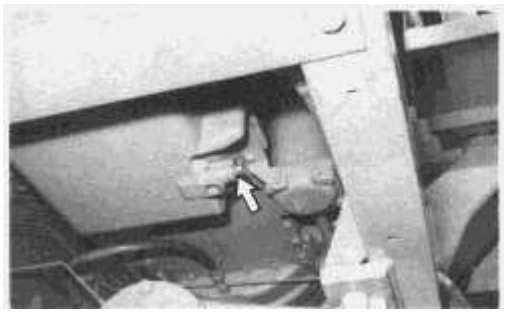
Every 250 Service Hours or Monthly

You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

Engine Oil and Filter

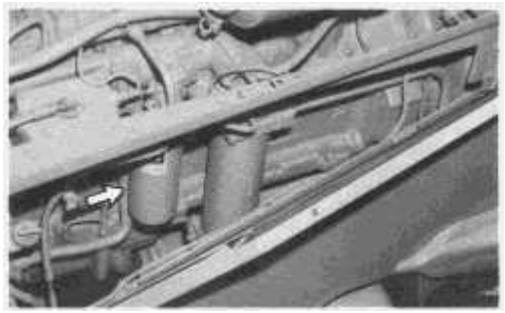
Change Oil and Filter

Ver imagen



1. Remove the crankcase drain plug. Allow the oil to drain. Clean and install the drain plug.

Ver imagen



2. Remove the left access cover of the machine. Remove the filter element with a strap-type wrench.

3. Clean the filter housing base. Make sure all of the old filter gasket is removed.

4. Apply a light coat of engine oil to the gasket of the new filter.

5. Install the new filter by hand. When the gasket contacts the filter base, tighten the filter 1/2 turn more.

Ver imagen

6. Remove the oil fill plug (1). Fill the crankcase with new oil. See the "Lubricant Viscosities and Refill Capacities". Clean and install the fill plug.

7. Start the engine and allow the oil to warm. Check for leaks. Stop the engine.

Ver imagen

8. Maintain the oil on the dipstick between the ADD and Full marks.

9. Install the left access cover.

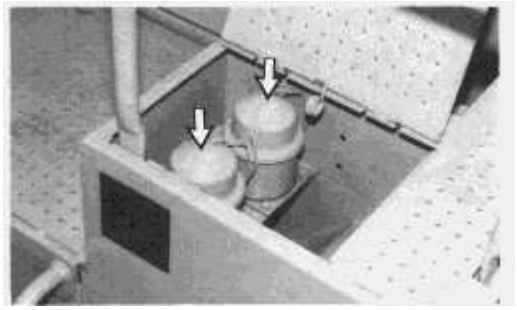
Brake Fluid Reservoirs

Check Fluid Level

Ver imagen

Brake fluid reservoir access cover is located behind the operator's compartment in the hood of the machine.

Ver imagen



1. Remove the covers from the both brake fluid reservoirs. Inspect the brake fluid level. The level must be within 1 cm (1/2 inch) of the top of the reservoirs. Add brake fluid, if necessary.

Ver imagen

2. Clean and install the covers.

3. Test the brakes. See the next two topics on brake testing.

Brakes

Test Service Brake Holding Ability

Be sure the area around machine is clear of personnel and obstructions.

Be sure the steering frame lock link is in the stored position.

Test the brakes on a dry, level surface.

Fasten the seat belt before testing the brakes.

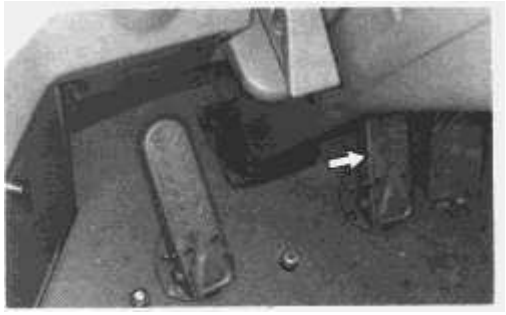
The following tests are to determine if the service brake is functional. These tests are not intended to measure maximum brake holding effort. Brake holding effort required to hold a machine at a specific engine rpm will vary from machine to machine due to differences in engine setting, power train efficiency, etc., as well as differences in brake holding ability.

Engine rpm at beginning of machine movement, with service brake applied, should be compared against the engine rpm your specific machine was able to hold on a prior test, as an indication of system deterioration.

Ver imagen

1. Start the engine, and raise the bucket slightly. Apply the service brake and release the parking/secondary brake.

Ver imagen



2. With the service brake applied (right brake pedal only), Move the transmission to 2nd speed forward

2. With the service brake applied (right brake pedal only), move the transmission to 2nd speed forward.

Ver imagen

3. Gradually increase the engine speed to high idle. The machine should not move.

WARNING

If the machine begins to move, reduce the engine speed immediately and engage the parking/secondary brake.

4. Reduce the engine speed to low idle, move the transmission to NEUTRAL. Engage the parking/secondary brake, lower the bucket to the ground and stop the engine.

NOTICE

If the machine moved while testing the brakes, contact your Caterpillar dealer. Have the dealer inspect and, if necessary, repair the service brakes before returning the machine to operation.

Test Parking/Secondary Holding Ability

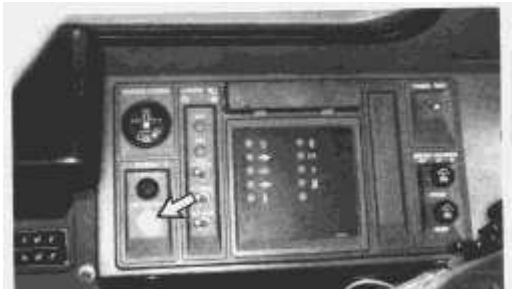
Be sure the area around machine is clear of personnel and obstructions.

Be sure the steering frame lock link is in stored position.

Test the brakes on a dry, level surface.

The following tests are to determine if the parking/secondary brake is functional. These tests are not intended to measure maximum brake holding effort. Brake holding effort required to hold a machine at a specific engine rpm will vary from machine to machine due to differences in engine setting, power train efficiency, etc., as well as differences in brake holding ability.

Ver imagen

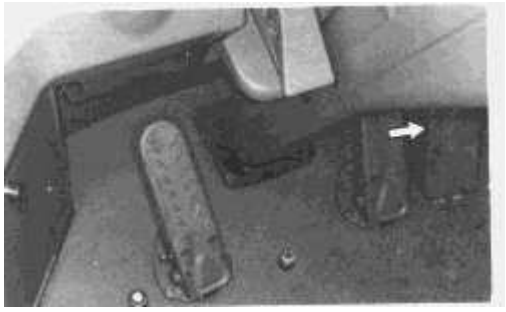


1. Start the engine, and raise the bucket slightly.

Ver imagen

2. With the parking/secondary brake engaged, move the transmission to 3rd speed forward.

Ver imagen



3. Gradually increase the engine speed to high idle. The machine should not move.

WARNING

If the machine begins to move, reduce the engine speed immediately and apply the service brake.

Ver imagen

4. Reduce the engine speed, move the transmission to NEUTRAL. Lower the bucket to the ground and stop the engine.

NOTICE

If the machine moved while testing the brakes, contact your Caterpillar dealer. Have the dealer inspect and, if necessary, repair the

parking/secondary brakes before returning the machine to operation.

Cooling System

Add Coolant Additive

NOTICE

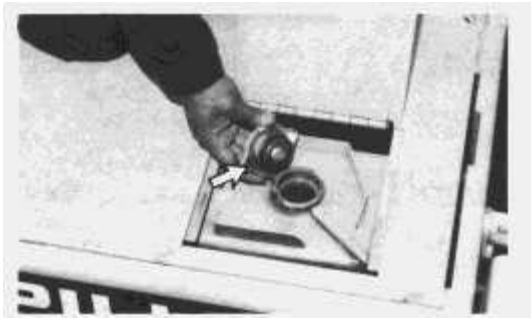
Do not add coolant additive until you read and understand the material in the "Cooling System Specifications" section.

Ver imagen

The radiator cap access cover is located on the top of the hood at the left rear.

1. Open the hood access cover.

Ver imagen



2. Remove the radiator cap slowly to relieve pressure.

3. Add .25 liters (1/2 pint) of liquid coolant additive.

4. Install the radiator fill cap and close the access cover.

Drive Shaft Spline

Lubricate Fitting

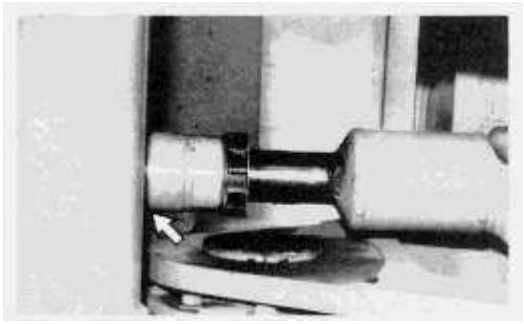
Ver imagen

1. Disconnect the steering frame lock link. Start the engine.

2. Turn the machine full right or left.

3. Lower the bucket, engage the parking/secondary brake and stop the engine.

Ver imagen



4. Lubricate one fitting.

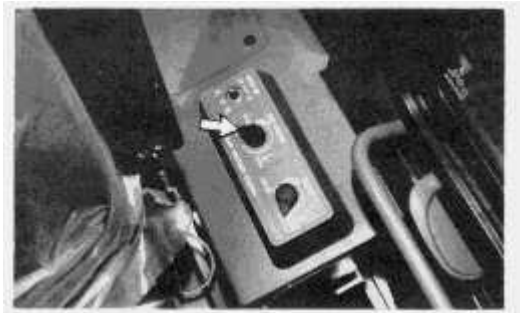
Air Conditioner (If Equipped)

Test Operation - Adjust Belt

Ver imagen

1. Start the engine. Operate the engine at high idle.

Ver imagen

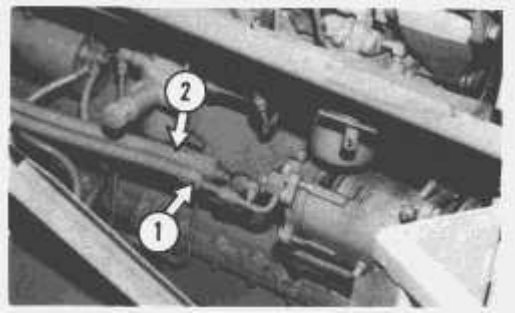


2. Set the air conditioner control for maximum cooling, and fan control on HIGH.

2. Set the air conditioner control for maximum cooling, and fan control on HIGH.

3. Allow two minutes for the air conditioning system to stabilize.

Ver imagen



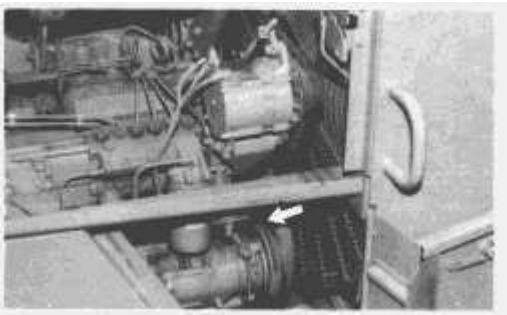
4. Check for freon in the system as follows: Feel the suction line (1) and the discharge line (2).

If the system contains freon, the discharge line will be warmer than the suction line.

If the system does not contain, or is very low on freon, poor cooling will result.

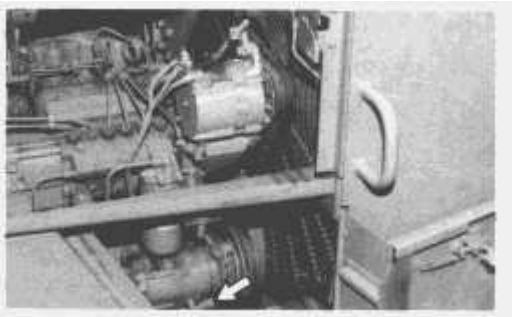
5. Stop the engine to inspect the compressor belt.

Ver imagen



6. Inspect the condition and the adjustment of the compressor belt. The belt should deflect 14 to 20 mm (9/16 to 13/16 inch) under 110 N (25 lb.) force.

Ver imagen

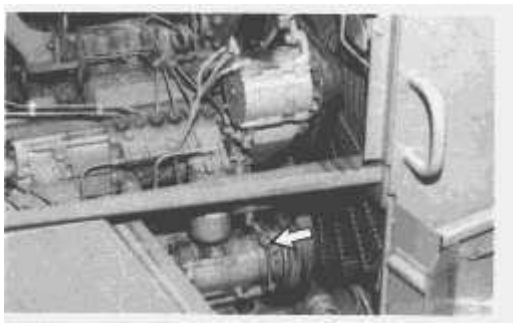


7. To adjust, loosen the compressor lock nut.

Ver imagen

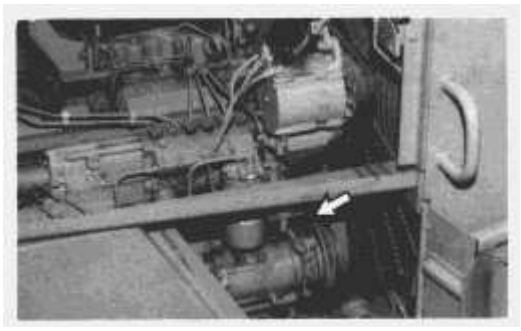
8. Turn the adjusting nuts until the correct belt tension is reached. Tighten the adjusting nuts to 150 ± 20 N·m (110 ± 15 lb ft).

Ver imagen



9. Tighten the compressor lock nut.

Ver imagen



10. Recheck the belt adjustment

11. Repeat steps 1 through 3.

Ver imagen

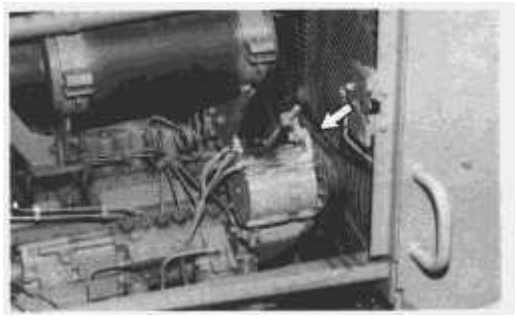
12. If poor cooling is experienced, turn off the air conditioner. Stop the engine. Contact your Caterpillar dealer for air conditioner system service, if necessary.

Fan and Alternator Belts

Inspect-Adjust-Replace

Ver imagen

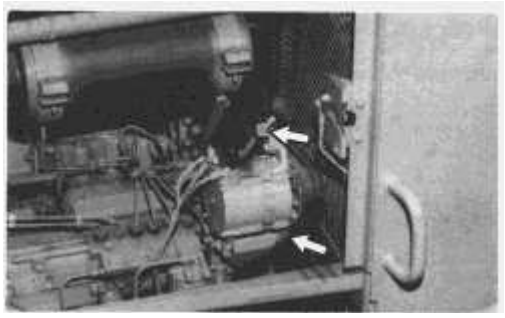
Ver imagen



Inspect the condition and the adjustment of belts. Replace the belts in sets only, if one or more are worn or damaged.

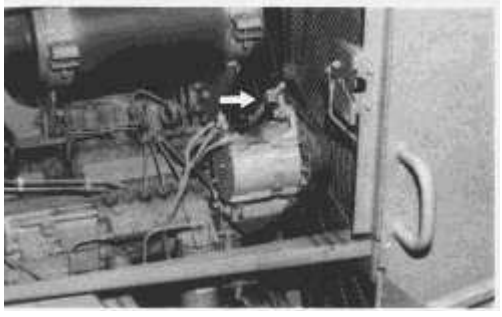
1. Inspect the condition and the adjustment of alternator belts. The belts should deflect 14 to 20 mm (9/16 to 13/16 inch) under 110 N (25 lb) force.

Ver imagen



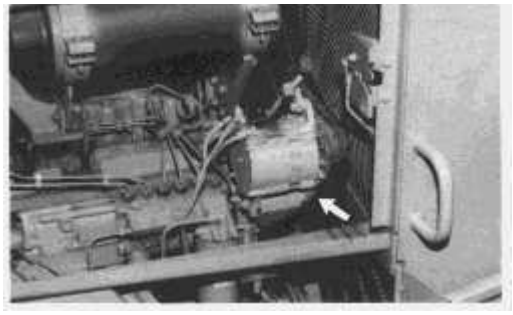
2. Loosen alternator bracket and mounting bolts. Loosen the adjusting locknut.

Ver imagen



3. Tighten the adjusting nut until the belt tension is reached. Tighten the adjusting locknut to 150 ± 20 N·m (110 ± 15 lb ft).

Ver imagen



4. Tighten the alternator mounting bolts.

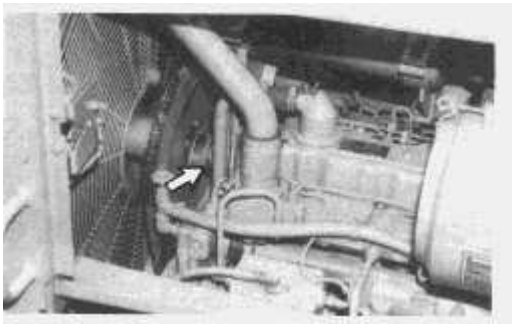
Fan Bearing

Lubricate

Ver imagen

Open the engine access cover on the right side of the machine.

Ver imagen



Lubricate the fan bearing fitting.

Every 500 Service Hours or 3 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

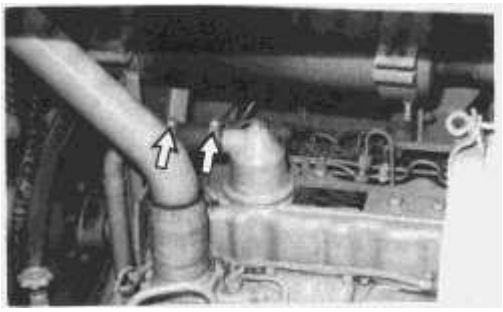
Engine Crankcase Breather

Clean Breather

Ver imagen

Open the access cover located on the right side of the engine.

Ver imagen



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.

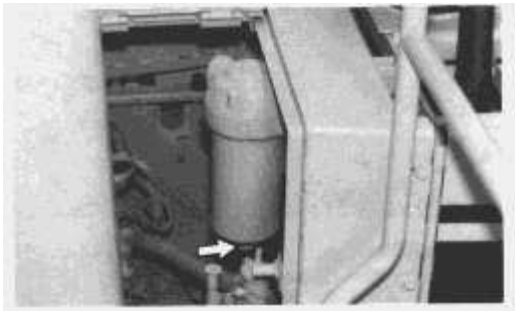
Transmission

Change Filter

Ver imagen

1. Open the access cover on the left rear side of the operator's platform.

Ver imagen



2. Remove the drain plug from the bottom of the filter housing and drain the oil. Install the drain plug.

3. Use a strap-type wrench or a cross bar to remove the filter housing.

4. Remove and discard the used element.

5. Clean the filter housing with a clean, nonflammable solvent.

6. Clean the housing base.

7. Insert a new filter element into the filter housing.

8. Inspect the filter housing seal. Replace the seal, if it is damaged.

9. Install the filter housing into the housing base.

Ver imagen

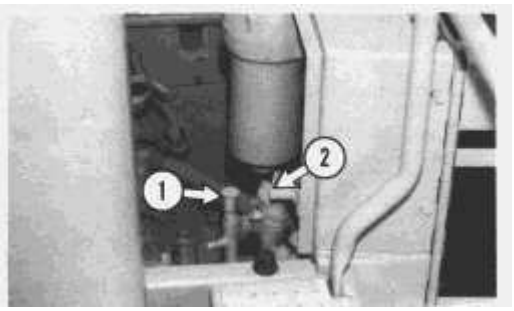
10. Start the engine. Apply the service brake. Use the right brake pedal only.

Ver imagen

11. Slowly operate the transmission controls to circulate the transmission oil.

12. Lock the transmission control lever in NEUTRAL. Inspect for leaks.

Ver imagen



13. Maintain the oil level to the FULL mark on dipstick (1). Add the oil through fill tube (2) if necessary.

14. Stop the engine and install the access cover.

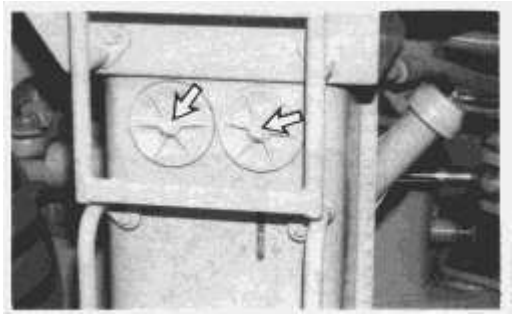
Hydraulic System

Change the Filter

Ver imagen

1. Remove the oil filler cap to relieve the tank pressure.

Ver imagen



2. Loosen the retaining bolts.

3. Remove covers and elements.

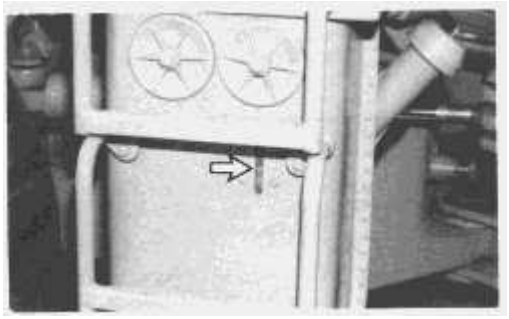
Ver imagen

4. Discard the filter elements.

5. Inspect the condition of the "O" ring seal. Replace if necessary.

6. Install the new filter elements and covers. Tighten the cover retaining bolt to 58 ± 5 N·m (40 ± 4 ft lb).

Ver imagen



7. Maintain the hydraulic oil to the FULL mark in sight gauge. Add oil if necessary through the fill tube.

8. Inspect the filler cap gasket. Replace the gasket, if it is damaged. Install the oil filler cap.

Fuel System

Clean and Change Filters

NOTICE

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

Wash the Primary Filter Element

Ver imagen

1. Remove the left front access cover of the machine.

Ver imagen

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 if damaged.

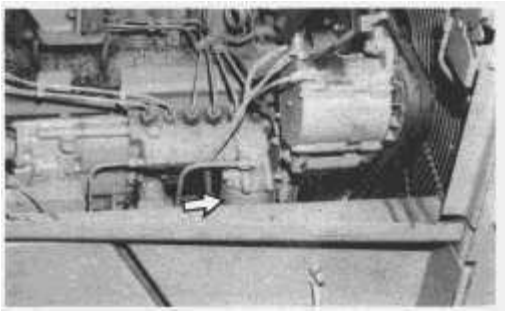
9. Insert the clean element.

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

Ver imagen



1. Remove and discard the filter.

2. Clean the filter mounting base. Be sure all of the old seal is removed.

3. Coat the seal of a new filter with clean diesel fuel.

4. Install the new filter 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. Prime the fuel system. (See next topic).

Priming the Fuel System

The injection pumps and high pressure lines must be primed if the engine will not start, or runs rough, after priming the filters and pump housing.

Each injection pump has a reverse flow check valve. These cannot be opened with hand priming pump pressure. Use the following procedure to prime the injection pumps and lines.

NOTICE

The fuel injection nozzles can be permanently damaged by twisting if only one wrench is used to loosen or tighten the fuel line nuts. Use one wrench to hold the nozzle and another to loosen the nut.

---

1. Loosen the fuel injection lines at the cylinder head of the engine.

2. Move the governor control lever to the LOW IDLE position.

3. Turn the start switch key to START. Crank the engine, until the fuel flows free of air bubbles, from all fuel lines. Stop cranking the engine.

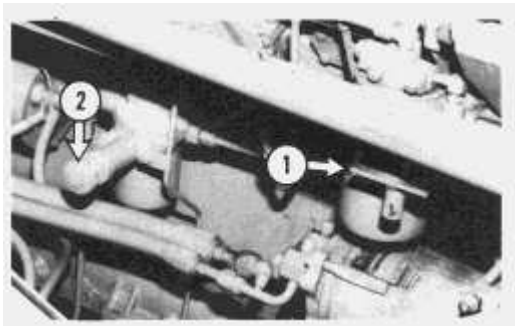
4. Tighten the fuel line nuts to a torque of 40 ± 7 N·m (30 ± 5 lb ft). Use a second wrench on the nozzle to prevent damage to it.

5. Start the engine and check for leaks.

6. Close the access door.

Priming Pump (If Equipped)

Ver imagen



Filters and Pump Housing

1. Open the fuel system purge valve (1) on the pump housing.

2. Unlock the priming pump plunger (2) and operate pump.

3. When fuel flows free of air bubbles, close pump and lock the plunger.

4. Close the purge valve.

5. Start the engine and check for leaks.

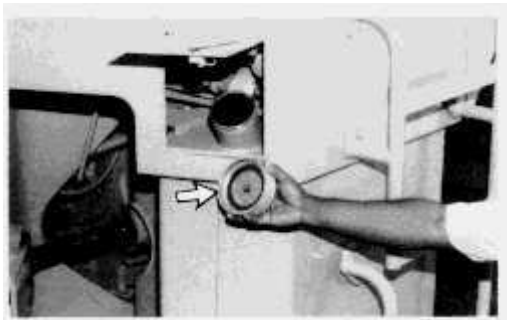
Fuel Tank Cap and Fill Screen

Clean

Ver imagen

The fuel cap is located on the right rear side of the machine.

Ver imagen



1. Remove the cap.

2. Replace the cap if the gasket is damaged.

3. Remove the strainer from the fill opening.

4. Wash the strainer in clean, nonflammable solvent.

5. Install the strainer.

Every 1000 Service Hours or 6 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

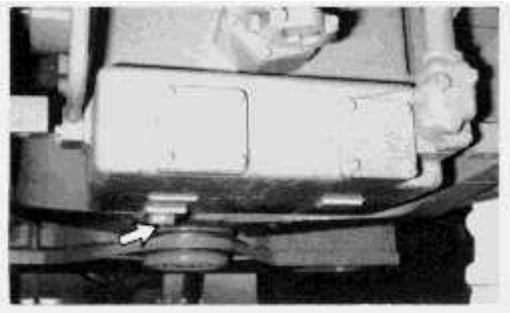
Transmission Oil

Change the Oil

Operate the engine long enough to warm the oil. The machine must be level. Lower the bucket with slight down pressure.

Engage the parking/secondary brake. Stop the engine.

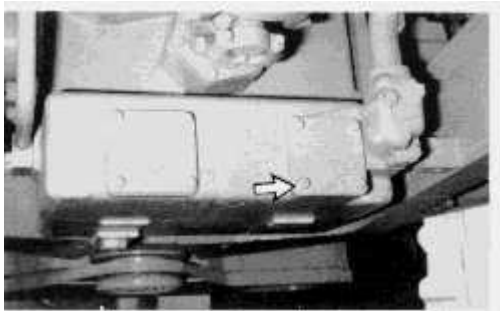
Ver imagen



1. Remove the transmission drain plug and drain the oil.

2. Change the filter element. See the topic "Transmission" under "Every 500 Service Hours or 3 Months".

Ver imagen



3. Remove the magnetic strainer cover.

4. Remove the magnets from the housing.

5. Remove the screen from the housing.

6. Wash the tube and the screen in a clean, nonflammable solvent.

7. Clean the magnets with a cloth, a stiff bristle brush or pressure air.

NOTICE

Do not drop or rap the magnets against any hard objects. Replace any

damaged magnets.

8. Clean the cover and inspect the seal. Replace the seal, if it is damaged.

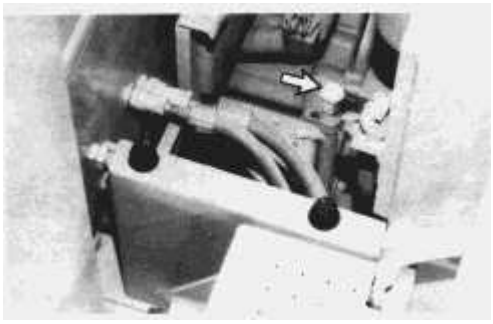
9. Insert the magnets in the screen.

10. Insert the screen, tube and magnets in the housing.

11. Install the cover. Tighten the cover bolts.

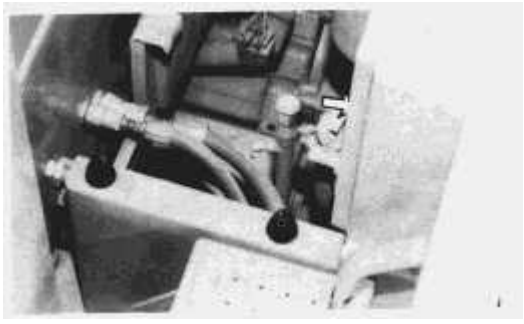
12. Clean and install the transmission drain plug.

Ver imagen



13. Fill the transmission with oil through the fill tube. See the "Lubricant Viscosities and Refill Capacities" chart.

Ver imagen

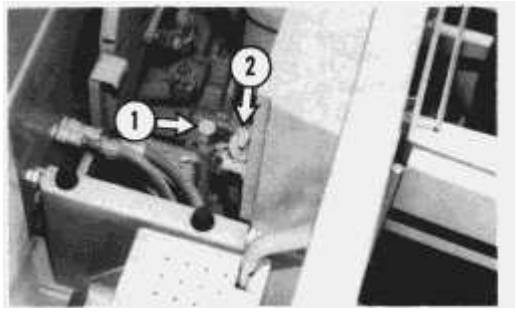


14. Remove the transmission breather located on the top of the transmission case. Install new transmission breather.

15. Start the engine. Apply the service brake. Depress the right brake pedal only.

16. Slowly operate the transmission controls to circulate the oil. Lock the transmission control in NEUTRAL.

Ver imagen



17. Maintain the oil level to the FULL mark on dipstick (1). Add the oil through fill tube (2) if necessary.

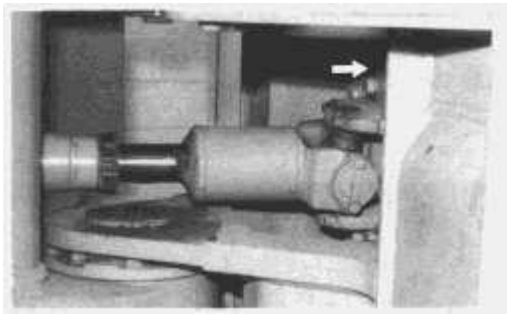
18. Stop the engine.

Drive Shaft Support Bearing

Lubricate Fitting

Ver imagen

Ver imagen



Lubricate one fitting.

Drive Shaft Universal Joints

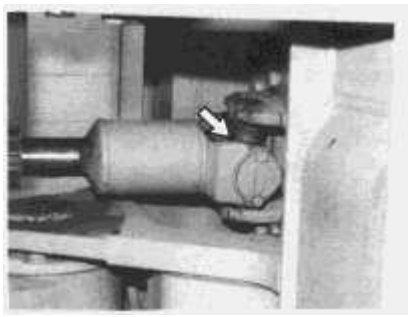
Lubricate Fittings

Ver imagen

Ver imagen

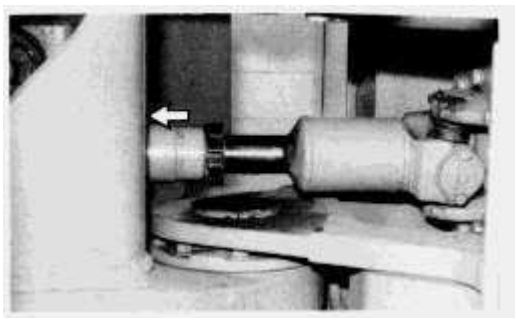
1. Lubricate one fitting in the front shaft universal joint.

Ver imagen



2. Lubricate one fitting in the front universal joint of the center shaft.

Ver imagen



3. Lubricate one fitting in the rear universal joint of the center shaft.

Ver imagen

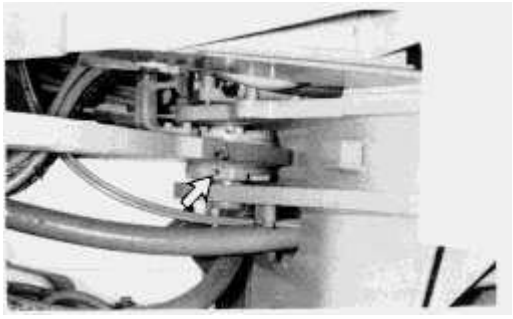
4. Lubricate one fitting in each of the two rear shaft universal joints. Total of 5 fittings.

Frame Pivot Bearings

Lubricate Fittings

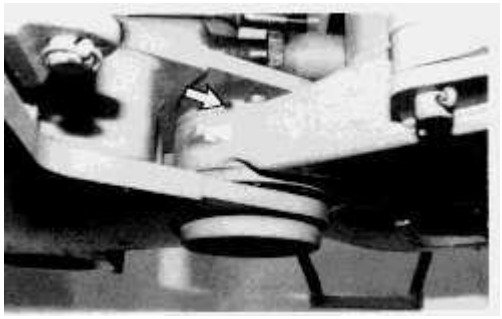
Ver imagen

Ver imagen



1. Lubricate one fitting at the upper pivot pin.

Ver imagen



2. Lubricate one fitting at the lower pivot pin. Total of two fittings.

Rollover Protective Structure (ROPS)

Inspect

Ver imagen

Look for any loose or damaged bolts. Replace damaged bolts or missing bolts with original equipment parts only. Retighten bolts to a torque of:

Tighten the six mounting bolts on each side of the machine to 875 ± 100 N·m (640 ± 80 lb. ft.)

Replace ROPS mounting supports if the ROPS rattles or makes a noise when the machine is operated on a rough surface.

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.

Every 2000 Service Hours or 1 Year

You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

Hydraulic Tank Oil

Change the Oil

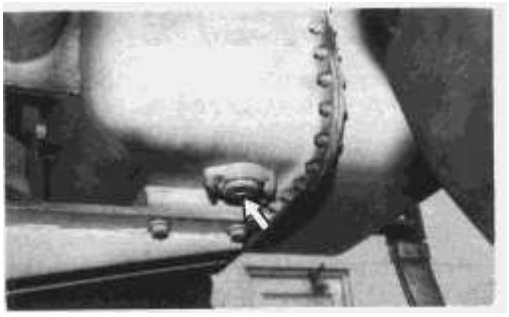
Operate the machine long enough to warm the oil.

The machine should be level. All implements lowered to ground with slight down pressure. Transmission lock lever and parking/secondary brake engaged, and the engine stopped.

Ver imagen

1. Remove the hydraulic system oil tank filler cap.

Ver imagen



2. Open the drain valve, located in the bottom of the hydraulic tank. Allow the oil to drain.

3. Close the drain valve.

4. Change the hydraulic system filter. See "Hydraulic System" in the "Every 500 Service Hours or 3 Months" section.

5. Remove the fill screen. Clean and install fill screen.

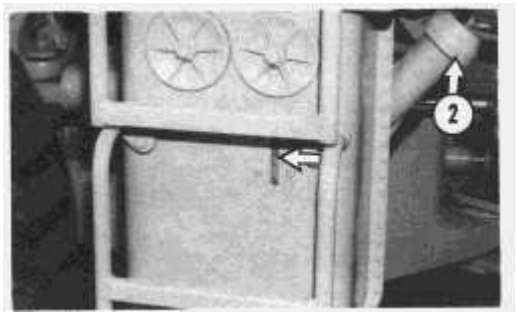
6. Fill the hydraulic system oil tank. See "Lubricant Viscosities and Refill Capacities."

7. Inspect the filler cap gasket. Replace the gasket if damaged.

8. Install the oil filler cap.

9. Start and run the engine for a few minutes.

Ver imagen



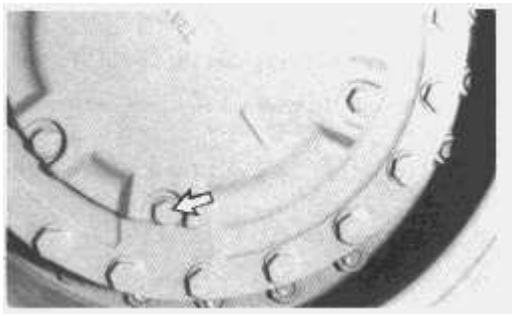
10. Maintain the oil level to the FULL mark in the sight gauge (1). Add oil through the fill tube (2), if necessary.

11. Stop the engine.

Differentials and Final Drives

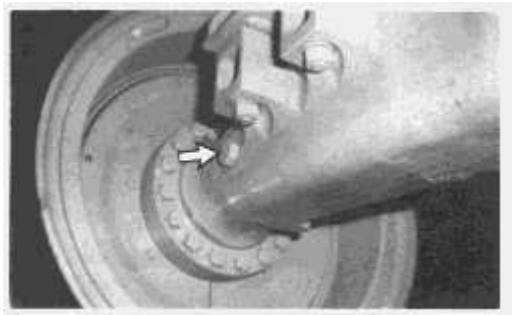
Change the Oil

Ver imagen



1. Position each wheel with the drain plug down. Remove the drain plugs and drain the oil.

Ver imagen



2. Remove the front differential access plug.

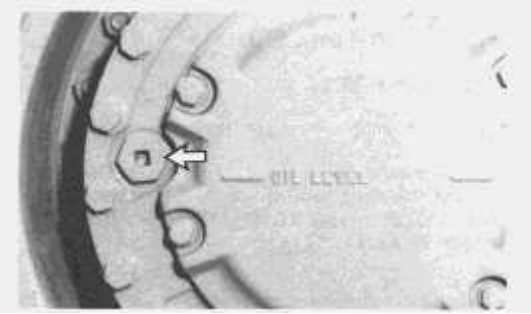
Ver imagen

3. Remove the rear differential access plug, located near the rear of the rear case guard.

4. Remove the front and rear differential drain plugs and allow the oil to drain.

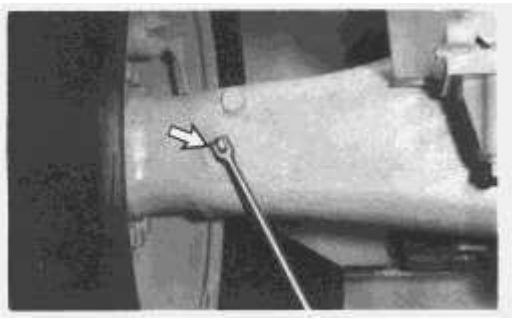
5. Clean and install all drain plugs and access plugs.

Ver imagen



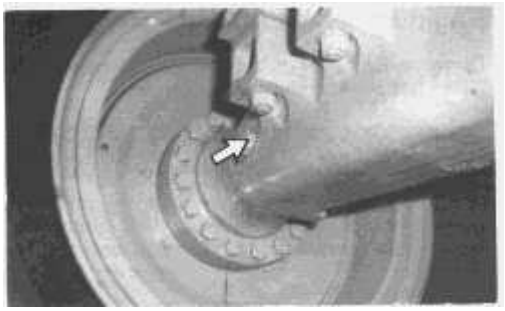
6. Remove the front differential and final drive fill plugs.

Ver imagen



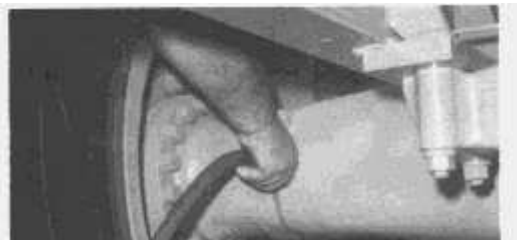
7. Remove the rear differential and final drive fill plug, located at the right front of the rear axle housing.

Ver imagen



8. Fill the front differential and the final drives through fill opening. See the "Lubricant Viscosities and Refill Capacities" chart.

Ver imagen

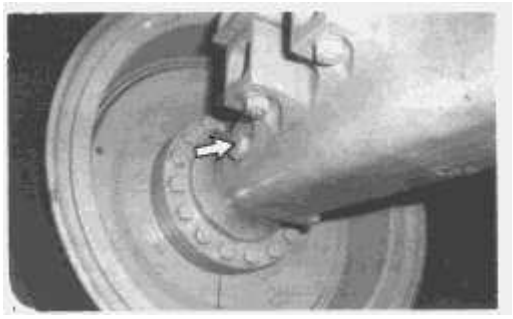


9. Fill the rear differential and final drives through the fill openings. See the "Lubricant Viscosities and Refill Capacities" chart. Clean and install the fill plug.

Ver imagen

10. If the complete amount of oil listed in the "Refill Capacities" chart will not go into the housing, install the plug. Run the machine on level ground a few minutes to equalize the oil in the differential and final drives.

Ver imagen



11. Remove the fill plug and add the remaining oil.

Ver imagen

12. Operate the machine a few minutes and recheck the oil level. Oil should be to the bottom of the fill plug opening.

Engine Valve Lash

Adjust

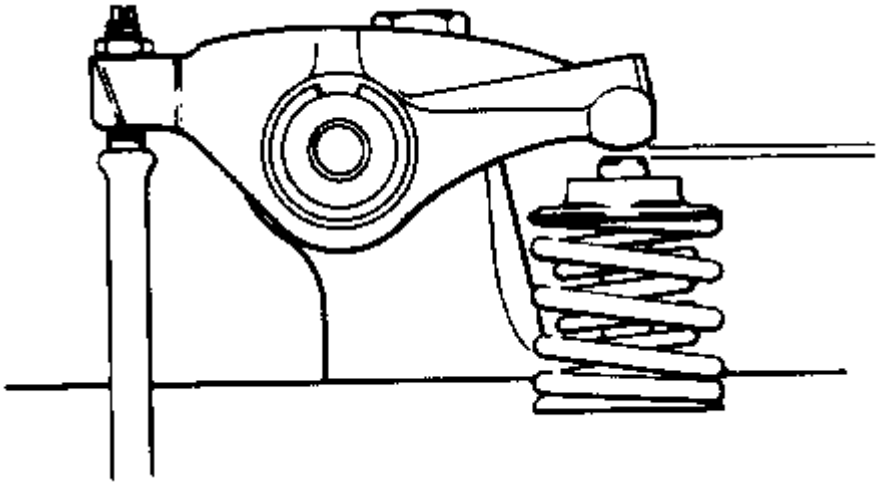
To prevent possible injury, do not use the starter motor to turn the flywheel.

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.

Ver imagen



Adjust the valve clearance to within ± 0.08 mm (.003 in) of the valve clearance setting given in the chart.

Ver imagen

VALVE CLEARANCE SETTING	
Intake	0.38 mm (.015 in)
Exhaust	0.64 mm (.025 in)

Refer to the Service Manual or your Caterpillar dealer for the complete valve adjustment procedure.

Engine Valve Rotators

Observe Rotation of Valves With Engine Idling After Setting the Valve Clearances

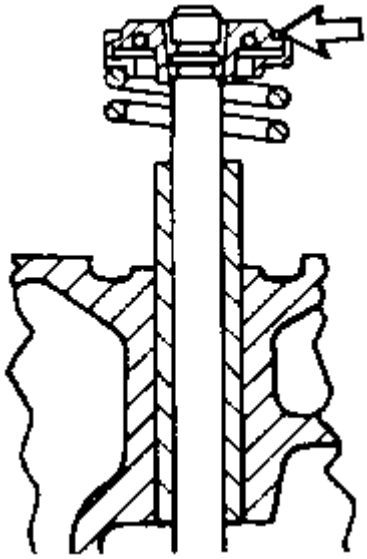
WARNING

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 and run at low idle.

Ver imagen



2. Watch the top surface on each valve rotator. Each valve rotator should turn slightly each time the valve closes.

If a valve fails to rotate, contact your Caterpillar dealer.

Every 3000 Service Hours or 2 Years

You must read and understand the warnings and instructions contained in the Safety section of this manual before performing any operation or maintenance procedures.

Cooling System Coolant

Change Coolant/Clean System

NOTICE

Do not change the coolant until you read and understand the material in the "Cooling System Specifications" section.

Drain the coolant earlier whenever the coolant is dirty or foaming is observed.

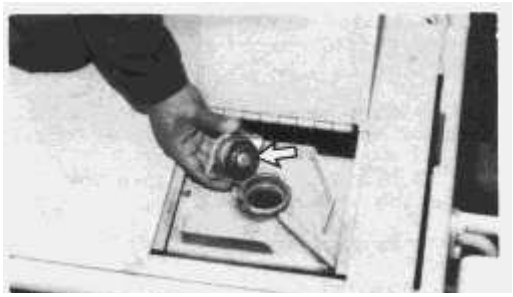
Ver imagen

The radiator cap access is located in the top of the hood.

Ver imagen

1. Open the radicator cap access door.

Ver imagen



2. Remove the radiator cap slowly to relieve pressure.

Ver imagen

3. Open the drain valve and allow the coolant to drain. Drain valve is located under the radiator.

4. Close the drain valve. Fill the system with clean water and a 6 to 10% concentration of cooling system cleaner.

5. Start and run the engine for 1 1/2 hours. 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.

8. Add the coolant solution. See "Cooling System Specifications" and "Lubricant Viscosities and Refill Capacities."

NOTE: Do not add supplemental coolant additive at this time, unless you are not using Caterpillar Antifreeze which contains additive.

9. Start the engine and operate it with the radiator cap off, until the thermostat opens and the level stabilizes.

10. Maintain the coolant level to within 1 cm (1/2 in) of the bottom of the fill pipe.

11. Replace the cap if the gasket is damaged. Install the cap.

12. Stop the engine.

Foreword

This publication is a reference for the new operator and a refresher for the experienced one. Ready - study - and keep it handy.

Illustrations guide the operator through the correct procedures of checking, starting, operating and stopping the machine and attachments.

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

Your safety and the safety of others depends upon care and judgment in the operation of this machine. A careful operator is good insurance against an accident.

Some photographs in this publication may 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 may not be included in this publication.

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

Manual de Operación y Mantenimiento

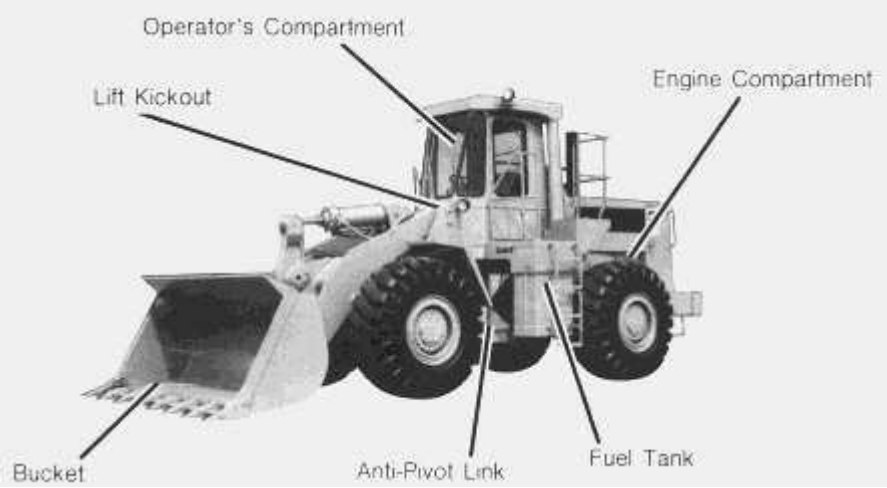
966D WHEEL LOADER

Número de medio -SEBU5934-03 **Fecha de publicación -01/07/1986** **Fecha de actualización -10/12/2004**

Model Views

966D Wheel Loader

Ver imagen



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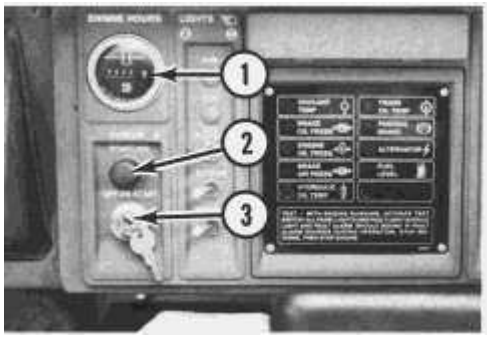
Fri Feb 11 2011 13:42:19 GMT-0300

Operator's Compartment

Operator Panel

Ver imagen



Engine Hours (1.) - The service meter indicates the total operating hours of the engine. It should be used to determine service intervals.

Start Aid (2.) - Depress the starting aid button when starting aid is required during cold weather. This releases a premeasured amount of ether into the air intake.

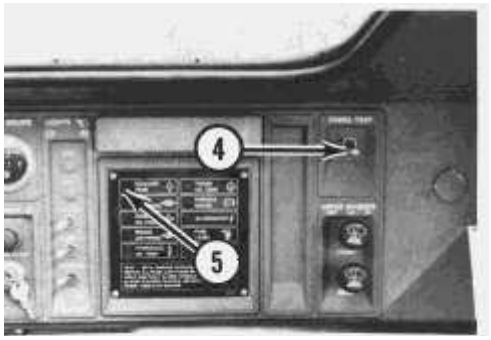
Power Switch OFF (3.) - no electrical power to the cab.

ON - all circuits in the cab are operational.

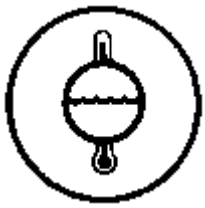
START - starts the engine, key returns to the ON position when released.

System Monitor

Ver imagen

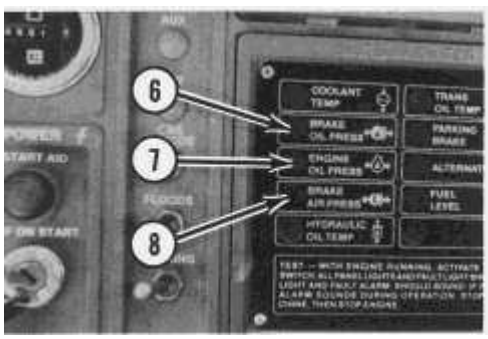


Panel Test (4.) - With the engine running, move the test switch up. All lights should light and the warning horn should sound. Release the switch. It will return to the off position.



Coolant Temperature (5.) - Indicates excessive coolant temperature. If the red light comes on, pull the machine to a convenient stop. Investigate the cause. Do not operate the machine if the light is on, and the main fault light flashes.

Ver imagen

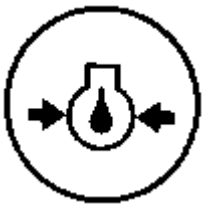


NOTICE

NOTICE

If any of the systems (6) through (8) malfunction, a warning buzzer will also sound. Shut down the machine immediately, and correct the cause of the warning.

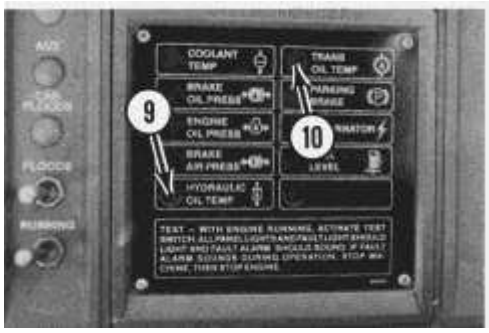
Brake Oil Pressure (6.) - Indicates low oil pressure to the brakes. If the red light comes on, the warning buzzer should also sound, and the main fault light should flash. Stop the machine immediately, apply the parking brake and shut off the engine. Investigate the cause. Do not operate the machine until the cause has been corrected.



Engine Oil Pressure (7.) - Indicates low oil pressure. If the red light comes on, the warning buzzer should also sound, and the main fault light should flash. Stop the machine immediately. Shut off the engine. Investigate the cause. Do not operate the machine until the cause has been corrected.

Brake Air Pressure (8.) - Indicates low air pressure to the brakes. If the red light comes on, the warning buzzer should also sound, and the main fault light should flash. Stop the machine immediately, apply the parking brake and shut off the engine. Investigate the cause. Do not operate the machine until the cause has been corrected.

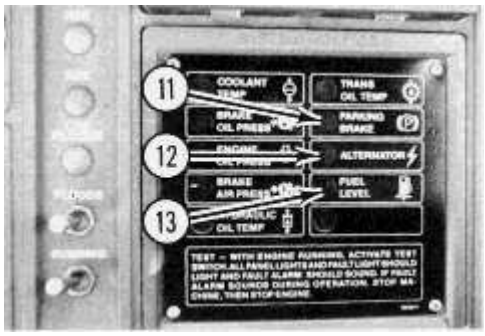
Ver imagen



Hydraulic Oil Temperature (9.) - Indicates excessive hydraulic oil temperature. If the red light comes on, reduce the load on the machine. If the light stays on, pull the machine to a convenient stop. Investigate the cause. Do not operate the machine if the light stays on, and the main fault light flashes.

