CATERPILLAR®

SEBU7334-03
October 2008

Operation and Maintenance Manual

R1300G Series II Load Haul Dump

RSL1-Up (Machine)

Important Safety Information

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

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

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

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

The hazards are identified by the “Safety Alert Symbol” and followed by a “Signal Word” such as “DANGER”, “WARNING” or “CAUTION”. The Safety Alert “WARNING” label is shown below.

⚠ WARNING

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

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

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

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

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Caterpillar dealers have the most current information available.

⚠ WARNING

When replacement parts are required for this product Caterpillar recommends using Caterpillar replacement parts or parts with equivalent specifications including, but not limited to, physical dimensions, type, strength and material.

Failure to heed this warning can lead to premature failures, product damage, personal injury or death.

Table of Contents

Foreword

Literature Information

This manual should be stored in the operator's compartment in the literature holder or seat back literature storage area.

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

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

Continuing improvement and advancement of product design might have caused changes to your machine which are not included in this publication. Read, study and keep this manual with the machine.

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

Safety

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

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

Operation

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

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

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

Maintenance

The maintenance section is a guide to equipment care. The Maintenance Interval Schedule (MIS) lists the items to be maintained at a specific service interval. Items without specific intervals are listed under the "When Required" service interval. The Maintenance Interval Schedule lists the page number for the step-by-step instructions required to accomplish the scheduled maintenance. Use the Maintenance Interval Schedule as an index or "one safe source" for all maintenance procedures.

Maintenance Intervals

Use the service hour meter to determine servicing intervals. Calendar intervals shown (daily, weekly, monthly, etc.) can 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 chart might 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 and every 10 service hours or daily.

California Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Battery posts, terminals and related accessories contain lead and lead compounds. **Wash hands after handling.**

Certified Engine Maintenance

Proper maintenance and repair is essential to keep the engine and machine systems operating correctly. As the heavy duty off-road diesel engine owner, you are responsible for the performance of the required maintenance listed in the Owner Manual, Operation and Maintenance Manual, and Service Manual.

It is prohibited for any person engaged in the business of repairing, servicing, selling, leasing, or trading engines or machines to remove, alter, or render inoperative any emission related device or element of design installed on or in an engine or machine that is in compliance with the regulations (40 CFR Part 89). Certain elements of the machine and engine such as the exhaust system, fuel system, electrical system, intake air system and cooling system may be emission related and should not be altered unless approved by Caterpillar.

Machine Capacity

Additional attachments or modifications may exceed machine design capacity which can adversely affect performance characteristics. Included would be stability and system certifications such as brakes, steering, and rollover protective structures (ROPS). Contact your Caterpillar dealer for further information.

Caterpillar Product Identification Number

Effective First Quarter 2001 the Caterpillar Product Identification Number (PIN) has changed from 8 to 17 characters. In an effort to provide uniform equipment identification, Caterpillar and other construction equipment manufacturers are moving to comply with the latest version of the product identification numbering standard. Non-road machine PINs are defined by ISO 10261. The new PIN format will apply to all Caterpillar machines and generator sets. The PIN plates and frame marking will display the 17 character PIN. The new format will look like the following:

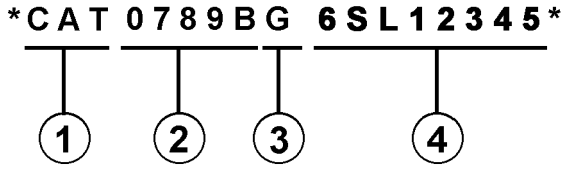

Illustration 1 g00751314

Where:

1. Caterpillar's World Manufacturing Code (characters 1-3)

2. Machine Descriptor (characters 4-8)

3. Check Character (character 9)

4. Machine Indicator Section (MIS) or Product Sequence Number (characters 10-17). These were previously referred to as the Serial Number.

Machines and generator sets produced before First Quarter 2001 will maintain their 8 character PIN format.

Components such as engines, transmissions, axles, etc. and work tools will continue to use an 8 character Serial Number (S/N).

Safety Section

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Safety Messages

SMCS Code: 7000

There are several specific safety messages on this machine. The exact location of the hazards and the description of the hazards are reviewed in this section. Please become familiarized with all safety messages.

Make sure that all of the safety messages are legible. Clean the safety messages or replace the safety messages if you cannot read the words. Replace the illustrations if the illustrations are not legible. When you clean the safety messages , use a cloth, water and soap. Do not use solvent, gasoline, or other harsh chemicals to clean the safety messages . Solvents, gasoline, or harsh chemicals could loosen the adhesive that secures the safety message. Loose adhesive will allow the safety message to fall.

Replace any safety message that is damaged, or missing. If a safety message is attached to a part that is replaced, install a safety message on the replacement part. Any Caterpillar dealer can provide new safety messages.

Do Not Operate

Illustration 2 g00994953

This safety label is located in the operator station.

Illustration 3 g00788977

WARNING

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

Do Not Weld the ROPS

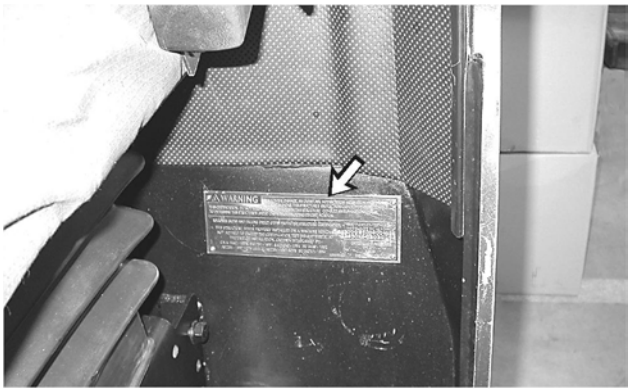

Illustration 4 g00994954

This safety label is located in the operator station.

Illustration 5 g00892002

WARNING

Structural damage, an overturn, modification, alteration, or improper repair can impair this structure's protection capability thereby voiding this certification. Do not weld on or drill holes in the structure. Consult an Elphinstone dealer to determine this structure's limitations without voiding its certification.

Rollover and Falling Object Protective Structure Certification

This structure, when properly installed on a machine which is not altered to exceed the certification test weight meets, at the time of installation, criteria established by: C.S.A B352-1990, SAEJ231-1981, SAEJ1040-1994, ISO 3449-1992, AS2294-1997 FOPS LEVEL II, AS2294-1997 ROPS, ISO 3471/1-1994.

No Clearance

Illustration 6 g01244481

This safety label is located on both sides of the machine articulating hitch.

Illustration 7 g00892055

WARNING

No clearance for person in this area when machine turns. Severe injury or death from crushing could occur. Connect steering frame lock between front and rear frames before lifting, transporting, or servicing machine in articulation area. Disconnect lock and secure before resuming operation.

STIC Steering Control

Illustration 8 g00994956

This safety label is located on the inside of the operator station door.

Illustration 9 g00892146

WARNING

Use grab handle not STIC control when entering or leaving operator's station.

Severe injury or death may be caused by crushing when machine turns

Operator Station Access

Illustration 10 g00994957

This safety label is located on the inside of the operator station door.

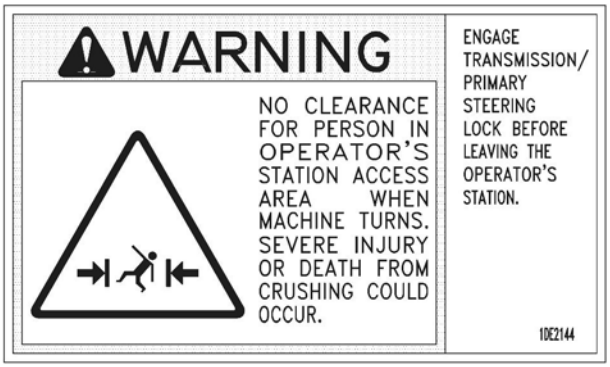

Illustration 11 g00892207

WARNING

No clearance for person in operator's station access area when machine turns. Severe injury or death from crushing could occur.

Engage transmission/primary steering lock before leaving the operator's station.

Lift Arm Support Pins

Illustration 12 g01244478

This safety label is located on both sides of the lift arm.

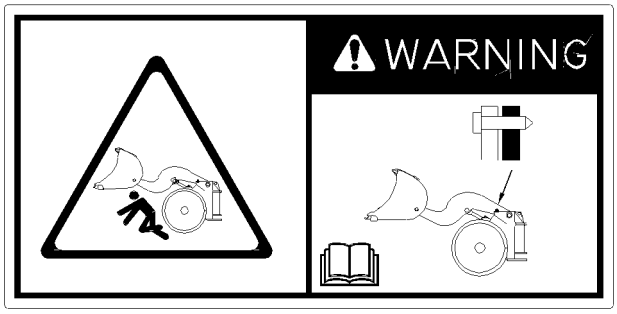

Illustration 13 g01234078

WARNING

No clearance for person in this area when lift arm lowers. Crush hazard could cause serious injury or death. Confirm lift arm support pins are installed. Follow the procedure in the operation manual.

High Pressure Cylinder (Ride Control)

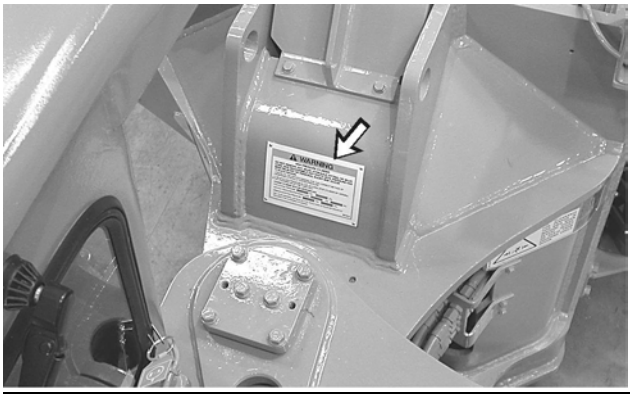

Illustration 14 g00994959

This safety label is located on the front frame near the ride control accumulator (if equipped).

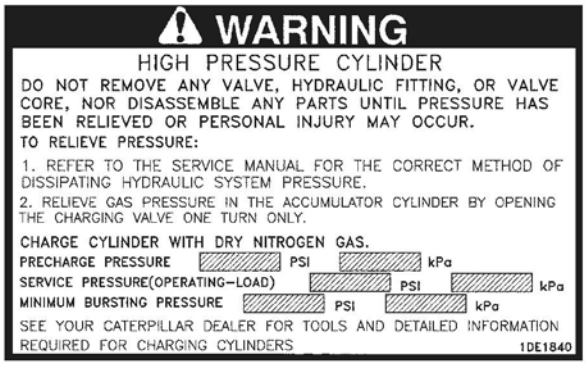

Illustration 15 g00892476

WARNING

High Pressure Cylinder!

Do not remove any valve, hydraulic fitting, or valve core, nor disassemble any parts until pressure has been relieved, or personal injury may occur.

To relieve pressure:

1. **Refer to the Service Manual for the correct method of dissipating hydraulic system pressure.**

2. **Relieve gas pressure in the accumulator cylinder by opening the charging valve one turn only.**

Charge the cylinder with dry nitrogen gas.

See your Caterpillar dealer for tools and detailed information required for charging cylinders.

High Pressure Cylinder (Brake Accumulator)

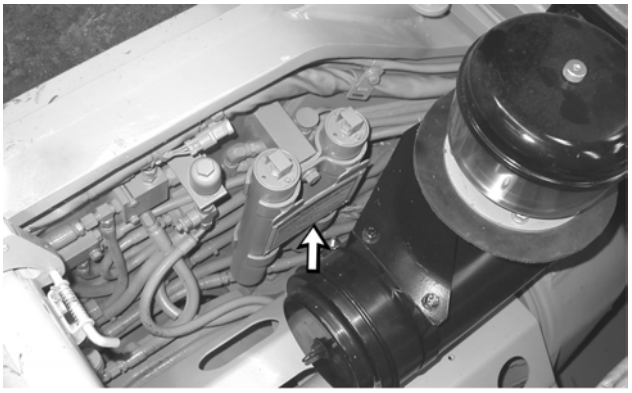

Illustration 16 g01245064

This safety label is located on the brake accumulators.

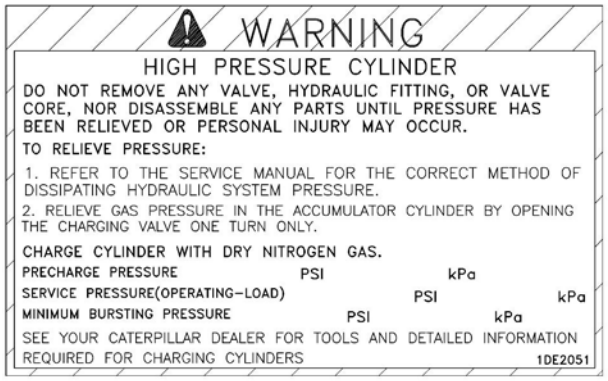

Illustration 17 g00892403

WARNING

High Pressure Cylinder!

Do not remove any valve, hydraulic fitting, or valve core, nor disassemble any parts until pressure has been relieved, or personal injury may occur.

To relieve pressure:

1. **Refer to the Service Manual for the correct method of dissipating hydraulic system pressure.**

2. **Relieve gas pressure in the accumulator cylinder by opening the charging valve one turn only.**

Charge the cylinder with dry nitrogen gas.

See your Caterpillar dealer for tools and detailed information required for charging cylinders.

Batteries

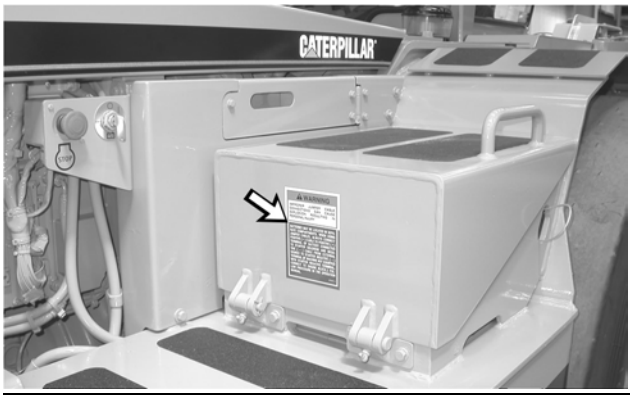

Illustration 18 g01244475

This safety label is located on the right side of the battery compartment.

Illustration 19 g00892563

WARNING

IMPROPER JUMPER CABLE CONNECTIONS CAN CAUSE EXPLOSION RESULTING IN PERSONAL INJURY.

BATTERIES 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 MACHINE NOT EQUIPPED WITH STARTER NEGATIVE TERMINAL, CONNECT TO ENGINE BLOCK.) FOLLOW PROCEDURE IN THE OPERATION MANUAL.

Engine Coolant

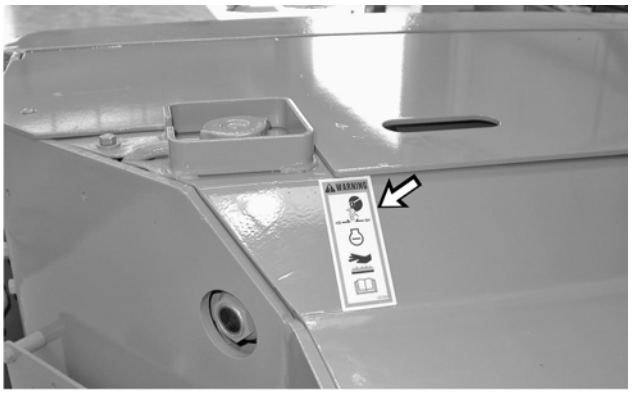

Illustration 20 g01244477

This safety label is located near the cooling system pressure cap.

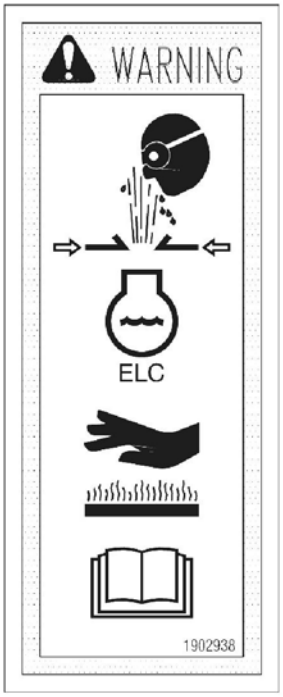

Illustration 21 g00892607

WARNING

PRESSURIZED SYSTEM: HOT COOLANT CAN CAUSE SERIOUS BURN. TO OPEN CAP, STOP ENGINE, WAIT UNTIL RADIATOR IS COOL. THEN LOOSEN CAP SLOWLY TO RELIEVE THE PRESSURE.

Do Not Use Ether Starting Aid

Illustration 22 g01130881

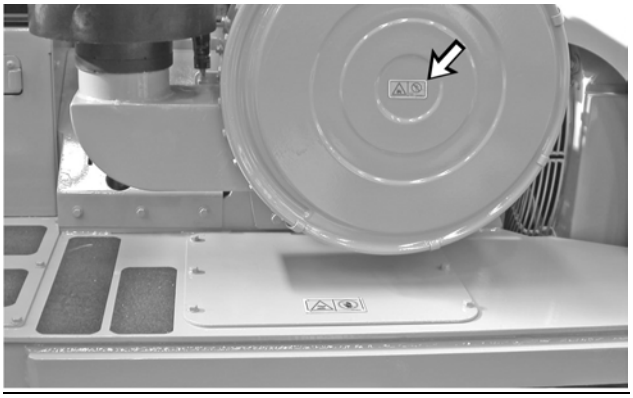

Illustration 23 g01241292

This safety label is located on the engine and on the air cleaner.

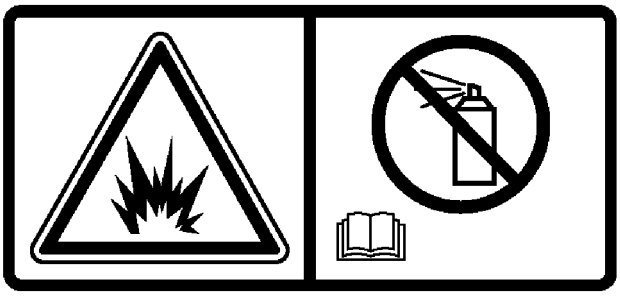

Illustration 24 g01055438

WARNING

Do not use aerosol types of starting aids such as ether. Such use could result in an explosion and personal injury.

Hot Surface

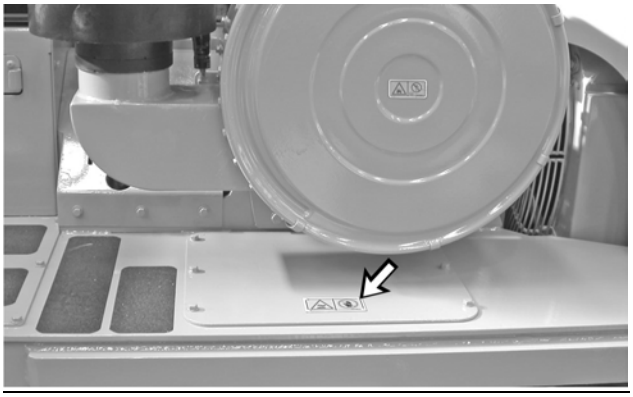

Illustration 25 g01241299

This safety label is located on the exhaust cover.

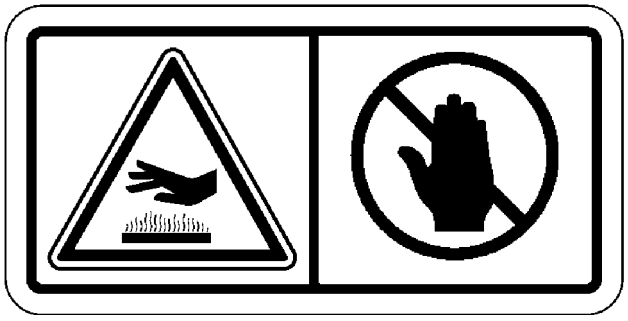

Illustration 26 g01164435

⚠ WARNING

Avoid contact with hot surfaces. Exhaust piping and engine components become hot during engine operation and cool slowly after engine shutdown. Any contact with hot surfaces can cause severe burns.

Compressed Spring

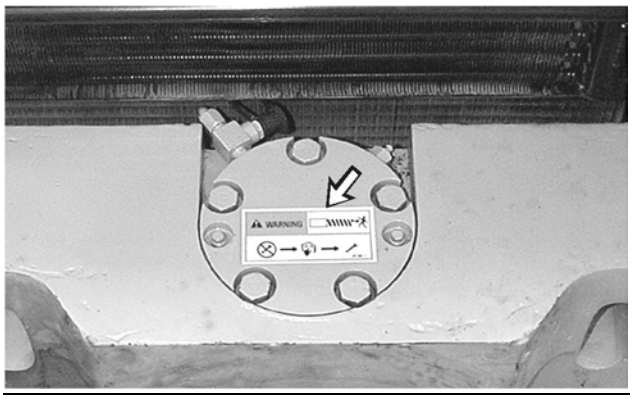

Illustration 27 g00994963

This safety label is located on the brake release cylinder (if equipped).

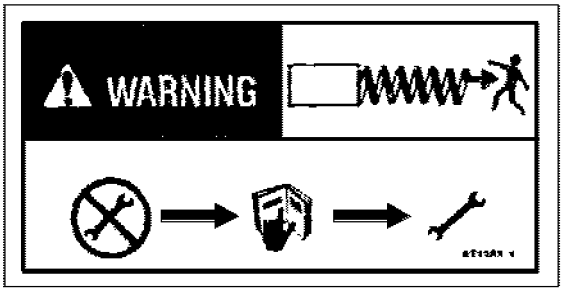

Illustration 28 g00100414

⚠ WARNING

Personal injury can result from spring force released when removing cap screws.

Internal spring force will be released when cylinder assembly cap screws are removed causing injury.

Always restrain cover as cap screws are loosened.

Follow the established procedure in the Service Manual to service these parts.

Recovery Hook

Illustration 29 g00994964

This safety label is located next to the recovery hook (if equipped).

Illustration 30 g00946835

WARNING

Do not use this recovery device for towing other machines or equipment.

Use of this hook may disengage the parking/secondary brake.

Personal injury or death from run over could result.

Marked tow devices should be used to tow other machines.

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Additional Messages

SMCS Code: 7000

There are several specific messages on this machine. The exact location of the messages and the description of the messages are reviewed in this section. Please become familiarized with all messages.

Make sure that all of the messages are legible. Clean the messages or replace the messages if you cannot read the words. Replace the illustrations if the illustrations are not legible. When you clean the messages, use a cloth, water and soap. Do not use solvent, gasoline, or other harsh chemicals to clean the messages. Solvents, gasoline, or harsh chemicals could loosen the adhesive that secures the messages. Loose adhesive will allow the messages to fall.

Replace any message that is damaged, or missing. If a message is attached to a part that is replaced, install a message on the replacement part. Any Caterpillar dealer can provide new messages.

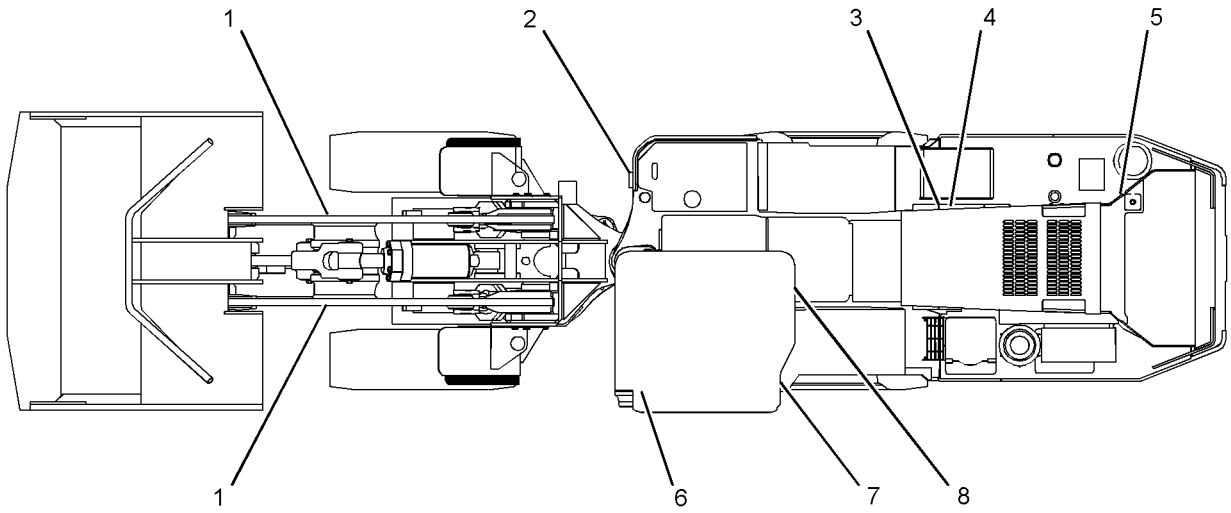

Illustration 31 g01218473

Do Not Weld or Drill on Lift Arms (1). This message is located on the left side and the right side of the lift arms.

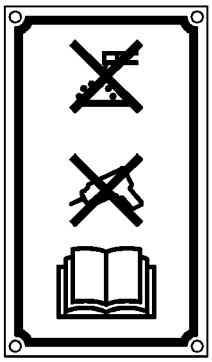

Illustration 32 g01592896

Hydraulic Oil Fast Fill (2). This message is located in the articulation area on the right side of the machine.

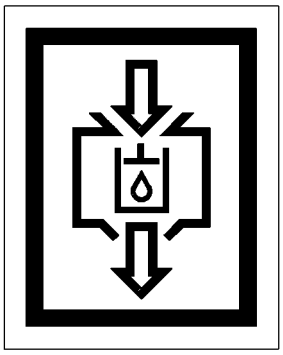

Illustration 33 g01592853

This additional message identifies the location of the fast fill connector for the hydraulic oil.

Transmission Oil Fast Fill (3). This message is located in the transmission compartment on the right side of the machine.

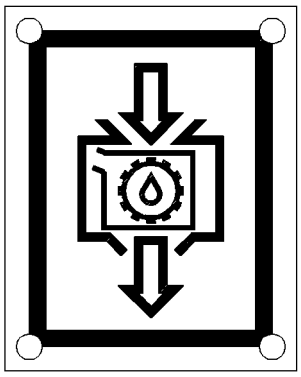

Illustration 34 g01429856

This additional message identifies the location of the fast fill connector for the transmission oil.

Engine Oil Fast Fill (4). This message is located on the right side of the machine.

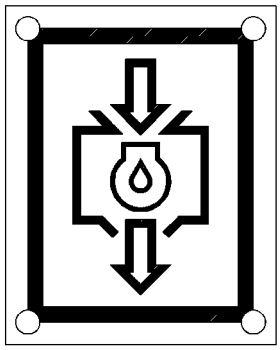

Illustration 35 g01593673

This additional message identifies the location of the fast fill connector for the engine oil.

Engine Coolant Fast Fill (5). This message is located front of the radiator on the right side of the machine.

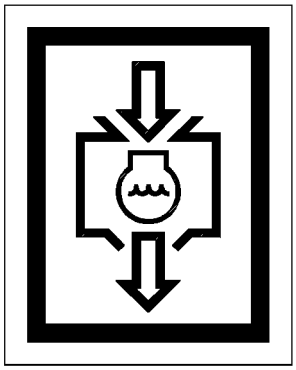

Illustration 36 g01592793

This additional message identifies the location of the fast fill connector for the engine coolant.

Do Not Weld or Drill on ROPS (6). This message is located inside the operator station on the left side of the seat.

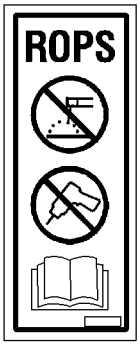

Illustration 37 g00899564

Alternate Exit (7). This message is located on the rear window.

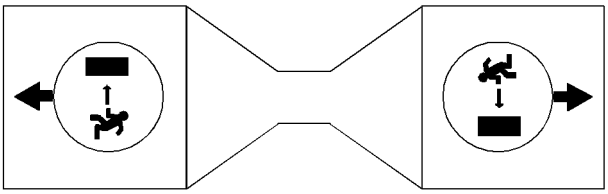

Illustration 38 g01592833

Note: The rear window is the alternate exit. Other windows in the operator station may be fitted with this additional message.

If the primary exit is blocked, exert outward pressure on the window until the window separates from the operator station frame. Exit the machine through the window.

Alternate Exit (8). This message is located on the rear window.

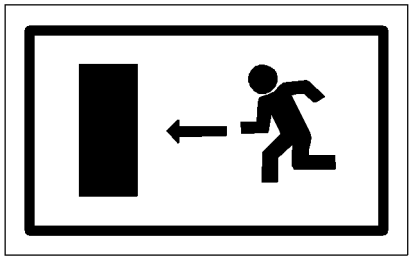

Illustration 39 g01002993

Note: The rear window is the alternate exit. Other windows in the operator station may be fitted with this additional message.

If the primary exit is blocked, exert outward pressure on the window until the window separates from the operator station frame. Exit the machine through the window.

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General Hazard Information

SMCS Code: 7000

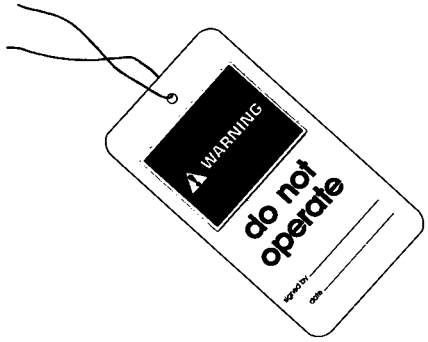


Illustration 40 g00104545

Attach a “Do Not Operate” warning tag or a similar warning tag to the start switch or to the controls before you service the equipment or before you repair the equipment. These warning tags (Special Instruction, SEHS7332) are available from your Caterpillar dealer.

Know the width of your equipment in order to maintain proper clearance when you operate the equipment near fences or near boundary obstacles.

Be aware of high voltage power lines and power cables that are buried. If the machine comes in contact with these hazards, serious injury or death may occur from electrocution.

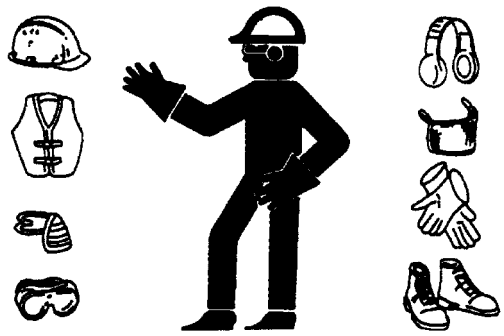


Illustration 41 g00702020

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

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

Make sure that all protective guards and all covers are secured in place on the equipment.

Keep the equipment free from foreign material. Remove debris, oil, tools, and other items from the deck, from walkways, and from steps.

Secure all loose items such as lunch boxes, tools, and other items that are not a part of the equipment.

Know the appropriate work site hand signals and the personnel that are authorized to give the hand signals. Accept hand signals from one person only.

Do not smoke when you service an air conditioner. Also, do not smoke if refrigerant gas may be present. Inhaling the fumes that are released from a flame that contacts air conditioner refrigerant can cause bodily harm or death. Inhaling gas from air conditioner refrigerant through a lighted cigarette can cause bodily harm or death.

Never put maintenance fluids into glass containers. Drain all liquids into a suitable container.

Obey all local regulations for the disposal of liquids.

Use all cleaning solutions with care. Report all necessary repairs.

Do not allow unauthorized personnel on the equipment.

Unless you are instructed otherwise, perform maintenance with the equipment in the servicing position. Refer to Operation and Maintenance Manual for the procedure for placing the equipment in the servicing position.

Pressurized Air and Water

Pressurized air and/or water can cause debris and/or hot water to be blown out. This could result in personal injury.

When pressurized air and/or pressurized water is used for cleaning, wear protective clothing, protective shoes, and eye protection. Eye protection includes goggles or a protective face shield.

The maximum air pressure for cleaning purposes must be reduced to 205 kPa (30 psi) when the nozzle is deadheaded and the nozzle is used with an effective chip deflector and personal protective equipment. The maximum water pressure for cleaning purposes must be below 275 kPa (40 psi).

Trapped Pressure

Pressure can be trapped in a hydraulic system. Releasing trapped pressure can cause sudden machine movement or attachment movement. Use caution if you disconnect hydraulic lines or fittings. High pressure oil that is released can cause a hose to whip. High pressure oil that is released can cause oil to spray. Fluid penetration can cause serious injury and possible death.

Fluid Penetration

Pressure can be trapped in the hydraulic circuit long after the engine has been stopped. The pressure can cause hydraulic fluid or items such as pipe plugs to escape rapidly if the pressure is not relieved correctly.

Do not remove any hydraulic components or parts until pressure has been relieved or personal injury may occur. Do not disassemble any hydraulic components or parts until pressure has been relieved or personal injury may occur. Refer to the Service Manual for any procedures that are required to relieve the hydraulic pressure.

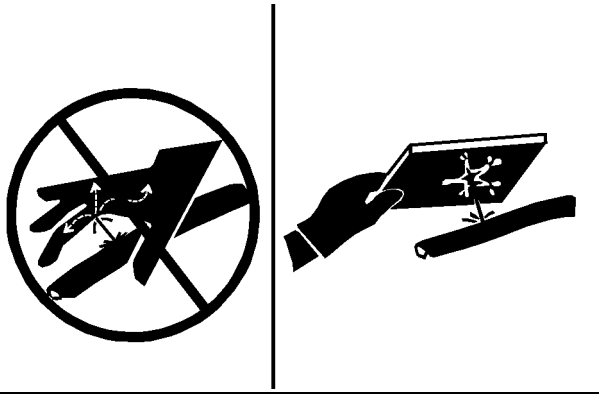


Illustration 42 g00687600

Always use a board or cardboard when you check for a leak. Leaking fluid that is under pressure can penetrate body tissue. Fluid penetration can cause serious injury and possible death. A pin hole leak can cause severe injury. If fluid is injected into your skin, you must get treatment immediately. Seek treatment from a doctor that is familiar with this type of injury.

Containing Fluid Spillage

Care must be taken in order to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the equipment. Prepare to collect the fluid with suitable containers before opening any compartment or disassembling any component that contains fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for the following items:

- Tools that are suitable for collecting fluids and equipment that is suitable for collecting fluids
- Tools that are suitable for containing fluids and equipment that is suitable for containing fluids

Obey all local regulations for the disposal of liquids.

Asbestos Information

Illustration 43 g00702022

Caterpillar equipment and replacement parts that are shipped from Caterpillar are asbestos free. Caterpillar recommends the use of only genuine Caterpillar replacement parts. Use the following guidelines when you handle any replacement parts that contain asbestos or when you handle asbestos debris.

Use caution. Avoid inhaling dust that might be generated when you handle components that contain asbestos fibers. Inhaling this dust can be hazardous to your health. The components that may contain asbestos fibers are brake pads, brake bands, lining material, clutch plates, and some gaskets. The asbestos that is used in these components is usually bound in a resin or sealed in some way. Normal handling is not hazardous unless airborne dust that contains asbestos is generated.

If dust that may contain asbestos is present, there are several guidelines that should be followed:

- Never use compressed air for cleaning.
- Avoid brushing materials that contain asbestos.
- Avoid grinding materials that contain asbestos.
- Use a wet method in order to clean up asbestos materials.
- A vacuum cleaner that is equipped with a high efficiency particulate air filter (HEPA) can also be used.

- 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. In the United States, use Occupational Safety and Health Administration (OSHA) requirements. These OSHA requirements can be found in “29 CFR 1910.1001”.
- Obey environmental regulations for the disposal of asbestos.
- Stay away from areas that might have asbestos particles in the air.

Dispose of Waste Properly

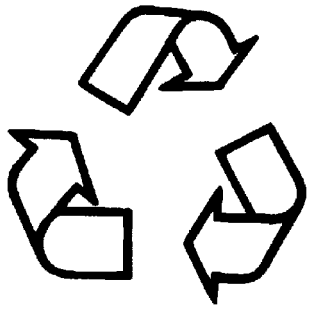


Illustration 44 g00706404

Improperly disposing of waste can threaten the environment. Potentially harmful fluids should be disposed of according to local regulations.

Always use leakproof containers when you drain fluids. Do not pour waste onto the ground, down a drain, or into any source of water.

i01359664

Crushing Prevention and Cutting Prevention

SMCS Code: 7000

Support the equipment properly before you perform any work or maintenance beneath that equipment. Do not depend on the hydraulic cylinders to hold up the equipment. Equipment can fall if a control is moved, or if a hydraulic line breaks.

Do not work beneath the cab of the machine unless the cab is properly supported.

Unless you are instructed otherwise, never attempt adjustments while the machine is moving or while the engine is running.

Never jump across the starter solenoid terminals in order to start the engine. Unexpected machine movement could result.

Whenever there are equipment control linkages the clearance in the linkage area will change with the movement of the equipment or the machine. Stay clear of areas that may have a sudden change in clearance with machine movement or equipment movement.

Stay clear of all rotating and moving parts.

If it is necessary to remove guards in order to perform maintenance, always install the guards after the maintenance is performed.

Keep objects away from moving fan blades. The fan blade will throw objects or cut objects.

Do not use a kinked wire cable or a frayed wire cable. Wear gloves when you handle wire cable.

When you strike a retainer pin with force, the retainer pin can fly out. The loose retainer pin can injure personnel. Make sure that the area is clear of people when you strike a retainer pin. To avoid injury to your eyes, wear protective glasses when you strike a retainer pin.

Chips or other debris can fly off an object when you strike the object. Make sure that no one can be injured by flying debris before striking any object.

i01329099

Burn Prevention

SMCS Code: 7000

Do not touch any part of an operating engine. Allow the engine to cool before any maintenance is performed on the engine. Relieve all pressure in the air system, in the oil system, in the lubrication system, in the fuel system, or in the cooling system before any lines, fittings or related items are disconnected.

Coolant

When the engine is at operating temperature, the engine coolant is hot. The coolant is also under pressure. The radiator and all lines to the heaters or to the engine contain hot coolant.

Any contact with hot coolant or with steam can cause severe burns. Allow cooling system components to cool before the cooling system is drained.

Check the coolant level only after the engine has been stopped.

Ensure that the filler cap is cool before removing the filler cap. The filler cap must be cool enough to touch with a bare hand. Remove the filler cap slowly in order to relieve pressure.

Cooling system conditioner contains alkali. Alkali can cause personal injury. Do not allow alkali to contact the skin, the eyes, or the mouth.

Oils

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

Remove the hydraulic tank filler cap only after the engine has been stopped. The filler cap must be cool enough to touch with a bare hand. Follow the standard procedure in this manual in order to remove the hydraulic tank filler cap.

Batteries

Electrolyte is an acid. Electrolyte can cause personal injury. Do not allow electrolyte to contact the skin or the eyes. Always wear protective glasses for servicing batteries. Wash hands after touching the batteries and connectors. Use of gloves is recommended.

i01359795

Fire Prevention and Explosion Prevention

SMCS Code: 7000

Illustration 45 g00704000

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

Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire. Fire may cause personal injury and property damage.

Remove all flammable materials such as fuel, oil, and debris from the machine. Do not allow any flammable materials to accumulate on the machine.

Store fuels and lubricants in properly marked containers away from unauthorized persons. Store oily rags and any flammable materials in protective containers. Do not smoke in areas that are used for storing flammable materials.

Do not operate the machine near any flame.

Exhaust shields (if equipped) protect hot exhaust components from oil spray or fuel spray in case of a break in a line, in a hose, or in a seal. Exhaust shields must be installed correctly.

Do not weld on lines or on tanks that contain flammable fluids. Do not flame cut lines or tanks that contain flammable fluid. Clean any such lines or tanks thoroughly with a nonflammable solvent prior to welding or flame cutting.

Check all electrical wires daily. Repair any wires that are loose or frayed before you operate the machine. Clean all electrical connections and tighten all electrical connections.

Dust that is generated from repairing nonmetallic hoods or nonmetallic fenders can be flammable and/or explosive. Repair such components in a well ventilated area away from open flames or sparks.

Inspect all lines and hoses for wear or for deterioration. The hoses must be properly routed. The lines and the hoses must have adequate support and secure clamps. Tighten all connections to the recommended torque. Leaks can cause fires.

Illustration 46 g00704059

Use caution when you are refueling a machine. Do not smoke while you are refueling a machine. Do not refuel a machine near open flames or sparks. Always stop the engine before refueling. Fill the fuel tank outdoors.

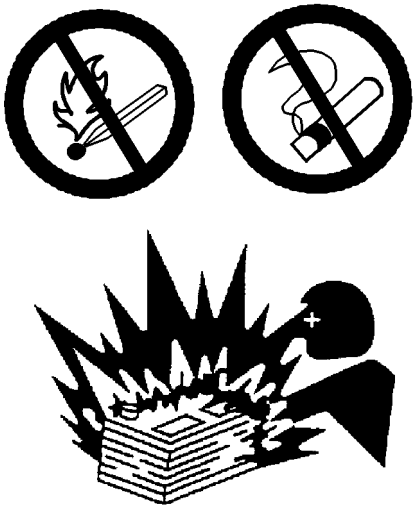


Illustration 47 g00704135

Gases from a battery can explode. Keep any open flames or sparks away from the top of a battery. Do not smoke in battery charging areas.

Never check the battery charge by placing a metal object across the terminal posts. Use a voltmeter or a hydrometer.

Improper jumper cable connections can cause an explosion that can result in injury. Refer to the Operation Section of this manual for specific instructions.

Do not charge a frozen battery. This may cause an explosion.

Fire Extinguisher

Make sure that a fire extinguisher is available. Be familiar with the operation of the fire extinguisher. Inspect the fire extinguisher and service the fire extinguisher regularly. Obey the recommendations on the instruction plate.

Ether

Ether is flammable and poisonous.

Use ether in well ventilated areas. Do not smoke while you are replacing an ether cylinder or while you are using an ether spray.

Do not store ether cylinders in living areas or in the operator compartment of a machine. Do not store ether cylinders in direct sunlight or in temperatures above 49 °C (120 °F). Keep ether cylinders away from open flames or sparks.

Dispose of used ether cylinders properly. Do not puncture an ether cylinder. Keep ether cylinders away from unauthorized personnel.

Do not spray ether into an engine if the machine is equipped with a thermal starting aid for cold weather starting.

Lines, Tubes and Hoses

Do not bend high pressure lines. Do not strike high pressure lines. Do not install any lines that are bent or damaged.

Repair any lines that are loose or damaged. Leaks can cause fires. Consult your Caterpillar dealer for repair or for replacement parts.

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. Tighten all connections to the recommended torque.

Replace the parts if any of the following conditions are present:

- End fittings are damaged or leaking.
- Outer coverings are chafed or cut.

- Wires are exposed.
- Outer coverings are ballooning.
- Flexible part of the hoses are kinked.
- Outer covers have embedded armoring.
- End fittings are displaced.

Make sure that all clamps, guards, and heat shields are installed correctly. During machine operation, this will help to prevent vibration, rubbing against other parts, and excessive heat.

i02439234

Fire Extinguisher Location

SMCS Code: 7000; 7419

Make sure that a fire extinguisher is on the machine. Make sure that you are familiar with the operation of the fire extinguisher. Inspect the fire extinguisher and service the fire extinguisher on a regular basis. Obey the recommendations on the instruction plate.

If equipped, know how to use the machine fire suppression system.

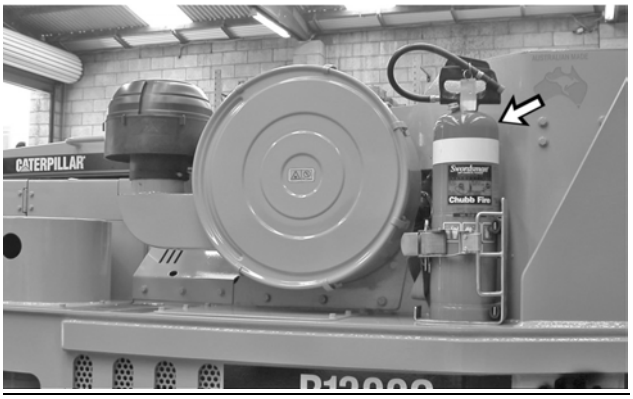


Illustration 48 g01218826

The fire extinguisher should be mounted on the left side of the radiator guard. This is the recommended location. Do not weld the ROPS in order to install the fire extinguisher. Also, do not drill holes in the ROPS in order to mount the fire extinguisher.

Illustration 49 g00995244

If more than one fire extinguisher is required, the recommended place to mount a second fire extinguisher is on the right side of the front frame.

i01557411

Tire Information

SMCS Code: 7000

Explosions of air inflated tires have resulted from heat-induced gas combustion inside the tires. Explosions can be caused by heat that is generated by welding, by heating rim components, by external fire, or by excessive use of brakes.

A tire explosion is much more violent than a blowout. The explosion can propel the tire, the rim components, and the axle 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 property damage, personal injury, or death.

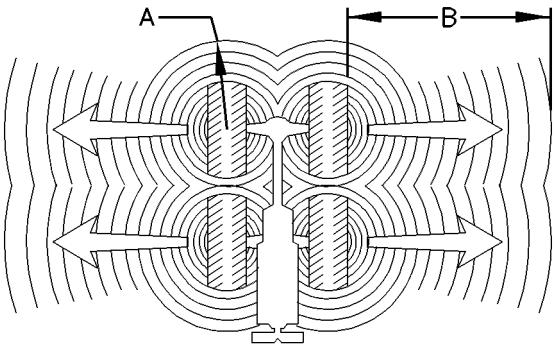


Illustration 50 g00337832

(A) At least 15 m (50 ft)
(B) At least 500 m (1500 ft)

Do not approach a warm tire. Maintain a minimum distance, as shown. Stay outside the shaded area in Illustration 50.

Do not use water or calcium as a ballast for the tires. Dry nitrogen 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 aid combustion. Nitrogen helps to prevent oxidation of the rubber, deterioration of rubber, and corrosion of rim components.

To avoid overinflation, proper nitrogen inflation equipment and training in the usage of the equipment are necessary. A tire blowout or a rim failure can result from improper equipment or from misused equipment.

When you inflate a tire, stand behind the tread and use a self-attaching chuck.

Servicing tires and rims can be dangerous. Only trained personnel that use proper tools and proper procedures should perform this maintenance. If correct procedures are not used for servicing tires and rims, the assemblies could burst with explosive force. This explosive force can cause serious personal injury or death. Carefully obey the specific instructions from your tire dealer.

i01122596

Electrical Storm Injury Prevention

SMCS Code: 7000

When lightning is striking in the vicinity of the machine, the operator should never attempt the following procedures:

- Mount the machine.
- Dismount the machine.

If you are in the operator's station during an electrical storm, stay in the operator's station. If you are on the ground during an electrical storm, stay away from the vicinity of the machine.

i01411864

Mounting and Dismounting

SMCS Code: 7000

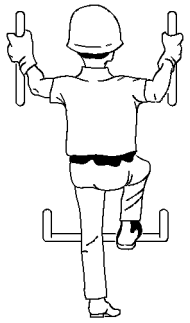


Illustration 51 g00037860

Mount the machine and dismount the machine only at locations that have steps and/or handholds. Before you mount the machine, clean the steps and the handholds. Inspect the steps and handholds. Make any necessary repairs.

Face the machine whenever you mount the machine and whenever you dismount the machine.

Maintain a three-point contact with the steps and with the handholds.

Note: Three-point contact can be two feet and one hand. Three-point contact can also be one foot and two hands.

Never mount a moving machine. Never dismount a moving machine. Never jump off the machine.

Do not carry tools or supplies when you mount the machine or when you dismount the machine. Use a hand line to raise and lower tools or supplies.

Do not use any controls as handholds when you enter the operator compartment or when you exit the operator compartment.

Alternate Exit

Machines that are equipped with cabs may have alternate exits. For additional information on machines that are equipped with alternate exits, see Operation and Maintenance Manual, "Alternate Exit".

i01909924

Before Starting Engine

SMCS Code: 1000; 7000

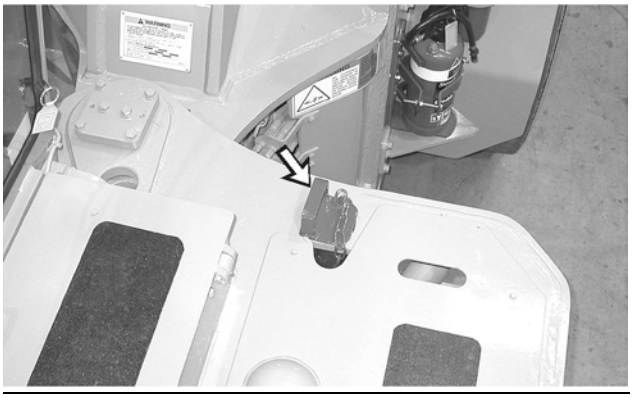


Illustration 52 g00995248

Make sure the steering frame lock is stored in the unlocked position as shown. The steering frame lock must be removed to steer the machine.

Note: Start the engine only from the operator station. Never short across the starter terminals or across the batteries. Shorting could bypass the engine neutral start system. Shorting could also damage the electrical system.

Before you mount the machine, perform a walk around inspection. Look for any damaged components and leaks. Report discrepancies and make any necessary repairs before operating the machine.

Reference: For more information, refer to the Operation and Maintenance Manual, “Walk Around Inspection” for the machine that is being serviced.

When you enter the operator station, inspect the condition of the seat belt and the condition of the mounting hardware. Replace any damaged parts and any worn parts. Regardless of appearance, replace the seat belt after three years of use. Do not use a seat belt extension on a retractable seat belt.

Adjust the seat so that full pedal travel can be achieved when the operator’s back is against the back of the seat.

Make sure that the machine is equipped with a lighting system that is adequate for the job conditions. Make sure that all lights are working properly.

Before you start the engine or before you move the machine, make sure that no one is on the machine, underneath the machine, or around the machine. Make sure that there are no personnel in the area.

i01909926

Engine Starting

SMCS Code: 1000; 7000

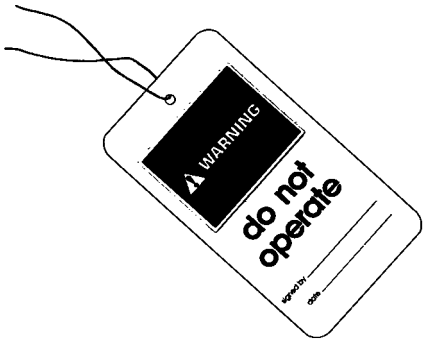


Illustration 53 g00104545

If a warning tag is attached to the engine start switch or to the machine controls, do not start the engine. Also, do not move any machine controls.

Move all hydraulic controls to the HOLD position before you start the engine.

Move the transmission control to the NEUTRAL position.

Move the steering and transmission lock control to the LOCKED position.

Engage the parking brake.

Diesel engine exhaust contains products of combustion which can be harmful to your health. Always operate the engine in a well ventilated area. If you are in an enclosed area, vent the exhaust to the outside.

i01740680

Before Operation

SMCS Code: 7000

Make sure that there are no personnel on the machine or in the area around the machine.

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

Make sure that all windows are clean. Secure the door in the closed position.

Make sure that the horn, the backup alarm, the action alarm, the dash indicator lamps and all other warning devices are working properly.

Fasten the seat belt securely.

i03162317

Visibility Information

SMCS Code: 7000

Before you start the machine, perform a walk-around inspection in order to ensure that there are no hazards around the machine.

While the machine is in operation, constantly survey the area around the machine in order to identify potential hazards as hazards become visible around the machine.

Your machine may be equipped with visual aids. Some examples of visual aids are Closed Circuit Television (CCTV) and mirrors. Before operating the machine, ensure that the visual aids are in proper working condition and that the visual aids are clean. Adjust the visual aids using the procedures that are located in this Operation and Maintenance Manual. If equipped, the Work Area Vision System shall be adjusted according to Operation and Maintenance Manual, SEBU8157, “Work Area Vision System”.

It may not be possible to provide direct visibility on large machines to all areas around the machine. Appropriate job site organization is required in order to minimize hazards that are caused by restricted visibility. Job site organization is a collection of rules and procedures that coordinates machines and people that work together in the same area. Examples of job site organization include the following:

- Safety instructions
- Controlled patterns of machine movement and vehicle movement
- Workers that direct traffic to move when it is safe
- Restricted areas
- Operator training
- Warning symbols or warning signs on machines or on vehicles
- A system of communication
- Communication between workers and operators prior to approaching the machine

Modifications of the machine configuration by the user that result in a restriction of visibility shall be evaluated.

i02443319

Operation

SMCS Code: 7000

Machine Operating Temperature Range

The standard machine configuration is intended for use within an ambient temperature range of 0° ± 45°C (32° ± 113°F). Special configurations for different ambient temperatures may be available. Consult your Caterpillar dealer for additional information on special configurations of your machine.

Machine Operating Altitude Range

If the machine is used at elevations higher than 3000 m (9843 ft) please contact your Caterpillar dealer.

Machine Operation

Only operate the machine while you are sitting in a seat. The seat belt must be fastened while you operate the machine. Only operate the controls while the engine is running.

While you operate the machine slowly in an open area, check for proper operation of all controls and all protective devices.

Before you move the machine, make sure that no one will be endangered.

Do not allow riders on the machine unless the machine has the following equipment:

- Additional seat.
- Additional seat belt.
- Falling Object Protective Structure (FOPS).

Note any needed repairs during machine operation. Report any needed repairs.

Carry work tools at approximately 400 mm (15 inches) above ground level.

Do not go close to the edge of a cliff, an excavation, or an overhang.

Avoid operating the machine across the slope. When possible, operate the machine up the slopes and down the slopes. If the machine begins to sideslip on a downgrade, immediately remove the load and turn the machine downhill.

Avoid any conditions that can lead to tipping the machine. The machine can tip when you work on hills, on banks and on slopes. Also, the machine can tip when you cross ditches, ridges or other unexpected obstructions.

Maintain control of the machine. Do not overload the machine beyond the machine capacity.

Make sure that the hitches and the towing devices are adequate. Only connect trailing equipment to a drawbar or to a hitch.

Never straddle a wire cable. Never allow other personnel to straddle a wire cable.

Before you maneuver the machine, make sure that no personnel are between the machine and the trailing equipment. Block up the hitch of the trailing equipment in order to align the hitch with the drawbar. Maneuver the machine. Connect the machine to the trailing equipment.

Know the maximum dimensions of your machine.

Always keep the Rollover Protective Structure (ROPS) or the Falling Object Protective Structure (FOPS) installed during machine operation.

Always anticipate the grade and select the proper gear range for the grade.

Obey all road signs.

A signalman should be present, when you move the machine in a building or out of a building.

i02624835

Engine Stopping

SMCS Code: 1000; 7000

Do not stop the engine immediately after the machine has been operated under load. This can cause overheating and accelerated wear of engine components.

After the machine is parked and the parking brake is engaged, allow the engine to run for two minutes before shutdown. This allows hot areas of the engine to cool gradually.

i02006656

Parking

SMCS Code: 7000

Park the machine on a level surface. If you must park on a grade, block the machine's wheels.

Apply the service brake in order to stop the machine. Move the transmission control to the NEUTRAL position.

Engage the parking brake.

Lower all work tools to the ground. Move the steering and transmission lock lever to the LOCKED position and activate any control locks.

Stop the engine.

Turn the engine start switch to the OFF position.

Turn the battery disconnect switch to the OFF position and remove the engine start switch key. Remove the disconnect switch key if you do not operate the machine for an extended period of time. This will prevent drainage of the battery. A battery short circuit, any current draw from certain components, and vandalism can cause drainage of the battery.

i02780235

Slope Operation

SMCS Code: 7000

Machines that are operating safely in various applications depend on these criteria: the machine model, configuration, machine maintenance, operating speed of the machine, conditions of the terrain, fluid levels, and tire inflation pressures. The most important criteria are the skill and judgment of the operator.

A well trained operator that follows the instructions in the Operation and Maintenance Manual has the greatest impact on stability. Operator training provides a person with the following abilities: observation of working and environmental conditions, feel for the machine, identification of potential hazards, and operating the machine safely by making appropriate decisions.

When you work on side hills and when you work on slopes, consider the following important points:

Speed of travel – At higher speeds, forces of inertia tend to make the machine less stable.

Roughness of terrain or surface – The machine may be less stable with uneven terrain.

Direction of travel – Avoid operating the machine across the slope. When possible, operate the machine up the slopes and operate the machine down the slopes. Place the heaviest end of the machine uphill when you are working on an incline.

Mounted equipment – Balance of the machine may be impeded by the following components: equipment that is mounted on the machine, machine configuration, weights, and counterweights.

Nature of surface – Ground that has been newly filled with earth may collapse from the weight of the machine.

Surface material – Rocks and moisture of the surface material may drastically affect the machine's traction and machine's stability. Rocky surfaces may promote side slipping of the machine.

Slippage due to excessive loads – This may cause downhill tracks or downhill tires to dig into the ground, which will increase the angle of the machine.

Width of tracks or tires – Narrower tracks or narrower tires further increase the digging into the ground which causes the machine to be less stable.

Implements attached to the drawbar – This may decrease the weight on the uphill tracks. This may also decrease the weight on the uphill tires. The decreased weight will cause the machine to be less stable.

Height of the working load of the machine – When the working loads are in higher positions, the stability of the machine is reduced.

Operated equipment – Be aware of performance features of the equipment in operation and the effects on machine stability.

Operating techniques – Keep all attachments or pulled loads low to the ground for optimum stability.

Machine systems have limitations on slopes – Slopes can affect the proper function and operation of the various machine systems. These machine systems are needed for machine control on slopes.

Note: Safe operation on steep slopes may require special machine maintenance. Excellent skill of the operator and proper equipment for specific applications are also required. Consult the Operation and Maintenance Manual sections for the proper fluid level requirements and intended machine use.

i01329161

Equipment Lowering with Engine Stopped

SMCS Code: 7000

Before lowering any equipment with the engine stopped, clear the area around the equipment of all personnel. The procedure to use will vary with the type of equipment to be lowered. Keep in mind most systems use a high pressure fluid or air to raise or lower equipment. The procedure will cause high pressure air, hydraulic, or some other media to be released in order to lower the equipment. Wear appropriate personal protective equipment and follow the established procedure in the Operation and Maintenance Manual, "Equipment Lowering with Engine Stopped" in the Operation Section of the manual.

i02444241

Sound Information and Vibration Information

SMCS Code: 7000

Hearing protection may be needed when the machine is operated with an open operator station for extended periods or in a noisy environment. Hearing protection may be needed when the machine is operated with a cab that is not properly maintained.

The operator sound pressure level for an enclosed cab is 81 dB(A) measured according to the test procedures and conditions specified in "ISO 6394" or "98/37/EC".

Vibration Level

The hands and arms are exposed to a weighted root mean square acceleration that is 2.1 m/s^2.

The whole body is exposed to a weighted root mean square acceleration that is 1.2 m/s^2.

Measurements are obtained on a representative machine using the procedures in the following standards:

- "ISO 2631/1"
- "ISO 5349"

i01649970

Operator Station

SMCS Code: 7000; 7301; 7325

Any modifications to the inside of the operator station should not project into the operator space. The addition of a radio, fire extinguisher, and other equipment must be installed so that the defined operator space is maintained. Any item that is brought into the cab should not project into the defined operator space. A lunch box or other loose items must be secured. Objects must not pose an impact hazard in rough terrain or in the event of a rollover.

i01992325

Guards (Operator Protection)

SMCS Code: 7000; 7150; 7325

There are different types of guards that are used to protect the operator. The machine and the machine application determines the type of guard that should be used.

A daily inspection of the guards is required in order to check for structures that are bent, cracked or loose. Never operate a machine with a damaged structure.

The operator becomes exposed to a hazardous situation if the machine is used improperly or if poor operating techniques are used. This situation can occur even though a machine is equipped with an appropriate protective guard. Follow the established operating procedures that are recommended for your machine.

Rollover Protective Structure (ROPS), Falling Object Protective Structure (FOPS) or Tip Over Protection Structure (TOPS)

The ROPS/FOPS Structure (if equipped) on your machine is specifically designed, tested and certified for that machine. Excavators are not equipped with ROPS structures. Any alteration or any modification to the ROPS/FOPS Structure could weaken the structure. This places the operator into an unprotected environment. Modifications or attachments that cause the machine to exceed the weight that is stamped on the certification plate also place the operator into an unprotected environment. Excessive weight may inhibit the brake performance, the steering performance and the ROPS. The protection that is offered by the ROPS/FOPS Structure will be impaired if the ROPS/FOPS Structure has structural damage. Damage to the structure can be caused by an overturn, a falling object, a collision, etc.

Do not mount items (fire extinguishers, first aid kits, work lights, etc) by welding brackets to the ROPS/FOPS Structure or by drilling holes in the ROPS/FOPS Structure. Welding brackets or drilling holes in the ROPS/FOPS Structures can weaken the structures. Consult your Caterpillar dealer for mounting guidelines.

The Tip Over Protection Structure (TOPS) is another type of guard that is used on mini hydraulic excavators. This structure protects the operator in the event of a tipover. The same guidelines for the inspection, the maintenance and the modification of the ROPS/FOPS Structure are required for the Tip Over Protection Structure.

Other Guards (If Equipped)

Protection from flying objects and/or falling objects is required for special applications. Logging applications and demolition applications are two examples that require special protection.

A front guard needs to be installed when a work tool that creates flying objects is used. Mesh front guards that are approved by Caterpillar or polycarbonate front guards that are approved by Caterpillar are available for machines with a cab or an open canopy. On machines that are equipped with cabs, the windshield should also be closed. Safety glasses are recommended when flying hazards exist for machines with cabs and machines with open canopies.

If the work material extends above the cab, top guards and front guards should be used. Typical examples of this type of application are listed below:

- Demolition applications
- Rock quarries
- Forestry products

Additional guards may be required for specific applications or work tools. The Operation and Maintenance Manual for your machine or your work tool will provide specific requirements for the guards. Consult your Caterpillar dealer for additional information.

Product Information Section

General Information

i02402583

Welding on Machines and Engines with Electronic Controls

SMCS Code: 1000; 7000

Proper welding procedures are necessary in order to avoid damage to the electronic controls and to the bearings. When possible, remove the component that must be welded from the machine or the engine and then weld the component. If you must weld near an electronic control on the machine or the engine, temporarily remove the electronic control in order to prevent heat related damage. The following steps should be followed in order to weld on a machine or an engine with electronic controls.

1. Turn off the engine. Place the engine start switch in the OFF position.

2. If equipped, turn the battery disconnect switch to the OFF position. If there is no battery disconnect switch, remove the negative battery cable at the battery.

NOTICE
Do NOT use electrical components (ECM or ECM sensors) or electronic component grounding points for grounding the welder.

3. Clamp the ground cable from the welder to the component that will be welded. Place the clamp as close as possible to the weld. Make sure that the electrical path from the ground cable to the component does not go through any bearing. Use this procedure in order to reduce the possibility of damage to the following components:

   - Bearings of the drive train
   - Hydraulic components
   - Electrical components
   - Other components of the machine

4. Protect any wiring harnesses from the debris which is created from welding. Protect any wiring harnesses from the splatter which is created from welding.

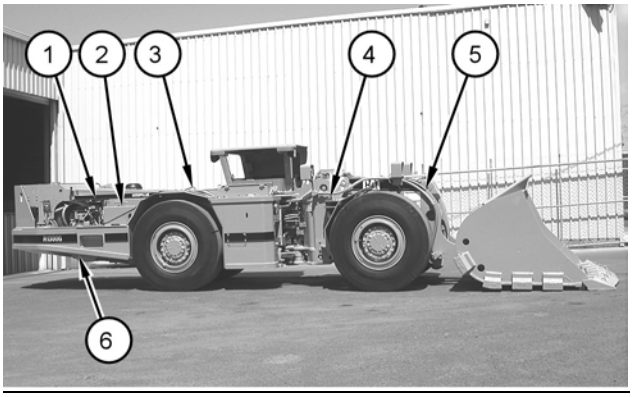
5. Use standard welding procedures in order to weld the materials together.

Model Views and Specifications

i02443314

Model Views and Specifications

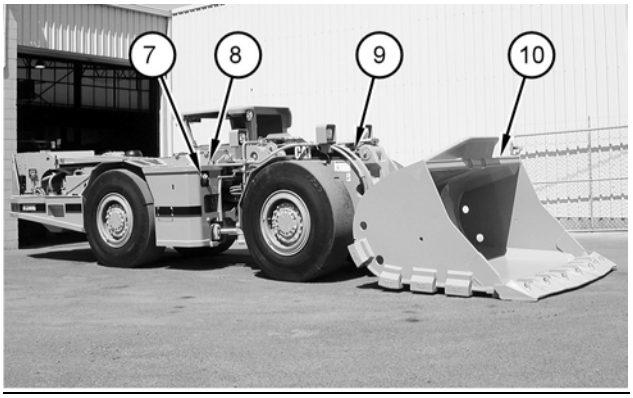
SMCS Code: 7000



g01131290

Illustration 54

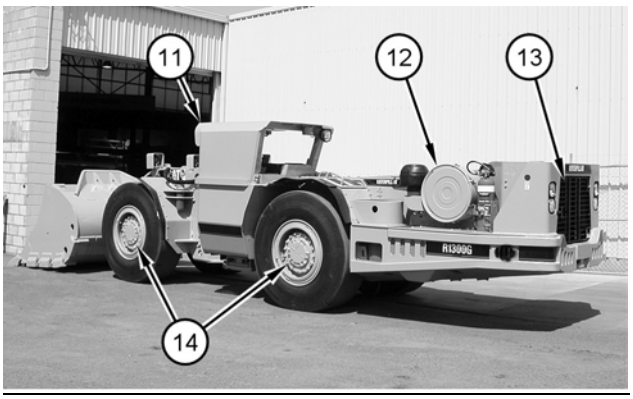
(1) Engine compartment
(2) Battery compartment
(3) Transmission compartment
(4) Bucket control group safety pin
(5) Lift arm
(6) Fuel tank



g01131241

Illustration 55

(7) Hydraulic tank
(8) Steering frame lock
(9) Tilt cylinder
(10) Bucket



g01131244

Illustration 56

(11) Operator station
(12) Engine air cleaner
(13) Radiator
(14) Final drives

Basic machine operating specifications are listed in the following table.

Table 1

R1300G Load Haul Dump	
Weight (approximate)(1)	21150 kg (46600 lb)
Length (maximum)	9095 mm (358 inch)
Width (maximum)	2200 mm (86.6 inch)
Width across Tires	1900 mm (74.8 inch)
Height over ROPS	2100 mm (82.7 inch)

(1) The weight includes a full fuel tank, a 75 kg (165.3 lb) operator, an enclosed operator station and a standard bucket. If additional attachments have been installed on your machine, the weight of your machine may vary.

Intended Use

This machine is classified as a loader with wheels as described in ISO 6165:2001. This machine is attached with a front mounted bucket or work tool. Work tools are used for digging, loading, lifting, and carrying material such as fractured rock or crushed rock.

Application and Configuration Restrictions

The maximum approved operating weight of the R1300GII, (including payload) is 27950 kg (61619 lb).

Use the R1300GII only in non-explosive gas environments.

i02226330

Bucket Rated Load

SMCS Code: 6700

⚠ WARNING

Failure to comply to the rated load can cause possible personal injury or property damage. Review the rated load of a particular work tool before performing any operation. Make adjustments to the rated load as necessary for non-standard configurations.

Note: Rated loads should be used as a guide. Work tools, uneven ground conditions, soft ground conditions, or poor ground conditions have effects on rated loads. The operator is responsible for being aware of these effects.

Rated loads are based upon a standard machine with the following conditions:

- proper lubricants
- full fuel tank
- enclosed ROPS
- 75 kg (165 lb) operator
- 17.5x25 20PR L-5 tires or equivalent for the R1300GII Load Haul Dump

Rated loads will vary for different work tools. Consult your Caterpillar dealer about the rated load for specific work tools.

The rated operating load is defined by the ISO 5998 (1986) standard as 50 percent of the full turn static tipping load.

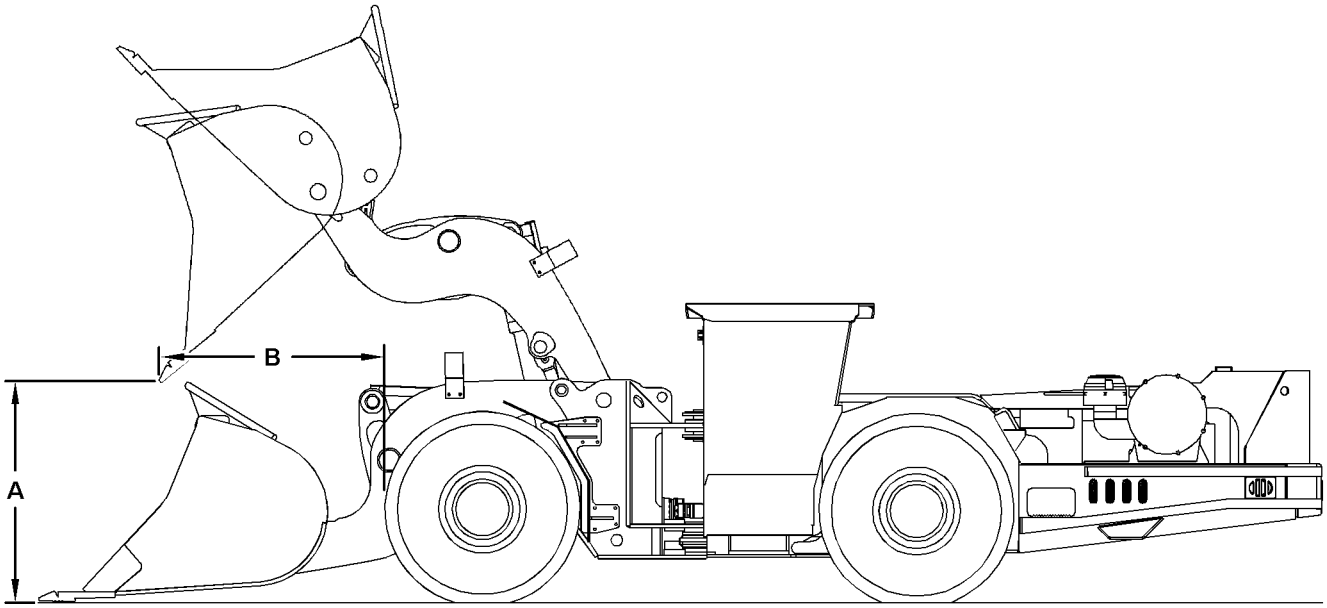


Illustration 57 g01130891

Dimension (A) represents the dump clearance. Dimension (B) represents the reach.

The dump clearance and the reach are given for each bucket at maximum lift height and at a 43 degree dumping angle. Dump clearance (A) is measured from the ground to the bucket edge when the bucket is in the full DUMP position. Reach (B) is measured from the front of the front tire to the bucket edge when the bucket is in the full DUMP position.

The following table provides the rated operating load for the standard machine configuration.

Table 2

Rated Load					
Machine Model	**Ground Engaging Tools**	**Rated Volume**	**Rated Operating Load**	**Dump Clearance A**	**Reach B**
R1300GII Load Haul Dump	Half Arrow Head Type Cutting Edge	3.1 m^3 (4.1 yd^3)	6800 kg (15000 lb)	1560 mm (61.4 inch)	1600 mm (63 inch)

Identification Information

i02454259

Plate Locations and Film Locations

SMCS Code: 1000; 7000

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 engines, transmissions and major attachments that are not designed for an operator to ride are identified by Serial Numbers.

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

Product Identification Number

Illustration 58 g01244480

Machine PIN_____

The PIN plate is located on the front frame in the articulation area.

Serial Number Plates (SN)

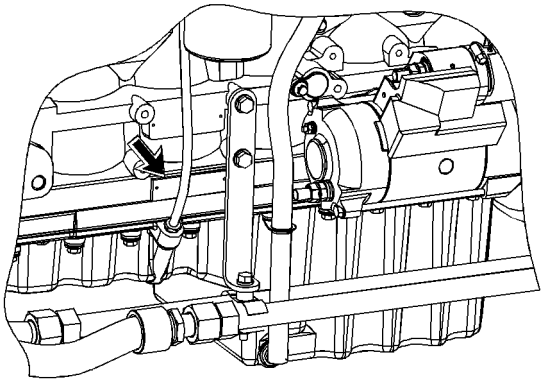


Illustration 59 g01139599

Engine Serial Number_____

The engine SN plate is located on the left side of the engine.

Illustration 60 g01131296

Transmission Serial Number_____

Certification Plate (CE)

Illustration 61 g01244480

The CE plate is located on the front frame in the articulation area. The CE plate is located on the PIN plate. The Year of Manufacture is located on the CE plate.

i02242600

Emissions Certification Film (If Equipped)

SMCS Code: 1000; 7000; 7405

Note: This information is pertinent in the United States, in Canada, and in Europe.

The certification film is used to verify an engine's conformance to the emissions requirements of the country that the engine will operate.

The certification film is located on the engine or in the engine compartment.

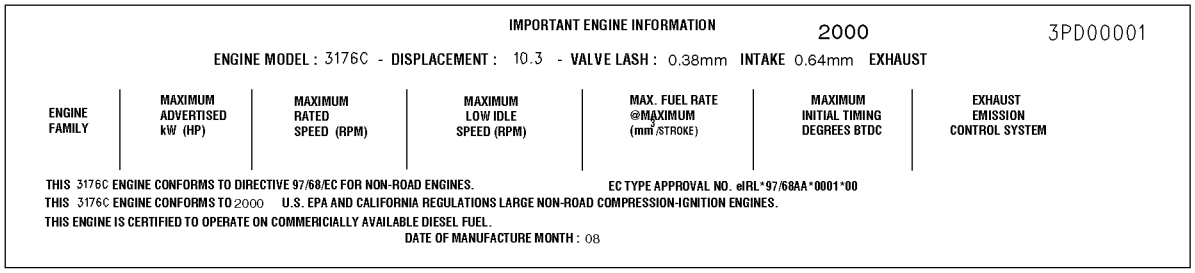
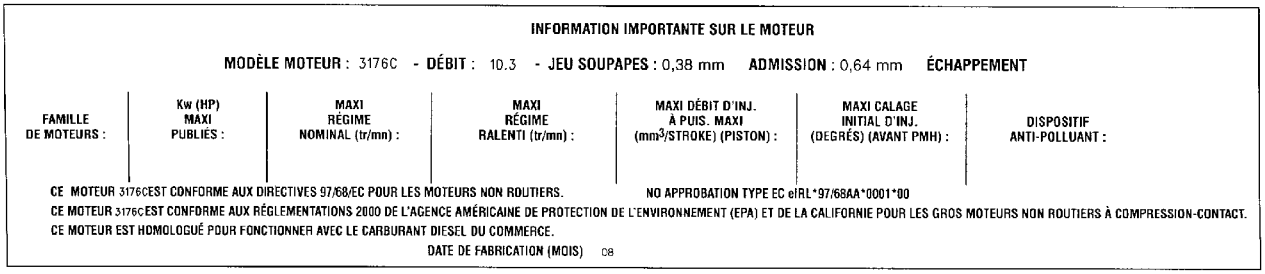


Illustration 62 g00993693

Typical Example (English)



Étiquette d'homologation anti-pollution

Illustration 63 g00993704

Typical Example (French)

Operation Section

Monitoring Systems and Operator Station Features

i02226334

Battery Disconnect Switch

SMCS Code: 1411

Illustration 64 g01164736

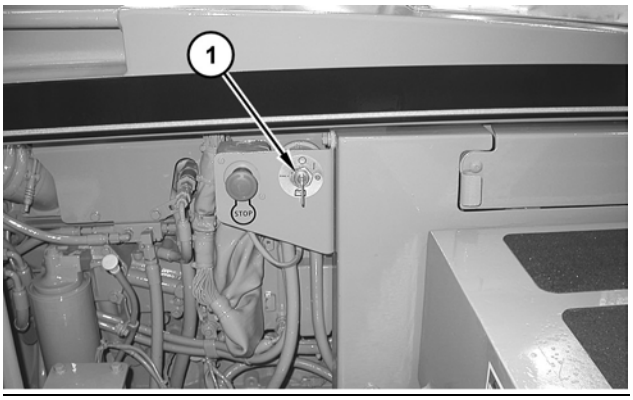


Illustration 65 g01164427

The battery disconnect switch (1) is located on the right rear side of the machine.

Disconnect Switch ON – To activate the electrical system, insert the battery disconnect switch key and turn the key clockwise. The battery disconnect switch must be in the ON position before you start the engine.

Disconnect Switch OFF – To deactivate the electrical system, turn the battery disconnect switch key counterclockwise to the OFF position.

The battery disconnect switch and the engine start switch perform different functions. The entire electrical system is disabled when you turn off the battery disconnect switch. The battery remains connected to the electrical system when you turn off the engine start switch key.

Turn the battery disconnect switch to the OFF position and remove the key when you service the electrical system or any other machine components.

Turn the battery disconnect switch to the OFF position and remove the disconnect switch key if you do not operate the machine for an extended period of a month or more. This will prevent the drainage of the battery.

NOTICE
Never move the battery disconnect switch to the OFF position while the engine is operating. Serious damage to the electrical system could result.

i02226335

Engine Shutdown Switch

SMCS Code: 7418-ZS

Illustration 66 g01164736

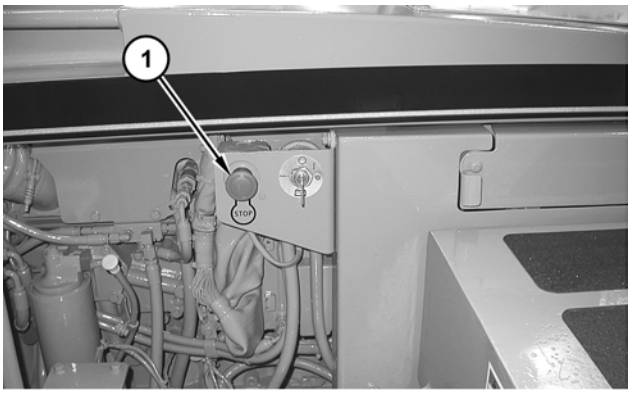


Illustration 67 g01164431

Engine shutdown switch (1) is located on the right rear side of the machine.

Engine Shutdown Switch (1) – Use engine shutdown switch (1) in order to stop the engine from the ground level. In order to use engine shutdown switch (1), push the engine shutdown switch knob in to the OFF position. This will stop the engine. After the engine stops, turn the knob clockwise. This will reset the engine shutdown switch to the ON position.

During normal operation, use the engine start switch to stop the engine.

Note: The engine shutdown switch (1) does not deactivate the machine's electrical system.

i01912408

Engine Start Switch

SMCS Code: 1416

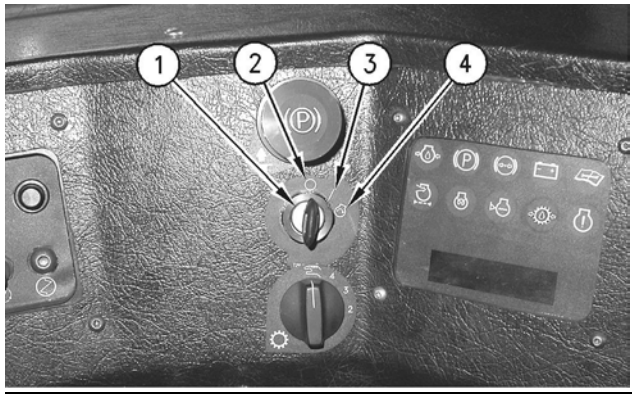


Illustration 68 g00995855

Engine start switch (1) – The engine start switch is used to turn the electrical system on and the engine start switch is also used to start the engine.

OFF Position (2) – When you insert the engine start switch key and when you remove the engine start switch key, the engine start switch must be in the OFF position. To disconnect the power to the electrical circuits in the operator station, turn the engine start switch to the OFF position. Also, turn the engine start switch to the OFF position in order to stop the engine.

Note: The front lights, the rear lights, and the dome lamp can be turned on when the engine start switch is in the OFF position.

ON Position (3) – To activate the electrical circuits in the operator station, turn the engine start switch key clockwise to the ON position.

START Position (4) – To start the engine, turn the engine start switch clockwise to the START position. When the engine start switch key is released, the engine start switch will return to the ON position.

Note: If the engine fails to start, return the engine start switch to the OFF position. This must be done before you attempt to start the engine again.

i01912409

Idle Timer Control (Engine Shutdown) (If Equipped)

SMCS Code: 7418

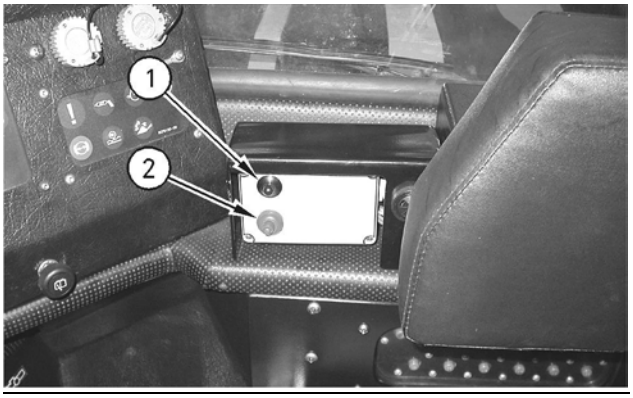


Illustration 69 g00995858

The function of the idle timer control is to provide a timed period of idle (three minutes) before engine shutdown when the engine start switch is turned to the OFF position.

Note: The idle timer will activate whenever the engine start switch is turned from the ON position to the OFF position.

Idle Timer On Indicator (1) – Indicates that the idle timer has been activated. When the engine start switch is turned to the OFF position, the indicator will flash and the engine will stop after three minutes.

Engine Shutdown Switch (2) – This switch allows the engine to be stopped immediately. Push down on the engine shutdown switch in order to stop the engine.

To override the idle timer and stop the engine, turn the engine start switch to the OFF position and push the engine shutdown switch down.

Note: If the idle timer has been activated without starting the engine, it can be deactivated by pushing engine shutdown switch (2) down. Indicator (1) should stop flashing.

NOTICE
Never turn the battery disconnect switch to the OFF position with the idle timer activated (engine running). Electrical system damage could result.

Note: Certain machines may be equipped with a fire suppression control (engine shutdown) in addition to the idle timer control. For more information on the operation of the fire suppression control, refer to the Operation and Maintenance Manual, “Fire Suppression System (Foam)” for the machine that is being serviced.

i02442401

Caterpillar Monitoring System

SMCS Code: 7451; 7490

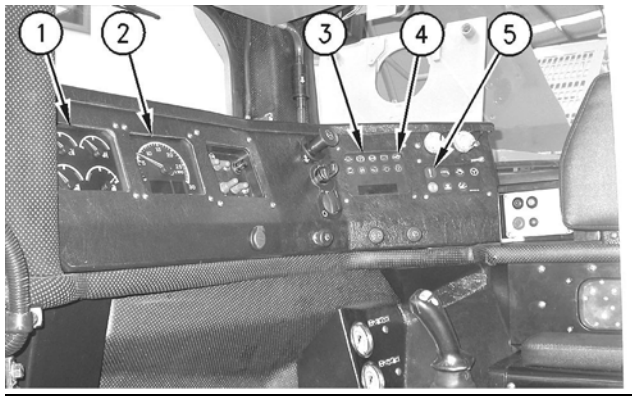


Illustration 70 g00995862

The Caterpillar Monitoring System consists of gauge display (1), speedometer/tachometer display (2), an action alarm, monitoring system display (3), and action lamp (5). Individual alert indicators (4) for each machine system are located on the monitoring system display.

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

Warning Operation

Table 3

Warning Operation					
Warning Category	Warning Indications[1]			Required Action from the Operator	Possible Result[2]
	Alert Indicator Flashes[3] or a Gauge will Show in the Red Range	Action Lamp Flashes[4]	The Action Alarm Sounds		
1	X			No immediate action is required. The system needs attention soon.	No harmful effects or damaging effects will occur.
2	X	X		Change machine operation or perform maintenance to the system.	Damage to machine components will occur.
2-S	X	X	X[5]	Immediately change the machine operation.	Severe damage to components.
3	X	X	X[6]	Immediately perform a safe engine shutdown.	Injury to the operator or severe damage to components will occur.

(1) The active warning indications are marked with an X.
(2) If the required action is not carried out then the following results will occur.
(3) The alert indicator flashes at a 10 Hz rate.
(4) The action lamp flashes at a 1 Hz rate.
(5) The alarm is on continuously.
(6) The action alarm will sound at a 1 Hz rate.

Warning Categories

The monitoring system provides three warning categories. The first category requires only operator awareness. The second warning category requires the operation of the machine or the maintenance procedure for the machine to be changed. The third warning category requires immediate safe shutdown of the machine.

Warning Category 1

In this category, only the appropriate alert indicators will flash. The alert indicator informs the operator that a machine system needs attention. The condition of the machine system should not endanger the operator. Also, the condition of the machine system should not damage the machine.

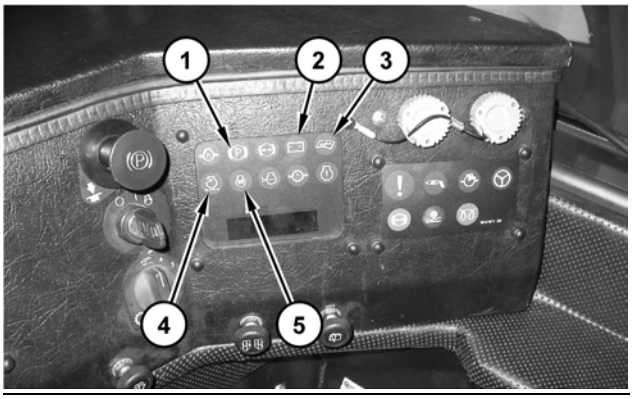


Illustration 71 g01220187

Parking Brake (1) – Indicates the parking brake is engaged and the transmission is in NEUTRAL. The alert indicator should flash during start-up. It should go out when the parking brake is disengaged.

Electrical System (2) – Indicates a malfunction in the electrical system. If this alert indicator flashes, the system voltage is either too high for normal machine operation or the system voltage is too low for normal machine operation.

If the electrical loads (air conditioning and/or lighting) are high and the engine speed is low, increase the engine speed. This will generate more output from the alternator. If the alert indicator for the electrical system turns off within one minute, the electrical system is operating normally. Overload can occur during periods of low engine speeds.

Revise the operating cycle in order to avoid overloading the electrical system. Overloading the electrical system could result in discharging the batteries.

Low idle must be corrected. Adjust the low idle setting to the high side of low idle when the most common electrical loads are turned on. Reducing loads will also help. Use the medium fan speed instead of the high fan speed.

If this procedure does not cause the alert indicator to turn off, stop the machine and investigate the cause of the fault. The fault may be caused by an alternator belt that is loose or broken. Also, the batteries may be faulty.

If the light remains on near normal operating speeds and with light electrical loads, stop the machine and investigate the cause of the fault. The fault may be caused by an alternator belt that is loose or broken. Also, the batteries or the alternator may be faulty.

Maintenance Required (3) – This alert indicator will be on constantly when the machine requires maintenance. The alert indicator can be reset and the maintenance interval can be altered using a laptop computer with Electronic Technician (ET) software.

Fuel Pressure (3) – This alert indicator will flash if the fuel filter is blocked. If this indicator flashes during operation, service the fuel filter that day.

Air Filter Restriction (4) (Not Used)

Air Intake Heater (5) (Not Used)

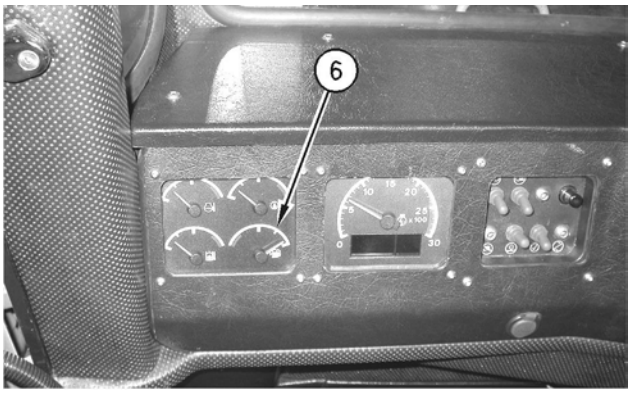


Illustration 72 g00995864

Fuel Level Gauge (6) – If the gauge needle enters the red range, this indicates low fuel level (15 percent of the tank capacity). Refuel the tank within the hour in order to avoid running out of fuel.

NOTICE
Running out of fuel can cause engine damage. Do not continue to operate the machine when critically low on fuel.

Warning Category 2

In this category, one of the following conditions will occur:

- An alert indicator and the action lamp will flash.
- A gauge will show in the red range and the action lamp will flash.

This warns the operator that a change in machine operation is required in order to reduce excessive temperature in one or more of the systems. Move the machine to a convenient place in order to park the machine and stop the engine. Investigate the cause of the alert indicator or the gauge and report the problem immediately.

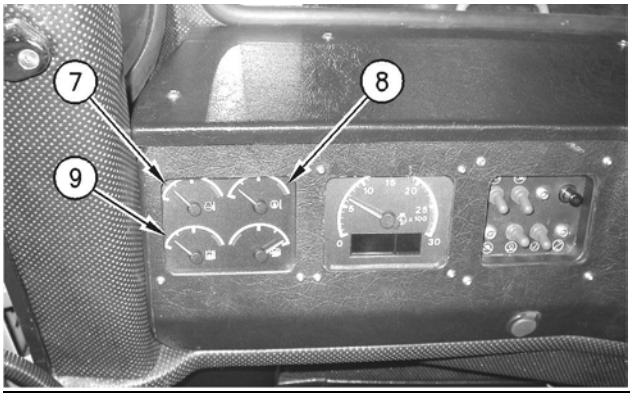


Illustration 73 g00995865

Engine Coolant Temperature (7) – Indicates excessive engine coolant temperature. If the gauge needle is in the red range, move the machine to a convenient location to park the machine and stop the engine. Investigate the cause of the fault. Do not operate the machine if the gauge needle remains in the red range and the action lamp continues to flash.

Transmission Oil Temperature (8) – Indicates excessive torque converter/transmission oil temperature. If the gauge needle is in the red range, reduce the load on the machine. If the gauge needle is in the red range and the action lamp continues to flash after approximately five minutes, stop the machine and investigate the cause of the fault.

Hydraulic Oil Temperature (9) – Indicates excessive hydraulic oil temperature. If the gauge needle is in the red range, reduce the load on the system. If the gauge needle remains in the red range and the action lamp continues to flash, stop the machine and investigate the cause of the fault.

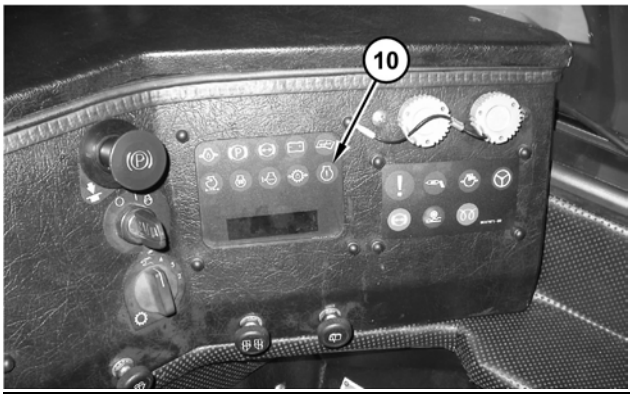


Illustration 74 g01220189

Engine Overspeed (10) (Not Used)

Warning Category 2-S

The warning category 2-S includes a constant alarm. Warning category 2-S includes all warnings in category 2. The warning category 2-S is a severe condition. The operator should immediately change the operating procedures in order to prevent damage to the machine. When the correct measures have been taken, the alarm will stop. A category 2-S is logged.

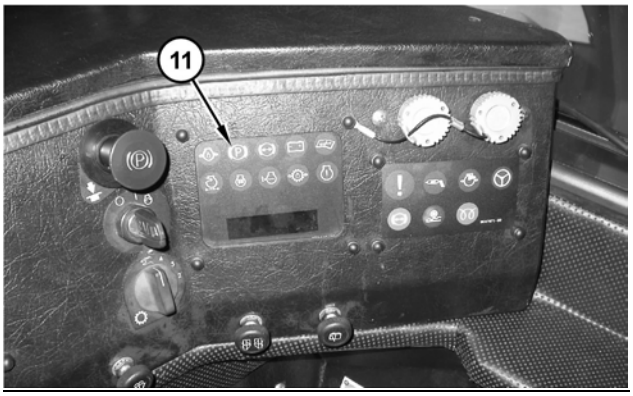


Illustration 75 g01220190

Parking Brake (11) – Indicates the machine is not in neutral and the parking brake is engaged. The action alarm will continuously sound. If the alert indicator flashes during operation and the alarm continuously sounds, stop the machine immediately. Investigate the cause of the fault.

Warning Category 3

In this category, the alert indicator and the action lamp will flash and the action alarm will sound. This category requires immediate safe shutdown of the machine in order to prevent possible injury to the operator and/or severe damage to the system and the machine.

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

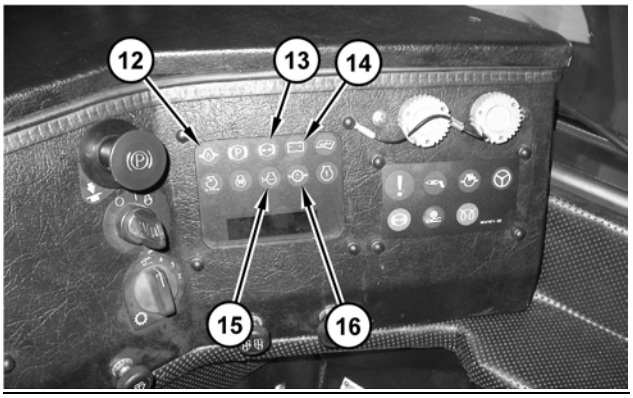


Illustration 76 g01220191

Engine Oil Pressure (12) – Indicates low engine oil pressure. If this alert indicator flashes, stop the machine immediately and engage the parking brake. Stop the engine and investigate the cause of the fault.

Brake Accumulator Oil Pressure (13) – Indicates low brake accumulator oil pressure. If the brake accumulator oil pressure further decreases, the parking brake will automatically engage. If this alert indicator flashes, stop the machine immediately and engage the parking brake. Stop the engine and investigate the cause of the fault.

Electrical System (14) – Indicates a serious malfunction in the electrical system. If this alert indicator flashes during operation, stop the machine immediately and engage the parking brake. Stop the engine and investigate the cause of the fault.

Engine Coolant Level (15) – Indicates low engine coolant level. If this alert indicator flashes, stop the machine immediately and engage the parking brake. Stop the engine and investigate the cause of the fault.

Transmission Oil Pressure (16) – Indicates that the machine has low transmission oil pressure. If the transmission oil pressure further decreases the parking brake may automatically engage.