Transmission Oil Temperature (10.) - Indicates excessive transmission oil temperature. If the red light comes on, the main fault light should also flash. If the light stays on, pull to a convenient stop. Investigate the cause. Do not operate the machine if the light stays on and the main fault light flashes.

Ver imagen



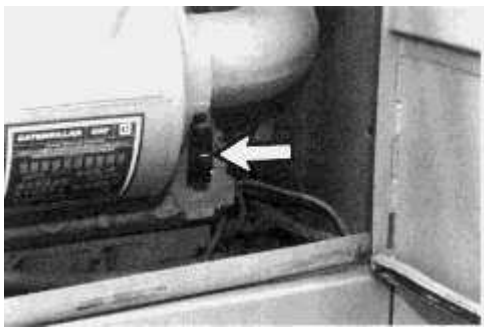
Parking Brake (11.) - Indicates parking brake is engaged. If the red light comes on during operation, the main fault light should flash and the warning buzzer should sound. Stop the machine immediately. Shut off the engine. Investigate the cause. Do not operate the machine until the cause has been corrected. The red light and main fault light should come on during start-up. It should go out when the parking brake is released.

Alternator (12.) - Indicates alternator is malfunctioning. If the red light 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.

Fuel Level (13.) - The red light will come on when the fuel level reaches 10% of tank capacity. To avoid being stranded without fuel, refuel as soon as possible within the hour.

Air Filter Service Indicator

Ver imagen

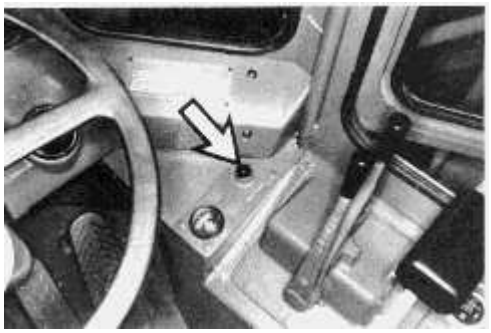


Observe the air filter indicator and change the air filter element, when the indicator piston locks in the RED position.

Filter service instructions are outlined in the "Maintenance Guide" for this machine.

Main Fault Light

Ver imagen

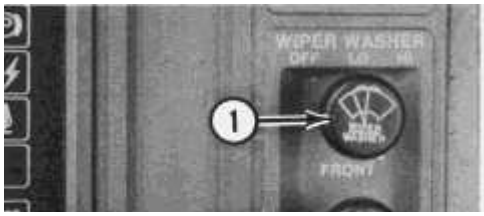


The main fault light will flash if any of the systems described under (5) through (10) malfunction.

The main fault light will flash when the engine is started with the parking brake applied. Release the parking brake to stop the flashing.

Windshield Wiper/Washer

Ver imagen



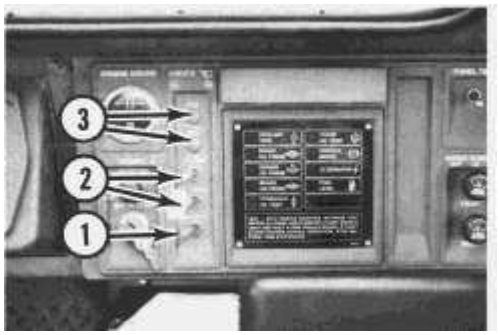
Front Windshield (1.) - Turn the knob clockwise to turn on the windshield wiper.

Pull the knob to activate the windshield washer. Spring force will return the knob when released.

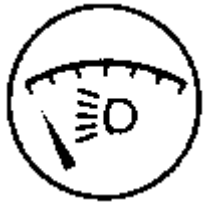
Rear Windshield (If Equipped) (2.) - Operates the same as described under "Front Windshield."

Light Switches

Ver imagen



Running Lights (1.) - Move the switch to the center position to turn on the running lights (front & rear).



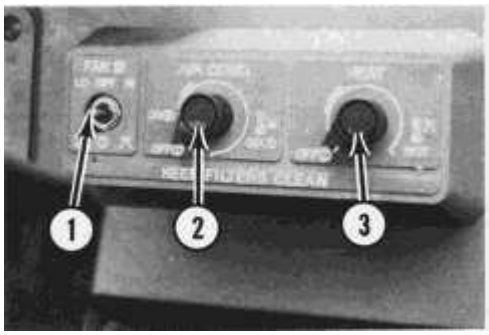
Panel Lights - Move the running lights switch (1) to the right position to turn on the panel lights.

Flood Lights (2.) - Move the switch to the right position to turn on the flood lights for illumination of the work area.

Auxiliary (3.) - Two additional locations are available for installation of additional switches for optional lighting (auxiliary flood lights, rotating beacon, etc.).

Heating and Air Conditioning - If Equipped with Cab

Ver imagen



Fan Control (1.) - This switch controls the air flow speed.

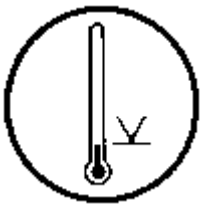
HI - Move the switch to the right to run the fan at high speed.

OFF - Move the switch to the center to turn the fan off.

LO - Move the switch to the left to run the fan at low speed.

Air Conditioning Control (2.) - OFF - turn the knob all the way to the left (counterclockwise).

ON - turn the knob to ON to activate the air conditioning control system.



cool - turn the knob to the right (clockwise towards COLD) until the desired amount of cooling is achieved.

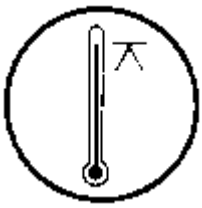
The knob can be set at any position

Ver imagen

to obtain the desired amount of cooling.

Heating Control (3.) - OFF - turn the knob all the way to the left (counterclockwise)

Heating Control (8.) - OFF - turn the knob all the way to the left (counterclockwise).



warm - turn the knob to the right (clockwise towards HOT) until the desired amount of heating is achieved.

The knob can be set at any position

Ver imagen

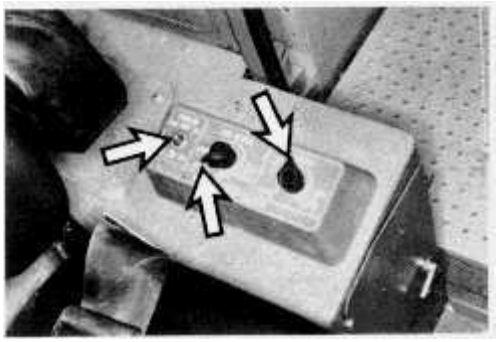
to obtain the desired amount of heating.

Heating and Air Conditioning System Operation

The heating and cooling system can perform four functions.

Heating:

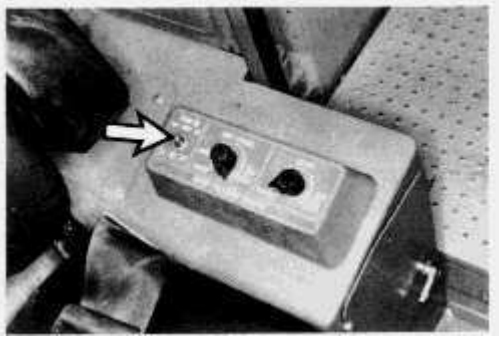
Ver imagen



Turn the cooling control OFF. Push the blower fan switch to LOW or HIGH speed. Adjust the heating control for the desired temperature. Adjust the air flow louvers in the dash and in the seat base for the desired air flow pattern.

Cooling:

Ver imagen

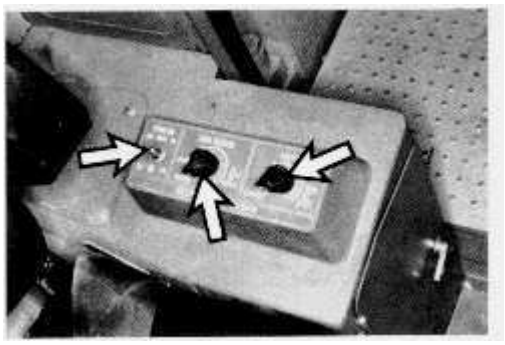


Turn the heating control OFF. Push the blower fan switches to LOW or HIGH speed. Adjust the cooling

control for the desired temperature. Adjust the air flow louvers.

Pressurizing:

Ver imagen



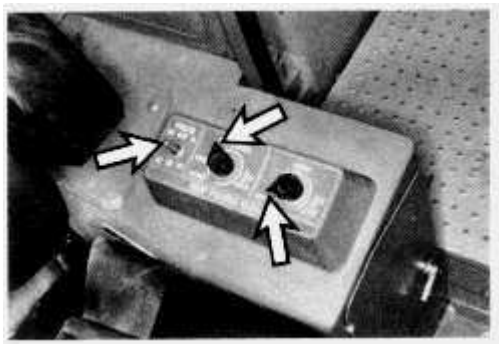
Pressure inside the cab will help keep dust out when heating or cooling is not desired.

Turn the heating and air conditioning controls to OFF.

Turn the fan switch to either LOW or HIGH speed, as needed to keep out dust. Adjust the air flow with the louvers.

Defogging:

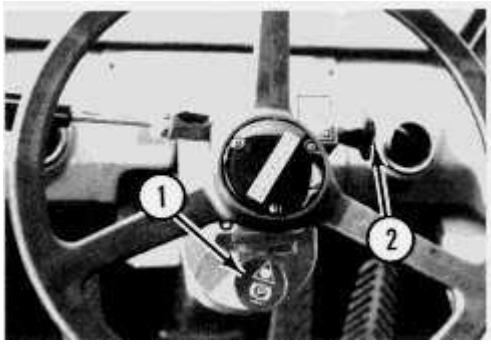
Ver imagen



Turn on the fan. Adjust the heating and cooling controls until the moisture level is lowered, and the temperature is comfortable. Adjust the air flow with the louvers.

Controls

Ver imagen



NOTICE

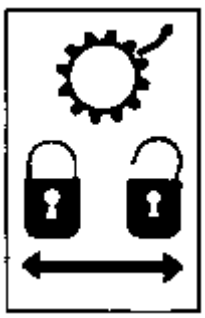
Do not apply the parking/emergency brake while the machine is moving. unless an emergency exists. The use of the parking brake as a service brake in regular operation will cause severe damage to the parking brake system.

Parking/Emergency Brake (1.) - Pull the knob up to apply the brake.

When the brake is applied, the transmission is in NEUTRAL.

Push the knob down to release the brake.

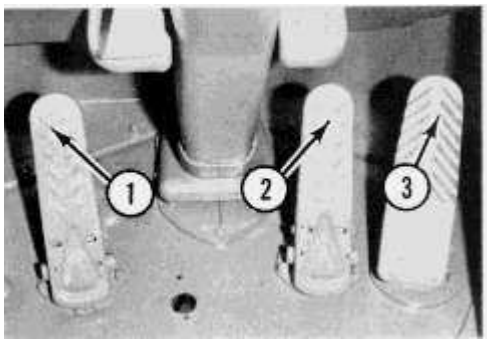
Release the brake before moving the machine.



Transmission Control Lock (2.) - Engaged (pushed in) - The transmission control is locked in NEUTRAL.

Released (pulled out) - The transmission control lever can be moved to the FORWARD or REVERSE position.

Ver imagen



1. Brake Pedal - The left brake pedal disengages the transmission and brakes the machine. This permits higher engine speed for better hydraulic response.

Depress the left brake pedal when positioning and raising the bucket at the same time.

Release the pedal to re-engage the transmission and to release the brake.

Brake Pedal (2.) - Depress the right brake pedal for normal machine braking.

Release the pedal to release the brake.

Accelerator (3.) - Depress to increase the engine speed. Release to decrease the engine speed.

The accelerator pedal can be used to shut off the engine by pulling the pedal back past the detent.

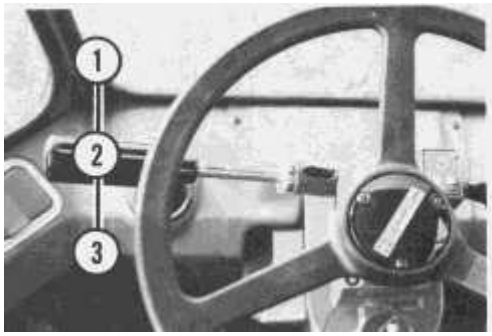
Controls

Transmission Control Lever

NOTICE

Apply the service brake before moving the transmission control lever.

Ver imagen



Direction Selector:

Forward (1.) - Push the transmission lever forward. The machine will move forward.

Neutral (2.) - The machine should not move when lever is in neutral.

Reverse (3.) - Pull the transmission lever towards the operator. The machine will move in reverse.

Ver imagen

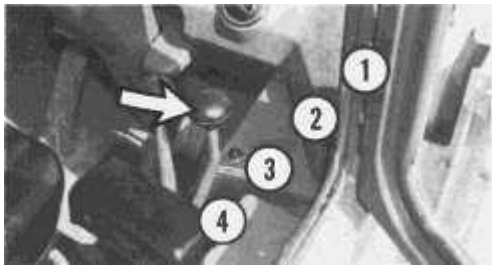
Speed Selector:

Rotate the transmission control lever to the desired gear speed:

1 First Speed
2 Second Speed
3 Third Speed
4 Fourth Speed

Bucket Lift Lever

Ver imagen



Bucket Float Position (1.) - Push the lever all the way forward into detent for FLOAT. The bucket will lower to the ground and follow ground contour.

The lever will remain in FLOAT until pulled out of detent. The lever will then return to HOLD when released.

NOTICE

NEVER use FLOAT position to lower a loaded bucket.

Bucket Lower Position (2.) - Push the lever forward from HOLD position to LOWER the bucket. The lever will return to HOLD when released.

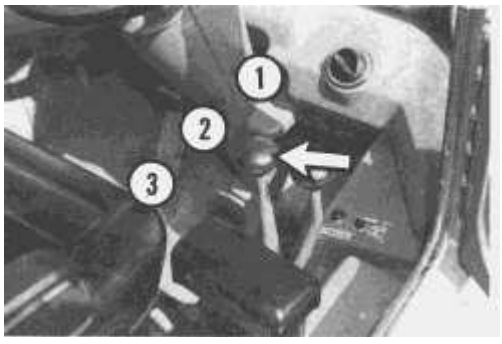
Bucket Hold Position (3.) - The lever will return to HOLD when released from either RAISE or LOWER. The bucket will remain in the position it is in.

Bucket Raise Position (4.) - Pull the lever back to RAISE the bucket. Release the lever to stop lifting the bucket. The lever will return to HOLD when released.

The lever is detented in the full raise position. It will stay in detent until the bucket reaches height set by the lift kickout. Then it returns to HOLD.

Bucket Tilt Lever

Ver imagen



Bucket Tilt - Dump Position (1.) - Push the lever forward to DUMP the bucket.

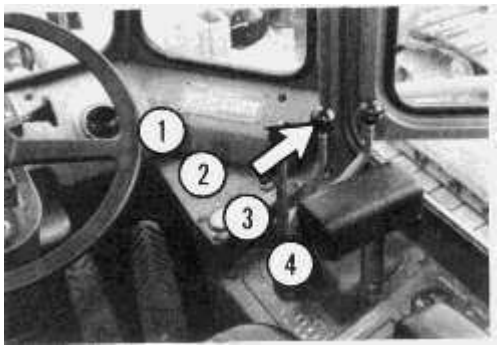
Bucket Tilt - Hold Position (2.) - Release the tilt lever. The bucket will remain in the position it is in.

Bucket Tilt - Tilt Back Position (3.) - Pull the lever back to tilt the bucket back.

Controls

Log or Lumber Fork Lift Lever

Ver imagen



1. Fork Float Position - Push the lever all the way forward into detent for fork FLOAT. The fork will lower to the ground and move up and down, following ground contour.

The lever will remain in float until pulled out of detent. The lever will then return to HOLD when it is released.

NOTICE

NEVER use FLOAT position to lower a loaded fork.

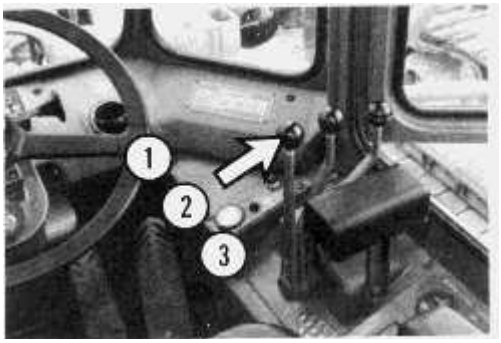
Fork - Lower Position (2.) - Push the lever forward to LOWER the fork. When the lever is released it will return to HOLD.

Fork - Hold Position (3.) - The lever will return to HOLD when it is released from either RAISE or LOWER. The fork will remain in the position it is in.

Fork - Raise Position (4.) - Pull the lever back to RAISE the fork. Release the lever to stop lifting the fork. Lever will return to HOLD when released.

Log or Lumber Fork Tilt Lever

Ver imagen



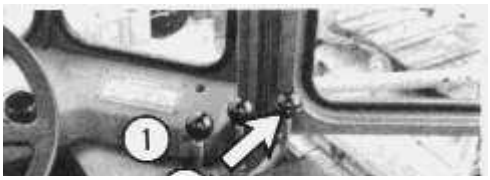
Fork Tilt Forward Position (1.) - Push the lever forward to tilt the fork FORWARD. The lever will return to HOLD when released. The fork will remain in the position it is in.

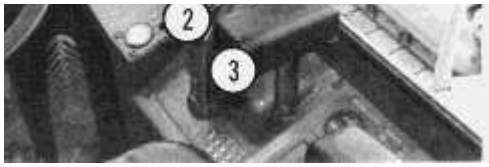
Fork Tilt Hold Position (2.) - Release the tilt lever, and the fork will remain in the position it is in.

Fork - Tilt Back Position (3.) - Pull the lever back to tilt the fork BACK. Release the lever and it will return to HOLD. The fork will remain in the position it is in.

Top Clamp Lever

Ver imagen





Clamp Close Position (1.) - Push the lever forward to CLOSE the clamp. Release the lever and it will return to HOLD.

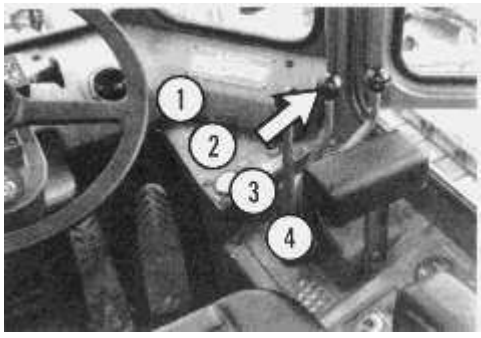
Clamp Hold Position (2.) - Release the tilt lever. The clamp will remain in the position it is in.

Clamp Open Position (3.) - Pull the lever back and the clamp will OPEN. Release the lever and it will return to HOLD.

NOTE: On machines equipped with a Lumber Fork with Top Clamp, the controls and their operation are identical to the controls for the Log Fork and Top Clamp and their operation.

Side Dump Bucket Lift Lever

Ver imagen



Side Dump Bucket Float Position (1.) - Push the lever all the way forward into the detent, for side dump bucket FLOAT. The side dump bucket will lower to the ground, and move up and down, following the ground contour.

NOTICE

NEVER use the FLOAT position to lower a loaded side dump bucket.

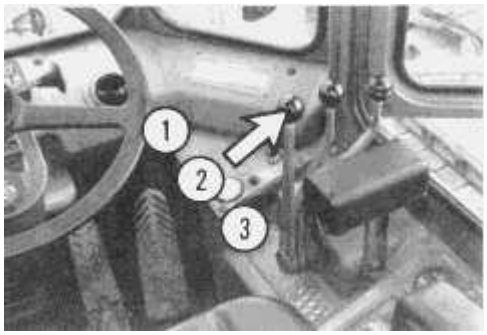
Side Dump Bucket - Lower Position (2.) - Push the lever forward to LOWER the side dump bucket. When the lever is released it will return to HOLD.

Side Dump Bucket - Hold Position (3.) - The lever will return to HOLD when it is released from either RAISE or LOWER. The side dump bucket will remain in the position it is in.

Side Dump Bucket - Raise Position (4.) - Pull the lever back to RAISE the side dump bucket. Release the lever to stop lifting the bucket. Lever will return to HOLD when released.

Side Dump Bucket Tilt Lever

Ver imagen



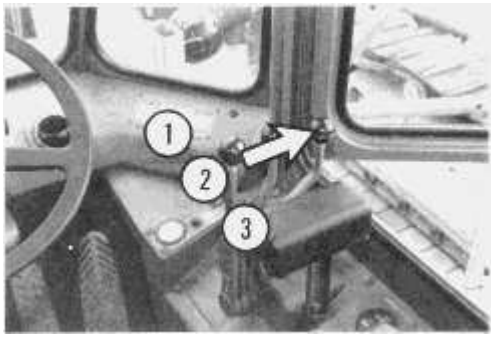
Bucket Tilt-Dump Position (1.) - Push the lever forward to tilt the side dump bucket FORWARD. The lever will return to HOLD when released. The side dump bucket will remain in the position it is in.

Bucket Tilt-Hold Position (2.) - Release the tilt lever and the side dump bucket will remain in the position it is in.

Bucket Tilt-Tilt Back Position (3.) - Pull the lever back to tilt the side dump bucket BACK. Release the lever and it will return to HOLD. The side dump bucket will remain in the position it is in.

Side Dump Lever

Ver imagen



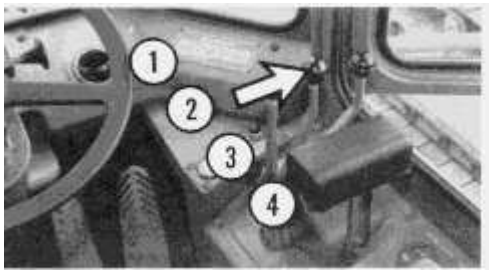
Bucket Side Dump Position (1.) - Push the lever forward to SIDE DUMP the bucket. Release the lever and it will return to HOLD.

Bucket Hold Position (2.) - Release the tilt lever. The bucket will remain in the position it is in.

Bucket Return Position (3.) - Pull the lever back and the bucket will RETURN. Release the lever and it will return to HOLD.

Multipurpose Bucket Lift Lever

Ver imagen



1. Multipurpose Bucket Float Position - Push the lever all the way forward into detent for bucket FLOAT. The bucket will lower to the ground and move up and down, following ground contour.

The lever will remain in float until pulled out of detent. The lever will then return to HOLD when it is released.

NOTICE

NEVER use FLOAT position to lower a loaded multipurpose bucket.

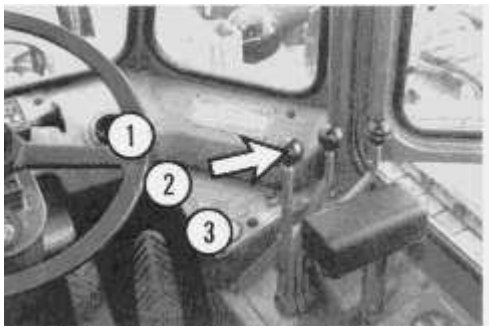
Multipurpose Bucket - Lower Position (2.) - Push the lever forward to LOWER the bucket. When the lever is released, it will return to HOLD.

Multipurpose Bucket - Hold Position (3.) - The lever will return to HOLD when it is released from either RAISE or LOWER. The bucket will remain in the position it is in.

Multipurpose Bucket - Raise Position (4.) - Pull the lever back to RAISE the bucket. Release the lever to stop lifting the bucket. Lever will return to HOLD when released.

Multipurpose Bucket Tilt Lever

Ver imagen



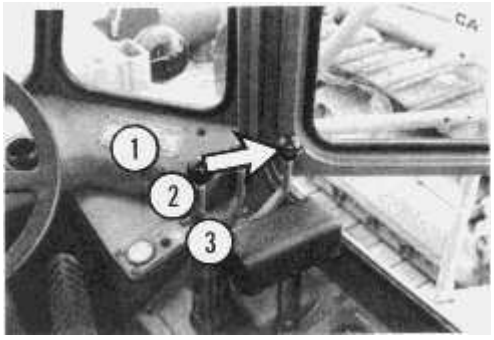
Bucket Tilt-Dump Position (1.) - Push the lever forward to tilt the bucket FORWARD. The lever will return to HOLD when released. The bucket will remain in the position it is in.

Bucket Tilt-Hold Position (2.) - Release the tilt lever and the bucket will remain in the position it is in.

Bucket Tilt-Back Position (3.) - Pull the lever back to tilt the bucket BACK. Release the lever and it will return to HOLD. The bucket will remain in the position it is in.

Multipurpose Bucket Bowl Lever

Ver imagen



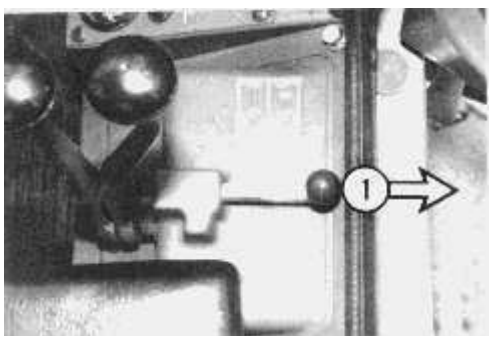
Bowl Close Position (1.) - Push the lever forward to CLOSE the bowl. Release the lever and it will return to HOLD.

Bowl Hold Position (2.) - Release the tilt lever. The bowl will remain in the position it is in.

Bowl Open Position (3.) - Pull the lever back and the bowl will OPEN. Release the lever and it will return to HOLD.

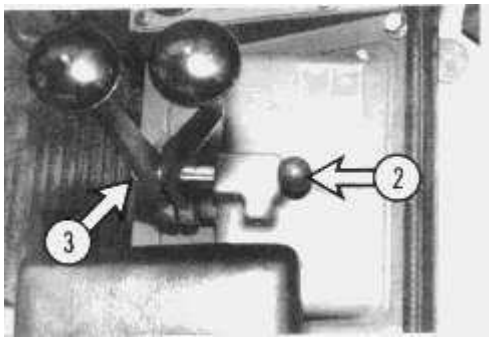
Hydraulic Control Lever Lock

Ver imagen



Released Position (1.) - Push the knob away from the operator to extend the lock rod and release the hydraulic control levers.

Ver imagen

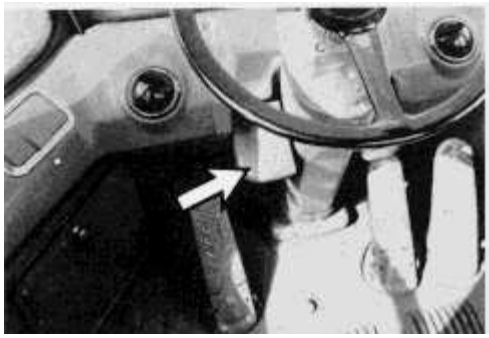


Locked Position (2.) - Pull the knob towards the operator to retract the lock rod and lock the hydraulic control levers.

3. The end of the lock rod has an eye to accept a padlock. This helps against vandalism and unauthorized use.

Steering Column Tilting

Ver imagen

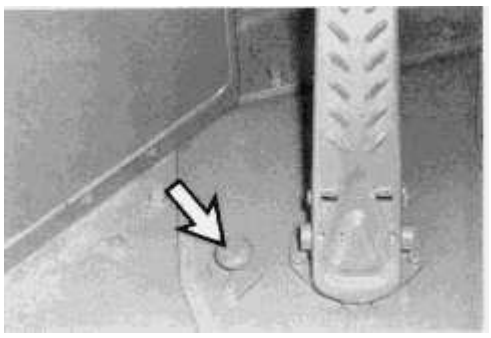


Steering Column Tilting:

Lift the latch to RELEASE the steering column. Move the column to the desired position. Release the latch to LOCK the steering column.

Horn Button

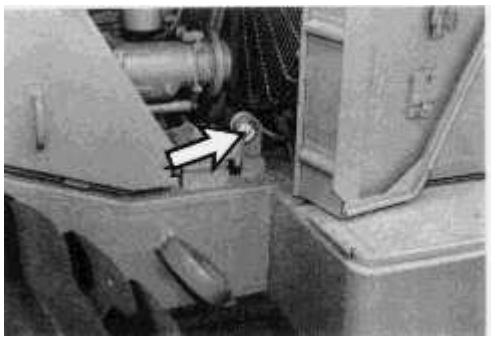
Ver imagen



Horn Button - Depress the horn button to sound the horn. The horn is used to warn or signal personnel.

Disconnect Switch

Ver imagen



Disconnect Switch - Insert the key, and turn it to the right, to turn ON the electrical system.

Turn the key to the left to turn OFF the electrical system.

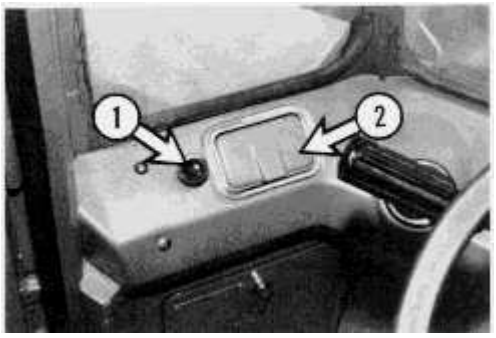
Remove the key when leaving the machine. Also, remove it when servicing the electrical system.

NOTICE

Never turn the disconnect key off with the engine running.

Operator Comfort Features

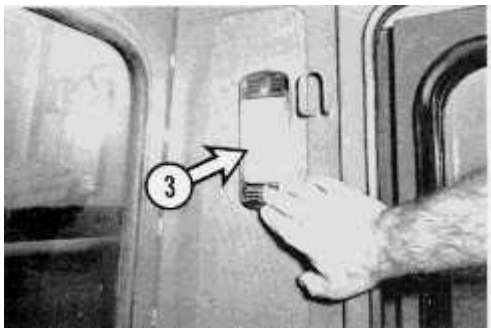
Ver imagen



Lighter (1.) - Push the lighter in and release. The lighter will pop out when ready for use.

2. Ashtray - Pull the ashtray open to use. Shut it when not in use.

Ver imagen



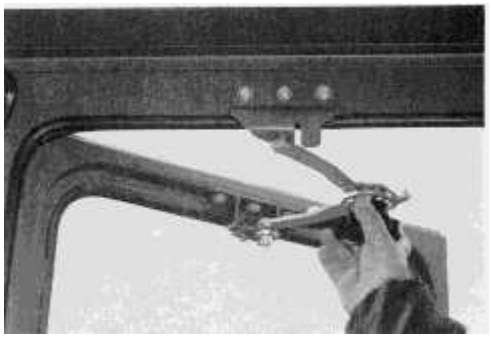
Cab Lights (If Equipped) (3.) - The cab lights are located on the rear post of the cab. One on each post.

Lights are individually operated by the switch at the bottom of each light.

Ver imagen

Right Cab Door (4.) - The cab door on the right side serves as an emergency exit. It can be opened from the inside only. Push the button and open the door.

Ver imagen



The door can be secured in the open position with a brace.

Open the door as far as desired, then tighten the knob.

This will eliminate cab pressurization.

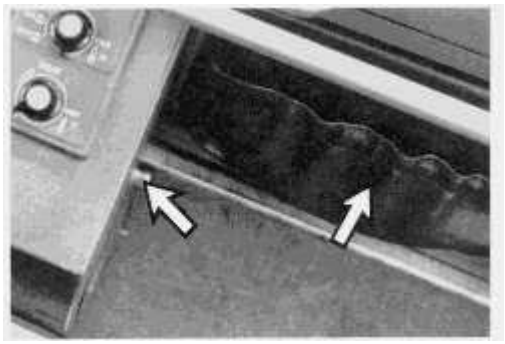
Ver imagen

The coat hook is next to the cab light on the left side of the cab (if equipped).

Ver imagen

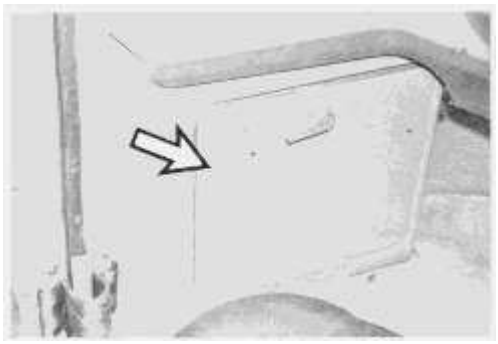
The literature compartment is in the back of the seat backrest.

Ver imagen



A storage pouch is in the left cab door. Another storage compartment is under the left control console.

Ver imagen



A storage compartment is on the left front under the dash.

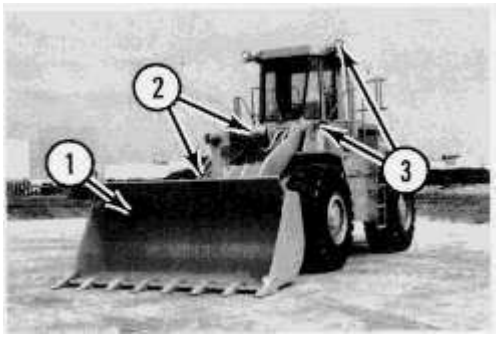
Before Starting the Engine

Walk-Around Inspection

For your own safety and maximum service life of the vehicle, 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 or missing bolts, trash buildup, oil, coolant or fuel leaks. Inspect the condition and inflation of the tires, condition of the bucket, and the bucket linkage.

Ver imagen



1. Bucket

Inspect for damage or excessive wear.

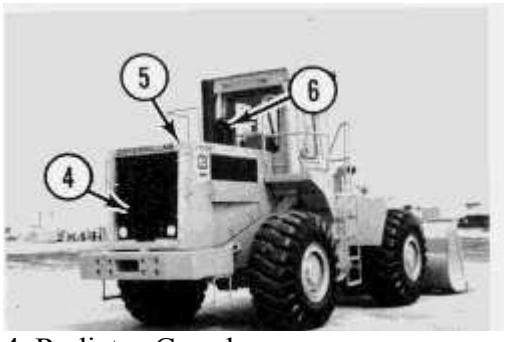
2. Bucket Control Linkage

Inspect for damage or excessive wear.

3. Lights

Inspect for broken bulbs and lenses. Check for loose or frayed wires.

Ver imagen



4. Radiator Guard

Inspect for trash buildup.

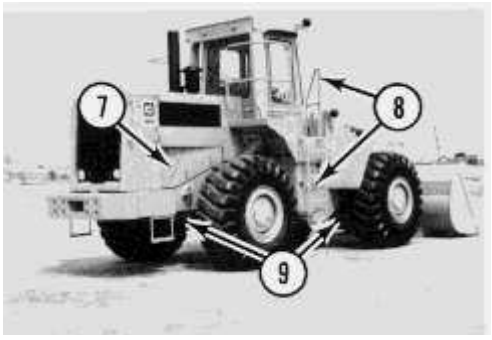
5. Cooling System

Inspect for leaks - trash buildup.

6. Engine Precleaner

Inspect for dirt buildup.

Ver imagen



7. Engine Compartment

Inspect for leaks - trash buildup.

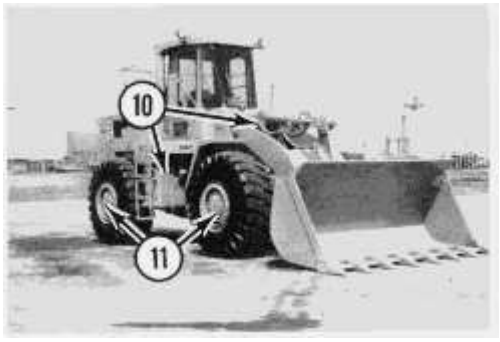
8. Steps and Grab Irons

Inspect their condition and cleanliness.

9. Differentials (front and rear)

Inspect under machine for leaks.

Ver imagen



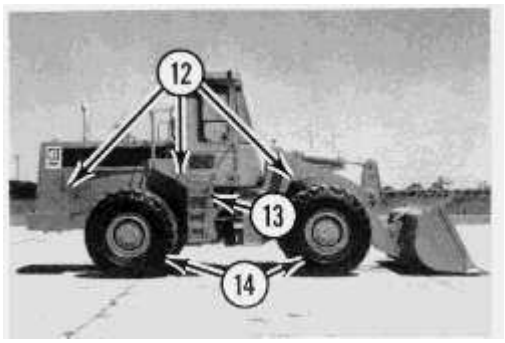
10. Hydraulic System

Inspect for leaks. Check for loose hose connections. Check for frayed hoses.

11. Final Drives (front and rear)

Inspect for leaks.

Ver imagen



12. Covers and Guards

Be sure they are firmly in place. Inspect for damage.

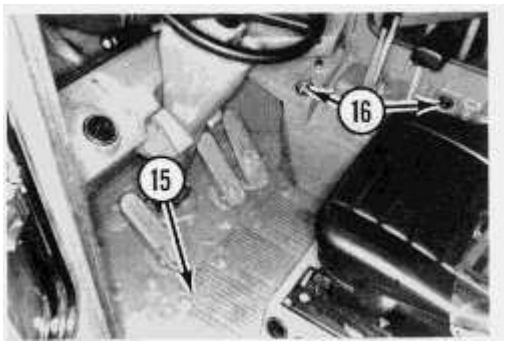
13. Transmission

Inspect for leaks.

14. Tires (front and rear)

Inspect for damage and proper inflation.

Ver imagen



15. Operator's Compartment

Inspect for cleanliness.

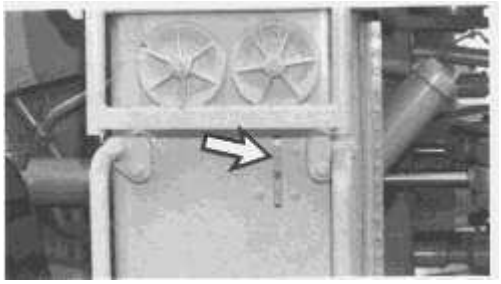
16. Instrument Panel

Inspect for broken gauges and indicator lights.

Ver imagen

Measure the crankcase oil level. The level should be above the ADD mark on the ENGINE STOPPED side of the dipstick.

Ver imagen



Observe the hydraulic system oil level. Maintain the oil level above the ADD mark in the sight gauge.

Ver imagen

Inspect the air intake screen. Clean off any debris.

Ver imagen

Measure the transmission oil level. Oil must show on the dipstick.

Ver imagen

Observe the coolant level. Maintain the coolant within 1 cm (1/2 inch) of the bottom of the fill pipe.

Ver imagen

Measure the tire pressure. See the topic "Tire Inflation Information."

Ver imagen

Measure the fuel level. Fill the fuel tank after each day of operation to help prevent condensation in the tank.

Ver imagen

Inspect the wheel brakes for oil leaks.

Positioning Seat

WARNING

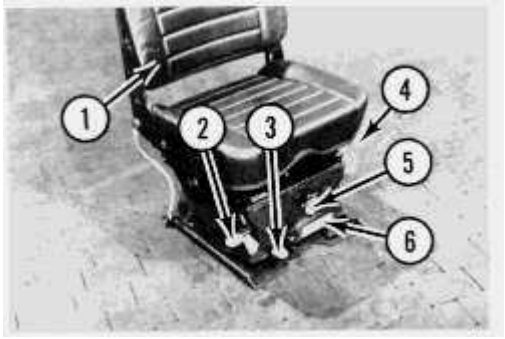
Inspect condition of the seat belt and the mounting hardware. Replace any defective components.

Always wear the seat belt when operating the machine.

Adjust the seat at the beginning of each shift or when operators change.

Replace the seat belt at least every 3 years, regardless of appearance.

Ver imagen



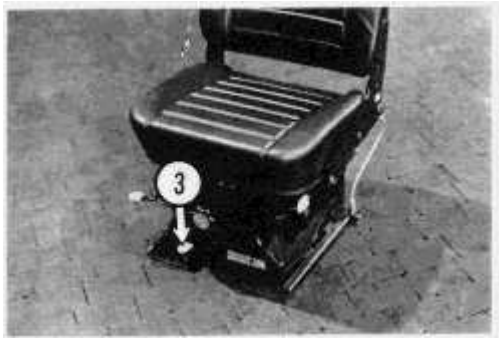
Ver imagen

1. Raise the backrest (1) up and move it to the desired position. Lower it to lock it into position.

Ver imagen

2. Push down on the seat height level lever (2) to release the lock. Press the seat to the desired height. Release the lever to lock the seat.

Ver imagen

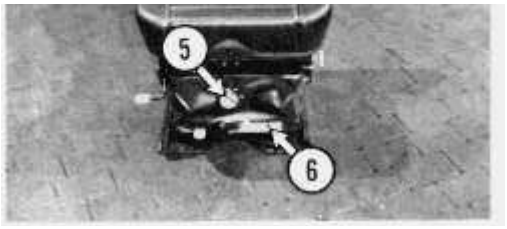


3. Pull up the fore-aft lever (3). Slide the seat forward or back to the desired position. Release the lever to lock the seat.

Ver imagen

4. Pull up the seat angle lever (4). Adjust the seat cushion to the desired angle. Release the lever to lock the seat cushion.

Ver imagen



5. Turn the knob (5) clockwise to increase or counterclockwise to decrease the stiffness of the suspension until the yellow rod in the indicator (6) is just visible.

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

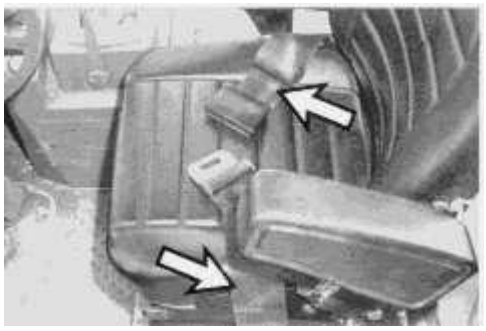
Seat Belt

WARNING

Replace the seat belt or mounting hardware if it is damaged. Replace the belt at least every 3 years.

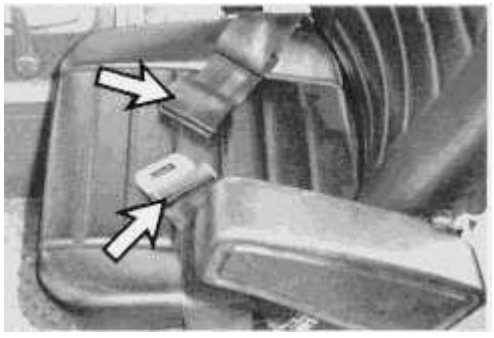
Adjust and fasten the seat belt before operating the machine.

Ver imagen



Inspect for worn or frayed webbing.

Ver imagen



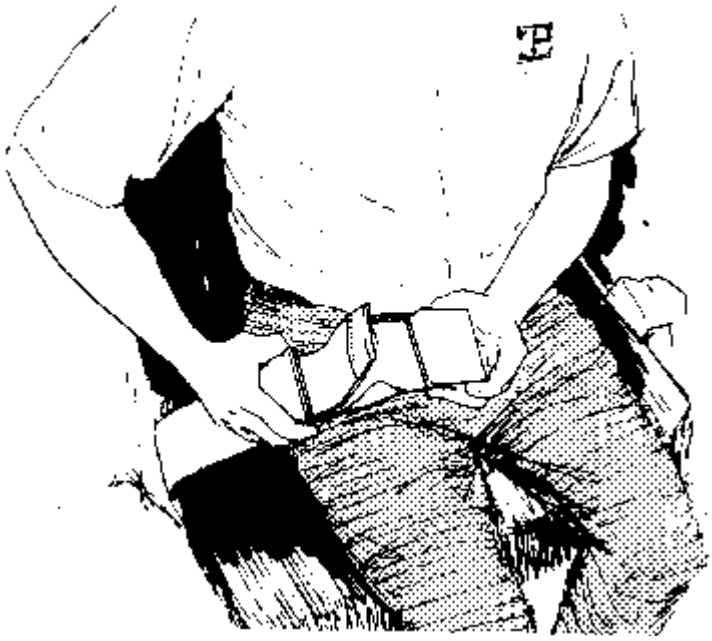
Check for worn or damaged buckle or anticreep slide on each half of the belt. Replace the belt, buckle, or slides if they are worn or damaged.

Ver imagen

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

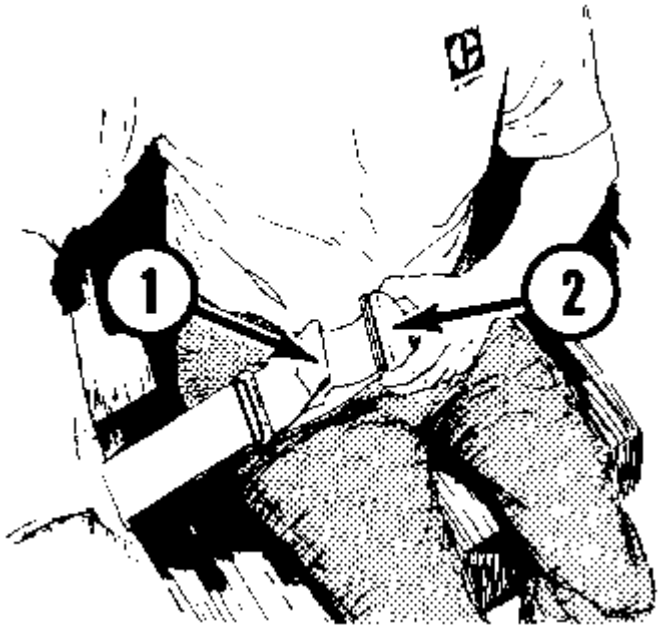
To Lengthen the Belt:

Ver imagen



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

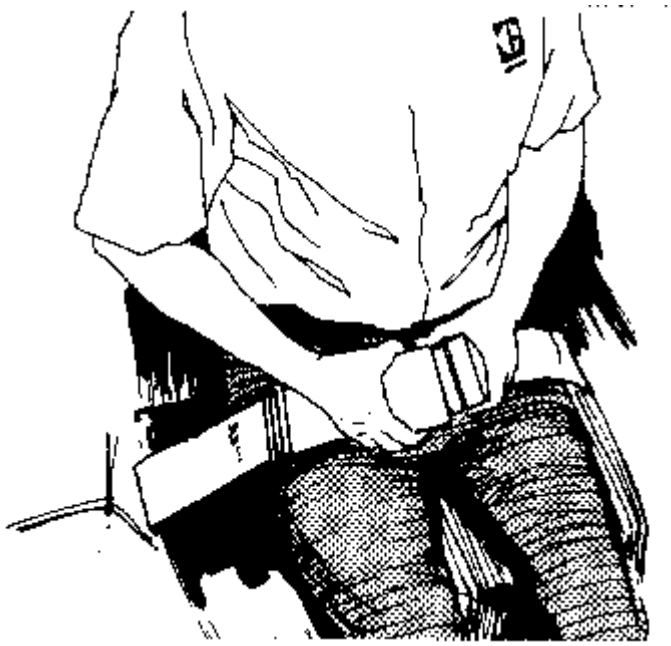
Ver imagen



2. To remove the slack in the outer loop (1), rotate the 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.

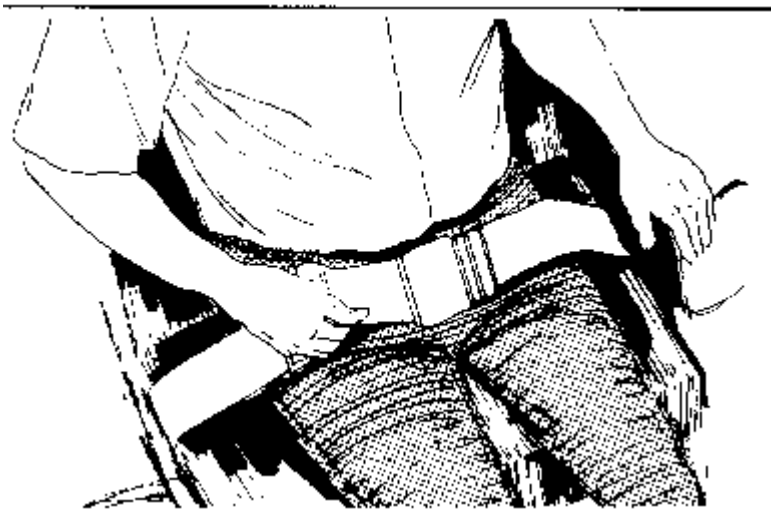
Ver imagen



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:

Ver imagen



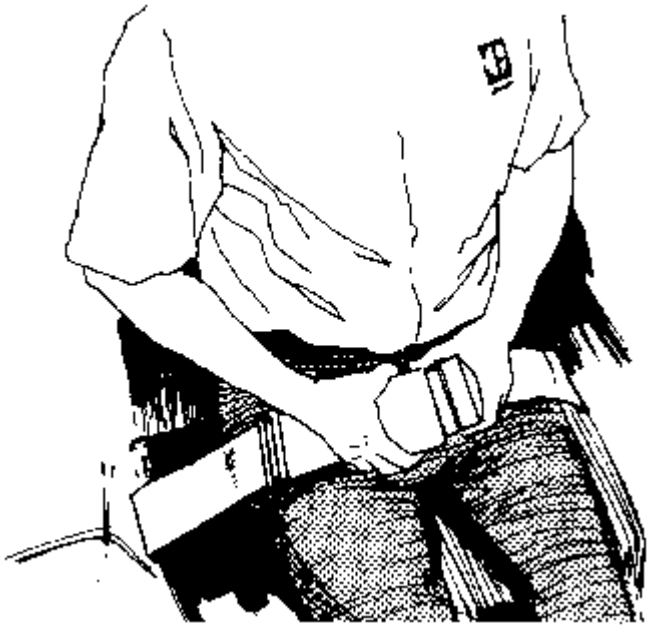
1. With the belt fastened, pull on the outer loop to tighten the belt.

Ver imagen

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.

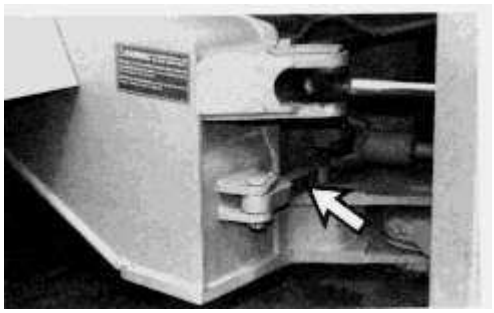
Ver imagen



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

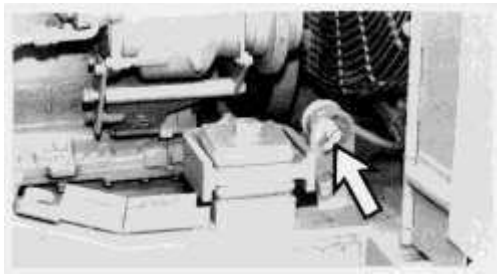
Starting the Engine

Ver imagen



1. Be sure the steering frame lock link is in carry position.

Ver imagen

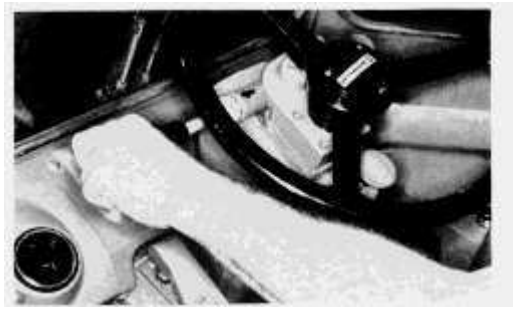


2. If the disconnect switch was turned off, turn it on.

Ver imagen

3. Pull up the knob to apply the parking brake.

Ver imagen



4. Move the transmission control to NEUTRAL.

Ver imagen

5. Push in the knob to engage the transmission control lock.

Ver imagen

6. Move all hydraulic control levers to HOLD.

Above 0°C (32°F)

Ver imagen

1. Depress the accelerator pedal just past the detent.

Ver imagen

2. Turn the start switch to START to crank the engine. Release the switch when the engine starts.

The low air pressure buzzer should sound until air pressure is normal and the parking brake is released, or until the transmission is shifted into NEUTRAL.

NOTICE

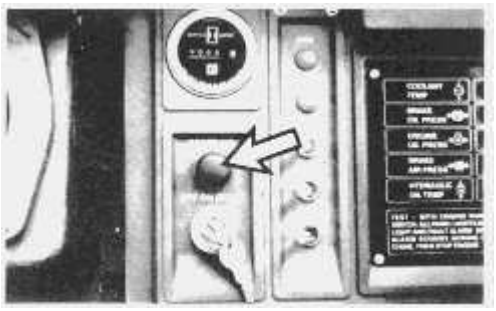
Do not crank the engine for more than 30 seconds. Allow the starter to cool for 2 minutes before cranking again.

Above 0°C (32°F), no starting aid should be needed. If a starting aid is required, see the next topic, "Below 0°C, (32°F)."

Below 0°C (32°F)

1. Repeat steps 1 and 2 as outlined in the topic, "Above 0°C (32°F)."

Ver imagen



2. After cranking begins, push the starting aid button. Repeat every 2 seconds until the engine starts.

3. When the engine starts, push the starting aid button about every 2 seconds until the engine runs smoothly.

NOTICE

Do not use the starting aid excessively during starting or when the engine is running.

Do not use starting aid when the engine is warm and running.

For starting below -18°C (0°F), the use of additional optional starting aids is recommended. Heating of the coolant and/or use of extra battery capacity may be required.

At starting temperatures below -23°C (-10°F), consult your Caterpillar dealer or refer to the "Cold Weather Operation Guide," Caterpillar Form SEBU5898.

Starting With A Boost

WARNING

When starting from another machine, make sure the machines do not touch. This prevents sparks near the battery, which could ignite the hydrogen gas given off by the battery, causing the battery to explode.

Always wear eye protection when starting a machine with a boost.

To prevent possible personal injury, use care when removing the cables from the machine that has been started. Do not allow the cable ends to

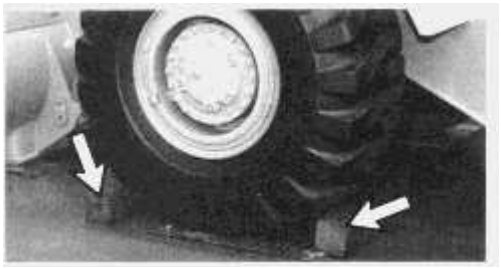
contact each other or the machine.

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

Ver imagen

The machine to be started should be parked on level ground with all equipment lowered.

Ver imagen



If this is not possible, the wheels must be blocked securely, so that the machine cannot move.

NOTICE

These machines have a 24 Volt starting system. Use only the same voltage (24 Volt) for boost starting. Use of a welder or higher voltage will damage the electrical system.

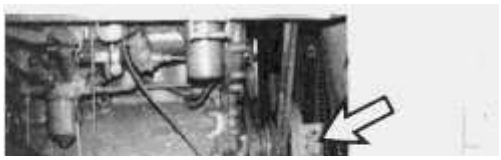
Starting Kit

An emergency starting kit helps when starting with a boost. It provides a permanent receptacle (4V3445) on the machine to plug in a booster cable.

Two different cable assemblies are available for boost starting. For starting from an operating machine, use 9S3664. For starting from an auxiliary power pack, use 8S2632.

The boost starting cable assembly must be attached to the boost source (operating machine or auxiliary power pack) first.

Ver imagen



Insert the plug in the receptacle of the machine to be started. Start the engine. After the engine starts, remove the plug from the receptacle.

Boost Cables

WARNING

Connect the batteries in parallel: negative (-) to negative (-) and positive (+) to positive (+). Attach the positive booster cable, from the positive post of the booster battery to the positive post of the battery of the machine to be started. Attach the negative booster cable from the negative post of the booster battery to the starter ground terminal or to the disconnect switch ground terminal of the vehicle to be started.

Disconnect the ground cable first when removing the booster cables. This will prevent sparks near the battery.

Ver imagen

1. Attach one cable to the POSITIVE (+) terminal of the battery on the left side of the machine to be started.

2. Attach the opposite end of the cable to the POSITIVE (+) terminal of the boost source.

3. Attach the second cable to the NEGATIVE (-) terminal of the boost source.

Ver imagen

4. Attach the remaining cable end to the starter ground terminal or to the disconnect switch ground terminal of the machine to be started.

terminal of the machine to be started.

5. Start the engine. See "Starting the Engine."

6. After the engine starts, remove the cable from the starter ground terminal or from the disconnect switch ground terminal first.

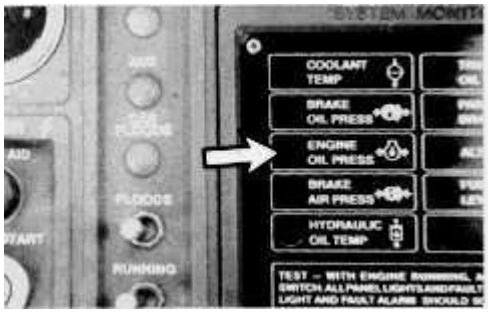
7. Remove the opposite end of the cable from the boost source.

Ver imagen

8. Remove the cable from the POSITIVE (+) terminal of the battery of the machine that was started. Remove the opposite end of the cable from the boost source.

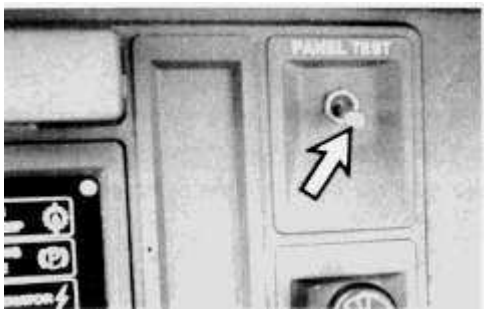
After Starting

Ver imagen



1. Keep the engine speed low until the oil pressure light goes out. If the oil pressure light does not go out within 10 seconds, stop the engine and investigate.

Ver imagen



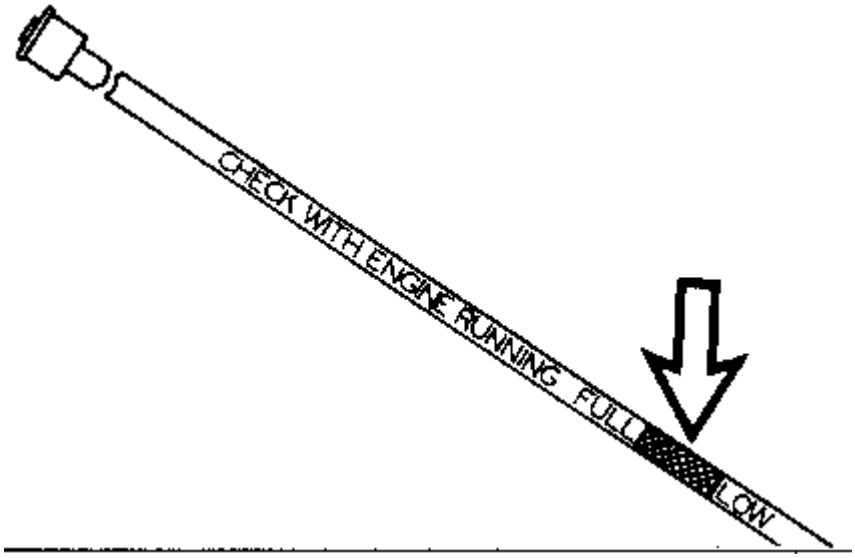
2. Push the panel test switch to the test position to test the indicator lights.

3. If the lights do not come on, make any necessary repairs.

4. If any of the indicator lights stay on, have any necessary repairs made before operating the machine.

5. Look at the operator's panel frequently during operation. If any of the indicator lights come on, stop the machine, if necessary, and investigate.

Ver imagen

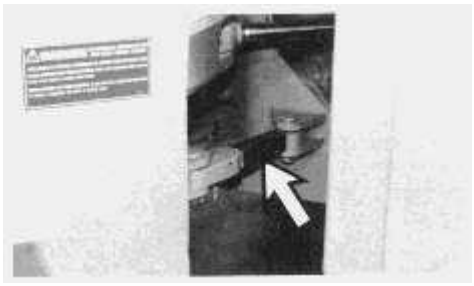


6. Maintain the oil level between the FULL and ADD OIL mark on the ENGINE RUNNING side of the dipstick.

7. The transmission oil level measurement can be inaccurate (show too high or low on the "ENGINE RUNNING" side of the dipstick) during the first few minutes of operation with cold oil. If the transmission oil level must be measured with the engine running, wait until the oil has warmed and the machine has been moved in all speeds, and in both directions.

Moving the Machine

Ver imagen



1. Make sure the steering frame lock link is in the carry position.

Ver imagen

2. Raise the bucket to the carry position approximately 40 cm (15 inches) above the ground.

Ver imagen

3. Push the knob down to release the parking brake.

Ver imagen

4. Pull out the knob to release the transmission control lock.

It is possible to start the engine when the transmission control lever is in FORWARD or REVERSE, but the machine will not move. Should this happen, move the lever to NEUTRAL, then to the desired speed and direction.

WARNING

Be sure the area is clear of personnel and obstructions.

Ver imagen

5. Move the transmission control to the desired travel direction. Rotate the control to the desired speed.

Ver imagen

6. Depress the accelerator pedal.

Drive the machine forward for best visibility and control.

NOTICE

For operator safety and comfort and maximum service life of power train components, deceleration and/or braking is recommended before any directional shifts are made.

Emergency Brake System

WARNING

If the brake system air pressure drops below normal operating pressure, a warning horn will sound. The low brake pressure and the parking brake indicators on the operator's panel will light up. The fault light will start flashing.

If the pressure drops further, the parking/emergency brake will apply automatically and the transmission will shift to neutral.

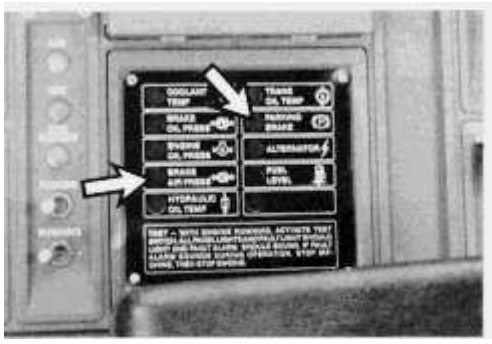
Be prepared for a sudden stop. Correct the reason for the loss of air pressure. Do not move the machine without normal air pressure.

In an emergency, the machine can be moved with the parking/emergency brake applied, with the engine running, by holding the shift lever in 1st speed. The lever and transmission will return to NEUTRAL immediately when the lever is released.

NOTICE

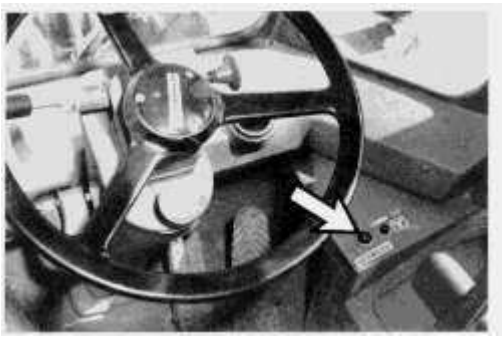
Moving the machine with the parking/emergency brake applied can cause excessive wear or damage to the brake. If necessary, have the brake repaired before operating the machine.

Ver imagen



Loss of brake oil or air pressure will cause the brake indicators on the operator panel to light up. The emergency brake will automatically engage and stop the machine.

Ver imagen



The fault light will also flash when the monitor system lights go on.

Test Emergency Braking System:

WARNING

Be sure that the area around the machine is clear of personnel and obstructions.

Be sure the antipivot link is in the carry position.

Test the brakes on a dry, level surface.

Fasten the seat belt before testing the brakes.

Ver imagen

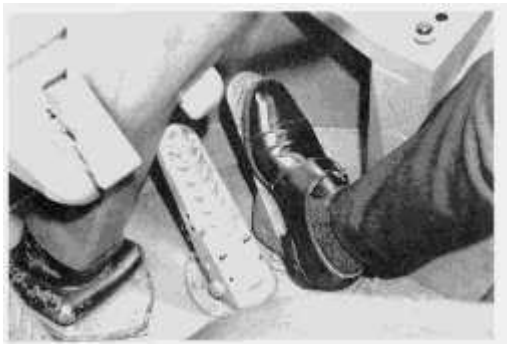
1. Start the engine and raise the bucket slightly.

Ver imagen

2. With the parking brake applied, shift the transmission to 3rd gear forward.

It will be necessary to hold the lever in forward or the lever will move to NEUTRAL.

Ver imagen

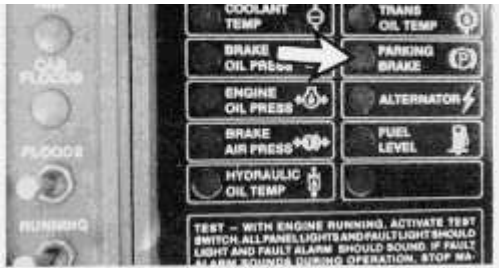


3. Gradually increase the engine speed to high idle. The machine must not move.

WARNING

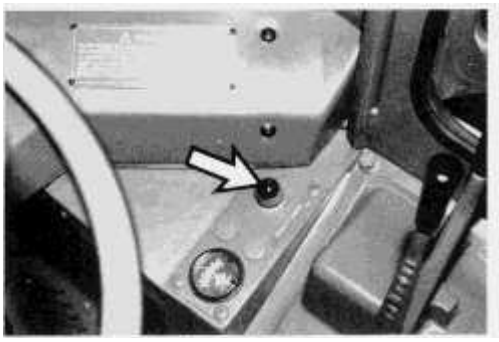
If the machine begins to move, reduce the engine speed immediately and apply the service brakes.

Ver imagen



The parking brake light must come on.

Ver imagen



The main fault light must flash and the warning horn must sound.

NOTICE

If the machine moved while testing, have your Caterpillar dealer inspect the brake. If necessary, repair the parking brake before returning the machine to operation.

Ver imagen

4. Reduce engine speed, shift the transmission to NEUTRAL, lower the bucket to the ground, and stop the engine.

Supplemental Steering (If Equipped)

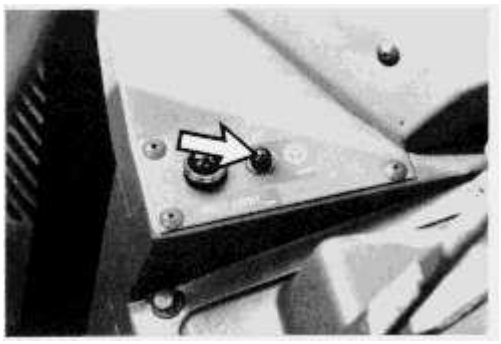
WARNING

If the supplemental steering warning light comes on, steer the machine IMMEDIATELY to a safe location and stop.

Have any necessary repairs made before returning the machine to operation.

Supplemental steering works only while the machine is in motion.

Ver imagen



If the machine is equipped with supplemental steering and the standard steering malfunctions or the engine stops, the indicator light will go on.

Parking the Machine

Stopping the Machine

NOTICE

Park on a level surface. If it is necessary to park on a grade, block the wheels securely.

Do not apply the parking brake while machine is moving unless an emergency exists.

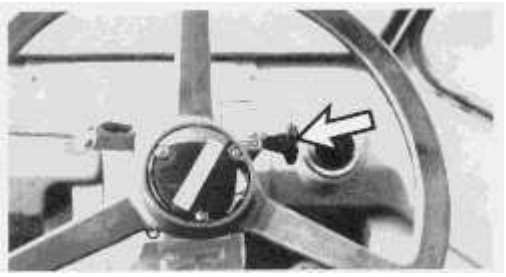
Ver imagen

1. Apply the service brakes to stop the machine.

Ver imagen

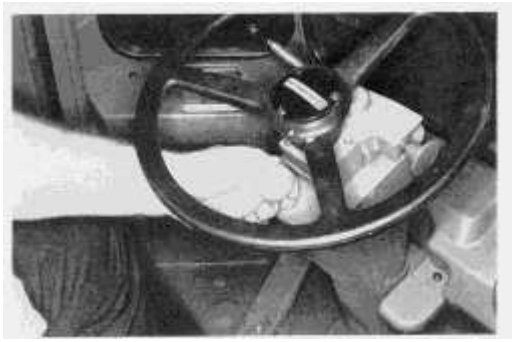
2. Move the transmission control to NEUTRAL.

Ver imagen



3. Push the knob in to engage the transmission control lock.

Ver imagen



4. Pull the knob up to engage the parking brake.

Ver imagen

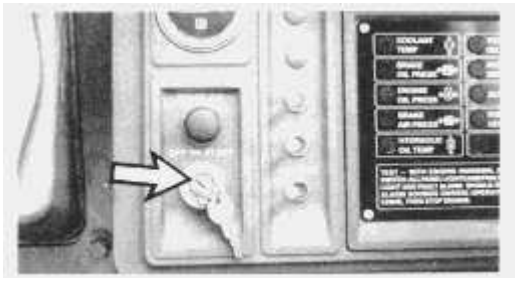
5. Lower the bucket to the ground and apply slight down pressure.

Stopping the Engine

Ver imagen

1. With the machine stopped, run the engine for 5 minutes at low idle.

Ver imagen



2. Turn off the starter key to stop the engine. Remove the key.

Ver imagen

3. If, for any reason, the key switch does not turn off the engine, pull the accelerator pedal back past the detent.

Ver imagen

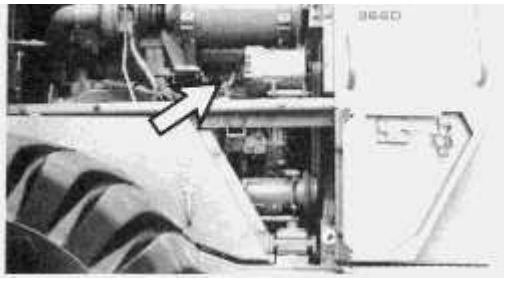
4. Use the ladder and grab irons, use both hands and face the machine, when dismounting.

Ver imagen

Ver imagen

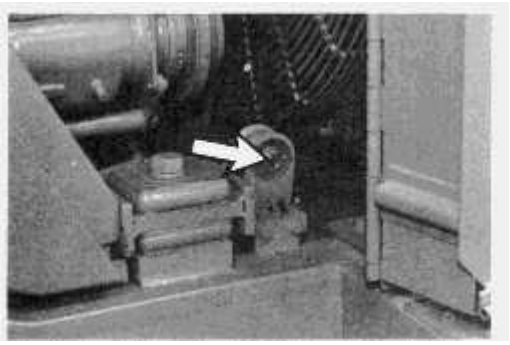
5. Drain the moisture from the air tank daily.

Ver imagen



6. Inspect the engine compartment for paper and debris. Clean out any debris and paper to avoid a fire.

Ver imagen



If the machine is being parked for an extended period (overnight, etc.), turn off the disconnect switch and remove the key.

Ver imagen

Install all vandalism protection locks and covers.

Operating Adjustments

Bucket Positioner - Tilt Adjustment

WARNING

Stop the engine.

Lower the equipment.

Apply the parking brake.

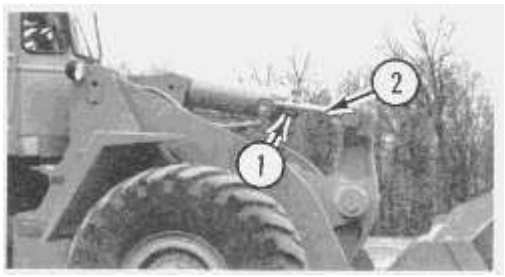
Block the tires.

Ver imagen

1. Lower the bucket to the ground.

2. Position the bucket at the desired angle to the ground. Stop the engine and turn the key to ON. Move the tilt control to TILT BACK detent.

Ver imagen

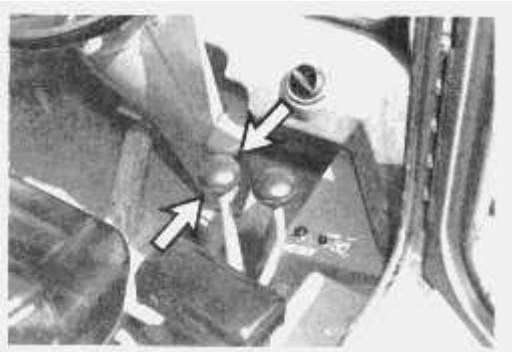


3. Loosen two bracket bolts (1). Move the tube assembly (2) toward the bucket. When the switch aligns with the magnet the tilt lever should move from the TILT BACK to the HOLD position.

Ver imagen

4. To test the adjustment, start the engine. Raise and dump the bucket. Move the tilt control lever to TILT BACK detent.

Ver imagen



5. When the pre-set bucket angle is reached, the tilt control lever should return to HOLD.

Bucket Lift Kickout

WARNING

Use caution to avoid possible personal injury when adjusting the bucket lift kickout.

Keep personnel off the machine. Clear the area when working under or around the bucket linkage.

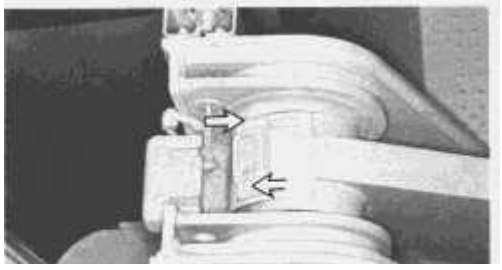
With the bucket raised, proper support must be provided for the bucket and/or the linkage.

Ver imagen

1. Start the engine. Raise the bucket to the desired height and stop the engine.

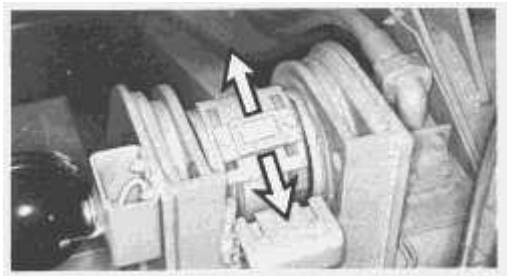
2. Block the bucket and the linkage.

Ver imagen



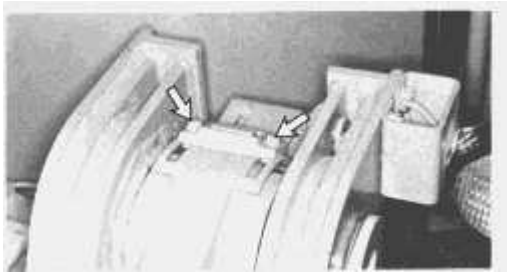
3. Loosen the plate clamp bolts. Align the plate and the switch assembly with the magnet.

Ver imagen



4. Move the switch away from the magnet to increase, or toward the magnet to decrease the bucket lift kickout height.

Ver imagen



5. Tighten the bolts. Check the adjustment.

6. Start the engine and move the bucket lift control to the RAISE detent.

Ver imagen

7. At the pre-set lift height, the control lever should return to HOLD.

Operating Techniques

General

Ver imagen

For good operator vision and loader stability, carry the loaded bucket low, approximately 40 cm (15 inches) above the ground.

Ver imagen

Utilize wait time to clean and level the work area.

Ver imagen

Maintain traction by avoiding excessive down pressure on the bucket.

Ver imagen

When working in hard material, use bucket teeth, or "half-arrow" bolt-on cutting edges.

Ver imagen

To control dumping, move the tilt control lever to the DUMP position. Then return to the HOLD position. Repeat until the bucket is empty.

Ver imagen

To keep dust away from the engine and maintain visibility, dump with the wind to your back.

Ver imagen

Be certain that the bucket used is appropriate for for the work performed. Exceeding the machine limits will reduce the service life of the machine.

Dozing

NOTICE

Do not bulldoze with the bucket in the dump position.

Ver imagen

When bulldozing, keep the bucket bottom parallel to the ground.

Dumping

Ver imagen

Use the bucket stops for maximum dumping angle.

NOTICE

Striking the stops unnecessarily and repetitively can result in accelerated wear and high maintenance cost of the loader linkage.

Loading from a Stockpile

Ver imagen

1. Position the bucket parallel to, and just skimming, the ground. Drive the bucket straight into the pile.

Ver imagen

2. Move the control to the RAISE detent position as forward movement slows. Return to the HOLD position for additional crowding power.

Ver imagen

3. To pump in a heaped load, work the tilt control lever back and forth.

Ver imagen

4. When the bucket is loaded, move the tilt control to the TILT BACK position.

Ver imagen

5. When the tilt control lever is released to the HOLD position, the bucket will rise.

Ver imagen

6. Raise the bucket high enough to clear the material being loaded. Shift the transmission control to REVERSE.

Ver imagen

7. Carry the loaded bucket approximately 40 cm (15 inches) above the ground level.

Ver imagen

8. When reaching the dump area, move the lift control to the RAISE detent. The lift kickout will automatically return the lift control to HOLD.

Loading Hauling Units

Ver imagen

1. To reduce the loader turning and travel, position the hauling unit at an angle to the material being loaded.

Ver imagen

2. The travel distance should be long enough for the bucket to reach the lift height without slowing

loader movement.

Ver imagen

3. Position the loader to dump the load in the center of the hauler body. If the hauler body is two bucket widths or more in length, dump from the front to the rear.

Ver imagen

4. Push the tilt lever forward to dump the bucket.

Ver imagen

5. Shake the bucket to loosen sticky material. Move the tilt lever back and forth quickly, allowing the tilt arms to strike the stops.

Ver imagen

6. Put the tilt lever in the TILT BACK detent.

Before lowering the bucket, make sure the hauling unit is out from under the bucket.

7. Lower the bucket while positioning the loader for the next load.

Loading from a Bank

WARNING

Remove any overhang and watch for sliding material.

Ver imagen

1. Start to load at the base of the bank and follow up the face.

Ver imagen

2. Raise the bucket slightly and move away from the bank.

Excavating

Ver imagen

1. Lower the bucket to the ground and position for a slight digging angle.

Ver imagen

2. Apply down pressure to the bucket as the loader starts forward. Return the lift control to HOLD when sufficient penetration is obtained.

Ver imagen

3. Maintain level cuts, while moving forward, by raising and lowering the bucket.

Ver imagen

4. When the bucket is loaded, tilt it back against the stops. Carry the loaded bucket approximately 40 cm (15 inches) above the ground when moving to the dump area.

Loading Rock in a Quarry

WARNING

Stay at a safe distance during blasting, and until the face is clear.

Make absolutely sure that the loading area is safe before entering.

Remove any overhang and watch for sliding material.

If falling rock is encountered, quickly move as far away from the quarry face as possible.

Ver imagen

Use a rock bucket with teeth when working in a quarry.

Ver imagen

1. Start loading at the base of the rockpile. Very large boulders may have to be loaded individually.

Ver imagen

2. Remove any overhang and watch for sliding material.

Ver imagen

3. Load the fine material into the truck first. This will help minimize any damage to the truck.

4. To reduce the dump shock on the hauling unit, dump from the lowest height possible.

Loading Hoppers

Ver imagen

1. Load the bucket (see "Loading from a Stockpile" steps 1 through 8).

Ver imagen

2. When the lift kickout height is reached, dump the load into the hopper. If possible, dump with the wind to your back.

Log Fork with Top Clamp

Ver imagen

1. Position the fork in the center of the load, with the top clamp open.

Ver imagen

2. Close the top clamp and tilt the fork back to hold the load against the fork uprights.

Ver imagen

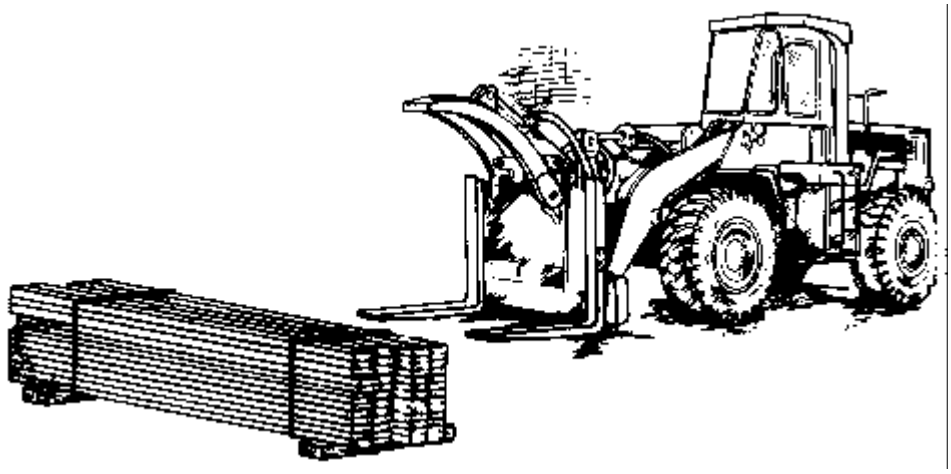
3. For best operator vision and loader stability, carry the load as low as possible.

Ver imagen

4. Position the load over the stacking area. Tilt the fork down and raise the clamp to release the load.

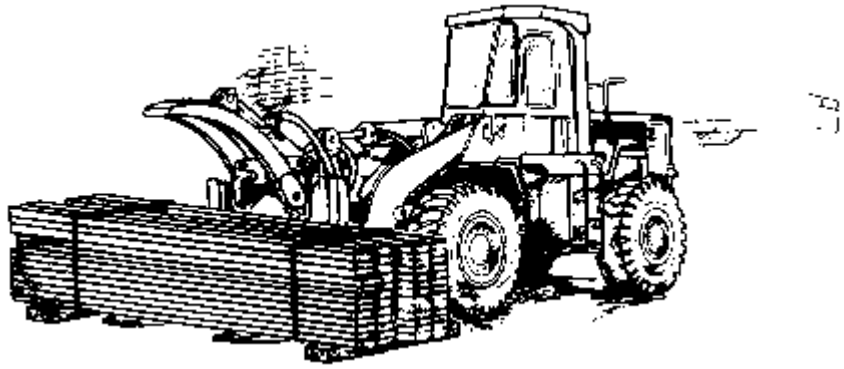
Lumber Fork with Top Clamp

Ver imagen



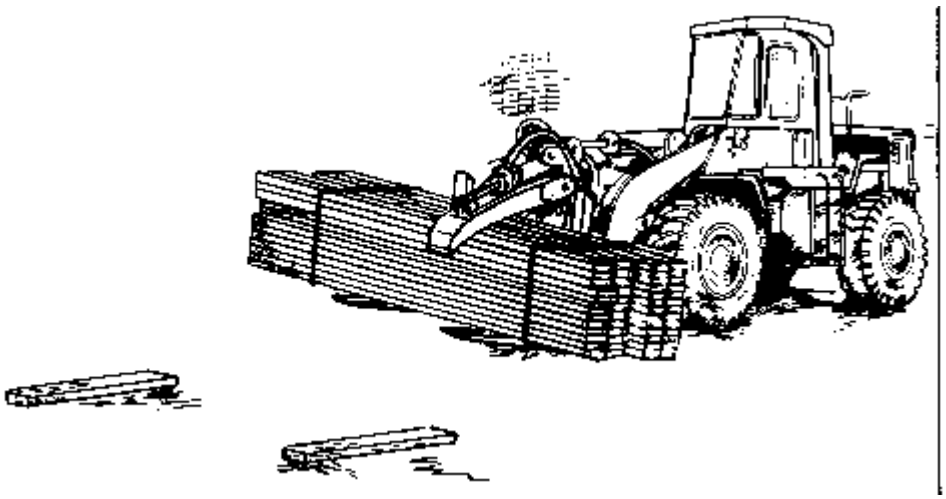
1. Position the fork in the center of the load, with the top clamp open.

Ver imagen



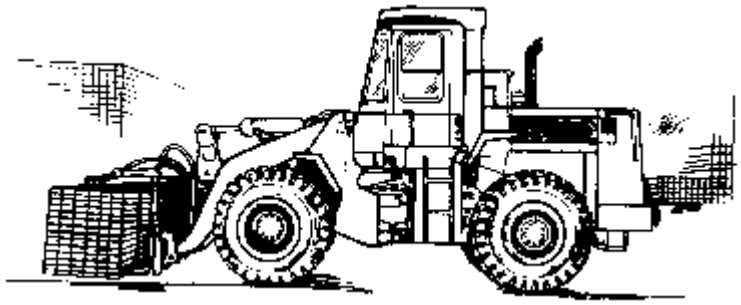
2. Move the machine forward and move the fork tines under the load.

Ver imagen



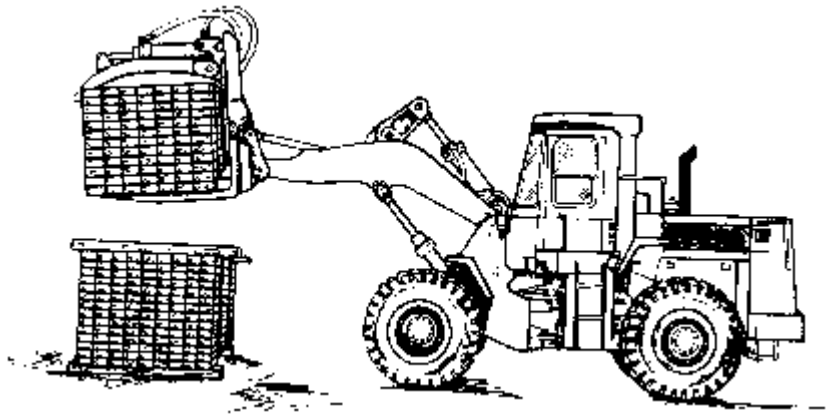
3. Close the top clamp and tilt the fork back to hold the load against the fork uprights.

Ver imagen



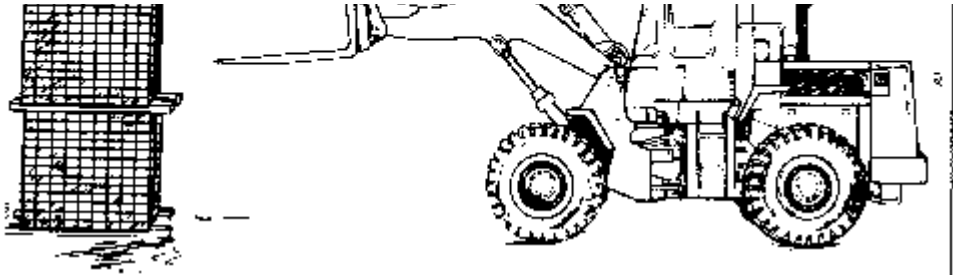
4. For best operator vision and load stability, carry the load as low as possible.

Ver imagen



5. Position the load over the stacking area. Tilt the fork forward.

Ver imagen



6. Raise the top clamp. Back the machine out, until the fork tines clear the stack.

Side Dump Bucket

Ver imagen

1. The bucket is loaded the same as the General Purpose Bucket (see "Loading from a Stockpile" steps 1 through 9).

Ver imagen

2. When loading a hauling unit, the side dump bucket can be used like a General Purpose Bucket for unloading...

Ver imagen

3. or can be dumped to the left, which is helpful in restricted loading space or when a side approach can reduce loader cycle time.

Ver imagen

4. The Side Dump Bucket also allows even distribution of loading material in the hauling unit body.

Ver imagen

5. Raise the bucket and side dump as the loader moves alongside the hauling unit.

Ver imagen

6. The Side Dump Bucket can also be used for backfilling or windrowing.

Ver imagen

7. Side dump the bucket slowly to deposit backfill or windrow material.

Ver imagen

8. Distribute or doze the material the same as with a General Purpose Bucket.

Multipurpose Bucket

Ver imagen

1. Bucket used as a clamp. Open the bowl and lower the open bucket over the loading material.

Ver imagen

2. Close the bowl to load the material.

Ver imagen

3. Bucket used for dozing. Open the bowl to use the blade for dozing.

Ver imagen

4. Maintain a level cut with the bucket lift control.

Ver imagen

5. Use the bucket as a scraper for leveling, stripping or spreading fill.

Ver imagen

6. When loaded, close the bowl and tilt the bucket back.

Ver imagen

7. For maximum dumping height or when unloading sticky material, position the bucket over the dump area. Open the bowl to dump the load.

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, air pressure released brakes. If the engine or hydraulics are inoperable, the brakes are applied and the machine should not be moved.

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.

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

Do not allow riders 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.

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.

Consult your Caterpillar dealer for towing a disabled machine.

Engine Running:

NOTICE

If the power train and the steering system are operable, and the engine

is running, the vehicle can be towed a SHORT DISTANCE, pulled out of mud or to the side of the road.

The operator on the towed vehicle MUST steer in the direction of the tow line.

Engine Stopped:

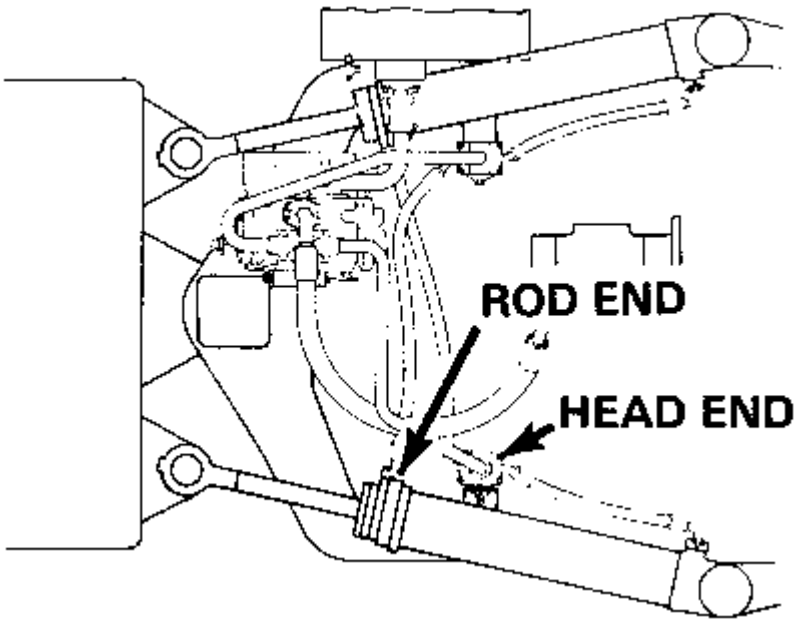
WARNING

Do not push the machine with the engine stopped. The brakes, steering and bucket controls will not function.

The machine can be towed up to 3 km (2 miles), but ONLY if 8 km/h (5 mph) is not exceeded and the following precautionary steps are taken.

Perform the following steps before towing the machine with the engine stopped:

Ver imagen



1. Reverse the hydraulic steering hose connections ON ONE CYLINDER ONLY, so the steering cylinders can move freely.

NOTICE

Be sure the cylinder hoses are connected correctly before operating the machine. With the hoses reversed, the steering system will not function.

Ver imagen

2. If internal transmission or drive line failure is suspected, remove the axle shafts.

WARNING

When the axle shafts are removed, the machine has NO brakes.

Ver imagen

3. Release the parking brake.

4. Fasten the tow bar.

Ver imagen

5. Remove the wheel blocks.

6. Tow the machine slowly. Do not tow any faster than 8 km/h (5 mph).

Transportation Hints

Shipping

WARNING

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

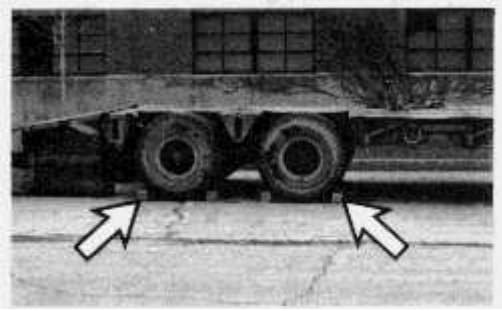
To prevent the machine from slipping while loading or shifting in transit, remove ice, snow or other slippery material from the loading dock and the truck bed before loading.

NOTICE

Obey all state and local laws governing the weight, width and length of a load.

Observe all regulations governing wide loads.

Ver imagen



1. Block the trailer or rail car wheels before loading.

Ver imagen

2. After the machine is in position, connect the steering frame lock link to hold the articulated frame rigid.

Ver imagen

3. Lower the bucket and shift the transmission to NEUTRAL.

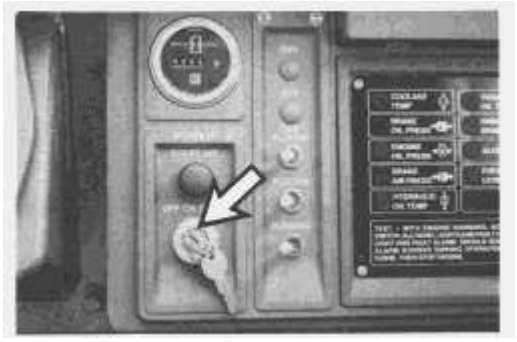
Ver imagen

4. Engage the transmission control lock.

Ver imagen

5. Engage the parking brake.

Ver imagen



6. Turn off the engine. Remove the starter key.

Ver imagen

7. Turn the disconnect switch off and remove the key.

Ver imagen

8. Block the tires and secure the machine with tie-downs (rail car).

Ver imagen

Tractor-Traile

Ver imagen

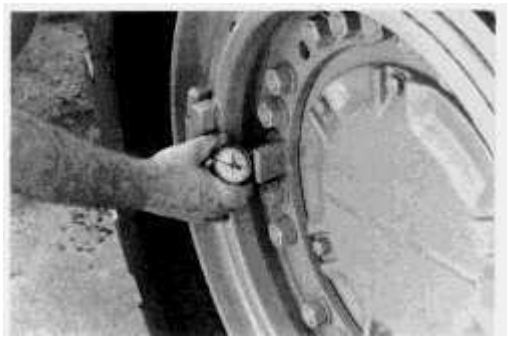
9. Cover the exhaust opening or secure the rain cap to prevent the turbocharger from "windmilling" in transit.

Roading

NOTICE

When roading a machine, consult your tire dealer for recommended pressures and speed limitations.

Ver imagen



Inflate the tires to the correct pressure.

Ver imagen

Use a self-attaching inflation chuck and stand behind the tire tread while inflating the tire. See "Tire Inflation Information."

Ver imagen

Bring the engine coolant, the crankcase oil and the transmission oil up to the correct levels.

Check with the proper officials to obtain the required permits, etc.

Travel at a moderate speed. Observe all speed limitations when roading the machine.

Ver imagen

Stop every 25 miles or 1 hour for 30 minutes to allow the tires and components to cool. Perform a "Walk-Around Inspection" and measure the fluid levels in the various compartments.

Transportation Hints

Shipping

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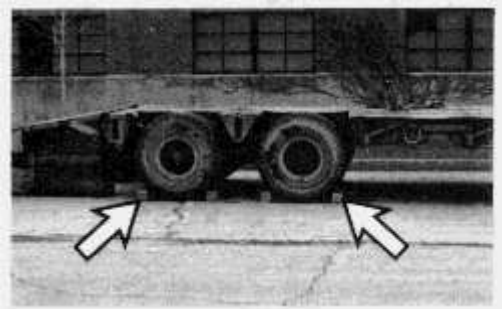

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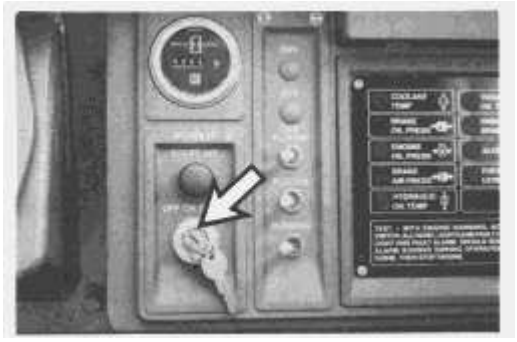

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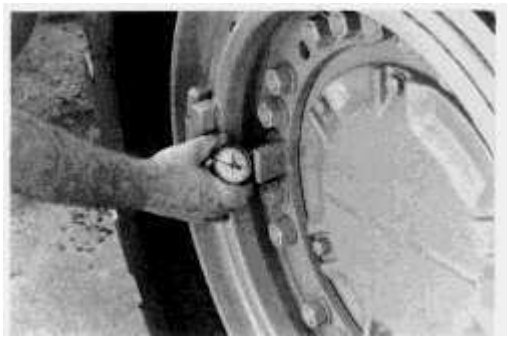

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Stop every 25 miles or 1 hour for 30 minutes to allow the tires and components to cool. Perform a "Walk-Around Inspection" and measure the fluid levels in the various compartments.

Foreword

This book 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 Chart; are referenced to detailed instructions that follow.

Use the service meter to determine servicing intervals. Calendar intervals (daily, weekly, 2 weeks, etc.) shown may be used instead of service meter intervals if it provides more convenient servicing schedules; and approximates the indicated service meter reading.

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

Perform previous interval items at multiples of the original requirement. For example, at "Every 100 Service Hours or 2 Weeks," also perform those items listed under "Every 50 Service Hours or Weekly" and "Every 10 Service Hours or Daily."

Some photographs in this publication may show details or attachments that may be different from your unit.

Continuing improvement and advancement of product design may cause changes to your machine which may not be included in this publication.

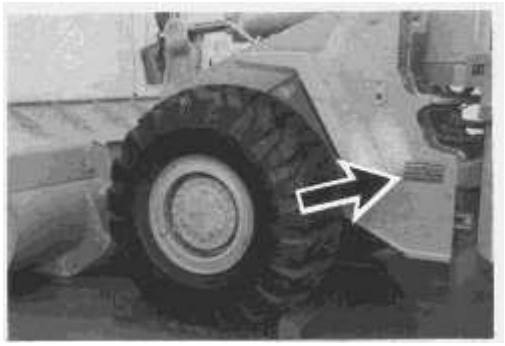
Whenever a question arises regarding your Caterpillar product, or this publication, please consult your Caterpillar dealer for the latest available information.

Safety

Ver imagen

To prevent personal injury, always lower all equipment, stop the engine, set the parking brake and block or restrain the machine before servicing it, unless otherwise specified.

Ver imagen



Read and understand all warning and caution information provided on the machine. Follow servicing instructions carefully.

Do not attempt adjustments while the machine is moving or the engine is running.

Do not allow unauthorized personnel on the machine while it is being serviced.

Wear a hard hat, protective glasses and protective shoes as the job requires.

Use the proper tools. Repair or replace broken or damaged equipment.

Operate the engine only in a well ventilated area.

When operating the engine in a closed area, vent the exhaust to the outside.

Always inspect the cooling system with the engine stopped and cool. Remove the radiator cap slowly to relieve pressure. Steam can cause personal injury.

Cooling system conditioner contains alkali, avoid contact with the skin and eyes.

Store all oily rags and other combustible material in a container in a safe place.

Do not smoke when observing the battery electrolyte level. Batteries give off flammable fumes.

Electrolyte solution is an acid. Do not allow the electrolyte solution to contact the skin or eyes.

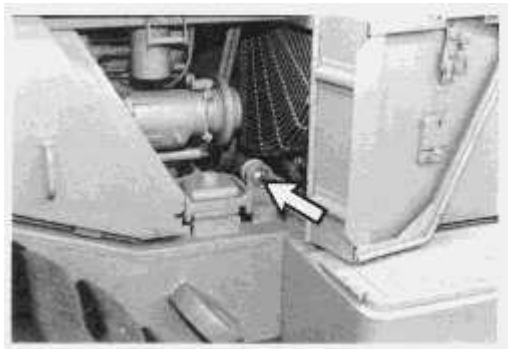
Ver imagen

Engage the parking brake, block the tires and attach warning tags to the controls while servicing the machine.

Ver imagen

Connect frames with the steering frame lock link before servicing the machine center area.

Ver imagen



Turn the disconnect switch OFF and remove the key before servicing the electrical system.

Ver imagen

Use caution when removing the radiator cap or any drain plugs, grease fittings or pressure taps.

To avoid possible weakening of the ROPS (Roll-Over Protective Structure), consult a Caterpillar dealer before altering the ROPS in any way. The protection offered by the ROPS will be impaired if it has

before altering the ROPS in any way. The protection offered by the ROPS will be impaired if it has been subjected to structural damage or has been involved in an overturn incident.

When using pressure air, wear protective glasses and protective clothing. Maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Diesel fuel and all lubricants are flammable. Do not weld on pipes or tubes that contain oil. Clean them thoroughly with nonflammable solvent before welding.

Do not smoke when refueling.

Loose or damaged lines, tubes, and hoses, which leak, can cause fires.

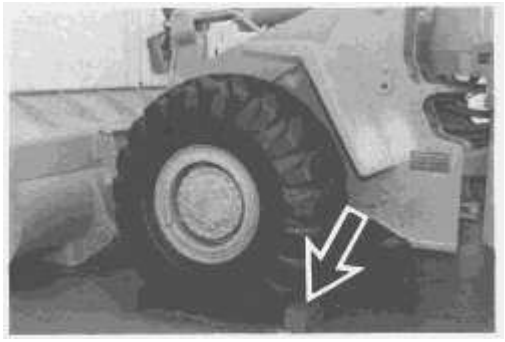
Do not bend or strike high pressure lines. Do not install bent or damaged lines, tubes, and hoses.

Inspect all lines, tubes, and hoses, carefully. Tighten all connections to the recommended torque. Make sure that all clamps, guards, and heat shields, are installed correctly to prevent vibration, rubbing against other parts, or excessive heat during operation.

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.

Do not attempt any repairs you do not understand.

Ver imagen



If the engine is not running, do not release the emergency or parking brake systems unless the machine is blocked or restrained.

Ver imagen

Use a self-attaching air chuck and stand behind the tread when inflating tires.

Ver imagen

Whenever draining a lubricant, extreme caution should be used; the lubricant may be hot and can cause personal injury.

Ver imagen

Hot hydraulic oil can cause personal injury. Remove the hydraulic tank fill cap slowly to relieve the tank pressure. Allow the oil to cool before draining the tank.

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 service hours or anytime a significant quantity of oil is spilled on the machine.

Have jobsite fuel tanks protected by an embankment or steel post so tanks are not struck by equipment when fueling.

Collect drained oil and wipe up spills when draining oil.

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

When starting from an external power source, attach the ground cable last, and remove it first, to prevent sparks from occurring near the battery, which could cause battery vapors to explode. Attach the ground cable from the booster source to the starter ground terminal on the machine to be started.

This machine has a 24 Volt starting system. Use only equal voltage for boost starting. The use of a welder or higher voltage will damage the electrical system.

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

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

1. Never use compressed air for cleaning.

2. Use vacuum or wet methods for cleanup.

3. Use exhaust ventilation on permanent machining jobs.

4. Wear an approved respirator if there is no other way to control the dust.

5. Follow environmental rules and regulations for disposal of asbestos.

6. Avoid areas where asbestos particles may be in the air.

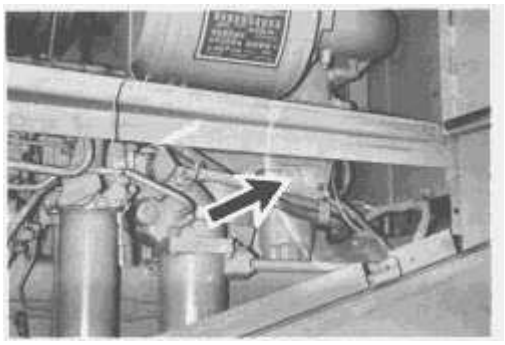
Serial Number Locations

For quick reference, record your machine's serial numbers in the spaces provided below the photographs.

Ver imagen

Vehicle Serial Number _____

Ver imagen



Engine Serial Number _____

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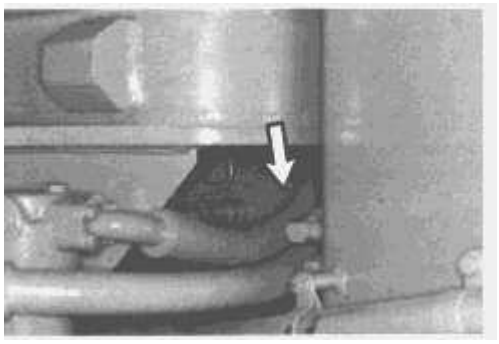
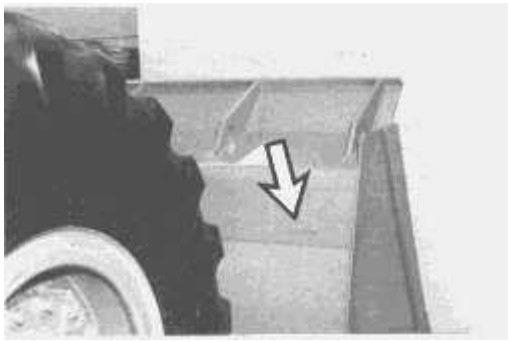


Transmission Serial Number _____

Ver imagen

Combined Serial Number Plate

Ver imagen



Bucket Serial Number _____

Maintenance Recommendations

Cooling System

NOTICE

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

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

If the machine is to be stored in, or shipped to, an area with below freezing temperatures; the cooling system must be protected against freezing to the lowest expected ambient 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.

Do not use Caterpillar 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 should be drained and replaced "Every 2000 Service Hours or 1 Year." However, when Cooling System Conditioner additions are made every 250 service hours as recommended, the drain period can be extended to "4000 Service Hours or 2 Years."

A 3% to 6% concentration of Caterpillar Cooling System Conditioner can be maintained by adding conditioner as follows.

Ver imagen

Cooling System Conditioner	
When Filling Complete System	2 qt.
Every 250 Service Hours	1 pt.

Premix antifreeze solution to provide protection to the lowest expected ambient 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, run the engine with the filler cap off until the coolant level stabilizes. Add coolant as necessary to fill the system.