NOTICE

If the transmission oil pressure indicator comes on, the parking brake may engage. Cease operation, quickly move the machine to a safe area to engage the parking brake and stop the engine. Inspect and repair the cause of the problem before returning the machine to operation.

i02454260

Gauges

SMCS Code: 7450

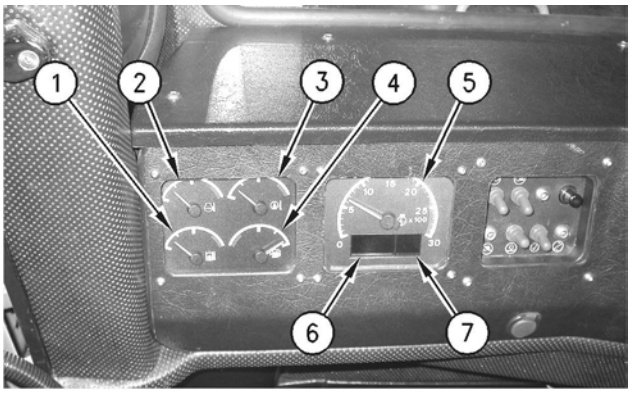


Illustration 77 g00996204

Hydraulic Oil Temperature (1) – Indicates the temperature of the hydraulic oil. The normal operating range is the white range. The gauge needle will indicate in the red range if the hydraulic oil temperature exceeds 104 °C (219 °F).

Engine Coolant Temperature (2) – Indicates the temperature of the engine coolant. The normal operating range is the white range. The gauge needle will indicate in the red range if the engine coolant temperature exceeds 112 °C (234 °F).

Transmission Oil Temperature (3) – Indicates the temperature of the torque converter/transmission oil. The normal operating range is the white range. The gauge needle will indicate in the red range if the transmission oil temperature exceeds 129 °C (264 °F).

Fuel Level (4) – Indicates the amount of fuel remaining in the fuel tank.

Tachometer (5) – The tachometer displays the engine speed during machine operation.

Speedometer (6) – The speedometer consists of three digits. The speedometer shows the ground speed of the machine in kilometers per hour or miles per hour.

Actual Gear Indicator (7) – The actual gear indicator consists of two digits. The two digits indicate the actual transmission gear that is engaged. The left digit is the actual gear. The right digit shows the direction that was selected.

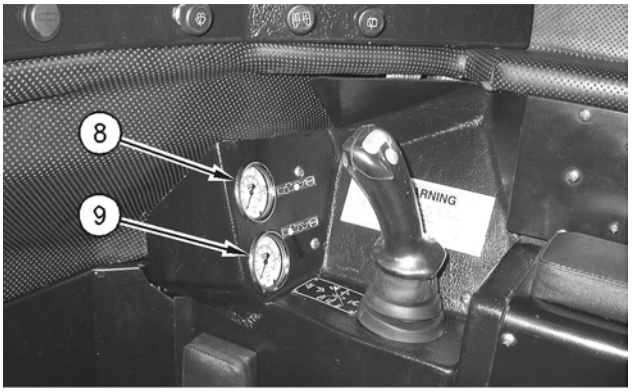


Illustration 78 g01003592

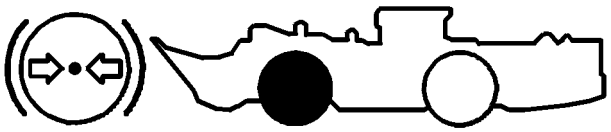


Illustration 79 g00937414

Front brake oil pressure

Front Brake Oil Pressure Gauge (8) (If Equipped) – Shows the hydraulic pressure in the front braking circuit when the service brakes are fully applied. The front brake oil pressure should be 6890 ± 345 kPa (1000 ± 50 psi).

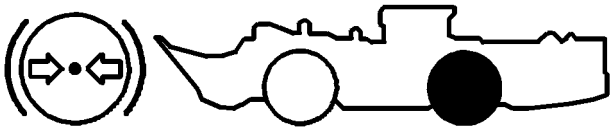


Illustration 80 g00937415

Rear brake oil pressure

Rear Brake Oil Pressure Gauge (9) (If Equipped) – Shows the hydraulic pressure in the rear braking circuit when the service brakes are fully applied. The rear brake oil pressure should be 6890 ± 345 kPa (1000 ± 50 psi).

NOTICE

Loss of brake oil pressure may decrease the brake application force. Also, loss of brake oil pressure may cause the parking brake to engage. If low brake oil pressure is indicated, stop the machine immediately. Inspect the system for the cause of low brake oil pressure. Repair the brake system before returning the machine to operation.

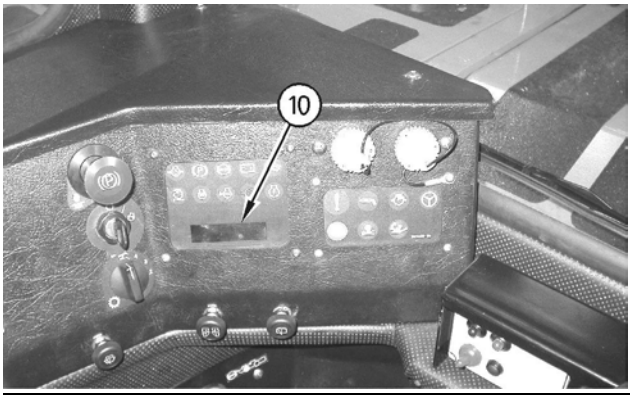


Illustration 81 g00996208

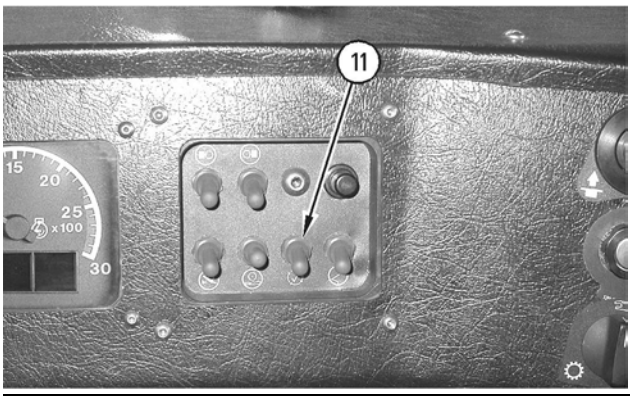


Illustration 82 g00996206

Display Window (10) – Indicates various machine system conditions on a six digit display. The display window provides a digital readout that can show total operating hours of the engine (hourmeter), current engine speed (tachometer), total travel distance (odometer), or logged and active diagnostic codes. Also, the gauges in the gauge display may be monitored digitally in the display window.

Press operator mode scroll switch (11) on the right side of the dash panel until the desired information is selected. The proper unit of measurement (°C, kPa, miles, km, rpm, liters, or service code) will be indicated at the top of the display window.

Reference: For further information on the operator mode scroll switch and the display windows, refer to the Operation and Maintenance Manual, “Operator Mode Scroll Switch” for the machine that is being serviced.

i02457047

Indicators

SMCS Code: 7400; 7450

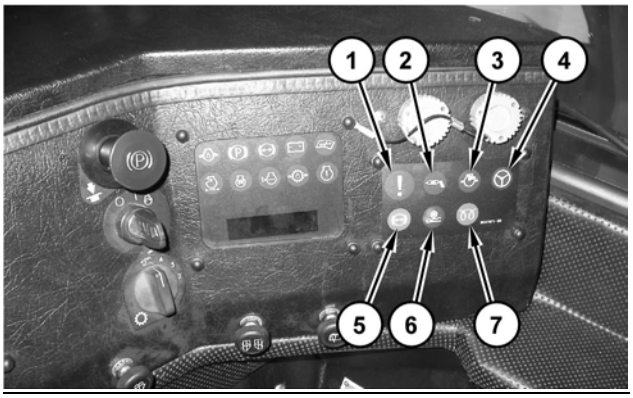


Illustration 83 g01226179

Action Lamp (1) – This indicator flashes to indicate a Warning Category 2 or a Warning Category 3 has been registered by the Caterpillar Monitoring System.

Automatic Lubrication Indicator (2) (Hydraulic Type) (If Equipped) – This indicator will be on when there is a fault in the automatic lubrication system. Report the fault to service personnel when convenient. This indicator will be on for two seconds after the engine starts in order to alert the operator that the indicator is functioning properly. It is important for the operator to visually inspect this indicator. If the indicator does not come on after start-up, or if the indicator glows dimly after start-up, or if the indicator remains on, stop the engine and find the cause.

Exhaust Back Pressure Indicator (3) (If Equipped) – Indicates high exhaust back pressure. If back pressure is over 6 kPa (25 inches H_2O), the light will illuminate and the exhaust purifilter must be cleaned.

Primary Steering Indicator (4) (If Equipped) – Indicates a failure of the primary steering system. The secondary steering system (if equipped) should be automatically activated. Stop the machine and investigate the cause.

Note: The secondary steering system only operates while the machine is moving.

Residual Brake Oil Pressure Indicator (5) (If Equipped) – Indicates that there is oil pressure in the service brake section of the wheel brakes. The lamp will illuminate when the service brakes are applied. The lamp should go out when the brakes are released. If this indicator stays on the brakes are holding residual brake oil pressure. Stop the machine and investigate the cause.

Ride Control Indicator (6) (If Equipped) – Indicates the ride control system is activated.

Glow Plug Indicator (7) – Indicates the glow plugs are activated. When the engine start switch is turned to the ON position glow plug indicator (7) will illuminate, if the indicator is off the engine can be started.

i01912942

Light Switches

SMCS Code: 1429-ZS; 7451

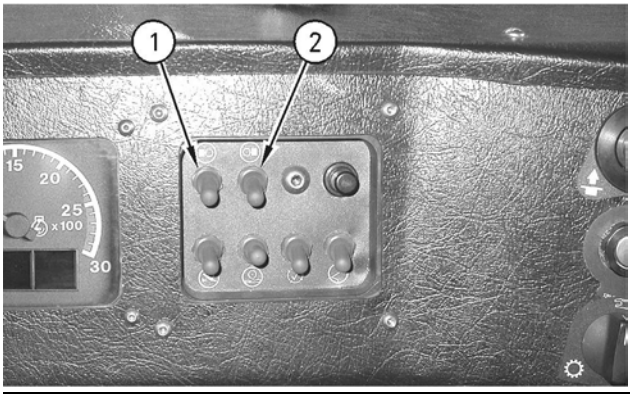


Illustration 84 g00996212

Front Light Switch (1) – Move the switch to the upper position to turn on the front lights and the tail light (if equipped). Move the switch to the lower position to turn off the lights.

Rear Light Switch (2) – Move the switch to the upper position to turn on the rear lights. Move the switch to the lower position to turn off the rear lights.

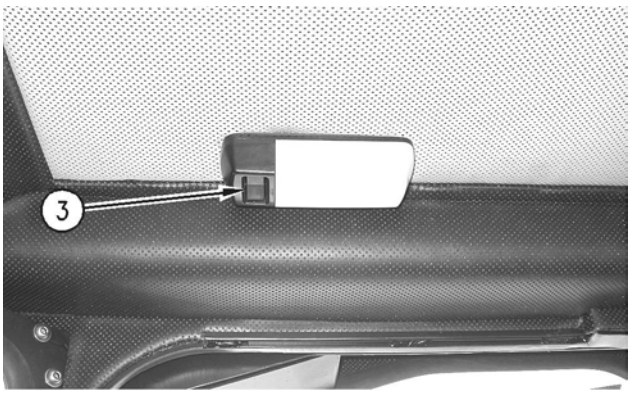


Illustration 85 g00949389

Dome Lamp Switch (3) – Switch (3) for the interior lamp is located on the interior lamp. Push the left half of switch (3) to turn on the interior lamp. Push the right half of switch (3) to turn off the interior lamp. When the door is opened, an automatic switch turns on the interior lamp.

i01912945

Window Wiper and Washer Control

SMCS Code: 7305; 7306

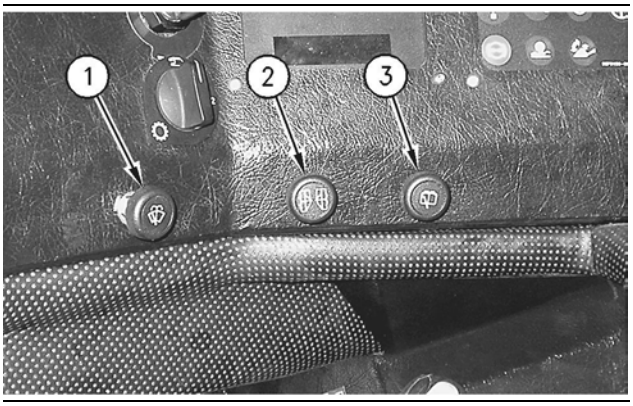


Illustration 86 g00996553

Front Window Wiper and Washer Switch (1) – Turn the knob clockwise to turn on the front window wiper. Push the knob to activate the window washer. Spring force will return the knob when released.

Side Window Wiper and Washer Switch (2) – Turn the knob clockwise to turn on the side window wiper. Push the knob to activate the window washer. Spring force will return the knob when released.

Rear Window Wiper and Washer Switch (3) – Turn the knob clockwise to turn on the rear window wiper. Push the knob to activate the window washer. Spring force will return the knob when released.

i01913517

Remote Control Switch (If Equipped)

SMCS Code: 7451; 7600-ZM

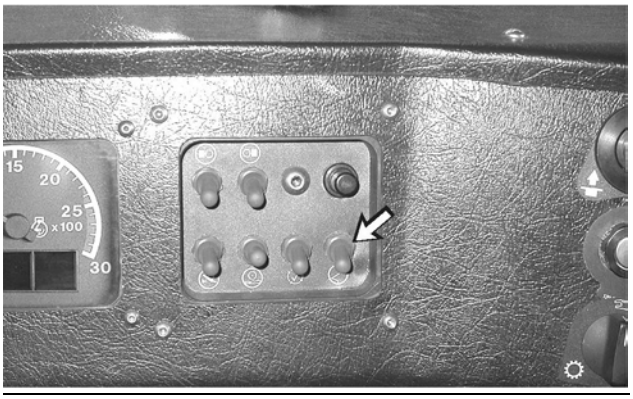


Illustration 87 g00996559

Remote Control Switch (If Equipped) – Move the switch to the upper position to activate the remote control system.

Reference: For more information about the remote control operating instructions, refer to the Operation and Maintenance Manual, “Remote Control System” for the machine that is being serviced.

WARNING

Personal injury or machine damage can result if the remote control switch is turned on while manually operating the machine. If the remote control switch is turned on during manual operation, the engine will shut down and the brakes will apply.

WARNING

This machine can cause severe injury or death if operated by untrained personnel.

If you are not trained in accordance with mine practice in the operation of remote control for this machine, DO NOT OPERATE.

i01913520

Lift Arm Positioner Switch

SMCS Code: 5109; 7451

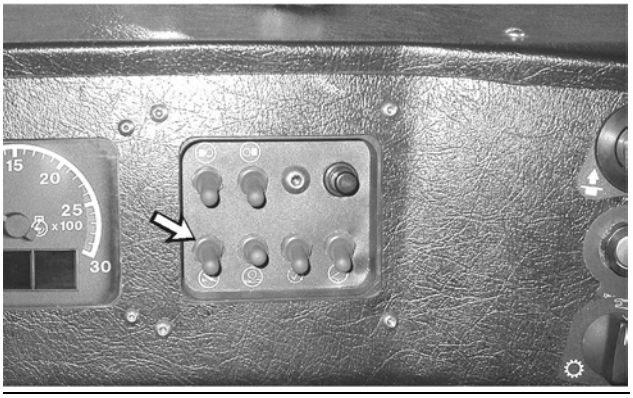


Illustration 88 g00996560

Lift Arm Positioner Switch – Move the switch to the upper position to activate the lift arm positioner. The lift arm positioner system returns the lift arm to a preset height when the lift arm is lowered.

i02442403

Ride Control (If Equipped)

SMCS Code: 5004; 7451

Travel at high speeds over rough terrain causes bucket movement and a swinging motion. The ride control system acts as a shock absorber by dampening forces from the bucket. This helps to stabilize the entire machine.

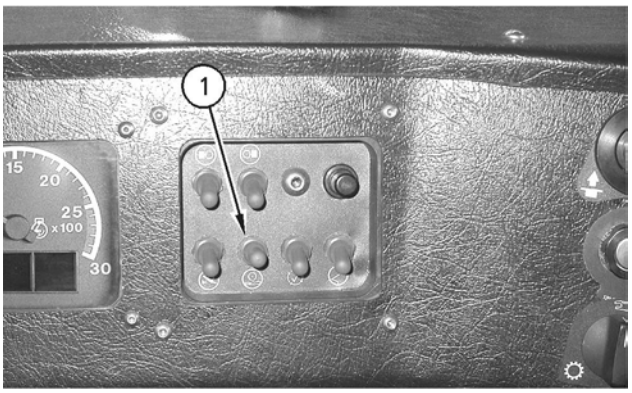


Illustration 89 g00996563

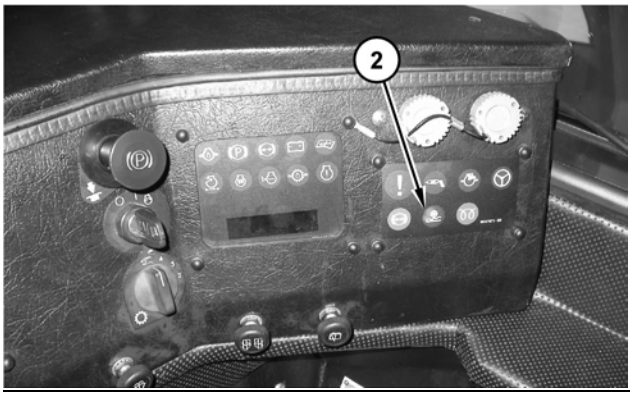


Illustration 90 g01220192

Automatic Ride Control – Move switch (1) to the upper position to turn on the automatic ride control system. The ride control system will automatically turn on if the ground speed exceeds 5 km/h (3 mph). The ride control system will automatically turn off if the ground speed is less than 5 km/h (3 mph). Indicator (2) will come on when the ride control system is automatically activated.

OFF – Move switch (1) to the center position to turn off the ride control system.

Service Mode – Push down and hold switch (1) in the lower position to turn on the ride control system. Switch (1) will return to the OFF position when released. The ride control system will be activated when the switch is held down. Indicator (2) will come on when the ride control system is activated. Hold the switch in SERVICE MODE when testing and/or troubleshooting the ride control system.

Reference: For further information on the ride control system, refer to the Hydraulic System, Systems Operation, Testing and Adjusting for the machine that is being serviced.

i02442405

Operator Mode Scroll Switch

SMCS Code: 7451

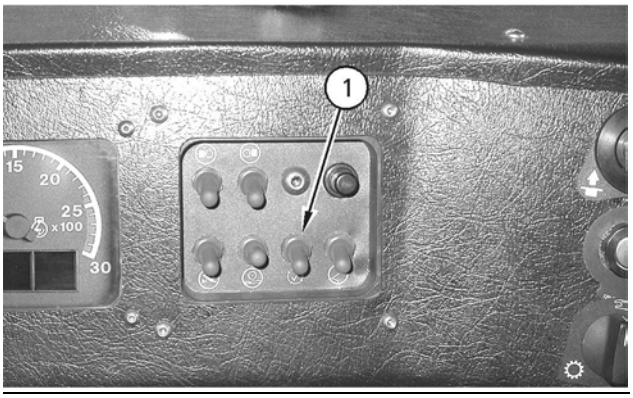


Illustration 91 g00996571

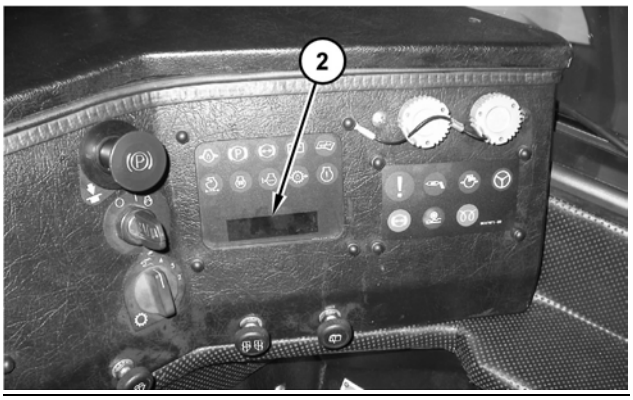


Illustration 92 g01220194

Operator Mode Scroll Switch (1) – Move switch (1) to the upper position to scroll through the operator modes in display window (2).

Operator Modes

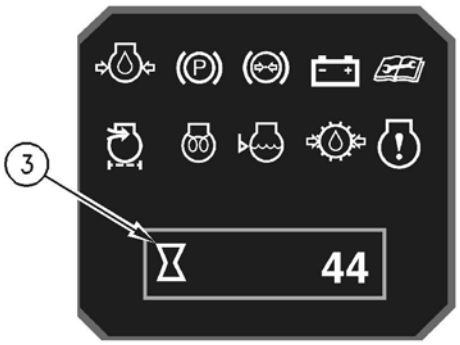


Illustration 93 g00996573

Service Meter – In this mode, the six digit display window will show the total number of machine operating hours. It should be used to determine maintenance intervals. Indicator (3) will show that the display window is operating in the service meter mode.

If there is an active fault, SERV CODE is displayed in the upper right hand corner of the display window. If SERV CODE is displayed during normal operation, an existing problem should be addressed.

Illustration 94 g00996574

Odometer – In this mode, the display window will show the total distance that has been travelled by the machine. This measurement can be displayed in “MILES” or “KM” depending on the units of measure selected.

Illustration 95 g00996575

Digital Tachometer – In this mode, the engine rpm will be displayed in the display window.

Illustration 96 g00996576

Diagnostic Scrolling – In this mode, the display window will show the faults that have been detected by the Caterpillar Monitoring System. Faults cannot be cleared in this mode. Also, faults may not be placed on hold. The service code will only be displayed when the fault is active.

i02442406

Service Ports

SMCS Code: 0350

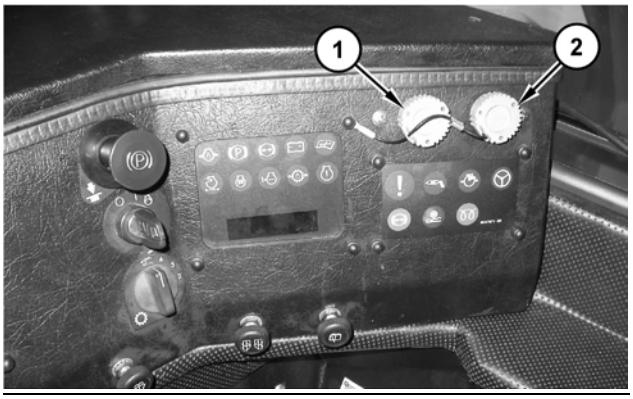


Illustration 97 g01220195

ET Service Port (1) – This service port allows for the connection of a laptop computer using Electronic Technician (ET) software. This will allow service personnel to diagnose the ECM for the transmission, the ECM for the engine, the ECM for the Caterpillar Monitoring System, or the ECM for the Payload Control System (PCS).

Service Tool Port (2) – This service port allows for the connection of a Caterpillar 4C-8195 Control Service Tool to provide diagnostic access to the Caterpillar Monitoring System, the ECM for the transmission, the ECM for the engine, or the ECM for the Payload Control System (PCS). This service tool allows the technician to scroll through display modes on the digital display window and clear recorded faults as required.

Reference: For further information on using the Electronic Technician and the Control Service Tool, refer to the Systems Operation, Troubleshooting, Testing and Adjusting, "Caterpillar Monitoring System" for the machine that is being serviced.

i01913533

Horn

SMCS Code: 7402

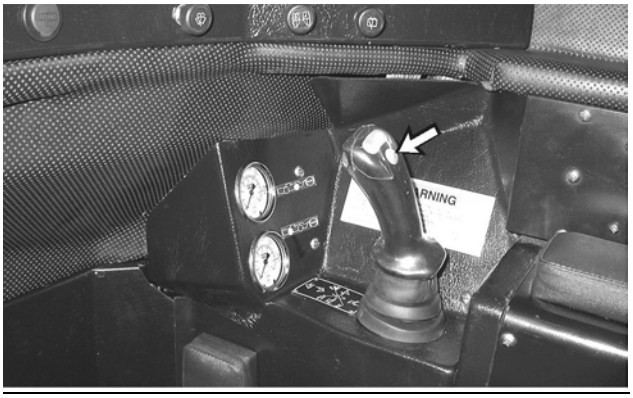


Illustration 98 g01003597

Horn – Push the horn button in order to sound the horn. Use the horn button for alerting personnel or for signalling personnel.

i02447198

Backup Alarm

SMCS Code: 7406

Illustration 99 g01164436

Backup Alarm – The backup alarm will sound when the transmission direction and speed control is in the REVERSE position. The backup alarm warns personnel behind the machine that the machine is backing up.

The backup alarm is located at the rear of the machine.

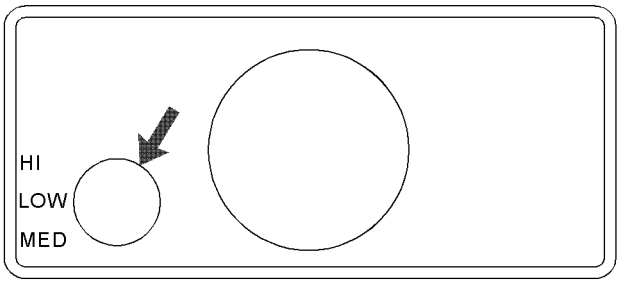


Illustration 100 g01124582

A three position switch at the rear of the backup alarm regulates the volume of the alarm.

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

i01913536

Air Conditioning and Heating Control

SMCS Code: 7304; 7320; 7337

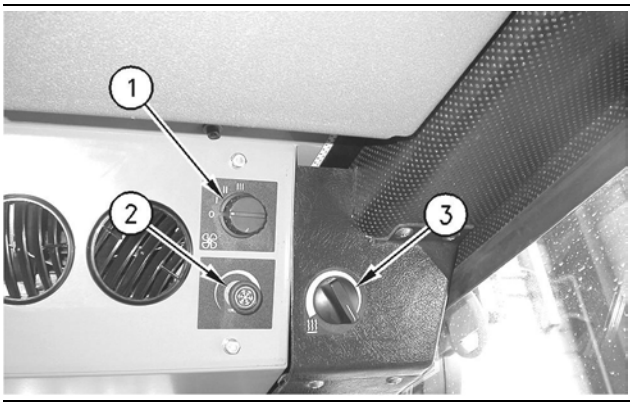


Illustration 101 g00996596

Fan Speed Switch (1) – This switch operates the three-speed blower fan motor for heating and for air conditioning. Turn the knob anywhere between OFF position (left) and THIRD speed position (right).

Air Conditioning Control (2) – Use this knob to control the air conditioner temperature. Turn the knob anywhere between MINIMUM position (left) and MAXIMUM position (right).

Heating Control (3) (If Equipped) – Use this knob to control the heater temperature. Turn the knob anywhere between MINIMUM position (right) and MAXIMUM position (left).

Air Conditioning and Heating System Operation

The air conditioning and heating system can perform four functions:

Heating – Turn air conditioning control (2) counterclockwise to the MINIMUM position in order to deactivate the air conditioner. Turn heating control (3) counterclockwise for the desired temperature. Turn fan speed switch (1) to FIRST speed, SECOND speed, or THIRD speed.

Cooling – Turn heating control (3) clockwise to the MINIMUM position. Turn air conditioning control (2) clockwise for the desired temperature. Turn fan speed switch (1) to FIRST speed, SECOND speed, or THIRD speed.

Pressurizing – Turn air conditioning control (2) counterclockwise to the MINIMUM position in order to deactivate the air conditioner. Turn heating control (3) clockwise to the MINIMUM position. Turn fan speed switch (1) to FIRST speed, SECOND speed, or THIRD speed. The speed of the blower fan depends on the volume of air that is needed in order to keep out the dust. Pressure inside the operator station will help keep out the dust when heating or cooling is not desired.

Defogging – Turn air conditioning control (2) clockwise to the MAXIMUM position in order to activate the air conditioner. Turn heating control (3) counterclockwise to the MAXIMUM position. Turn fan speed switch (1) to FIRST speed, SECOND speed, or THIRD speed. The speed of the blower fan depends on the volume of air that is needed in order to remove moisture from the air in the operator station. Once the windows are free from moisture, adjust the air conditioning control and the heating control until the operator’s station is comfortable. This will prevent moisture from forming on the windows.

i02431690

Seat

SMCS Code: 7312

Adjust the seat in order to allow full travel of the pedals. Make the seat adjustments when the operator is sitting against the back of the seat.

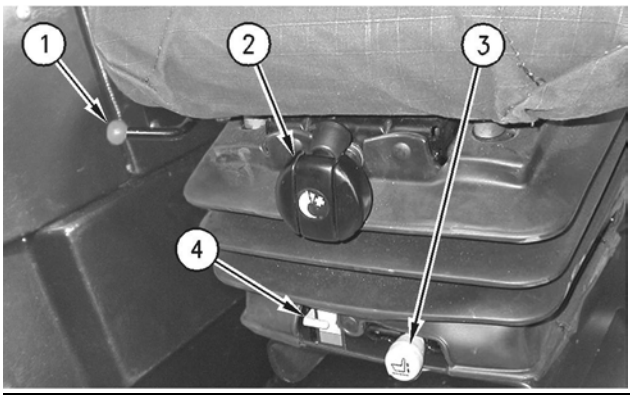


Illustration 102 g01003601

Fore and Aft Lever (1) – Pull up fore and aft lever (1). Hold the lever upward and slide the seat forward or backward to the desired position. Release the lever in order to lock the seat into position.

Weight Adjusting Knob (2) – Turn weight adjusting knob (2) in order to adjust the seat suspension for different operator weights. Turn weight adjusting knob (2) until the yellow indicator (4) is in the green area.

Seat Height Lever (3) – While sitting on the seat, move lever (3) to the left or to the right to one of four positions in order to adjust the upper stop for the seat height.

i02707449

Seat Belt

SMCS Code: 7327

Note: This machine was equipped with a seat belt when the machine was shipped from Caterpillar. At the time of installation, the seat belt and the instructions for installation of the seat belt meet the SAE J386 standards. See your Caterpillar dealer for all replacement parts.

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

Seat Belt Adjustment for Non-Retractable Seat Belts

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

Lengthening the Seat Belt

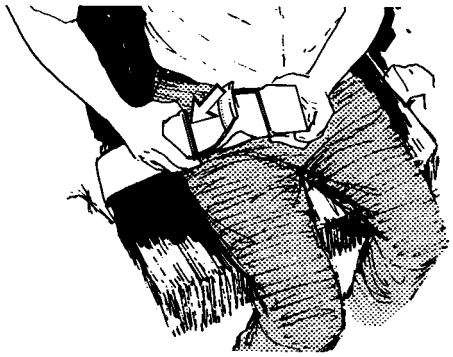


Illustration 103 g00100709

1. Unfasten the seat belt.

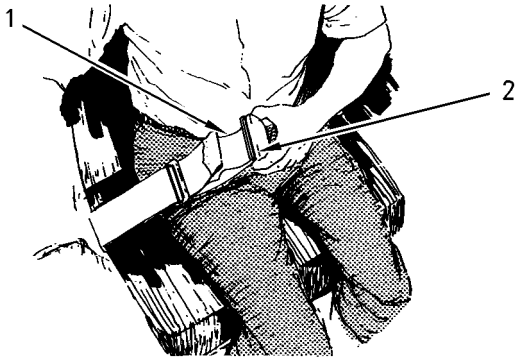


Illustration 104 g00932817

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

3. Remove the slack from the outer belt loop by pulling on the buckle.

4. Loosen the other half of the seat belt in the same manner. If the seat belt does not fit snugly with the buckle in the center, readjust the seat belt.

Shortening the Seat Belt

Illustration 105 g00100713

1. Fasten the seat belt. Pull out on the outer belt loop in order to tighten the seat belt.
2. Adjust the other half of the seat belt in the same manner.
3. If the seat belt does not fit snugly with the buckle in the center, readjust the seat belt.

Fastening The Seat Belt

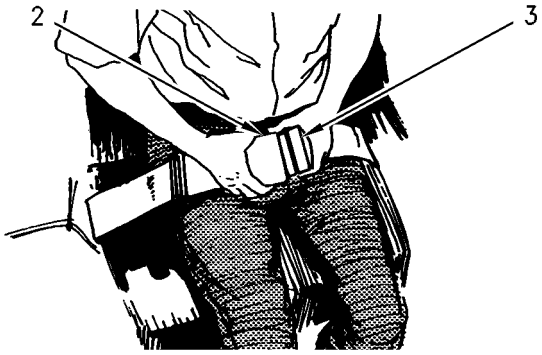


Illustration 106 g00932818

Fasten the seat belt catch (3) into the buckle (2). Make sure that the seat belt is placed low across the lap of the operator.

Releasing The Seat Belt

Illustration 107 g00100717

Pull up on the release lever. This will release the seat belt.

Seat Belt Adjustment for Retractable Seat Belts

Fastening The Seat Belt

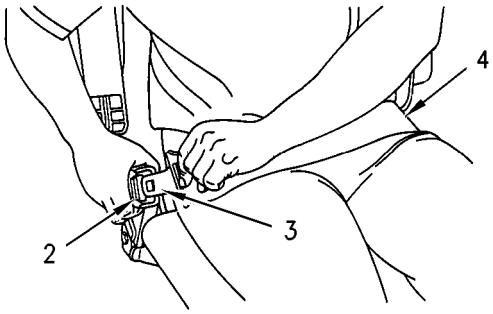


Illustration 108 g00867598

Pull seat belt (4) out of the retractor in a continuous motion.

Fasten seat belt catch (3) into buckle (2). Make sure that the seat belt is placed low across the lap of the operator.

The retractor will adjust the belt length and the retractor will lock in place. The comfort ride sleeve will allow the operator to have limited movement.

Releasing The Seat Belt

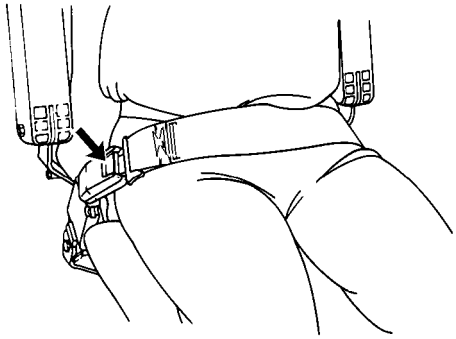


Illustration 109 g00039113

Push the release button on the buckle in order to release the seat belt. The seat belt will automatically retract into the retractor.

Extension of the Seat Belt

⚠ WARNING

When using retractable seat belts, do not use seat belt extensions, or personal injury or death can result.

The retractor system may or may not lock up depending on the length of the extension and the size of the person. If the retractor does not lock up, the seat belt will not retain the person.

Longer, non-retractable seat belts and extensions for the non-retractable seat belts are available.

Caterpillar requires only non-retractable seat belts to be used with a seat belt extension.

Consult your Caterpillar dealer for longer seat belts and for information on extending the seat belts.

i02490753

Alternate Exit

SMCS Code: 7310

⚠ WARNING

Incorrect window sealing (beading) may obstruct window removal and may cause inability to use alternate exit. Personal injury can result.

Use the correct method of sealing (beading) to secure the operator's station windows. Contact your Caterpillar dealer for the correct sealing (beading) method.

In order to exit the operator station through the rear window, exert outwards pressure on the window until the window separates from the operator station frame.

Illustration 110 g01244526

In order to remove the rear window from outside the operator station, pull on the locking strip tab to remove the locking strip. Exert inwards pressure on the window until it separates from the operator station frame.

In order to install the window and seal, contact your Caterpillar dealer for the correct sealing method.

Machine Controls and Operation

i02442407

Braking

SMCS Code: 4250; 4251; 4267; 4278; 4284

Parking Brake

This machine is equipped with spring applied parking brakes. The spring force engages the brakes on all four wheels. Hydraulic pressure is used to disengage the brakes. If the hydraulic pressure is unavailable, the brakes will remain engaged.

If hydraulic pressure is unavailable and the machine must be towed, use the 1DE3048 Portable Hydraulic Pump in order to release the parking brake.

Reference: For further information on towing an inoperable machine, consult your Caterpillar dealer or refer to Operation and Maintenance Manual, “Towing Information” for the machine that is being serviced.

⚠ WARNING

Personal injury could result from the sudden stop of the machine. The parking brake is automatically engaged when brake oil pressure drops below an adequate operating pressure.

If the brake system oil pressure drops below normal operating pressure, the action alarm will sound. The brake oil pressure indicator and the action lamp will start flashing.

If the pressure drops further, the parking brake will engage automatically, the parking brake indicator on the operator’s panel will come on and the transmission will shift to neutral.

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

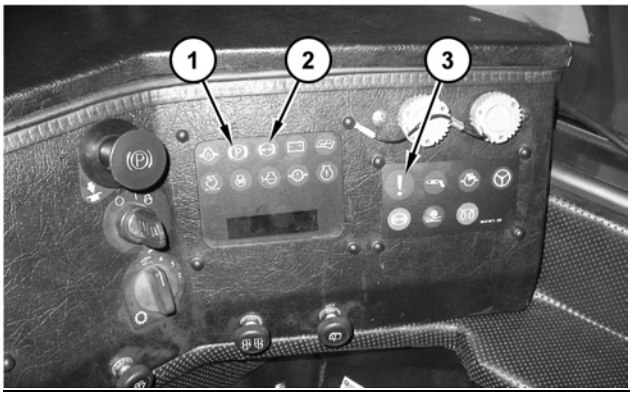


Illustration 111 g01220196

Loss of brake oil pressure will cause the action alarm to sound, action lamp (3) and brake accumulator oil pressure indicator (2) to flash. Further loss of oil pressure will cause parking brake indicator (1) to come on and the parking brake will automatically engage to stop the machine.

Also the parking brake will engage when the interlock strategy conditions are not met.

Reference: For further information on the interlock strategy conditions, refer to Operation and Maintenance Manual, “Machine Operation Information”.

Note: If the machine was started with the parking brake control in the OFF position, reset the control by moving it to the ON position and then to the OFF position before the parking brake will disengage.

NOTICE

The standard parking brake control is a pull-to-engage type. When the knob is pulled OUT, the parking brake will be engaged.

Certain mining regulations require machines to be equipped with a push-to-engage parking brake control. When the knob is pushed IN, the parking brake is engaged.

Before operating the machine, ensure you are familiar with the operation of the parking brake control.

Standard Pull-to-Engage Type Parking Brake Control

Illustration 112 g00996201

Use the parking brake control to engage the parking brake when you park the machine. The parking brake control is a push-pull type switch.

Parking Brake Control – Push parking brake control knob inward to the OFF position in order to disengage the parking brake. Pull the parking brake control knob outward to the ON position in order to engage the parking brake.

Optional Push-to-Engage Type Parking Brake Control

Illustration 113 g00996202

Use the parking brake control to engage the parking brake when you park the machine. The parking brake control is a push-pull type switch.

Parking Brake Control – Pull parking brake control knob outward to the OFF position in order to disengage the parking brake. Push the parking brake control knob inward to the ON position in order to engage the parking brake.

Parking Brake Drive Through

In the case of a hydraulic failure where pressure oil to release the parking brake is not available, a drive through mode is provided. This will allow the machine to be driven through the parking brakes to a safe location.

If a hydraulic or electrical failure occurs, the parking brake may automatically engage. Perform the following procedure to move the machine under these conditions. During this procedure, the monitoring system activates a category 2-S warning.

1. Make sure the area is clear of personnel and other machines.

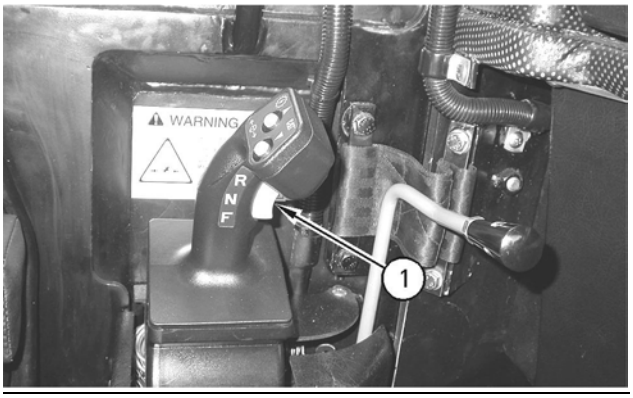


Illustration 114 g01003611

2. Move transmission direction and speed control (1) to the FIRST speed forward or FIRST speed reverse position.

3. In a rapid motion, move transmission direction and speed control (1) to the NEUTRAL position and then back to FIRST speed forward or FIRST speed reverse position.

4. Increase the engine speed and the machine will drive through the engaged parking brake.

5. Steer the machine to a safe location.

NOTICE
Driving the machine through the parking brakes for an extended period can cause severe damage to the braking system.

Inspect the parking brake system and make any necessary repairs before returning the machine to operation.

Service Brake

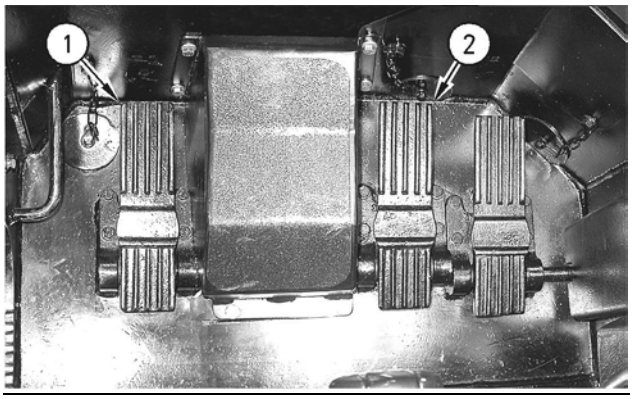


Illustration 115 g01003612

Service Brake/Transmission Neutralizer Pedal (1) – Use the left brake pedal to disengage the transmission and to slow down the machine's ground speed. This permits higher engine speed for better hydraulic response.

APPLY – Depress the left brake pedal when truck loading, positioning or when raising the bucket to increase hydraulic speed and reduce unnecessary torque converter stalling. It can also be used to give additional hydraulic power in difficult or particularly tight digging (mucking) conditions.

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

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

APPLY – Depress the right brake pedal for normal machine braking.

RELEASE – Release the right pedal in order to release the brake.

If the service brake pedal does not stop the machine, use the parking brake control to stop the machine. When the machine stops, block the wheels. If necessary, make repairs.

i02275361

Steering and Transmission Lock Control (STIC Steering)

SMCS Code: 3034

WARNING

No clearance for person in operator's station access area when machine turns. Severe injury or death from crushing could occur.

Engage transmission/primary steering lock before leaving the operator's station.

Illustration 116 g01003901

Steering and Transmission Lock Lever – This lock lever is used to lock the transmission shift into neutral and is the primary lockout system used to disable the steering.

Locked – Move the steering and transmission lock lever towards the STIC steering control to engage the lock. When the lock lever is moved to the locked position, the steering is disabled and the transmission will shift to neutral.

Illustration 117 g01003900

Unlocked – Move the lock lever away from the STIC steering control to unlock the STIC steering control. When the lock lever is moved to the unlocked position, the transmission will not shift into a speed until the transmission direction control switch is first moved to the NEUTRAL position.

i01929788

Transmission Control

SMCS Code: 3065; 3168; 4800

Direction Selection

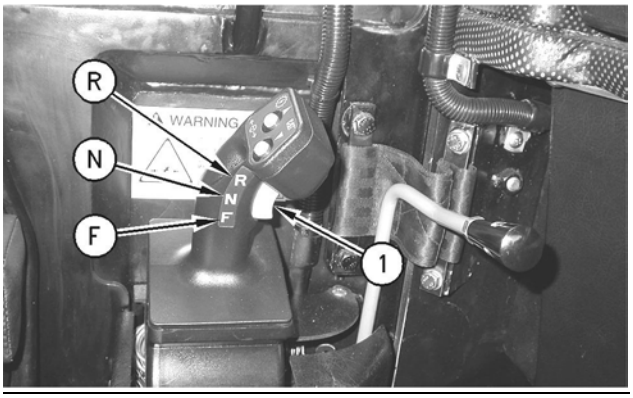


Illustration 118 g01003920

The direction of the machine is determined by the position of transmission direction control switch (1) that is located on the STIC steering control lever.

FORWARD (F) – The machine will move in a forward direction.

NEUTRAL (N) – The machine should not move when the transmission direction control switch is in neutral.

REVERSE (R) – The machine will move in a reverse direction.

Illustration 119 g00897771

The transmission direction that is currently in use, F (Forward), N (Neutral) or R (Reverse), is displayed on the instrument panel.

Speed Selection

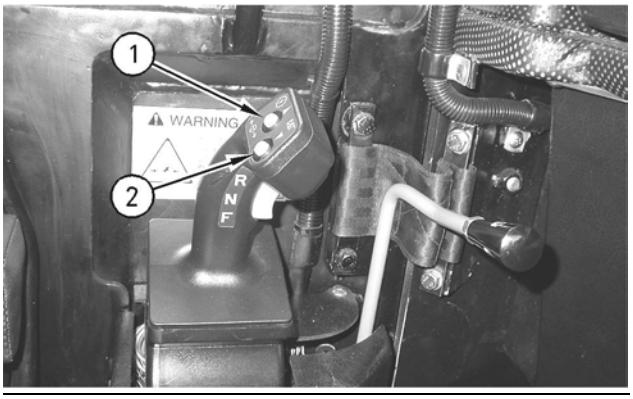


Illustration 120 g01003921

The gear speed is selected by pushing transmission upshift switch (1) or transmission downshift switch (2). The switches are located on the STIC steering control lever.

Transmission Upshift Switch (1) – Push the transmission upshift switch in order to shift the transmission into the next highest gear speed.

Transmission Downshift Switch (2) – Push the transmission downshift switch in order to shift the transmission into the next lowest gear speed.

The transmission has four speeds. The transmission gear speed that is currently in use is displayed on the instrument panel.

1 – First Speed

2 – Second Speed

3 – Third Speed

4 – Fourth Speed

Note: When the parking brake is engaged, the transmission cannot be shifted into the first gear speed (unless the parking brake drive through feature is activated). For further information on the Parking Brake Drive Through feature, refer to the Operation and Maintenance Manual, “Braking” for the machine that is being serviced.

Note: The transmission can shift automatically or the transmission can shift manually. Refer to the Operation and Maintenance Manual, “Autoshift Control” for the machine that is being serviced.

i01930323

Autoshift Control (STIC Steering)

SMCS Code: 3168; 4800; 7451-ZS

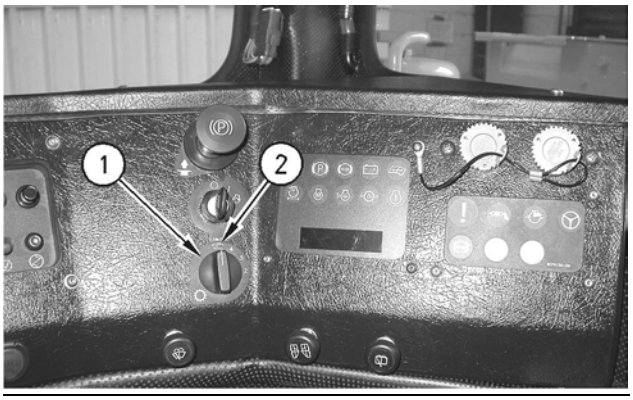


Illustration 121 g01004252

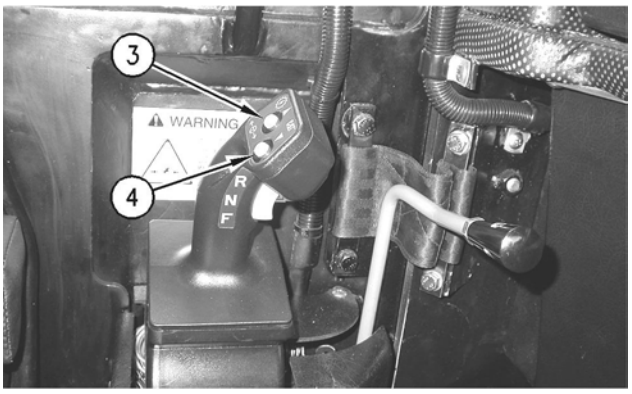


Illustration 122 g01004251

Manual Mode – To select the gear speed, turn transmission autoshift switch (1) to manual position (2).