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

Operate with a thermostat in the cooling system all year-round. Cooling system problems can arise without a thermostat.

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. The fuel expands as it gets warm and may overflow.

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

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

Drain the fuel tank of water and sediment as required by prevailing conditions.

Water and sediment should be drained 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 fuel filters, always bleed the fuel system to remove air bubbles from system.

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

Use only fuel as recommended in the "Fuels, Lubricants, and Coolant" Section of this Guide.

Hydraulic System

NOTICE

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

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

Air Intake System

Check precleaner screen daily for accumulation of dust and debris.

Service air cleaner when YELLOW piston in indicator reaches RED zone. The indicator is marked in 5 inch of Hg. increments to show the amount of air cleaner restriction at all times.

The primary element can be cleaned up to 6 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 6 times.

The secondary filter element has a tab on the outer end of the element to keep a record of when the secondary element should be changed. A section of the tab should be pulled off each time a primary element is serviced. At the time of the third change of a primary element, the secondary element must be replaced.

Electrical System

NOTICE

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

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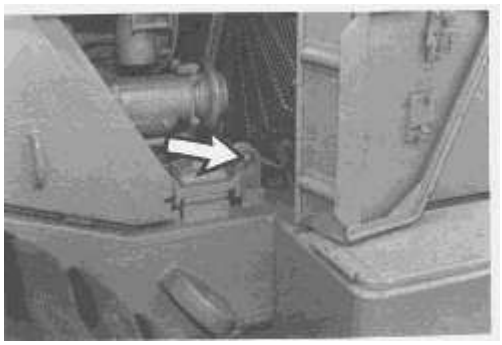

NOTICE

When using an external electrical source to start the machine, turn the disconnect switch off and remove the key before attaching a booster cable to the starter ground terminal.

When using booster cables, be sure to connect in parallel: POSITIVE (+) to POSITIVE (+) and NEGATIVE (-) to NEGATIVE (-).

Do not allow the free end of booster cables to touch either machine. This helps avoid sparks.

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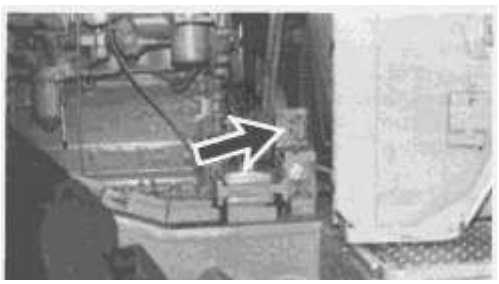

An emergency starting kit is available for starting from an external power source. It provides a permanent receptacle (4V3445) on the machine to plug in a booster cable. Two different cable assemblies are needed for auxiliary starting. For starting from an operating machine (with a receptacle 4V3445) use cable assembly 9S3664. For starting from an auxiliary power pack use cable assembly 8S2632.

When starting a machine with booster cables, remove all caps from both batteries. Leave these off during the starting process to allow venting of hydrogen gas.

Ver imagen

Connect one cable to the ungrounded terminal of the battery of the machine to be started.

Connect the other end of this cable to the terminal of the same polarity [positive (+) to positive (+) and negative (-) to negative (-)] on the auxiliary power pack.

Connect the second cable to the other terminal of the stronger battery.

Ver imagen

Finally, connect the remaining cable end to the starter ground terminal.

Scheduled Oil Sampling

Use scheduled oil sampling to monitor machine condition and maintenance requirements. Each oil sample should be taken when the oil is hot and well mixed, to ensure the sample is representative of the oil in the compartment.

Ver imagen

Sampling Interval Chart	
Compartment	**Interval**

Engine Crankcase	250 Service Hours
Transmission	500 Service Hours
Final Drives	500 Service Hours
Hydraulic System	500 Service 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.

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1 kilopascal (kPa) is approximately equal to 0.01 bar (kg/cm^2).

Drain moisture and sediment from the air reservoir at the beginning of each day of operation.

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

Ver imagen

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

Ver imagen

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

Ver imagen

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 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 general torques for bolts and nuts with Grade 8.8.

Ver imagen

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.

Ver imagen

clamp width	initial installation torque on new hose	
	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
clamp width	**reassembly or retightening torque**	
	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.

Tire Inflation Information

2

Inflation of Tires with Nitrogen (N)

Caterpillar recommends using dry nitrogen (N_2) gas for tire inflation and tire pressure adjustments on all rubber tired machines. Nitrogen is an inert gas and will not support combustion inside the tire.

WARNING

Proper nitrogen inflation equipment, and training in using the equipment, are necessary to avoid overinflation. A tire blowout or rim failure can result from improper or misused equipment.

In addition to reducing the risk of an explosion, using nitrogen instead of air to inflate tires lessens the slow oxidation of the rubber and the accompanying gradual tire deterioration. This is especially important for tires that have an expected long service life (four or more years). It also reduces the corrosion of rim components and the resulting disassembly problems.

WARNING

Use a self-attaching inflation chuck and stand behind the tread when inflating a tire.

NOTICE

Set the tire inflation equipment regulator at no more than 140 kPa (20 psi) over the recommended tire pressure.

Use only Caterpillar Part 6V4040 Nitrogen Tire Inflation Group, or equivalent, to inflate tires from a nitrogen gas cylinder. Refer to Special Instruction, Form SMHS7867, for tire inflation instructions.

Use the same tire pressures for nitrogen inflation that are used for air inflation. (Consult your tire dealer for operating pressures.)

Shipping Pressure

NOTICE

The chart below is for shipping pressures only. Consult your tire dealer for operating pressures.

Ver imagen

Size	Ply Rating or Strength Index	Inflation Pressure	
		kPa	psi
23.5 x 25	16	345	50
23.5 x 25	24 Logging	485	70
23.5 x 25	Radial	380	55
26.5 x 25	14	240	35
26.5 x 25	20 Logging	345	50
26.5 x 25	Radial	310	45

Adjusted Inflation Pressures

A tire inflated in a warm shop area at a temperature of 18° to 21°C (65° to 70°F) will be underinflated if the machine works in freezing temperatures. Low pressure shortens the life of a tire.

If the machine is operated in freezing temperatures, consult the Cold Weather Operation Guide, Form SEBU5898, for adjusted inflation pressures.

Roading

Before roading a machine, consult your tire dealer for recommended tire pressures and speed limitations.

"TON km/h" (TON mph) limitations must be observed. Consult your tire dealer for the speed limit of the tires involved.

When traveling long distances, stop every 40 km (25 miles) or 3 hours for 30 minutes to allow the tires and components to cool.

Fuels - Coolants - Lubricants

Fuel Specifications

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.

Cetane Requirement

The minimum cetane number recommended for the 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.

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 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.

Coolant Specifications

Use a mixture of fill water and antifreeze, and cooling system conditioner.

Caterpillar Form Number SEBD0518 titled, "Know Your Cooling System," can provide more detailed specifications.

Fill Water

Always add conditioner to water. Never use plain water only.

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

Ver imagen

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 ethylene glycol-type antifreeze. Use the correct amount to provide freeze protection to the lowest expected outside temperature.

Conditioner

Use Caterpillar cooling system conditioner or equivalent. Follow the instructions on the container.

Lubricant Specifications

The abbreviations listed below follow S.A.E. J754 nomenclature. The classifications follow S.A.E. J183 classifications. The MIL specifications are U.S.A. Military Specifications.

These definitions will be of assistance in purchasing. The specific classifications for this machine are found on the "Recommended Lubricant Viscosities" chart.

Engine Oils (CD or CD/TO-2)

Use oils that meet the Engine Service Classification CD (MIL-L-2104D) or oils that have satisfactory performance in the Caterpillar Oil Test Number TO-2. These oils are referred to as Service Classification CD/TO-2.

Consult the "EMA Lubricating Oils Data Book," Form SEBU5939, for a listing of CD oil brands.

The percentage of sulfur in the fuel will affect the engine oil recommendations. If the fuel has over 0.5% sulfur content, the CD engine oil must have a TBN of 20 times the percentage of fuel sulfur (TBN as measured by the ASTM D-2896 method).

If the sulfur content is greater than 1.5% by weight, use an oil with a TBN of 30 and reduce the oil change interval by one half. Consult your Caterpillar dealer for correct engine oil recommendations.

Higher TBN values are essential to retard the corrosive damage to metal engine parts.

Your oil supplier should be able to furnish the correct oils.

Transmission and Clutch Oils (CD/TO-2)

Use Service Classification CD oils that have satisfactory performance in the Caterpillar Oil Test No. TO-2: Referred to as Service Class CD/TO-2 oil.

Hydraulic Oils (HYDO)

Use Engine Service Classification CC (MIL-L-2104B), CC/SF (MIL-L-46152B), CD (MIL-L-2104D) or industrial-type hydraulic oils that are certified by the oil supplier to have antiwear, antifoam, antirust, and antioxidation additive properties for heavy duty use.

Multipurpose-type Gear Lubricant (MPL)

Use Gear Lubricant Classification GL-5 (MIL-L-2105B) Multipurpose-type Gear Lubricant (MPL).

Lubricating Grease (MPG)

Use Multipurpose-type Grease (MPG). Multipurpose-type grease which contains 3% to 5% molybdenum disulfide (MPGM) is preferred. NLGI No. 2 Grade is suitable for most temperatures. Use NLGI No. 1 or No. 0 Grade for extremely low temperatures.

Hydraulic Brake Fluid (BF)

Use heavy duty hydraulic brake fluid certified by the oil supplier to meet SAE1703f.

Refill Capacities - Approximate

Ver imagen

Compartment or System	Liters	U.S. Gallons	Imperial Gallons
Engine Crankcase	29	7.5	6.4
Transmission System	46	12	10
Hydraulic Tank	140	37	30.8
Front Differential & Final Drives	47	12.5	10.4
Rear Differential & Final Drives	53	14	11.7
Fuel Tank	308	81	67.7
Cooling System	44	12	9.6
Service Brake Reservoirs	6	1.5	1.25

Fuels - Coolants - Lubricants

Fuel Specifications

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.

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The minimum cetane number recommended for the 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.

Fuel Sulfur Content

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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 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.

Coolant Specifications

Use a mixture of fill water and antifreeze, and cooling system conditioner.

Caterpillar Form Number SEBD0518 titled, "Know Your Cooling System," can provide more detailed specifications.

Fill Water

Always add conditioner to water. Never use plain water only.

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

Ver imagen

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Your oil supplier should be able to furnish the correct oils.

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Use Gear Lubricant Classification GL-5 (MIL-L-2105B) Multipurpose-type Gear Lubricant (MPL).

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Hydraulic Brake Fluid (BF)

Use heavy duty hydraulic brake fluid certified by the oil supplier to meet SAE1703f.

Refill Capacities - Approximate

Ver imagen

Compartment or System	Liters	U.S. Gallons	Imperial Gallons
Engine Crankcase	29	7.5	6.4
Transmission System	46	12	10
Hydraulic Tank	140	37	30.8
Front Differential & Final Drives	47	12.5	10.4
Rear Differential & Final Drives	53	14	11.7
Fuel Tank	308	81	67.7
Cooling System	44	12	9.6
Service Brake Reservoirs	6	1.5	1.25

Recommended Lubricant Viscosities

Ver imagen

For Temperature Ranges °F and °C*					
Compartment or System	Oil Viscosities	Degrees F		Degrees C	
		Minimum	Maximum	Minimum	Maximum
Engine Crankcase CD or CD/TO-2	SAE 5W-20 (SPC)	−22	+50	−30	+10
	SAE 5W-20	−13	+50	−25	+10
	SAE 10W	−4	+50	−20	+10
	SAE 10W-30	−4	+104	−20	+40
	SAE 15W-40	+5	+122	−15	+50
	SAE 30	+32	+104	0	+40
	SAE 40	+41	+122	+5	+50
Transmission CD/TO-2	SAE 5W-20 (SPC)	−22	+50	−30	+10
	SAE 5W-20	−13	+32	−25	0
	SAE 10W	−4	+50	−20	+10
	SAE 10W-30	−4	+50	−20	+10
	SAE 15W-40	+5	+77	−15	+25
	SAE 30	+32	+104	0	+40
	SAE 40	+41	+122	+5	+50
Hydraulic System HYDO	SAE 5W-20 (SPC)	−22	+104	−30	+40
	SAE 5W-20	−13	+50	−25	+10
	SAE 10W	−4	+104	−20	+40
	SAE 10W-30	−4	+104	−20	+40
	SAE 15W-40	+5	+122	−15	+50
	SAE 30	+50	+122	+10	+50
Differentials and Final Drives CD/TO-2	SAE 5W-20 (SPC)	−22	+32	−30	0
	SAE 10W	−22	+32	−30	0
	SAE 30	−4	+77	−20	+25
	SAE 40	+14	+104	−10	+40
	SAE 50	+32	+122	0	+50
Brakes BF	SAE J1703I	−22	+122	−30	+50

*When operating below −30°C (−22°F) refer to the Cold Weather Recommendation Operation and Maintenance Guide, Form SEBU5698, available from your Caterpillar dealer.

Lubrication and Maintenance Chart

Ver imagen

Item	Service	Lubricant	Page
When Required			
Transmission	Inspect lubricant level if leakage develops or is suspected	CD/TO-2	20
Front and Rear Differentials and Final Drives	Inspect lubricant level if leakage develops or is suspected	CD/TO-2	21
Air Intake System	Service when indicator locks in RED position		22
Precleaner	Clean precleaner — inspect exhaust connections, if air cleaner needs frequent servicing		27
Cooling System	Drain and clean when engine overheats or solution is dirty		28
Fuel Tank	Drain water and sediment when engine misfires		32
Fuel System	Change final filter and clean primary filter, if filter plugging or power loss occurs. Normal fuel filter service interval is 500 Service Hours or 3 Months.		74
Alternator Belt	Adjust or replace belt when indicator light comes on		33
Bucket Teeth	Inspect condition — replace if worn or damaged		33
Cutting Edge	Change before wear occurs on edge support		34
Seat Belts	Inspect — replace if damaged. Seat belt must be replaced at least every 3 years		36
Windshield Wiper and Washer	Inspect condition of wiper blades if streaking develops — fill washer reservoir		36
Fuses	Replace fuses if elements are broken		37
Air Conditioner	Clean condenser coil — wash filter elements if poor cooling is experienced		38
Ether Starting Aid	Install, change or temporarily remove ether cylinder		39

Ver imagen

Item	Service	Lube.	Page
Every 10 Service Hours or Daily			
① Walk-Around Inspection	Inspect machine.		42
①A Hydraulic System	Observe oil level.	HYDO	43
② Engine Crankcase	Measure oil level.	CD	44
③ Radiator	Inspect coolant level.		45
④ Air Intake Screen	Clean if necessary.		45
⑤ Air Reservoir	Drain moisture and sediment.		45
⑥ Indicator Lights	Test for proper function.		46
⑥A Transmission	Measure oil level.	CD/TO-2	46
Service item ⑨ when operating in very dusty conditions			
Every 50 Service Hours or Weekly			
⑦ Bucket Lower Pivot Pins	Lubricate 2 fittings.	MPG	47
⑧ Tires	Measure inflation pressure – inspect for damage.		47
⑨ Cab Air System	Clean filter elements.		48
Every 100 Service Hours or 2 Weeks			

	Every 100 Service Hours or 2 Weeks			
⑩	Rear Axle Trunnion Bearings	Lubricate 2 fittings.	MPG	49
⑪	Steering Cylinder Bearings	Lubricate 4 fittings.	MPG	49
⑫	Hydraulic System	Observe oil level.	HYDO	50
⑬	Bucket Upper Pivot Pin	Lubricate 1 fitting.	MPG	50
⑭	Bucket Control Cylinder and Linkage	Lubricate 10 fittings.	MPG	51
⑮	Logging Fork Clamp	Lubricate 6 fittings.	MPG	52
⑯	Batteries	Measure electrolyte level.		52
	Every 250 Service Hours or Monthly			
⑰	Engine Crankcase	Change oil and filter elements.	CD	54
⑱	Brake Fluid Reservoirs	Observe fluid level.	BF	56
⑲	Service Brakes	Determine holding ability.		57
⑳	Parking Brake	Determine holding ability – test warning light and horn for proper function.		58
㉑	Drive Shaft Spline	Lubricate 1 fitting.	MPG	61

Ver imagen

Item	Service	Lube.	Page
Every 250 Service Hours or Monthly (Cont'd)			
㉒ Alternator Belts	Inspect – adjust or replace, if necessary.		62
㉓ Air Conditioner	Inspect compressor belt – adjust or replace, if necessary.		63
㉔ Fan Belt	Inspect – adjust if necessary.		64
㉕ Fan Bearing	Lubricate 1 fitting.	MPG	64
㉖ Cooling System	Add cooling system conditioner.		65
Every 500 Service Hours or 3 Months			
㉗ Fuel Tank Cap and Fill Screen	Wash tank cap and fill screen.		67
㉘ Hydraulic System	Change filter elements.		68
㉙ Transmission	Change filter element.	CD/TO-2	71
㉚ Fuel System	Clean primary filter – change final filter – prime fuel system.		74
㉚A Engine Crankcase Breather	Clean.		76
Every 1000 Service Hours or 6 Months			
㉛ Transmission	Change oil, wash suction screen and magnets and change breather.	CD/TO-2	77
㉜ Drive Shaft Support Bearing	Lubricate 1 fitting.	MPG	81
㉝ Drive Shaft Universal Joints	Lubricate 5 fittings.	MPG	81
㉞ Frame Upper and Lower Pivot Bearings	Lubricate 2 fittings.	MPG	82
㉟ Rollover Protective Structure (ROPS)	Inspect – tighten bolts.		83
Every 2000 Service Hours or 1 Year			
㊱ Front and Rear Differentials and Final Drives	Change lubricant.	CD/TO-2	84
㊲ Hydraulic System	Change oil, wash fill screen, inspect suction hose.	HYDO	86
㊳ Cooling System	Change coolant solution.		89
㊴ Engine Valve Lash	Measure – adjust if necessary.		92

When Required

Transmission

WARNING

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

NOTICE

The transmission oil level measurement can be inaccurate (show too high or low on the "ENGINE RUNNING" side of the dipstick) during the first few minutes of operation with cold oil. If the transmission oil level must be measured with the engine running, wait until the oil has warmed and the machine has been moved in all speeds, and in both directions.

Ver imagen

The machine must be parked on level ground and the engine stopped. Lock the transmission control in NEUTRAL.

Ver imagen

Lower the bucket with slight down pressure. Apply the parking brake.

Ver imagen

1. Lift the hinged cover behind the operator's compartment.

Ver imagen

2. Measure the oil level. Maintain the oil level between the FULL and ADD marks on dipstick.

3. Close the access cover.

Front and Rear Differentials and Final Drives

WARNING

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

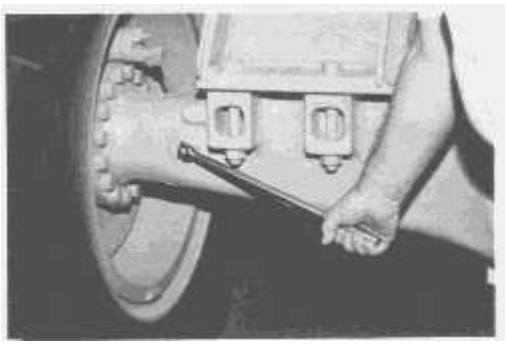
Ver imagen

Operate the machine for a few minutes to allow the lubricant to reach a common level, before measuring the lubricant level.

Ver imagen

1. Park the machine on level ground. Lower the bucket with slight down pressure. Apply the parking brake. Stop the engine.

Ver imagen



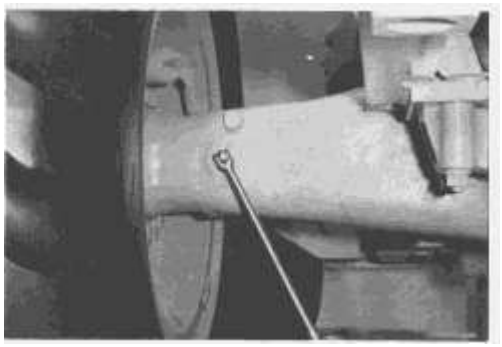
2. Remove the fill plug from the front axle housing.

Important: If the lubricant level is above the fill plug opening, do not drain the lubricant to the bottom of the fill plug opening. Install the fill plug.

Ver imagen

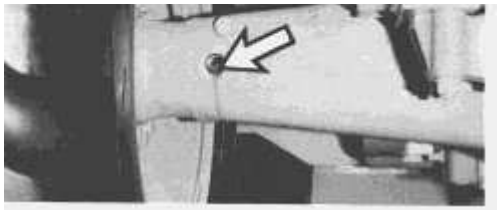
3. If the lubricant level is below the fill plug opening, add lubricant to bring the lubricant level to the bottom of the fill plug opening.

Ver imagen



4. Remove the rear differential fill plug slowly from the rear axle housing.

Ver imagen



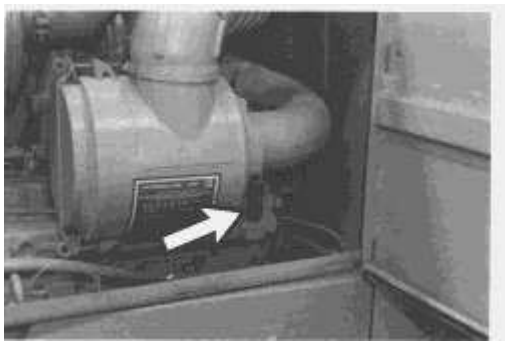
5. Maintain the oil level to the bottom of the fill plug openings. Clean and install both fill plugs.

Air Intake System

NOTICE

Never service the air cleaner when the engine is running.

Ver imagen



Service the filter elements when the indicator piston locks in the RED position.

Primary Element

Ver imagen

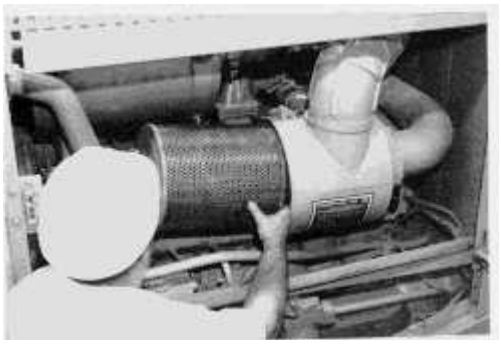
1. Remove the cover and the primary element. Clean and inspect the element. See the topic "Cleaning Air Cleaner Elements."

NOTICE

Always inspect the primary element before and after cleaning with a light bulb inside the element. Discard the element, if any tears, rips or damage are evident.

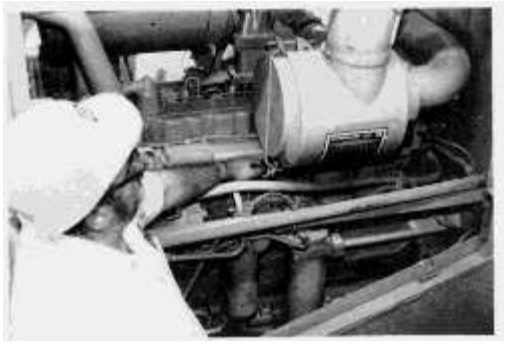
Ver imagen

Ver imagen



2. Clean the inside of the air cleaner housing and the cover. Install a clean element and the cover.

Ver imagen



NOTICE

Tighten the cover screws finger tight to 4 N·m (3 lb ft) torque maximum. Do not use a tool to tighten them.

If the indicator locks again in the RED position shortly after the installation of a primary element, which has been cleaned 6 times, change to another clean element.

The primary element should be replaced after being cleaned a maximum of 6 times. Replace the element once a year, even though it has not been cleaned 6 times.

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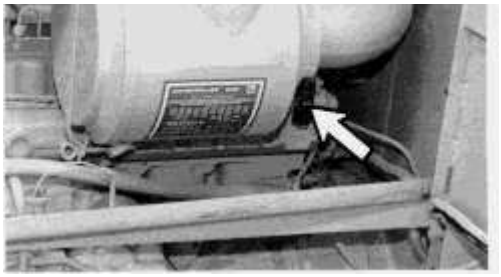
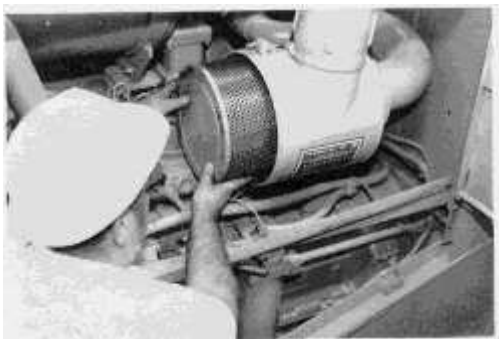


If the indicator locks again in the RED position, shortly after the installation of a clean primary element, change the secondary element.

Replace the secondary element at the time the primary element is cleaned for the third time.

Secondary Element

Ver imagen



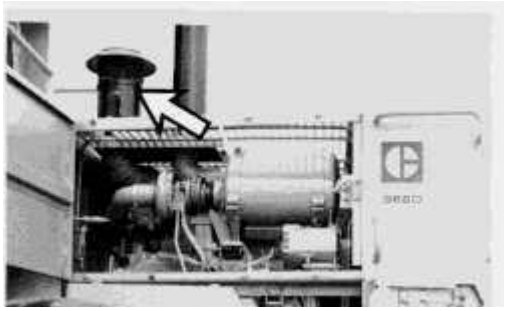
1. Remove the cover and the primary element.

Ver imagen

2. Remove the bolts (do not remove the two bolts in the filter flange recesses). Remove the secondary element. Discard the secondary element.

3. Cover the air inlet opening.

Ver imagen



4. Clean the entire air cleaner, including the precleaner, if necessary.

5. Uncover the air inlet opening.

6. Inspect the gasket between the filter housing and the engine air inlet. Replace the gasket, if it is damaged.

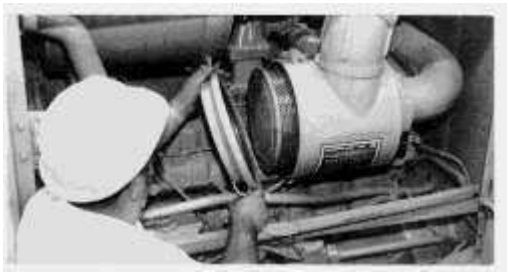
NOTICE

Always replace the secondary element. Do not attempt to reuse it by cleaning.

Ver imagen

7. Install a new secondary element. Torque the element nuts to 27 ± 7 N·m (20 ± 5 lb ft).

Ver imagen



8. Install a clean primary element and the cover.

Ver imagen

9. Tighten the cover screws finger tight to 4 N·m (3 lb ft) torque maximum. Do not use a tool to tighten them.

Cleaning Air Cleaner Elements

WARNING

When using pressure air wear a protective face shield and protective clothing. The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

WARNING

Do not clean any elements by bumping or tapping.

Do not use elements with damaged pleats, gaskets or seals.

Have spare elements on hand to use while cleaning used elements.

Pressure Air - 205 kPa (30 psi) Maximum

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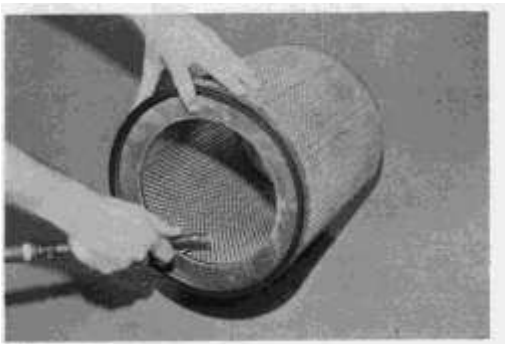


1. Direct the air inside the element along the length of the pleats.

Ver imagen

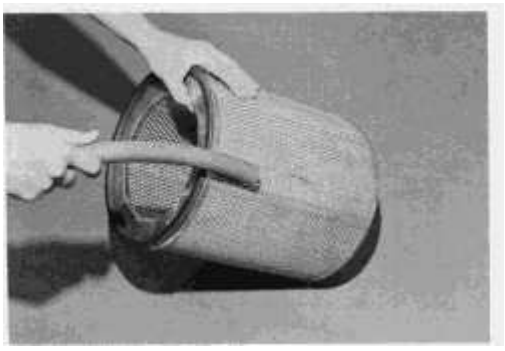
2. Direct the air outside the element along the length of the pleats. Direct the air inside the element along the length of the pleats. Inspect the element.

Water - 280 kPa (40 psi) Maximum

Ver imagen

1. Direct the water inside the element along the length of the pleats.

Ver imagen



2. Direct the water outside the element along the length of the pleats. Rinse and air dry thoroughly. Inspect the element.

Detergent

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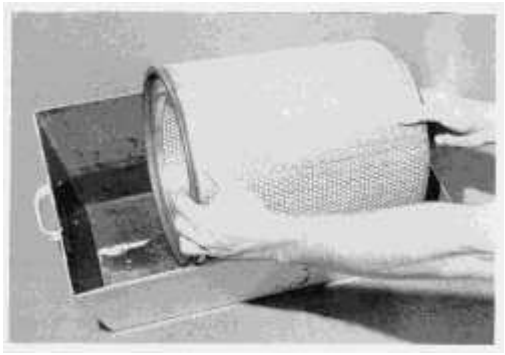

1. Wash the element in warm water and a nonsudsing household detergent.

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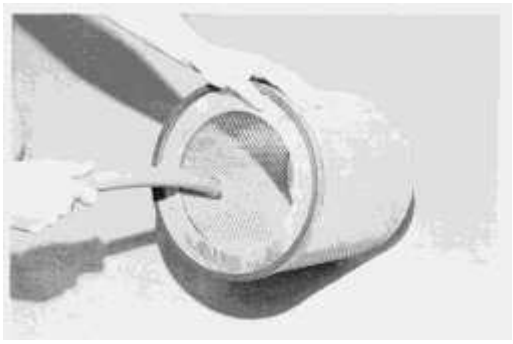


2. Rinse with clean water. See preceding topic.

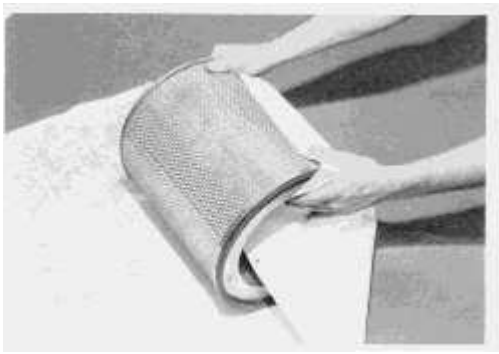
3. Air dry thoroughly. Inspect the element.

Inspecting Element

Ver imagen

1. Insert a light inside each clean and dry element and inspect. Discard the element if rips or tears are found.

Ver imagen



2. Wrap and store all good elements in a clean, dry place.

Precleaner

Ver imagen

1. Loosen the clamp bolt.

Ver imagen

2. Remove the rain cap and the screen. Inspect the screen for accumulation of dust and debris.

Ver imagen

3. Loosen the hose clamp and the tube assembly clamp. Remove the tube assembly.

WARNING

When using pressure air, wear a protective face shield and protective clothing. The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Ver imagen

4. Clean all parts with compressed air or wash in warm water. Dry all parts and install them. Tighten the hose clamp bolt and the clamp bolts.

Cooling System - Cleaning

WARNING

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

Steam can cause personal injury.

Check coolant level ONLY when engine is stopped and radiator filler cap is cool enough to touch with your hand.

Remove filler cap slowly to relieve pressure.

Cooling System Conditioner contains alkali. Avoid contact with skin and eyes to prevent personal injury.

Use all cleaning solutions with care:

NOTICE

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

Use clean water that is low in scale-forming minerals - not softened water.

Measure specific gravity of antifreeze solution frequently in cold weather to assure adequate protection.

NOTE: Most commercial cooling system cleaners may be used.

Ver imagen

The machine must be level, the bucket lowered with slight down pressure, the engine stopped and cool.

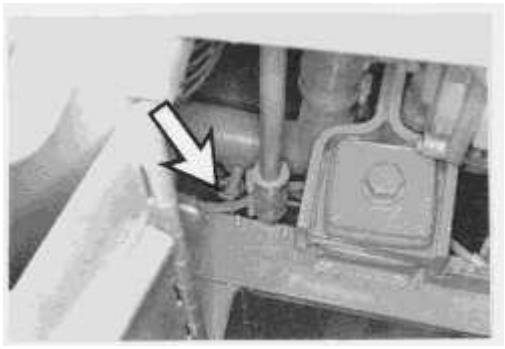
Ver imagen

1. Open the access cover in the hood.

Ver imagen

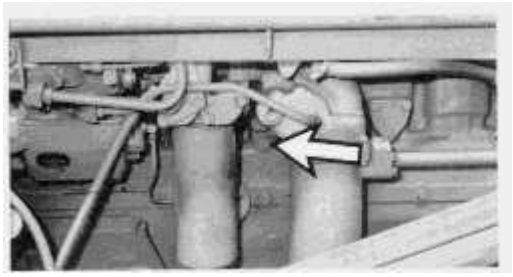
2. Turn the radiator cap slowly to relieve any pressure, then remove the cap.

Ver imagen



3. Open the drain valve and drain the coolant.

Ver imagen



4. Remove the drain plug from the engine block. Drain the coolant.

Ver imagen

5. Remove the drain plug from the torque converter oil cooler. Drain the coolant.

6. Close the drain valve. Clean and install all drain plugs. Fill the system with a cleaning solution.

Any commercial cooling system cleaner can be used, or mix 1 kg Sodium Bisulfate ($NaHSO_4$) per 40 liters of water (2 lb per 10 gal).

7. Start and run the engine for 1/2 hour. Stop the engine and drain the cleaning solution.

8. Flush the system with clean water until the draining water is clean. Do not run the engine while flushing.

Ver imagen

9. Close the drain valve. Fill the system with a neutralizing solution. Any commercial cooling system neutralizer can be used, or mix 250 g of Sodium Carbonate Crystals ($Na_2CO_3 \cdot 10H_2O$) per 40 liters of water (1/2 lb per 10 gal).

10. Start and run the engine for 10 minutes. Stop the engine and drain the neutralizing solution.

Ver imagen

11. Flush the system with clean water until the draining water is clean. Do not run the engine while flushing.

12. Close the drain valve and install all drain plugs. Fill the system with clean water. Start and run the engine for 5 minutes. Stop the engine and drain the cooling system. Repeat this procedure, until the drained water is clean.

13. Mix the antifreeze solution to provide protection to the lowest expected outside temperature. Add 2 liters (2 quarts) of Caterpillar Cooling System Conditioner or equivalent.

14. Close the drain valve. Add the coolant slowly, 20 liters (5 U.S. gallons) per minute or less, to the proper level. See "Refill Capacities." Adding the coolant too fast will produce air pockets in the system.

Ver imagen

15. Run the engine with the radiator cap off until the coolant level stabilizes.

If necessary, add more coolant until the level is within 1 cm (1/2 inch) of the bottom of the fill pipe.

Ver imagen

16. Inspect the radiator cap gasket. Replace the gasket if it is damaged.

Ver imagen

17. Install the radiator cap.

Cooling System Relief Valve

WARNING

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

Steam can cause personal injury.

Check coolant level ONLY when engine is stopped and radiator filler cap is cool enough to touch with your hand.

Remove filler cap slowly to relieve pressure.

Cooling System Conditioner contains alkali. Avoid contact with skin and eyes to prevent personal injury.

Use all cleaning solutions with care.

With the engine stopped and cool:

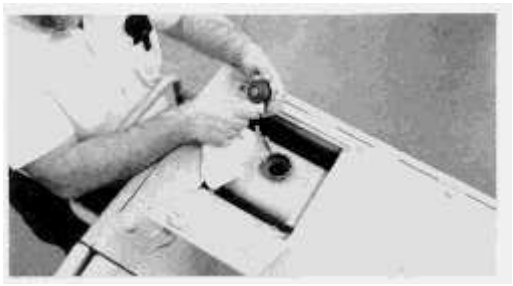
Ver imagen

1. Remove the radiator cap slowly to relieve any pressure in the system.

Ver imagen

2. Inspect the valve for damage, deposits or foreign material.

Ver imagen



3. Clean the pressure relief valve with a clean cloth, or replace the radiator cap, if necessary.

Ver imagen

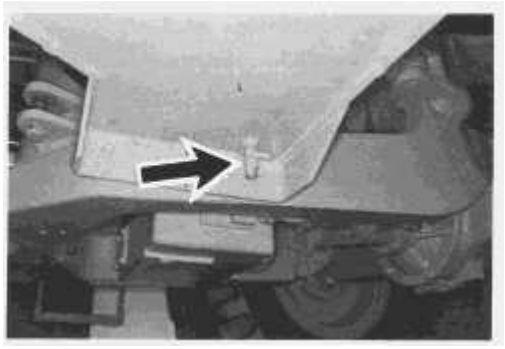
4. Inspect the coolant level. Maintain the coolant level to within 1 cm (1/2 inch) of the bottom of the fill pipe.

Ver imagen

5. Install the radiator cap.

Fuel Tank

Ver imagen



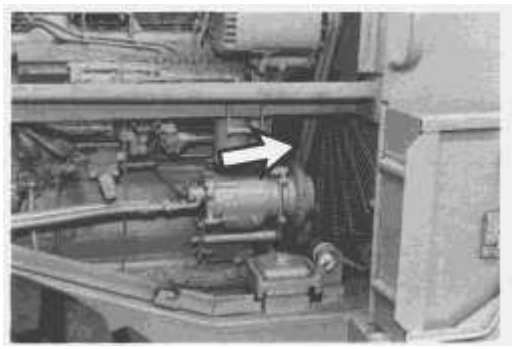
Open the fuel tank drain valve. Drain moisture and sediment. Close the drain valve.

WARNING

Escaping fuel is flammable. Do not smoke while draining moisture and sediment from the fuel tank.

Alternator Belts

Ver imagen



If the alternator warning light on the indicator panel in the operator's compartment comes on while the engine is running, inspect the alternator belts.

Tighten the alternator belts as shown in the topic "Alternator Belts" under "Every 250 Service Hours or Monthly." Replace the alternator belts, if they are worn or damaged.

Bucket Teeth - Replace Tips

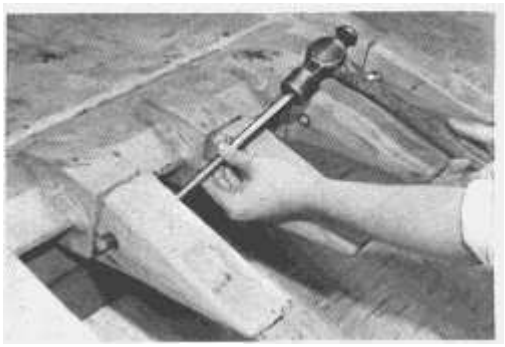
WARNING

Block the bucket before changing the bucket teeth.

To prevent possible injury to the eyes, wear a protective face shield when striking the pin.

The pin, when struck, can fly out and cause injury to nearby personnel.

Ver imagen



1. Drive the pin out of the tip from the retainer side of the tip. Remove the tip and the retainer.

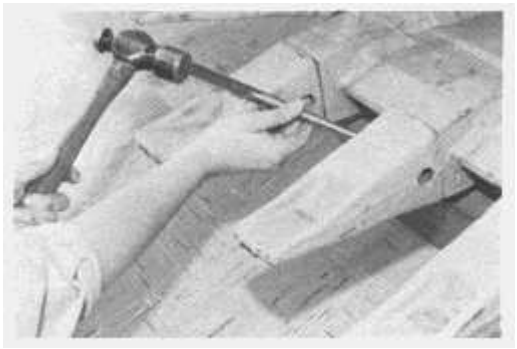
Ver imagen

2. Clean the adapter, the pin and the retainer. Install the retainer in the groove in the side of the adapter.

Ver imagen

3. Install a new tip over the retainer in either the runner or the digger position.

Ver imagen



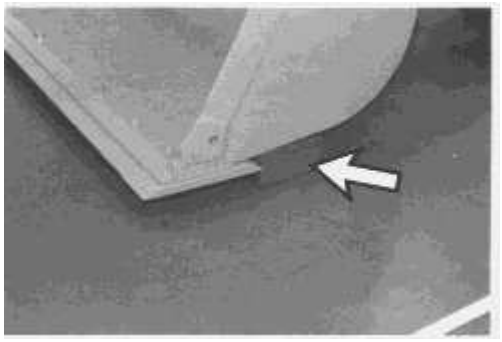
4. Drive the pin through the tip, adapter, and the retainer from the opposite side of the retainer.

Cutting Edge

WARNING

Block the bucket before changing the bucket cutting edge.

Ver imagen

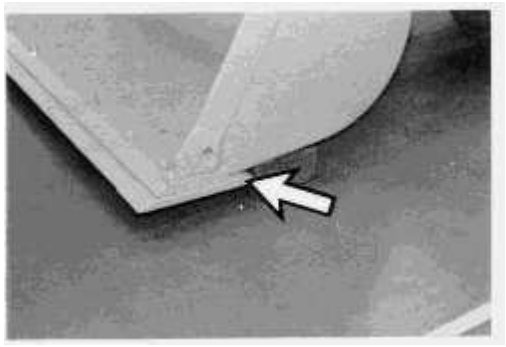


1. Raise and block the bucket. Stop the engine.

Ver imagen

2. Remove the cutting edge. Clean all contact surfaces.

Ver imagen

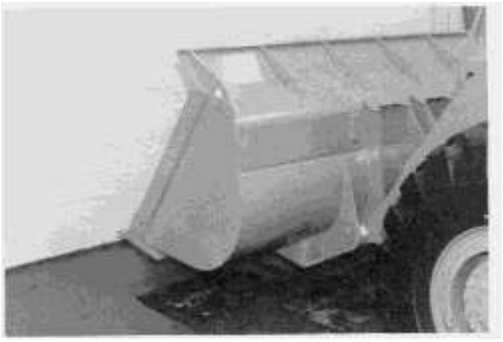


3. Use the opposite side of the cutting edge if it is not worn. Use a new section if both edges are worn.

Ver imagen

4. Install all bolts and tighten them to the specified torque. See the "Bolt Torque for Ground Engaging Tools" chart in the "Maintenance Recommendations" section.

Ver imagen



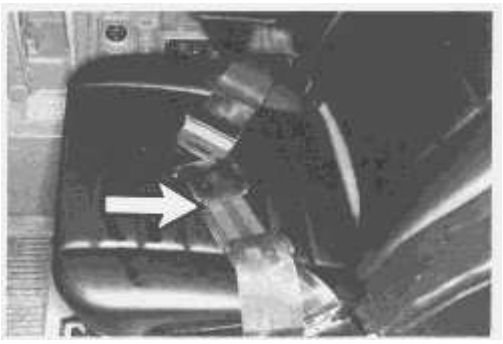
5. Start the engine, raise the bucket slightly and remove the blocks.

Ver imagen

6. After a few hours of operation retighten all bolts to the proper torque.

Seat Belt

Ver imagen



Inspect the condition of the seat belt and all mounting hardware frequently. Replace the seat belt or any part of the mounting hardware, if it is damaged.

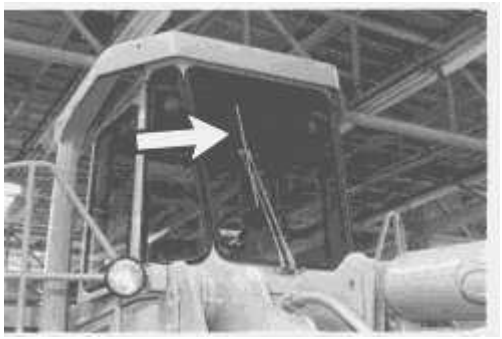
WARNING

Replace the seat belt every 3 years regardless of its condition or

appearance.

Windshield Wiper and Washer - If Equipped

Ver imagen

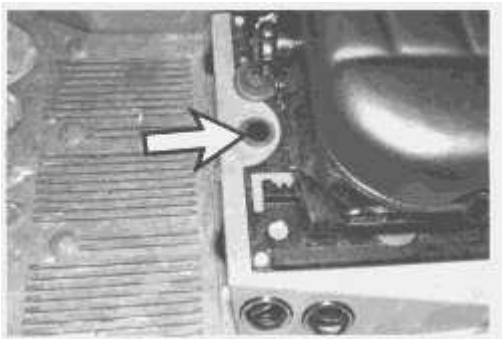


1. Inspect the windshield wiper blades. Replace them if they are worn or damaged, or if streaking occurs.

NOTICE

When operating in freezing temperatures, use a nonfreezing window washer solvent. Any commercially available nonfreezing window washer solvent can be used.

Ver imagen



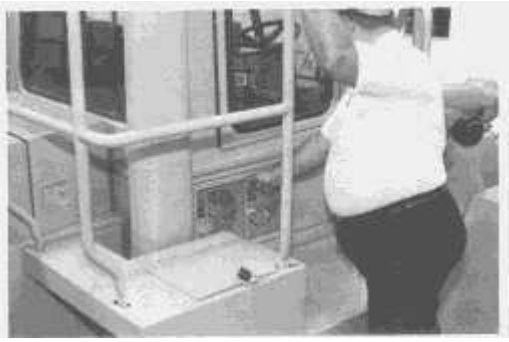
2. Fill the windshield washer bottle, located in the operator's seat base.

Fuses

Ver imagen

1. The fuse panel is located behind the cab air intake cover on the right side of the operator's platform.

Ver imagen



2. Open the access panel on the right side of the cab.

Ver imagen

3. Remove and inspect the fuses. Replace any fuse if the element is broken.

NOTICE

If it is necessary to replace fuses frequently, consult your Caterpillar dealer.

Air Conditioner - If Equipped

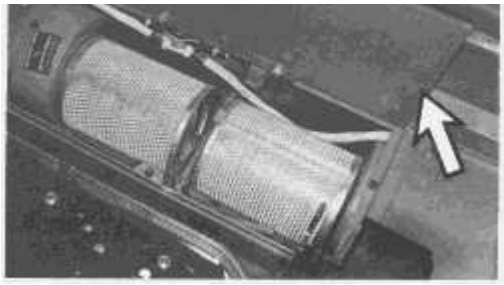
WARNING

When using pressure air wear a protective face shield and protective clothing. The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Clean the filter elements. See the topic "Cab Air System" under "Every 50 Service Hours or Weekly."

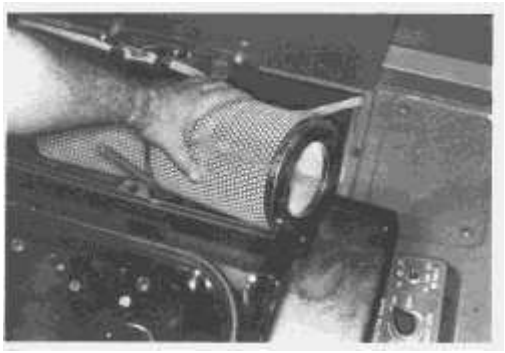
Changing Elements

Ver imagen



1. Open the cover behind the operator's seat.

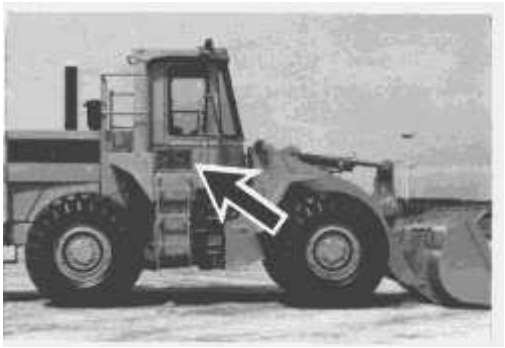
Ver imagen



2. Remove the filter elements. Install clean elements. Close the cover.

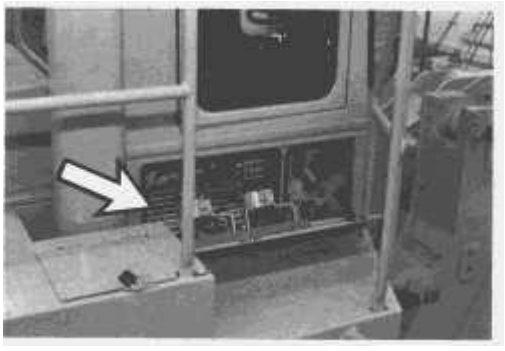
Cleaning Condenser Coil

Ver imagen



1. Open the access door on the right side of the cab.

Ver imagen



2. Clean the condenser coil. Use a vacuum cleaner, if necessary. Close the access door.

Ether Starting Aid - Ether Cylinder

WARNING

Ether is a poison and is flammable.

Do not smoke while installing or changing the ether cylinder.

Use ether only in well ventilated areas.

Use ether with care to avoid fires.

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

Keep ether cylinders out of the reach of children.

Avoid breathing of the vapors or repeated contact of ether with the skin.

Do not store cylinders at temperatures above 49°C (120°F).

Do not store cylinders in direct sunlight.

Do not puncture or burn cylinders.

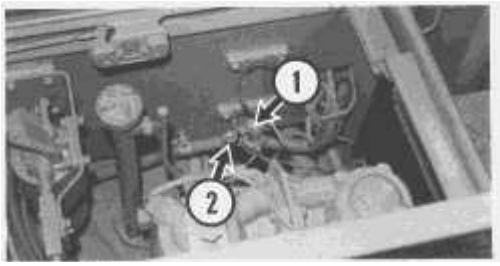
Discard empty cylinders in a safe place.

Ver imagen

The ether cylinder valve is located in the service compartment behind the operator's compartment.

Initial Installation (typical procedure shown)

Ver imagen

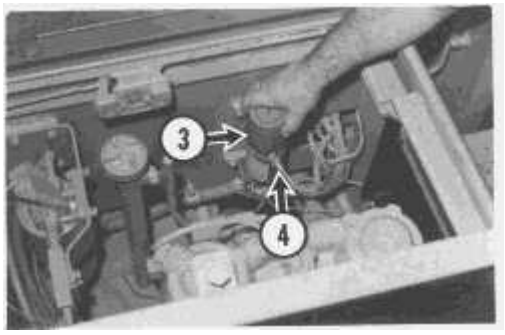


1. Remove the protective plug (1) from the ether cylinder valve. Store the plug in the threaded holder (2).

Ver imagen

2. Install the gasket into the valve.

Ver imagen



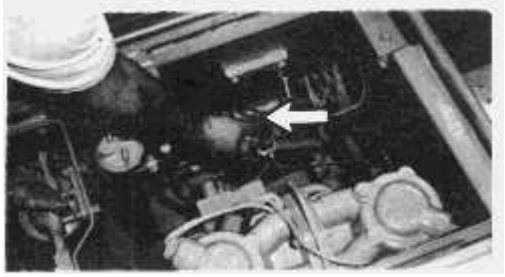
3. Screw the ether cylinder (3) into the valve hand tight. Do not use any tools to tighten it. Fasten the cylinder clamp (4) securely around the cylinder.

Changing (typical procedure shown)

Ver imagen

1. Loosen the cylinder clamp. Unscrew and remove the cylinder.

Ver imagen



2. Remove the used gasket. Install the new gasket, provided with the new cylinder.

Ver imagen

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

Temporary Removal (typical procedure shown)

WARNING

Observe all safety precautions to store partially filled cylinders for future use.

Ver imagen

1. Loosen the cylinder clamp.

Ver imagen

2. Remove the cylinder and the gasket. Store the cylinder and the gasket in a safe place.

Ver imagen

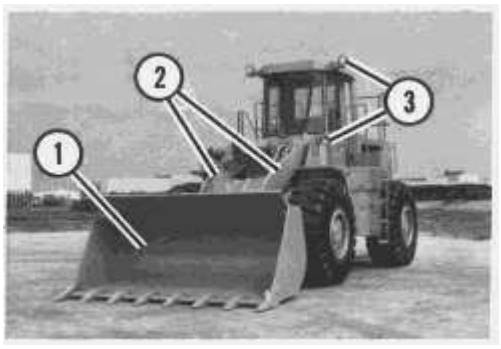
3. Remove the protective plug from the threaded holder. Screw it finger tight into the cylinder valve.

Every 10 Service Hours or Daily

(1)Walk-Around Inspection

For your own safety, and maximum service life of the vehicle, 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 or missing bolts, trash buildup, oil, coolant or fuel leaks, condition and inflation of tires, condition of bucket and linkage.

Ver imagen



1. Bucket

Inspect for damage, or excessive wear.