Pressing transmission upshift switch (3) will cause the transmission to shift into the next highest gear.

Pressing transmission downshift switch (4) will cause the transmission to shift into the next lowest gear.

Automatic Mode – The operator selects the highest desired operating speed from the options on transmission autoshift switch (1). The electronic transmission control selects the proper transmission gear according to the ground speed of the machine.

Downshift switch (4) is active in all gears. Down shift switch (4) can cause transmission downshifts at machine speeds that are higher than normal.

Pressing and releasing downshift switch (4) will cause a downshift of one gear. The downshift will only occur if the machine speed and the engine speed will not result in an engine overspeed condition.

Pressing and holding downshift switch (4) will cause the transmission to continue to downshift as the machine speed decreases.

The transmission will remain in the downshifted gear for three seconds after the downshift switch is released. Then, automatic shifting is resumed.

Turn autoshift switch (1) to a selected gear speed in order to activate the autoshift function. The transmission will shift from first gear through to the selected gear automatically. The highest gear that will be used is determined by the selection on the switch.

As the machine slows, the transmission will automatically downshift.

i02228998

Throttle Control

SMCS Code: 1276

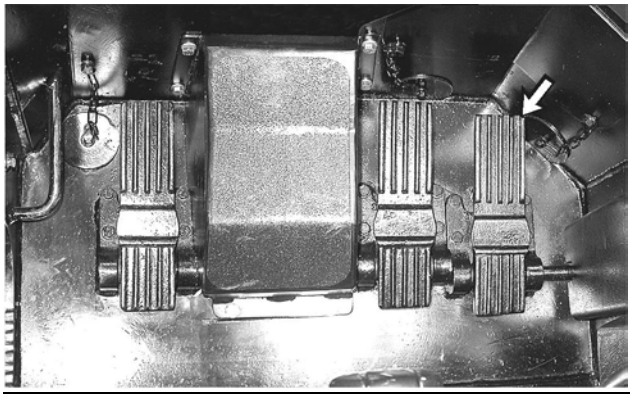


Illustration 123 g01004263

Throttle Pedal – The throttle pedal is located on the floor of the operator station.

Depressing the Throttle Control – Depress the throttle pedal in order to increase the engine speed.

Releasing the Throttle Control – Release the throttle pedal in order to decrease the engine speed.

i02457048

Steering Control

SMCS Code: 4309; 4343

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

Reference: For information on removing the steering frame lock, refer to the Operation and Maintenance Manual, “Steering Frame Lock” for the machine that is being serviced.

Note: The machine’s steering control functions will be disabled when the parking brake is engaged and the engine speed is less than 1500 rpm.

STIC Steering Control

The directional steering of the machine is controlled by the STIC steering control lever.

When the STIC steering control lever is moved to the right of center, the machine steers to the right. When the STIC steering control lever is moved to the left of center, the machine steers to the left.

Note: When the STIC steering control lever is released, the lever will return to the center position. However, the machine will maintain the direction in which it was moving.

The STIC steering control lever must be moved past center in the opposite direction to which the machine was turning to return to straight ahead travel.

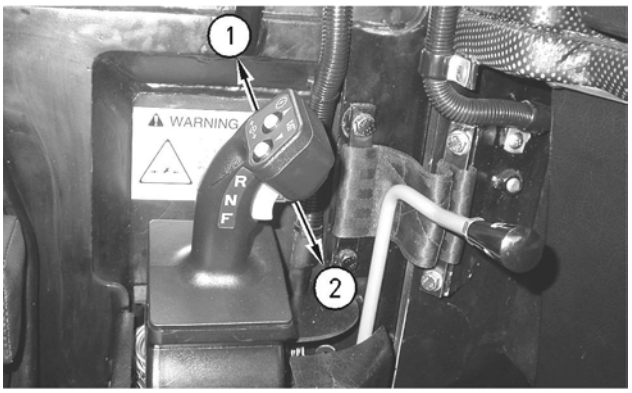


Illustration 124 g01004267

Left Turn (1) – Move the STIC steering control lever to the left of center in order to steer the machine to the left. The further the steering control lever is moved, the faster the machine steers to the left.

Right Turn (2) – Move the STIC steering control lever to the right of center in order to steer the machine to the right. The further the steering control lever is moved, the faster the machine steers to the right.

i02248404

Joystick Control

SMCS Code: 5063; 6107

Note: The joystick control functions will be disabled when the parking brake is engaged and the engine speed is less than 1500 rpm.

NOTICE
The standard joystick control lever is a pull-back-to-raise, push-forward-to-lower type.

Certain mining regulations require machines to be equipped with a push-right-to-raise, pull-left-to-lower type.

Before operating the machine, ensure you are familiar with the operation of the type of joystick control lever on your machine.

Joystick Control Lever - Standard Type

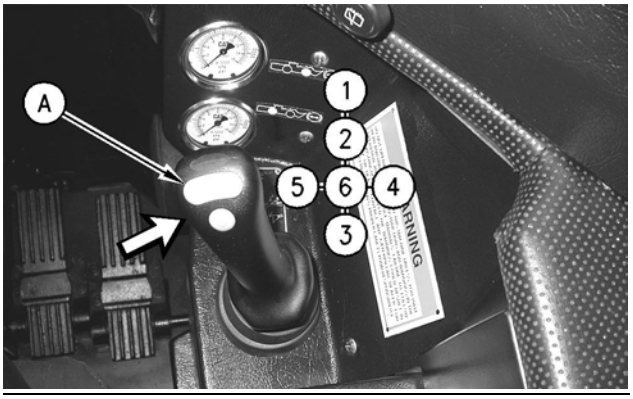


Illustration 125 g01004271

The joystick control lever performs the following functions:

FLOAT (1) – Push and hold the lever all the way forward for the FLOAT position. The bucket will lower to the ground and move up and down following the ground contour. The lever will return to the HOLD position when released.

NOTICE
Never use the FLOAT position to lower a loaded bucket.

Machine damage can result from a bucket that falls too fast.

LOWER (2) – Push the lever forward to lower the bucket. The lever will return to the HOLD position when released.

RAISE (3) – Pull the lever back to raise the bucket. The lever will return to the HOLD position when released.

DUMP (4) – Push the lever across to the right to dump the bucket. The lever will return to the HOLD position when released.

TILT BACK (5) – Pull the lever across to the left to tilt the bucket back. The lever will return to the HOLD position when released.

HOLD (6) – The lever will return to the HOLD position automatically when released. The bucket will remain in the selected position when in the HOLD position.

EJECT EJECTOR BUCKET (A4) – Depress and hold the left side of switch (A) while pushing the lever across to the DUMP position. This will cause the ejector bucket to eject the load. The lever will return to the HOLD position when released.

RETRACT EJECTOR BUCKET (A5) – Depress and hold the left side of switch (A) while pulling the lever across to the TILT BACK position. This will cause the ejector plate to retract into the ejector bucket. The lever will return to the HOLD position automatically when released. The lever will return to the HOLD position when released.

Joystick Control Lever - Optional Type

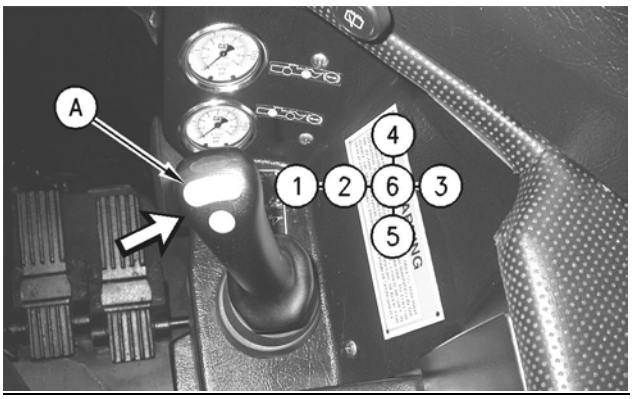


Illustration 126 g01004272

The joystick control lever performs the following functions.

FLOAT (1) – Pull and hold the lever all the way across to the left for the FLOAT position. The bucket will lower to the ground and move up and down following the ground contour. The lever will return to the HOLD position when released.

NOTICE
Never use the FLOAT position to lower a loaded bucket.

Machine damage can result from a bucket that falls too fast.

LOWER (2) – Pull the lever across to the left to lower the bucket. The lever will return to the HOLD position when released.

RAISE (3) – Push the lever across to the right to raise the bucket. The lever will return to the HOLD position when released.

DUMP (4) – Push the lever forward to dump the bucket. The lever will return to the HOLD position when released.

TILT BACK (5) – Pull the lever back to tilt the bucket back. The lever will return to the HOLD position when released.

HOLD (6) – The lever will return to the HOLD position automatically when released. The bucket will remain in the selected position when in the HOLD position.

EJECT EJECTOR BUCKET (A4) – Depress and hold the left side of switch (A) while pushing the lever across to the DUMP position. This will cause the ejector bucket to eject the load. The lever will return to the HOLD position when released.

RETRACT EJECTOR BUCKET (A5) – Depress and hold the left side of switch (A) while pulling the lever across to the TILT BACK position. This will cause the ejector plate to retract into the ejector bucket. The lever will return to the HOLD position automatically when released. The lever will return to the HOLD position when released.

i01930895

Payload Control System (PCS) (If Equipped)

SMCS Code: 7494

Note: The following information is a brief overview of the basic functions of the system.

General Operations of the Keypad

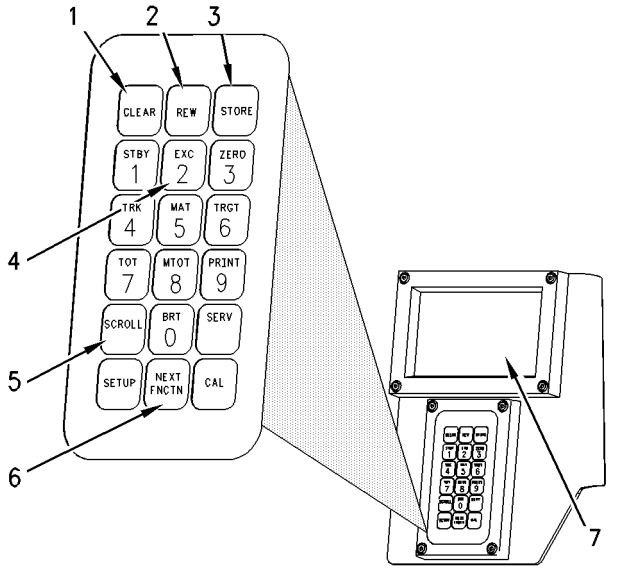


Illustration 127 g00905299

“CLEAR” key (1) – Use the “CLEAR” key in order to exit from a function, or use the "CLEAR" key in order to erase an entry.

“STORE” key (3) – Use the “STORE” key in order to store payload data. Use the “STORE” key in order to make a selection from a menu. Use the “STORE” key in order to enter a number.

“SCROLL” key (5) – Use the “SCROLL” key in order to move through options of a menu.

“NEXT FUNCTION” key (6) – Use the “NEXT FUNCTION” key in the setup, service and calibration modes.

Measuring the Load of a Bucket on the Go

1. Push “CLEAR” key (1) in order to set display (7) at zero.
2. Load the first bucket load. Continuously lift the load to above the horizontal position.
   - Keep the bucket in a fully tilted back position.
   - Raise the load at steady rate.
   - Keep the engine speed high when the load is lifted for the greatest accuracy.
   - Operate the lift arms smoothly and avoid sudden stops or jerky motion.

Note: Display (7) will show “WEIGH” as the system measures the load. When the measurement is complete, the top row of the display shows the weight of the bucket. The bottom row of the display shows the total weight for the current truck. If the “REW” indicator comes on then the load was incorrectly measured. Either the lift arms were not raised smoothly, or the engine speed was not above 1/2 maximum speed. Press “REW” key (2) and measure the load again.

3. Dump the load into the truck. Repeat the above steps until the truck is loaded.

4. Push “STORE” key (3) in order to save the payload data in the memory. Display (7) will reset automatically. The payload display is ready for a new truck.

Measuring the Load of a Bucket in the Stationary Position

Measure the load of the bucket in a stationary position. Adjust the final load of the bucket in order to attain the correct load of the truck.

After measuring the final load of the bucket, the total load of the truck may be too large. One of two steps can be performed.

- Dump partial loads back into the pile and use “REW” key.
- Dump partial loads into the truck and use “EXC” key.

The system will calculate the new load of the truck automatically.

Using the “REW” Key

1. Remain at the pile as the measurement of the last load is performed.

2. If display (7) shows that the total load of the truck is too large, then perform the following procedures:
   - Dump some material back into the pile.
   - Adjust the bucket into the fully tilted back position.
   - Raise the lift arms slightly.
   - Press “REW” key (2).
   - The machine and lift arms must be kept stationary while the measurement is performed.
   - If the total load of the truck is too large, then repeat the above steps.

3. Dump the load into the truck and press the “STORE” key (3).

Using the “EXC” Key

1. Approach the truck as the measurement of the last load is performed.

2. If display (7) shows that the total load of the truck is too large, then perform the following procedures:
   - Dump some material into the truck.
   - Adjust the bucket into the fully tilted back position.
   - Raise the lift arms slightly.
   - The machine and lift arms must be kept stationary while the measurement is performed.
   - Press “EXC” key (4) in order to measure the addition of material to the total of the truck.
   - Display (7) will update the total load of the truck automatically.
   - If the total load of the truck is not large enough, then repeat the above steps.

3. Press “STORE” key (3) and dump the excess material back into the pile.

Additional Features

Reference: More complete information is available from your Caterpillar dealer. Refer to the Operation and Maintenance Manual, SEBU7012, “Payload Control System” for additional features.

i02444816

Fire Suppression System (Foam) (If Equipped)

SMCS Code: 7401

This section contains basic operating procedures for the foam fire suppression system. The foam fire suppression system may be activated automatically or manually. The foam fire suppression system may also include an engine shutdown control.

Reference: For more complete information, refer to the fire suppression system manufacturer's information.

Fire Suppression Control (Manual)

⚠ WARNING

Manual actuation of the fire suppression system will result in immediate system discharge which may obscure vision and affect the operator's ability to control the machine. This may result in personal injury or death. Make certain the machine is stopped safely before manually actuating the system. Manual actuation will bypass all auxiliary shutdown and alarm functions.

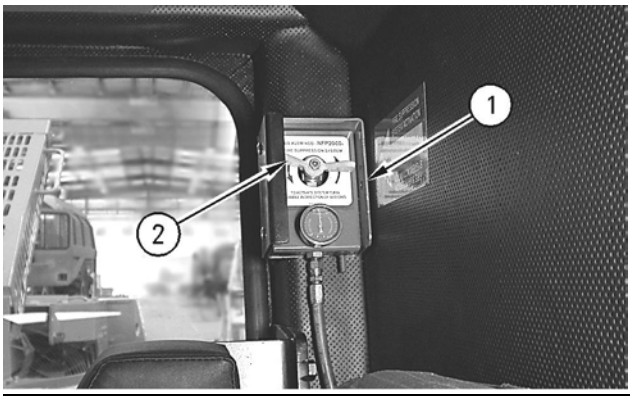


Illustration 128 g01004633

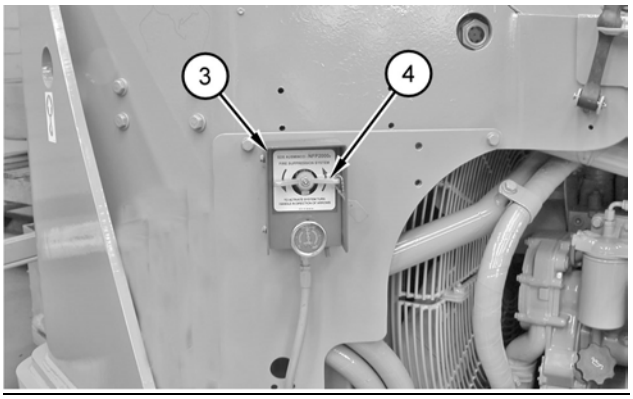


Illustration 129 g01131695

There are two manual actuators on the machine.

Manual actuator (1) is located in the operator station of the machine. Manual actuator (3) is located on the right side of the radiator guard.

Activate the fire suppression system by turning handle (2) or (4) counterclockwise.

Fire Suppression Control (Engine Shutdown)

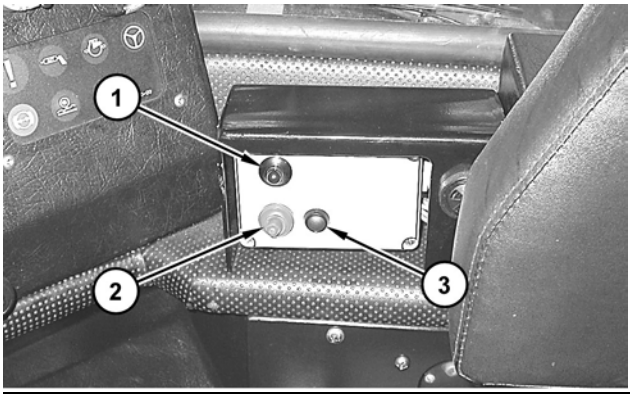


Illustration 130 g01221603

Engine shutdown control for fire suppression

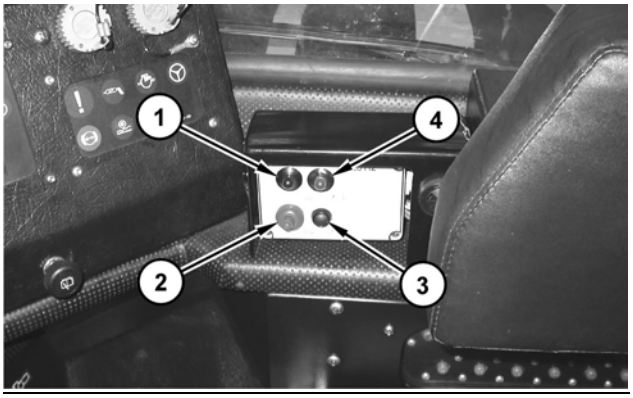


Illustration 131 g01221599

Engine shutdown control for fire suppression and idle timer

The function of the fire suppression control is to cause a delayed engine shut down when the fire suppression system is activated.

Fire System Activated (1) – This indicates that the fire suppression system has been activated. When this indicator flashes, an alarm will sound and the engine will shutdown after a six second delay.

Engine Shutdown Switch (2) – This switch allows the engine to be shutdown immediately. Push and hold engine shutdown switch (2) down to shutdown the engine.

Note: During normal operation use the engine start switch to shutdown the engine.

System Reset Button (3) – This button is used to override the fire suppression control so that the machine can be moved after discharge of the fire suppression system and loss of system pressure.

The “SYSTEM RESET” button must be held in for the engine to operate. Upon release, the engine will shutdown after six seconds.

Note: The override function should only be used in an extreme emergency. Restarting the machine before the fire suppression system has been recharged can reignite the fire that had been previously suppressed, without a means of extinguishment.

Idle Timer Function

Certain machines may be equipped with an idle timer control (engine shutdown) in addition to the fire suppression control.

Idle Timer On Indicator (4) – Indicates that the idle timer has been activated. When the engine start switch is turned to the OFF position, the indicator will flash and the engine will stop after three minutes.

Note: The idle timer will activate whenever the engine start switch is turned from the ON position to the OFF position.

To override the idle timer and stop the engine, turn the engine start switch to the OFF position and push the engine shutdown switch down.

Note: If the idle timer has been activated without starting the engine, it can be deactivated by pushing engine shutdown switch (2) down. Indicator (1) should stop flashing.

NOTICE
Never turn the battery disconnect switch to the OFF position with the idle timer activated (engine running). Electrical system damage could result.

In Case of Fire

⚠ WARNING

In case of fire, evacuate the area to reduce the risk of injury from flames, heat, hazardous vapors, explosions, or any other hazards that may be created.

The following procedure should be read and performed in accordance with the current mine site practices.

In case of fire perform the following procedure:

1. When a fire is detected or when the system alarm (if equipped) sounds, bring the machine to a safe controlled stop.
2. Stop the engine.
3. Engage the parking brake.
4. If not automatically activated, manually activate the fire suppression system by turning the handle on the manual fire suppression control counterclockwise.
5. Evacuate the machine.
6. If possible, turn the battery disconnect switch to the OFF position.
7. Notify the appropriate mine personnel.
8. Stand by (at a safe distance) with a portable fire extinguisher.

Note: Stand by with a portable fire extinguisher to guard against any fire that may reignite after the fire suppression system has discharged. Remain alert until the possibility of reignition is past.

NOTICE
If the fire suppression system has been activated, the system must be flushed and recharged. Have the machine cleaned, inspected and repaired before returning the machine to operation.

i02453738

Fire Suppression System (Dry Powder) (If Equipped)

SMCS Code: 7401

This section contains basic operating procedures for the dry powder fire suppression system. The dry powder fire suppression system may be activated automatically or manually.

Reference: For more complete information, refer to the fire suppression system manufacturer’s information.

Fire Suppression Control (Automatic)

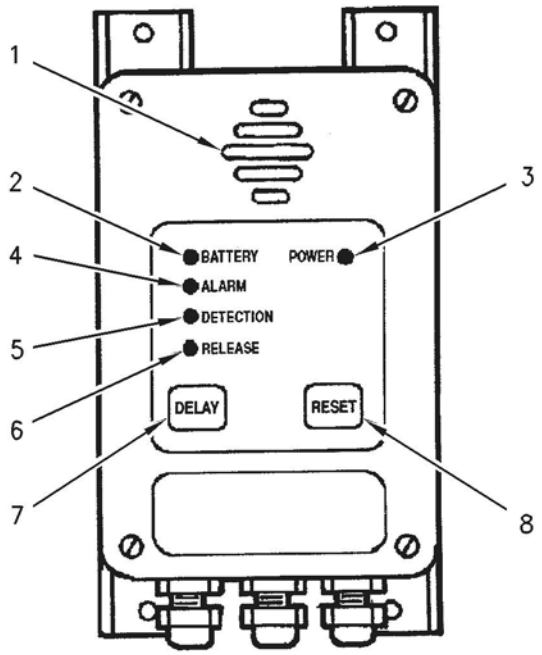


Illustration 132 g00899222

The fire suppression control is located in the operator station.

Audio Sounder (1) – The audio sounder gives the audio indication for all alarm and fault outputs. The sounder will pulse at the same rate as the corresponding indicator.

Battery Fault (Yellow) (2) – This indicator and the audio sounder will pulse once every ten seconds to indicate a low power condition.

Power Normal (Green) (3) – This indicator pulses once every three seconds to indicate normal battery power. The indicator will be off to indicate a loss of power or a low power condition.

Alarm (Red) (4) – This indicator and the audio sounder will pulse at two times per second if an alarm condition exists. An alarm condition is caused by the detection of a fire or by the operation of a manual actuator. The indicator and the audio sounder will pulse until the source of the alarm is removed and the fire suppression control is reset.

Detection Fault (Yellow) (5) – This indicator and the audio sounder will pulse once every ten seconds when the fire suppression control detects a fault in the detection circuit. The fire suppression control will return to normal when the fault condition is cleared.

Release Fault (Yellow) (6) – This indicator and the audio sounder will pulse once every ten seconds when a fault condition is detected in the release circuit. The fire suppression control will return to normal when the fault condition is cleared. The indicator will also pulse after the system has completed a discharge cycle. The fault signal in this condition is used to indicate that a recharge of the fire suppression system is necessary.

Delay Button (7) – Push and release the DELAY button to restart the delay period for the shutdown of the engine after a fire has been detected. Push and hold the DELAY button to indefinitely delay the shutdown of the engine after a fire has been detected.

Reset Button (8) – Push and hold the RESET button to override the fire suppression control so that the machine can be restarted after discharge of the fire suppression system.

The RESET button must be held in for the engine to operate. Upon release, the engine will shutdown after three seconds.

Note: The override function should only be used in an extreme emergency. Restarting the machine before the fire suppression system has been recharged, can reignite the fire that had been previously suppressed, without a means of extinguishment.

The RESET button is also used to reset the fire suppression control after the fire suppression system has been charged. When depressed, it provides an indication that all the indicators and the audio sounder are functional. When the RESET button is pressed, three short audio and visual indications will acknowledge that the system has been reset.

Fire Suppression Control (Manual)

⚠ WARNING

Manual actuation of the fire suppression system will result in immediate system discharge which may obscure vision and affect the operator's ability to control the machine. This may result in personal injury or death. Make certain the machine is stopped safely before manually actuating the system. Manual actuation will bypass all auxiliary shutdown and alarm functions.

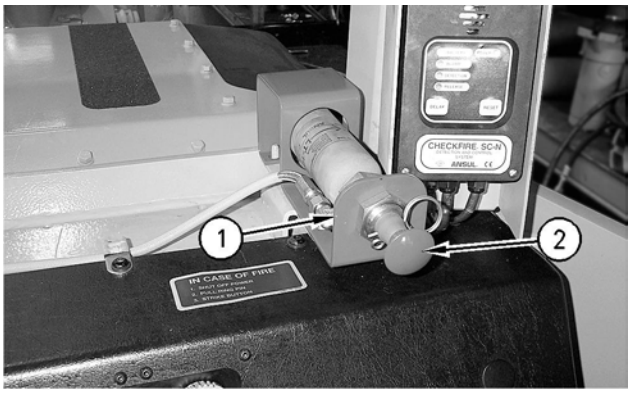


Illustration 133 g00899282

Typical example

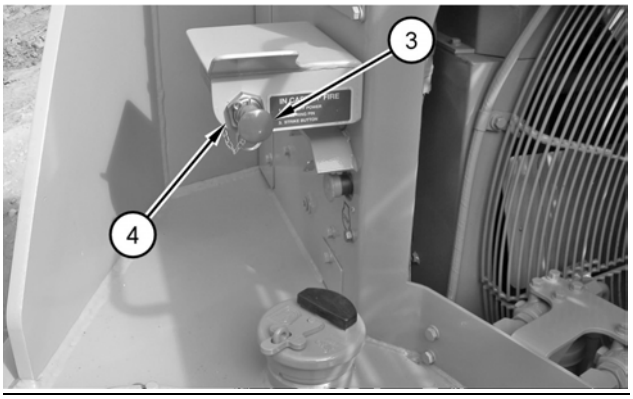


Illustration 134 g01142005

Typical example

There are two manual actuators on the machine.

Manual actuator (1) is located in the operator station of the machine. Manual actuator (4) is located on the right side of the engine compartment.

Activate the fire suppression system by pulling the ring pin on manual actuator (1) or (4) and striking red button (2) or (3).

In Case of Fire

WARNING

In case of fire, evacuate the area to reduce the risk of injury from flames, heat, hazardous vapors, explosions, or any other hazards that may be created.

The following procedure should be read and performed in accordance with the current mine site practices.

In case of fire perform the following procedure:

1. When the system alarm sounds, bring the machine to a safe controlled stop.
2. Stop the engine.
3. Engage the parking brake.
4. If not automatically activated, manually activate the fire suppression system by pulling the ring pin on the manual actuator and striking the red button.
5. Evacuate the machine.
6. If possible, turn the battery disconnect switch to the OFF position.
7. Notify the appropriate mine personnel.
8. Stand by (at a safe distance) with a portable fire extinguisher.

Note: Stand by with a portable fire extinguisher to guard against any fire that may reignite after the fire suppression system has discharged. Remain alert until the possibility of reignition is past.

NOTICE

If the fire suppression system has been activated, the system must be flushed and recharged. Have the machine cleaned, inspected and repaired before returning the machine to operation.

i02249831

Fuel Shutoff Valve

SMCS Code: 1329

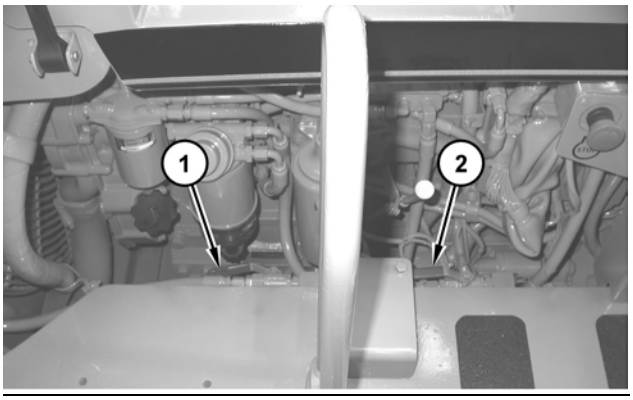


Illustration 135 g01164722

The shutoff valves for the fuel lines are located on the right side of the machine at the top of the fuel tank. Shutoff valve (1) is for the return line. Shutoff valve (2) is for the supply line.

i01930900

Steering Frame Lock

SMCS Code: 7506

⚠ WARNING

No clearance for person in this area when machine turns. Severe injury or death from crushing could occur.

Note: To install the steering frame lock the machine must be in the straight ahead position.

The steering frame lock is located at the articulating hitch in the center of the machine.

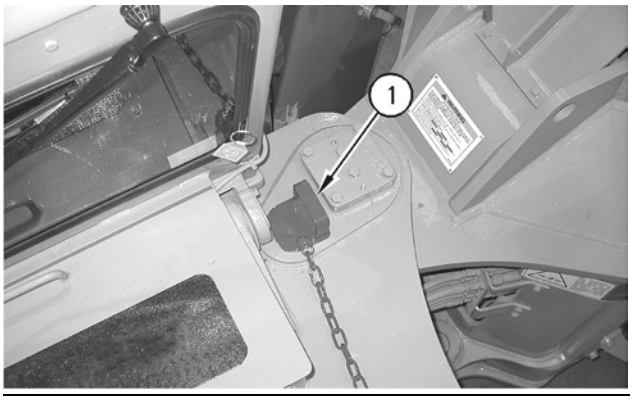


Illustration 136 g01004597

Install the steering frame lock when the machine is being lifted and when the machine is being transported. Also install the steering frame lock if you are performing service work near the articulating hitch. Install pin (1) through the bores of the front and rear frames, as shown.

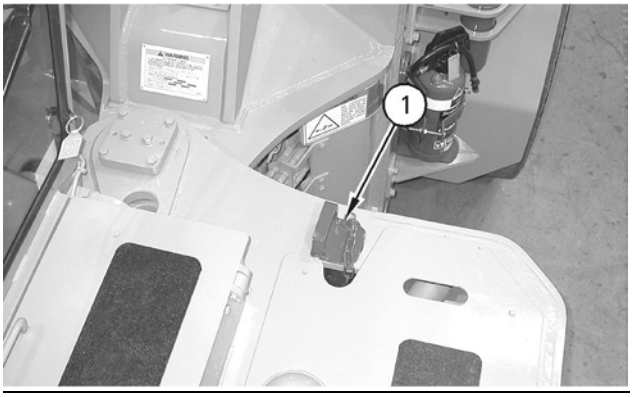


Illustration 137 g01004598

Remove the steering frame lock before the machine is operated. Remove pin (1) from the bores of the front and rear frames and install the pin in the stored position, as shown.

i02455892

Lift Arm Support Pins

SMCS Code: 7507

⚠ WARNING

No clearance for person in this area when lift arm lowers. Severe injury or death from crushing could occur.

Install lift arm support pins before servicing machine in this area.

Remove lift arm support pins and secure before resuming operation.

NOTICE
Before operating the machine, be sure the lift arm support pins are removed and placed in the stored position. Damage to the front frame and to the lift arm can result if the machine is operated with the lift arm support pins installed in the lift arm.

The lift arm support pins are located on both sides of the lift arm. Install the lift arm support pins before performing service work in the bucket control group area of the machine.

1. Park the machine on a flat, level surface in a straight ahead position.
2. Engage the parking brake.

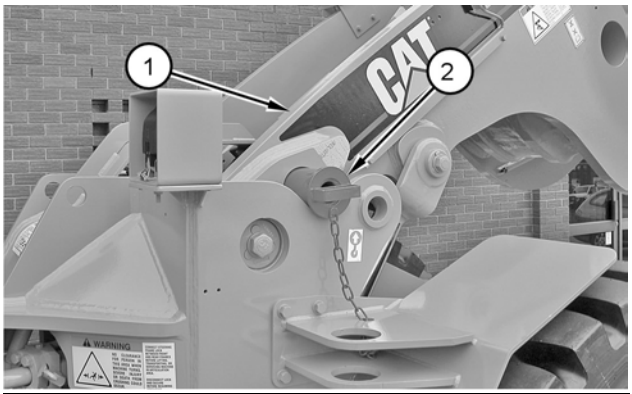


Illustration 138 g01132079

3. Raise lift arm (1) until the lift arm support pin bore can be aligned with the front frame tower.
4. Remove lift arm support pins (2) from the stored position. Fully insert each lift arm support pin (2) into the bores of the lift arm on each side of the machine, as shown.

5. Lower the lift arm until lift arm support pins (2) contact the front frame tower.

6. Move the bucket to the fully dumped position.

Note: The following steps are for the removal of the lift arm support pins.

7. Raise lift arm (1) until lift arm support pins (2) are above both sides of the front frame tower.

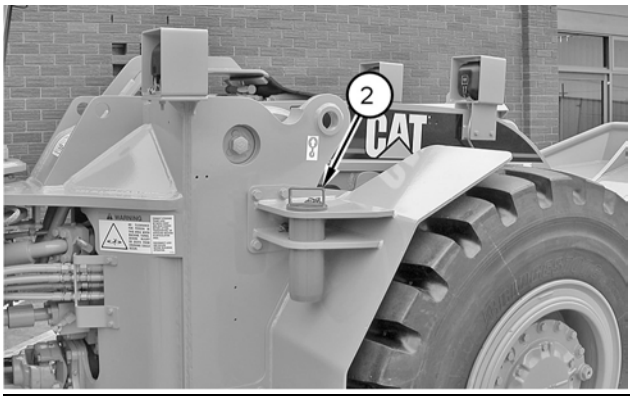


Illustration 139 g01132080

8. Remove lift arm support pin (2) from the lift arm on each side of the machine. Install lift arm support pins (2) in the stored position bore, as shown. The bores for storing the pins are located on each side of the front frame.

9. Lower the bucket to the ground.

Before Starting Engine

i02444793

Walk-Around Inspection

SMCS Code: 1000; 7000

For maximum service life of the machine, make a thorough walk-around inspection before you mount the machine.

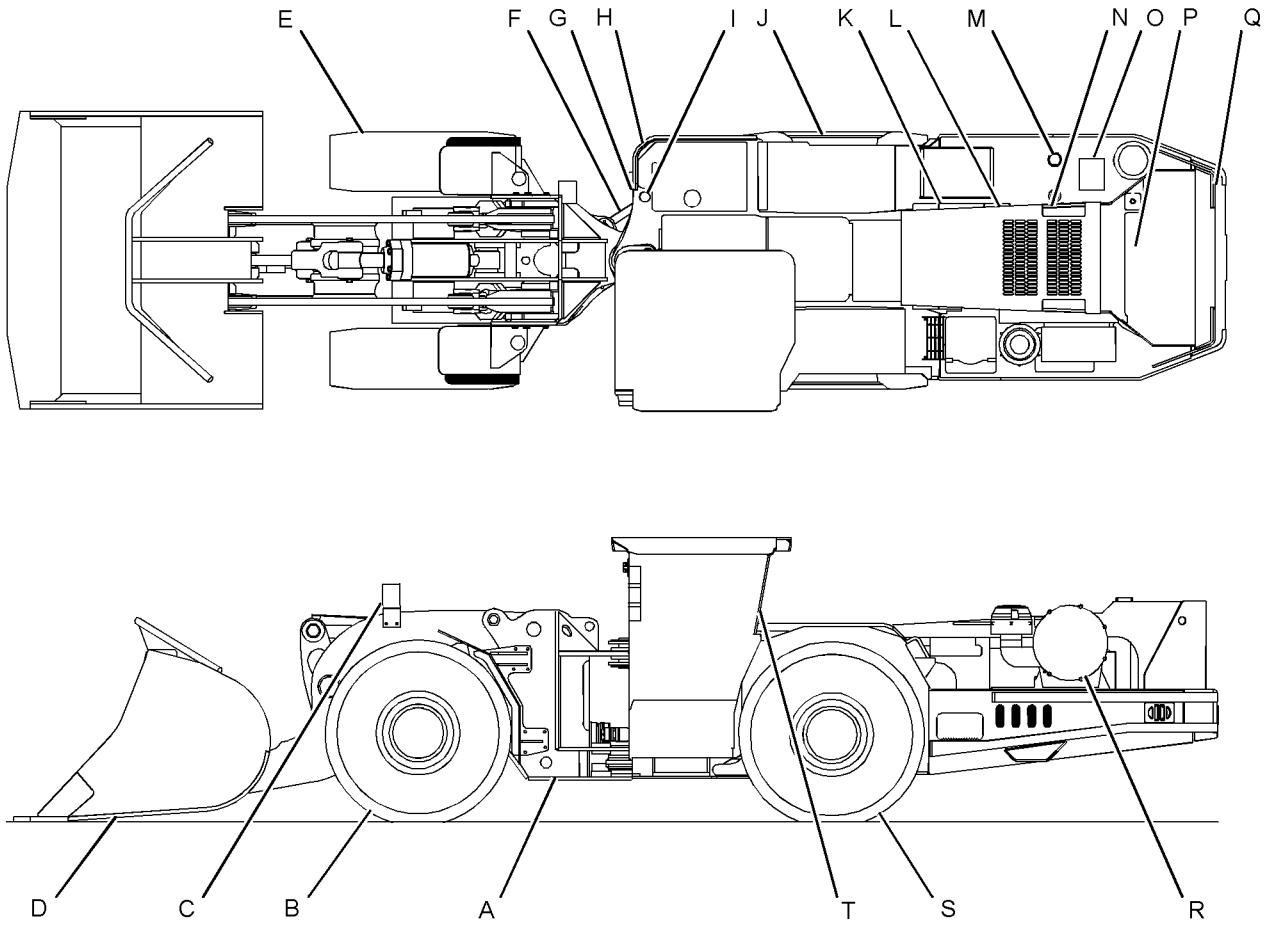
Look around the machine and under the machine. Inspect the condition of all major components. Check all grease fittings. Look for the following discrepancies:

- loose bolts
- trash buildup
- oil, coolant, or fuel leaks
- broken parts or worn parts
- cracks in the frames

Remove any trash and any debris. Report any abnormalities to the shop. Make any necessary repairs before you operate the machine.

Note: If the machine has not been operated for more than 48 hours, qualified personnel should complete a service inspection before you operate the machine.

Reference: Refer to the Operation and Maintenance Manual, “Service Inspection” for further information.

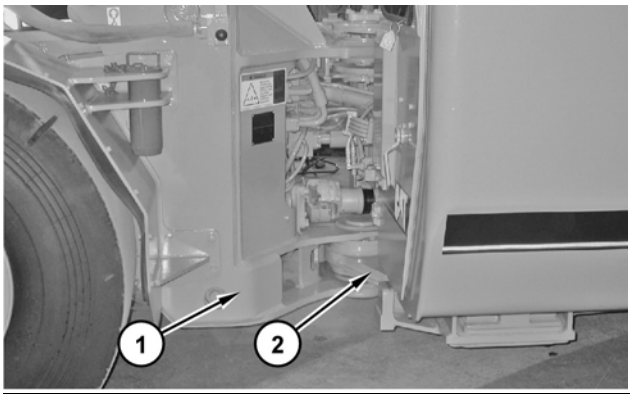


g01232627

Illustration 140

Inspection points for the walk-around inspection

(A) Frame
(B) Left front tire
(C) Front lights
(D) Bucket and linkage
(E) Right front tire
(F) Steering cylinder
(G) Window washer bottle
(H) Hydraulic tank
(I) Steering frame lock
(J) Right rear tire
(K) Power train
(L) Ground level controls
(M) Fuel tank
(N) Engine
(O) Automatic lubrication reservoir (if equipped)
(P) Radiator
(Q) Rear lights
(R) Air cleaner
(S) Left rear tire
(T) Windows



g01221571

Illustration 141

(A) Inspect front frame (1) and rear frame (2). Check for cracks or damage.

(B) Inspect the left front tire. Check the tire inflation. Make sure that you check the inside of the tire for damage or for wear. Inspect the tire treads for damage. Remove large rocks from the treads. Check the wheel for nuts and washers that are loose or missing.

Note: Rust behind a nut may indicate that the nut is loose. Shiny metal areas around a nut may indicate that the nut is loose.

(C) Inspect the front operating lights for damage.

(D) Inspect the bucket and linkage for damage or for excessive wear.

(E) Repeat procedure (B) for the right front tire.

(F) Inspect the steering cylinder. Look for leaks, cracking, or marks on the chrome. Inspect the articulating hitch.

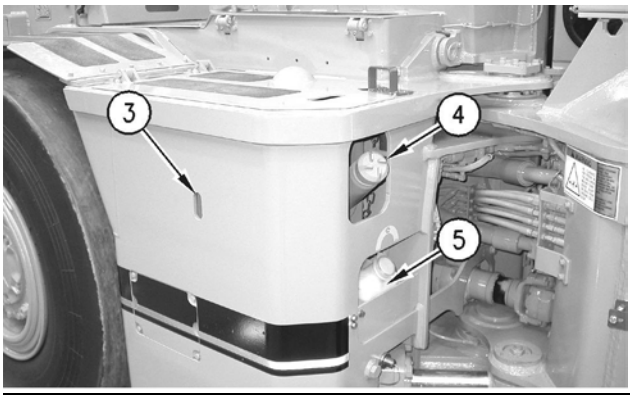


Illustration 142 g01004275

(G) Check the fluid level in window washer bottle (5).

(H) Inspect the hydraulic tank. Check the oil level in the hydraulic tank in sight gauge (3). Inspect the tank for leaks or for damage. Make sure that filler cap (4) is installed.

(I) Check that the steering frame lock is not installed. The machine will not steer if the steering frame lock is installed.

(J) Repeat procedure (B) for the right rear tire.

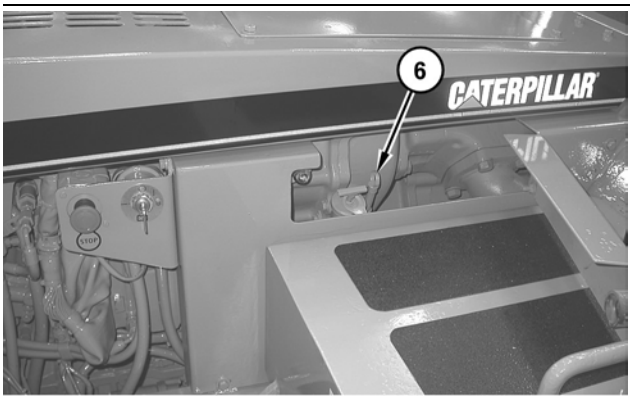


Illustration 143 g01164729

(K) Inspect the power train. Use dipstick (6) to check the transmission oil level when the engine is running at low idle. Check for leaks from the torque converter and from the transmission.

(L) Inspect the ground level controls. Make sure that the engine shutdown switch and the battery disconnect switch are in the ON position.

(M) Inspect the fuel tank. Make sure that the filler cap is installed correctly. Look for any leaks or damage to the fuel tank.

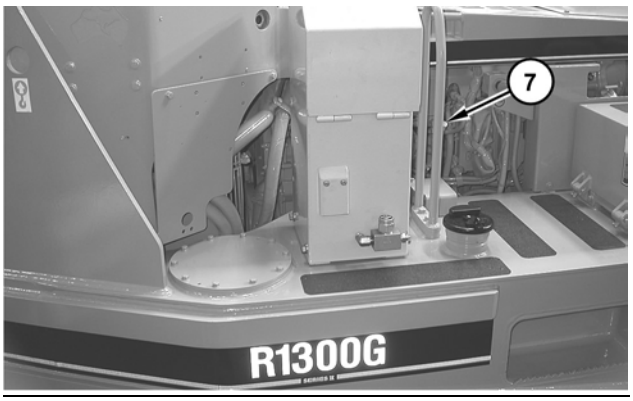


Illustration 144 g01164728

(N) Inspect the engine. Use dipstick (7) to check the oil level in the sump of the engine. Check for oil leaks and coolant leaks.

(O) Inspect the automatic lubrication reservoir (if equipped) for leaks.

(P) Check the coolant level in the radiator sight gauge. Inspect the radiator. Check for leaks. Remove any debris that could block the air flow.

(Q) Inspect the rear lights for damage.

(R) Inspect the air cleaner. Remove debris that may obstruct the air cleaner.

(S) Repeat procedure (B) for the left rear tire.

(T) Make sure that all of the windows are clean. Make sure that the operator’s vision is not impaired by dust, mud, or other foreign materials.

Refer to the Operation and Maintenance Manual, “Service Inspection” for further information.

i02415882

Mounting and Dismounting

SMCS Code: 7000

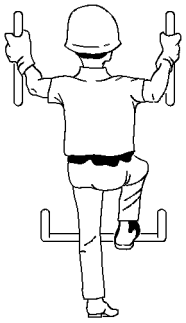


Illustration 145 g00037860

Use steps and handholds whenever you mount the machine. Use steps and handholds whenever you dismount the machine. Before you mount the machine, clean the step and the handholds. Inspect the step and handholds. Make all necessary repairs.

Face the machine whenever you mount the machine and whenever you dismount the machine. Maintain a three-point contact with the step and with handholds.

Note: Three-point contact can be two feet and one hand. Three-point contact can also be one foot and two hands.

Do not mount a moving machine. Do not dismount a moving machine. Never jump off the machine. Do not try to mount the machine when you carry tools or supplies. Do not try to dismount the machine when you are carrying tools or supplies. Use a hand line to pull equipment onto the platform. Do not use any controls as handholds when you enter the operator compartment or when you exit the operator compartment.

i01930928

Seat Adjustment and Seat Belt Inspection

SMCS Code: 7312; 7327

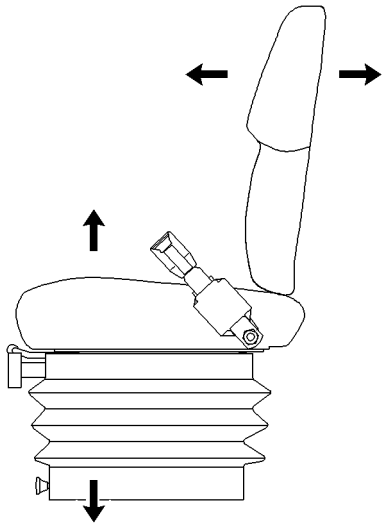


Illustration 146 g01004634

Note: Adjust the seat at the beginning of each shift or adjust the seat when there is a change of operators.

When the operator is seated against the back of the seat, adjust the seat in order to allow full pedal travel. The operator may adjust the seat forward or backward.

Inspect the belt mounting hardware. If the hardware is damaged or worn, replace the hardware. Keep the mounting bolts tight.

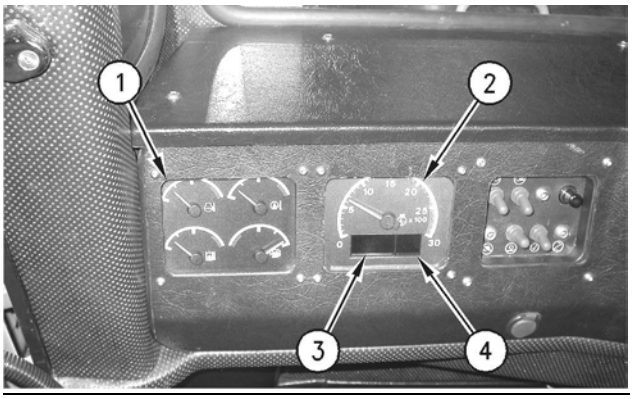
Fasten the seat belt before you start the engine.

Reference: For further information on the seat and the seat belt, refer to the Operation and Maintenance Manual, “Seat, Seat Belt” for the machine that is being serviced.

i02442408

Caterpillar Monitoring System - Self Test

SMCS Code: 7490

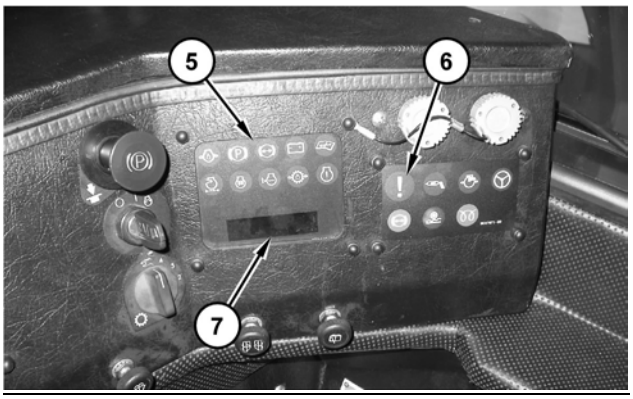


g01004886

Illustration 147

Caterpillar Monitoring System

(1) Gauge cluster
(2) Tachometer
(3) Digital speedometer
(4) Actual gear indicator



g01220197

Illustration 148

Caterpillar Monitoring System

(5) Alert indicators
(6) Action lamp
(7) Digital display window

In order to check the operation of the Caterpillar Monitoring System, observe the self test when the engine start switch is turned from the OFF position to the ON position.

Note: The battery disconnect switch must be in the ON position in order to supply the operator station with electrical power for the self test.

The Caterpillar Monitoring System will perform an automatic self test at start-up whenever the engine start switch is turned to the ON position. First the Caterpillar Monitoring System calibrates gauge cluster (1) and tachometer (2). Before the beginning of the system test, gauge cluster (1)) and tachometer (2) go from the initial value to zero. Then, the Caterpillar Monitoring System performs a test.

Alert indicators (5) flash for approximately three seconds in order to permit the operator to know that the indicators are functioning properly. Certain diagnostics are not possible with the use of LED lamps, so it is important for the operator to visually inspect alert indicators (5) during starting. If an alert indicator does not flash, find the cause immediately. Also, if an alert indicator remains ON after three seconds, find the cause immediately.

Digital display window (7) will show the following readouts for approximately three seconds:

- All indicators of units (Deg C, kPa, miles, kilometers, rpm and liters).
- "X 10".
- Symbol for the service hour meter.
- "888.8.8.8" in the six digit display area.

The self test will also activate the gauge panel to show the following:

- The gauges in gauge cluster (1) and tachometer (2) will be calibrated. The gauges will sweep to half scale and the gauges will return to zero. Then, the gauges will sweep to full scale and the gauges will return to operating values.
- Digital speedometer (3) activates every segment of the display. This will produce the following readout: "188", "MPH", and "km/h".
- Actual gear indicator (4) for the transmission activates every segment of the readout. You will see a "0" with an "X", and a "+" sign on top of the "0". There should be two of these symbols.
- Action lamp (6) illuminates.
- The action alarm will sound once.

If any of the alert indicators, action lamp, or digital readouts do not appear, or if the gauges do not sweep, the electrical system must be inspected. Perform all necessary repairs before the engine is started again.

If all the alert indicators and the action lamp come on, start the engine.

After you start the engine, observe the gauge panel and the monitoring panel. If any alert indicators or the action lamp remain on, or if the action alarm sounds, stop the engine. Inspect the electrical system and any other machine systems which were indicated. Perform all necessary repairs before the engine is started again.

Engine Starting

i02438336

Starting the Engine

SMCS Code: 1000; 7000

⚠ WARNING

Diesel engine exhaust contains products of combustion which may cause personal injury.

Always start and operate the engine in a well ventilated area, and, if in an enclosed area, vent the exhaust to the outside.

1. Make sure that no one is on the machine, underneath the machine or around the machine. Make sure that there are no personnel in the area.
2. Close the operator station door.
3. Adjust the operator's seat.
4. Fasten the seat belt.

Note: Before you start the engine, wait for the self test of the Caterpillar Monitoring System. The self test will activate when the engine start switch is turned to the ON position.

Reference: Refer to the Operation and Maintenance Manual, "Caterpillar Monitoring System - Self Test" in this section for further information.

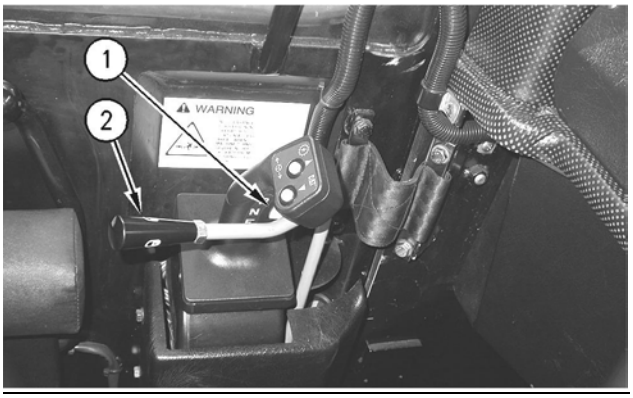


Illustration 149 g01004896

5. Move transmission direction control switch (1) to the NEUTRAL position. Move steering and transmission lock lever (2) to the LOCKED position.

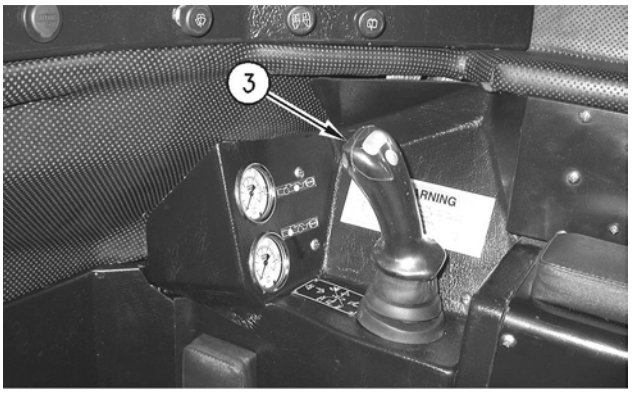


Illustration 150 g01004897

6. Move joystick control lever (3) to the HOLD position.

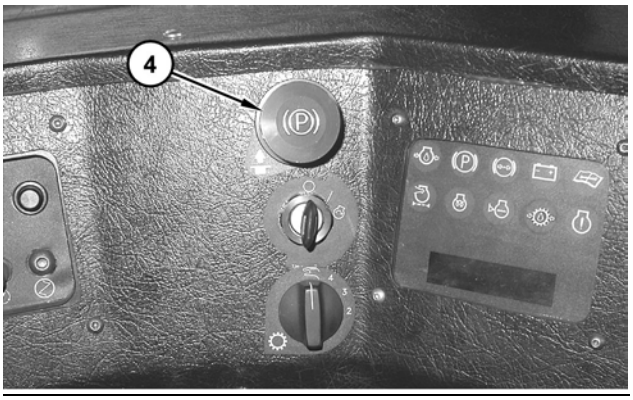


Illustration 151 g01220780

7. Move parking brake control (4) to the ON position to engage the parking brake.

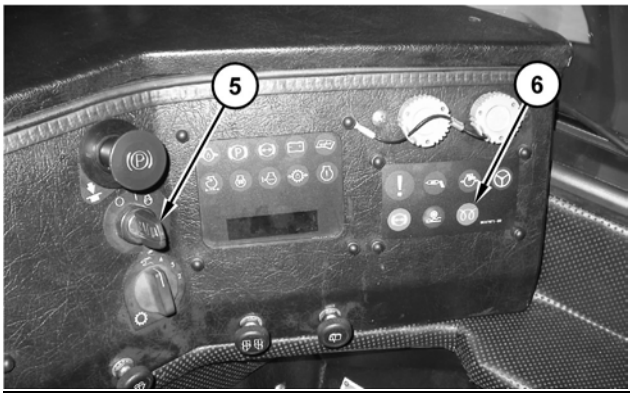


Illustration 152 g01220778

8. Turn engine start switch key (5) to the ON position, wait for glow plug indicator (6) to go out.
9. Sound the horn.
10. Turn engine start switch key (5) to the START position.

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

NOTICE
Do not crank the engine continuously for more than 30 seconds. Allow the starting motor to cool for two minutes before cranking the engine again.

Note: For starting below −18 °C (0 °F), use of additional cold weather starting aids is recommended. A coolant heater, a fuel heater or some extra battery capacity may be required. At temperatures below −23 °C (−10 °F), consult your Caterpillar dealer or refer to the Operation and Maintenance Manual, SEBU5898, “Cold Weather Recommendations” for the machine that is being serviced.

i02407539

Engine Starting with Jump Start Cables

SMCS Code: 1000; 1401; 7000

WARNING

Failure to properly service the batteries may cause personal injury.

Prevent sparks near the batteries. They could cause vapors to explode. Do not allow the jump start 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 the skin or eyes.

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

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

When using jumper cables, always connect the positive (+) jumper cable to the positive (+) battery terminal first. Next, connect the negative (-) jumper cable to the frame away from the batteries. Follow the procedure in the Operation and Maintenance Manual.

Jump start only with an energy source of the same voltage as the stalled machine.

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

WARNING

Do not attempt to charge a battery that has ice in any of the cells.

Charging a battery in this condition can cause an explosion that may result in personal injury or death.

Always let the ice melt before attempting to charge.

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

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

Severely discharged maintenance free batteries do not fully recharge from the alternator after jump starting. The batteries must be charged to proper voltage with a battery charger. Many batteries thought to be unusable are still rechargeable.

This machine has a 24 volt starting system. Use only the same voltage for jump starting. Use of a higher voltage damages the electrical system.

Use of Jump Start Cables

1. Place the transmission control on the stalled machine in the NEUTRAL position. Engage the parking brake. Lower all attachments to the ground. Move all controls to the HOLD position.

2. On the stalled machine, turn the engine start switch to the OFF position. Turn off the accessories.

3. On the stalled machine, turn the battery disconnect switch to the ON position.

4. Move the machine or the auxiliary power source close to the stalled machine so that the cables can reach. **DO NOT ALLOW THE MACHINE OR THE AUXILIARY POWER SOURCE TO CONTACT THE STALLED MACHINE.**

5. Stop the engine on the machine that is the electrical source. (If you are using an auxiliary power source, turn off the charging system.)

6. Check the battery caps for correct placement and for correct tightness. Make these checks on both machines. Make sure that the batteries in the stalled machine are not frozen. Check the batteries for low electrolyte.

7. Connect the positive jump start cable to the positive cable terminal of the discharged battery.

   Do not allow positive cable clamps to contact any metal except for battery terminals.

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

8. Connect the positive jump start cable to the positive terminal of the electrical source. Use the procedure from Step 7 in order to determine the correct terminal.

9. Connect one end of the negative jump start cable to the negative terminal of the electrical source.

10. Make the final connection. Connect the negative cable to the frame of the stalled machine. Make this connection away from the battery, away from the fuel, away from the hydraulic lines, and away from all moving parts.

11. Start the engine of the machine that is the electrical source. (If you are using an auxiliary power source, energize the charging system on the auxiliary power source.)

12. Allow the electrical source to charge the batteries for two minutes.

13. Attempt to start the stalled engine.

    Reference: For more information, refer to Operation and Maintenance Manual, “Engine Starting”.

14. Immediately after the stalled engine starts, disconnect the jump start cables in reverse order.

i02453733

Engine Starting with Auxiliary Start Receptacle

SMCS Code: 1450; 1463

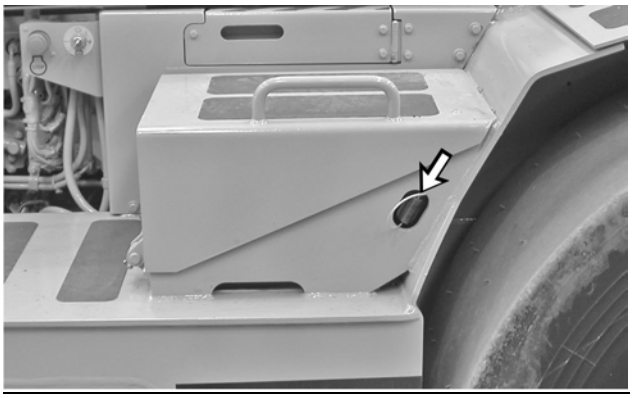


Illustration 153 g01245070

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

There are two cable assemblies that can be used to jump start the stalled machine. You can jump start the stalled machine from another machine that is equipped with an auxiliary start receptacle or with an auxiliary power pack. Your Caterpillar dealer can provide the correct cable lengths for your application.

1. Determine the reason that the engine will not start.

   Reference: Refer to Special Instruction, SEHS7633, “Battery Test Procedure” for more information.

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

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

4. Turn the battery disconnect switch on the stalled machine to ON.

5. Move the machine that is being used as a power source close to the stalled machine. The jump start cables should reach the batteries on both machines. **DO NOT ALLOW THE MACHINES TO CONTACT EACH OTHER.**

6. Stop the engine on the machine that is being used as a power source. If you use an auxiliary power source, turn off the charging system.

7. Connect the appropriate jump start cable to the auxiliary start receptacle on the stalled machine.

8. Connect the other end of the jump start cable to the auxiliary start receptacle of the machine that is being used as a power source.

9. Start the engine on the machine that is being used as a power source or energize the charging system on the auxiliary power source.

10. Allow the machine that is being used as a power source to charge the batteries for two minutes.

11. Attempt to start the stalled engine.

12. Immediately after the stalled engine starts, disconnect the jump start cable from the power source.

13. Disconnect the other end of the jump start cable from the stalled machine.

14. Conclude the failure analysis on the starting charging system of the stalled machine, as required. Check the machine while the engine is running and the charging system is in operation.

i02442412

Engine and Machine Warm-Up

SMCS Code: 1000; 7000

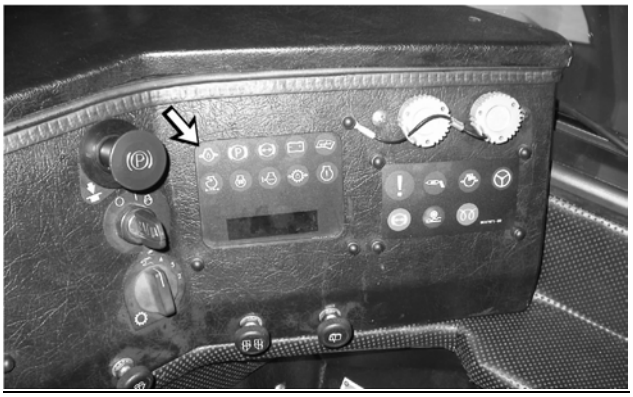


Illustration 154 g01220198

NOTICE
Keep engine speed low until the engine oil pressure alert indicator goes out. If the alert indicator does not go out within ten 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. To help the hydraulic components to warm up faster, engage and disengage the hydraulic controls to help speed warm up of the hydraulic oil and components.

   The hydraulic oil will warm up faster if the joystick control is held in the full TILT BACK position for short periods of ten seconds or less. This will allow the hydraulic oil to reach relief pressure, which causes the hydraulic oil to warm more rapidly.

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

2. Look at the alert indicators and the gauges frequently during operation.

   When you idle the engine in order to warm up the engine, observe the following recommendations:

   - Allow the engine to warm up for approximately 15 minutes when the temperature is higher than 0 °C (32 °F).

- Allow the engine to warm up for approximately 30 minutes or more when the temperature is below 0 °C (32 °F).

- More time may be required if the temperature is less than −18 °C (0 °F). More time may also be required if the hydraulic functions are sluggish.

Preparing to Operate the Machine

1. Do not attempt to move the machine without normal brake oil pressure.

2. In order to prevent injury, make sure that no one is working on the machine or near the machine. Keep the machine under control at all times in order to prevent injury.

3. Know the maximum height of the machine. Know the maximum width of the machine. Maintain proper clearance.

4. With the engine at low idle and with the oil at normal operating temperature, check the oil level of the transmission.

   Reference: Refer to the Operation and Maintenance Manual, “Transmission Oil Level - Check” for the machine that is being serviced.

5. Before the machine operates at a high speed, check the operation of the braking system and of the steering system. These systems should be checked while the machine maintains a low speed.

Note: Every 10 service hours or daily, test the operation of the braking system. For the correct procedure, refer to the Operation and Maintenance Manual, “Braking System - Test” for the machine that is being serviced.

Note: Every 10 service hours or daily, test the operation of the steering lockout system. For the correct procedure, refer to the Operation and Maintenance Manual, “Steering Lockout (STIC Steering) - Test ” for the machine that is being serviced.

Reference: For further operating information, refer to the Operation and Maintenance Manual, “Operating Technique Information, Loading, Hauling and Dumping, and Bucket Loading Hauling Units” for the machine that is being serviced.

Operation

i02249826

Machine Operation Information

SMCS Code: 7000

Follow these basic instructions whenever you are operating the machine:

- To prevent injury, make sure that no one is working on the machine or near the machine. Always maintain control of the machine.
- Raise the bucket or the work tool enough to negotiate any obstacles.
- Before you disengage the parking brake, depress the service brake pedal in order to keep the machine from moving.
- Reduce the engine speed when you maneuver in tight quarters and when you are going over a hill.
- When you drive downhill, use the same gear range that is used for driving uphill. Do not change gears while you travel downhill.
- Do not allow the engine to overspeed while you travel downhill. Apply the service brake in order to reduce the engine speed.

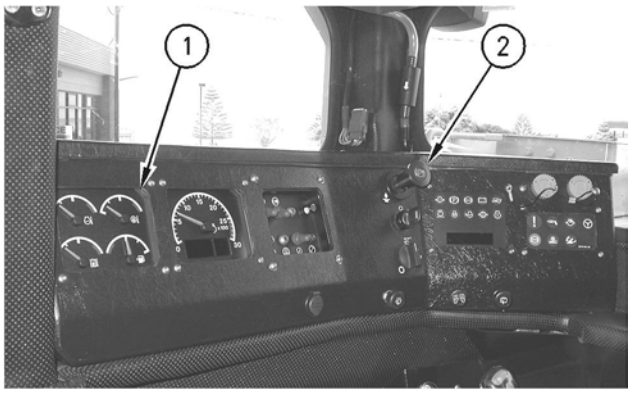


Illustration 155 g01005084

1. Frequently observe messages, warnings, alert indicators and gauges (1). All gauges should be at normal operating range. The alert indicators, the action lamp and the action alarm should be off.
2. Adjust the operator's seat.
3. Fasten the seat belt.
4. Raise the bucket approximately 400 mm (15 inch) above the ground.

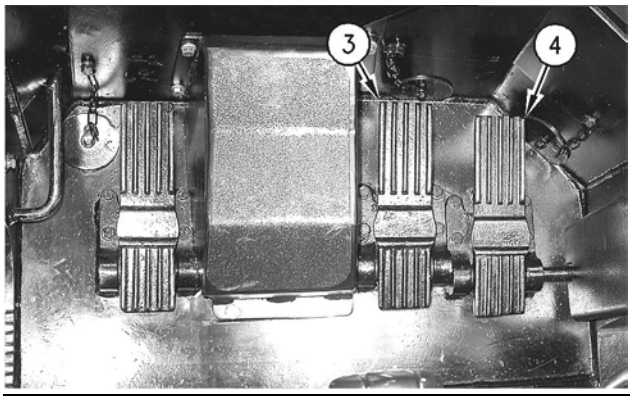


Illustration 156 g01005085

5. Depress service brake pedal (3).
6. Move parking brake control (2) to the OFF position to disengage the parking brake.

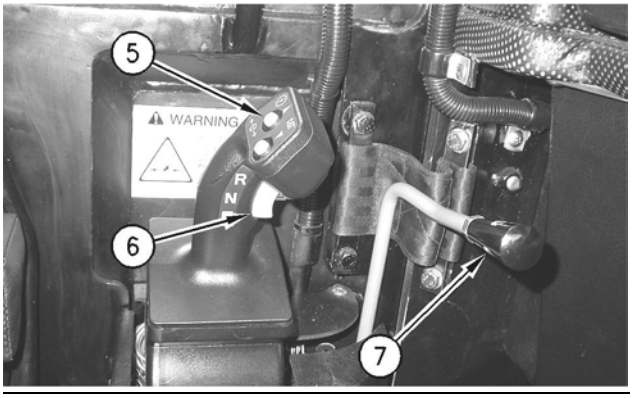


Illustration 157 g01005086

7. Move steering and transmission lock lever (7) to the UNLOCKED position. Move transmission direction control switch (6) to the desired travel direction. Push transmission upshift switch (5) to select the desired speed.
8. Release service brake pedal (3).
9. Depress throttle pedal (4) to the desired engine and machine speed.

Interlock Strategy

When operating the machine you must perform one of the following actions within three seconds or the parking brake will engage, the transmission will select neutral and the engine will stop.

- Apply the service brake
- Maintain engine speed above 850 rpm
- Maintain ground speed above 5 km/h (3.1 mph)

When the machine is stopped you must perform one of the following actions within three seconds or the parking brake will engage, the transmission will select neutral and the engine will stop.

- Apply the service brake
- Maintain engine speed above 850 rpm
- Engage the parking brake

Also, to operate the steering and implement functions with the parking brake engaged you must perform the following action.

- Maintain engine speed above 1500 rpm.

Downhill Operation

Maintain a ground speed that is slow enough for the conditions. Before you operate the machine down a hill, select the proper gear before you start down the grade. The proper gear should allow the machine to maintain the appropriate speed on the down grade. The throttle control should be at high idle and the engine should not overspeed. In most situations, the proper gear will be the same gear that is required to drive up the grade.

If the machine builds up excessive speed, the engine can overspeed. This can result in damage to the engine. Use the service brake in order to slow the machine until a lower gear can be selected. Select the lower gear and proceed with the throttle control at high idle.

Use the service brakes for stopping the machine. Using the service brakes in order to control the travel speed of the machine or using the service brakes for stopping from high speeds can cause the axle oil to overheat. This will result in significant wear and/or damage to the service brakes and the axle components.

Note: The left pedal should not be used for downhill braking.

i01759577

Changing Direction and Speed

SMCS Code: 1000; 7000

Speed changes at full engine speed and directional changes at full engine speed are possible. However, deceleration and/or braking is recommended when you change direction. This will maximize operator comfort and the service life of the power train components.

1. Decrease the engine speed by releasing the throttle pedal.
2. Push the brake pedal downward in order to slow down the machine. If you are shifting from FORWARD to REVERSE or vice versa, stop the machine completely.
3. Shift the transmission to the desired speed and/or to the desired direction.
4. Release the brake pedal.
5. Increase the engine speed by depressing the throttle pedal.

i02442415

Parking Brake

SMCS Code: 7000

⚠ WARNING

Personal injury could result from the sudden stop of the machine. The parking brake is automatically engaged when brake oil pressure drops below an adequate operating pressure.

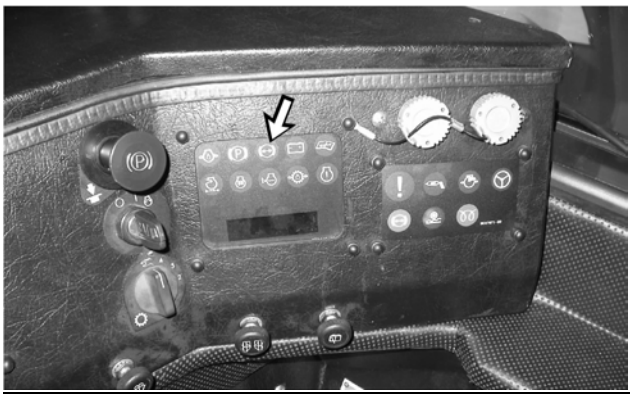


Illustration 158 g01220199

If the braking system loses oil pressure, the alert indicator for the brakes and the action lamp will flash, and the action alarm will sound. The alert indicator for the brakes is on the dash panel. Loss of oil pressure will cause the parking brake to automatically engage. This will stop the machine.

Anticipate a sudden stop. Correct the cause of the loss of oil pressure. Do not operate the machine without normal brake oil pressure.

NOTICE

Moving the machine with the parking brake engaged or the service brake pedal locked can cause excessive wear or damage to the brake. If necessary, have the brake repaired before operating the machine.

i02442416

Secondary Steering (If Equipped)

SMCS Code: 7000

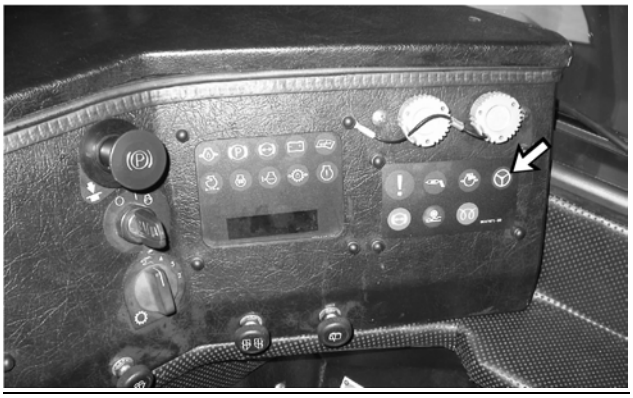


Illustration 159 g01220200

The activation of the primary steering indicator indicates a failure of the primary steering system. If this indicator comes on during operation, steer the machine to a convenient location and immediately stop the machine. Stop the engine and investigate the cause of the problem.

Note: The secondary steering system works while the machine is in motion.

Complete any necessary repairs before you return the machine to operation.

Operating Techniques

i01932034

Operating Technique Information

SMCS Code: 7000

g00942662

Illustration 160

Typical example

For good operator vision and machine stability, carry the loaded bucket low, approximately 400 mm (15 inch) above the ground.

Travel in reverse when you carry a load down a steep incline. Travel forward when you go uphill.

g00942663

Illustration 161

Typical example

Clean the work area during waiting periods and level the work area during waiting periods.

g00942665

Illustration 162

Typical example

Maintain traction by avoiding excessive downward pressure on the bucket.

g00942667

Illustration 163

Typical example

Make sure that the bucket that is being used is appropriate for the work that is being performed. Exceeding the machine limits will reduce the service life of the machine.

i01932035

Loading, Hauling and Dumping

SMCS Code: 7000

Illustration 164 g00942706

Typical example

1. Position the bucket parallel to the ground. The bucket should barely skim the ground. Drive the bucket straight into the pile.

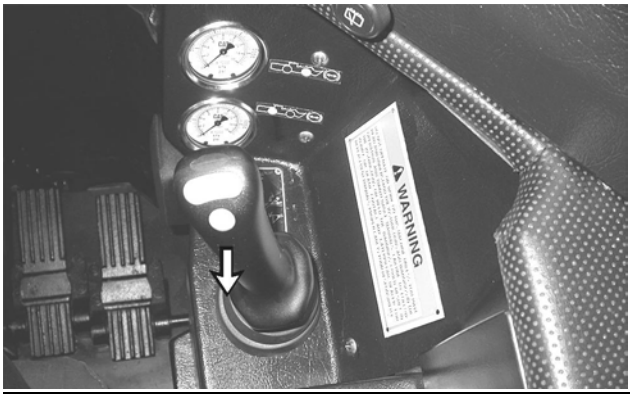


Illustration 165 g01005151

2. Move the joystick control lever to the RAISE position as forward movement slows. Return the lever to the HOLD position for additional tilt back power.

Illustration 166 g00942707

Typical example

3. To fill the bucket, work the joystick control lever back and forth from the TILT BACK position to the HOLD position. Continue to use RAISE as required to reduce wheel slip.

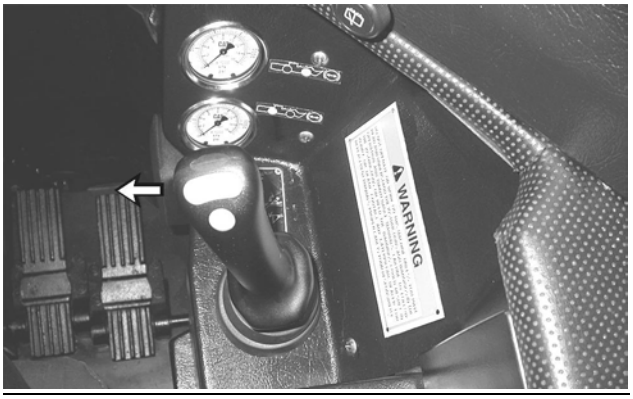


Illustration 167 g01005152

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

Illustration 168 g00942662

Typical example

5. Raise the bucket high enough to clear the material being loaded. Tilt the bucket back until the bucket contacts the stops. Always carry the load with the bucket in the fully tilted back position to avoid material spillage and minimize loader linkage wear.

6. Move the transmission direction and speed control to the REVERSE position. Carry the loaded bucket approximately 400 mm (15 inch) above the ground level.

Illustration 169 g01005151

7. When you reach the dump area, move the joystick control lever to the RAISE position.

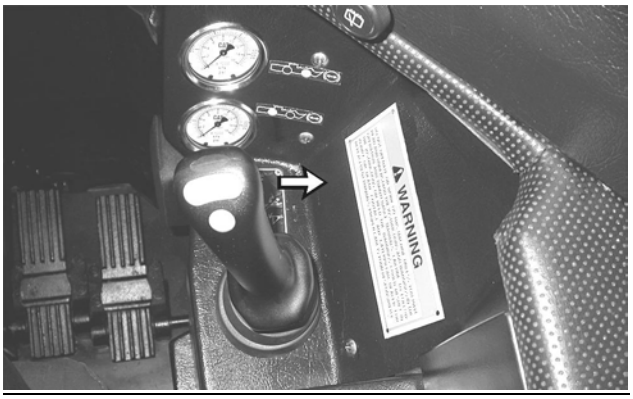


Illustration 170 g01005153

8. When at the correct height, move the joystick control lever to the DUMP position.

9. To control dumping, move the joystick control lever to the DUMP position. Then, return the lever to the HOLD position. Repeat this procedure until the bucket is empty.

Illustration 171 g00942712

Typical example

10. To achieve the maximum angle for dumping, use the stops for the bucket.

NOTICE

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

i01932036

Bucket Loading Hauling Units

SMCS Code: 7000

Illustration 172 g00942731

Typical example

1. To reduce the loader turning and the travel distance, position the hauling unit at an angle to the material that is being loaded (if possible).

2. The optimum travel distance should be long enough so that the bucket can reach the lift height without slowing the movement of the loader. This may vary due to specific underground loading areas.

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

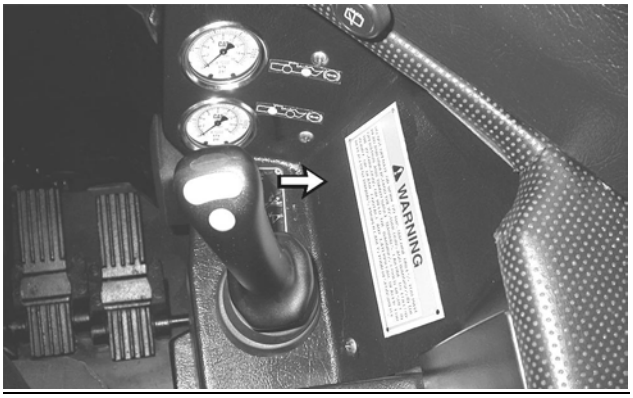


Illustration 173 g01005153

4. Move the joystick control lever to the DUMP position in order to dump the load from the bucket.

Illustration 174 g00942733

Typical example

5. Shake the bucket in order to loosen sticky material. Move the joystick control lever quickly from the TILT BACK to the DUMP position, allowing the lift arm to strike the stops.

NOTICE

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

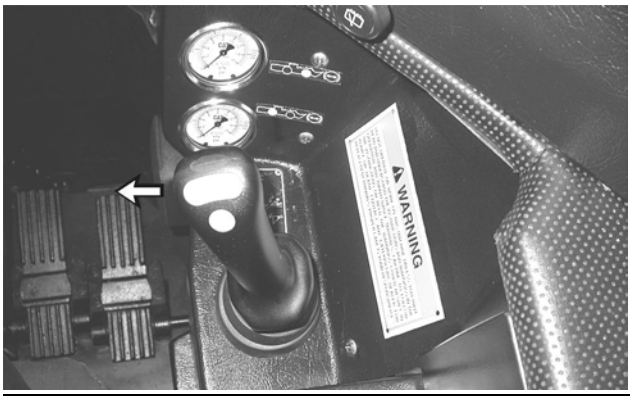


Illustration 175 g01005152

6. Move the joystick control lever to the TILT BACK position.

7. Before lowering the bucket, make sure that the hauling unit is not under the bucket.

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

Parking

i01931964

Stopping the Machine

SMCS Code: 7000

⚠ WARNING

Personal injury or death can result from not engaging the parking brake.

If the parking brake is not engaged, the machine may roll while personnel are on or near the machine.

Always engage the parking brake before leaving the machine.

⚠ WARNING

No clearance for person in operator's station access area when machine turns. Severe injury or death from crushing could occur.

Engage transmission/primary steering lock before leaving the operator's station.

NOTICE
Do not engage the parking brake while the machine is moving unless the service brakes fail. The use of the parking brake as a service brake in regular operation will cause severe damage to the parking brake.

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

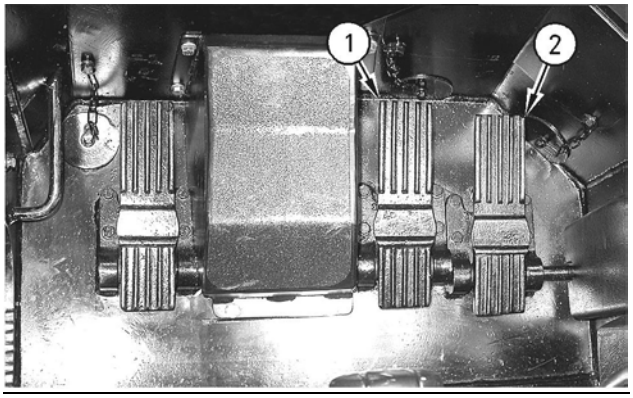


Illustration 176 g01005126

2. Release throttle pedal (2). Depress service brake pedal (1) in order to stop the machine.

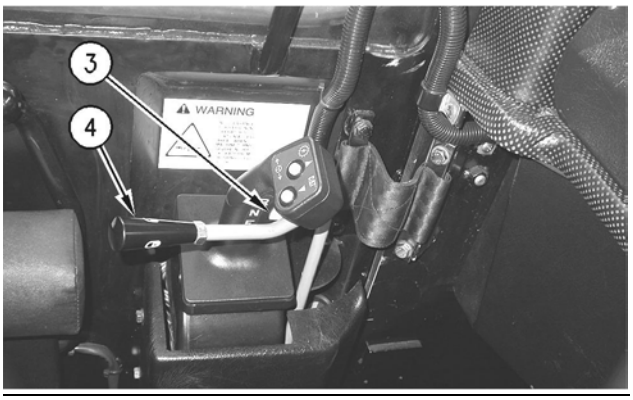


Illustration 177 g01005128

3. Move transmission direction control switch (3) to the NEUTRAL position. Move steering and transmission lock lever (4) to the LOCKED position.

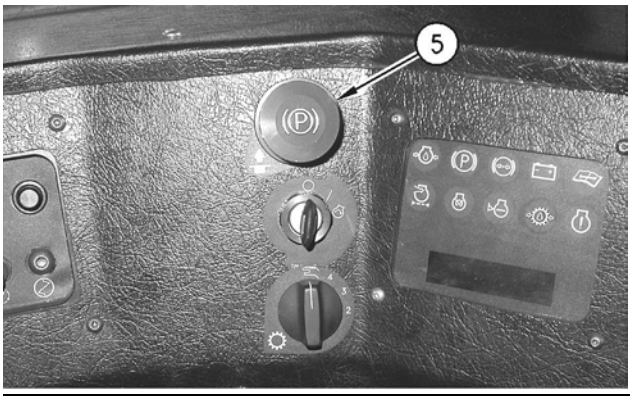


Illustration 178 g01005129

4. Move parking brake control (5) to the ON position in order to engage the parking brake.

5. Lower the bucket to the ground and apply a slight downward pressure.

i01931968

Stopping the Engine

SMCS Code: 1000; 7000

1. Park the machine on level ground. For the recommended procedure, refer to the Operation and Maintenance Manual, “Stopping the Machine” for the machine that is being serviced.

NOTICE
Stopping the engine immediately after it has been working under load can result in overheating and accelerated wear of the engine components.

If the engine has been operating at high rpm and/or high loads, run at low idle for at least three minutes to reduce and stabilize internal engine temperature before stopping the engine.

Avoiding hot engine shutdowns will maximize turbocharger shaft and bearing life.

2. In order to allow the engine to gradually cool, operate the engine at low idle for three minutes.

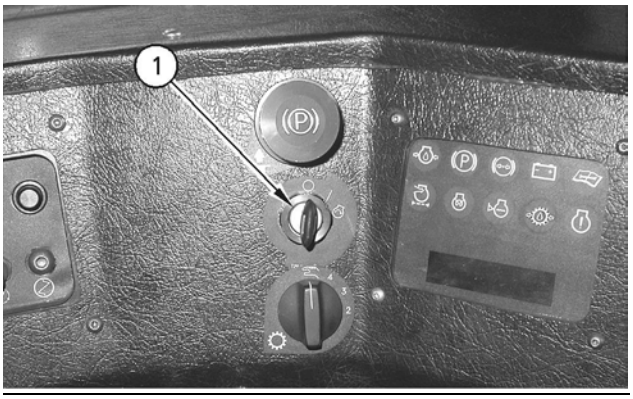


Illustration 179 g01005135

3. Turn engine start switch key (1) to the OFF position in order to stop the engine.

NOTICE
Never turn the battery disconnect switch key to OFF with the engine running. Electrical system damage could result.

4. If the machine is parked, block the wheels.

i02234210

Stopping the Engine if an Electrical Malfunction Occurs

SMCS Code: 1000; 7000

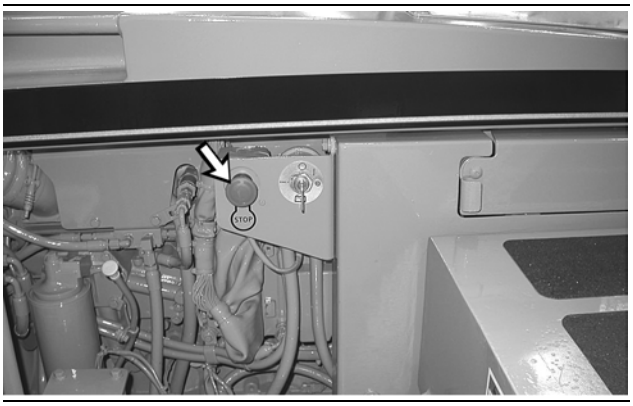


Illustration 180 g01132445

If the engine start switch is in the OFF position but the engine does not stop, use the engine shutdown switch to stop the engine.

Reference: For further information, refer to the Operation and Maintenance Manual, “Engine Shutdown Switch” for the machine that is being serviced.

Note: Do not operate the machine again until the problem has been corrected.

i02230960

Equipment Lowering with Engine Stopped

SMCS Code: 7000

Note: Before you lower the bucket or the work tool, make sure that the area around the machine is clear of all persons.

1. Close the operator’s station door.

2. Cycle the engine start switch to the ON position.

3. Move the joystick control lever to the LOWER position in order to lower the bucket or the work tool to the ground. The joystick control lever will return to the HOLD position when released.

i01761975

Leaving the Machine

SMCS Code: 7000

Illustration 181 g00901356

1. Use the steps and the handholds when you get off the machine. Make sure the steps are clear of debris before dismounting. Face the machine and maintain a three-point contact with the steps and with the handholds.

Note: Three-point contact can be two feet and one hand. Three-point contact can also be one foot and two hands.

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

3. Turn the battery disconnect switch to the OFF position. Remove the battery disconnect switch key. This will help to prevent a battery short circuit. This will also help to protect the battery from any possible current draw by components over extended time periods.

NOTICE
Never turn the battery disconnect switch key to OFF with the engine running. Electrical system damage could result.

Remote Control System

i02438341

General Information (Remote Control)

SMCS Code: 7000-RCT; 7600-ZM

⚠ WARNING

This machine can cause severe injury or death if operated by untrained personnel.

If you are not trained in accordance with mine practice in the operation of remote control for this machine, DO NOT OPERATE.

This section contains basic operating procedures for the Caterpillar remote control system. There are two types of systems available on Caterpillar Load Haul Dump machines, the DIRECT system and the PROPORTIONAL system.

These basic operations are for the Control Master transmitter and receiver. Other brands of transmitter and receiver may be used with the Caterpillar remote control interface.

For more information on the type of transmitter and receiver for your machine, refer to the manufacturer's instructions or contact the supplier of the transmitter and receiver.

i02234211

Transmitter Controls

SMCS Code: 7600-ZM

Motion Control Lever

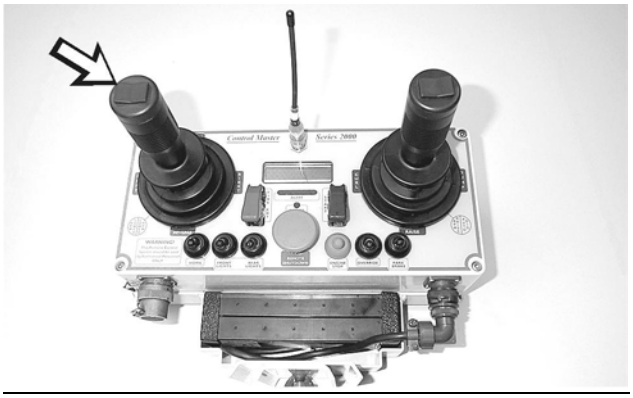


Illustration 182 g00901537

Motion Control Lever – This lever is used to control the machine forward/reverse direction, directional steering, engine throttle selection and to apply the brakes.

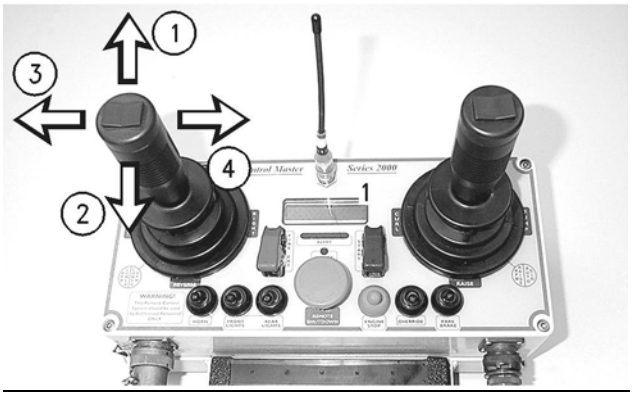


Illustration 183 g00901539

Forward (1) – Push the motion control lever forward to move the machine in a forward direction.

Reverse (2) – Pull the motion control lever back to move the machine in a reverse direction.

Left Turn (3) – Move the motion control lever to the left to steer the machine in a left direction.

Right Turn (4) – Move the motion control lever to the right to steer the machine in a right direction.

Brake Control (Proportional System) – The brakes will release when the motion control lever is moved to the FORWARD position or to the REVERSE position. The brakes will apply when the motion control lever is returned to the center position. The lever will return to the center position when released.

Brake Control (Direct System) – The brakes will release when the motion control lever is moved to the FORWARD position or to the REVERSE position and either full or part throttle is selected. The brakes will apply when the motion control lever is returned to the center position. The lever will return to the center position when released.

Throttle Control (Proportional System) – Move the motion control lever to either the FORWARD position or the REVERSE position. The further the motion control lever is moved, the more the engine RPM will increase.

Bucket Control Lever

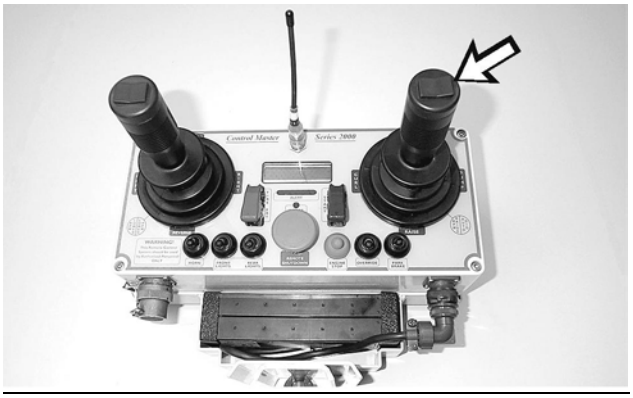


Illustration 184 g00901395

Bucket Control Lever – This lever is used to control the bucket functions of the machine.

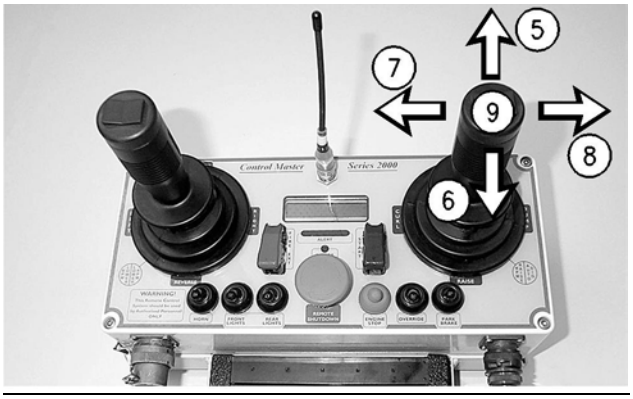


Illustration 185 g00901399

Lower (5) – Push the bucket control lever forward to lower the bucket. The lever will return to the HOLD position when released.

Raise (6) – Pull the bucket control lever back to raise the bucket. The lever will return to the HOLD position when released.

Tilt Back (Curl) (7) – Move the bucket control lever to the left to tilt the bucket back. The lever will return to the HOLD position when released.

Dump (8) – Move the bucket control lever to the right to dump the bucket. The lever will return to the HOLD position when released.

Hold (9) – The bucket control lever will return to the HOLD position automatically when released. The bucket will remain in the position it is in when the lever is in the HOLD position.

Transmitter Control Switches

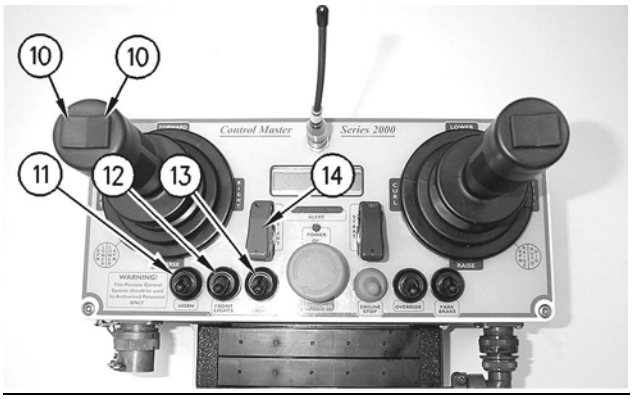


Illustration 186 g00901401

Lower RPM Switch (10) (Direct System) – Press and hold this switch to activate the part throttle function. The engine speed should increase to a preset speed which is approximately 1/2 the maximum engine rpm.

Horn Switch (11) – Press the spring return switch up to sound the horn.

Front Light Switch (12) – Push the switch up to turn on the front lights.

Rear Light Switch (13) – Push the switch up to turn on the rear lights.

Note: If the remote shutdown switch is turned off while the lights are on, they will remain on. The remote shutdown switch must be turned back on to power up the transmitter to turn the lights off.