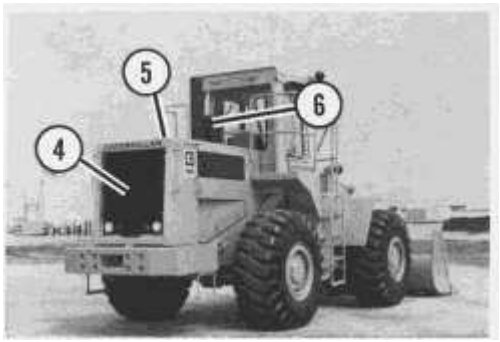
2. Bucket Control Linkage

Inspect for damage or excessive wear.

3. Lights

Inspect for broken bulbs and lenses.

Ver imagen



4. Radiator Guard

Inspect for trash buildup.

5. Cooling System

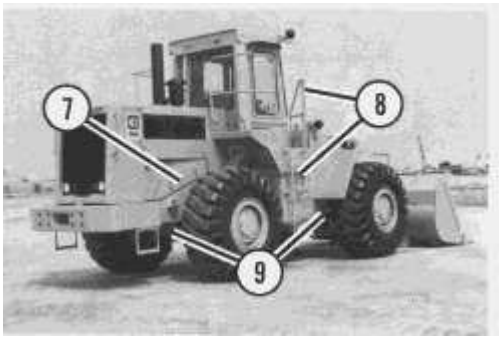
Inspect for leaks - trash build-up.

6. Engine Precleaner

Inspect for dirt build-up.

Ver imagen

Ver imagen



7. Engine Compartment

Inspect for leaks - trash build-up.

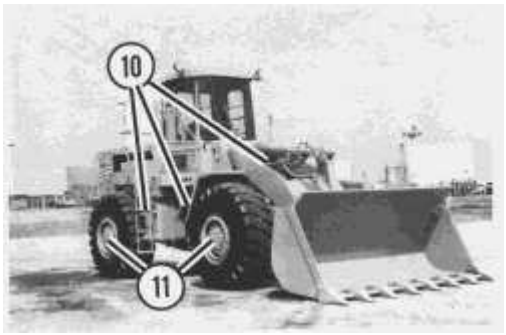
8. Steps and Grab Irons

Inspect their condition and cleanliness.

9. Differentials (front and rear)

Inspect under machine for leaks.

Ver imagen



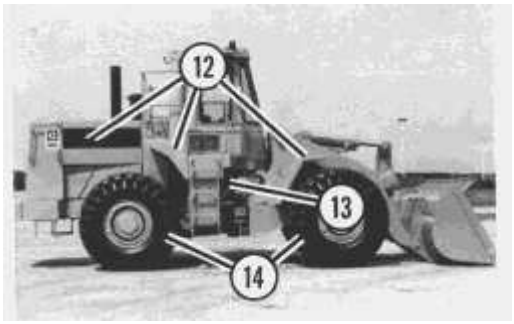
10. Hydraulic System

Inspect for leaks.

11. Final Drives (front and rear)

Inspect for leaks.

Ver imagen



12. Covers and Guards

Be sure they are firmly in place. Inspect for damage.

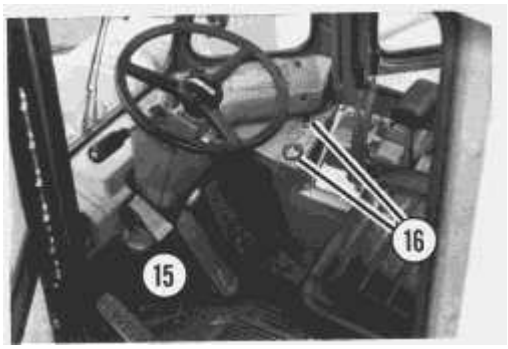
13. Transmission

Inspect for leaks.

14. Tires (front and rear)

Inspect for damage and proper inflation.

Ver imagen



15. Operator's Compartment

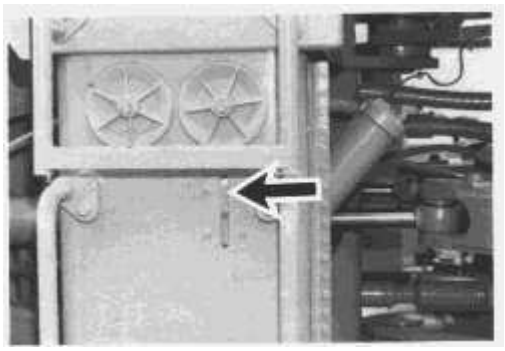
Inspect for cleanliness.

16. Instrument Panel

Inspect for broken gauges and indicator lights.

(1)AHydraulic System

Ver imagen



1. Observe the oil level at the sight gauge.

2. Add oil, if necessary.

(2)Engine Crankcase

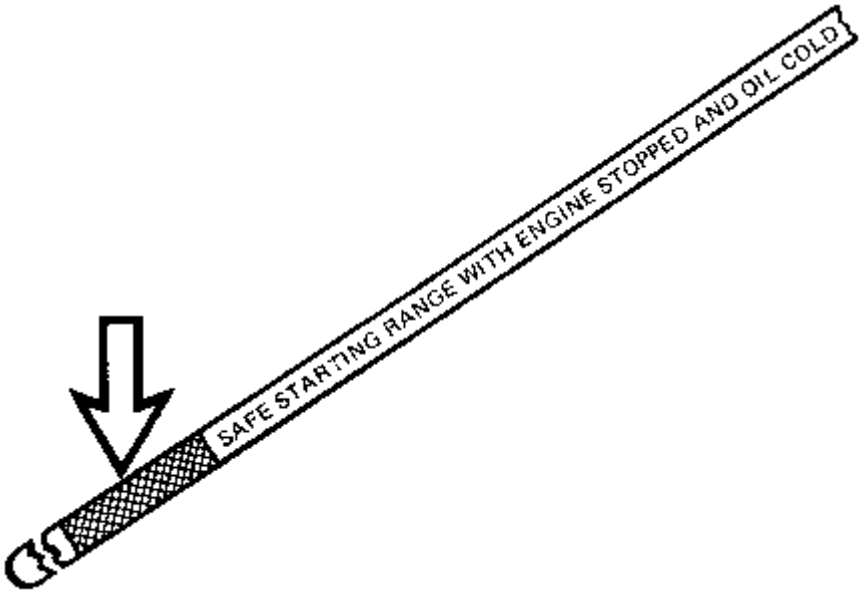
Ver imagen

1. measure oil level with the machine level. Lower the bucket with slight down pressure and apply the parking brake.

Ver imagen

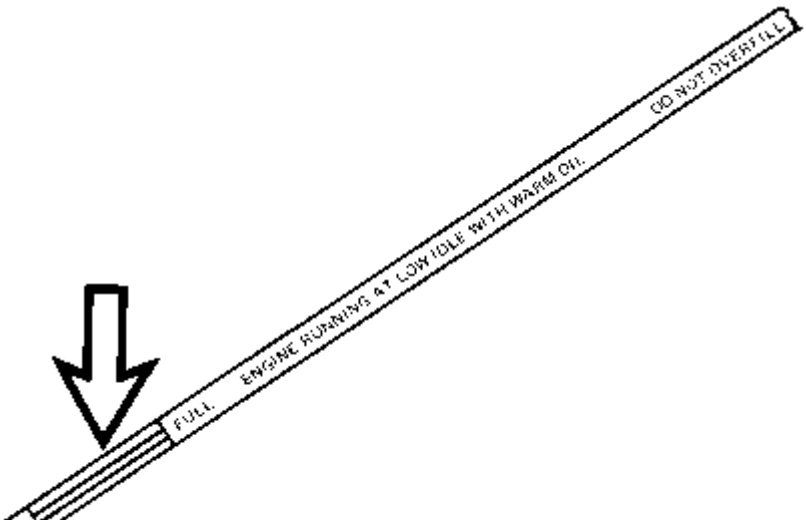
2. The level can be measured with the engine stopped or the engine running and the oil warm.

Ver imagen



3. With the engine stopped, the oil level should be in the SAFE STARTING RANGE on the ENGINE STOPPED side of the dipstick.

Ver imagen



4. With the engine running, the oil level should be between the FULL and the ADD mark on the ENGINE RUNNING side of the dipstick.

(3)Radiator

WARNING

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

Steam can cause personal injury.

Check coolant level ONLY when engine is stopped and radiator filler cap is cool enough to touch with your hand.

Remove filler cap slowly to relieve pressure.

Cooling System Conditioner contains alkali. Avoid contact with skin and eyes to prevent personal injury.

Use all cleaning solutions with care.

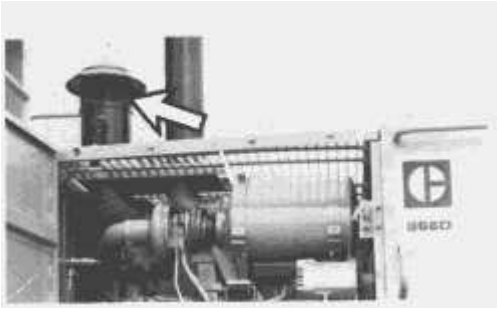
Ver imagen

1. Observe the coolant level with the engine stopped and cool. Remove the radiator cap slowly to relieve the pressure.

2. Inspect the radiator cap gasket and replace it if it is damaged. Install the radiator cap.

(4)Air Intake Screen

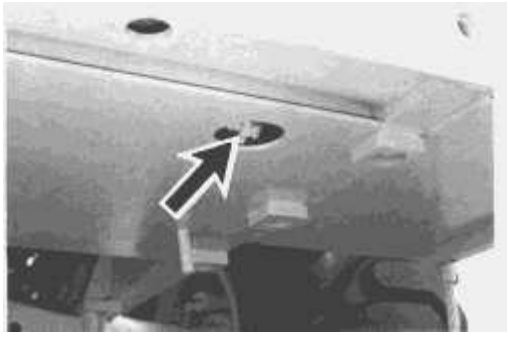
Ver imagen



Remove any accumulated debris.

(5)Air Reservoir

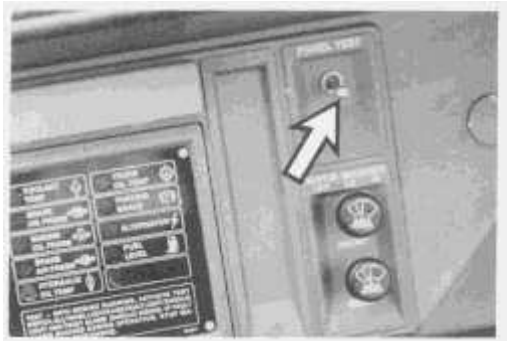
Ver imagen



Open drain valve, which is located under rear of machine, to drain any moisture and sediment. Close the valve.

(6)Indicator Lights

Ver imagen



With the engine running move the test switch to the TEST position. All indicator lights should come on and the warning horn should sound.

Ver imagen

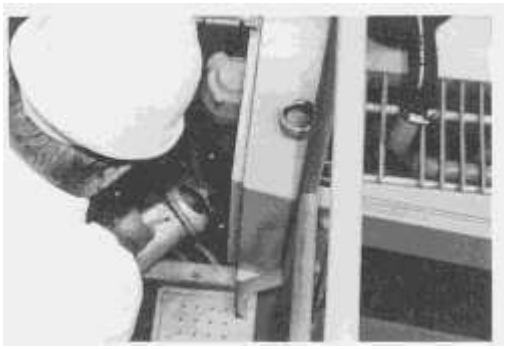
The main fault light should flash when the panel test switch is activated. Investigate and report any malfunction.

(6)ATransmission

Ver imagen

1. Measure the oil level.

Ver imagen



2. Maintain the oil level between the FULL and ADD OIL mark on the ENGINE RUNNING side of the dipstick.

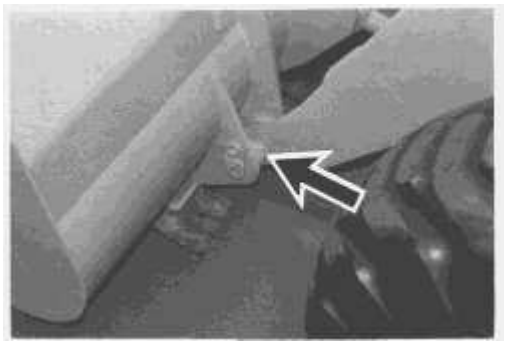
3. Add oil if necessary.

4. Stop the engine.

Every 50 Service Hours or Weekly

(7)Bucket Lower Pivot Pins

Ver imagen



Lubricate 1 fitting on each side of the bucket. Total of 2 fittings.

(8)Tires

Ver imagen

1. Measure the tire pressure on each tire. Consult your tire dealer for correct load rating and operating pressures.

WARNING

Use a self-attaching air chuck and stand behind the tire tread while inflating the tire.

Ver imagen

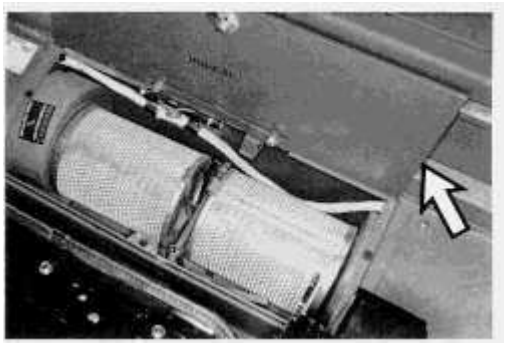
2. Inflate the tires, if necessary. See "Tire Inflation Information."

(9)Cab Air System

WARNING

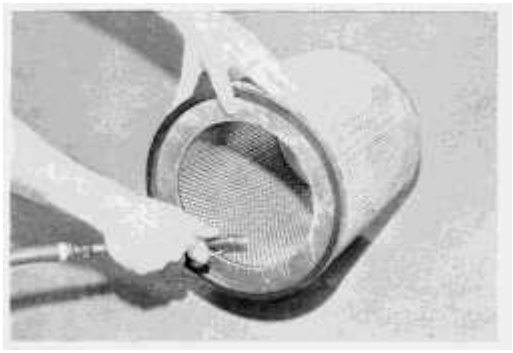
When using pressure air, wear a protective face shield and protective clothing. The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Ver imagen



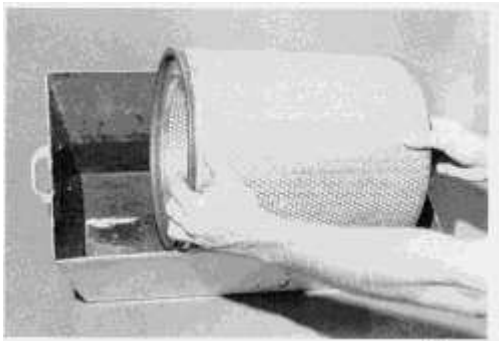
1. Open the cover behind the operator's seat. Remove the filter elements.

Ver imagen



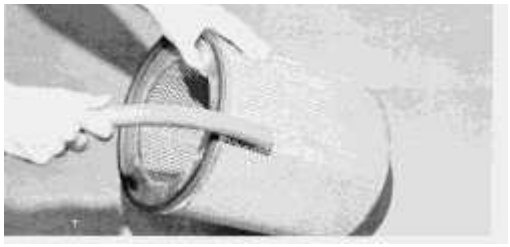
2. Clean the filter elements with pressure air ...

Ver imagen



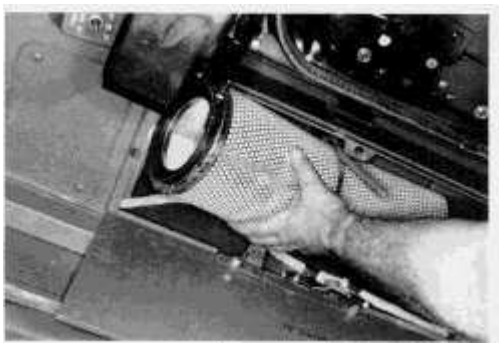
... or wash the elements in warm water and a nonsudsing household detergent.

Ver imagen



3. Rinse in clean water and air dry thoroughly.

Ver imagen

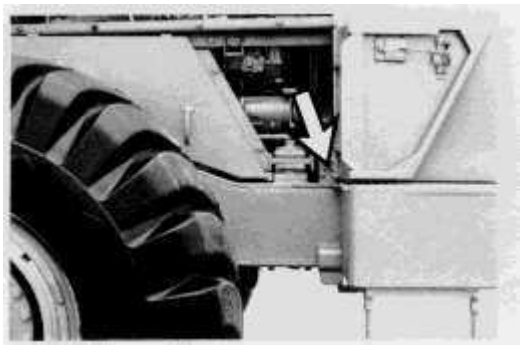


4. Install clean elements. Close the cover.

Every 100 Service Hours or 2 Weeks

(10)Rear Axle Trunnion Bearings

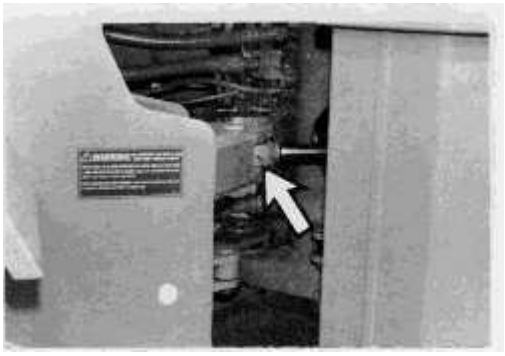
Ver imagen



Lubricate 2 fittings in the lube fitting block on the left side of the rear frame.

(11)Steering Cylinder Bearings

Ver imagen



1. Lubricate 1 fitting at the rod end of the left and right cylinders.

Ver imagen

2. Lubricate 1 fitting in the cylinder end of the left and right cylinders.

(12)Hydraulic System

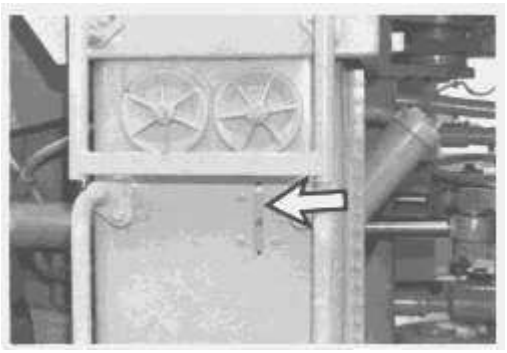
Ver imagen

1. The machine must be level, the oil warm and the engine running at low idle.

Ver imagen

2. Lock the transmission control lever in NEUTRAL. Apply the parking brake. Lower the bucket with slight down pressure.

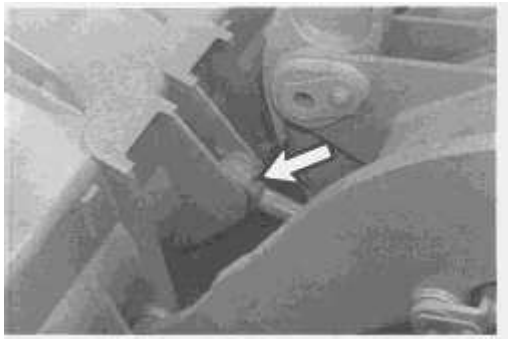
Ver imagen



3. Inspect the oil level in the hydraulic tank sight gauge. Maintain the oil level between the ADD and the FULL mark in the sight gauge.

(13)Bucket Upper Pivot Pin

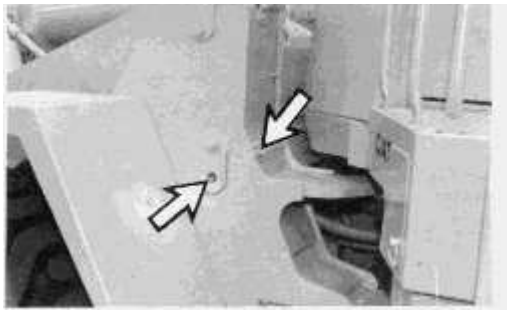
Ver imagen



Lubricate 1 fitting.

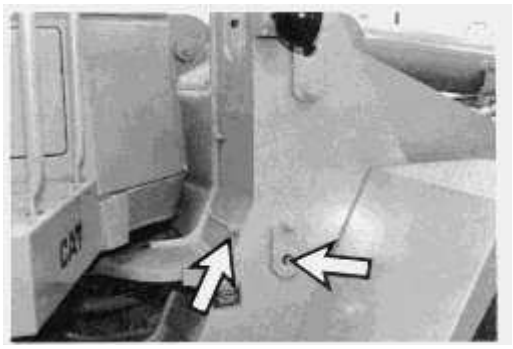
(14)Bucket Cylinder and Linkage Bearings

Ver imagen



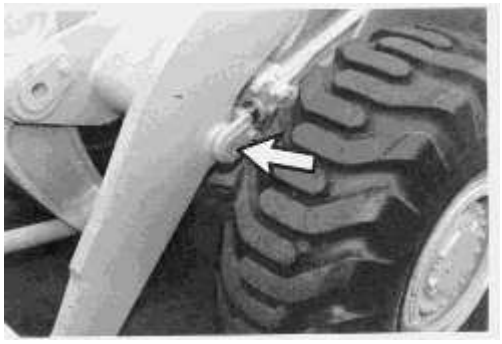
1. Lubricate 3 fittings on the left side of the machine.

Ver imagen



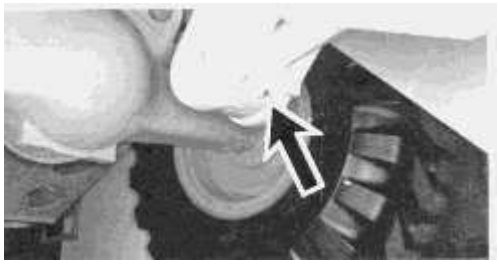
2. Lubricate 2 fittings on the right side of the machine.

Ver imagen



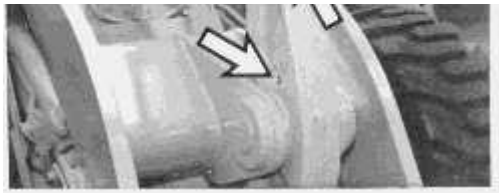
3. Lubricate 1 fitting on each side of the machine.

Ver imagen



4. Lubricate 1 fitting on the lower bucket link.

Ver imagen

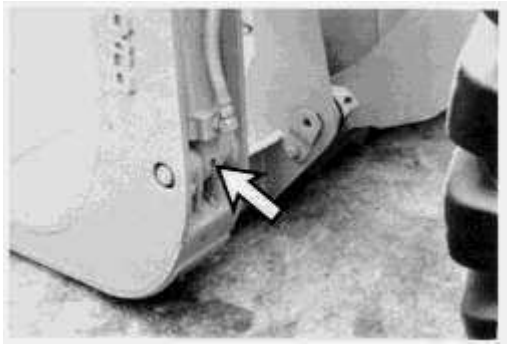


5. Lubricate 2 fittings on the bucket tilt link.

Total of 10 fittings.

(15)Logging Fork Clamp

Ver imagen



1. Lubricate 1 fitting at the bottom of the clamp cylinder on each side of the machine.

Ver imagen

2. Lubricate 1 fitting each at the top of the clamp cylinder and on the clamp pivot pin on each side of the machine. Total 6 fittings.

(16)Batteries

WARNING

Do not smoke when observing the battery electrolyte level. Batteries give off fumes that can explode.

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

Ver imagen

1. Unlatch the battery compartment cover on both rear bumpers of the machine.

Ver imagen

2. Clean the top of the batteries. Coat all posts with petroleum jelly.

Ver imagen

3. Remove each fill cap. Inspect the electrolyte level.

Ver imagen

4. If necessary, add distilled water to bring the electrolyte level to the bottom of the fill opening.

At proper charge rate in temperate climate, a battery will not require more than 30 cc (1 ounce) of water per cell per week.

Ver imagen

5. Install all fill caps. Close both compartment covers.

Every 250 Service Hours or Monthly

(17)Engine Crankcase

WARNING

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

NOTICE

Never install a damaged filter. Damaged filters can cause severe damage to the engine.

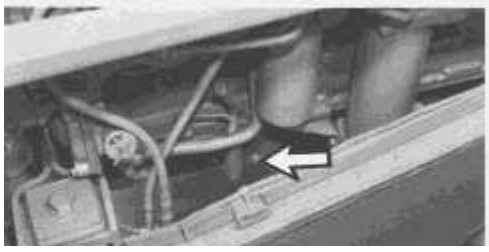
Ver imagen

The machine must be level and the engine oil warm. Lower the bucket with slight down pressure.

Ver imagen

Apply the parking brake and stop the engine.

Ver imagen

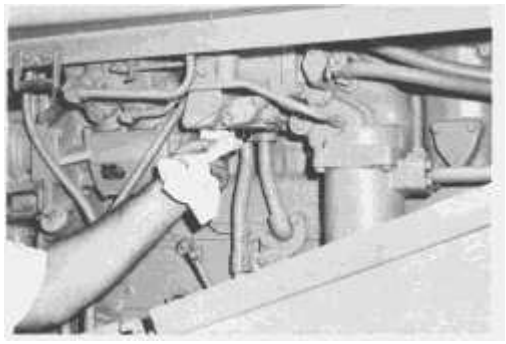


1. Open the crankcase drain valve and drain the oil.

Ver imagen

2. Remove the filter with a strap-type wrench.

Ver imagen



3. Clean the filter base. Remove all of the old gasket.

Ver imagen

4. Apply a light coat of engine oil to the gasket of the new filter.

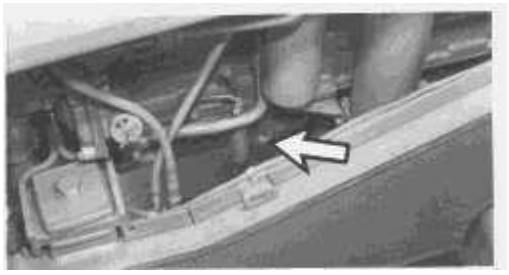
Ver imagen

5. Install the new filter by hand.

Ver imagen

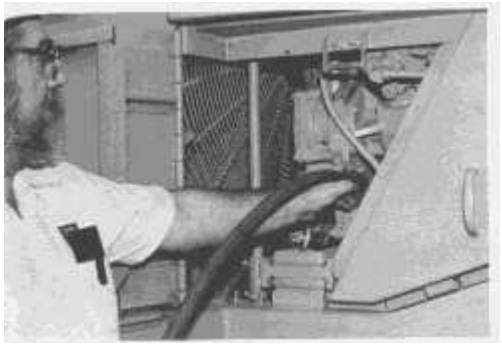
6. When the gasket contacts the filter base, tighten the filter 1/2 turn more.

Ver imagen



7. Close the crankcase drain valve.

Ver imagen



8. Fill the crankcase with new oil. See "Refill Capacities."

Ver imagen

9. Start the engine and allow the oil to warm. Check for leaks. Measure the oil level.

Ver imagen

10. Add oil, if necessary, to bring the oil level to the FULL mark on the ENGINE RUNNING side of the dipstick.

(18)Brake Fluid Reservoirs

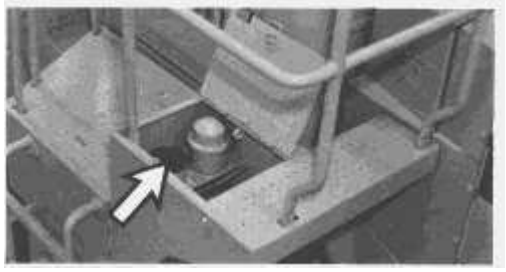
Ver imagen

1. Open the access cover in the left platform.

Ver imagen

2. Unlock the retainers.

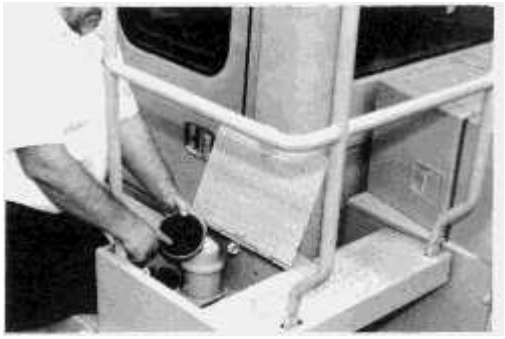
Ver imagen



3. Remove the lids from both brake fluid reservoirs.

Maintain the brake fluid within 1 cm (1/2inch) of the top of each reservoir.

Ver imagen



4. Inspect all seals, and replace them if necessary.

Ver imagen

5. Replace the lids on the reservoirs. Secure them with the retainers. Close the access cover.

(19)Service Brakes - Testing

WARNING

Be sure the area around machine is clear of personnel and obstructions.

Be sure the antipivot link is in stored position.

Test the brakes on a dry, level surface.

Fasten the seat belt before testing the brakes.

Ver imagen

1. Start the engine, and raise the bucket slightly. Apply the service brake (right brake pedal only) and release the parking brake.

Ver imagen

2. With the service brake applied (right brake pedal only), shift the transmission to 2nd speed forward.

Ver imagen

3. Gradually increase the engine speed to high idle. The machine should not move.

WARNING

If the machine begins to move, reduce the engine speed immediately and apply the parking brake.

Ver imagen

4. Reduce the engine speed to low idle, shift the transmission to NEUTRAL. Apply the parking brake, lower the bucket to the ground and stop the engine.

NOTICE

If the machine moved while testing the brakes, contact your Caterpillar dealer. Have him inspect and, if necessary, repair the service brakes before returning the machine to operation.

(20)Parking Brake - Testing

WARNING

Be sure the area around machine is clear of personnel and obstructions.

Be sure the steering frame lock link is in stored position.

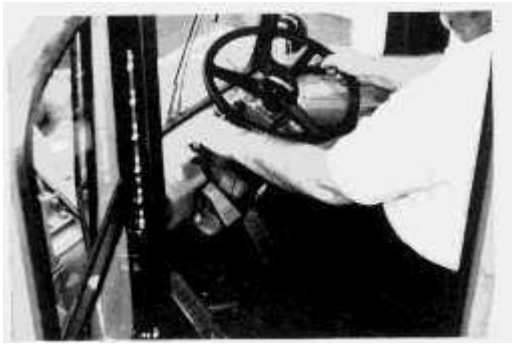
Test the brakes on a dry, level surface.

Fasten the seat belt before testing the brakes.

Ver imagen

1. Start the engine and raise the bucket slightly.

Ver imagen



2. With the parking brake applied shift the transmission to 3rd speed forward. It will be necessary to hold the lever in forward or the lever will move to NEUTRAL.

Ver imagen

3. Gradually increase the engine speed to high idle. The machine must not move.

NOTICE

If the machine begins to move, reduce the engine speed immediately and apply the service brake.

Ver imagen

The parking brake indicator light should come on. If the light does not come on, have the electrical system inspected and the necessary repairs made.

Ver imagen

The main fault light must flash and the warning horn must sound.

Important: If the light does not flash or the horn does not sound, have the electrical system inspected and the necessary repairs made.

Ver imagen

4. Reduce the engine speed, shift the transmission to NEUTRAL. Lower the bucket to ground and stop the engine.

NOTICE

If the machine moved while testing the brake, contact your Caterpillar dealer. Have him inspect and, if necessary, repair the parking brake before returning the machine to operation.

---

(21)Drive Shaft Spline

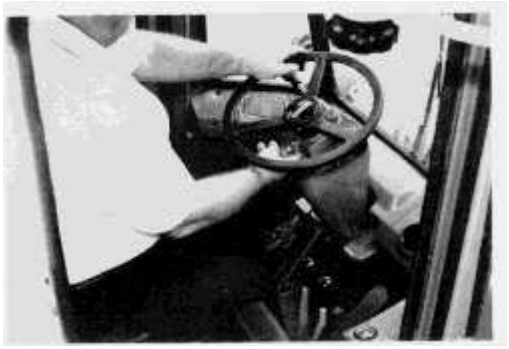
Ver imagen

1. Disconnect the steering frame lock link. Start the engine.

Ver imagen

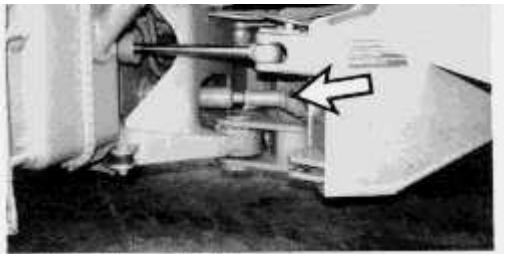
2. Turn the machine full right or left.

Ver imagen



3. Lower the bucket, apply the parking brake and stop the engine.

Ver imagen



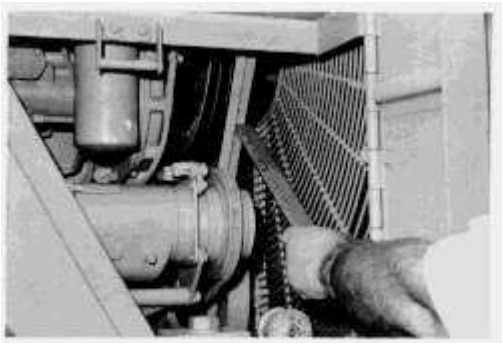
4. Lubricate 1 fitting.

WARNING

Straighten the machine and connect the steering frame lock link after servicing the drive shaft spline.

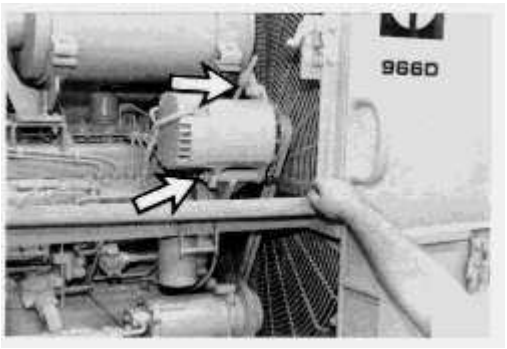
(22)Alternator Belts

Ver imagen



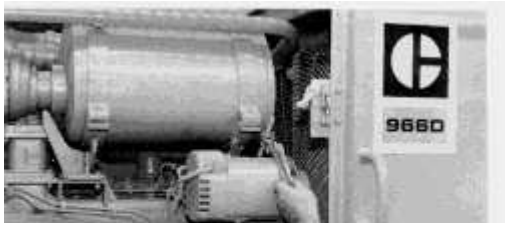
1. Inspect the condition and the adjustment. The belts should deflect 14 to 20 mm (9/16 to 13/16 inch) under 11.5 kg (25 lb) force.

Ver imagen



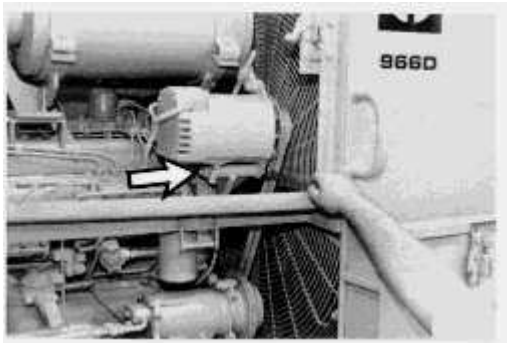
2. Loosen the alternator mounting bolts. Loosen the adjusting locknut.

Ver imagen



3. Turn the adjusting nut until the correct belt tension is reached. Tighten the adjusting locknut to 150 ± 20 N·m (110 ± 15 lb ft).

Ver imagen



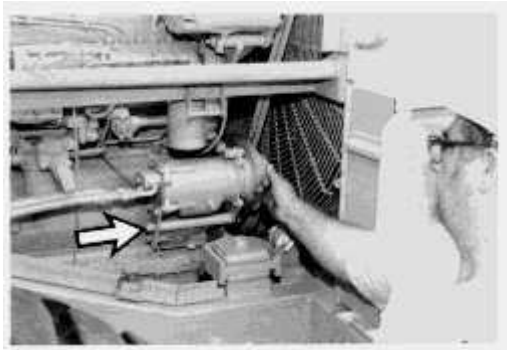
4. Tighten the alternator mounting bolts.

(23)Air Conditioner - If Equipped

Ver imagen

1. Inspect the condition and the adjustment of the compressor belt. The belt should deflect 14 to 20 mm (9/16 to 13/16 inch) under 11.5 kg (25 lb.) force.

Ver imagen

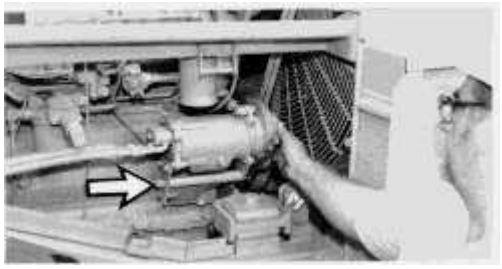


2. To adjust, loosen the compressor bracket bolts.

Ver imagen

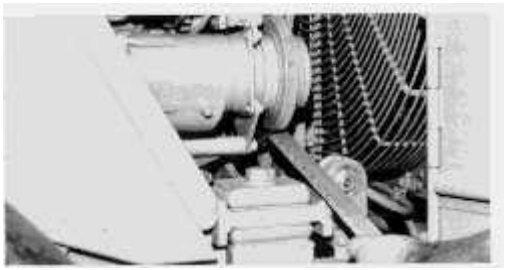
3. Turn the adjusting nuts until the correct belt tension is reached. Tighten the adjusting nuts to 150 ± 20 N·m (110 ± 15 lb ft).

Ver imagen



4. Tighten the compressor bracket bolts.

Ver imagen

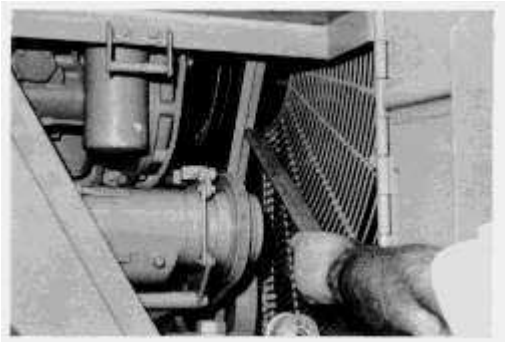


5. Recheck the belt adjustment.

6. If poor cooling is experienced, turn off the air conditioner. Stop the engine. Contact your Caterpillar dealer for air conditioner system service, if necessary.

(24)Fan Belts

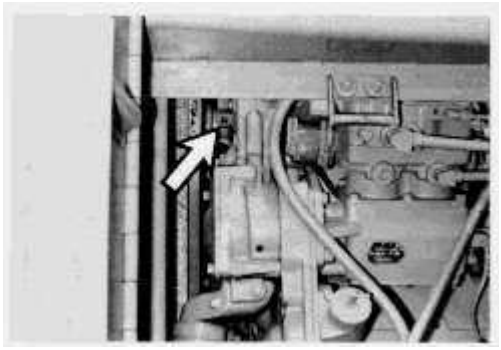
Ver imagen



Inspect the condition and the adjustment of the belts. Replace the belts in sets only, if one or more are worn or damaged.

(25)Fan Bearing

Ver imagen



Lubricate the fan bearing.

(26)Cooling System - Add Conditioner

WARNING

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

Steam can cause personal injury.

Inspect the coolant level ONLY when the engine is stopped and the radiator cap is cool enough to touch with your hand.

Remove the radiator cap slowly to relieve pressure.

The cooling system conditioner contains alkali, avoid contact with the skin and eyes to prevent personal injury.

NOTICE

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

Do not use Caterpillar Cooling System Conditioner with Dowtherm 209 Full-Fill coolant. Follow the recommendations provided with Dowtherm 209 Full-Fill coolant.

Do NOT add liquid cooling system conditioner MONTHLY unless the machine has actually operated 250 Service Hours. Adding cooling system conditioner before 250 Service Hours will give an excessive concentration of conditioner.

If the cooling system was drained and refilled, see the topic "Cooling System" under "Every 2000 Service Hours or 1 Year."

It may be necessary to drain enough coolant to allow for the addition of cooling system conditioner.

Add 1/2 liter (1/2 quart) of Caterpillar Cooling System Conditioner, or equivalent, to this cooling system. This will maintain the required 3% concentration of conditioner.

Make-up coolant should contain a 3% concentration of conditioner - 1 liter of conditioner per 33 liters

of water (1 pint per 4 gallons).

Ver imagen

1. Loosen the radiator cap slowly to relieve any pressure. Remove the radiator cap.

Ver imagen

2. Add cooling system conditioner. See above for the amount of conditioner to add.

Ver imagen

3. Inspect the radiator cap gasket and replace it, if it is damaged.

Ver imagen

4. Install the radiator cap.

Every 500 Service Hours or 3 Months

(27)Fuel Tank Cap and Fill Screen

Ver imagen

1. Remove and disassemble the fuel tank cap.

WARNING

When using pressure air wear a protective face shield and protective clothing. The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Use all cleaning solutions with care.

Ver imagen

2. Wash all cap parts in a clean, nonflammable solvent.

3. Oil the element slightly. Assemble the cap.

Ver imagen

4. Remove the retaining ring and the fill screen.

Ver imagen

5. Wash the screen in clean, nonflammable solvent. Shake or blow dry.

6. Install the screen and the retaining ring.

Ver imagen

7. Inspect the fuel tank cap gasket. Replace the gasket, if it is damaged.

8. Install the fuel tank cap.

(28)Hydraulic System

WARNING

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

NOTICE

The hydraulic system is equipped with two hydraulic filters. Each filter contains two filter elements. The filter change procedure applies to both filters. All four filter elements must be changed.

Ver imagen

The machine must be level and the hydraulic oil warm. Lower the bucket with slight down pressure.

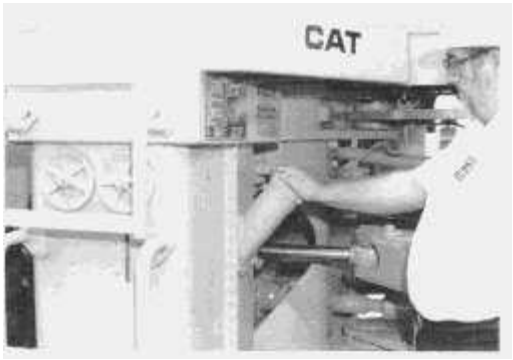
Ver imagen

Apply the parking brake. Stop the engine.

Ver imagen

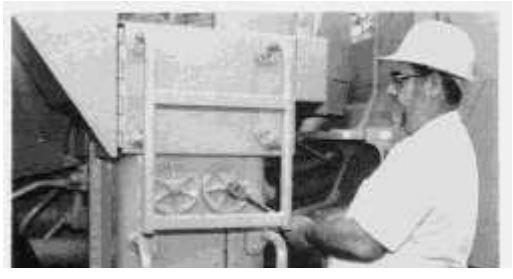
1. Move the hydraulic controls to help relieve the pressure.

Ver imagen



2. Remove the hydraulic tank cap slowly to relieve the pressure.

Ver imagen



3. Loosen the filter housing cover retaining bolt.

Ver imagen

4. Remove the cover and both elements.

WARNING

When using pressure air, wear a protective face shield and protective clothing. The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Use all cleaning solutions with care.

Ver imagen

5. Clean the cover in a clean, nonflammable solvent. Shake or blow dry.

Ver imagen

6. Inspect the seal. Replace the seal, if necessary.

Ver imagen

7. Install new elements and the cover assembly.

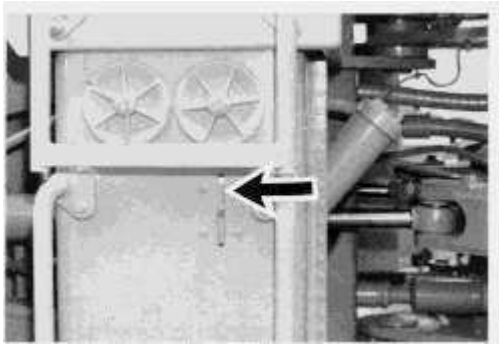
Ver imagen

8. Tighten the cover bolt to 58 ± 4 N·m (43 ± 3 lb ft).

Ver imagen

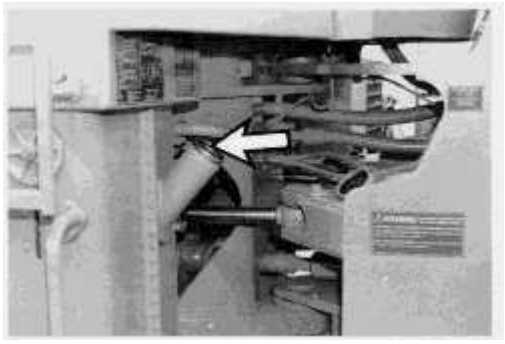
9. Repeat the entire procedure in the same manner and sequence for the other filter.

Ver imagen



10. Observe the oil level at the sight gauge.

Ver imagen



11. Add oil, if necessary.

(29)Transmission

WARNING

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

When using pressure air, wear a protective face shield and protective clothing. The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Use all cleaning solutions with care.

Ver imagen

The machine must be level and the oil warm. Lower the bucket with slight down pressure.

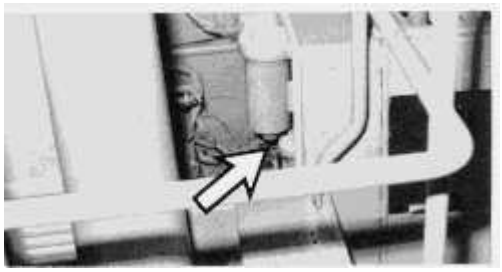
Ver imagen

Apply the parking brake. Stop the engine.

Ver imagen

1. Open the access door behind the operator's compartment.

Ver imagen



2. Remove the filter housing drain plug. Allow the oil to drain from the filter housing.

Ver imagen

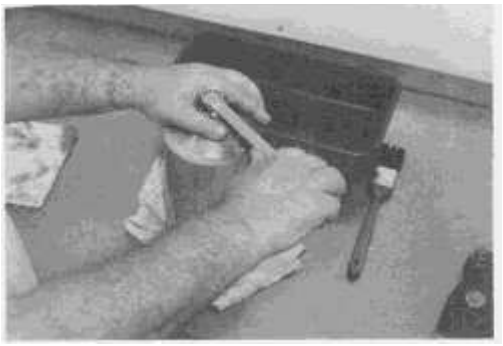
3. Use a strap-type wrench to remove the filter housing.

Ver imagen

4. Remove and discard the used element. Clean the filter housing with a clean, nonflammable solvent.

5. Clean the housing base.

Ver imagen



6. Clean and install the filter housing drain plug.

Ver imagen

7. Insert a new element into the filter housing.

Ver imagen

8. Turn the filter housing into the housing base.

NOTICE

Be careful not to damage the thread on the filter housing or filter base, when installing the filter housing. Do not overtighten.

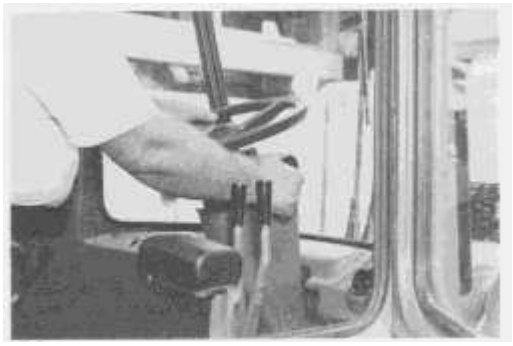
Ver imagen

9. Start the engine. Apply the service brake. Use the right brake pedal only.

Ver imagen

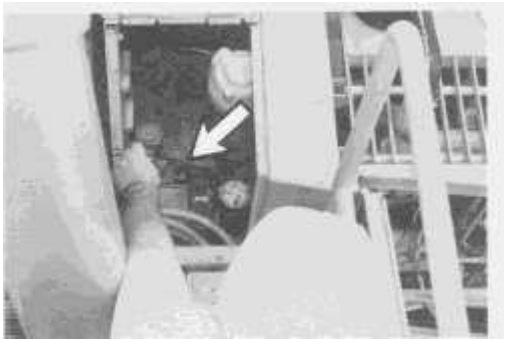
10. Slowly operate the transmission controls to circulate the oil.

Ver imagen



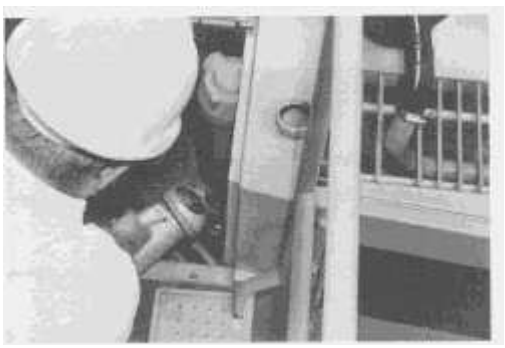
11. Lock the transmission control lever in NEUTRAL. Inspect for leaks.

Ver imagen



12. Measure the oil level.

Ver imagen

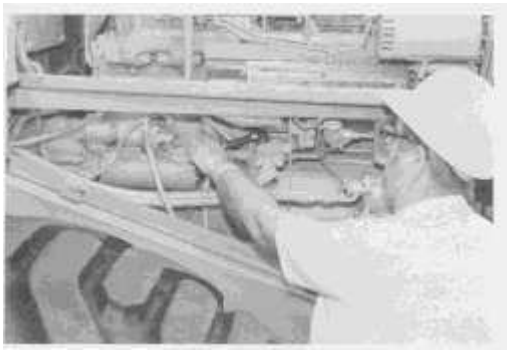


13. Add oil, if necessary, to bring the oil level to the FULL mark on the dipstick. Stop the engine.

(30)Fuel System

Primary Fuel Filter

Ver imagen



1. Loosen the filter case retaining bolt. Remove the case and the element from the filter base.

WARNING

Use all cleaning solutions with care.

Ver imagen

2. Wash the case and the element in a clean, nonflammable solvent. Shake or blow all parts dry.

Ver imagen

3. Insert the element in the case. Install the case and element on the base. Tighten the retaining bolt.

Ver imagen

4. Start the engine and check for leaks.

Final Filter

Ver imagen

1. Remove the fuel filter with a strap-type wrench.

Ver imagen

2. Clean the filter base gasket surface. Remove all of the old gasket.

Ver imagen

3. Lubricate the new filter gasket with clean diesel fuel.

Ver imagen

4. Install the new filter element by hand. When the gasket contacts the base, tighten 1/2 turn more.

NOTICE

Do not overtighten the filter element.

---

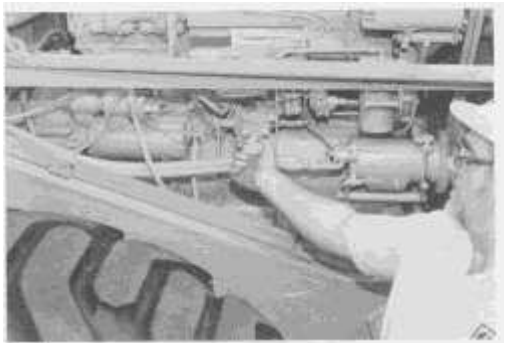
5. Prime the fuel system (see the next topic).

Ver imagen

6. Start the engine and check for leaks.

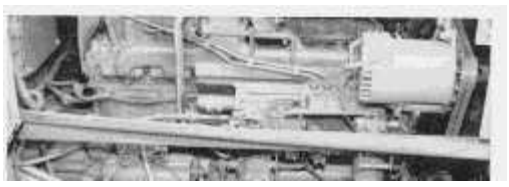
Priming the Fuel System

Ver imagen



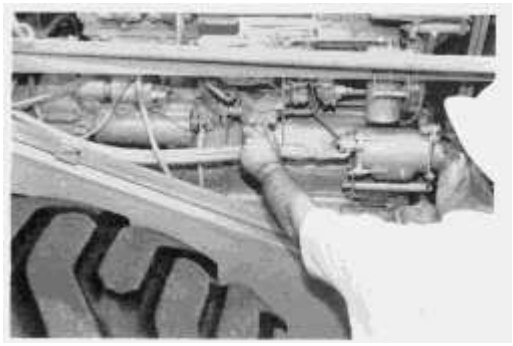
1. Unlock the priming pump plunger.

Ver imagen



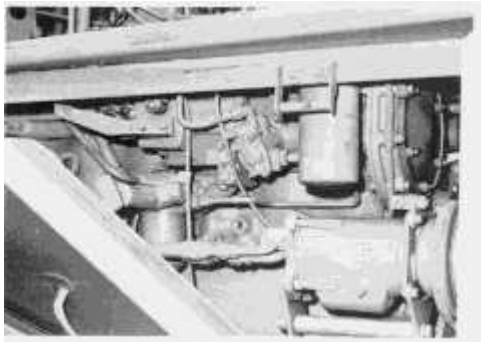
2. Operate the plunger until the fuel flows free of bubbles from the drain tube.

Ver imagen



3. Close the pump and lock the plunger.

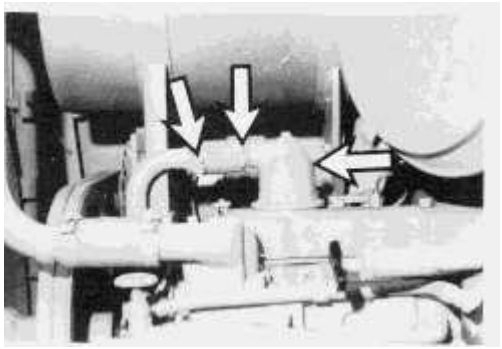
Ver imagen



4. Start the engine and inspect for leaks.

(30)AEngine Crankcase Breather

Ver imagen



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

2. Remove the breather. Wash the element in clean solvent. Install the element and cover.

(31)Transmission

WARNING

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

Ver imagen

The machine must be level and the oil warm. Lower the bucket with slight down pressure.

Ver imagen

Apply the parking brake. Stop the engine.

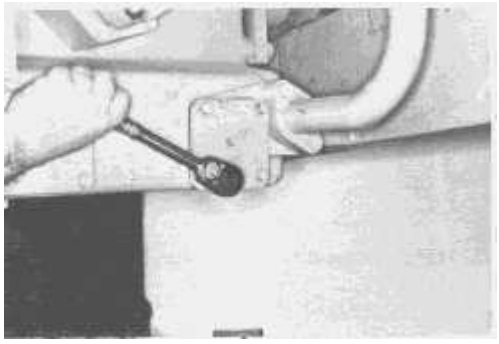
Ver imagen

1. Remove the transmission drain plug and drain the oil.

Ver imagen

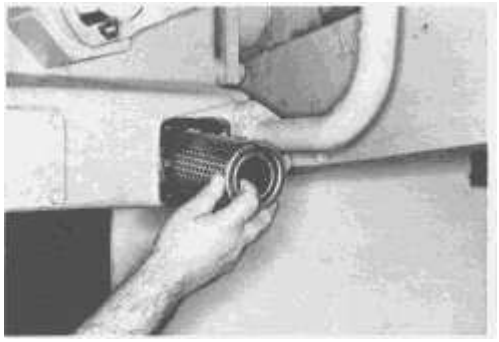
2. Change the filter element. See the topic "Transmission" under "Every 500 Service Hours or 3 Months."

Ver imagen



3. Remove the magnetic strainer cover.

Ver imagen



4. Remove the retainer, the tube and the screen from the housing.

WARNING

When using pressure air, wear a protective face shield and protective clothing. The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Use all cleaning solutions with care.

Ver imagen

5. Remove the tube and magnets from the screen.

Ver imagen

6. Wash the tube and the screen in a clean, nonflammable solvent.

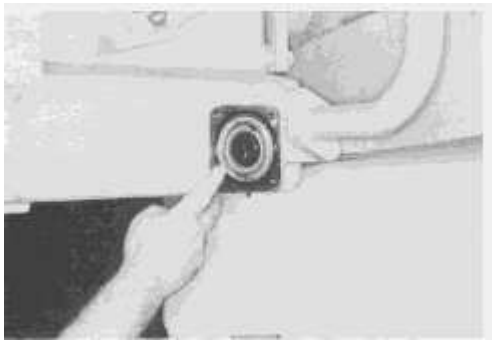
Ver imagen

7. Clean the magnets with a cloth, a stiff bristle brush or pressure air.

NOTICE

Do not drop or rap the magnets against any hard objects. Replace any damaged magnets.

Ver imagen



8. Clean the cover and inspect the seal. Replace the seal, if it is damaged.

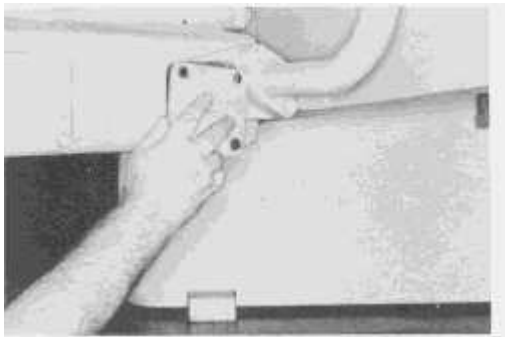
Ver imagen

9. Insert the tube and magnets in the screen.

Ver imagen

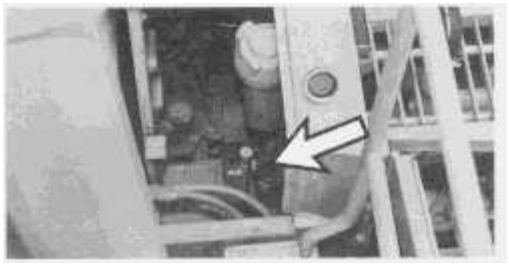
10. Insert the screen, tube and magnets in the housing.

Ver imagen



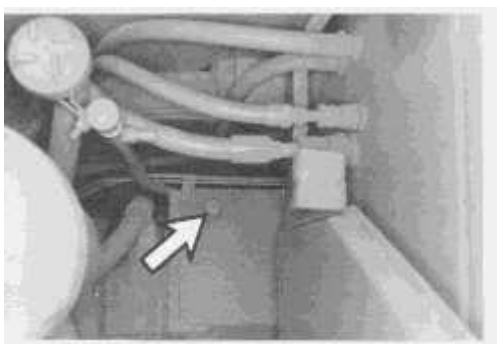
11. Install the cover. Tighten the cover bolts.

Ver imagen



12. Clean and install the transmission drain plug. Fill the transmission with oil. See "Refill Capacities."

Ver imagen



13. Install a new breather.

Ver imagen

14. Start the engine. Apply the service brake. Depress the right brake pedal only.

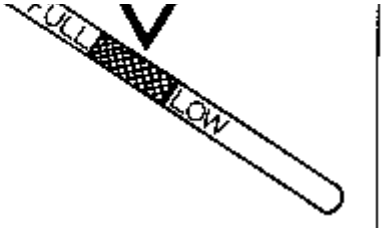
Ver imagen

15. Slowly operate the transmission controls to circulate the oil. Lock the transmission control in NEUTRAL.

Ver imagen

16. Inspect for leaks. Measure the oil level.

Ver imagen



17. Maintain the oil level between the FULL and ADD OIL mark on the ENGINE RUNNING side of the dipstick.

Ver imagen

18. Add oil if necessary.

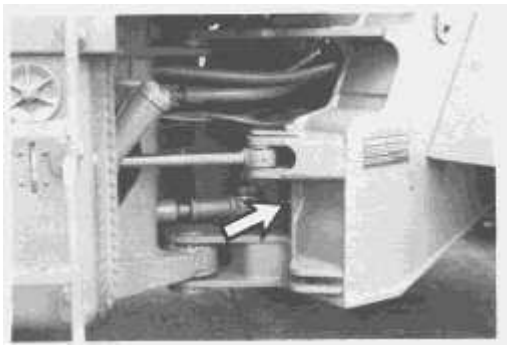
19. Stop the engine.

(32)Drive Shaft Support Bearing

Ver imagen

The lube fitting for the drive shaft support bearing is mounted on the right hand side of the front loader frame.

Ver imagen



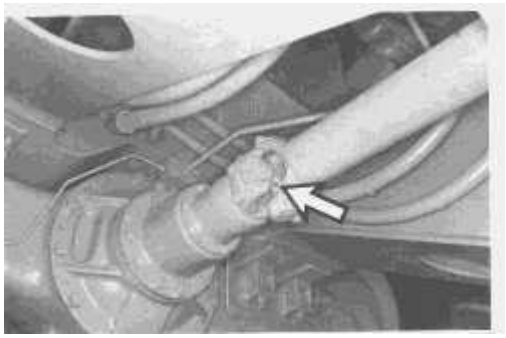
Lubricate 1 fitting.

(33)Drive Shaft Universal Joints

NOTICE

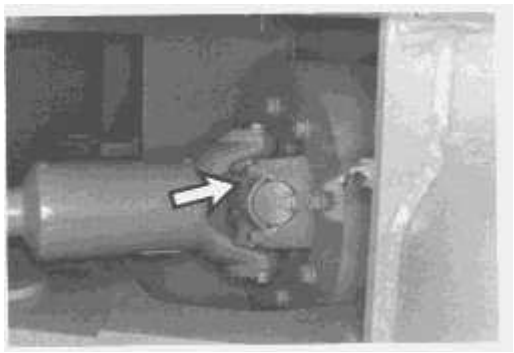
Lubricate the drive shaft universal joints with a lever-type hand-operated grease gun. Pressure-air operated lubricating equipment can damage the seals.

Ver imagen



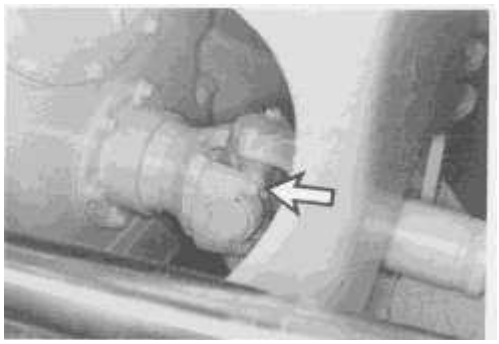
1. Lubricate 1 fitting in the front shaft universal joint.

Ver imagen



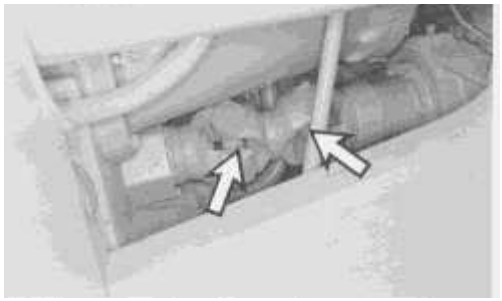
2. Lubricate 1 fitting in the front universal joint of the center shaft.

Ver imagen



3. Lubricate 1 fitting in the rear universal joint of the center shaft.

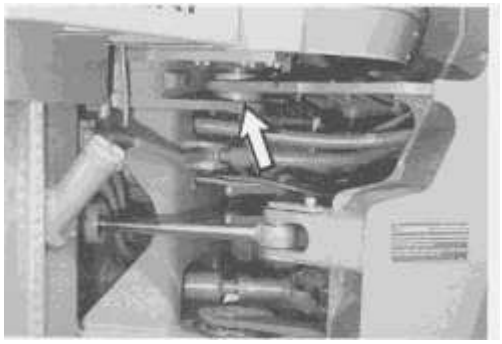
Ver imagen



4. Lubricate 1 fitting in each of the two rear shaft universal joints. Total 5 fittings.

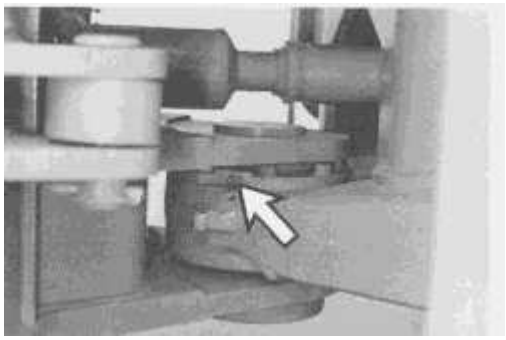
(34)Frame Upper and Lower Pivot Bearings

Ver imagen



1. Lubricate 1 fitting at the upper pivot pin.

Ver imagen



2. Lubricate 1 fitting at the lower pivot pin. Total 2 fittings.

(35)ROPS (Roll-Over Protective Structure)

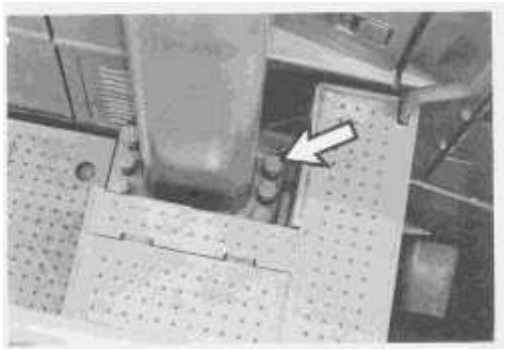
WARNING

To avoid possible weakening of the ROPS (Roll-Over Protective Structure), consult a Caterpillar dealer before altering the ROPS in any way. The protection offered by the ROPS will be impaired if it has been subjected to structural damage or has been involved in an overturn incident.

Ver imagen

1. Inspect the ROPS structure.

Ver imagen



2. Tighten the 6 mounting bolts on each side of the machine to 875 ± 100 N·m (640 ± 80 lb. ft.). Total of 12 bolts.

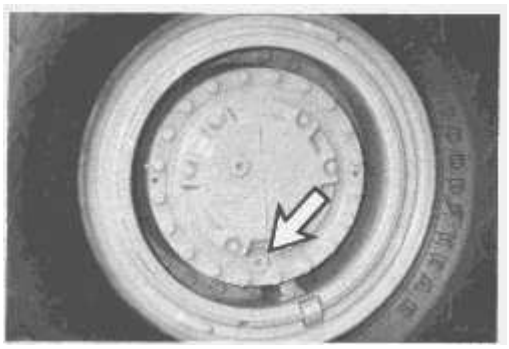
Every 2000 Service Hours or 1 Year

(36)Differentials and Final Drives

WARNING

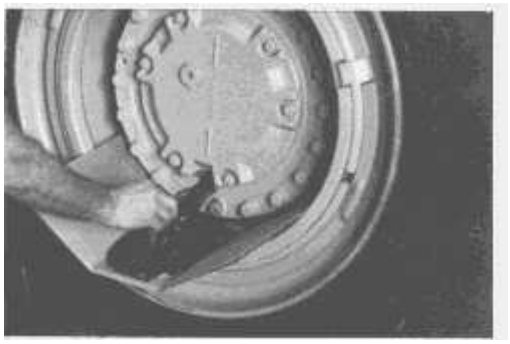
Hot oil and components can cause injury. Do not allow hot oil or components to contact the skin.

Ver imagen



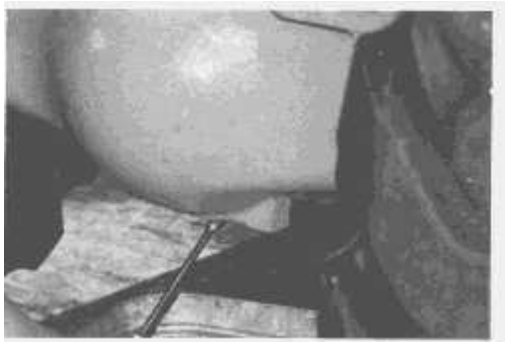
1. Position each wheel in turn with the drain plug at the lowest point.

Ver imagen



2. Remove each final drive drain plug in turn and drain the oil.

Ver imagen



3. Remove the front differential drain plug and drain the oil.

Ver imagen

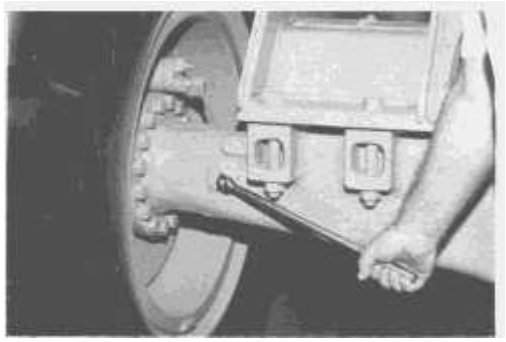
4. Remove the rear differential drain plug and drain the oil.

Ver imagen

5. Clean the differential and final drive drain plugs.

6. Install the differential and final drive drain plugs.

Ver imagen

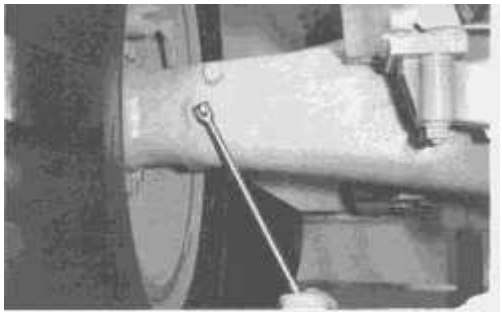


7. Remove the front differential fill plug from the right front of the front axle housing.

Ver imagen

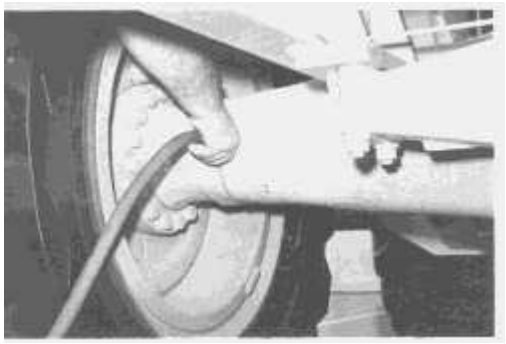
8. Fill the front differential and the final drives through the front differential fill opening. See "Refill Capacities." Clean and install the fill plug.

Ver imagen



9. Remove the rear differential fill plug from the left rear of the rear axle housing.

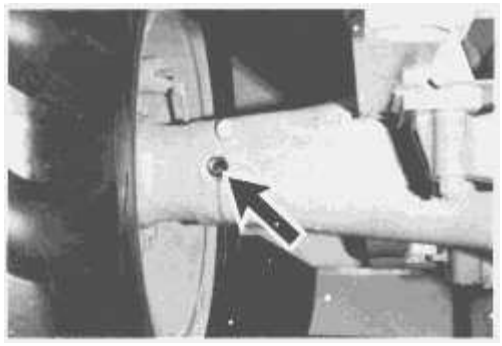
Ver imagen



10. Fill the rear differential and the final drives through the rear differential fill opening. See "Refill Capacities." Clean and install the fill plug.

11. Operate the machine for one hour. Stop the machine and stop the engine. Inspect for leaks.

Ver imagen



12. Remove the fill plugs. Maintain the oil level to the bottom of the fill plug opening.

If the lubricant level is above the fill plug opening, do not allow the lubricant to drain to the level of the plug opening. Install the fill plug.

Ver imagen

13. Add oil, if necessary, to bring the oil level to the bottom of the fill plug opening.

(37)Hydraulic System

WARNING

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

Ver imagen

The machine must be level and the oil warm. Lower the bucket with slight down pressure.

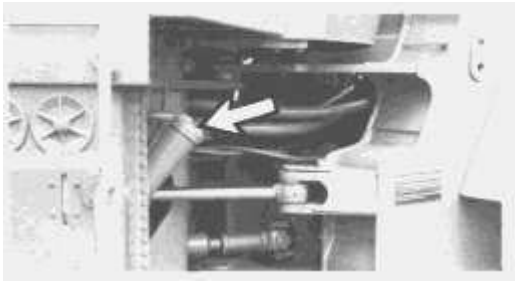
Ver imagen

Apply the parking brake and stop the engine.

Ver imagen

1. Move the hydraulic controls to help relieve the system pressure.

Ver imagen



2. Remove the fill cap slowly to relieve the pressure.

Ver imagen

3. Remove the tank drain plug.

Ver imagen

4. Install a pipe nipple (Caterpillar part number 6B3156) to unseat the drain valve.

NOTICE

Install the drain pipe nipple only finger tight until the oil starts to drain. Do NOT force the pipe nipple into the valve. This will damage the drain valve and cause leakage.

---

5. Allow the oil to drain. Change the filter element. See the topic "Hydraulic System" under "Every 500 Service Hours or 3 Months."

Ver imagen

6. Remove the fill screen retaining ring and remove the screen.

WARNING

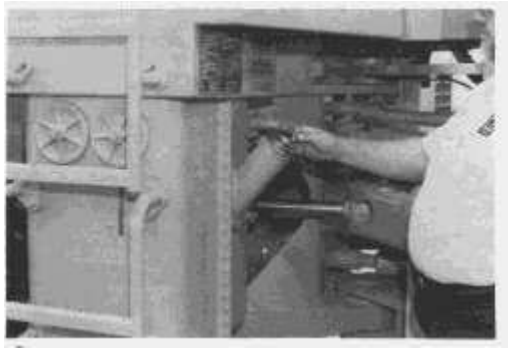
When using pressure air, wear a protective face shield and protective clothing. The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Use all cleaning solutions with care.

Ver imagen

7. Clean the fill screen in a clean, nonflammable solvent. Shake or blow dry.

Ver imagen



8. Install the fill screen and the retaining ring.

Ver imagen

9. Inspect the drain plug seal. Replace the seal, if it is damaged. Clean and install the tank drain plug.

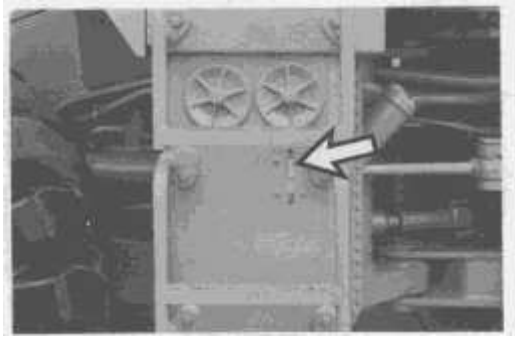
Ver imagen

10. Fill the tank. See "Refill Capacities." Install the fill cap.

Ver imagen

11. Start the engine. Operate the controls to circulate the oil.

Ver imagen



12. Observe the sight gauge. Add oil, if necessary, to bring the oil level above the ADD mark.

(38)Cooling System - Change Coolant

WARNING

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

Steam can cause personal injury.

Check coolant level ONLY when engine is stopped and radiator filler cap is cool enough to touch with your hand.

cap is cool enough to touch with your hand.

Remove filler cap slowly to relieve pressure.

Cooling System Conditioner contains alkali. Avoid contact with skin and eyes to prevent personal injury.

Use all cleaning solutions with care.

NOTICE

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

Maintain a 3% concentration of Caterpillar Cooling System Conditioner or equivalent. Follow the recommendations on the container.

Do not use Caterpillar Cooling System Conditioner with Dowtherm 209 Full-Fill coolant. Follow the recommendations provided with Dowtherm 209 Full-Fill coolant.

When conditioner is added to the cooling system at recommended intervals, it is not necessary to drain and refill yearly. The cooling system drain period can then be extended to 4000 service hours or 2 years.

Use clean water that is low in scale forming minerals - not softened water. Measure the specific gravity of the antifreeze solution frequently in cold weather to assure adequate protection.

Ver imagen

The machine must be level, the engine stopped and cool. The bucket must be lowered with slight down pressure.

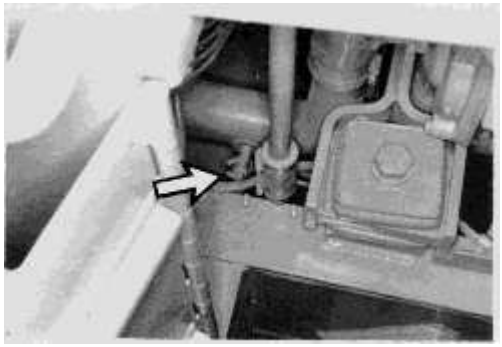
Ver imagen

Apply the parking brake.

Ver imagen

1. Loosen the radiator cap slowly to relieve any pressure. Remove the cap.

Ver imagen



2. Open the radiator drain valve and drain all the coolant from the engine and the radiator.

3. Remove all drain plugs to speed draining of the coolant. See topic Cooling System - Cleaning, under "When Required."

4. Close the drain valve and install all drain plugs.

Ver imagen

5. Mix the coolant solution, (See "Refill Capacities") to provide protection to the lowest expected ambient temperature.

Ver imagen

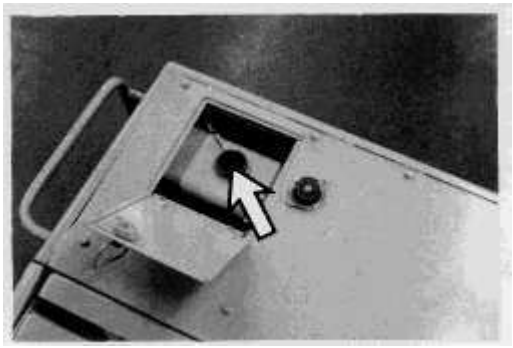
6. Add the coolant slowly, 20 liters (5 U.S. gallons) per minute or less, to the proper level.

Ver imagen

7. Add 2 liters (2 quarts) of cooling system conditioner, to provide a 3% concentration of conditioner in the system.

8. With the radiator cap removed, start the engine. Allow the coolant to warm and the coolant level to stabilize.

Ver imagen



9. Observe the coolant level. Maintain the coolant level to within 1 cm (1/2 inch) of the bottom of the fill pipe.

Ver imagen

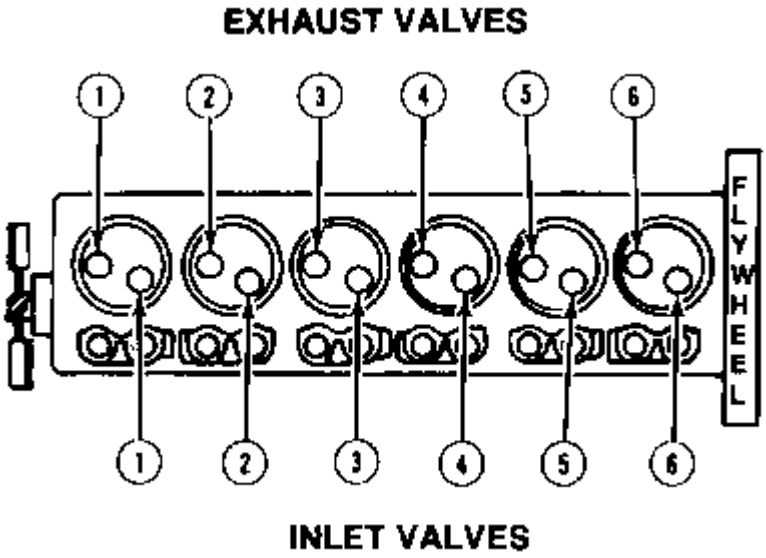
10. Stop the engine. Add more coolant if necessary.

Ver imagen

11. Inspect the radiator cap gasket. Replace it if it is damaged. Install the radiator cap.

(39)Engine Valve Lash

Ver imagen



Valve Numbering Guide

NOTICE

Adjust the valves with the engine stopped and cold.

Adjust the valve lash only if it is not within specifications.

EXHAUST VALVES - 0.64 ± 0.08 mm (.025 ± .003 inch)
INTAKE VALVES - 0.38 ± 0.08 mm (.015 ± .003 inch)

Use Caterpillar part number 5P7307 Engine Turning Tool to turn the engine. See the "966D Wheel Loader Service Manual" for valve adjustment procedure.

Fri Feb 11 2011 14:19:09 GMT-0300

Aceite para engranajes

SMCS - 7000; 7551; 7581

ATENCION

No utilice GO Cat (aceite para engranajes) o el aceite comercial para engranajes en los compartimientos de la máquina, a menos que lo recomiende Caterpillar específicamente. El aceite para engranajes puede causar la falla de los sellos. Los sellos también pueden tener fuga. Es posible que el aceite para engranajes no sea compatible con el material de fricción. El aceite puede reducir la eficacia de la transmisión y el rendimiento de los frenos.

Aplicaciones

Se recomienda el uso de aceite para engranajes para ciertas transmisiones de mando directo, diferenciales, mandos finales, mandos de la transferencia, mandos circulares (excavadoras) y para otras aplicaciones. Los detalles de las aplicaciones de estos aceites se encuentran en la sección "Viscosidad del lubricante" de esta Publicación Especial.

GO (aceite para engranajes)Cat

El aceite para engranajes (GO) Cat ofrece la protección máxima contra los daños siguientes: arañazo de los dientes del engranaje, picaduras de los dientes de los engranaje y picaduras de las piezas de los cojinetes de rodillos. El GO Cat ofrece una excelente estabilidad en condiciones de temperatura alta. El GO Cat también posee un rendimiento superior a temperaturas bajas. Este aceite también ofrece protección contra el óxido y la corrosión. Algunas aplicaciones requieren aditivos para las presiones extremas que se pueden producir en las superficies/bordes de los componentes. Para estas aplicaciones, el GO Cat proporciona la protección adicional.

Cuando se especifica el uso de aceite para engranajes, utilice GO Cat o Synthetic GO Cat para maximizar la vida útil del componente.

ATENCION

El aceite GO Cat no es igual al aceite TDTO Cat y no cumple con los requisitos de rendimiento de los aceites TO-4 o TO-4M Cat. No se debe utilizar GO Cat ni aceites comerciales para engranajes en compartimientos que especifican el uso de aceite TO-4 o TO-4M Cat.

ATENCION

El aceite GO Cat no es igual al aceite FDAO Cat y no cumple con los requisitos de rendimiento del aceite FD-1 Cat. No se debe utilizar GO Cat ni aceites comerciales para engranajes en compartimientos que especifican el uso de aceite FD-1 Cat.

Aceites comerciales para engranajes

ATENCION

Caterpillar no garantiza la calidad o el rendimiento de fluidos de marcas diferentes de Caterpillar.

Los aceites para engranajes se clasifican de acuerdo con la categoría de servicio API y el grado de viscosidad SAE que se define en el estándar "SAE J306".

Si el GO Cat o el Synthetic GO Cat no pueden utilizarse, seleccione un aceite comercial que cumpla con la especificación "API GL-5".

Nota: Los aceites comerciales para engranajes que cumplen con API GL-5 que "no son de Caterpillar" son, en conjunto, aceites de segunda opción.

Aceite multiuso para tractores

SMCS - 7000; 7581

Aplicación

Se recomienda el uso de aceites de uso múltiple para tractores en ciertos ejes, mandos finales, dirección de implementos, ejes motrices trasero y otras aplicaciones. Los detalles de las aplicaciones de estos aceites se encuentran en la sección "Viscosidad del lubricante" de esta Publicación Especial.

El aceite de uso múltiple para tractores (MTO) Cat es un aceite multigrado que puede usarse en operaciones en clima frío. Para conocer los detalles, consulte las "Tablas de viscosidad" en la sección "Viscosidades del lubricante" de esta Publicación Especial.

MTO (aceite de uso múltiple para tractores)Cat

ATENCION

El aceite MTO Cat no es igual al aceite TDTO Cat y no cumple con las especificaciones de aceites de la transmisión/tren de impulsión TO-4 o TO-4M Cat. No se debe utilizar MTO Cat en compartimientos que especifican el uso de aceite TO-4 o TO-4M Cat.

ATENCION

El aceite MTOCat no es igual al aceite FDAO Cat y no cumple con la especificación del aceite FD-1 Cat. No se debe utilizar MTO Cat en compartimientos que especifican el uso de aceite FD-1 Cat.

El MTO Cat es un aceite multigrado desarrollado, probado y aprobado por Caterpillar para proporcionar una protección óptima a los componentes en los casos en que su uso esté aprobado. El MTO Cat ofrece las siguientes cualidades de servicio: mejores frenos y embrague, mejor control y vida prolongada de los embragues y los frenos mojados, propiedades antidesgaste superiores, estabilidad térmica y resistencia a la oxidación para una vida útil más prolongada en aplicaciones exigentes.

Aceites comerciales de uso múltiple para tractores

Nota: Los aceites comerciales para tractor multiuso no fabricados por Caterpillar son, en conjunto, aceites de segunda opción.

ATENCION

Caterpillar no garantiza la calidad o el rendimiento de fluidos de marcas diferentes de Caterpillar.

Si no dispone de MTO Cat, use un aceite que cumpla las especificaciones "M2C134-D de Ford/New Holland". El aceite también debe satisfacer los requisitos de los siguientes sistemas de máquina comerciales:

- Transmisión de tractor multiuso
- Mandos hidráulicos de tractores agrícola y tractores industriales
- Mandos finales de tractores agrícolas y tractores industriales

Aceite de la transmisión automática

Los aceites de la transmisión automática están clasificados por los requisitos de rendimiento del aceite AT-1 (Transmisión automática - 1) de Cat. Caterpillar desarrolló AT-1 para su uso en las transmisiones automáticas de camiones de carretera y en las transmisiones de camiones de carretera Serie CX de Caterpillar.

El fluido de transmisión automática ATF-HD Cat es el aceite recomendado para maximizar la vida útil y el rendimiento de las transmisiones automáticas en los casos en que su uso esté recomendado.

Aplicación

Los aceites de transmisión automática se recomiendan para uso en transmisiones automáticas de camiones de carretera y en transmisiones de camiones de carretera Serie CX de Caterpillar. Consulte en el Manual de Operación y Mantenimiento para obtener más información detallada.

ATENCION

No utilice fluidos TDTO Cat en transmisiones automáticas para vehículos de carretera de la Serie CX.

ATF-HD Cat

El fluido ATF-HD Cat es un fluido de transmisión automática sintético desarrollado para brindar un rendimiento óptimo en las transmisiones de camiones de carretera Serie CX de Caterpillar. El fluido ATF Cat puede usarse en transmisiones automáticas que están diseñadas para operar con fluidos que cumplan con los requisitos de rendimiento AT-1 de Cat o Dexron-III(H). Consulte a su distribuidor Caterpillar para conocer la disponibilidad del aceite ATF-HD Cat.

El aceite ATF-HD Cat aumenta el intervalo de drenaje de aceite estándar para la transmisión automática de camiones de carretera Serie CX (4 a 6 veces) en relación con los aceites de segunda opción cuando se establece el siguiente cronograma de intervalos de mantenimiento para cambios de filtro de aceite y para muestras de aceite en el Manual de Operación y Mantenimiento para su transmisión en particular.

Nota: Se deben emplear procedimientos de calentamiento adecuados cuando la temperatura es inferior a -23° C (-10° F). A fin de mantener condiciones operativas óptimas de los componentes de cojinete, se debe permitir que el motor se caliente durante unos 20 minutos. Una alternativa es instalar un calentador de transmisión del tamaño apropiado. Siga todas las instrucciones y consulte con su distribuidor Caterpillar para conocer la operación en clima frío de las transmisiones automáticas de camiones de carretera Serie CX de Cat.

Fluidos comerciales

Los fluidos comerciales, para que puedan ser utilizados en las transmisiones automáticas de camiones de carretera Serie CX de Cat, deben cumplir con los requisitos de la especificación AT-1 Cat o con los requisitos de Dexron-III(H).

Nota: Los aceites comerciales que no son de Caterpillar y cumplen los requisitos de rendimiento AT-1 de Cat son aceites de segunda opción.

Viscosidades de lubricantes

SMCS - 1000; 7000; 7581

Selección de viscosidad

La temperatura ambiente es la temperatura del aire en la proximidad inmediata a la máquina. Esta temperatura puede diferir debido a la aplicación de la máquina a partir de la temperatura ambiente genérica de una región geográfica. Para seleccionar la viscosidad apropiada del aceite, determine **ambas** temperaturas ambiente, la de la región y la que sea posible para una aplicación dada de la máquina. Generalmente, considere la temperatura más alta como criterio para la selección de la viscosidad del aceite. Generalmente, considere la viscosidad más alta de aceite permitida para la temperatura ambiente cuando vaya a arrancar la máquina. Para obtener instrucciones, consulte las tablas de "Viscosidades de lubricantes para temperaturas ambiente". En aplicaciones de clima frío, el método recomendado es utilizar calentadores del tamaño apropiado para los compartimientos de la máquina y un aceite con un grado de viscosidad más alto. Se recomiendan los calentadores controlados por termostato que hacen circular el aceite.

El grado apropiado de viscosidad del aceite se determina según la temperatura ambiente mínima (el aire en las inmediaciones de la máquina). Ésta es la temperatura de arranque y operación de la máquina. Para determinar el grado apropiado de viscosidad del aceite, consulte la columna "Mín." de la siguiente tabla. Esta información muestra la temperatura ambiente más fría para arrancar y operar una máquina fría. Consulte la columna "Máx." en la siguiente tabla para seleccionar el grado de viscosidad del aceite para operar la máquina a la temperatura ambiente más alta que se anticipe. A menos que se especifique lo contrario, en las tablas de "viscosidades de lubricantes para temperaturas ambiente", use la viscosidad de aceite más alta permitida para la temperatura ambiente a la que se vaya a arrancar la máquina.

Las máquinas que se operan continuamente deben utilizar, en los mandos finales y en los diferenciales, aceites que tengan la viscosidad más alta. Los aceites que tengan la viscosidad más alta mantendrán el máximo espesor posible de la película de aceite. Consulte esta Publicación Especial, artículo Información general para lubricantes, tabla Viscosidades de lubricantes y cualquier nota al pie de página asociada. Consulte con su distribuidor Caterpillar si necesita información adicional.

Nota: Los aceites SAE 0W y SAE 5W, aunque permitidos para usar en compartimientos de sistemas no hidráulicos, no se recomiendan generalmente para usar en máquinas que operen continuamente o con cargas pesadas. Consulte las tablas "Viscosidades de lubricantes para temperaturas ambiente" para obtener orientación. Los aceites que tengan la viscosidad más alta mantendrán el máximo espesor posible de la película de aceite. Consulte con su distribuidor Caterpillar si necesita información adicional.

Nota: La selección del grado de viscosidad del aceite depende también del compartimiento específico de la máquina. Algunos modelos de máquina y/o compartimientos de máquina no permiten el uso de todas las clasificaciones de viscosidad disponibles. Si desea obtener instrucciones para seleccionar la viscosidad del aceite, consulte las tablas de "Viscosidades de lubricantes para temperaturas ambiente".

Nota: Como regla general, utilice la viscosidad de aceite más alta disponible para cumplir con el requisito de temperatura al momento de arrancar.

ATENCION

La viscosidad apropiada del aceite Y el tipo/especificación del aceite son necesarios para maximizar el rendimiento y la vida útil del

compartimiento de la máquina. NO use sólo la viscosidad del aceite o el tipo de aceite para hacer la selección del aceite para el compartimiento de la máquina. Si sólo usa la viscosidad o el tipo de aceite para hacer la selección del aceite para el compartimiento de la máquina, se puede reducir el rendimiento y producirse averías en el compartimiento. Consulte las tablas "Viscosidades de lubricantes para temperaturas ambiente" y TODAS las notas al pie de página correspondientes.

ATENCION

Si no sigue las recomendaciones de las tablas "Viscosidades de lubricante para temperatura ambiente" y de las notas correspondientes puede producirse una reducción del rendimiento y un fallo del compartimiento.

ATENCION

En condiciones frías, puede ser necesario seguir el procedimientos de calentamiento de la máquina o calor suplementario para el compartimiento de fluido de la máquina. Los procedimientos de calentamiento específicos de la máquina se pueden encontrar normalmente en el Manual de Operación y Mantenimiento de la máquina. Además, los procedimientos genéricos de calentamiento de la máquina se pueden encontrar en esta Publicación Especial, "Procedimientos para máquinas que se usan en climas fríos - (Genérico)". Algunas tablas de "Viscosidades de lubricantes para temperaturas ambiente" de esta Publicación Especial incluyen notas al pie de página que tratan el calentamiento del compartimiento.

Información general sobre lubricantes

La información que se brinda en este artículo y las tablas sobre "Viscosidades de lubricantes para temperaturas ambiente" deben usarse junto con la información que se proporciona en la sección "Especificaciones de lubricante" (Sección de Mantenimiento) de esta Publicación Especial.

ATENCION

Caterpillar no garantiza la calidad o rendimiento de los fluidos y grasas que no sean de Caterpillar.

ATENCION

Si no sigue las recomendaciones de esta Publicación Especial puede producirse una reducción del rendimiento y falla del compartimiento.

ATENCION

NO use las viscosidades del aceite sólo para determinar el aceite recomendado para un compartimiento del motor. También DEBE usarse el tipo de aceite (especificación).

Nota: Algunos modelos de máquinas o compartimientos de máquina NO permiten el uso de todos los grados de viscosidad disponibles.

Nota: Utilice el tipo y la especificación de aceite que se recomienden para los distintos compartimientos de la máquina.

Nota: Para algunos compartimientos de la máquina se permite el uso de más de un tipo de aceite. Para obtener los mejores resultados, no mezcle distintos tipos de aceite.

Nota: Aceites de diferentes marcas usan diferentes paquetes de aditivos para cumplir las diversas recomendaciones de especificación de rendimiento para compartimientos de máquinas. Para obtener los mejores resultados, no mezcle aceites de distintas marcas.

Nota: La disponibilidad de los distintos aceites Caterpillar varía según la región.

Nota: El aceite de grado de viscosidad SAE 10W de la mayoría de los compartimientos de las máquinas Caterpillar debe tener una viscosidad mínima de 5,8 cSt a 100 °C (212 °F) ("ASTM D445").

Nota: La viscosidad mínima aceptable para los aceites alternativos comerciales en la mayoría de los sistemas hidráulicos y de transmisiones hidrostáticas de las máquinas Caterpillar es de 6,6 cSt a 100 °C (212 °F) ("ASTM D445").

El aceite GO Cat (aceite para engranajes) está disponible en los grados de viscosidad SAE 80W-90 y SAE 85W-140.

El aceite Cat Synthetic GO tiene un grado de viscosidad SAE 75W-140.

El aceite FDAO Cat (aceite para ejes y mandos finales) supera los requisitos de rendimiento de aceite FD-1 de Cat.

El aceite TDTO-TMS Cat (aceite de la transmisión multiclima) es una mezcla sintética que supera los requisitos de rendimiento de aceite TO-4M multigrado Cat.

Nota: Los aceites Caterpillar son los**recomendados**. TODOS los demás tipos y especificaciones de aceite que se indican en la sección correspondiente son aceites aceptables.

Cuando esté operando la máquina a temperaturas por debajo de -20°C (-4°F), consulte la Publicación Especial, SEBU5898, "Recomendaciones para clima frío". Lo puede obtener por medio de su distribuidor Caterpillar.

Para aplicaciones de clima frío para las que se recomienda aceite de la transmisión SAE 0W-20, la opción número uno es el aceite TDTO Cat para clima frío. La segunda opción para aplicaciones de la transmisión en clima frío son los aceites comerciales de base completamente sintética sin mejorados del índice de viscosidad que cumplen con los requisitos de rendimiento de la especificación TO-4 de Cat. Los grados de viscosidad del lubricante típicos son SAE 0W-20, SAE 0W-30 y SAE 5W-30. La última opción son los aceites comerciales que contienen un paquete de aditivos TO-4 Cat y un grado de viscosidad del lubricante de SAE 0W-20, SAE 0W-30 o SAE 5W-30.

Las notas al pie de página son una parte fundamental de las tablas. Lea TODAS las notas de pie de página relacionadas con el compartimiento de la máquina en cuestión.

Tabla 1

Recomendaciones para el tren de fuerza, transmisiones y fluidos hidráulicos, además de requisitos de rendimiento de Caterpillar		
Preferido	**Requisitos mínimos aceptables de rendimiento para aceites comerciales**	**Aplicación**
HYDO Advanced Cat	Según requisitos de Hoja de datos de producto	Sistemas hidráulicos y transmisiones hidrostáticas
Bio HYDO Advanced Cat	Cat BF-2	Sistemas hidráulicos y transmisiones hidrostáticas que requieren líquidos biodegradables
TDTO Cat	Cat TO-4	Servotransmisiones, algunas transmisiones de mando directo, mandos finales y mandos de transferencia de muchas máquinas
TDTO-TMS Cat	Cat TO-4M	
Cat ATF	Cat AT-1	Transmisiones automáticas de camión en carretera
Cat FDAO, Cat FDAO SYN	Cat FD-1	Ejes y mandos finales muy cargados que no tienen materiales de fricción
Aceite para engranajesCat	API GL-5	Engranajes y cojinetes de rodillos donde se requieren aditivos de presión extrema.

Organización de las tablas

La tabla 2 es para todos los motores de máquinas Cat. Esto se aplica a todos los aceites que se recomiendan para el cárter del motor.

La tabla 3 es para todos los sistemas hidráulicos y transmisiones hidrostáticas de máquinas Cat. Esto se aplica a todos los aceites que se recomiendan para sistemas hidráulicos de máquinas, bombas y válvulas. Esto se aplica a todos los aceites que se recomiendan para las transmisiones hidrostáticas de las máquinas.

Todas las demás tablas aparecen en las categorías de línea de producto. Estas tablas contienen información sobre otros compartimientos de la máquina y las recomendaciones de lubricación para cada compartimiento. Algunos compartimientos de la máquina permiten el uso de más de de un tipo de aceite. Algunos compartimientos de la máquina restringen el uso de ciertos tipos de aceite. Estas tablas contienen todas las excepciones a las primeras dos tablas. Consulte con su distribuidor Caterpillar si necesita información adicional sobre cualquiera de las excepciones.

Al final de esta sección se incluyen aplicaciones especiales. Esto incluye motor de arranque y ventilador de inclinación variable. Si no encuentra un compartimiento en la categoría de producto, revise esta tabla. Consulte con su distribuidor Caterpillar si necesita información adicional sobre aplicaciones especiales.

Nota: En las tablas de las secciones de línea de productos aparecen las excepciones a la información de las tablas comunes.

las tablas comunes.

Todos los motores de máquinas Cat

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de los mismos.

Se recomienda un calentamiento adicional para los arranques extremadamente fríos por debajo de la temperatura ambiente mínima. La carga parásita y otros factores determinan si se necesita calentamiento adicional para los arranques extremadamente fríos por encima de la temperatura ambiente mínima determinada. Los arranques extremadamente fríos ocurren cuando el motor no se ha operado durante un cierto período de tiempo. El aceite se torna más viscoso debido a las temperaturas ambiente más frías.

Para conocer las recomendaciones de aceites para motores certificados que cumplan con las normativas EPA nivel 4, motores aprobados de la UE etapa IIIB y IV y motores aprobados para Japón Paso IV, consulte la sección "Aceite del Motor" en esta Publicación Especial.

Consulte la sección "Información sobre lubricantes" en esta Publicación Especial para obtener una lista de todos los aceites del motor Cat.

DEO-ULS SYN Cat y DEO SYN Cat son aceites con grado de viscosidad SAE 5W-40.

El aceite Cat DEO-ULS para clima frío es de grado de viscosidad SAE 0W-40.

ECF de Cat hace referencia a las especificaciones de fluidos para el cárter del motor. Consulte la sección "Mantenimiento" en esta Publicación Especial, "Información sobre Lubricantes" para obtener más detalles. Los aceites comerciales alternativos para motores diésel deben cumplir una o más de estas especificaciones ECF de Cat.

Nota: El aceite SAE 10W-30 es el grado de viscosidad recomendado para los motores diésel 3116, 3126, C7, C-9, y C9 cuando la temperatura ambiente se encuentra entre -18 °C (0 °F) y 40 °C (104 °F).

Nota: Los motores diésel serie C175 requieren el uso de aceites SAE 40 **multigrado**. Por ejemplo: SAE 0W-40, SAE 5W-40, SAE 10W-40 o SAE 15W-40. En temperaturas ambiente de -9,5 °C (15 °F) o por encima, SAE 15W-40 es el aceite con grado de viscosidad recomendado

Si las condiciones de temperatura ambiente al arrancar el motor requieren el uso de aceite multigrado SAE 0W, el grado de viscosidad SAE 0W-40 es generalmente el recomendado en lugar del SAE 0W-30.

Tabla 2

Viscosidades de lubricantes para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
Cárter del motor de	**Cat DEO-ULS Cat DEO Cat DEO-ULS SYN Cat DEO SYN**	SAE 0W-40	-40	40	-40	104
		SAE 5W-30	-30	30	-22	86
		SAE 0W-30	-40	30	-40	86
		[illegible]	[illegible]	50	-22	[illegible]

todas las máquinas	**Cat DEO-ULS para clima frío Cat ECF-1-a, Cat ECF-2, Cat ECF-3**	SAE 5W-40	-30			122
		SAE 10W-30	-18	40	0	104
		SAE 10W-40	-18	50	0	122
		SAE 15W-40	-9,5	50	15	122

Todos los sistemas hidráulicos de máquinas y transmisiones hidrostáticas de máquinasCat

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

HYDO Advanced 10 Cat SAE 10W, HYDO Advanced 30 Cat SAE 30W o BIO HYDO Advanced Cat son los aceites recomendados para utilizar en la mayoría de los sistemas hidráulicos y de transmisiones hidrostáticas de las máquinas Caterpillar. **Los fluidos HYDO Advanced Cat presentan un aumento del 50% en el intervalo estándar de drenaje de aceite** para los sistemas hidráulicos de máquinas (3.000 horas en contraposición a 2.000 horas) en comparación con los aceites de segunda y tercera opción, cuando se sigue el programa del intervalo de mantenimiento de cambio de los filtros de aceite y de muestreo de aceite que se indica en el Manual de Operación y Mantenimiento de su máquina. Se logran intervalos de drenaje del aceite de 6.000 horas cuando se utiliza el análisis de aceite del programa de servicios S·O·S. Consulte con su distribuidor Caterpillar para obtener detalles. Para aprovechar al máximo el rendimiento mejorado de los fluidos diseñados HYDO Advanced Cat, cuando se cambia a fluidos HYDO Advanced Cat, la contaminación interna con el aceite anterior debe mantenerse por debajo del 10%.

Los aceites de segunda opción son MTO Cat, DEO Cat, DEO-ULS Cat, TDTO Cat, TDTO para clima frío Cat, TDTO-TMS Cat, DEO-ULS SYN Cat, DEO SYN Cat, DEO-ULS para clima frío Cat. **Los aceites de tercera opción** son aceites comerciales que cumplen con los estándares ECF-1-a de Cat, ECF-2 de Cat, ECF-3 de Cat, TO-4 de Cat o con los requisitos de rendimiento TO-4M de Cat, y que tienen un nivel de aditivo de zinc del 0,09 por ciento (900 ppm). El aceite comercial hidráulico biodegradable tiene que cumplir con la especificación BF-2 de Cat. Consulte el Manual de Operación y Mantenimiento de la máquina o consulte con su distribuidor Caterpillar local antes de usar aceites comerciales que cumplan con Cat BF-2 en excavadoras hidráulicas Cat.

La viscosidad mínima aceptable para los aceites alternativos comerciales utilizados en la mayoría de los sistemas hidráulicos y de transmisiones hidrostáticas de las máquinas Cat es de 6,6 cSt a 100 °C (212 °F) ("ASTM D445").

Nota: Para máquinas equipadas con martillos hidráulicos, no use aceites con grado de viscosidad SAE 0W o SAE 5W. Consulte la sección "Aplicaciones Especiales" en este artículo.

Tabla 3

Viscosidades de lubricantes para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
		SAE 0W-20	-40	40	-40	104

Sistema hidráulico y transmisiones hidrostáticas Motor de rotación y sistemas del motor de desplazamiento	**HYDO Advanced 10Cat HYDO Advanced 30 Cat Cat BIO HYDO Advanced** MTO Cat Cat DEO-ULS Cat DEO Cat DEO-ULS SYN Cat DEO SYN TDTO Cat TDTO-TMS Cat Cat DEO-ULS para clima frío Cat TDTO para clima frío Cat ECF-1-a, Cat ECF-2, Cat ECF-3, Cat TO-4, Cat TO-4M, Cat BF-2	[illegible]				
		SAE 0W-40	-40	40	-40	104
		SAE 0W-30	-40	40	-40	104
		SAE 5W-40	-30	40	-22	104
		SAE 10W	-20	50	-4	122
		SAE 30	10	50	50	122
		Bio HYDO Advanced	-40	40	-40	104
		SAE10W-30	-20	40	-4	104
		SAE15W-40	-15	50	5	122
		MTO Cat	-20	40	-4	104
		TDTO-TMS Cat	-15	50	5	122

Camiones articulados

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos:

- 725 a 740

Para obtener información sobre camiones articulados subterráneos para minería, consulte la sección Minería subterránea en este artículo.

En la mayoría de las aplicaciones de Diferenciales y Mandos Finales serie E II y serie 700, se recomienda utilizar TDTO Cat SAE 50 o un aceite comercial que cumpla con los requisitos de rendimiento TO-4 de Cat de SAE 50, particularmente en la operación continua. Si la temperatura ambiente está por debajo de -15 °C (5 °F), caliente el aceite antes de la operación. Se debe mantener el aceite a una temperatura mayor que -15 °C (5 °F) durante la operación. Si la temperatura ambiente está por debajo de -15 °C (5 °F), siga los procedimientos que se indican en el tema del Manual de Operación y Mantenimiento, "Calentamiento y asentamiento del diferencial" antes de iniciar la operación. Si la temperatura ambiente está por debajo de -25 °C (-13 °F), consulte con el distribuidor Caterpillar para obtener instrucciones. Si no se calienta el aceite antes de operar la máquina, ésta puede dañarse.

En el caso de Diferenciales y Mandos Finales serie E II y serie 700, NO utilice aceites SAE 0W-20 cuando la temperatura ambiente máxima diaria sea mayor que -10 °C (14 °F).