Fire Extinguisher Switch (14) (If Equipped) – Lift the protective cover and push the switch up to activate the machine fire suppression system (if equipped). This will also cause a "forced shutdown" of the machine.

Reference: For further information, refer to the Operation and Maintenance Manual, “Forced Shutdown of Machine (Remote Control)” for the machine that is being serviced.

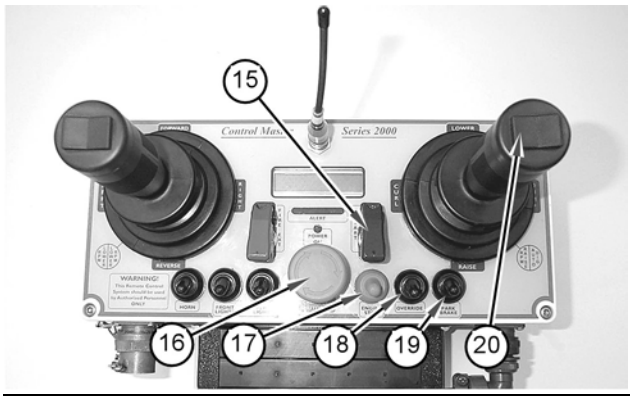


Illustration 187 g01126582

Engine Start Switch (15) – Lift the protective cover and push the spring return switch up to activate the starter motor and start the engine.

Note: The engine start function will only operate if the bucket control lever and the motion control lever on the transmitter are in the center position, and the parking brake switch is ON.

Remote Shutdown Switch (16) – Turn the knob clockwise and it will lift up to turn on the transmitter and power up the remote control system. Push the knob in to turn off the transmitter.

Note: When the transmitter is first switched on, the receiver will not operate unless all transmitter switches (except the lights) are turned off and the parking brake switch is in the ON position.

Note: The remote shutdown switch can be used to stop the machine in an emergency. If the remote shutdown switch is pressed while the machine is operating on remote control, the machine brakes will apply, the transmission will select neutral, and the engine will shutdown.

Engine Stop Switch (17) – Press the spring return switch up to shut the engine off.

Engine Pre-heat/Override Switch (18) – Not used.

Park Brake Switch (19) – Push the switch up to engage the parking brake. No moving functions will operate when the park brake switch is in the ON position.

Note: The park brake switch is also the reset switch for the remote control receiver. When the receiver is locked out either by an emergency stop, loss of signal, tilt switch activated or initial power up, the park brake switch must be moved to the ON position.

Raise RPM Switch (20) – Press and hold this switch to activate the full throttle function. The engine speed should increase to the maximum rpm.

Tilt Switch – The remote control transmitter is fitted with a tilt switch. This switch prevents the operation of the remote control system if the transmitter is tilted past approximately 45 degrees in any direction. If the tilt switch is activated while the machine is operating on remote control, a "forced shutdown" will occur.

Reference: For further information, refer to the Operation and Maintenance Manual, “Forced Shutdown of Machine (Remote Control)” for the machine that is being serviced.

i01931956

Before Operation (Remote Control)

SMCS Code: 7600-ZM

WARNING

A safe operating distance in accordance with mine practice must be maintained between the machine and the operator and transmitter.

Operating the machine within an unsafe distance can be dangerous and could result in severe injury or death.

Before using the machine on remote control do a walk around inspection. Check levels of oil and water and check for leaks and damage.

Operate the machine manually to ensure that all controls operate normally and the brakes operate effectively.

Always ensure no personnel are near the machine or in the area where the machine will be operating while it is on remote control.

Under no circumstances should any service work or testing and adjusting be carried out on the machine while the machine is operating on remote control.

1. Park the machine in a convenient and safe location to start remote control operation.

2. Move the transmission direction and speed control to the NEUTRAL position. Move the steering and transmission lock control to the locked position.

NOTICE
The transmission direction and speed control must be in the NEUTRAL position.

Failure to put the transmission direction and speed control in the NEUTRAL position may result in the start function being disabled.

3. Engage the parking brake.

4. Lower the bucket and move the hydraulic controls to the HOLD position.

5. Stop the engine.

Illustration 188 g01005100

6. Turn the engine start switch to the ON position.

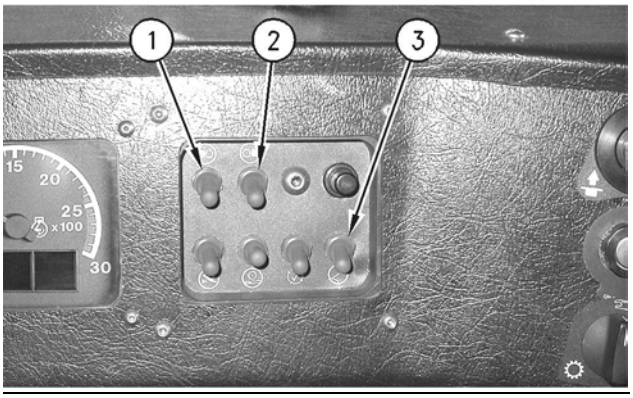


Illustration 189 g01005107

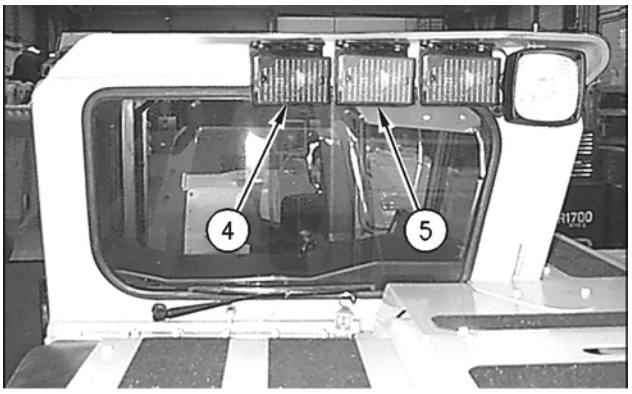


Illustration 190 g01005110

7. Move remote control switch (3) to the upper position to turn on the remote control system. Green light (4) (if equipped) on the operator station will light up and stay on while the remote control system is activated. Amber light (5) will light up and stay on until the brakes are released by the remote control system.

8. Move front light switch (1) and rear light switch (2) to the lower position to turn the front and rear lights off. Ensure the machine does not move. Leave the machine.

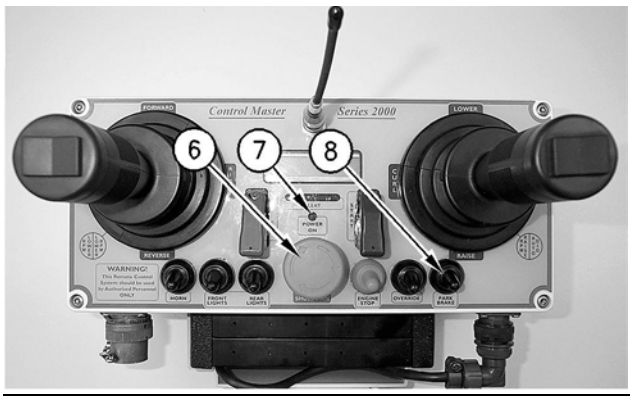


Illustration 191 g00901748

9. Position the remote control transmitter in a safe location, away from where the machine will be operating on remote control.

10. Connect a 12 volt battery or other 12V DC power source to the transmitter. Push parking brake switch (8) up to the ON position (parking brake engaged).

11. Turn clockwise and pull up on remote shutdown switch (6) to turn on the transmitter. LED indicator (7) will light up when the transmitter is turned on. The machine is now ready for remote control operation.

i02249829

Operation (Remote Control)

SMCS Code: 7600-ZM

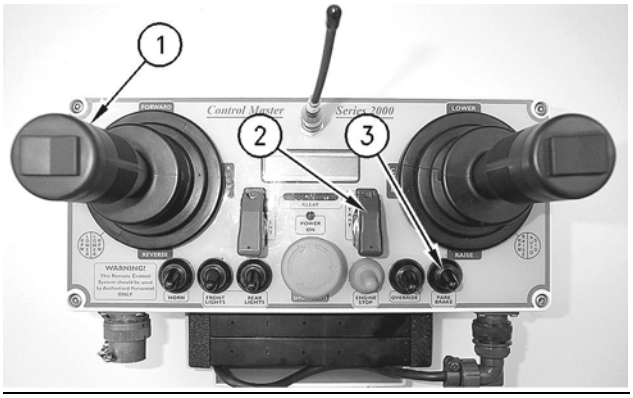


Illustration 192 g00901819

Check all remote control functions prior to operating or entering the work area with the machine. Should any function not operate correctly, have it repaired before resuming operation.

1. Lift protective cover (2). Push up and hold the engine start switch until the starter engages and starts the engine. Release the start switch when the engine starts.

NOTICE
Do not crank the engine continuously for more than 30 seconds. Allow the starting motor to cool for two minutes before cranking the engine again.

2. Disengage the parking brake by moving park brake switch (3) down to the OFF position.

3. Switch the lights ON if required and raise the bucket to the carry position, approximately 400 mm (15 inch) above the ground.

4. Direct System - Move motion control lever (1) to the desired direction and select either full throttle or part throttle to move the machine. The motion control lever has to be in either the FORWARD position or the REVERSE position and either part throttle or full throttle positions selected before the brakes will release. The brakes will apply when the motion control lever is returned to the center position. The lever will return to the center position when released.

   Proportional System - Move motion control lever (1) to the desired direction. The further the motion control lever is moved, the more the engine RPM will increase. The brakes will release when the motion control lever is moved from the center position. The brakes will apply when the motion control lever is returned to the center position. The lever will return to the center position when released.

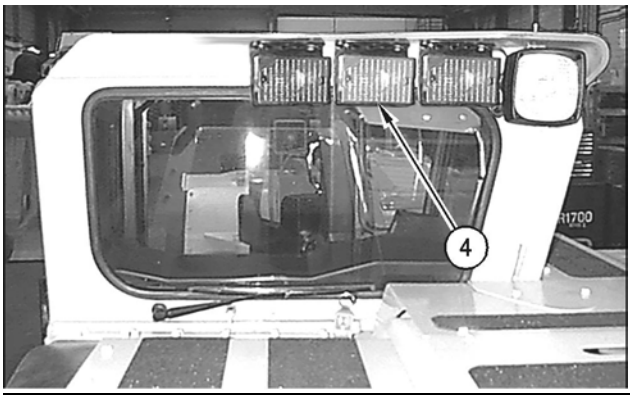


Illustration 193 g01005116

5. Amber light (4) on the operator station of the machine will go out when the brakes are released with the motion control lever.

NOTICE
Do not operate the machine if the amber light remains ON. This indicates the machine has either low brake oil pressure or the brakes are applied. Driving the machine with the brakes applied for an extended period can cause severe damage to the braking system.

6. The machine can now be operated on remote control from the transmitter.

Interlock Strategy

When operating the machine you must perform one of the following actions within 3 seconds or the parking brake will engage, the transmission will select neutral and the engine will stop.

- Maintain engine speed above 850 rpm
- Select either forward direction or reverse direction

When the machine is stopped you must perform one of the following actions within 3 seconds or the parking brake will engage, the transmission will select neutral and the engine will stop.

- Maintain engine speed above 850 rpm
- Engage the parking brake

i01931962

Parking (Remote Control)

SMCS Code: 7600-ZM

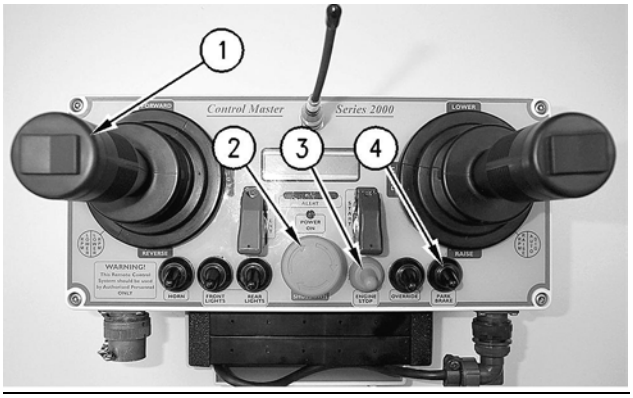


Illustration 194 g00901851

1. Release motion control lever (1) or move motion control lever (1) to the center position. When the motion control lever is in the center position, the brakes will apply. The amber light on the operator station should illuminate.

2. Engage the parking brake by pushing park brake switch (4) up to the ON position.

3. If the bucket is empty, lower the bucket to the ground.

4. If the bucket is loaded, fully tilt the bucket back and lower it to the carry position, approximately 400 mm (15 inch) above the ground.

NOTICE

Stopping the engine immediately after it has been working under load can result in overheating and accelerated wear of the engine components.

If the engine has been operating at high rpm and/or high loads, run at low idle for at least three minutes to reduce and stabilize internal engine temperature before stopping the engine.

Avoiding hot engine shutdowns will maximize turbocharger shaft and bearing life.

5. Push up engine stop switch (3) until the engine shuts down.

6. Push down remote shutdown switch (2) to turn off the transmitter. The machine can now be mounted.

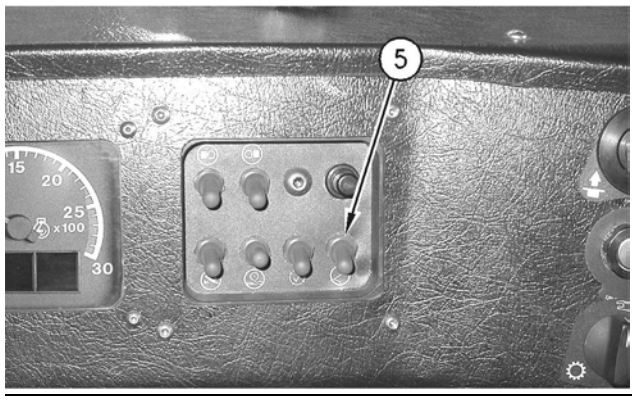


Illustration 195 g01005123

7. Push down remote control switch (5) to turn off the remote control system. The machine can now be operated manually.

NOTICE

If the machine is not going to be operated by remote control for an extended period of time, remove the receiver from the machine and store it in a dry, secure place. This will prevent accidental damage to the receiver.

i01778443

Emergency Stopping (Remote Control)

SMCS Code: 7600-ZM

There are three ways to stop the machine in an emergency:

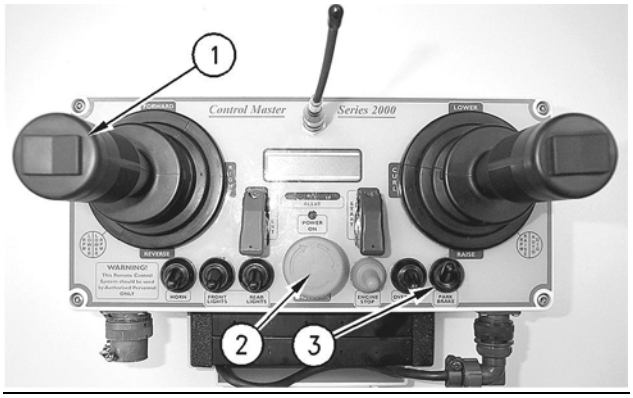


Illustration 196 g00909412

- Release spring centered motion control lever (1). This applies the brakes to stop the machine, leaving the engine running and the lights on.
- Push parking brake switch (3) up to the ON position (brakes engaged). The parking brake engages and the machine comes to a stop. The engine will remain running and the lights on.
- Depress remote shutdown switch (2) to turn off the transmitter. The radio signal to the receiver will cease causing the engine to shut down and the parking brake to engage.

NOTICE

Stopping the engine immediately after it has been working under load can result in overheating and accelerated wear of the engine components.

If the engine has been operating at high rpm and/or high loads, run at low idle for at least three minutes to reduce and stabilize internal engine temperature before stopping the engine.

Avoiding hot engine shutdowns will maximize turbocharger shaft and bearing life.

i02009352

Forced Shutdown of Machine (Remote Control)

SMCS Code: 7600-ZM

The remote control system has an inbuilt protection system to safeguard the machine against accidental damage. If the receiver loses communication with the transmitter, the transmitter tilt switch is activated, or a power loss or fault occurs to the transmitter, receiver, or remote control interface, the following forced shutdown will occur:

- The parking brake will be engaged.
- The transmission will select neutral.
- The engine will shutdown.

If a forced shutdown occurs, it may be possible to restore full operation of the remote control system at the transmitter by turning the parking brake ON (brakes engaged) and turning the remote shutdown switch and all other functions OFF. Power up the transmitter again and try the remote control functions.

If the machine cannot be re-started or remote control functions cannot be restored, perform the following:

- Turn off the remote control transmitter.
- Do not approach the machine or allow other personnel near the machine if it is in a stope or dangerous area.
- Immediately contact your supervisor and service personnel to arrange recovery of the machine.

⚠ WARNING

Personal injury or death can result from attempting repairs on a machine while it is in a stope or dangerous area.

The machine must be recovered by a machine operated by remote control and moved to a safe location for repairs.

Note: If the machine is equipped with a brake release system, this system can be used to release the brakes for towing. For more information, refer to the Operation and Maintenance Manual, “Brake Release (If Equipped)” for the machine that is being serviced.

Transportation Information

i01932037

Shipping the Machine

SMCS Code: 7000; 7500

Consult your Caterpillar dealer for shipping instructions for your machine.

Investigate the travel route for overpass clearances. Make sure that there is adequate clearance for the machine that is being transported.

Remove ice, snow, or other slippery material from the loading dock and from the transport machine before you load the machine. This will help to prevent slippage of the machine. This will also help to prevent a shift while the machine is moving in transit.

NOTICE

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

Make sure the cooling system has proper antifreeze if moving machine to a colder climate.

Observe all regulations governing wide loads.

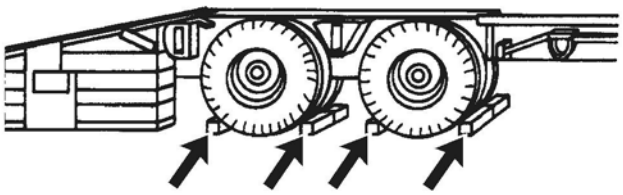


Illustration 197 g00901921

1. Block the trailer wheels or rail car wheels before you load the machine (trailer shown).
2. After the machine is positioned, install the steering frame lock in order to hold the front frame and the rear frame in place.
3. Lower the bucket or the attachment to the floor of the transport vehicle. Move the transmission direction and speed control to the NEUTRAL position.
4. Engage the parking brake.
5. Move the steering and transmission lock control to the LOCKED position.
6. Turn the engine start switch to the OFF position. Remove the engine start switch key.
7. Turn the battery disconnect switch to the OFF position. Remove the battery disconnect switch key.
8. Lock the door and the access covers. Attach any vandalism protection.
9. Secure the machine, any equipment and any tools with adequate tie-downs in order to prevent movement during shipping.
10. Cover the exhaust opening. The turbocharger should not rotate when the engine is not operating. Damage to the turbocharger can result.

i01762989

Roading the Machine

SMCS Code: 7000; 7500

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

Limitations for TON-kilometer per hour (TON-mile per hour) must be obeyed. Consult your tire dealer for the speed limit of the tires that are used.

When you travel for long distances, schedule stops in order to allow the tires and the components to cool. Stop for 30 minutes after every 40 km (25 miles) or after every hour.

Perform a Walk-Around Inspection and measure the fluid levels in each of the compartments.

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

Inflate the tires to the correct pressure.

Use a self-attaching inflation chuck in order to inflate the tire. Stand behind the tire tread while you inflate the tires.

Reference: For information on tire inflation, refer to the Operation and Maintenance Manual, “Tire Inflation Information” for the machine that is being serviced.

Check with the proper officials in order to obtain the required licenses and other similar items.

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

i02234206

Lifting and Tying Down the Machine

SMCS Code: 7000; 7500

NOTICE
Improper lifting or tie-downs can allow the load to shift and cause injury or damage. Install the steering frame lock link before lifting.

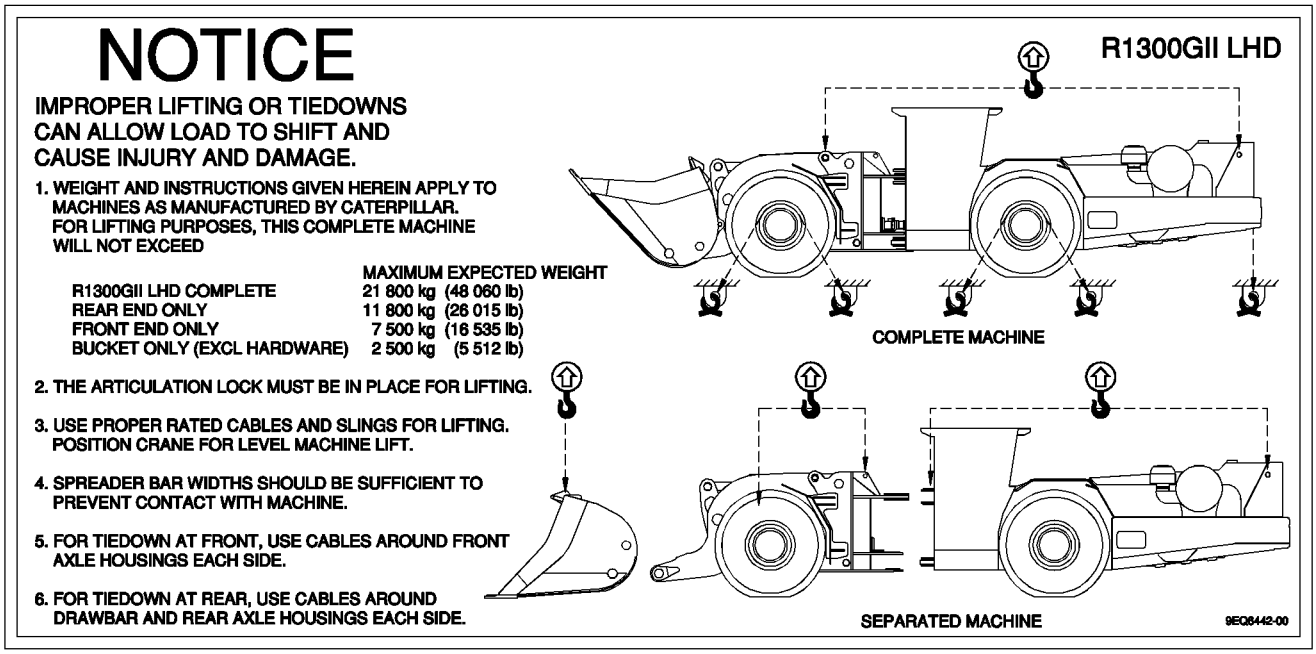


Illustration 198 g01165108

Proper lifting points are marked on the machine by this decal.

Proper tie-down points are marked on the machine by this decal.

Reference: Refer to the Operation and Maintenance Manual, “Model Views and Specifications” for the dimensions of the machines.

Use proper rated cables and proper rated slings for lifting the machine. Position the crane in order to lift the machine in a level plane.

The spreader bar widths must be sufficient in order to prevent contact with the machine.

Install tie-downs at several locations. Place blocks in front of the wheels and behind the wheels.

Obey the appropriate laws that govern the dimensions of the load (weight, width, and length).

Consult your Caterpillar dealer for shipping instructions for your machine.

Towing Information

i01931622

Towing the Machine

SMCS Code: 7000

⚠ 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.

In order to properly perform the towing procedure, use the following recommendations.

This machine is equipped with spring applied parking brakes that are released by oil pressure. If the engine is inoperable or if the brake oil system is inoperable, the parking brakes are engaged. The machine can not be moved.

The parking brake can be disengaged manually in the event of insufficient oil pressure in the system.

Reference: For additional information, refer to the Operation and Maintenance Manual, “Parking Brake Manual Release” for the machine that is being serviced.

Use these towing instructions for moving a disabled machine over a short distance. Do not move the machine faster than 2 km/h (1.2 mph). Move the machine to a convenient location for repair. Use these instructions for emergency situations only. Always haul the machine if long distance moving is required.

Shielding must be provided on both machines in order to protect the operator in case the tow line breaks or the tow bar breaks.

Do not allow riders on a machine that is being towed unless the operator can control the steering and/or the braking.

Before you tow the machine, inspect the condition the tow line or of the tow bar. Make sure that the tow line or the tow bar is sturdy enough to tow the disabled machine. The tow line or the tow bar must have a strength that is equal to 1.5 times the gross weight of the machine that is being towed. Use a tow bar with this strength or a tow line with this strength to tow a disabled machine that is stuck in the mud. Also, use a tow bar with this strength or a tow line with this strength to tow a disabled machine up a grade.

Do not use a chain for pulling. A chain link may break. This can cause personal injury. Use a wire rope cable with cable loops or end rings. Position an observer at a safe location. The observer should stop the pulling procedure if the cable starts to break or the cable starts to unravel. If the towing machine moves without the pulled machine, stop the pulling procedure.

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

Quick machine movement could overload the tow line or the tow bar. This could cause the tow line or the tow bar to break. Gradual, smooth machine movement will be more effective.

Normally, the towing machine should be as large as the disabled machine. The towing machine must have enough brake capacity, enough weight, and enough power for the grade that is involved and for the distance that is involved.

It may be necessary to connect a larger machine or additional machines to the disabled machine in order to provide sufficient control and sufficient braking. This will prevent the disabled machine from rolling away out of control on a downgrade.

The requirements for all different situations cannot be specified. Minimal towing machine capacity is required on smooth, level surfaces. Maximum towing machine capacity is required on inclines or on poor surface conditions.

If possible, dump the load before attempting to tow the machine. Any towed machine with a load must be equipped with a braking system that can be operated from the operator’s station.

Consult your Caterpillar dealer for additional details about towing a disabled machine.

Towing with an Operable Engine

If the engine is running, the machine can be towed for a short distance under certain conditions. The power train and steering system must be operable. Tow the machine for a short distance only. For example, pull the machine out of mud or pull the machine to the side of the road.

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

Carefully obey all of the instructions that are outlined in this topic.

Towing with an Inoperable Engine

NOTICE
Certain Caterpillar machines may be equipped with an optional secondary steering system.

The secondary steering system provides emergency steering only while the machine is in motion.

The secondary steering system can only be used to safely steer the machine while it is being towed.

Perform the following steps before you tow the machine.

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

   Reference: For information on removing the axle shafts, refer to the Power Train, Disassembly and Assembly, “Axle Shafts - Remove” for the machine that is being serviced.

⚠ WARNING

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

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.

3. If possible, dump the bucket load.
4. Fasten the tow bar.
5. Manually release the parking brake.

   Reference: For information about the manual release of the parking brake, refer to the Operation and Maintenance Manual, “Parking Brake Manual Release” for the machine that is being serviced.

NOTICE
Release the parking brake to prevent excessive wear and damage to the parking brake system when towing the machine.

6. Remove the wheel blocks. Tow the machine slowly. Do not exceed 2 km/h (1.2 mph).

⚠ WARNING

Personal injury or death can occur from a brake malfunction.

Make 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.

i03322314

Parking Brake Manual Release

SMCS Code: 4267; 7000

⚠ WARNING

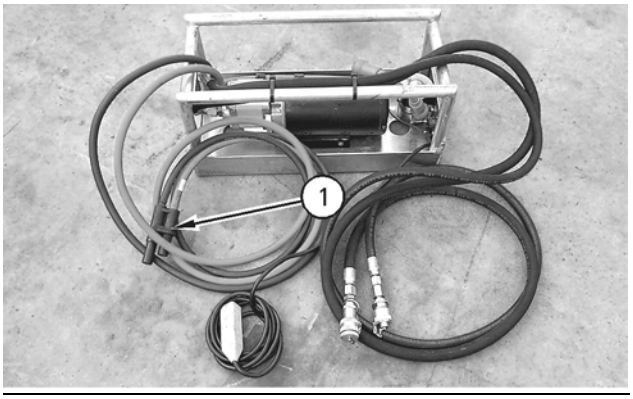
Personal injury or death can result from a brake malfunction. Do not operate the machine if the brake was applied due to a malfunction of the oil system or the brake.

Correct any problem before attempting to operate the machine.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.



g00943687

Illustration 199
212-6102 Portable Hydraulic Pump

1. Connect plug (1) of the 212-6102 Portable Hydraulic Pump to the machine's 24 volt DC power supply.

Note: The machine batteries must be fully charged for the operation of the portable hydraulic pump. If battery charge is low, connect to an external 24 volt DC power supply.

2. Turn the battery disconnect switch to the ON position.

3. Turn the engine start switch to the ON position.

4. Depress the service brake pedal at least 80 times to release the oil pressure from the brake hydraulic system.

5. Move the joystick control lever several times through the full range of travel to release any pressure in the implement pilot circuits.

6. Move the STIC steering control several times in both directions to release any pressure in the steering hydraulic system.

7. Press and hold the breaker relief valve to release any pressure in the hydraulic tank.

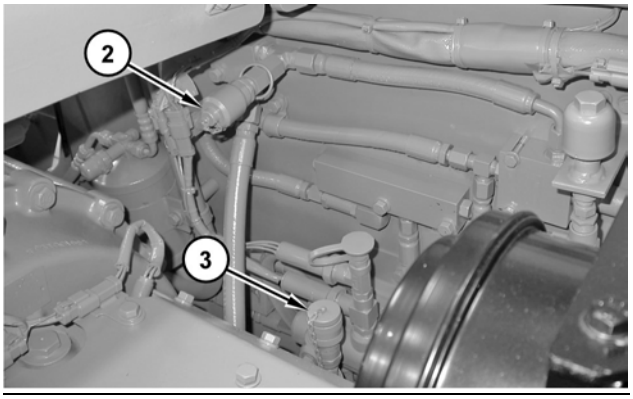


Illustration 200 g01244523

8. Remove the caps from quick connect couplers (2) and (3). Connect the hydraulic hoses from the portable hydraulic pump to quick connect couplers (2) and (3).

9. Connect a 4C-8195 Control Service Tool and a 257-8717 Cable Adapter to the service tool port.

   Reference: For information on using the 4C-8195 Control Service Tool, refer to the Service Manual, "Caterpillar Monitoring System" for the machine that is being serviced.

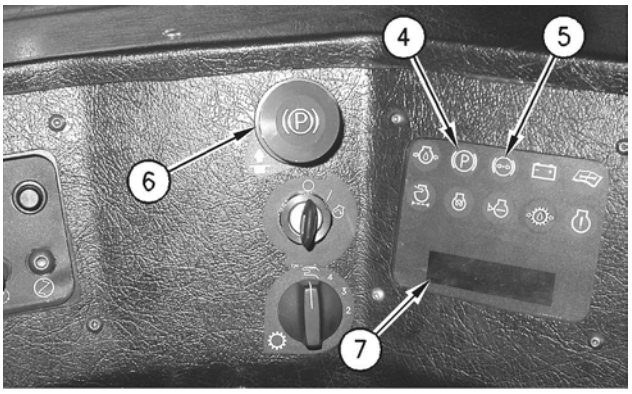


Illustration 201 g01004871

10. Use the control service tool to access Mode 6.0 (Transmission Pressure Override) on the Caterpillar Monitoring System display window (7). The default display window reading is "PO-OFF".

11. Operate the clear switch on the control service tool to change the display window reading to "PO-ON".

Note: Leave the Caterpillar Monitoring System in Mode 6.0 until the procedure has been completed. Changing to another mode will cause the Caterpillar Monitoring System to revert to the default setting and the parking brake will not disengage.

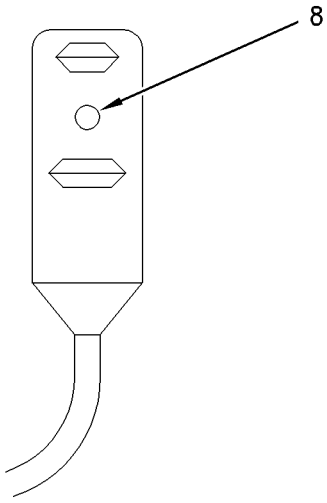


Illustration 202 g00943691

12. Position switch (8) (from the portable hydraulic pump) inside the operator station.

13. Press and hold switch (8) in the ON position to activate the portable hydraulic pump. Brake accumulator oil pressure indicator (5) will go out when the braking system has full oil pressure.

Note: Operation of the switch should only take place from inside the operator station. Observe brake indicators and gauges (if equipped) while operating the portable hydraulic pump.

14. When the braking system has full oil pressure, move parking brake control (6) to the OFF position to disengage the parking brake. Hold switch (8) in the ON position until parking brake indicator (4) on the Caterpillar Monitoring System panel goes out. The parking brake is now disengaged.

Note: The service brakes can be used to stop the machine when the machine has brake oil pressure. Use the service brakes to control the machine when the machine is being towed.

Note: Using the service brakes will cause the braking system oil pressure to decrease. If brake accumulator oil pressure indicator (5) comes on, operate the portable hydraulic pump to increase the braking system pressure. Ensure that the braking system pressure is maintained for the duration of the towing.

NOTICE
Operating the portable hydraulic pump for extended periods of time may cause overheating and possible damage of the electric motor. If overheating is observed, stop operating the portable hydraulic pump and allow it time to cool before towing is continued.

Note: For the removal of the portable hydraulic pump from the machine, refer to Step 15 through Step 18.

Note: Turning the engine start switch to the OFF position will change the Caterpillar Monitoring System Mode 6.0 to the default setting.

15. Turn the engine start switch to the OFF position.

16. Repeat Step 3 through Step 7.

17. Disconnect and remove the portable hydraulic pump from the machine.

18. Install the caps on the quick connect couplers.

i02007659

Brake Release (If Equipped)

SMCS Code: 4267

Certain Caterpillar machines fitted with remote controls may be equipped with an optional brake release system. The brake release system is used to recover a machine from a stope or dangerous area.

If the parking brake is engaged due to a machine fault, or if the machine becomes partially buried in a rock fall, the brake release system can be used to disengage the parking brake to enable the machine to be towed.

If the recovery machine is equipped with a recovery bar, the recovery bar can be used to activate the brake release system. If the disabled machine is equipped with a recovery hook, the recovery hook can be used to activate the brake release system.

The machine may be equipped with the optional steering release system. The steering release system is activated when the brake release system is activated. When the steering release system is activated the oil in the rod end and the head end of the steering cylinder is open to the hydraulic tank. The machine will articulate freely.

Brake Release with the Recovery Bar

⚠ WARNING

If the disabled machine is in a stope or dangerous area, the recovery machine must be operated by remote control.

The brake release system must only be activated by a recovery bar securely attached to the recovery machine. The recovery bar must be securely attached to the hitch of the disabled machine prior to activating the brake release system. Failure to securely attach the recovery bar may result in the disabled machine moving. Uncontrolled movement of the disabled machine can cause serious personal injury or death.

When the disabled machine has been towed to a safe place, ensure that the machine is parked on level ground and the wheels are blocked securely. Be sure that the machine can not move before performing any service work on the machine.

Ensure that the disabled machine cannot move before disconnecting the recovery bar.

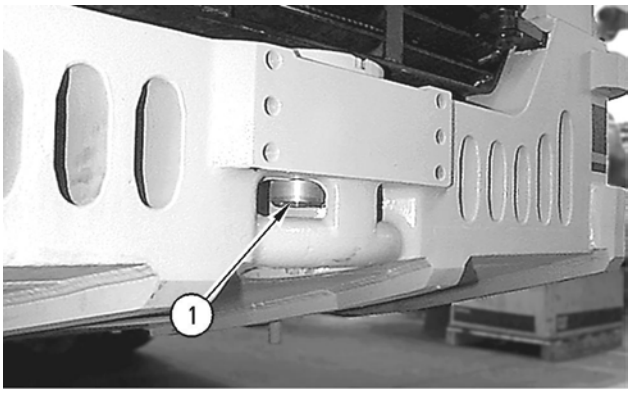


Illustration 203 g00901945

The brake release system is activated by a recovery bar attached to a recovery machine. The recovery bar depresses piston (1). When the piston is depressed, the parking brake will be disengaged.

Perform the following steps to activate the brake release system and to recover a disabled machine.

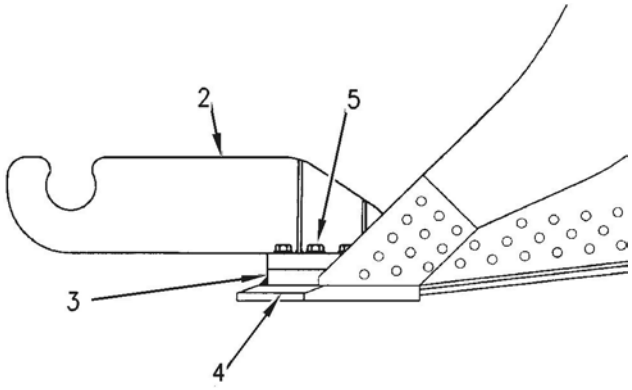


Illustration 204 g00901998

Attachment of recovery bar to bucket

(2) Recovery bar
(3) Weld-on adapter plate
(4) Bucket lower lip
(5) Bolts

1. Attach recovery bar (2) to the bucket of the recovery machine, as shown in the above illustration.

Note: Some types of bucket hardware allow direct bolt-on fastening of the recovery bar to the bucket. For more information on attaching the recovery bar to the bucket, contact your Caterpillar dealer.

2. Position the recovery machine at the rear of the disabled machine.

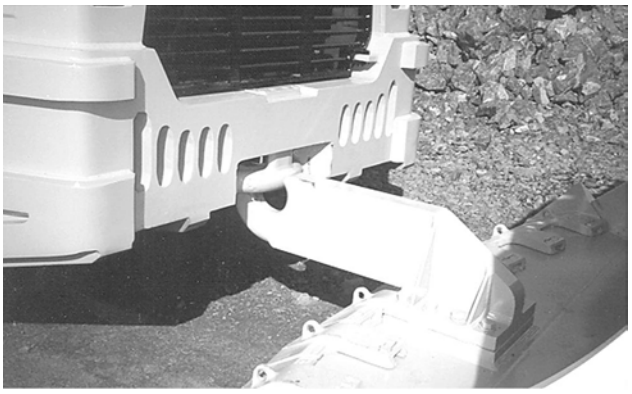


Illustration 205 g00902000

3. Guide the recovery bar into the hitch of the disabled machine.

4. Lift and tilt back the bucket on the recovery machine until the recovery bar depresses the piston of the brake release cylinder. The parking brake on the disabled machine will be disengaged when the piston is fully depressed.

⚠ WARNING

Once the brake release system is activated, the machines can roll freely.

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

Ensure that the recovery machine is securely attached to the hitch with the brakes applied to prevent the machines from rolling unexpectedly. Keep all personnel clear of the disabled machine until it has been towed to a safe place and the wheels securely blocked.

Illustration 206 g00902004

5. Use the recovery machine to tow the disabled machine to a safe place. Follow all the precautionary steps outlined under the "Towing Information" section of this manual.

6. Block the wheels of the disabled machine prior to disconnecting the recovery machine and performing any service work.

Brake Release with the Recovery Hook

⚠ WARNING

If the disabled machine is in a stope or dangerous area, the recovery machine must be operated by remote control.

The brake release system must only be activated by a tow line securely attached to the recovery machine. The tow line must be securely attached to the recovery hook of the disabled machine prior to activating the brake release system. Failure to securely attach the tow line may result in the disabled machine moving. Uncontrolled movement of the disabled machine can cause serious personal injury or death.

When the disabled machine has been towed to a safe place, ensure that the machine is parked on level ground and the wheels are blocked securely. Be sure that the machine can not move before performing any service work on the machine.

⚠ WARNING

Do not use this recovery device for towing other machines or equipment. Use of this hook may disengage the parking/secondary brake.

Personal injury or death from crushing could result.

Marked tow devices should be used to tow other machines or equipment.

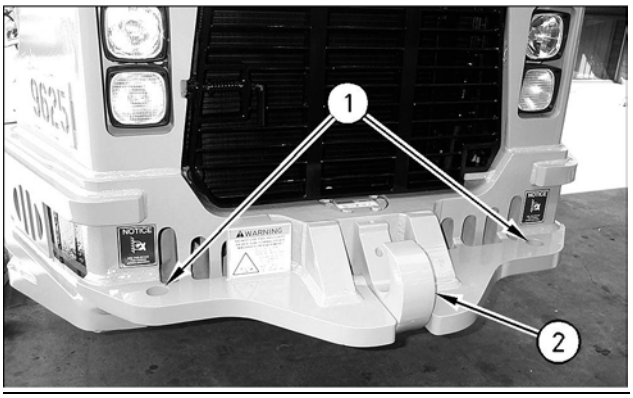


Illustration 207 g01004861

Note: When towing other machines, attachments or equipment, only use towing points (1) at the rear of the machine.

Note: The recovery hook brake release system will only operate when the engine is stopped.

The brake release system is activated by a pulling force applied to recovery hook (2). When the pulling force is applied, the recovery hook will pivot and depress the piston of the brake release cylinder. When the piston is depressed, the parking brake will be disengaged.

Perform the following steps to activate the brake release system and to recover a disabled machine.

1. Position the recovery machine at the rear of the disabled machine.

2. Attach a tow line between the towing point of the recovery machine and recovery hook (2) of the disabled machine.

⚠ WARNING

Once the towing brake release system is activated, the machine can roll freely.

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

Keep all personnel clear of the disabled machine until it has been towed to a safe place and the wheels securely blocked.

3. Use the recovery machine to exert a smooth, gradual pulling force on the recovery hook. The recovery hook will pivot and depress the piston of the brake release system. The parking brake on the disabled machine will be disengaged when the piston is fully depressed.

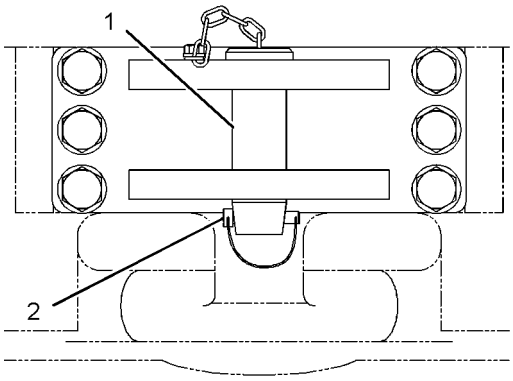
4. Use the recovery machine to tow the disabled machine to a safe place. Follow all the precautionary steps outlined under the "Towing Information" section of this manual.

5. Block the wheels of the disabled machine prior to disconnecting the recovery machine and performing any service work.

i02861079

Recovery Drawbar (If Equipped)

SMCS Code: 7105



g01425058

Illustration 208

(1) Drawbar pin
(2) Retainer pin

The recovery drawbar is located at the rear of the machine.

The recovery drawbar is for retrieval purposes only, when the machine is mired or disabled.

1. Use the recovery machine to tow the mired or disabled machine to a safe place.

Reference: For information on towing the machine, refer to, Operation and Maintenance Manual, “Towing the Machine” for the correct procedure.

Adjustments

i01932553

Lift Arm Positioner

SMCS Code: 5112

⚠ WARNING

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

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

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

Keep unauthorized personnel off the machine.

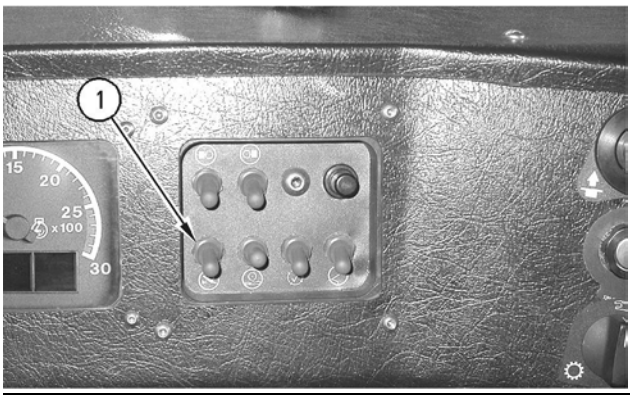


Illustration 209 g01000381

1. Move lift arm positioner switch (1) to the ON position.

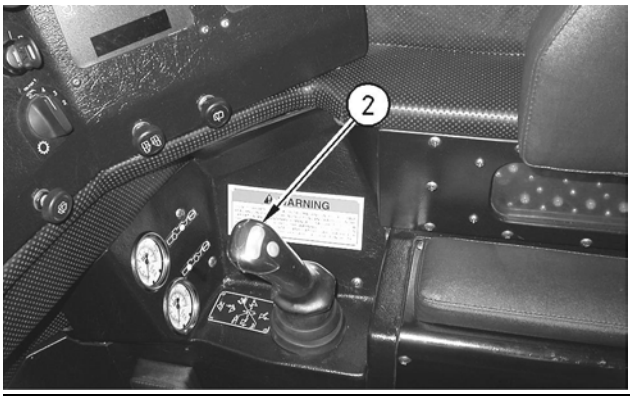


Illustration 210 g01004890

2. With the engine running, move joystick control lever (2) to the TILT BACK position until the bucket is fully tilted back.

3. Raise the lift arm to the full height. Move the joystick control lever to the FLOAT position to lower the lift arm. The lift arm positioner should bring the lift arm to a controlled stop at the correct height for digging.

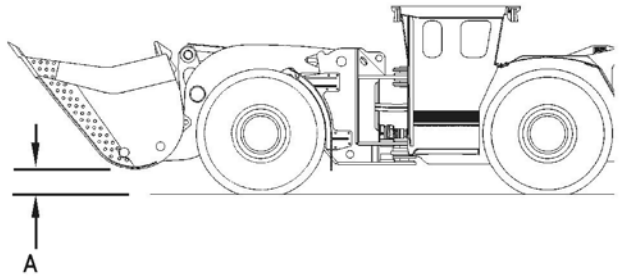


Illustration 211 g00947049

4. Illustration 211 shows the correct height the bucket should be above the ground. Refer to Table 4 for Dimension (A).

Table 4

Dimension	Bucket	Ejector Bucket
Dimension (A)	220 ± 25 mm (8.7 ± 1.0 inch)	300 ± 25 mm (11.8 ± 1.0 inch)

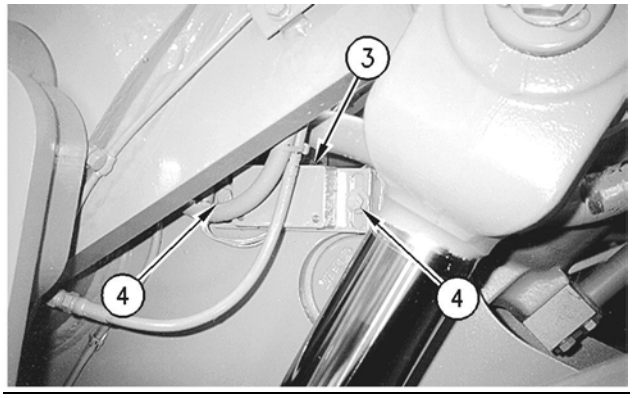


Illustration 212 g00947050

5. If the height of the bucket exceeds the upper limit of Dimension (A), adjust magnetic switch (3) downwards. If the height of the bucket exceeds the lower limit of Dimension (A), adjust magnetic switch (3) upwards.

6. To adjust magnetic switch (3), loosen two bolts (4) that fasten the switch to the frame and move the switch to the desired position. Tighten two bolts (4).

7. Repeat Steps 3 through 6 until Dimension (A) is correct.

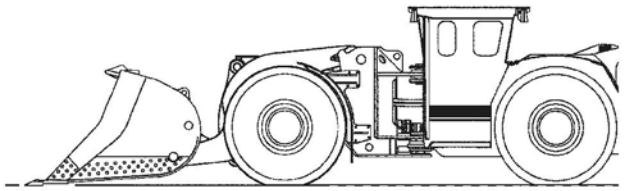


Illustration 213 g00947053

8. To check the final bucket height, repeat Step 3. Tilt the bucket forward until the cutting edge of the bucket touches the ground. The bucket should be in the digging position, as shown in Illustration 213. A final adjustment may be necessary to obtain the correct digging position.

9. Finally, tighten two bolts (4) to a torque of 47 ± 9 N·m (35 ± 7 lb ft).

Maintenance Section

Tire Inflation Information

i01763544

Tire Inflation with Nitrogen

SMCS Code: 4203-PX; 7500

Caterpillar recomends the use of dry nitrogen gas for tire inflation and for tire pressure adjustments. This includes all machines with rubber tires. Nitrogen is an inert gas that will not aid 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 personal injury or death can occur.

A tire blowout and/or rim failure can occur if the inflation equipment is not used correctly, due to the fact that a fully charged nitrogen cylinder's pressure is approximately 15000 kPa (2200 psi).

There are other benefits to using nitrogen in addition to reducing the risk of an explosion. The use of nitrogen for tire inflation lessens the slow oxidation of the rubber. Use of nitrogen also slows gradual tire deterioration. This is especially important for tires that are expected to have a long service life of at least four years. Nitrogen reduces the corrosion of rim components. Nitrogen also reduces problems that result from disassembly.

⚠ WARNING

A tire blowout or a rim failure can cause personal injury.

Use a self-attaching inflation chuck and stand behind the tread when inflating a tire, to prevent personal injury.

Note: Do not set the tire inflation equipment regulator higher than 140 kPa (20 psi) over the recommended tire pressure.

Use 6V-4040 Inflation Group or an equivalent inflation group to inflate tires with a nitrogen gas cylinder. Refer to Special Instruction, SMHS7867 for tire inflation instructions.

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

i02234199

Tire Shipping Pressure

SMCS Code: 4203-PX; 7500

The following table contains the cold tire shipping pressures.

Table 5

R1300GII Load Haul Dump			
Tire Size	Ply Rating or Strength Index	Shipping Pressure	
		Front	Rear
17.5-25	20	690 kPa (100 psi)	585 kPa (85 psi)
17.5-R25	Two Star	690 kPa (100 psi)	585 kPa (85 psi)

Note: The "R" in the tire size signifies radial construction.

The tire inflation pressure is based on the weight of a ready-to-work machine without attachments, at rated payload, and in average operating conditions. The tire pressures for each application may vary. Always obtain the proper pressures from your tire supplier.

i01763687

Tire Inflation Pressure Adjustment

SMCS Code: 4203-025-PX; 7500

The tire pressure in a warm shop area 18° to 21°C (65° to 70°F) will significantly change when you move the machine into freezing temperatures. If you inflate the tire to the correct pressure in a warm shop, the tire will be underinflated in freezing temperatures. Low pressure shortens the life of a tire.

Reference: When you operate the machine in freezing temperatures, refer to Operation and Maintenance Manual, SEBU5898, "Cold Weather Recommendations" in order to adjust tire inflation pressures.

Lubricant Viscosities and Refill Capacities

i02234207

Lubricant Viscosities

SMCS Code: 1000; 7000; 7581

The oil viscosities shown in **bold type** in the following table are the standard oils used in Caterpillar R1300GII machines. If the ambient temperatures you operate in do not fall within the standard oil temperature range, choose an oil that meets the required ambient temperature range.

Table 6

Lubricant Viscosities for Ambient Temperatures[1]						
Compartment or System	**Oil Type and Classification**	**Oil Viscosities**	**°C**		**°F**	
			Min	**Max**	**Min**	**Max**
Engine Crankcase	**Caterpillar Multigrade DEO EMA LRG-1 API CH-4**	SAE 0W20	−40	+10	−40	+50
		SAE 0W30	−40	+30	−40	+86
		SAE 0W40	−40	+40	−40	+104
		SAE 5W30	−30	+30	−22	+86
		SAE 5W40	−30	+40	−22	+104
		SAE 10W30	−20	+40	−4	+104
		SAE 15W40	**−10**	**+50**	**+14**	**+122**
Power Shift Transmission	**Caterpillar TDTO Commercial TO-4 Caterpillar TDTO-TMS**	SAE 0W20 [2]	−40	+10	−40	+50
		SAE 0W30 [2]	−40	+10	−40	+50
		SAE 5W30 [2]	−30	+20	−22	+68
		SAE 10W	−20	+10	−4	+50
		SAE 30	**0**	**+35**	**+32**	**+95**
		SAE 50	+10	+50	+50	+122
		TDTO-TMS [3]	−10	+43	+14	+110
Hydraulic Systems	**Caterpillar Biodegradable Hydraulic Oil (HEES) Caterpillar HYDO Caterpillar DEO Caterpillar TDTO Caterpillar MTO API CG-4 API CF-4 API CF Commercial TO-4 Caterpillar TO-4M Caterpillar TDTO-TMS API CH-4 Commercial BF-1[4] Global DHD-1**	SAE 0W20 [2]	−40	+40	−40	+104
		SAE 0W30 [2]	−40	+40	−40	+104
		SAE 5W30 [2]	−30	+40	−22	+104
		SAE 5W40	−30	+40	−22	+104
		SAE 10W	**−20**	**+40**	**−4**	**+104**
		SAE 30	+10	+50	+50	+122
		SAE 10W30	−20	+40	−4	+104
		SAE 15W40	−15	+50	+5	+122
		Caterpillar MTO	−25	+40	−13	+104
		Cat Biodegradable Hydraulic Oil (HEES) [4]	−40	+43	−40	+110
		TDTO-TMS [3]	−20	+50	-4	+122
Drive Axles	**Caterpillar TDTO Commercial TO-4 Caterpillar TDTO-TMS**	SAE 30	−20	+20	−4	+68
		SAE 50	**−10**	**+43**	**+14**	**+110**
		SAE 60	−5	+50	+23	+122
		TDTO-TMS [3]	−25	+22	−13	+72

[1] When you are operating the machine in temperatures below −20°C (−4°F), refer to Operation and Maintenance Manual, SEBU5898, “Cold Weather Recommendations”. This is available from your Caterpillar dealer.

[2] First Choice: Oils of full synthetic base stock without viscosity index improvers that meet the performance requirements of the TO-4 specification for the SAE 30 viscosity grade. Typical lubricant viscosity grades are SAE 0W-20, SAE 0W-30, and SAE 5W-30. Second Choice: Oils that contain a TO-4 additive package and a lubricant viscosity grade of SAE 0W-20, SAE 0W-30, or SAE 5W-30.

[3] TDTO-TMS Transmission Multi-Season (exceeds the TO-4/TO-4M multigrade specification requirements).

[4] Commercial Biodegradable Hydraulic Oil (HEES) must meet the Caterpillar BF-1 specification. The listed ambient temperature range is for the current Caterpillar Biodegradable Hydraulic Oil (HEES), not for commercial BF-1 oil.

i02234209

Capacities (Refill)

SMCS Code: 7560

Table 7

Approximate Refill Capacities			
Compartment or System	**Liters**	**US Gallons**	**Imperial Gallons**
Engine Crankcase	15.5	4.1	3.4
Transmission	56	14.8	12.3
Hydraulic Tank	88	23.2	19.3
Cooling System	43.9	11.6	9.7
Front Differential and Final Drives	38	10	8.3
Rear Differential and Final Drives	42	11.1	9.2
Fuel Tank	307	81.1	67.5

Maintenance Locations

i02234107

Filter and Screen Locations

SMCS Code: 1000; 1050; 3000; 4000; 4250; 4300; 5050; 7000

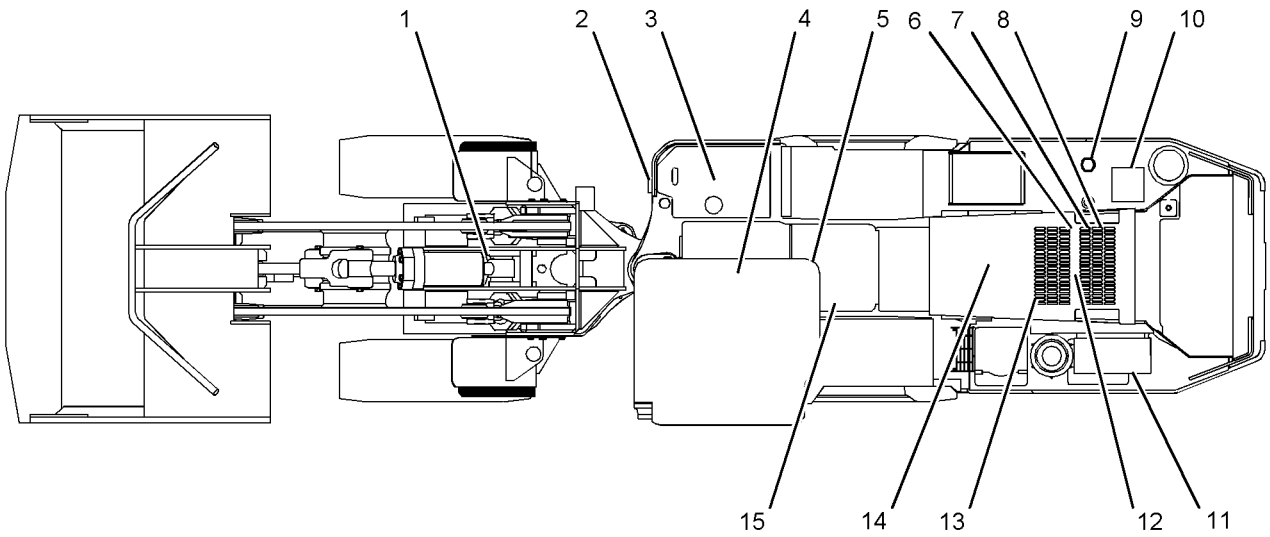


Illustration 214 g01126543

(1) Front axle breather
(2) Hydraulic system oil filler screen
(3) Hydraulic system oil filters
(4) Cab return air filter
(5) Cab pressurizer filter
(6) Engine oil filter
(7) Primary fuel filter
(8) Secondary fuel filter
(9) Fuel tank filler screen
(10) Automatic lubrication system filters (if equipped)
(11) Engine air filters
(12) Engine crankcase breather
(13) Transmission oil filter
(14) Transmission magnetic screen
(15) Rear axle breather

i02490740

Sampling Interval and Location of Sampling Valve

SMCS Code: 1000; 1318; 1348; 3080; 4070; 4250; 4300; 5050; 7000; 7542

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Take the oil samples as close as possible to the standard intervals. To receive the full value from the S·O·S oil analysis, you must establish a consistent trend of data. To establish a pertinent history of data, perform consistent oil samplings at set intervals.

Operate the machine for a few minutes before you obtain the oil sample. This will thoroughly mix the oil for a more accurate sample.

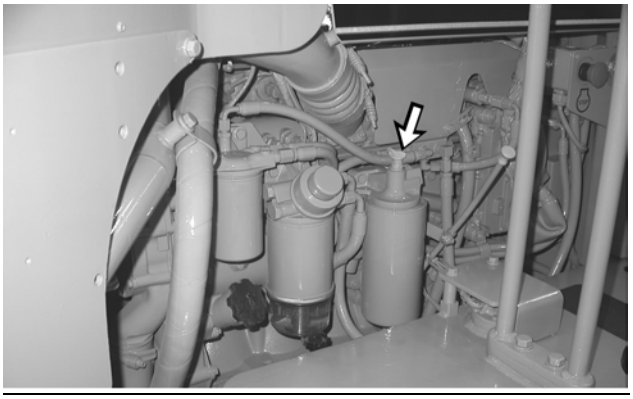
Reference: Refer to Special Publication, PEHP6001, “How to Take a Good Oil Sample” for more information about obtaining an oil sample.

Table 8

Type of Fluid	Change Interval	Sampling Interval	Sampling Valve
Engine Oil	500 Hours	250 Hours	Yes
Transmission Oil	1000 Hours	500 Hours	Yes
Hydraulic Oil	2000 Hours	500 Hours	Yes
Differential and Final Drive Oil	1000 Hours	500 Hours	No
Coolant	6000 Hours	500 Hours	No

Consult your Caterpillar dealer for complete information and for assistance in establishing a S·O·S program for your equipment.

Location of Sampling Valves

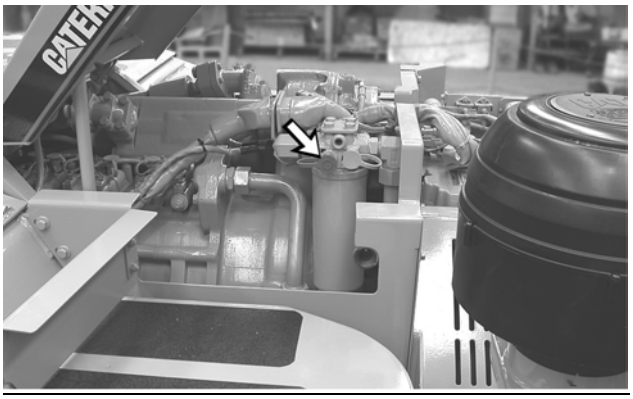


g01130244

Illustration 215

Sampling valve for the engine oil

The sampling valve for the engine oil is located on the left side of the engine.

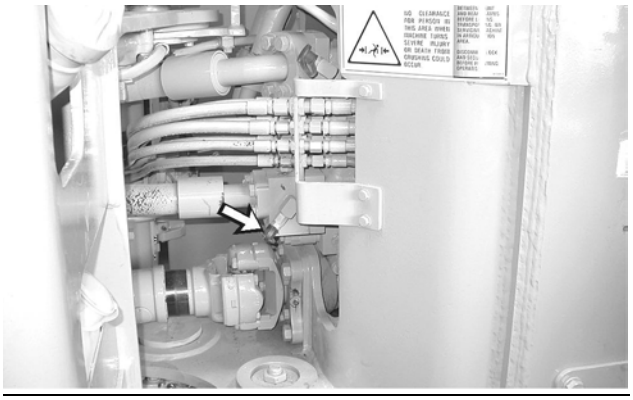


g01132799

Illustration 216

Sampling valve for the transmission and torque converter oil

The sampling valve for the transmission and torque converter oil is located on the left side of the engine.

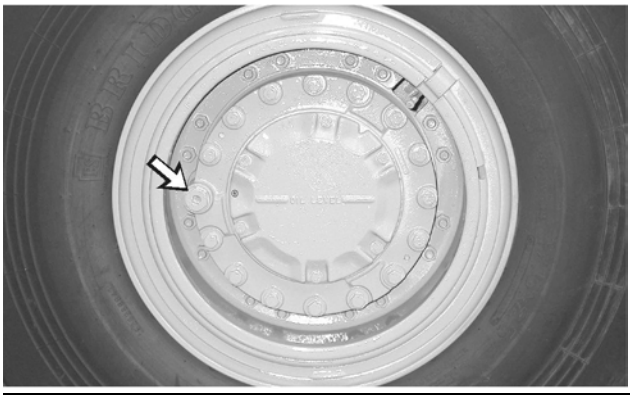


g01005841

Illustration 217

Sampling valve for the hydraulic system oil

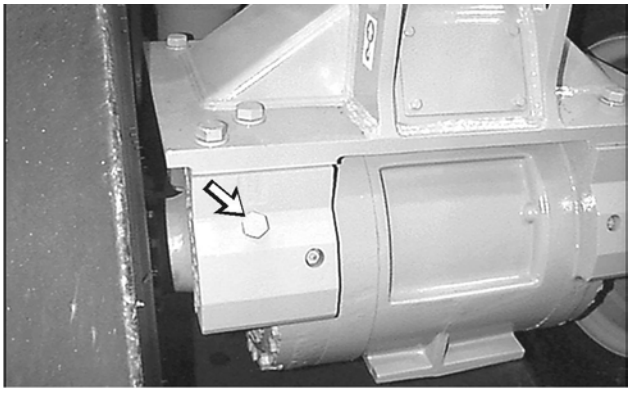
The sampling valve for the hydraulic system oil is located on a manifold near the articulation hitch.



g00996592

Illustration 218

Sampling port for the final drive oil



g00996598

Illustration 219

Sampling port for the front differential oil

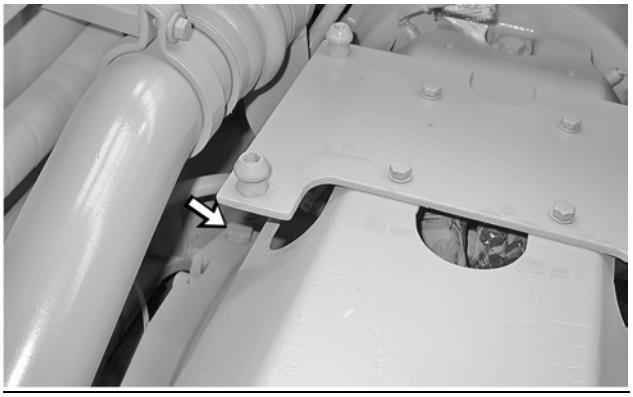


Illustration 220 g01132804

Sampling port for the rear differential oil

The axles are not equipped with sampling valves. Obtaining a sample of the differential and final drive oils will require a vacuum pump or an equivalent. Withdraw the oil through the filler opening on each axle and final drive.

Illustration 221 g01244484

The cooling system is not equipped with a sampling valve. Obtaining a sample of the coolant will require a vacuum pump or an equivalent. Slowly remove the cooling system pressure cap on top of the radiator and withdraw the coolant through the filler opening.

More Frequent S·O·S Sampling Improves Life Cycle Management

Traditionally, the suggested S·O·S sampling intervals have been at each oil change (250 hours for engines and every 500 hours for all other compartments). However, more frequent oil sampling is recommended in severe applications. If the machine is operated under a high load and/or in high temperature conditions, sample all compartments at every 250 hour interval.

Application

Studies have revealed that obtaining oil samples at every 500 hours is too long a time interval in some applications in order to predict potential failure modes. A sampling interval at every 250 hours provides more data between oil change intervals. More data increases the chance for detecting a potential failure.

Determining Optimal Oil Change Intervals

Sampling the compartments at every 250 hours provides information for oil condition and for oil performance. This information is used to determine the optimum usable life of a particular oil. Also, more points of data will allow closer monitoring of component wear rates. Close monitoring also allows you to obtain the maximum use of the oil. For detailed information about extending oil change intervals, please consult your Caterpillar dealer.

Optimizing Component Life Cycle

An increase in the number of oil samples provides a better definition of the trends in data between oil change intervals. More oil samples will allow you to closely monitor wear patterns of components. This action will ensure that the full life of the components are achieved.

The standard interval that is used between S·O·S oil samples is 250 hours for all Caterpillar engines. While 500 hour oil sample intervals remain acceptable for non-engine compartments, these intervals are not necessarily optimum. If the machine is operated under a high load and/or high temperature condition, sample all compartments at the 250 hour interval.

i02903833

Maintenance Interval Schedule

SMCS Code: 1000; 7000

Ensure that all safety information, warnings and instructions are read and understood before any operation or any maintenance procedures are performed.

The user is responsible for the performance of maintenance, including all adjustments, the use of proper lubricants, fluids, filters, and the replacement of components due to normal wear and aging. Failure to adhere to proper maintenance intervals and procedures may result in diminished performance of the product and/or accelerated wear of components.

Use mileage, fuel consumption, service hours, or calendar time, WHICH EVER OCCURS FIRST, in order to determine the maintenance intervals. Products that operate in severe operating conditions may require more frequent maintenance.

Before each consecutive interval is performed, all maintenance from the previous interval must be performed.

When Required

Every 10 Service Hours or Daily

Every 50 Service Hours or Weekly

Initial 250 Service Hours

Every 250 Service Hours or Monthly

Every 500 Service Hours or 3 Months

Every 1000 Service Hours or 6 Months

Every 2000 Service Hours or 6 Months

Every 2000 Service Hours or 1 Year

Every 3000 Service Hours or 2 Years

Every 3 Years After Date of Installation or Every 5 Years After Date of Manufacture

Every 6000 Service Hours or 4 Years

i01765022

Articulated Hitch Bearings - Inspect

SMCS Code: 7057-040-BD; 7065-040-BD; 7066-040-BD

Before inspecting the articulated hitch bearings, check the retaining bolt torque for the upper and lower articulated hitch.

Reference: For the correct bolt torque, refer to Specifications, “Articulated Hitch” for the machine that is being serviced.

⚠ WARNING

No clearance for a man in this area when the machine turns. Severe injury or death from crushing could occur.

Install the steering frame lock pin into the locked position before lifting the machine, transporting the machine on another vehicle, or performing service near the center of the machine.

Disengage the steering lock pin from articulation joint and store in retainer before resuming operation or the machine will not steer.

⚠ WARNING

This test is a two person operation. There is no clearance in the articulation area if the machine turns. Severe injury or death from crushing could occur. Stand clear of the machine while observing the articulated hitch bearings.

Inspect the articulated hitch bearings for wear by performing the following procedure:

1. Park the machine on a flat level surface in a straight ahead position.
2. Engage the parking brake.
3. Using the bucket and the lift arm, raise the front wheels of the machine slightly off the ground. Then lower the front wheels onto the ground.
4. Have a second person, standing clear of the machine and in view of the machine operator, observe the upper and lower pivot bearings for movement as Step 3 is performed repeatedly.
5. Lower the front wheels to the ground.
6. If there is any noticeable movement, contact your Caterpillar dealer for further information.

i01929790

Articulated Hitch Bearings - Lubricate

SMCS Code: 7057-086-BD; 7065-086-BD; 7066-086-BD

Wipe off the fittings before any lubricant is applied.

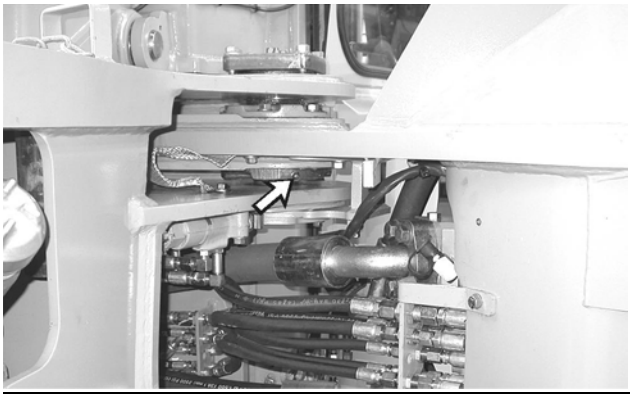


Illustration 222 g01005141

Apply lubricant through one fitting for the upper hitch bearing.

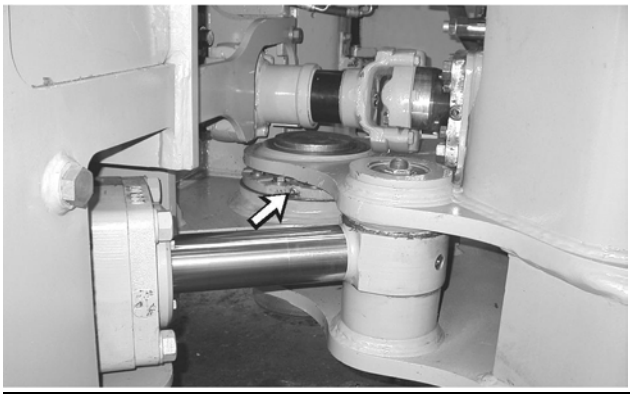


Illustration 223 g01005143

Apply lubricant through one fitting for the lower hitch bearing.

i02234215

Automatic Lubrication Filler Filter - Clean (Hydraulic Type - If Equipped)

SMCS Code: 7540-070-HR

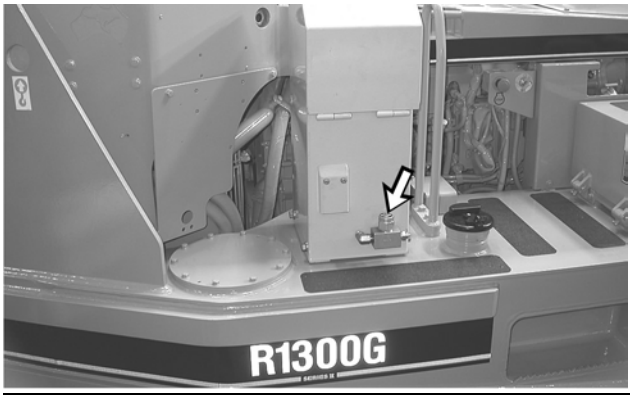


Illustration 224 g01165106

Clean the filler filter every 50 Service Hours or Weekly.

Reference: For information on cleaning the automatic lubrication system filler filter, refer to Systems Operation, Testing and Adjusting, “Automatic Lubrication System, Hydraulic Type” for the machine that is being serviced.

i02234216

Automatic Lubrication Grease Tank - Fill (Hydraulic Type - If Equipped)

SMCS Code: 7540-544

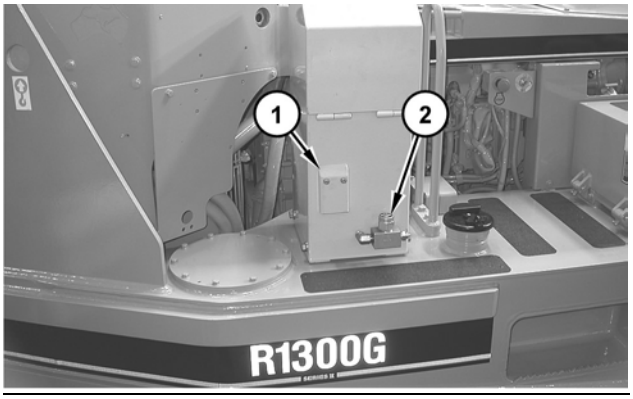


Illustration 225 g01165107

Note: The lubricant tank should be refilled at regular intervals. Refills should be performed daily to prevent emptying the system.

1. Use a manual lubricant gun or pump to fill the tank through filler fitting (2) in the pump body. Fill the tank until lubricant appears at overflow relief valve (1).
2. Check all lubricant lines for leakage.
3. Check hydraulic lines for leakage. Check for worn or damaged hoses.
4. Check all lubricant injectors are operative. Check all bearings that are lubricated by the automatic lubrication system for signs of lubrication.
5. Inspect the electrical system for worn or frayed wiring, damaged connectors or a tripped circuit breaker.

Reference: For more information on the automatic lubrication system, refer to Systems Operation, Testing and Adjusting, “Automatic Lubrication System, Hydraulic Type” for the machine that is being serviced.

i02452600

Backup Alarm - Test

SMCS Code: 7406-081

Make sure that the parking brake is engaged.

Turn the engine start switch to the ON position to perform the test.

Make sure that the area behind the machine is clear of personnel and clear of obstacles.

Apply the service brake. Move the transmission direction and speed control to the REVERSE position.

The backup alarm should start to sound immediately. The backup alarm should continue to sound until the transmission direction and speed control is moved to the NEUTRAL position or to the FORWARD position.

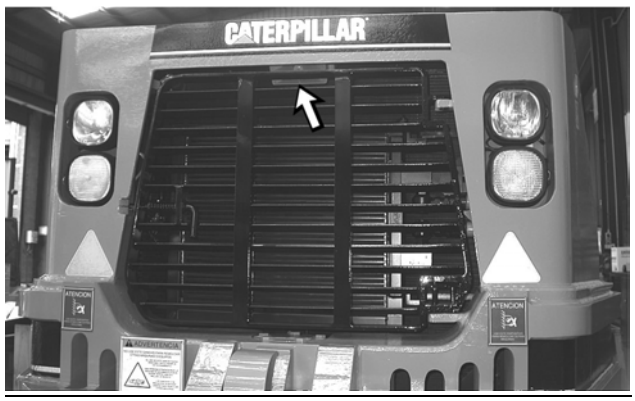


Illustration 226 g01164436

The backup alarm is located at the rear of the machine.

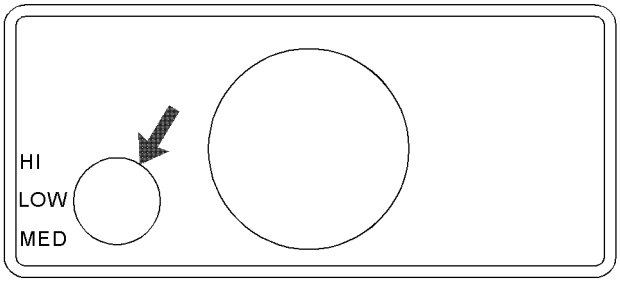


Illustration 227 g01124582

A three position switch at the rear of the backup alarm regulates the volume of the alarm.

To adjust the sound level, move the switch to the required setting. The setting should remain on high, unless the job site requires a lower sound level.

i00993589

Battery - Recycle

SMCS Code: 1401-561

Always recycle a battery. Never discard a battery.

Always return used batteries to one of the following locations:

- A battery supplier
- An authorized battery collection facility
- Recycling facility

i02491409

Battery Electrolyte Level - Check

SMCS Code: 1401-535-ESG

Table 9

Battery Electrolyte Level	
Battery	**Interval**
Conventional	100 Hours
Low Maintenance	250 Hours
Maintenance Free	No Interval

Tighten the battery retainers on all of the batteries. Tighten the battery retainers at every 1000 hours.

Check the following areas at a minimum interval of 1000 hours. Check the following areas more frequently during adverse conditions.

Illustration 228 g01133200

1. The battery access cover is located on the right side of the rear frame. Open the battery access cover.

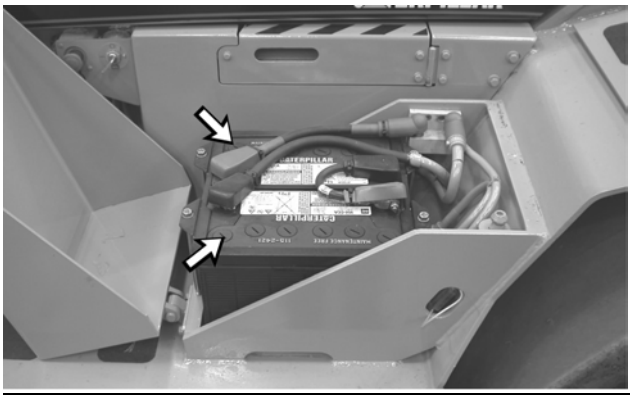


Illustration 229 g01245072

2. Clean the battery surface with a clean cloth.
3. Disconnect all battery cables from the batteries.

   Reference: For more information on disconnecting the battery cables, refer to the Operation and Maintenance Manual, “Battery, Battery Cable or Battery Disconnect Switch - Replace” for the machine that is being serviced.

4. Clean the battery cables and the battery posts. Coat the battery posts with 1P-0808 Multipurpose Grease or petroleum jelly.
5. Connect the battery cables to the batteries.

Reference: For more information on connecting the battery cables, refer to the Operation and Maintenance Manual, “Battery, Battery Cable or Battery Disconnect Switch - Replace” for the machine that is being serviced.

6. Coat the terminals with 1P-0808 Multipurpose Grease or petroleum jelly. Then, install the post cover.

7. For conventional batteries and batteries of low maintenance, follow these additional instructions:

   - Inspect the battery electrolyte level in each battery cell. A maintenance free battery does not require inspection.
   - Maintain the level of the distilled water to the bottom of the filler openings. If distilled water is not available, use clean drinking water.
   - A battery should not require more than 30 cc (1 ounce) of water per cell per week. This requirement should exist with the proper charging rate and with a moderate climate.
   - In extreme temperatures, check the water in the cells weekly. Cell water usage could be higher in extreme temperatures.

8. Close the battery access cover.

i02235471

Battery, Battery Cable or Battery Disconnect Switch - Replace

SMCS Code: 1401-510; 1402-510; 1411-510

1. Turn the engine start switch to the OFF position.

2. Turn all switches to the OFF position.

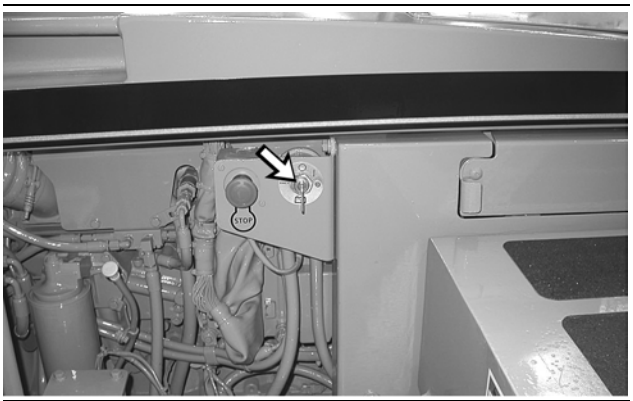


Illustration 230 g01133205

3. Turn the battery disconnect switch to the OFF position and remove the key.

4. Disconnect the negative end (-) of the battery cable from the electric starting motor.

Note: Do not allow the disconnected battery cable to contact the electric starting motor.

5. Disconnect the negative end (-) of the battery cable from the battery.

6. Disconnect the positive end (+) of the battery cable from the battery.

7. Replace the battery or make all necessary repairs to the battery.

8. Connect the positive end (+) of the battery cable to the battery.

9. Connect the negative end (-) of the battery cable to the battery.

10. Connect the negative end (-) of the battery cable to the electric starting motor.

11. Install the key. Turn the battery disconnect switch to the ON position.

i02235474

Belts - Inspect/Adjust/Replace

SMCS Code: 1357-025; 1357-040; 1357-510

The engine is equipped with a belt that drives the fan, the alternator and the air conditioning compressor (if equipped).

Note: The engine is equipped with a belt tensioner that automatically adjusts the belt that drives the fan, the alternator and the air conditioning compressor to the correct tension.

1. Park the machine on a level surface. Engage the parking brake. Stop the engine.

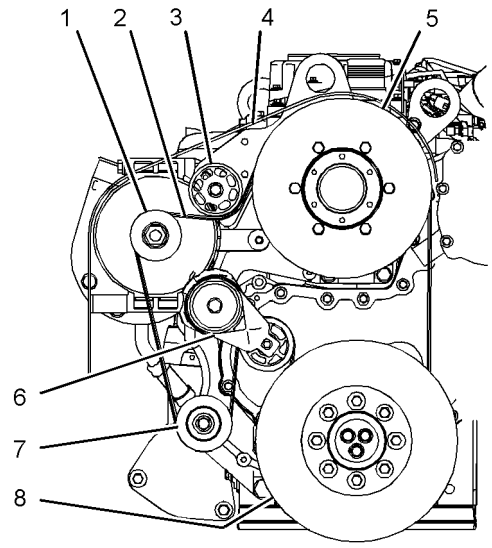


Illustration 231 g01127270

2. Remove guard (4).

3. Inspect the drive belt. Check the belt for wear, fraying or cracking. If the belt is damaged, replace the belt.

4. If belt (2) requires replacement, insert a square drive into the hole in tensioner (6) and turn clockwise in order to release the tension from the belt.

5. Remove the belt from the engine.

6. In order to install a new belt, insert a square drive into the hole in tensioner (6) and turn clockwise.

7. Install belt (2) in the following order: drive pulley (8) (not shown), fan pulley (5), lower idler pulley or air conditioning compressor pulley (if equipped) (7), tensioner (6), alternator pulley (1), and top idler pulley (3).

8. Install guard (4).

i02491407

Brake Accumulator - Check

SMCS Code: 4263-535

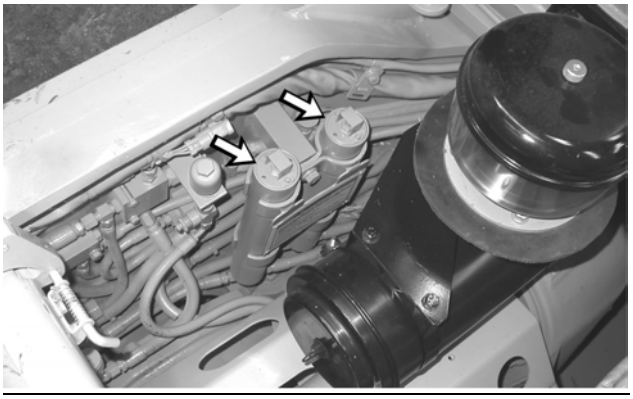


Illustration 232 g01245066

Correct brake accumulator charge pressure is necessary for efficient hydraulic brake operation.

Special tools and equipment are required to test the accumulator.

Reference: For the correct testing and charging procedures for the brake accumulator, refer to Systems Operation, Testing and Adjusting, “Testing and Charging the Accumulator” for the machine that is being serviced, or consult your Caterpillar dealer.

i01912918

Brake Discs - Check

SMCS Code: 4251-535; 4267-535

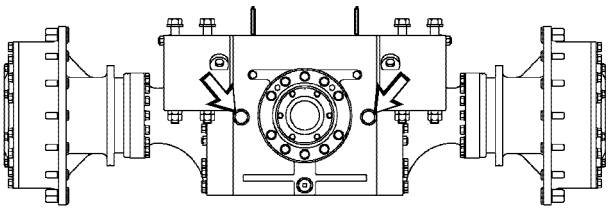


Illustration 233 g00996191

It is necessary to monitor brake disc wear to maintain an efficient braking system and prevent unnecessary wear to brake system components. The wheel brake disc wear can be checked without having to remove the wheel brake assembly.

Reference: For information on checking the brake disc wear, refer to Systems Operation, Testing and Adjusting, “Brake Disc Wear - Check” for the machine that is being serviced.

i01888912

Brake Release System - Test (If Equipped)

SMCS Code: 4284-081

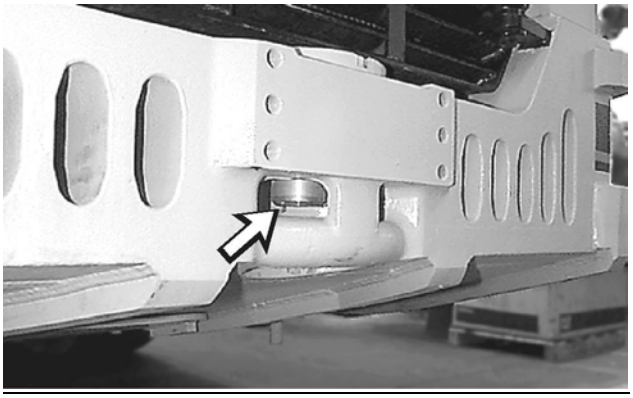


Illustration 234 g00908059

Test the operation of the brake release system.

Reference: For the correct procedure, refer to the Braking System, Systems Operation, Testing and Adjusting, “Brake Release System - Test” for the machine being serviced.

i03100920

Braking System - Test

SMCS Code: 4250-081; 4251-081; 4267-081

⚠ WARNING

Personal injury can result if the machine moves while testing.

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

Be sure the area around the machine is clear of personnel and obstructions. Be sure the steering frame lock 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 parking brake and the service brakes are functional. These tests are not intended to measure maximum 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 the 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.

To carry out the brake test, first start the engine and let the brake oil pressure build up to the operating range. The parking brake will stay engaged until operating oil pressure has been reached and the parking brake control is moved to the OFF position (parking brake disengaged). Once operating oil pressure has been reached a test of the braking system can be commenced.

Service Brake Holding Ability Test

⚠ WARNING

Personal injury can result if the machine moves while testing.

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

1. Move the transmission direction control to the NEUTRAL position. Start the engine. Raise the bucket slightly.

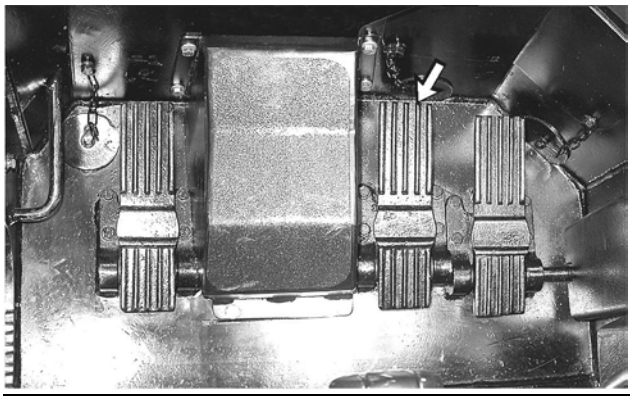


Illustration 235 g00996198

2. Depress the service brake pedal.

Illustration 236 g00996201

3. Disengage the parking brake by moving the parking brake control to the OFF position.

4. Move the transmission direction control to the SECOND SPEED FORWARD position.

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

6. Reduce the engine speed to low idle. Move the transmission direction control to the NEUTRAL position. Engage the parking brake and lower the bucket to the ground. 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 brake before returning the machine to operation.

Parking Brake Holding Ability Test

NOTICE
The standard parking brake control is a pull-to-engage type. When the knob is pulled OUT, the parking brake will be engaged.

Certain mining regulations require machines to be equipped with a push-to-engage parking brake control. When the knob is pushed IN, the parking brake is engaged.

Before operating the machine, ensure you are familiar with the operation of the parking brake control.

Standard Pull-to-Engage Type

⚠ WARNING

Personal injury can result if the machine moves while testing the parking brake.

If the machine begins to move during the test, reduce the engine speed immediately and apply the service brakes.

1. Move the transmission direction control to the NEUTRAL position. Start the engine. Raise the bucket slightly.

Illustration 237 g00996201

2. Engage the parking brake by pulling the parking brake control knob out to the ON position.

3. Move the transmission direction control to the SECOND SPEED FORWARD position.

4. In a rapid motion, move the transmission direction control to the NEUTRAL position and then back to SECOND SPEED FORWARD position.

Note: The parking brake indicator and the action lamp should illuminate. The action alarm should sound.

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

6. Reduce the engine speed to low idle. Move the transmission direction control to the NEUTRAL position. Lower the bucket to the ground. 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 brakes before returning the machine to operation.

Optional Push-to-Engage Type

⚠ WARNING

Personal injury can result if the machine moves while testing the parking brake.

If the machine begins to move during the test, reduce the engine speed immediately and apply the service brakes.

1. Move the transmission direction control to the NEUTRAL position. Start the engine. Raise the bucket slightly.

Illustration 238 g00996202

2. Engage the parking brake by pushing the parking brake control in to the ON position.
3. Move the transmission direction control to the SECOND SPEED FORWARD position.
4. In a rapid motion, move the transmission direction control to the NEUTRAL position and then back to SECOND SPEED FORWARD position.

Note: The parking brake indicator and the action lamp should illuminate. The action alarm should sound.

5. Gradually increase engine speed to high idle. The machine should not move.
6. Reduce the engine speed to low idle. Move the transmission direction control to the NEUTRAL position. Lower the bucket to the ground. 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 brakes before returning the machine to operation.

i02236272

Bucket Pivot Bearings - Lubricate

SMCS Code: 6107-086-BD

Wipe off the fittings before any lubricant is applied.

Illustration 239 g01133638

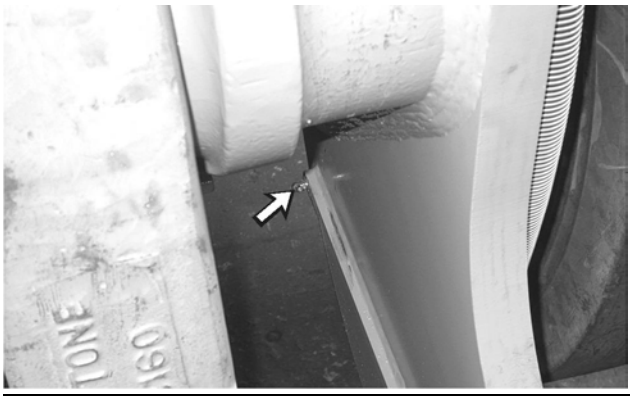


Illustration 240 g00996205

Apply lubricant through one remote mounted fitting for each of the bucket pivot bearings.

i02490742

Cab Air Filter - Clean/Replace (If Equipped)

SMCS Code: 7342-070; 7342-510

Note: Clean the cab air filters more often in dusty conditions. When rips or tears are noticed in the filter, or a reduction of air circulation is noticed in the cab after cleaning the filter, install a new filter.

Return Air Filter

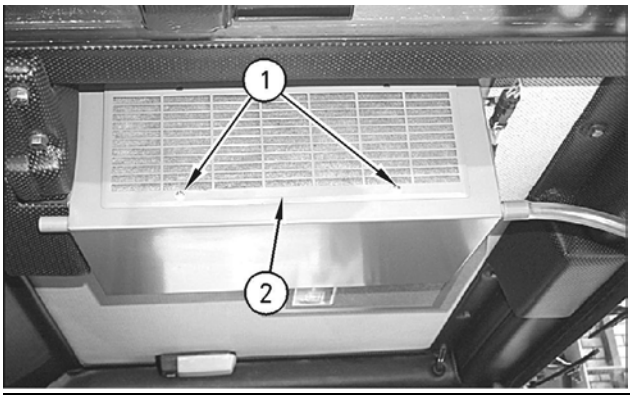


Illustration 241 g00926462

Rear view of typical air conditioning unit

1. Turn two screws (1) 90 degrees counterclockwise.
2. Remove cover (2) and the return air filter from the air conditioning unit.
3. Clean the return air filter using pressure air. When you use air pressure, the maximum air pressure should be 205 kPa (30 psi).
4. Install the filter, the cover and the screws on the air conditioning unit.

Cab Pressurizer Filter

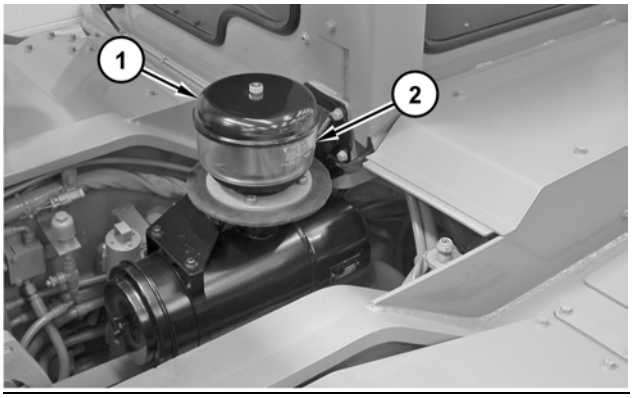


Illustration 242 g01244487

Note: When the debris reaches the full level on the precleaner, empty the precleaner.

1. Loosen the retaining nut and remove cover (1). Remove precleaner cup (2). Empty the precleaner cup.
2. Wash the cover and the precleaner cup in clean water and allow to air dry.
3. Install the precleaner cup and the cover. Tighten the retaining nut finger tight. Do not use a tool to tighten the retaining nut.

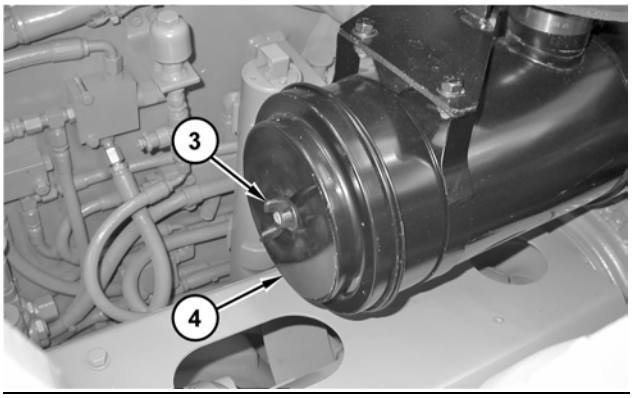


Illustration 243 g01244489

4. Loosen wing nut (3). Remove end cap (4). Empty the dust from the end cap.
5. Remove the wing nut on the filter element. Remove the filter element.
6. Clean the filter element with pressure air or wash the element in warm water and a nonsudsing household detergent. When you use air pressure, the maximum air pressure should be 205 kPa (30 psi). When you use water pressure, the maximum water pressure should be 280 kPa (40 psi).
7. If washed, rinse the element in clean water and air dry thoroughly.
8. Install the filter element and wing nut. Tighten the wing nut finger tight. Do not use a tool to tighten the wing nut.
9. Install end cap (4). Tighten wing nut (3) finger tight. Do not use a tool to tighten the wing nut.

i01913537

Central Lubrication System - Lubricate (If Equipped)

SMCS Code: 7510-086; 7540-086

NOTICE

Check that the lines attached to all the remote grease fittings are undamaged. If the grease lines are split, grease will not reach the components that require lubricating. Machine damage will result.