Tabla 4

Viscosidades de lubricantes de camiones articulados para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
	TDTO Cat TDTO-TMS	SAE 0W-20	-40	10	-40	50
			-20	10		

Servotransmisiones	Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 10W	-20	-10	-4	50
		SAE 30	0	50	32	122
		TDTO-TMS Cat	-10	50	14	122
Dispositivo de levantamiento (eyector), dirección y sistema de frenos, amortiguador de la válvula de control de los frenos y sistema hidráulico de suspensión para la Serie E II y la Serie 700	TDTO Cat TDTO para clima frío Cat Cat TO-4	SAE 0W-20 (1)	-40	40	-40	104
		SAE 10W (1)	-20	50	-4	122
Diferenciales y mandos finales (excepto Camiones Articulados de la Serie E II y la Serie 700)	GO Cat (aceite para engranajes) Cat Synthetic GO Aceite para engranajes API GL-5	SAE 75W-90	-30	40	-22	104
		SAE 75W-140	-30	45	-22	113
		SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122
		SAE 90	0	40	32	104
Diferenciales y mandos finales para Camiones Articulados de la Serie E II y la Serie 700	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	-10	-40	14
		SAE 50	-15	40	5	104
		SAE 60	-10	50	14	122
		TDTO-TMS Cat	-25	22	-13	72
Engranaje de transferencia de salida para Camiones Articulados de la Serie E II y la Serie 700	TDTO Cat TDTO para clima frío Cat Cat TO-4	SAE 0W-20	-40	-10	-40	14
		SAE 30	-20	50	-4	122

(1) La viscosidad máxima permisible del aceite a 100 °C es 6,6 cSt (ASTM D445).

Retroexcavadoras cargadoras

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de los mismos.

Esta sección incluye, entre otros, los siguientes modelos:

- 416 a 450

Tabla 5

Viscosidades de lubricantes de los retroexcavadoras cargadoras para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
Servotransmisión	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122
		TDTO-TMS Cat	-20	43	-4	110
		SAE 75W-90	-30	40	-22	104
		SAE 75W-140	-30	45	-22	113

Diferenciales y mandos finales para ciertas retroexcavadoras cargadoras (1)	GO (Aceite para Engranajes) Cat Cat Synthetic GO Aceite para engranajes API GL-5	SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122
		SAE 90	0	40	32	104
		FDAO Syn Cat	-15	50	5	122
Sistemas hidráulicos para retroexcavadoras cargadoras con desplazamiento lateral	**HYDO Advanced 10Cat Cat Bio HYDO Advanced** Cat TDTO para clima frío Cat BF-2 Cat TO-4	SAE 0W-20	-40	40	-40	104
		SAE 0W-30	-40	40	-40	104
		SAE 10W	0 (-20)	40	32	104
		Bio HYDO Advanced	-40	40	-4	104

(1) Consulte la tabla 6.

Ejes traseros de retroexcavadora cargadora

Estas recomendaciones son para las retroexcavadoras cargadoras con un eje trasero fijo (dirección en 2 ruedas). Para las retroexcavadoras cargadoras con ejes traseros de dirección en todas las ruedas (AWS), consulte las recomendaciones de lubricantes en el Manual de Operación y Mantenimiento de la máquina.

Se puede usar 197-0017 adicional para reducir el ruido del freno.

No use MTO Cat ni aceite comercial de especificación M2C134-D con los discos de freno 230-4017. No use MTO Cat ni aceite comercial de especificación M2C134-D en el eje traseros de la retroexcavadora cargadora de la serie E.

Tabla 6

Viscosidades de lubricantes para temperaturas ambiente para ejes traseros de retroexcavadoras cargadoras								
Retroexcavadoras cargadoras	**Número de pieza de disco de freno**	**Volumen de aditivo 197-0017**	**Tipo de aceite y requisitos de rendimiento para eje trasero**	**Grado de viscosidad del aceite**	**°C**		**°F**	
					Mín	**Máx**	**Mín**	**Máx.**
Serie B, C, D	133-7234	1L (1,1 cuartos) (1)	MTO o M2C134-D Cat					
Serie B, C, D	133-7234	1L (1,1 cuartos) (1)	Cat TDTO 30 o Cat TO-4 30					

Serie B, C, D	230-4017	150 mL (5,1 oz) (2)	Cat TDTO 30 o Cat TO-4 30	SAE 30	-25	40	-13	104
416E 420E 422E 428E 430E 432E 434E 444E	238-5291	500 mL (17,0 oz) (3)	Cat TDTO 30 o Cat TO-4 30					
450E	288-7303	200 mL (6,8 oz) (4)	Cat TDTO 30 o Cat TO-4 30					

(1) La cantidad máxima de 197-0017 para este freno es de 2 L (2,1 cuartos).
(2) La cantidad máxima de 197-0017 para este freno es de 300 mL (10,2 oz).
(3) La cantidad máxima de 197-0017 para este freno es de 550 mL (18,7 oz).
(4) La cantidad máxima de 197-0017 para este freno es de 250 mL (8,5 oz).

Excavadoras, palas frontales, excavadoras de gran volumen, excavadoras de demolición y manipuladores de material de cadenas

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca estos.

Esta sección incluye, entre otros, los siguientes modelos de Excavadoras:

- 301 a 390

Esta sección incluye, entre otros, los siguientes modelos de Palas Frontales:

- 5090 a 5230 y 385

Esta sección incluye, entre otros, los siguientes modelos de Excavadoras de Gran Volumen:

- 365 a 385 y 5110 a 5230

Esta sección incluye, entre otros, los siguientes modelos de Excavadoras de Demolición:

- 330 a 385

Esta sección incluye, entre otros, los siguientes modelos de Manipuladores de Material de Cadenas:

- 320 a 385

Para aplicaciones de mando final que requieran aceites SAE 0W-30 o 5W-30, son aceptables mejoradores de base sintética total sin índice de viscosidad que cumplan con los requisitos de la especificación TO-4 de Cat de SAE 30. Los grados de viscosidad del lubricante típicos son SAE 0W-20, SAE 0W-30 y SAE 5W-30. **Segunda opción:** Aceites que contienen un paquete de aditivos TO-4 Cat y un grado de viscosidad del lubricante SAE 0W-20, SAE 0W-30 o SAE 5W-30.

Tabla 7

Excavadoras, palas frontales, excavadoras de gran volumen, excavadoras de demolición y manipuladores de material de cadenas Viscosidades de lubricantes para temperaturas ambiente				

Compartimiento o sistema	Requisitos de tipo y rendimiento del aceite	Grado de viscosidad del aceite	°C		°F	
			Mín	Máx	Mín	Máx.
Mandos finales y mandos de rotación	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	0	-40	32
		SAE 10W	-30	0	-22	32
		SAE 30	-25	25	-13	77
		SAE 50	-15	50	5	122
		TDTO-TMS Cat	-30	25	-22	77
Resorte tensor del bastidor de rodillos de cadena y cojinetes del eje de pivote	TDTO Cat Cat TDTO-TMS TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	0	-40	32
		SAE 10W	-30	0	-22	32
		SAE 30	-20	25	-4	77
		SAE 40	-10	40	14	104
		SAE 50	0	50	32	122
		TDTO-TMS Cat	-25	25	-13	77
Ruedas guía y rodillos de cadena	Cat DEO (grado único) Cat DEO SYN Cat DEO-ULS SYN Cat ECF-1-a ECF-2 Cat ECF-3 Cat CF API	SAE 30	-20	25	-4	77
		SAE 5W-40	-35	40	-31	104

Miniexcavadora hidráulica

Tabla 8

Viscosidades de lubricantes de las miniexcavadoras hidráulicas para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
		SAE 75W-90	-30	40	-22	104

Diferenciales y mandos finales	**GO Cat (aceite para engranajes) Cat Synthetic GO Aceite para engranajes API GL-5**	SAE 75W-140	-30	45	-22	113
		SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122
		SAE 90	0	40	32	104
Resorte tensor del bastidor de rodillos y cojinetes del eje de pivote	**TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	0	-40	32
		SAE 10W	-30	0	-22	32
		SAE 30	-20	25	-4	77
		SAE 40	-10	40	14	104
		SAE 50	0	50	32	122
		TDTO-TMS Cat	-25	25	-13	77

Aplicación forestal

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos de Cargadores de Troncos:

- 320 a 345

Esta sección incluye, entre otros, los siguientes modelos de Taladores Apiladores de Ruedas:

- 533 a 573

Esta sección incluye, entre otros, los siguientes modelos de Taladores Apiladores de Cadenas:

- TK711 a TK722
- TK1051 a TK1162
- 511 a 552

Esta sección incluye, entre otros, los siguientes modelos de Cosechadoras de Cadenas:

- 320 y 501

Esta sección incluye, entre otros, los siguientes modelos de Arrastradores de Troncos de Cadenas:

- 517 a 527

Esta sección incluye, entre otros, los siguientes modelos de Arrastradores de Troncos de Ruedas:

- 515 a 545

Esta sección incluye, entre otros, los siguientes modelos de Cargadores de Pluma Recta:

- 519 y 579

El aceite comercial hidráulico biodegradable (HEES) debe cumplir con la especificación BF-2 de Caterpillar.

SAE 15W-40 MTO Cat es el grado de viscosidad preferido para el sistema hidráulico de inclinación del capó cuando la temperatura ambiente es inferior a -15 °C (+5 °F) y no llega a superar los 40 °C (104 °F).

Tabla 9

Viscosidades de lubricantes de aplicaciones forestales para temperaturas ambiente

Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
Servotransmisiones	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	50	32	122
		TDTO-TMS Cat	-10	50	14	122
		SAE 50W	10	50	50	122
Mando final y mando de rotación	TDTO **Cat TDTO-TMS Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	0	-40	32
		SAE 10W	-30	0	-22	32
		SAE 30	-25	25	-13	77
		SAE 50	-15	50	5	122
		TDTO-TMS	-30	25	-22	77
	Cat DEO (grado único) Cat DEO SYN Cat DEO ULS	SAE 30	-20	25	-4	77

Ruedas guía y rodillos de cadena	Cat DEO-ULS SYN Cat ECF-1-a ECF-2 Cat ECF-3 Cat CF API					
		SAE 5W-40	-35	40	-31	104
Ventilador de inclinación variable	**Cat DEO-ULS SYN** **Cat DEO SYN** **Cat DEO-ULS para clima frío** **Cat ECF-1-a** ECF-2 **Cat** ECF-3 **Cat**	SAE 0W40	-40	40	-40	104
		SAE 5W40	-40	50	-40	122
Ejes motrices para Arrastradores de Troncos de Ruedas (525-545) y Taladores Apiladores de Ruedas (533, 573)	TDTO **Cat** TDTO-TMS **Cat** **TDTO para clima frío Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	0	-40	32
		SAE 10W	-25	15	-13	59
		SAE 30	-20	43	-4	110
		SAE 50	10	50	50	122
		TDTO-TMS Cat	-30	43	-22	110
Mandos finales para arrastradores de troncos de cadenas de gran tamaño (máquinas con cadenas de acero con mandos finales elevados, excepto los modelos 561M y 561N)	FDAO Cat FDAO SYN Cat TDTO Cat TDTO-TMS Cat Cat FD-1, Cat TO-4, Cat TO-4M	SAE 60	-7	50	19	122
		SAE 50	-15	32	5	90
		SAE 30	-25	15	-13	59
		TDTOTMS Cat	-35	15	-31	59
		FDAO SYN Cat	-15	50	5	122

Motoniveladoras

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos:

- 12 a 24
- 120 a 163

Para el mando en tándem, añada 0,015 L (0,015 cuartos de galón) de aditivo de aceite **1U-9891** por 1 L (1 cuarto de galón) de aceite.

Tabla 10

Viscosidades de lubricantes de las motoniveladoras para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo y rendimiento del aceite**	**Grado de viscosidad del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**

Transmisión, diferencial y mando final	Cat TDTO TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122
		TDTO-TMS Cat	-20	43	-4	110
Mando en tándem y cojinetes de punta de eje de rueda	**TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M**	SAE 0W-20	-40	0	-40	32
		SAE 10W	-30	0	-22	32
		SAE 30	-20	25	-13	77
		SAE 50	-15	50	5	122
		TDTO-TMS Cat	-30	25	-22	77
Caja de engranajes de tracción en todas las ruedas	TDTO Cat Cat TO-4	SAE 50	-15	50	5	122
Mando circular, excepto las Series 16H, 24H, 16M y 24M	GO Cat (aceite para engranajes) Cat Synthetic GO Aceite para engranajes API GL-5	SAE 75W-90	-30	40	-22	104
		SAE 75W-140	-30	45	-22	113
		SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122
		SAE 90	0	40	32	104
Mando circular de motoniveladoras para las Series 16H, 24H, 16M y 24M	FDAO-Syn Cat Cat FD-1	FDAO Syn Cat	-15	50	5	122
Sistemas hidráulicos para	HYDO Advanced 10 **Cat** HYDO Advanced 30 **Cat** Bio HYDO Advanced **Cat**	SAE 0W-20	-40	40	-40	104
		SAE 0W-40	-25	40	-13	104
		SAE 0W-30	-40	40	-40	104

Sistemas hidráulicos para Motoniveladoras de la Serie M	**Cat DEO-ULS para clima frío** TDTO para clima frío Cat Cat BF-2 Cat TO-4 ECF-2 Cat ECF-3 Cat					
		SAE 10W	-15	40	5	104
		SAE 30	20	50	68	122
		Bio HYDO Advanced	-25	40	-13	104

Camiones de obras

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos:

- 769 a 797

Algunos convertidores de par de camiones de obras tienen un sumidero común con la transmisión. Por lo tanto, estos convertidores de par utilizan las mismas recomendaciones de fluidos que la transmisión. Entre los modelos de camiones de obras afectados se incluyen los siguientes: 769D, 770, 771D, 772, 773D, 773E, 773F, 775D, 775E, 775F, 793C-F, y todos los modelos 797.

Para la mayoría de diferenciales, ruedas delanteras y mandos finales, se recomienda utilizar FDAO SYN Cat, FDAO Cat SAE 60 o un aceite comercial que cumpla con la especificación FD-1 de SAE 60 de Cat, particularmente en la operación continua. Si la temperatura ambiente está por debajo de -10 °C (14 °F), caliente el aceite antes de la operación. Hay que mantener el aceite a una temperatura superior a los -10°C (14°F) durante la operación. Si la temperatura ambiente está por debajo de -10°C (14°F), siga los procedimientos indicados en el Manual de Operación y Mantenimiento, "Calentamiento y asentamiento del diferencial" antes de la operación. Si la temperatura ambiente es inferior a -25°C (-13°F) (por debajo de -35°C (-31°F) para el FDAO SYN Cat), pida instrucciones a su distribuidor Caterpillar. Si no se calienta el aceite antes de operar la máquina, ésta puede dañarse.

Tabla 11

Viscosidades de lubricantes de los camiones de obras para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
		SAE 0W-20	-40	10	-40	50

Servotransmisiones, excepto para los modelos que se enumeran a continuación	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4	SAE 10W	-20	10	-4	50
		SAE 30	0	50	32	122
		TDTO-TMS Cat	-10	50	14	122
Servotransmisión en 797 (todos los modelos)	TDTO Cat Cat TO-4	SAE 30	-6	50	-6	122
Servotransmisión para 768C, 768D, 769C, 769D, 770, 771C, 771D y 772	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	22	-40	72
		SAE 10W	-20	22	-4	72
		SAE 30	10	50	50	122
		TDTO-TMS Cat	10	50	50	122
Sistema de dirección, excepto para 785D, 793D, 793F, 795F, 797(todos los modelos)	HYDO Advanced 10 **Cat** HYDO Advanced 30 **Cat** Bio HYDO Advanced **Cat** MTO Cat Cat DEO Cat DEO-ULS TDTO Cat TDTO para clima frío Cat TDTO-TMS Cat Cat DEO-ULS SYN Cat DEO SYN Cat DEO-ULS para clima frío Cat ECF-1-a, Cat ECF-2, Cat ECF-3, Cat BF-2 Cat TO-4, Cat TO-4M	SAE 0W-20	-40	40	-40	104
		SAE 0W-40	-40	40	-40	104
		SAE 0W-30	-40	40	-40	104
		SAE 5W-30	-30	40	-22	104
		SAE 5W-40	-30	40	-22	104
		SAE 10W	-20	40	-4	104
		SAE 30	10	50	50	122
		Bio HYDO Advanced	-40	40	-4	104
		SAE 10W-30	-20	40	-4	104
		SAE 15W-40	-15	50	5	122
		MTO Cat	-20	40	-4	104
		TDTO-TMS Cat	-15	50	5	122

Sistema de dirección para 785D, 793D, 793F, 795F, 797B y 797F	**HYDO Advanced 30 Cat Bio HYDO Advanced Cat** Cat BF-2 TDTO 30 Cat TDTO-TMS Cat Cat DEO-ULS Cat DEO Cat DEO-ULS Syn Cat DEO-ULS para clima frío Cat ECF-1-a, Cat ECF-2, Cat ECF-3 Cat TO-4, Cat TO-4M	SAE 30	-5	50	23	122
		TDTO-TMS Cat	-15	50	5	122
		SAE 15W-40	-15	50	5	122
		SAE 0W-30	-40	25	-40	77
		SAE 5W-40	-30	40	-22	104
Dispositivo de levantamiento, convertidor de par y sistema de frenos	TDTO **Cat TDTO para clima frío Cat Cat TO-4**	SAE 0W-20	-40	40	-40	104
		SAE 10W	-20	50	-4	122
Diferencial, ruedas delanteras y mandos finales	FDAO **Cat** FDAO SYN **Cat Cat FD-1**	SAE 50	-10	32	14	90
		SAE 60	-10	50	14	122
		FDAO SYN Cat	-10	50	14	122

Aplicaciones especiales para camiones de obras

Tabla 12

Camión de Obras 795F AC Viscosidades de lubricantes para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
Escalera energizada	TDTO Cat Cat TO-4	SAE 10W	0	50	32	122
	TDTO para clima frío Cat	SAE 0W-20	0	50	32	122
	MIL-H-5606A	MIL-H-5606A	-40	40	-40	104

Pavimentación

Esta sección incluye, entre otros, los siguientes modelos:

- CS-323 a CS-683
- CP-323 a CP-663
- CB-14 a CB-34
- CB-114 a CB-634
- CC-24 a CC-34
- CS-44 a CS-76
- CP-44 a CP-76
- AS-2251 a AS-4251
- PS-150 a PS-360
- PF-300
- PM-102 a PM-565
- RM-250 a RM-500
- AP-500 a AP-1055
- BG-225 a BG-2455

No utilice aceites con un grado de viscosidad SAE 50 en las transmisiones controladas por ICM. No utilice aceites con un grado de viscosidad SAE 50 para la caja de cabrestante del mando hidráulico.

Se recomienda utilizar TDTO Cat SAE 50 o TO-4 Cat SAE 50 en la mayoría de las aplicaciones, particularmente en la operación continua. Si la temperatura ambiente está por debajo de -15 °C (5 °F), caliente el aceite antes de la operación. El aceite se debe mantener a una temperatura mayor que -15°C (5°F) durante la operación. Si la temperatura ambiente es menor que -15°C (5°F), efectúe los procedimientos del Manual de Operación y Mantenimiento, "Calentamiento del motor y de la máquina" antes de la operación. Si la temperatura ambiente está por debajo de -25°C (-13°F), consulte con su distribuidor Caterpillar para obtener instrucciones. Si no se calienta el aceite antes de operar la máquina, ésta puede dañarse.

Tabla 13

Viscosidades de lubricantes de pavimentación para temperaturas ambiente

Compartimiento o sistema	Requisitos de tipo de aceite y rendimiento	Viscosidades del aceite	°C		°F	
			Mín	Máx	Mín	Máx.
Servotransmisión, transmisiones manuales	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122
		TDTO-TMS Cat	-20	43	-4	110
Transmisión hidrostática, excepto para Compactadores Neumáticos PS-150B s/n:3XR00621-Up, PS-200B s/n:5JR00393-Up, PS-360B s/n:9LS00259-Up, PS-150C y PS360C	**HYDO Advanced 10 Cat** **HYDO Advanced 30 Cat** **Bio HYDO Advanced Cat** MTO Cat Cat DEO Cat DEO-ULS TDTO Cat TDTO para clima frío Cat TDTO-TMS Cat Cat DEO-ULS SYN Cat DEO SYN Cat DEO-ULS para clima frío Cat ECF-1-a, Cat ECF-2, Cat ECF-3, Cat BF-2 Cat TO-4, Cat TO-4M	SAE 0W-20	-40	40	-40	104
		SAE 0W-40	-40	40	-40	104
Sistemas hidráulicos, compactadores de asfalto, excepto para las siguientes máquinas: algunos Compactadores de Asfalto, Compactadores Neumáticos PS-150B s/n:3XR00621-Up, PS-200B s/n:5JR00393-Up, PS-360B s/n:9LS00259-Up, PS-150C y PS360C		SAE 0W-30	-40	40	-40	104
		SAE 5W-40	-30	40	-22	104
		SAE 10W	-20	40	-4	104
		SAE 30	10	50	50	122
		Bio HYDO Advanced	-40	40	-40	104
		SAE 10W-30	-20	40	-4	104
		SAE 15W-40	-15	50	5	122
		MTO Cat	-20	40	-4	104
		TDTO-TMS Cat	-15	50	5	122
Ejes motrices para Compactadores Medianos (815-826), números de modelos de compactadores	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat	SAE 0W-20	-40	0	-40	32
		SAE 10W	-25	15	-13	59
		SAE 30	-20	43	-4	110

vibratorios de suelos con la letra E o un sufijo superior	clima frío Cat Cat TO-4, Cat TO-4M					
		SAE 50	10	50	50	122
		TDTO-TMS Cat	-30	43	-22	110
Ejes motrices para compactadores de gran tamaño	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	-10	-40	14
		SAE 10W	-25	0	-13	32
		SAE 30	-20	20	-4	68
		SAE 50	-10	50	14	122
		TDTO-TMS Cat	-25	22	-13	72
Ejes para Compactadores Vibratorios de Suelos de la Serie 500, modelos con el sufijo D o inferior	MTO Cat M2C 134-D comercial	SAE 10W-30	-25	40	-13	104
Caja de las pesas excéntricas del compactador vibratorio (4), tambor planetario de mandos finales y soporte vibratorio	Aceite sintético Cat para compactadores		-40	21	-40	70
			-20	50	-4	122

Tabla 14

Viscosidades de lubricantes de pavimentación especial para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
Mando final de propulsión	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 50	10	50	50	122
		TDTO-TMS Cat	-20	43	-4	110
Reductores de sinfines, transportadores y mandos de bomba	GO Cat (aceite para engranajes) Cat Synthetic GO Aceite para engranajes API GL-5	SAE 75W-90	-30	40	-22	104
		SAE 75W-140	-30	45	-22	113
		SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122

		SAE 90	0	40	32	104
Rodillos intermedios de cadenas	Cat DEO (grado único) Cat DEO SYN Cat DEO-ULS SYN Cat ECF-1-a ECF-2 Cat ECF-3 Cat CF API	SAE 30	-20	25	-4	77
		SAE 5W-40	-35	40	-31	104

Montadores de tuberías

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos:

- 561 a 589
- PL61

Cuando se opera la máquina a temperaturas por debajo de -18 °C (0 °F), consulte en la Publicación Especial, SEBU5898, "Recomendaciones para clima frío para todos los equipos de Caterpillar". Puede obtener esta publicación por medio de su distribuidor Caterpillar.

Excepto en el sistema hidráulico del cabrestante, utilice un grado de viscosidad SAE 30 para temperaturas de 0 °C (32 °F) a 43 °C (110 °F) o TDTO-TMS Cat para temperaturas de -20 °C (-4 °F) a 50 °C (122 °F).

No use un grado de viscosidad SAE 50 en transmisiones con control de transmisión "ICM". No utilice

un aceite de grado de viscosidad SAE 50 en las cajas de cabrestante con mando hidráulico.

Se recomienda utilizar FDAO Cat o un aceite comercial que cumpla con FD-1 Cat para maximizar la vida útil del engranaje y el cojinete. No utilice FDAO Cat o FD-1Cat en compartimientos que tengan embragues o frenos. Se debe utilizar TDTO Cat, TDTO-TMS Cat o un aceite comercial que cumpla con TO-4 Cat en cualquier compartimiento que incluya material de fricción, a menos que Caterpillar indique lo contrario.

En el caso de mandos finales sometidos a un gran uso o que se encuentran en operación continua, es necesario CALENTARLOS. Ejercite los mandos finales durante varios minutos con el motor a aceleración parcial para calentar el aceite antes de comenzar la producción.

Tabla 15

Viscosidades de lubricantes de los montadores de tuberías para temperaturas ambiente

Compartimiento o sistema	Requisitos de tipo de aceite y rendimiento	Viscosidades del aceite	°C		°F	
			Mín	Máx	Mín	Máx.
Servotransmisión y cabrestante	**Cat TDTO TDTO-TMS Cat TDTO para clima frío Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122
		TDTO-TMS Cat	-20	43	-4	110
CabrestantesPACCAR	**TO-4 para clima frío Cat TDTO Cat**	SAE 0W-30	-40	30	-40	86
		SAE 0W-20	-40	10	-40	50
Pasadores de cadena	**GO Cat (aceite para engranajes) Cat Synthetic GO Aceite para engranajes API GL-5**	SAE 75W-90	-30	40	-22	104
		SAE 75W-140	-30	45	-22	113
		SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122
		SAE 90	0	40	32	104
		SAE 0W-20	-40	0	-40	32
		SAE 5W-20	-35	0	-31	32

Resorte tensor del bastidor de rodillos inferiores y cojinetes del eje pivote	**Cat TDTO TDTO-TMS Cat TDTO para clima frío Cat** Cat TO-4, Cat TO-4M	SAE 5W-20	-35	0		32
		SAE 10W	-30	0	-22	32
		SAE 30	-20	25	-4	77
		SAE 40	-10	40	14	104
		SAE 50	0	50	32	122
		TDTO-TMSCat	-25	25	-13	77
Ruedas guía y rodillos de cadena	**Cat DEO (grado único) Cat DEO SYN Cat DEO-ULS SYN Cat ECF-1-a ECF-2 Cat ECF-3 Cat CF API**	SAE 30	-20	25	-4	77
		SAE 5W-40	-35	40	-31	104
Mando final	**Cat TDTO TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M**	SAE 0W-20	-40	0	-40	32
		SAE 10W	-30	0	-22	32
		SAE 30	-25	25	-13	77
		SAE 50	-15	50	5	122
		TDTO-TMS Cat	-30	25	-22	77

Minicargadores

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos:

- 216 a 299

Tabla 16

Viscosidades de lubricantes de minicargadores para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
Mando final para cargadores todoterreno y cargadores de cadenas compactos	**Cat Synthetic GO**	SAE 75W-140	-30	45	-22	113

Telehandler

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos de Telehandlers:

- TH255 a TH407

Tabla 17

Viscosidades de lubricantes de telehandlers para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx**
Sistema hidráulico	TDTO **Cat TDTO-TMS Cat TDTO para clima frío Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122
		TDTO-TMS Cat	-20	43	-4	110

Cargadores de cadenas

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos:

- 933 a 973

Tabla 18

Viscosidades de lubricantes de cargadores de cadenas para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
		SAE 0W-20	-40	0	-40	32

Mando final	**Cat TDTO** TDTO-TMS **Cat** TDTO para clima frío **Cat** Cat TO-4, Cat TO-4M	SAE 10W	-30	0	-22	32
		SAE 30	-25	25	-13	77
		SAE 50	-15	50	5	122
		TDTO-TMS Cat	-30	25	-22	77
Extremo de la barra estabilizadora y de la unión del pasador	GO **Cat (aceite para engranajes) Cat Synthetic GO Aceite para engranajes API GL-5**	SAE75W-90	-30	40	-22	104
		SAE75W-140	-30	45	-22	113
		SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122
		SAE 90	0	40	32	104
Cojinetes del resorte tensor del bastidor de rodillos de cadena y del eje pivote	**TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	0	-40	32
		SAE 5W-20	-35	0	-31	32
		SAE 10W	-30	0	-22	32
		SAE 30	-20	25	-4	77
		SAE 40	-10	40	14	104
		SAE 50	0	50	32	122
		TDTO-TMS Cat	-25	25	-13	77
Ruedas guía y rodillos de cadena	Cat DEO (grado único) Cat DEO SYN Cat DEO-ULS SYN Cat ECF-1-a ECF-2 Cat ECF-3 Cat CF API	SAE 30	-20	25	-4	77
		SAE 5W-40	-35	40	-31	104

Tractores de cadenas

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos:

- D3 a D11

Se recomienda utilizar FDAO SYN Cat, FDAO Cat o un aceite comercial que cumpla con FD-1 Cat para maximizar la vida útil del engranaje y el cojinete. No utilice FDAO Cat, FDAO SYN Cat o FD-1 Cat en compartimientos que tengan embragues o frenos. Se debe utilizar TDTO Cat, TDTO-TMS Cat o un aceite comercial que cumpla con TO-4 Cat en cualquier compartimiento que incluya material de fricción, a menos que Caterpillar indique lo contrario.

En el caso de mandos finales sometidos a un gran uso o que se encuentren en operación continua, es necesario CALENTARLOS. Ejercite los mandos finales durante varios minutos con el motor a aceleración parcial para calentar el aceite antes de comenzar la producción.

Tabla 19

Viscosidades de lubricantes de tractores de cadenas para temperaturas ambiente							
Compartimiento o sistema	**Aplicación**	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
				Mín	**Máx**	**Mín**	**Máx.**
Servotransmisiones	Normal	**TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M**	SAE 0W-20	-40	10	-40	50
			SAE 10W	-20	10	-4	50
			SAE 30	0	35	32	95
			SAE 50	10	50	50	122
			TDTO-TMS Cat	-20	43	-4	110
			SAE 60	-7	50	19	122

Mando final para D7E y Tractores de Cadenas Elevados (excepto D5M, D5N, D6M y D6N)	Uso moderado u operación intermitente	FDAO **Cat** FDAO SYN **Cat** TDTO **Cat** TDTO-TMS **Cat** **Cat FD-1**, Cat TO-4, Cat TO-4M					
			SAE 50	-15	32	5	90
			SAE 30	-25	15	-13	59
			TDTO-TMS Cat	-35	15	-31	59
			FDAO SYN Cat	-15	50	5	122
	Uso severo u operación continua (varios turnos)	FDAO **Cat** FDAO SYN **Cat** TDTO **Cat** TDTO-TMS **Cat** **Cat FD-1**, Cat TO-4, Cat TO-4M	SAE 60	-25	50	-13	122
			SAE 50	-33	14	-27	58
			SAE 30	-40	0	-40	32
			TDTO-TMS Cat	-40	0	-40	32
			FDAO SYN Cat	-33	50	-27	122
Mandos finales (cajas de cambios del diferencial) Tractores de cadenas de forma ovalada (incluidos D5M, D5N, D6M y D6N) excepto D7E	Normal	TDTO **Cat** TDTO-TMS **Cat** TDTO para clima frío **Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	0	-40	32
			SAE 10W	-30	0	-22	32
			SAE 30	-25	25	-13	77
			SAE 50	-15	50	5	122

Aplicaciones especiales para tractores de cadenas

Tabla 20

Viscosidades de lubricantes de tractores de cadenas especiales para temperaturas ambiente							
Compartimiento o sistema	**Aplicación**	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
				Mín	**Máx**	**Mín**	**Máx.**
Uniones de pasadores de extremo para la barra estabilizadora, pasadores de cartucho de soporte basculante y pasadores de cadena	Normal	GO Cat (aceite para engranajes) Cat Synthetic GO Aceite para engranajes	SAE 75W-90	-30	40	-22	104
			SAE 75W-140	-30	45	-22	113
			SAE 80W-90	-20	40	-4	104

pasadores de cadena		engranajes API GL-5	SAE 85W-140	-10	50	14	122
Cabrestantes (mando hidráulico)	Normal	TDTO Cat TDTO-TMS Cat Cat TO-4, Cat TO-4M	SAE 90	0	40	32	104
			SAE 0W-20	-40	10	-40	50
			SAE 10W	-20	10	-4	50
			SAE 30	0	43	32	110
			TDTO-TMS Cat	-10	35	14	95
Resorte tensor del bastidor de rodillos de cadena y cojinetes del eje de pivote	Normal	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	0	v40	32
			SAE 5W-20	-35	0	-31	32
			SAE 10W	-30	0	-22	32
			SAE 30	-20	25	-4	77
			SAE 40	-10	40	14	104
			SAE 50	0	50	32	122
			TDTO-TMS Cat	-25	25	-13	77
Ruedas guía y rodillos de cadena	Normal	Cat DEO (grado único) Cat DEO SYN Cat DEO-ULS SYN Cat ECF-1-a ECF-2 Cat ECF-3 Cat CF API	SAE 30	-20	25	-4	77
			SAE 5W-40	-35	40	-31	104
			SAE 0W40	-40	40	-40	104
Ventilador de inclinación variable	Normal	Cat DEO-ULS SYN Cat DEO SYN Cat DEO-ULS para clima frío Cat ECF-1-a ECF-2 Cat ECF-3 Cat	SAE 5W40	-40	50	-40	122

Equipos de minería subterránea

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos:

- AD30 a AD55
- AE40
- R1300 a R2900

Tabla 21

Viscosidades de lubricantes de equipos de minería subterránea para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
Servotransmisión	TDTO **Cat** TDTO-TMS **Cat** **TDTO para clima frío Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122
		TDTO-TMS	-20	43	-4	110
Dispositivo de levantamiento, convertidor de par y sistema de frenos AD45 y AE40	TDTO Cat TDTO para clima frío Cat Cat TO-4, Cat	SAE 0W-20	-40	40	-40	104
		SAE 10W	-20	50	-4	122

AD45 y AE40	TO-4M	SAE 30	-15	50	5	122
Ejes motrices AD30-AD55 y AE40	TDTO Cat TDTO-TMS Cat Cat TO-4, Cat TO-4M	SAE 30	-20	43	-4	110
		SAE 50	-10	32	14	90
		SAE 60	-5	50	23	122
		TDTO-TMS	-25	22	-13	72
Ejes motrices Máquinas de carga, acarreo y descarga R1300 - R2900 (1)	TDTO **Cat** TDTO-TMS **Cat** Cat TO-4, Cat TO-4M	SAE 30	-20	20	-4	68
		SAE 50	-10	43	14	110
		SAE 60	-5	50	23	122
		TDTO-TMS Cat	-25	22	-13	72

(1) R2900 utiliza aceite SAE 50 si tiene un sistema de enfriamiento de aceite de ejes.

Excavadoras de ruedas y manipuladores de material de ruedas

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos de Excavadoras de Ruedas y Manipuladores de Material de Ruedas:

- M312 a M325

Con excepción de la caja de engranajes de cabrestante con mando hidráulico, utilice el grado de viscosidad SAE 30 para 0 °C (32 °F) a 43 °C (110 °F) o TDTO-TMS Cat para-20 °C (-4 °F) a 50 °C (122 °F).

No utilice aceites con un grado de viscosidad SAE 50 en las transmisiones controladas por ICM. No utilice aceites con un grado de viscosidad SAE 50 para la caja de cabrestante del mando hidráulico.

Tabla 22

Viscosidades de lubricantes de excavadoras de ruedas y manipuladores de material de ruedas para temperatura ambiente						
Compartimiento o sistema	Requisitos de tipo de aceite y rendimiento	Viscosidades del aceite	**°C**		**°F**	
			Mín	Máx	Mín	Máx.
	TDTO Cat	SAE 0W-20	-40	0	-40	32
		SAE 10W	-30	0	-22	32

Mandos de rotación para M325C MH, M325C L MH, M325D MH y M325D L MH	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 10W	-30	0		32
		SAE 30	-25	25	-13	77
		SAE 50	-15	50	5	122
		TDTO-TMS Cat	-30	25	-22	77
Mando final y eje para la Serie M300A, la Serie M300C con números de serie del 1 al 2000, M325C MH, M325C L MH, M325D MH y M325D L MH (1)	GO Cat (aceite para engranajes) Cat Synthetic GO Aceite para engranajes API GL-5	SAE 75W-90	-30	40	-22	104
		SAE 75W-140	-30	45	-22	113
		SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122
		SAE 90	0	40	32	104
		SAE 10W-30	-25	40	-13	104
		SAE 75W-90	-30	40	-22	104
		SAE 75W-140	-30	45	-22	113
		SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122
		SAE 90	0	40	32	104
Mando final y eje para la Serie M300A, la Serie M300C, la Serie M300D, M325C MH, M325C L MH, M325D MH y M325D L MH	MTO Cat M2C 134-D comercial	SAE 10W-30	-25	40	-13	104
Transmisión	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122

		TDTO-TMS Cat	-20	43	-4	110

(1) Todos los modelos requieren el uso de aditivo antideslizante limitado, Cat 197-0017. Consulte el Manual de Operación y Mantenimiento de la máquina.

Cargadores de ruedas, portaherramientas integrales, tractores de ruedas y compactadores

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos de Cargadores de Ruedas y Portaherramientas Integrales:

- 902 a 994
- IT14 a IT62

Esta sección incluye, entre otros, los siguientes modelos de Tractores de Ruedas y Compactadores:

- 814 a 854
- 816 a 836
- 815 a 825

Excepto las máquinas que tienen caja de engranajes de cabrestante con mando hidráulico. Utilice el grado de viscosidad SAE 30 para temperaturas entre 0°C (32 °F) y 43 °C (110 °F) o TDTO-TMS Cat para temperaturas entre -20 °C (-4 °F) y 50 °C (122 °F).

Cuando opere la máquina a temperaturas por debajo de los -20 °C (-4 °F), consulte en la Publicación Especial, SEBU5898, "Recomendaciones para clima frío". Esta publicación está disponible a través de su distribuidor Caterpillar.

Excepto las máquinas que tienen transmisiones controladas por ICM. No utilice aceites con un grado de viscosidad SAE 50 en las transmisiones controladas por ICM.

Tabla 23

Cargadores de ruedas, portaherramientas integrales, tractores de ruedas y compactadores Viscosidades de lubricantes para temperaturas ambiente				
			°C	**°F**

Compartimiento o sistema	Requisitos de tipo de aceite y rendimiento	Viscosidades del aceite	[illegible]		[illegible]	
			Mín	Máx	Mín	Máx.
Servotransmisión	TDTO **Cat** TDTO-TMS **Cat** **TDTO para clima frío Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122
		TDTO-TMS	-20	43	4	-110
Ejes motrices para Cargadores de Ruedas Compactos	TDTO **Cat** TDTO-TMS **Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	0	-40	32
		SAE 10W	-25	15	-13	59
		SAE 30	-20	43	-4	110
		SAE 50	10	50	50	122
		TDTO-TMS	-30	43	-22	110
Ejes motrices para Cargadores de Ruedas pequeños (910-930) y medianos (938-980), Máquinas IT12-IT62, Tractores de Ruedas pequeños y medianos (814, 824), Compactadores medianos (815-826)	TDTO **Cat** TDTO-TMS **Cat** **TDTO para clima frío Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	0	-40	32
		SAE 10W	-25	15	-13	59
		SAE 30	-20	43	-4	110
		SAE 50	10	50	50	122
		TDTO-TMS Cat	-30	43	-22	110
Ejes motrices para Cargadores de Ruedas grandes (988-993), Tractores de Ruedas grandes (834-854) y Compactadores grandes (836)	TDTO **Cat** TDTO-TMS **Cat** **TDTO para clima frío Cat** Cat TO-4, Cat TO-4M	SAE 0W-20	-40	-10	-40	14
		SAE 10W	-25	0	-13	32
		SAE 30	-20	20	-4	68
		SAE 50	-10	50	14	122
		TDTO-TMS Cat	-25	22	-13	72

Ejes motrices para Cargadores de Ruedas 994	TDTO Cat TDTO-TMS Cat Cat TO-4, Cat TO-4M	SAE 10W	-25	0	-13	32
		SAE 30	-20	20	-4	68
		SAE 50	-10	43	14	110
		SAE 60	-5	50	23	122
		TDTO-TMS Cat	-25	22	-13	72

Aplicaciones especiales para 906, 907, 908

Tabla 24

Viscosidades de lubricantes de cargadores de ruedas para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
Frenos en mando estándar	HYDO Advanced 10 **Cat**	SAE 10W	-20	40	-4	104

Mototraíllas

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos:

- 611 a 657
- TS180 a TS225

Excepto para la caja de engranajes de cabrestante de mando hidráulico. Utilice aceite con una viscosidad de grado SAE 30 para temperaturas entre 0 °C (32 °F) y 43 °C (110 °F) o TDTO-TMS Cat para temperatura entre -20 °C (-4 °F) y 50 °C (122 °F).

No utilice aceites con un grado de viscosidad SAE 50 en las transmisiones controladas por ICM. No utilice aceites con un grado de viscosidad SAE 50 para la caja de cabrestante del mando hidráulico.

Se recomienda utilizar TDTO Cat SAE 50 o un aceite comercial que cumpla con TO-4 Cat SAE 50 en la mayoría de las aplicaciones, particularmente en la operación continua. Si la temperatura ambiente está por debajo de -15 °C (5 °F), caliente el aceite antes de la operación. El aceite se debe mantener a una temperatura mayor que -15°C (5°F) durante la operación. Si la temperatura ambiente es menor que -15°C (5°F), efectúe los procedimientos del Manual de Operación y Mantenimiento, "Calentamiento del motor y de la máquina" antes de la operación. Si la temperatura ambiente está por debajo de -25°C (-13°F), consulte con su distribuidor Caterpillar para obtener instrucciones. Si no se calienta el aceite antes de operar la máquina, ésta puede dañarse.

Tabla 25

Viscosidades de lubricantes de mototraíllas para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
Transmisión	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4, Cat TO-4M	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122
		TDTO-TMS Cat	-20	43	-4	110
Ruedas no impulsadas de mototraílla para 613G	FDAO **Cat** FDAO SYN **Cat** TDTO **Cat** TDTO-TMS **Cat Cat FD-1**, Cat TO-4, Cat TO-4M	SAE 60	-7	50	19	122
		SAE 50	-15	32	5	90
		SAE 30	-25	15	-13	59
		TDTO-TMS Cat	-35	15	-31	59
		FDAO SYN Cat	-15	50	5	122
Ruedas no impulsadas de mototraílla para 613G	Grasa de uso múltiple Cat	NLGI 2	-30	40	-22	104
Ruedas no impulsadas de mototraílla (Mototraílla remolcadas)	GO Cat (aceite para engranajes) Cat Synthetic GO Aceite para engranajes API GL-5	SAE 75W-90	-30	40	-22	104
		SAE 75W-140	-30	45	-22	113
		SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122
		SAE 90	0	40	32	104
Diferenciales y mandos finales	GO Cat (aceite para engranajes)	SAE 75W-90	-30	40	-22	104
		SAE 75W-140	-30	45	-22	113

Diferenciales y mandos finales, cojinetes inferiores de sinfín, reductores de velocidad de sinfín y elevador	para engranajes) Cat Synthetic GO Aceite para engranajes API GL-5	SAE 80W-90	-20	40	-4	104
		SAE 85W-140	-10	50	14	122
		SAE 90	0	40	32	104
Rodillos inferiores del elevador	Cat DEO (grado único) Cat DEO SYN Cat DEO-ULS SYN Cat ECF-1-a ECF-2 Cat ECF-3 Cat CF API	SAE 30	-20	25	-4	77
		SAE 5W-40	-35	40	-31	104

Transmisiones de petróleo

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, los siguientes modelos:

- E61 a E81

Tabla 26

Viscosidades de lubricantes de transmisiones de petróleo para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
	TDTO Cat	SAE 0W-20	-40	10	-40	50
		[illegible]	-20	10	[illegible]	[illegible]

Transmisiones de Petróleo TH48-E70,TH48-E80 y TH55-E70	TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4	SAE 10W	-20	10	-4	50
		SAE 30	0	50	32	122
		TDTO-TMS Cat	-10	50	14	122
Transmisiones de Petróleo TH31-E61 y TH35-E81	TDTO Cat TDTO-TMS Cat TDTO para clima frío Cat Cat TO-4	SAE 0W-20	-40	22	-40	72
		SAE 10W	-20	22	-4	72
		SAE 30	10	50	50	122

Aplicaciones especiales

Consulte el artículo "Información general sobre lubricantes" para obtener información importante acerca de estos.

Esta sección incluye, entre otros, aplicaciones especiales para equipos Caterpillar.

Tabla 27

Viscosidades de lubricantes de aplicaciones especiales para temperaturas ambiente						
Compartimiento o sistema	**Requisitos de tipo de aceite y rendimiento**	**Viscosidades del aceite**	**°C**		**°F**	
			Mín	**Máx**	**Mín**	**Máx.**
Motores de arranque	SH SJ SL	SAE 0W-20	-40	40	-40	104
		SAE 0W-30	-40	40	-40	104
		SAE 5W-20	-30	10	-22	50
		SAE10W	-20	50	-4	122
Transmisión del motor de arranque	Cat DEO-ULS Cat DEO-ULS SYN Cat DEO SYN DEO SYN para clima frío Cat TDTO Cat TDTO para clima frío Cat MTO Cat Cat TO-4	SAE 0W-20	-40	10	-40	50
		SAE 0W-40	-40	40	-40	104
		SAE 5W-40	-40	50	-40	122
		SAE 5W-20	-30	10	-22	50
		SAE 10W	-30	20	-22	68
		SAE 30	-10	25	14	77
Ventilador de inclinación variable	**Cat DEO-ULS SYN** **Cat DEO SYN** **Cat DEO-ULS para clima frío** **Cat ECF-1-a** ECF-2 **Cat** ECF-3 **Cat**	SAE 0W-40	-40	40	-40	104
		SAE 5W-40	-40	50	-40	122
		SAE 10W	-20	50	-4	122
		SAE 30	10	50	50	122

Lubricantes especiales

SMCS - 7000; 7581

Tabla 1

Lubricantes especiales Caterpillar	
Artículo	**Tamaño**
Lubricante **6V-4876** (1)	500 g (17,6 oz)
Compuesto para rosca **5P-3931** (2)	150 g (5,3 oz)

(1) Recomendado para su uso en componentes típicos, como roscas de perno y arandelas.

(2) Recomendado para su uso en conectores en contacto, como prisioneros del múltiple de escape y tuercas del múltiple de escape.

Tabla 2

Requisito de aditivo especial para ejes de cargadores de ruedas, máquinas portaherramientas integrales, tractores de ruedas y compactadores	
Volumen necesario de Aditivo de Aceite 1U-9891 o Aditivo de Aceite 185-4771 para ejes que tienen discos lubricados y frenos de velocidad de semieje (1)	
Modelo de máquina	**Número de botellas por eje**
Todos los Cargadores de Ruedas pequeños y compactos (910-930) Portaherramientas Integrales IT28-IT62 Cargadores de Ruedas 938-962	0,5
Cargadores de Ruedas 966F, 970F, 966G y 972G Compactadores 815 y 816 Tractores de Ruedas 814	1,0
Cargadores de Ruedas 980F, 980G y 980H Topadores de Ruedas 824G y 824H Compactadores 825G, 825H, 826G y 826H	1,5
Cargadores de Ruedas 988FII, 988G y 988H Topadores de Ruedas 834B, 834G y 834H Compactadores 836, 836G y 836H	3
Cargadores de Ruedas 990 serie II Tractores de Ruedas 844	4
Cargadores de Ruedas 992G Topadores de Ruedas 854G Tractores de Ruedas 854K	5
Cargadores de Ruedas 993K	7

(1) El Aditivo de Aceite **1U-9891** no se debe usar en compartimientos de frenos cuando el freno de servicio también se usa como freno de estacionamiento, a menos que lo recomiende Caterpillar específicamente.

Tabla 3

Tabla 3

Tintes visibles a los rayos UV para detección de fugas			
Número de pieza	**Descripción**	**Tamaño**	**Dosaje**
Para detectar fugas de aceite en motores, transmisiones, sistemas hidráulicos, etc.			
1U-5572	Aditivo Oil Glo 22	Botella de 28,4 gramos (1 onza)	28,4 gramos (1 onza) por 7,58 L (2 gal EE.UU.) de aceite
1U-5573	Aditivo Oil Glo 22	Botella de 0,47 L (1 pinta)	28,4 gramos (1 onza) por 7,58 L (2 gal EE.UU.) de aceite
Para detectar fugas de combustible o sospecha de dilución de combustible			
1U-5574	Aditivo Gas Glo 32	Botella de 28,4 gramos (1 onza)	28,4 gramos (1 onza) por 37,9 L (10 gal EE.UU.) de gasolina o combustible diésel
1U-5575	Aditivo Gas Glo 32	Botella de 0,47 L (1 pinta)	28,4 gramos (1 onza) por 37,9 L (10 gal EE.UU.) de gasolina o combustible diésel
Para detectar fugas en el sistema de enfriamiento			
1U-5576	Aditivo Water Glo 23	Botella de 28,4 gramos (1 onza)	28,4 gramos (1 onza) por 151,5 L (40 gal EE.UU.) de agua
1U-5577	Aditivo Water Glo 23	Botella de 0,47 L (1 pinta)	28,4 gramos (1 onza) por 151,5 L (40 gal EE.UU.) de agua

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Intervalos de muestreo de aceite

SMCS - 1000; 3000; 4000; 4050; 4250; 4300; 5050; 7000; 7542

Obtenga las muestras de aceite lo más próximo posible a los intervalos adecuados. Para aprovechar todas las ventajas del análisis S·O·S se debe establecer una tendencia de datos uniforme. Para establecer un historial de datos pertinente, realice muestreos de aceite consistentes a intervalos uniformes.

Consulte el Manual de Operación y Mantenimiento de su máquina para ver los intervalos recomendados de tomas de muestras de aceite de cada compartimiento. Las aplicaciones más exigentes pueden necesitar un intervalo de toma de muestras de aceite más frecuente.

Para obtener información sobre tipos de aceite aceptables y especificaciones, consulte las tablas "Viscosidades del lubricante para temperaturas ambiente" de esta Publicación Especial.

Para obtener los mejores resultados, las tomas de muestras de aceite del motor deben tomarse e intervalos de 250 horas. Un intervalo de 250 horas para la toma de muestras puede proporcionar una indicación oportuna de la contaminación y de la degradación del aceite. En algunas condiciones, el distribuidor Caterpillar o el Manual de Operación y Mantenimiento pueden permitir un intervalo mayor entre tomas de muestra de aceite.

Consulte el Manual de Operación y Mantenimiento de su máquina para ver los intervalos recomendados de cambio de aceite de cada compartimiento.

Tabla 1

Compartimiento	Intervalo recomendado entre muestreos	Válvula de muestreo	Tipo de aceite
Motor	250 horas	Sí	Cat DEO Cat DEO-ULS
Transmisión	500 horas	Sí	TDTO Cat TDTO-TMS Cat
Sistema hidráulico	500 horas	Sí	HYDO Advanced Cat
Diferencial y mando final	500 horas	No	TDTO Cat FDAO Cat

Consulte con su distribuidor Caterpillar para obtener información completa y ayuda para establecer un programa de servicios S·O·S para su equipo.

Un muestreo S·O·S más frecuente mejora la administración del ciclo de vida útil

Tradicionalmente, los intervalos de muestras S·O·S han sido cada 250 horas para los motores y cada 500 horas para todos los demás compartimientos. Sin embargo, en aplicaciones de servicio más severas, se recomienda hacer tomas de muestras más frecuentes. El servicio más severo de los compartimientos lubricados se produce con carga altas, a altas temperaturas y en condiciones de polvo. Si existe cualquiera de estas condiciones, tome una muestra de aceite en intervalos de 125 horas y tome muestras del otro compartimiento en intervalos de 250 horas. Estas muestra adicionales aumentan las

posibilidades de detección de una posible avería.

Cómo determinar los intervalos óptimos de cambios de aceite

En alguna aplicaciones, los compartimientos del motor y del sistema hidráulico de las máquinas Caterpillar se pueden optimizar para prolongar la vida útil del fluido. Se pueden establecer programas de optimización para evaluar el estado del fluido basándose en los resultados de las muestras de aceite. Estos programas de optimización requieren tomas de muestras de aceite más frecuentes y un control detenido por parte de una analista capacitado. Para obtener información detallada sobre la optimización de los intervalos de cambio de aceite, póngase en contacto con su distribuidor Caterpillar.

Esta Publicación Especial no aborda los intervalos de drenaje del aceite recomendados; sin embargo, proporciona pautas que deben consultarse junto con los Manuales de Operación y Mantenimiento de la máquina o el motor para determinar los intervalos aceptables de drenaje del aceite. Consulte los Manuales de Operación y Mantenimiento de la máquina o el motor y a su distribuidor Caterpillar para obtener más orientación, incluso orientación sobre cómo establecer intervalos de drenaje del aceite optimizados o aceptables, pero sin limitarse a eso.

Nota: El uso del análisis de aceite de servicios S·O·S Cat contribuye a la sostenibilidad ambiental, ya que es la mejor manera de optimizar la vida útil del aceite, y permite que los motores alcancen la vida útil esperada. Para obtener información sobre las pruebas que se requieren para establecer intervalos de drenaje del aceite seguros y optimizados, consulte con su distribuidor Caterpillar.

Los intervalos de drenaje de aceite estándar que están publicados en los Manuales de Operación y Mantenimiento de cada motor específico corresponden a las aplicaciones típicas:

- Uso de aceites recomendados
- Uso de un buen combustible
- Uso de filtros recomendados
- Uso de buenas prácticas de mantenimiento estándar
- Cumplimiento de los intervalos de mantenimiento tal como están publicados en los Manuales de Operación y Mantenimiento de cada motor específico

Las aplicaciones más exigentes pueden requerir intervalos de drenaje de aceite más cortos, mientras que aplicaciones menos exigentes pueden permitir que los intervalos de drenaje de aceite estándar sean más prolongados. Los altos factores de carga (superior a 75%), en particular junto con combustibles con alto grado de azufre, pueden contribuir de manera significativa a reducir los intervalos de drenaje de aceite a un nivel inferior a los intervalos estándares.

Consulte con su distribuidor Caterpillar sobre las pruebas necesarias para establecer los intervalos de drenaje de aceite optimizados para su aplicación.

Para ayudar a proteger el motor y optimizar los intervalos de drenaje del aceite para aplicaciones específicas del motor y ciclos de trabajo, utilice el análisis de aceite de servicios S·O·S Cat de la siguiente manera:

- Recomendado habitualmente
- Enfáticamente recomendado para determinar los intervalos de drenaje del aceite cuando el motor opera con combustible que contiene niveles de azufre de entre 0,05% (500 ppm) y 0,5% (5.000 ppm).
- Necesario para determinar los intervalos de drenaje del aceite cuando el motor funciona con

combustible que contiene niveles de azufre por encima del 0,5% (5.000 ppm).

Nota: Las condiciones de operación del motor desempeñan un papel fundamental en la determinación del efecto que tiene el azufre del combustible sobre los depósitos del motor y sobre el desgaste del motor. Consulte con el distribuidor Caterpillar para que lo oriente cuando los niveles de azufre en el combustible son superiores al 0,1% (1.000 ppm).

Cómo optimizar el ciclo de vida útil de los componentes

Un aumento en el número de muestras de aceite proporciona una mejor definición de las tendencias entre intervalos de cambios de aceite. La obtención de más muestras de aceite le permitirá vigilar minuciosamente los patrones de desgaste de componentes. Esto contribuirá a asegurar que se alcance una plena duración de los componentes.

Preguntas más frecuentes - Combustible diésel ultra bajo en azufre (ULSD)

SMCS - 1000; 7000

ATENCION

Se ha tratado de proporcionar información exacta y actualizada. Al usar este documento, usted acuerda que Caterpillar Inc. no es responsable de los errores ni de las omisiones.

ATENCION

Los motores diésel para vehículos de carretera modelo 2007 y posteriores (con certificación para el modelo 2007 de la EPA de EE.UU.) REQUIEREN el uso de combustible diésel ultra bajo en azufre (ULSD) (≤ 15 ppm de azufre).

"Se recomienda enfáticamente el combustible diésel"libre de azufre≤ ("10 ppm de azufre) para su uso en motores diésel para vehículos de carretera con certificación"EURO IV≤, si bien el combustible diésel con 50 ppm de azufre es aceptable.

Se recomienda enfáticamente el combustible diésel bajo en azufre (LSD) (≤ 500 ppm de azufre) (requerido en los EE.UU.) para su uso en motores diésel para vehículos de carretera modelo 2006, si bien el combustible diésel con ≤ 5.000 ppm de azufre es aceptable para su uso en lugares del mundo donde la ley lo permite. Los motores que tienen catalizador de oxidación para combustible diésel (DOC) requieren el uso de combustible LSD o combustible ULSD.

Nota: Para obtener información adicional sobre ULSD, consulte la sección de esta Publicación Especial, "Especificaciones de combustibles".

1. ¿Qué es ULSD y por qué es diferente al diésel bajo en azufre (LSD)?

   La Agencia de Protección Ambiental (EPA) de los Estados Unidos (EE.UU.) define Diésel ultra bajo en azufre (ULSD - S15) como un combustible diésel de EE.UU. con un contenido de azufre que no excede las 15 partes por millón (ppm [mg/kg]) o 0,0015% del peso. El diésel bajo en azufre (LSD - S500) se define como un combustible diésel de EE.UU. con un contenido de azufre que no excede las 500 ppm o el 0,05% del peso. El combustible LSD que se usa normalmente en América del Norte no excede las 350 ppm de azufre. Tanto el ULSD como el LSD deben cumplir con los requisitos de combustible descritos en el nivel de revisión más reciente de "ASTM D975".

   Nota: En Europa, el combustible diésel de contenido ultra bajo de azufre tendrá como máximo 0,0010 por ciento (10 ppm) de azufre y se conoce típicamente como "libre de azufre". Además, el combustible diésel más común en Europa tiene un contenido máximo de azufre de 0,005 por ciento (50 ppm). Estos niveles de azufre se definen en el Estándar Europeo "EN 590:2004".

2. ¿Por qué se ha reducido a 15 ppm el contenido de azufre del combustible diésel en EE.UU.?

Las regulaciones de la EPA de EE.UU. exigen el uso de ULSD en vehículos de carretera para asegurar que estos vehículos cumplen los estándares de emisiones y para mejorar la calidad del aire. En California, también se controlan otras propiedades del combustible diésel para vehículos, para reducir la contaminación.

Para obtener requisitos adicionales para los motores diésel para vehículos de carretera, consulte el nivel de revisión más reciente de la Publicación Especial, SSBU6385, "Recomendaciones de fluidos para motores diésel para vehículos de carretera de Caterpillar".

3. ¿Puedo usar ULSD en motores que no son de carretera?

   Sí. Consulte las secciones "Preguntas más frecuentes" y "Especificaciones de combustible" de esta Publicación Especial para obtener información cuando use ULSD.

4. ¿Debo preocuparme por la lubricidad del ULSD?

   La lubricidad del combustible diesel es necesaria para minimizar el desgaste de las bombas e inyectores de combustible. El combustible ULSD requiere buena lubricidad e inhibidores de corrosión para evitar un desgaste inaceptable del motor. En los EE.UU., si es necesario, se añaden aditivos para aumentar la lubricidad y evitar la corrosión en el combustible ULSD antes de su venta al por menor. Con estos aditivos, se espera que el combustible ULSD rinda tanto como el combustible LSD. Todos los motores electrónicos Caterpillar producidos desde el año del modelo (MY) 2000, se pueden usar con combustible ULSD.

   Nota: Pida al proveedor de combustible que confirme si el ULSD disponible cumple el nivel de versión más reciente de los requisitos de lubricidad "ASTM D975" o "EN 590".

   En América del Norte, el combustible diésel identificado como "ASTM D975" Grado No. 2-D S15 o "ASTM D975" Grado No. 1-D S15 y que cumple las pautas de estabilidad térmica "ASTM D975-07b" X3.10.2.2 generalmente cumple los requisitos de la Especificación "Caterpillar de combustible diésel destilado para motores diésel de obra" para el combustible ULSD.

   En Europa, el combustible diésel que cumple los requisitos "EN 590" de 10 ppm o menos de azufre ("libre de azufre"), generalmente cumple los requisitos de Caterpillar para combustible ULSD.

   Nota: La norma "EN 590" permite el uso de hasta un 5 por ciento (B5) de biodiésel. Consulte la sección "Especificaciones de combustible" y el tema "Biodiesel" de esta Publicación Especial para obtener información sobre cuándo se usa biodiesel.

5. ¿Hay algún color o tinte que identifique el combustible ULSD?

   Debido al procesamiento necesario para producir combustible ULSD, el color del combustible ULSD puede variar ampliamente desde el tradicional incoloro ámbar, hasta cualquier tono de verde claro, amarillo, naranja o rosa. Bajo ciertas condiciones de luz, el color puede parecer ligeramente fluorescente.

   En EE.UU., la ley exige que el combustible diésel destinado a usos de obra se tiña de color rojo. El uso de combustible con este tinte rojo es ilegal en aplicaciones de carretera. En la actualidad no hay regulaciones que exijan que el combustible diesel destinado a aplicaciones de carretera se tiña de algún color.

   No hay relación entre el color natural del combustible diesel y cualidades deseables del combustible diesel como contenido de calor, viscosidad, punto de enturbiamiento, número cetano o gama de destilación. El color del combustible diesel varía según la fuente del crudo, los métodos de refinería y el uso de tintes. Sin embargo, el oscurecimiento apreciable del color del

combustible durante el almacenamiento podría indicar oxidación y/o contaminación por suciedad, agua, algas, bacterias u otras fuentes que podrían causar problemas de operación.

6. ¿El ULSD afecta los sellos del sistema de combustible?

   Caterpillar ha completado la revisión de la tecnología del sistema de combustible del motor y la compatibilidad del sistema con el combustible ULSD para productos de obra y de carretera. Los motores controlados electrónicamente (ECM), fabricados después del 2000 que han sido mantenidos apropiadamente, son compatibles con el combustible con un contenido menor de 50 ppm de azufre y cumplen las especificaciones "ASTM D975" Grado número 2-D S15 o "ASTM D975" Grado número 1-D S15 o "EN 590" "libre de azufre" (10 ppm o menos de azufre). Consulte la sección de esta Publicación Especial, "Especificaciones de combustible" para obtener más información.

   Los motores anteriores, incluyendo los que tienen sistemas de combustible mecánicos, deben inspeccionarse para ver si sufren fugas externas. Se piensa que sólo un pequeño número de sellos de sistema de combustible pueden haber sido afectados. Las fugas que aparecen normalmente se muestran como filtraciones, manchas o goteos menores. Si se produce una fuga, una posible corrección es apretar la unión y/o la conexión con el par de apriete apropiado. Si se detecta una fuga, póngase en contacto con el distribuidor Caterpillar o con el centro de servicio autorizado lo antes posible y programe una reparación. Siempre que sea posible, use materiales de sello y mangueras de Viton que sean compatibles con el combustible diesel como la mejor protección contra las fugas del sistema de combustible.

   Nota: Los aditivos de combustible no detienen ni evitan las fugas de sello, filtraciones, manchas o goteos, que pueden ser resultado de la transición al combustible ULSD.

7. ¿Puedo usar los filtro de combustible actuales de Caterpillar?

   Sí, el combustible ULSD es totalmente compatible con la tecnología de los filtros de combustible actuales. El combustible ULSD tiene tendencia a limpiar eficazmente el tanque de combustible y otras pieza del sistema de combustible, lo cual puede causar el taponamiento del filtro de combustible durante el periodo inicial de transición. Puede ser necesario el cambio más frecuente de los filtros de combustible durante el periodo de transición del combustible LSD al ULSD.

   El combustible ULSD normalmente tiene un contenido ligeramente superior de cera que el combustible LSD. Pida a su proveedor de combustible que confirme si el combustible ha sido mezclado para que fluya a la temperatura ambiente que hay en su región. En los EE.UU., los combustibles diésel normalmente se mezclan para proporcionar rendimiento en frío según las normas que se proporcionan en el nivel de revisión más reciente de "ASTM D975".

8. ¿Se recomienda el uso de aditivos de combustible de posventa con el ULSD?

   Hay muchos tipos diferentes de aditivos de combustible. Caterpillar generalmente no recomienda el uso de este tipo de productos.

   En circunstancias especiales, Caterpillar reconoce que es necesario usar aditivos en el combustible. Los aditivos de combustible deben usarse con precaución. El aditivo puede no ser compatible con el combustible. Algunos aditivos pueden precipitar y ocasionar depósitos en el sistema de combustible. Los depósitos pueden causar obstrucciones. Algunos aditivos pueden obturar los filtros de combustible. Algunos aditivos pueden ser corrosivos, y otros pueden ser dañinos para los elastómeros del sistema de combustible. Algunos aditivos pueden dañar los sistemas de control de emisiones. Algunos aditivos pueden elevar los niveles de azufre por encima del máximo permitido por la EPA de EE.UU. o, según corresponda, otras agencias regulatorias. Consulte con su proveedor de combustible cuando haya circunstancias que exijan el uso de aditivos de combustible. Su proveedor de combustible puede recomendar los aditivos que se deben usar y el nivel apropiado de tratamiento. Para obtener los mejores resultados, su proveedor

deben usar y el nivel apropiado de tratamiento. Para obtener los mejores resultados, su proveedor de combustible debe tratar el combustible cuando necesite aditivos. Consulte la respuesta a la pregunta 4 para obtener más información. Además, consulte los temas de esta Publicación Especial "Combustible diesel destilado", "Aditivos para combustible de posventa" y "Acondicionador de combustible diesel" Cat.

9. ¿El combustible biodiesel se puede mezclar con el ULSD?

   El biodiesel se puede mezclar como LSD o como ULSD.

   Para obtener información adicional, consulte la sección "Especificaciones de combustibles" y el tema "Biodiésel" de esta Publicación Especial.

   El usuario del motor tiene la responsabilidad de usar el combustible adecuado que recomienda el fabricante y que permite la EPA de EE.UU. y otras agencias regulatorias apropiadas.

10. ¿Qué efecto tiene la mezcla de aceite lubricante usado en el combustible diésel sobre el rendimiento del motor y la calidad del combustible?

    En general, esta práctica **no** se recomienda. Puede afectar negativamente la calidad del combustible y podría producir depósitos en el sistema de combustible y el pistón, aumento de las emisiones de escape y taponamiento del filtro de combustible. Esta práctica también puede hacer que el combustible diésel no cumpla los requisitos de la EPA de EE.UU., del estado y de otras agencias regulatorias aplicables.

    Nota: La mezcla de aceite lubricante con el combustible ULSD puede elevar el nivel de azufre por encima de las 15 ppm.

    No use combustible diesel que haya sido mezclado con aceite lubricante en las siguientes aplicaciones:

    - Motores diesel de carretera del modelo del año 2007 y posteriores (con certificación del 2007 de la EPA de EE.UU.) y/o motores diesel de carretera con certificación EURO 4. El uso de mezclas de aceite/combustible en estos motores diesel de carretera puede causar daños en el motor.
    - Motores equipados con un DPF. El uso de mezclas de aceite/combustible en motores diésel equipados con DPF puede hacer necesarios ciclos de limpieza más frecuentes, contribuir al taponamiento del DPF y causar daños en el DPF.

    El usuario del motor es responsable del uso del combustible adecuado que recomienda el fabricante y que permite la EPA de EE.UU. y otras agencias regulatorias apropiadas. El usuario también es responsable de obtener las exenciones locales, regionales o nacionales apropiadas necesarias para el uso de mezclas de aceite/combustible en el cárter en cualquier motor Caterpillar que esté regulado por estándares de emisiones.

11. ¿Qué sucede con los combustibles especiales (JP-5, JP-8, queroseno, Jet A, Jet A-1)?

    Estos combustibles normalmente tienen un contenido de azufre mucho mayor de lo que permiten las regulaciones de la EPA de EE.UU. para contenido máximo de azufre en ULSD. El contenido de azufre de estos combustibles normalmente excede de sobra las 15 ppm.

    Estos combustibles normalmente tienen un contenido en azufre mucho mayor que el contenido máximo de azufre en combustible permitido por el Estándar Europeo "590:2004". El contenido de azufre de estos combustibles en general excede de sobra las 50 ppm.

12. ¿El ULSD afecta al rendimiento y la economía de consumo del motor?

Los proveedores de combustible diesel informan de que el nuevo combustible ULSD contiene más cera, pero proporciona una economía de consumo de 0% a 2% menor (aproximadamente 1% menor de promedio). ¿Cómo puede ser?

Los operadores de motores diesel frecuentemente consideran que las ceras del combustible diesel proporcionan la mayoría de la energía del combustible. Eso se supone porque los combustibles más ligeros como el número 1D y el queroseno normalmente no tienen problemas de cera en invierno y porque el número 1D y el queroseno ofrecen una economía de consumo menor.

Durante la desulfurización, un porcentaje de los componentes aromáticos y nafténicos del combustible se convierten en ceras parafínicas menos densas. Ahora hay más cera, pero la densidad del combustible es menor. La baja densidad del combustible del ULSD genera menos energía por galón.

13. ¿De qué requisitos de especificación de combustible diesel debo preocuparme?

    El número de cetano (calidad de ignición), la limpieza, la operatividad a baja temperatura, la estabilidad y la lubricidad son los requisitos principales del combustible diésel para el usuario final.

    Nota: El ULSD tiene menos conductividad eléctrica que el LSD. Respete todas las prácticas estándar de conexión a tierra y seguridad de la industria.

    Nota: Para aplicaciones en las que se necesita ULSD, pida al proveedor de combustible que confirme si el combustible ULSD disponible cumple todos los requisitos de Caterpillar para combustible diésel destilado o el nivel de revisión más reciente de "ASTM D975 S15" o los requisitos "EN 590" ("libre de azufre").

    En América del Norte, el combustible diésel identificado como "ASTM D975" Grado No. 2-D S15 o "ASTM D975 S15" Grado No. 1-D S15 y que cumple las pautas de estabilidad térmica "ASTM D975-07b" X3.10.2.2 generalmente cumple los requisitos de Caterpillar de combustible ULSD. Consulte la sección de esta Publicación Especial, "Especificaciones de combustibles".

    En Europa, el combustible diésel que cumple los requisitos "EN 590" de 10 ppm o menos de azufre ("libre de azufre"), generalmente cumple los requisitos de Caterpillar para combustible ULSD. Consulte la sección de esta Publicación Especial, "Especificaciones de combustibles".

    Nota: "EN 590" permite el uso de hasta un 5 por ciento (B5) de biodiésel. Consulte la sección "Especificaciones de combustibles" y el tema "Biodiésel" de esta Publicación Especial para obtener información sobre cuándo se usa biodiésel.

14. ¿El combustible ULSD requiere un procedimiento de almacenamiento diferente?

    No. Cuando el proveedor de combustible trata apropiadamente el combustible con un aditivo para la estabilidad del combustible, el combustible LSD y el ULSD se pueden almacenar normalmente hasta un año. Las mismas prácticas aprobadas y de uso común de mantenimiento del tanque de almacenamiento que se usan con el combustible LSD se deben usar con el combustible ULSD. Los tanques y contenedores de almacenamiento de uso común con el combustible LSD son aceptables para el combustible ULSD.

Publicaciones de referencia

SMCS - 1000; 7000

Las siguientes publicaciones están disponibles a través de su distribuidor Caterpillar.

Nota: La información que figura en las publicaciones indicadas está sujeta a cambios sin previo aviso. Consulte con su distribuidor Caterpillar local para obtener las recomendaciones más recientes.

Nota: Consulte en esta Publicación Especial la hoja de datos del producto correspondiente y el Manual de Operación y Mantenimiento apropiado, para obtener las recomendaciones de aplicación del producto.

Refrigerante

- Publicación Especial, PSHJ0067, "Hoja de datos del producto para el ELC (Refrigerante de Larga Duración) Cat" (internacional)
- Publicación Especial, PMSP5027, "Hoja de datos del producto con Etiqueta Cat - Etiqueta de radiador ELC" (25 por paquete)
- Publicación Especial, PSHP9554, "Hoja de datos del producto para el DEA Cat (concentrado)"
- Publicación Especial, RSHS1063, "Conozca el sistema de enfriamiento de su tractor de cadenas"
- Publicación Especial, SSBD0518, "Conozca el sistema de enfriamiento"
- Publicación Especial, SSBD0970, "El refrigerante y el motor"

Aceite para motores diésel

- Publicación Especial, PSHJ0159, "Hoja de datos del producto para el DEO-ULS Cat (SAE 15W-40)" (América del Norte - Canadá, México y Estados Unidos)
- Publicación Especial, PSHJ0059, "Hoja de datos del producto para el DEO Cat (SAE 10W-30 y SAE 15W-40)" (América del Norte - Canadá, México y Estados Unidos)
- Publicación Especial, PSHJ0021, "Hoja de datos del producto para el DEO Cat (SAE 10W-30 y SAE 15W-40)" (internacional, con excepción de América del Norte, Egipto, Arabia Saudita y Brasil)
- Publicación Especial, PSHJ0072, "Hoja de datos del producto para el DEO Cat (SAE 10W-30 y SAE 15W-40)" (Brasil)
- Publicación Especial, PSHJ0091, "Hoja de datos del producto para el DEO Cat (SAE 10W-30 y SAE 15W-40)" (Egipto y Arabia Saudita)
- Publicación Especial, PSHP7062, "Hoja de datos del producto para el DEO SYN Cat (SAE 5W-40)"
- Publicación Especial, PSHJ0008, "Hoja de datos del producto para el DEO Cat para clima ártico (SAE 0W-30)" (Canadá y Estados Unidos)
- Publicación Especial, PSHJ0093, "Hoja de datos del producto para el DEO Cat (SAE 30 y SAE 40)" (**Para uso en motores diésel de la Serie 3600, motores diésel de la Serie C280** y motores

diésel más antiguos con cámara de precombustión. NO lo utilice en motores de la Serie 3500, de la Serie C175 y en motores diésel más pequeños de inyección directa).

Lubricantes de máquinas

Aceite para transmisiones/trenes de impulsión

- Publicación Especial, PSHJ0007, "Hoja de datos del producto para el TDTO Cat para clima frío (SAE 0W-20)" (mezcla sintética) (Canadá y Estados Unidos)
- Publicación Especial, PSHP7506, "Hoja de datos del producto para el TDTO Cat (SAE 10W, SAE 30 y SAE 50)" (Excede la especificación del TO-4 Cat).
- Publicación Especial, PSHP8035, "Hoja de datos del producto para el TDTO TMS Cat (aceite multiclima de la transmisión)" (mezcla sintética, multigrado) (Excede la especificación del TO-4M Cat).

Aceite para ejes y mandos finales

- Publicación Especial, PSHP9530, "Hoja de datos del producto para el FDAO Cat (SAE 60)" (Excede la especificación del FD-1 Cat).
- Publicación Especial, PSHP9570, "Hoja de datos del producto para el FDAO SYN Cat (multigrado)" (Excede la especificación del FD-1 Cat).

Aceite de uso múltiple para tractores

- Publicación Especial, PSHP3050, "Hoja de datos del producto para el MTO Cat (multigrado)"

Aceite para engranajes

- Publicación Especial, PSHJ0030, "Hoja de datos del producto para el Synthetic GO Cat (SAE 75W-140)"
- Publicación Especial, PSHP7508, "Hoja de datos del producto para el GO Cat (SAE 80W-90 y SAE 85W-140)"

Aceite hidráulico

- Publicación Especial, PSHJ0182, "Hoja de datos del producto para el HYDO Advanced 10 Cat"
- Publicación Especial, PSHP9544, "Hoja de datos del producto para el HYDO Cat (SAE30)" (no disponible en América del Norte)

Grasa

- Publicación Especial, PSGJ0035, "Guía de selección de grasas"
- Publicación Especial, PSHP0002, "Hoja de datos del producto para la grasa Advanced 3Moly Cat" (NLGI grado 2)
- Publicación Especial, NSHP6010, "Hoja de datos del producto para la grasa Ultra 5Moly Cat" (NLGI grados 1 y 2)

- Publicación Especial, NSHP6011, "Hoja de datos del producto para la grasa Cold Weather Platinum Cat" (NLGI grado 0)
- Publicación Especial, NSHP6012, "Hoja de datos del producto para la grasa Desert Gold Cat" (NLGI grado 2)
- Publicación Especial, NSHP6015, "Hoja de datos del producto para la grasa para cojinete de bolas de alta velocidad Cat" (NLGI grado 2)
- Publicación Especial, PSHJ0088, "Hoja de datos del producto para la grasa de uso múltiple Cat" (NLGI grado 2)

Combustible

- Publicación Especial, SSNR9620, "Cómo mejorar la duración del sistema de combustible"
- Publicación Especial, SSBD0717, "Los combustibles diésel y su motor"
- "Especificación de la norma ASTM D6751 para mezcla de combustible biodiésel (B100) para combustibles destilados medios"
- "Combustibles automotrices SN 14214 - Éster metílico ácido graso (FAME) para motores diésel - Requisitos y métodos de pruebas"
- "Especificación de la norma ASTM D7467 para aceite combustible diésel, mezcla de biodiésel (B6 a B20)"
- "Especificación de la norma ASTM D975-08a para aceites combustibles diésel" (incluye los requisitos para mezclas de biodiésel B5 y menores)
- "Combustibles automotrices ES 590 - Diésel - Requisitos y métodos de prueba" (incluye los requisitos para mezclas de biodiésel B5 y menores)
- "Productos de petróleo líquido ES 14078 - Determinación de ésteres metílicos ácidos grasos (FAME) en destilados medios - Método de espectroscopia infrarroja"
- "Derivados de aceites y grasas ES 14104 - Éster metílico ácido graso (FAME) - Determinación del valor de ácido"
- "Método de pruebas de la norma ASTM D664 para el índice de acidez de los productos de petróleo mediante el análisis volumétrico potenciométrico"
- "Guía de la norma ASTM D6469 para la contaminación microbiana en sistemas de combustible y combustibles"
- "Datos que debería saber sobre combustibles renovables, EMA (Asociación de fabricantes de máquinas)"
- "Posición técnica de la EMA sobre el uso de la declaración de posición del biodiésel, EMA (Asociación de fabricantes de máquinas)"

http://www.enginemanufacturers.org/articles

Filtros

- Publicación Especial, PSHP6028, "Filtros de aire de eficacia ultraaltaCat"

- Publicación Especial, PSHP7032, "Filtros de aire de sello radial"
- Publicación Especial, PSHJ0092, "Filtros de aire para cabinas Cat"
- Publicación Especial, PSHP7077, "Antefiltros de turbina Cat"
- Publicación Especial, PSHP9013, "Indicador de servicio del filtro de aire"
- Publicación Especial, PSHJ0082, "Separadores de agua/combustible y bombas de cebado PrimeTime Cat"
- Publicación Especial, PSHP7046, "Control de contaminación del combustible"
- Publicación Especial, PSHJ0068, "Filtro de aceite del motor de eficacia avanzada Cat"
- Publicación Especial, PSHJ0069, "Filtros hidráulicos y del tren de fuerza Cat"

Servicios S·O·S

- Publicación Especial, PSDP7036, "Puntos importantes del análisis S·O·S de fluidos"
- Publicación Especial, PSHP7052, "Cómo aprovechar al máximo los servicios S·O·S"
- Publicación Especial, PSHP7076, "Cómo interpretar las pruebas de servicios S·O·S"
- Publicación Especial, PEHP6001, "Cómo tomar una buena muestra de aceite"
- Publicación Especial, PSHP7057, "Análisis S·O·S del refrigerante"

Diversos

- Publicación Especial, SSBU5898, "Recomendaciones para climas fríos"
- Publicación Especial, PSDP9131, "Contaminación de fluidos. El ladrón silencioso"
- Video, PSVN4266, "Cómo lograr la potencia en las servotransmisiones" (VHS)
- Artículo publicado en la revista Construction Equipment, PEWP8029, "Ventajas del aceite multiclima para transmisiones/trenes de impulsión"
- Publicación Especial, AECQ1042, "Línea de Productos Caterpillar"
- Publicación Especial, PSWJ0074, "Guía de aplicación de filtros y fluidos Cat"
- Publicación Especial, PSCP9067, "Única fuente segura"
- Publicación Especial, PSWJ0074, "Guía de aplicaciones de filtros y fluidos Cat"
- Publicación Especial, NSNG2500, "Catálogo de herramientas de servicio de los distribuidores Caterpillar"
- Publicación Especial, PSCJ0003, "Catálogo de suministros y herramientas para taller Cat"
- Publicación Especial, SSNR3130, "Especificaciones de pares"
- Publicación Especial, SSNR9620, "Mejora de la durabilidad del componente. Sistemas de

combustible" (Paquete de 10)

- Publicación Especial, SEBF1018, "Mejora de la durabilidad del componente - Motores" (Paquete de 10)
- Publicación Especial, SEBF1020, "Mejora de la durabilidad del componente - Control de limpieza de fluidos" (Paquete de 10)
- Publicación Especial, SEBF1015, "mejora de la durabilidad del componente - mandos finales y diferenciales" (Paquete de 10)
- Publicación Especial, SEBF1016, "Mejora de la durabilidad del componente - Servotransmisiones" (Paquete de 10)
- Publicación Especial, SEBF1017, "Mejora de la durabilidad del componente - Remoción e instalación de componentes" (Paquete de 10)
- Publicación Especial, SEBF1019, "Mejora de la durabilidad del componente - Sistemas hidráulicos" (Paquete de 10)
- Publicación Especial, SSBF1021, "Mejora de la durabilidad del componente" Juegos en caja (incluye una de cada serie de 7 series de "mejora de la durabilidad del componente").
- Publicación Especial, SSBD0348, "Manual de Rendimiento de Caterpillar"

Material de referencia adicional

ClasificaciónSAE J183"" Habitualmente se puede encontrar en el manual de la SAE.

Combustibles dieselSAE J313"" Se puede encontrar en el manual de la SAE. Esta publicación también puede obtenerla en su sociedad tecnológica, biblioteca o universidad locales.

Nomenclatura"SAE J754" Se puede encontrar en el manual de la SAE.

Engine Manufacturers Association (Asociación de Fabricantes de Motores)"Libro de datos de fluidos de motor"

Cold Weather Information

SMCS - 1000; 7000

The information that is contained in this document is an aid to the operation and maintenance of your Caterpillar machine in cold weather. This information will cover operating your machine in temperatures from 9 °C (48 °F) to -40 °C (-40 °F).

When you operate the machine in temperatures above 9 °C (48 °F), refer to the Operation and Maintenance Manual for your machine.

It is difficult to outline the operation and maintenance of a machine that is used in freezing temperatures for a general publication. The difficulty in outlining the requirements is caused by the following conditions: the unlimited differences in weather conditions, applications and the supplies that are available in your area. In order to provide the best possible guidelines, use the information in this document and the following criteria: varying factors, recommendations from your Caterpillar dealer and past proven practices.

Hints for Cold Weather

Make sure that you read the information for selecting the lubricants to use in cold weather. Refer to Special Publication, SEBU6250, "Lubricant Viscosities" for more information.

Prepare the machine for the weather conditions. Use the following options to keep the machine warm: heaters, enclosures for compartments and storage facilities.

- To assist in warm-up, block the radiator. Blocking the radiator will restrict air from the fan.
- Before the beginning of cold weather, install the correct lubricant in each compartment.
- Keep all starting fluid at room temperature. Inject starting fluid only while the engine is cranking.
- Provide cooling system protection for the lowest expected outside temperature.

Premix the antifreeze solution for the cooling system. At the minimum, the freeze protection that is provided by the solution should be equal to the system protection requirements.

- Check all rubber parts weekly: hoses, tires and fan drive belts.
- Check all electrical wiring and connections for any fraying or for damaged insulation.
- Keep all batteries fully charged and warm.
- Fill the fuel tank at the end of each shift.
- Check the air cleaners and the air intake daily. If snow is present, check the air intake more frequently.

Steering response on equipment with hydraulic steering may become very slow at very low temperatures. This can happen even if the correct oils are used.

If the engine is started, run the engine until the engine reaches operating temperature. Achieving operating temperature will help prevent the intake valves and exhaust valves from sticking.

Personal injury or property damage can result from alcohol or starting fluids.

Alcohol or starting fluids are highly flammable and toxic and if improperly stored could result in injury or property damage.

NOTICE

Alcohol should never be injected or pured into the air brake system. The use of alcohol in the air brake system can cause components to wear prematurely. The use of alcohol in the air brake system will void the warranty of the system components.

Do not store starting fluid or store alcohol in the operator's compartment.

Do not Inject alcohol or pour alcohol into the air brake system. The use of alcohol in the air brake system can cause components to wear prematurely. The use of alcohol in the air brake system will void the warranty of the system components. Alcohol may be injected in certain air compressors in order to prevent moisture from freezing. Consult your Caterpillar dealer for further information.

The cooling system and the lubrication system for the engine do not lose heat immediately upon shutdown. The transmission and the hydraulic system lose heat more rapidly because of more exposed areas. Gear cases cool rapidly, since the gear cases do not operate as warm as other compartments.

This means that an engine can maintain the ability to start readily after being shut down for a few hours. The other systems will lose heat more rapidly. The equipment will require exercising upon starting. If the engine is shut down for at least sixteen hours, the engine will cool down to the outside temperature.

Running the engine at idle will keep the engine compartment warm. The compartment for the transmission will also be kept warm. However, running the engine will not keep hydraulic systems warm.

The outer wrapper on hydraulic hoses can crack when flexing occurs in cold temperatures. This does not mean that the hoses have failed. The hoses will still carry oil under pressure.

Condition the hydraulic hoses on the equipment before the temperatures decrease below -40°C (-40°F).

Perform the following steps in order to condition the hoses with the hoses on the machine: Operate at 66°C (150°F) hydraulic oil temperature for at least one hour. Use an oil that has a pour point of -54°C (-65°F).

Normal machine operation will condition the hoses if arctic fluids have been put into the system. However, the arctic fluid must be put into the system before cold weather begins.

Condition the hoses before installation if the ambient temperature is lower than -40°C (-40°F).

Perform the following steps in order to condition a hose before installation:

- Fill the hose assembly with kerosene or with a winter blend of diesel fuel. Leave the couplings attached.
- Keep the hoses filled for a minimum of eight hours at a temperature of 22°C (72°F).

- Hose assemblies should be installed within thirty days of conditioning.

Check the machine in order to be sure that the voltage of the electric heaters matches the power source.

Correct track tension is especially important during cold weather operation in snow. For adjustment procedures, refer to the Operation and Maintenance Manual for the machine.

Before Starting Engine

SMCS - 1000; 7000

NOTICE

Do not remove the air cleaner element when snow packing occurs. This could cause severe engine damage. Instead, rework the air intake so air is taken in under the hood.

Do not use a torch to heat a compartment. This causes fires, burns wiring, gaskets and seals, or melts the battery case.

When using canvas covers, do not install them near exhaust systems. This helps to prevent fires.

Check the air cleaner daily before starting the machine. If you operate the machine in heavy snow, attach a burlap sack loosely to the precleaner. By moving freely, the sack will prevent the snow from accumulating around the precleaner. Keep the burlap sack away from heated parts. The hot exhaust piping may ignite the burlap sack. Also, make sure that the burlap sack does not touch any moving parts.

In order to assist in warm-up, block the radiator. Blocking the radiator will restrict air from the fan. Additional items may be needed to assist in warm-up. The use of the following items may be required: coolant heaters, block heaters, tents and additional batteries.

Before entering the operator's station, inspect the condition of the following parts: hydraulic hoses, tires and fan drive belts. Carefully inspect these components for any of these conditions: cuts, cracks and worn spots. Check all electrical wiring and check electrical connections for any fraying or for damaged insulation.

If the machine is equipped with a gasoline starting engine, check the gasoline tank and check the sediment bowl. At every fifty service hours, check for moisture and check for dirt.

Engine Starting Information

SMCS - 1000; 7000

Categories

Table 1

Categories of Cold Weather	
Category	**Temperature Range**
Category 1	9 to -9.5 °C (48 to 15 °F)
Category 2	-9.5 to -18 °C (15 to 0 °F)
Category 3	-18 to -30 °C (0 to -22 °F)
Category 4	-30 to -40 °C (-22 to -40 °F)

The fluids in all compartments must have a pour point below the outside starting temperature.

Category 1

9 to -9.5 °C (48 to 15 °F)

At operating altitudes of 460 m (1500 ft) or less, a Caterpillar diesel engine will not normally require any starting aids for temperatures in "Category 1".

At operating altitudes of 460 m (1500 ft) or higher, a Caterpillar diesel engine may require a starting aid. The use of starting aids depends on the engine model and the altitude.

Table 2

Category 1 Starting Aids			
Altitude	**Engine Model**	**Recommended**	**Optional**
0 to 460 m (0 to 1500 ft)	All Models	None	None
above 460 m (1500 ft)	3126B, C-9, C7, C9	Continuous Flow Ether	None
	All Other Models	None	

Note: Continuous flow ether is controlled by the engine ECM. Manual operation during starting is not required.

Use only Caterpillar SAE 15W-40, 10W-30 oils or any commercial SAE multigrade oil that meets the ECF-1 requirements. Refer to the machine Operation and Maintenance Manual and Special Publication, SEBU6251 for more information.

Category 2

-9.5 to -18 °C (15 to 0 °F)

Table 3

Category 2 Starting Aids			
Altitude	**Engine Model**	**Recommended**	**Optional**
All Altitudes	All Models	Continuous Flow Ether	Coolant Heater
			Heavy Duty Battery and Starter Package (1)

(1) Contact your Caterpillar dealer for availability for your machine model.

Use only Caterpillar 10W-30 oil, or a lower viscosity multigrade oil, that meets ECF-1 requirements. Do not use SAE 15W multigrade oil in category 2 temperatures. Refer to the machine Operation and Maintenance Manual and Special Publication, SEBU6251 for more information.

Category 3

-18 to -30 °C (0 to -22 °F)

Table 4

Category 3 Starting Aids			
Altitude	**Engine Model**	**Recommended**	**Optional**
All Altitudes	All Models	Continuous Flow Ether	Oil Heater
		Coolant Heater	Fuel Heater
		Heavy Duty Battery and Starter (1)	Battery Warmer

(1) Contact your Caterpillar dealer for availability for your machine model.

Only use SAE 5W-40 or a lower viscosity multigrade oil. Do not use any SAE 15W or 10W multigrade oils in category 3 temperatures. Refer to the machine Operation and Maintenance Manual and Special Publication, SEBU6251 for more information.

Category 4

-30 to -40 °C (-22 to -40 °F)

Table 5

Category 4 Starting Aids			
Altitude	**Engine Model**	**Recommended**	**Optional**
All Altitudes	All Models	Continuous Flow Ether	Oil Heater
		Coolant Heater	Fuel Heater
		Heavy Duty Battery and Starter (1)	Battery Warmer

(1) Contact your Caterpillar dealer for availability for your machine model.

Use only SAE 0W-40 or a lower viscosity multigrade oil. Do not use any SAE 15W, SAE 10W or 5W multigrade oils in category 3 temperatures. Refer to the machine Operation and Maintenance Manual and Special Publication, SEBU6251 for more information.

Engine Starting with Starting Aid

SMCS - 1000; 1090; 1456; 7000

Diesel Engines That Are Equipped With Gasoline Starting Engines

1. Place the lever that is used to release compression into the START position.
2. Move the engine governor control to the SHUTOFF position.
3. Shift the transmission for the gasoline starting engine into the LOW speed position. Start cranking the diesel engine with the gasoline starting engine.
4. After the diesel engine cranks freely, disengage the clutch for the gasoline starting engine. Shift the transmission for the gasoline starting engine to HIGH speed. Engage the clutch for the gasoline starting engine. Crank the diesel engine for several minutes in order to warm the engine. As a result of cranking the diesel engine, the oil pressure should attain the NORMAL range on the gauge. Also, the pressure of the diesel fuel should register NORMAL.
5. Place the lever that is used to release compression into the RUN position. Move the diesel engine's governor control lever to the HIGH IDLE position.

NOTICE

Start the diesel engine with the starting engine transmission in High only.

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6. After the diesel engine starts, reduce the rpm of the diesel engine. Disengage the clutch for the gasoline starting engine. Turn off the fuel to the gasoline starting engine. Continue to run the gasoline starting engine until the gasoline starting engine's carburetor bowl is dry.

Diesel Engines That Are Equipped With Gasoline Starting Engines and Glow Plugs

1. Place the lever that is used to release compression into the START position.
2. Move the governor control lever to the SHUTOFF position.
3. Start cranking the diesel engine with the gasoline starting engine's transmission in LOW speed.
4. After the diesel engine cranks freely, disengage the clutch for the gasoline starting engine. Shift the transmission for the gasoline starting engine to HIGH speed. Engage the clutch for the gasoline starting engine. Crank the diesel engine for several minutes in order to warm the engine. Cranking the diesel engine will also bring the oil pressure to the NORMAL range on the gauges. Also, the pressure for the diesel fuel should register NORMAL.
5. Disengage the clutch for the gasoline starting engine, but allow the gasoline starting engine to run.
6. Turn the heat switch for the glow plug to the HEAT position. Allow the glow plug to operate for two to five minutes. Do not crank the diesel engine.

7. After warming the engine with the glow plug, move the lever that is used to release compression into the RUN position. Engage the clutch in order to crank the diesel engine.

8. With the heat switch in the ON position, allow the gasoline starting engine to crank the diesel engine. Continue cranking the diesel engine until normal cranking rpm is achieved.

NOTICE

Start the diesel engine with the starting engine transmission in High only.

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9. While you crank the engine with the heat switch in the ON position, move the governor control lever to the HIGH IDLE position.

10. Keep the heat switch in the ON position until the engine starts and the engine runs smoothly. After the engine starts, reduce the rpm of the engine.

NOTICE

Do not turn the heat switch to the Heat position if the engine is warm and running. Engine damage could result.

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11. Disengage the clutch for the gasoline starting engine. Turn off the fuel for the gasoline starting engine. Continue to run the gasoline starting engine until the engine's carburetor bowl is dry.

Diesel Engines That Are Equipped With Ether Starting Aid

Manual Metered Ether Injection System

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.

Do not smoke while changing ether cylinders.

Use ether with care to avoid fires.

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

Do not store ether cylinders in direct sunlight or at temperatures above 49 °C (120 °F).

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

Keep ether cylinders out of the reach of unauthorized personnel.

To avoid possible injury, be sure the brakes are applied and all controls are in Hold or Neutral when starting the engine.

At temperatures above 0°C (32°F), the use of ether is not normally necessary. At temperatures between 0°C (32°F) and −18°C (0°F), one to six injections of ether may be required. The amount of ether that is required will depend on the type of engine and the cranking rpm.

When you start the engine below −18°C (0°F), use a new container of ether to make sure that there is adequate delivery pressure.

NOTICE

Inject starting aid (ether), only while cranking the engine.

At temperatures below −18°C (0°F), three to six injections of ether will be required to start the engine. After the engine starts, and cranking is stopped, continue to inject ether until the engine runs smoothly and/or the white smoke stops. This may require as many as ten to twelve injections of ether.

Continuous Flow Ether System

The continuous flow ether system that is used as a starting aid in cold weather is controlled by the engine ECM and engine software. The continuous flow ether system is dependent on coolant temperature and altitude. The starting procedure is not affected during ether injection.

Note: On machine engines that are equipped with an air inlet heater and continuous flow ether, the heater indicator light may not illuminate under certain conditions. The ECM and engine software insure that ether injection will not occur when the air inlet heater is in use.

Note: Check the ether bottle to insure that the bottle contains an adequate supply of ether in order to aid engine starting. This can be done by removing the bottle and shaking the bottle. Replace with a new bottle if the bottle is empty.

Note: Insure the continuous flow ether is turned on using electronic technician (ET). Consult your Caterpillar dealer for more information.

Automatic Metered Ether Injection System

Start the engine with the ether starting aid in the AUTOMATIC position.

After the engine starts, move the ether starting aid switch to the MANUAL position. Hold the switch in the MANUAL position until the engine runs smoothly and/or the white exhaust smoke stops.

Note: Regardless of the switch position, if the jacket water coolant temperature is at least 13°C (55°F), ether will not be injected.

Allow the engine to warm up at low idle for a minimum of five minutes before operating the machine.

Diesel Engines That Are Equipped With Glow Plugs

1. Move the engine governor control to the FULL THROTTLE position.

2. Turn the heat-start switch to the HEAT position. Maintain heat to the engine for the time that is indicated in table 1.

Table 1

Times For Glow Plug Starting Aid	
Starting Temperature	Glow Plug Heating Time
Above 16°C (60°F)	Zero minutes
16 to 0°C (60 to 32°F)	One minute
0 to −18°C (32 to 0°F)	Two minutes
Lower Than −18°C (0°F)	Three minutes

3. Turn the heat-start switch to the START position. Spray ether starting fluid into the air intake while you crank the engine.

   Note: Ether starting fluid may not be required in all instances.

NOTICE

Never operate the starter for more than twenty seconds at a time without allowing two minutes for the engine to cool before attempting to start again.

Do not turn the heat start switch to the Heat position or the Start position with the engine warm or running. Engine damage could result.

Use ether sparingly. Spray ether into the air intake for approximately one second. Wait approximately two seconds before spraying again. Spray ether only while cranking the engine. Follow instructions on the container.

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4. When the engine starts, return the engine governor control to the LOW IDLE position. Run the engine at the rpm that allows the engine to run smoothly. If necessary, return the heat-start switch to the HEAT position until the engine runs smoothly.

5. When the engine is stopped, turn the disconnect switch to the OFF position in order to prevent battery discharge.

Diesel Engines That Are Equipped With An Air Inlet Heater

WARNING

If your engine is equipped with an air inlet heater (AIH) for cold weather starting, only use an approved continuous flow ether system that is installed by Caterpillar or by a Caterpillar dealer. The engine software must be activated in order to insure that ether injection and AIH operation will not occure at the same time. Use of any other manually or automatically operated ether started aid system could cause an explosion resulting in injury or death.

WARNING

Explosion hazard! This machine is equipped with an air inlet heater. Do not spray aerosol starting aids such as ether manually into the intake. The use of ether without an ether attachment could result in an explosion or fires that could cause personal injury or death.

1. Engage the parking brake.
2. Unlock the steering column and the steering wheel. Adjust the steering column and the steering wheel to the desired position. Lock the steering column and the steering wheel.
3. Move the control levers to the HOLD position.
4. Push in the starting aid switch for the air inlet heater and release the starting aid switch.
5. The indicator light for the air inlet heater may come on during engine start-up. When the indicator light goes off, turn the engine start switch to the START position.
6. Depress the throttle pedal by 1/3 of the full pedal travel during engine cranking.
7. When the engine starts, release the engine start switch key and the throttle pedal. The throttle pedal will return to the low idle position.

After engine start-up, the air inlet heater can be activated for an extended postheat cycle. The air inlet heater will operate for an additional 30 seconds in order to smooth a rough running engine.

When you are starting the engine at temperatures below −9.5 °C (15 °F) or below 9 °C (48 °F) when above 460 m (1500 ft), the use of additional cold weather starting aids is recommended. A coolant heater, a fuel heater, an oil heater, or extra battery capacity may be required.

Excessive Heat Can Cause A Tire Explosion

WARNING

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

A tire explosion is much more violent than a blowout. The explosion can propel the tire, rim, and final drive components as far as 460 m (1500 feet) or more from the machine. Both the force of the explosion and the flying debris can cause personal injury or death, and property damage.

Although the risk of an explosion is very low, the hazard is very great, particularly with large tires used on wheel tractor-scrapers, large wheel loaders and off-highway trucks.

All personnel should be made aware of this danger and the actions to take to minimize the risk.

Heat from any source can be transferred to the tire, causing deterioration of the bead. Normally, the burned bead causes loss of air, and the tire goes flat without hazard to anyone in the vicinity.

Bead burning can result in the release of an explosive gaseous mixture inside the tire. In some cases the gaseous mixture inside the tire ignites. The internal burning causes a rapid increase in pressure, resulting in a violent tire explosion. The explosion produces a blowout at the tire bead which reacts against the machine to propel the tire, rim assembly and final drive components a considerable distance from the machine.

The danger of a tire explosion is greatest after the machine stops, because of the loss of the cooling effect of the circulating air due to wheel rotation.

If smoke, excessive heat, the smell of burning rubber or hot brakes, or other indications of bead burning are noticed, take action to prevent personal injury.

Move the machine to a remote area, but only if it can be done without endangering the operator or other personnel in the area.

Remove all personnel from the area where the machine is located.

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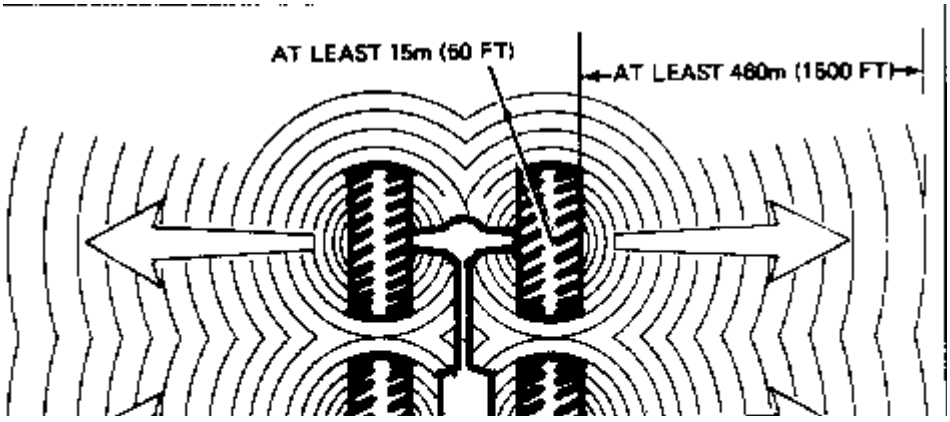

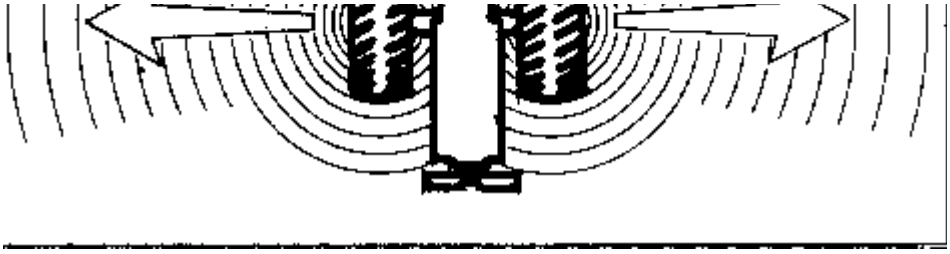

WARNING

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

If it is absolutely necessary to approach a machine with a suspected tire, do not get closer to the tires than 15 m (50 feet) at the front or rear of the machine, nor closer to the side of the tire than 460 m (1500 feet).

Do not approach any tire on the machine if there is a brake fire, burning rubber or other indications that excessive heat was generated by the brakes. Brake-generated heat probably affects all other tires on the machine, even though the visual evidence is only at one tire.

If there is evidence of a brake fire or the smell of burning rubber, don't go near the machine. FIGHT THESE FIRES FROM A REMOTE LOCATION. (Too often, the immediate response to a fire involving tires or brakes, is for people to grab a handheld fire extinguisher and rush up close to the machine to help put out the fire.) Stay away from the machine until the tires cool. Allow at least eight hours for the tires to cool before approaching the machine.

Keep observers out of the area, and at least 460 meters (1500 feet) away from the side of the tire and 15 meters (50 feet) away from the front or rear of the machine. See the above drawing.

There is no absolutely safe approach when fighting a machine fire. Approach only at the front or the rear of the machine and use a large dozer as a shield.

Current Recommendation

Caterpillar now recommends using dry nitrogen (N_2) gas for both tire inflation, and tire pressure adjustments on all current and past production rubber tired machines. Nitrogen is an inert gas and will not support combustion inside the tire.

WARNING

Proper nitrogen inflation equipment and training in its use are necessary to avoid over inflation. A tire blowout or rim failure can result from improper or misused equipment.

In addition to reducing the risk of an explosion, using nitrogen instead of air to inflate tires lessens the slow oxidation of the rubber and the accompanying gradual tire deterioration. This is especially important for tires that have an expected long service life (4 or more years). It also reduces the corrosion of rim components and the resultant disassembly problems.

Because a fully charged nitrogen cylinder's pressure is approximately 15000 kPa (2200 psi), a tire blowout and/or rim failure can occur if the inflation equipment is not used correctly. See "Nitrogen

blowout and/or rim failure can occur if the inflation equipment is not used correctly. See "Nitrogen Inflation Information," which follows.

Nitrogen Inflation Information

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WARNING

Stand behind the tread when inflating a tire.

NOTICE

Set the tire inflation equipment regulator at no more than 140 kPa (20 psi) over the recommended tire pressure.

Use only Caterpillar Part Number 6V4040 Nitrogen Tire Inflation Group to inflate tires from a nitrogen gas cylinder. See Caterpillar "Special Instruction," Form Number SMHS7867 for tire inflation instructions.

Use the same tire pressures for nitrogen inflation as would be used for air inflation. Consult the "Maintenance" Guide for the shipping pressure. Consult your tire dealer for operating pressures.