Wipe off the fittings before any lubricant is applied.

The fittings are located on the top of the front frame and on the right side of the lift arm.

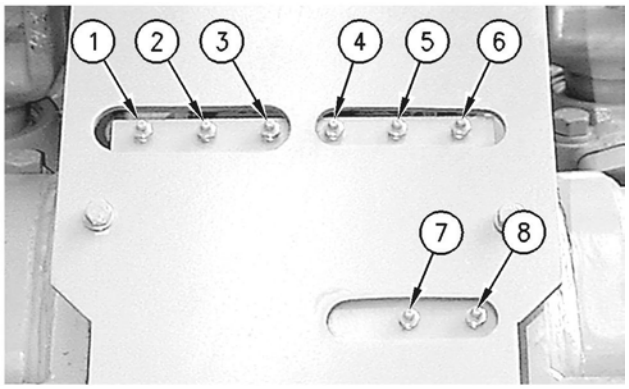


Illustration 244 g01001142

1. Apply lubricant through remote mounted fitting (1) for the left bucket pivot bearing.
2. Apply lubricant through remote mounted fitting (2) for the bearing at the rod end of the left lift cylinder.
3. Apply lubricant through remote mounted fitting (3) for the left rear lift arm bearing.
4. Apply lubricant through remote mounted fitting (4) for the bearing at the head end of the left lift cylinder.
5. Apply lubricant through remote mounted fitting (5) for the bearing at the head end of the tilt cylinder.
6. Apply lubricant through remote mounted fitting (6) for the bearing at the rod end of the right lift cylinder.
7. Apply lubricant through remote mounted fitting (7) for the bearing at the rod end of the steering cylinder.
8. Apply lubricant through remote mounted fitting (8) for the bearing at the head end of the right lift cylinder.

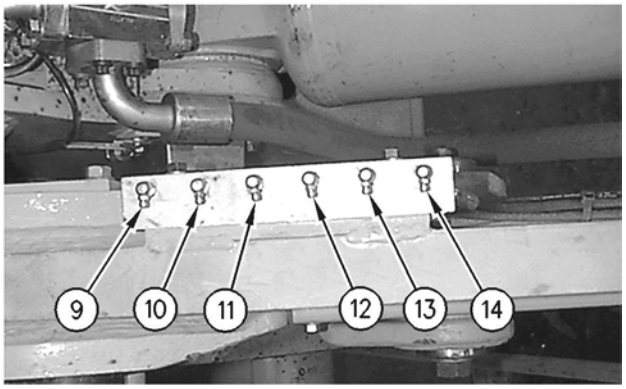


Illustration 245 g01001141

9. Apply lubricant through remote mounted fitting (9) for the right bucket pivot bearing.
10. Apply lubricant through remote mounted fitting (10) for the bearing at the rod end of the tilt cylinder.
11. Apply lubricant through remote mounted fitting (11) for the tilt lever center pivot bearing.
12. Apply lubricant through remote mounted fitting (12) for the bearing at the tilt lever end of the tilt linkage.
13. Apply lubricant through remote mounted fitting (13) for the bearing at the bucket end of the tilt linkage.
14. Apply lubricant through remote mounted fitting (14) for the right rear lift arm bearing.

i03027480

Circuit Breakers - Reset

SMCS Code: 1420-529

NOTICE
Replace circuit breakers with the same type and size only. Otherwise, electrical damage can result.

If it is necessary to reset circuit breakers frequently, an electrical problem may exist. Contact your Caterpillar dealer.

Circuit Breaker/Reset – Push in the button in order to reset the circuit breaker. If the electrical system is working properly, the button will remain depressed. If the button does not remain depressed, check the appropriate electrical circuit. Repair the electrical circuit, if necessary.

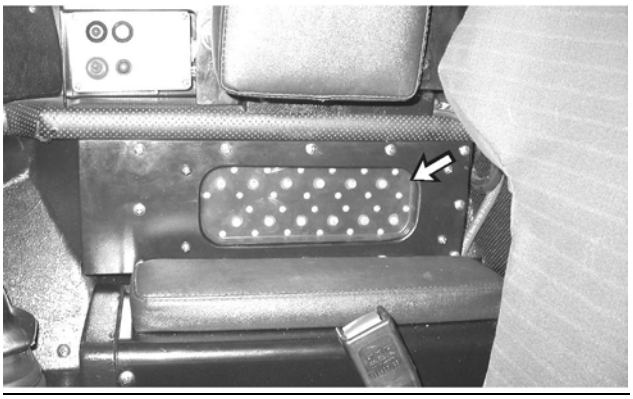


Illustration 246 g00996213

The circuit breaker panel is located at the rear of the operator station.

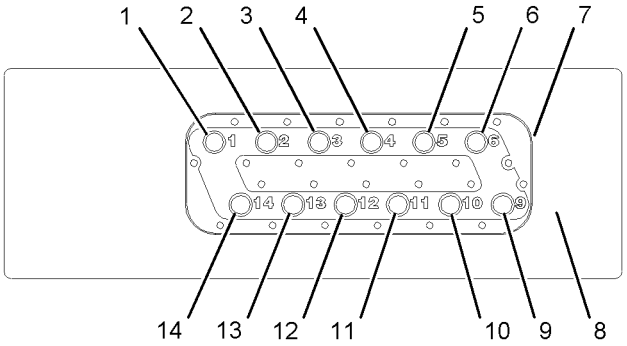


Illustration 247 g01138902

(1) Air Conditioner – 15 Amp

(2) Front Window Washer and Wiper – 15 Amp

(2) Side Window Washer and Wiper

(2) Rear Window Washer and Wiper

(3) Horn – 15 Amp

(3) Automatic Lubrication System (If Equipped)

(4) Payload Control System (If Equipped) – 15 Amp

(4) Ejector Bucket (If Equipped)

(4) Action Lamp

(5) Remote Control System (If Equipped) – 15 Amp

(6) Engine Electronic Control Module (ECM) – 15 Amp

(6) Key switch

(7) Left Front Lights – 30 Amp (Automatic)

(7) Left Rear Lights

(8) Right Front Lights – 30 Amp (Automatic)

(8) Right Rear Lights

(9) Power Train Electronic Control Module (ECM) – 15 Amp

(9) Dome Lamp

(9) 24V to 12V Converter

(10) Service Port – 15 Amp

(10) Remote Control System (If Equipped)

(11) 24V to 12V Converter – 15 Amp

(11) Monitor, Telemetry Port, Electronic Access Module (EAM)

(11) Residual Brake Oil Pressure

(11) Exhaust Gas Pressure

(12) Payload Control System (If Equipped) – 15 Amp

(12) Spare (24V)

(13) Caterpillar Monitoring System – 15 Amp

(13) Instrument Illumination

(13) Action Lamp

(14) Power Train Electronic Control Module (ECM) – 15 Amp

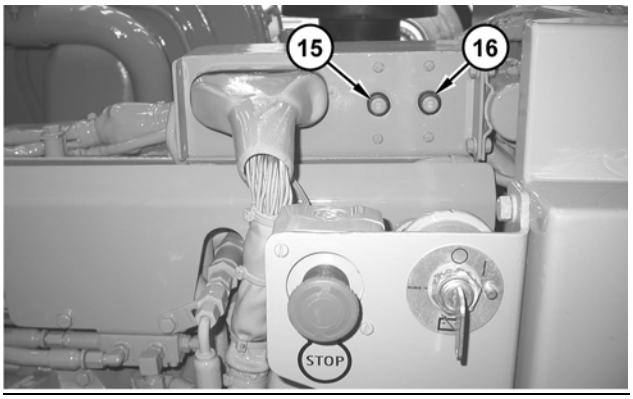


Illustration 248 g01138899

(15) Alternator - 105 Amp

(16) Main - 80 Amp

i02237292

Collet Pin Bolt Torque - Check

SMCS Code: 6107-535-BC

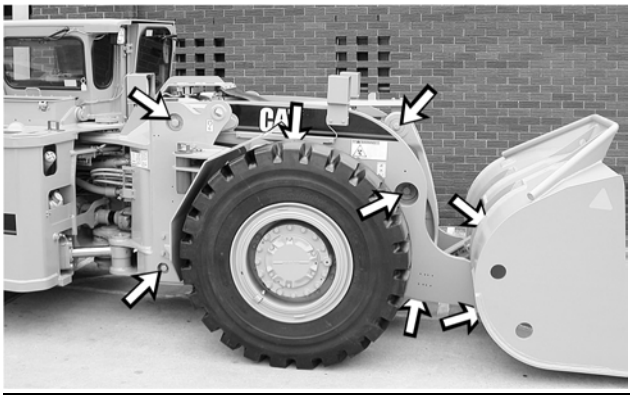


Illustration 249 g01128651

Check the retaining bolt torque on all bucket control group collet retaining bolts.

Reference: For the correct retaining bolt torque, refer to Hydraulic Specifications, “Bucket Control” for the machine that is being serviced.

i02490744

Cooling System Coolant (ELC) - Change

SMCS Code: 1352-044-NL; 1395-044-NL

⚠ WARNING

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

NOTICE
Do not change the coolant until you read and understand the cooling system information in Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”.

Failure to do so could result in damage to the cooling system components.

NOTICE
Mixing ELC with other products reduces the effectiveness of the coolant and shortens coolant life. Use only Caterpillar products or commercial products that have passed the Caterpillar EC-1 specifications for premixed or concentrate coolants. Use only Caterpillar Extender with Caterpillar ELC. Failure to follow these recommendations could result in the damage to cooling systems components.

If ELC cooling system contamination occurs see the topic Extended Life Coolant (ELC) in the Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”.

Note: This procedure pertains to machines using Extended life Coolant (ELC) only.

If the coolant is dirty or if you observe any foaming in the cooling system, drain the coolant before the recommended interval.

Illustration 250 g01244495

1. Loosen the pressure cap slowly to relieve cooling system pressure. Remove the pressure cap.

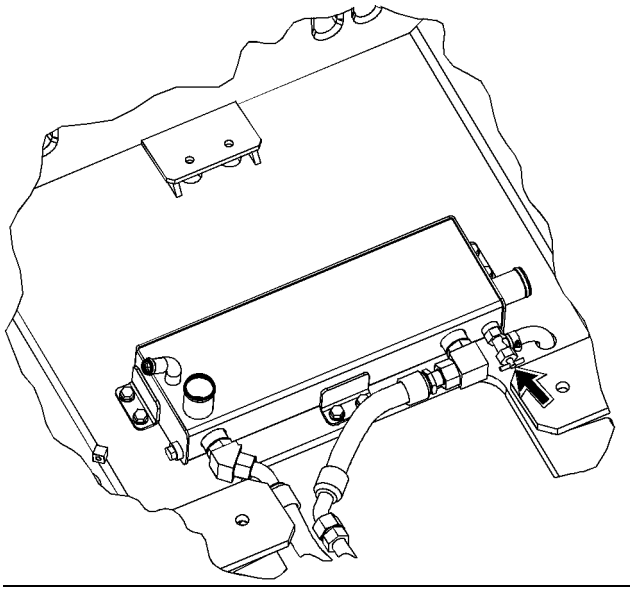


Illustration 251 g01138546

2. Remove the crankcase bottom guard.
3. Open the drain valve for the engine cooling system. Drain the coolant into a suitable container. The drain valve is located on the transmission oil cooler.
4. Close the drain valve. Fill the system with clean water and a 6 to 10 percent concentration of cooling system cleaner.
5. Start and run the engine for 90 minutes. Stop the engine and drain the cleaning solution into a suitable container.
6. When the engine is stopped, flush the cooling system with water until the draining water is clear. Drain the water into a suitable container.
7. Close the drain valve.
8. Add the coolant solution. Add coolant slowly to help avoid air locks, 20 L (5 US gal) per minute.

   Reference: For additional information on the cooling system capacity, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.
9. Start the engine. Run the engine with the cooling system pressure cap removed. Run the engine until the water temperature regulator opens and the coolant level stabilizes.

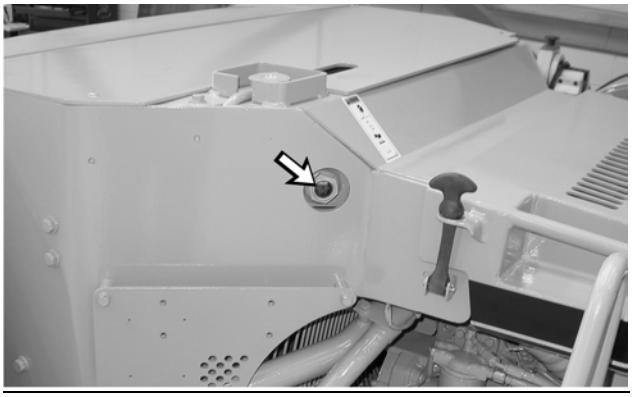


Illustration 252 g01244496

10. Maintain the coolant level to within 13 mm (0.50 inch) of the bottom of the filler pipe or to the proper level in the sight gauge.

11. Install the cooling system pressure cap.

12. Stop the engine.

i02490747

Cooling System Coolant Extender (ELC) - Add

SMCS Code: 1352-538-NL; 1395-538-NL

⚠ WARNING

Personal injury can result from hot coolant, steam and alkali.

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

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

Do not attempt to tighten hose connections when the coolant is hot, the hose can come off causing burns.

Cooling System Coolant Additive contains alkali. Avoid contact with skin and eyes.

NOTICE
Adding coolant to an overheated engine could result in damage to the engine. Allow the engine to cool before adding coolant.

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

The engine cooling system is normally protected to a minimum of−29°C (−20°F) with Caterpillar Antifreeze, when shipped from the factory unless special requirements are defined.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

NOTICE
Excessive additive (greater than the recommended 6% initial fill) together with concentrations of antifreeze greater than 60% cause deposits to form and can result in radiator tube blockage and overheating.

NOTICE
Mixing ELC with other products reduces the effectiveness of the coolant and shortens coolant life. Use only Caterpillar products or commercial products that have passed the Caterpillar EC-1 specifications for premixed or concentrate coolants. Use only Caterpillar Extender with Caterpillar ELC. Failure to follow these recommendations could result in the damage to cooling systems components.

If ELC cooling system contamination occurs see the topic Extended Life Coolant (ELC) in the Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”.

When a Caterpillar Extended Life Coolant (ELC) is used, an Extender must be added to the cooling system.

Reference: For the proper service interval, refer to the Operation and Maintenance Manual, “Maintenance Interval Schedule” for the machine that is being serviced.

The amount of extender is determined by the cooling system capacity.

Reference: For information on the cooling system capacity, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.

Reference: For all cooling system requirements, refer to Caterpillar Machine Fluids Recommendations, SEBU6250 or consult your Caterpillar dealer.

Illustration 253 g01244495

1. Loosen the pressure cap slowly to relieve cooling system pressure. Remove the pressure cap.
2. It may be necessary to drain enough coolant from the radiator to allow for the addition of the liquid coolant extender.

Note: Make sure that the coolant is drained into a suitable container.

3. Add the recommended amount of ELC Extender to the cooling system.
4. Clean the pressure cap and inspect the pressure cap. Install the pressure cap.
5. Start the engine and check for leaks. Allow the coolant level to stabilize.
6. If necessary, add premixed coolant in order to bring the coolant to the proper level in the sight gauge.

i02490748

Cooling System Level - Check

SMCS Code: 1350-535-FLV; 1395-535-FLV

⚠ WARNING

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Illustration 254 g01244496

1. Maintain the coolant level in the sight gauge located on the right side of the machine. If it is necessary to add coolant daily, check for leaks.
2. Inspect the radiator core for debris. Clean the radiator core, if necessary.

   Reference: For information on cleaning the radiator core, refer to the Operation and Maintenance Manual, “Radiator Core - Clean” for the machine that is being serviced.

Illustration 255 g01244495

3. If coolant level is low, loosen the pressure cap slowly to relieve pressure. Remove the pressure cap. Add coolant as required to within 13 mm (0.50 inch) of the bottom of the filler pipe or to the proper level in the sight gauge.

4. Inspect the pressure cap and cap seal for damage, deposits or foreign material. Clean the pressure cap with a clean cloth or replace the cap if it is damaged.

5. Install the cooling system pressure cap.

i02490749

Cooling System Pressure Cap - Clean/Replace

SMCS Code: 1382-070; 1382-510

⚠ WARNING

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

Illustration 256 g01244495

1. Loosen the pressure cap slowly in order to relieve cooling system pressure. Remove the pressure cap.

2. Inspect the pressure cap for damage, foreign material and for deposits.

3. Inspect the condition of the pressure cap seal. Replace the pressure cap if damaged. If the seal is not damaged, use a 9S-8140 Pressurizing Pump to pressure test the pressure cap. The correct cap relief pressure is stamped on the radiator cap. If the pressure cap does not hold the correct pressure, install a new cap.

4. Install the pressure cap.

i02477137

Cooling System Water Temperature Regulator - Replace

SMCS Code: 1355-510

⚠ WARNING

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

Replace the water temperature regulator on a regular basis in order to reduce the chance of unscheduled downtime and of problems with the cooling system.

The water temperature regulator should be replaced after the cooling system has been cleaned. Replace the water temperature regulator while the cooling system is completely drained or while the cooling system coolant is drained to a level that is below the water temperature regulator housing.

NOTICE
Failure to replace the engine's water temperature regulator on a regularly scheduled basis could cause severe engine damage.

Note: If you are only replacing a water temperature regulator, drain the cooling system coolant to a level that is below the water temperature regulator housing.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

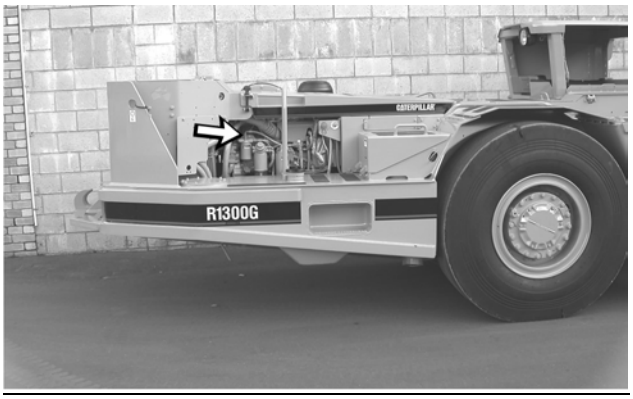


Illustration 257 g01165112

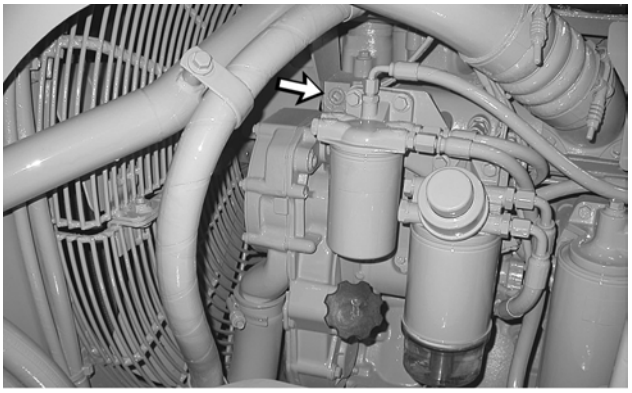


Illustration 258 g01165113

1. Remove the hose clamp and remove the hose from the water temperature regulator housing.

2. Remove the bolts from the water temperature regulator housing. Remove the water temperature regulator housing and seal.

NOTICE
Former water temperature regulators may be used, if they meet the test specifications and are not damaged or have excessive buildup or deposits.

NOTICE
Since Caterpillar engines incorporate a shunt design cooling system, it is mandatory to always operate the engine with a water temperature regulator.

Depending on load, failure to operate with a water temperature regulator could result in either an overheating or an overcooling condition.

3. Install a new seal in the new water temperature regulator housing. Install the water temperature regulator housing and the bolts.

4. Install the hose. Tighten the hose clamp.

5. Refill the cooling system.

Reference: For all cooling system requirements, refer to the Operation and Maintenance Manual, SEBU6250, “Caterpillar Machine Fluids Recommendations”.

Reference: For information on the cooling system capacity, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.

i02251894

Crankshaft Vibration Damper - Inspect

SMCS Code: 1205-040

Illustration 259 g01133653

The crankshaft vibration damper is located at the rear of the machine on the front of the engine.

Damage to the vibration damper or failure of the vibration damper will increase torsional vibrations. These vibrations will result in damage to the crankshaft and in damage to other engine components. A deteriorating vibration damper will cause excessive gear train noise at variable points in the speed range.

Caterpillar recommends replacing the vibration damper for any of the following reasons:

- The engine has had a failure because of a broken crankshaft.
- The S·O·S oil analysis detected a worn crankshaft front bearing.
- The S·O·S oil analysis detected a large amount of gear train wear that is not caused by a lack of oil.

The vibration damper can be used again if none of the above conditions are found and the damper is not damaged.

Inspect the vibration damper assembly for dents in the outer case. Dents in the outer case may cause failure of the damper assembly. Install a new vibration damper if the damper is damaged.

Reference: For information on replacing the crankshaft vibration damper, refer to Disassembly and Assembly, “Vibration Damper” for the machine that is being serviced.

i02491408

Differential and Final Drive Oil - Change

SMCS Code: 3278-044; 4050-044

⚠ WARNING

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

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Wipe covers and surfaces around openings before checking or adding oil. Park on a level surface.

Illustration 260 g00997227

1. Position the wheels so that the final drive fill/drain plugs are facing downward. Remove the final drive drain/fill plugs and allow the oil to drain into a suitable container. Clean the drain/fill plugs and install the drain/fill plugs.

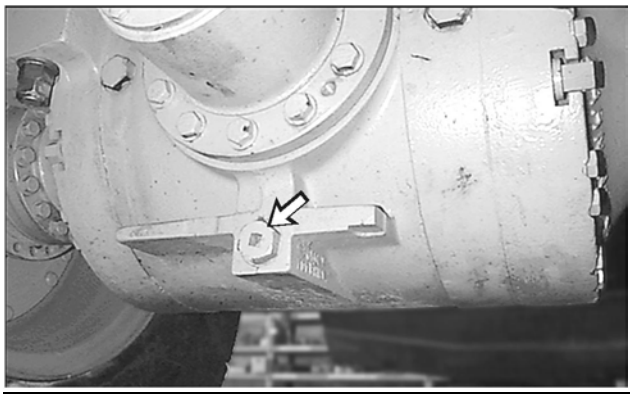


Illustration 261 g00997225

Location of the front differential drain plug

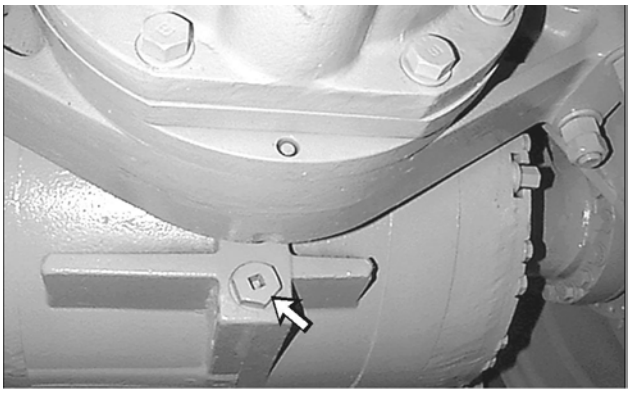


Illustration 262 g00996599

Location of the rear differential drain plug

2. Remove the differential drain plugs and allow the oil to drain into a suitable container. Clean the drain plugs and install the drain plugs.

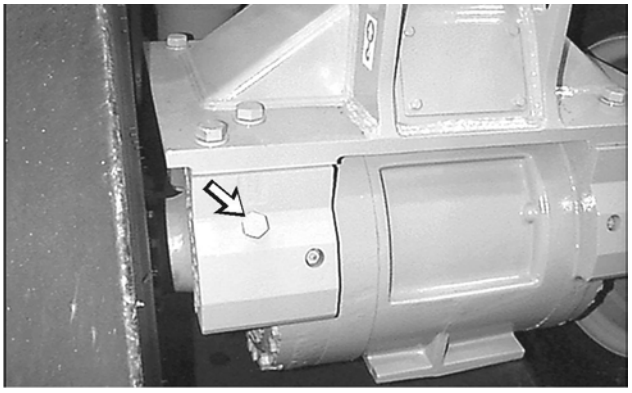


Illustration 263 g00996598

Location of the front differential dipstick/fill plug

3. Remove the front differential dipstick/fill plug. Fill the differential to the FULL mark on the level gauge.

Note: To avoid overfilling, allow several minutes for the oil to flow through the assembly. Check the oil level several times while the filling procedure is in progress.

Note: Make sure that the dipstick/fill plug is installed completely when checking the oil level. If the plug is not installed completely, an incorrect oil level reading can occur.

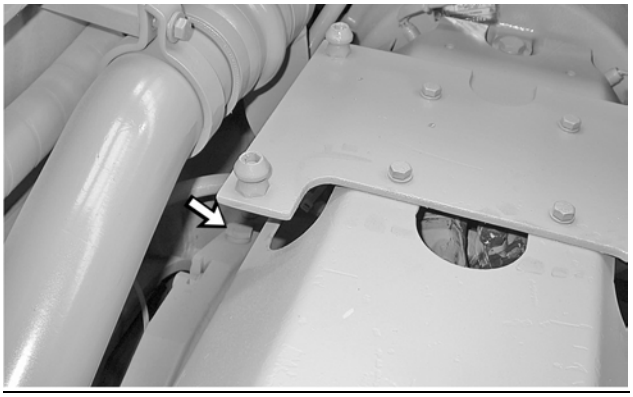


Illustration 264 g01132804

Location of the rear differential and transfer case dipstick/fill plug

4. Remove the rear differential and transfer case dipstick/fill plug. Fill the differential and the transfer case to the FULL mark on the level gauge.

Note: To avoid overfilling, allow several minutes for the oil to flow through the assembly. Check the oil level several times while the filling procedure is in progress.

Note: Make sure that the dipstick/fill plug is installed completely when checking the oil level. If the plug is not installed completely, an incorrect oil level reading can occur.

Reference: For additional information on lubricants and refill capacities, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.

5. Clean the dipstick/fill plugs and install the dipstick/fill plugs.

Illustration 265 g00996592

6. Position the wheels so that the fill/drain plugs are even with the center line of the wheel. Remove the fill/drain plugs.

7. Fill the final drives slowly to the bottom of the fill/drain openings.

   Reference: For additional information on lubricants and refill capacities, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.

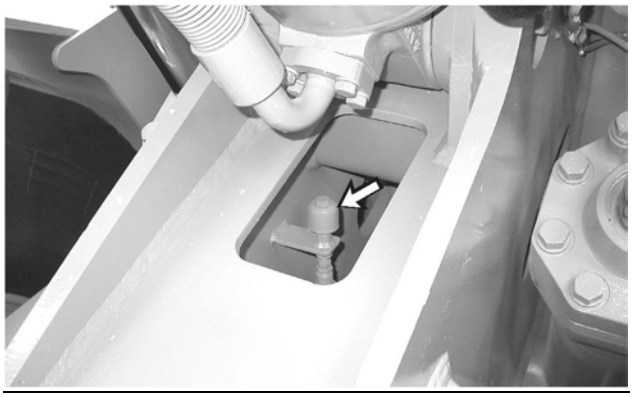
8. Clean the fill/drain plugs and install the fill/drain plugs.

9. If the specified amount of oil will not fit in the final drives, install the final drive fill/drain plugs. Operate the machine on level ground for a few minutes in order to equalize the oil level in the axles.

10. Remove the fill/drain plugs and add the remaining oil.

11. Operate the machine for a few minutes and recheck the oil level. The oil level should reach the bottom of the fill/drain plug opening.

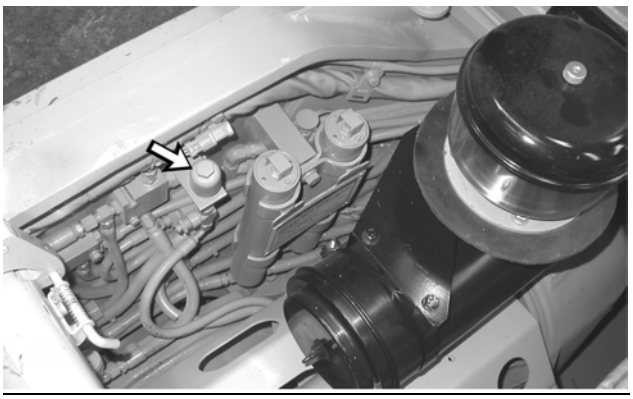
    Reference: For information for the correct procedure, refer to Operation and Maintenance Manual, “Differential and Final Drive Oil Level - Check” for the machine that is being serviced.



g00996590

Illustration 266

Location of the front differential breather



g01245067

Illustration 267

Location of the rear differential breather

12. Remove the front and rear differential breathers.

13. Wash the breathers in clean, nonflammable solvent.

14. Install the clean breathers.

i02237803

Differential and Final Drive Oil Level - Check

SMCS Code: 3278-535-FLV; 4050-535-FLV

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Note: Before you measure the oil level, operate the machine for a few minutes in order to equalize the oil level.

Wipe covers and surfaces around openings before checking or adding oil. Park on a level surface.

Note: Perform Steps 1 through 4 to the final drive on each wheel.

1. Park the machine on level ground. Engage the parking brake. Stop the engine.

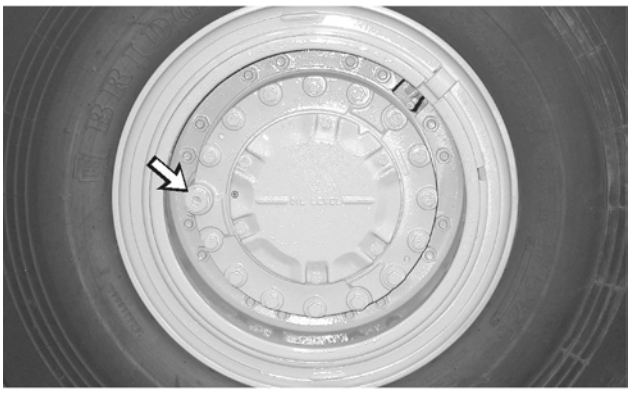


Illustration 268 g00996592

2. Position the wheels so that the final drive fill/drain plugs are even with the center line of the wheel. Stop the engine.

3. Remove the fill/drain plugs. The oil level should be at the bottom of the fill/drain plug openings. Add oil, if necessary.

   Reference: For information on lubricants, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.

4. Clean the fill/drain plugs and install the fill/drain plugs.

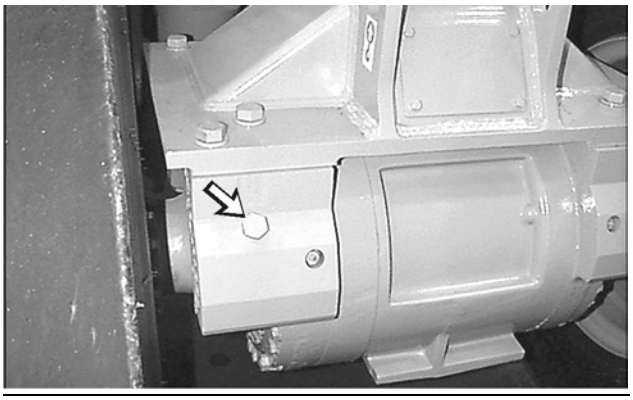


Illustration 269 g00996598

Location of the front differential dipstick/fill plug

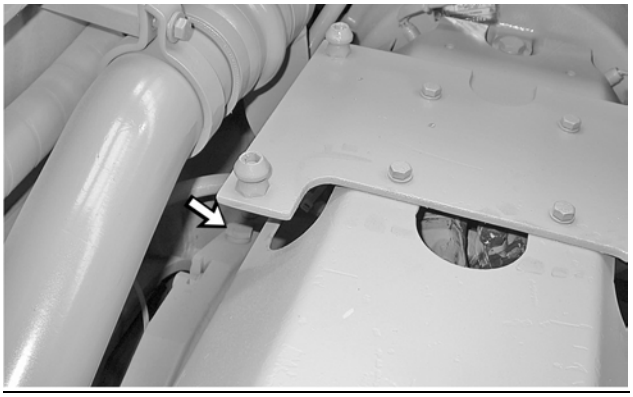


Illustration 270 g01132804

Location of the rear differential and transfer case dipstick/fill plug

5. Remove the differential dipstick/fill plug. Wipe off the level gauge with a clean cloth and reinsert the plug. This will ensure a more accurate measurement of the oil level.

Note: Make sure that the dipstick/fill plug is installed completely when checking the oil level. If the plug is not installed completely, an incorrect oil level reading can occur.

6. Remove the dipstick/fill plug again and check the oil level. Maintain the oil level between the ADD mark and the FULL mark. Add oil, if necessary.

   Reference: For information on lubricants, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.

7. Clean the dipstick/fill plug. Install the dipstick/fill plug.

i01914495

Drive Shaft Universal Joints, Splines and Bearings - Inspect/Lubricate

SMCS Code: 3251-040; 3251-086; 3253-040-SN; 3253-086-SN; 3267-040-BD; 3267-086-BD

Inspect the drive shaft universal joints for wear, loose bolts, or missing bolts. Tighten loose bolts and replace missing bolts. Inspect the drive shaft splines and bearings for wear. Replace worn components.

Wipe off the fittings before any lubricant is applied.

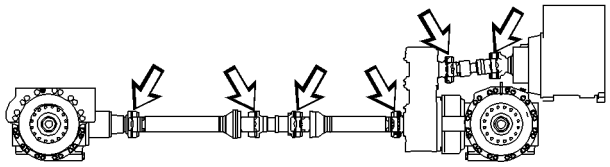


Illustration 271 g00997569

1. Apply lubricant through six fittings in universal joints.

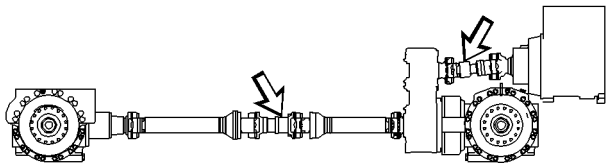


Illustration 272 g00997573

2. Apply lubricant through two fittings for the slip joint splines.

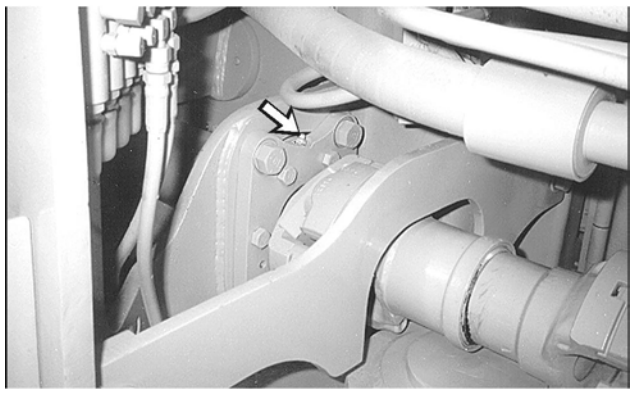


Illustration 273 g00997571

3. Apply lubricant through one fitting for the rear drive shaft support bearings.

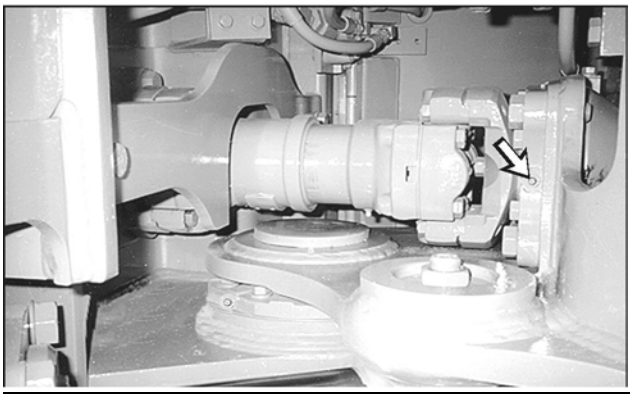


Illustration 274 g00997572

4. Apply lubricant through one fitting for the front drive shaft support bearings.

i03150480

Ejector Cylinder Bearing - Lubricate

SMCS Code: 5305-086-BD

NOTICE
Check that the lines attached to all the remote grease fittings are undamaged. If the grease lines are split, grease will not reach the components that require lubricating. Machine damage will result.

Wipe off the fittings before any lubricant is applied.

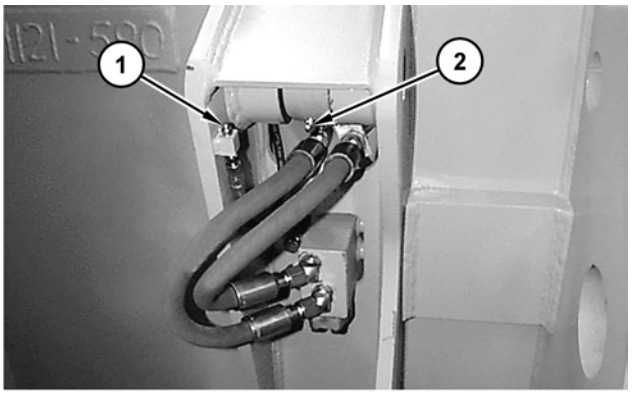


Illustration 275 g01619914

1. Apply lubricant through remote mounted fitting (1) for the bearing at the rod end of the ejector cylinder.

2. Apply lubricant through fitting (2) for the bearing at the head end of the ejector cylinder.

3. Repeat Step 1 and Step 2 for the other ejector cylinder.

i03150521

Ejector Plate Bearing - Lubricate

SMCS Code: 6128-086-BD

Wipe off the fittings before any lubricant is applied.

Illustration 276 g01620714

1. Apply lubricant through fitting (1) on each side of the bucket for the ejector plate bearings (2 points).

i02477135

Engine Aftercooler - Check

SMCS Code: 1063-535

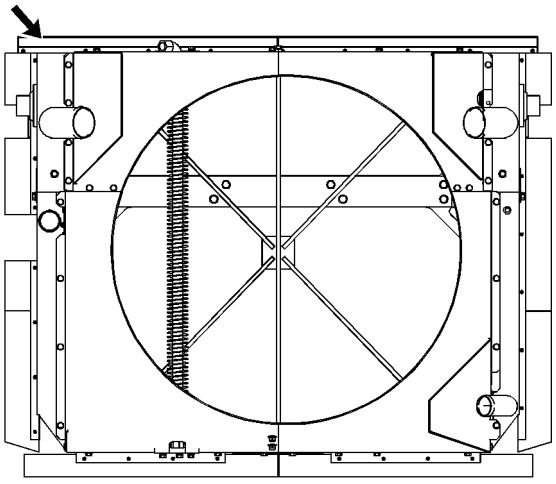


Illustration 277 g01236922

Check the engine aftercooler for cracks and damage. Check the condition of all connecting hoses, gasket connections and hose clamps. Check the torque of all hoses clamps.

Reference: For information on testing engine aftercoolers, refer to the Systems Operation, Testing and Adjusting, “Aftercooler - Test” for the machine that is being serviced.

i02431646

Engine Air Filter Primary Element - Clean/Replace

SMCS Code: 1054-070-PY; 1054-510-PY

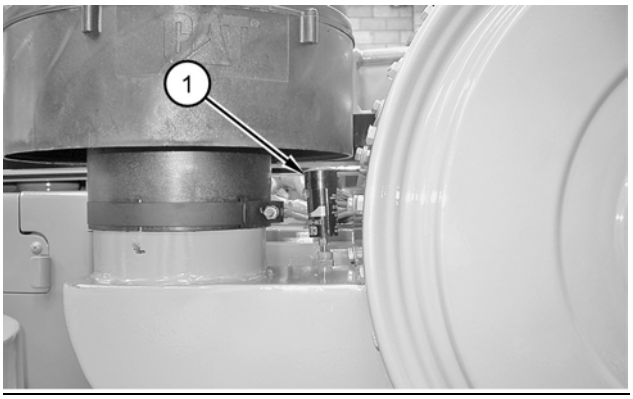


Illustration 278 g01134526

Service the air cleaner if the yellow piston in filter element indicator (1) moves into the red zone with the engine running at high idle. Stop the engine.

NOTICE
Service the air cleaner only with the engine stopped. Engine damage could result if the air cleaner is serviced while the engine is running.

NOTICE
This machine uses radial seal type air cleaners. To avoid engine damage, use only radial seal replacement filters. Others will not seal.

Radial seal filter gasket design and location are critical to proper air cleaner operation. Use only Caterpillar replacements.

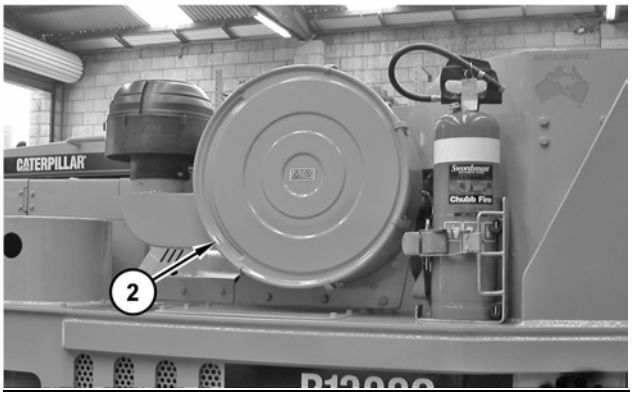


Illustration 279 g01244500

1. Remove cover (2) from the air cleaner housing.

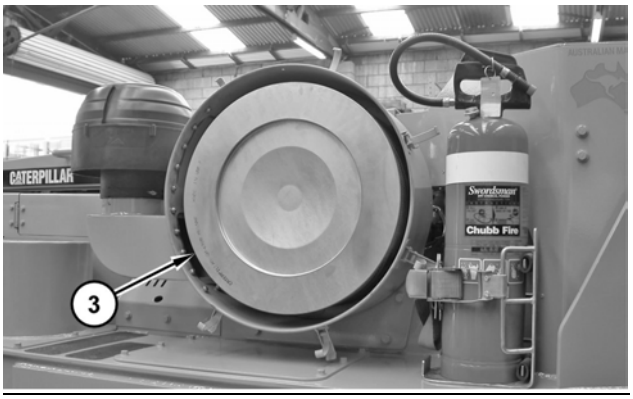


Illustration 280 g01215147

2. Remove primary filter element (3) from the air cleaner housing.

3. Clean the inside of the air cleaner housing.

4. Inspect the primary element. If the pleats, the gaskets, or the seals are damaged, discard the primary element. Replace a damaged primary element with a clean primary element.

NOTICE
Do not clean the primary elements by bumping or tapping them. Do not use primary elements with damaged pleats, gaskets or seals. Engine damage can result.

Make sure the cleaned primary elements are completely dry before installing them into the filter housing. Water remaining in the elements can cause false indications of contamination in S·O·S Analysis test results.

5. If the primary element is not damaged, clean the primary element. The primary element can be cleaned by using the following methods:

- Pressure air.
- Pressure water.
- Detergent washing.

When you use pressure air, the maximum air pressure is 205 kPa (30 psi). When you use pressure water, the maximum water pressure is 280 kPa (40 psi).

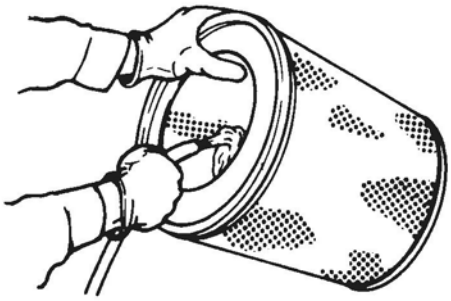


Illustration 281 g00905242

6. When you clean the inside pleats and the outside pleats, direct the air along the pleats or direct the water along the pleats.

The primary element can be washed in a solution that consists of warm water and of nonsudsing household detergent. Fully rinse the pleats. Allow the primary element to air dry completely.

7. Inspect the primary element after you clean the primary element. Do not use a primary element if the pleats, the gaskets or the seals are damaged.

8. Cover the clean primary element. Store the primary element in a clean, dry location.

A primary element may be cleaned for a maximum of six times. Also replace the primary element if the primary element has been in service for one year.

9. Install a clean primary element. Clean and install the cover.

Note: Make sure that the primary filter element is properly seated and sealed.

Note: If the yellow piston in filter element indicator (1) moves into the red zone after starting the engine, or the exhaust smoke is still black after installing a clean primary element, install a new primary filter element. If the piston remains in the red zone after installing a new primary filter element, replace the secondary filter element.

Reference: For the correct procedure to replace the secondary filter element, refer to the Operation and Maintenance Manual, “Engine Air Filter Secondary Element - Replace” for the machine that is being serviced.

i02431652

Engine Air Filter Secondary Element - Replace

SMCS Code: 1054-510-SE

NOTICE
Service the air cleaner only with the engine stopped. Engine damage could result.

NOTICE
Always replace the secondary element. Do not attempt to reuse it by cleaning. Engine damage could result.

Replace the engine air filter secondary element under the following conditions:

- A clean primary element has been installed and a warning for the air filter still occurs.
- The engine air filter primary element is serviced for the third time.
- The exhaust smoke remains black and a clean primary element has been installed.

1. Remove the primary element.

   Reference: For additional information, refer to the Operation and Maintenance Manual, “Engine Air Filter Primary Element - Clean/Replace” for the machine that is being serviced.

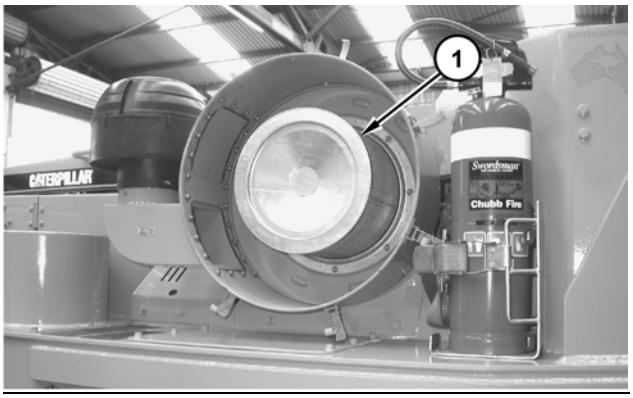


Illustration 282 g01215151

2. Remove lock nuts (1) that hold the secondary filter element to the housing. Remove the secondary element.
3. Cover the air inlet opening. Clean the inside of the air cleaner housing.
4. Uncover the air inlet opening. Install a new secondary element.
5. Install lock nuts (1) that hold the secondary filter element to the housing. Tighten the lock nuts to a torque of 47 ± 7 N·m (35 ± 5 lb ft).
6. Install a clean primary element and install the cover on the air cleaner housing.

i01968230

Engine Air Filter Service Indicator - Inspect

SMCS Code: 7452-040

Some engines are equipped with a differential gauge for inlet air pressure. The differential gauge for inlet air pressure displays the difference in the pressure that is measured before the air cleaner element and the pressure that is measured after the air cleaner element. As the air cleaner element becomes dirty, the pressure differential rises.

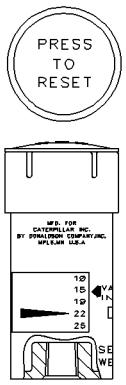


Illustration 283 g01001638

The air filter service indicator is located near the air filter housing.

1. Observe the performance of the air filter service indicator. The air filter element should be cleaned or the air filter element should be replaced when one of the following conditions occur:
   - The yellow diaphragm enters the red zone.
   - The red piston locks in the visible position.
2. If any component damage is present, replace the service indicator.

3. If air leaks are present, replace the service indicator.

Note: When a new service indicator is installed, excessive force may crack the top of the service indicator. Tighten the service indicator to a torque of 2 N·m (18 lb in).

i02431615

Engine Air Precleaner - Clean

SMCS Code: 1055-070

NOTICE
Service the air cleaner only with the engine stopped. Engine damage could result.

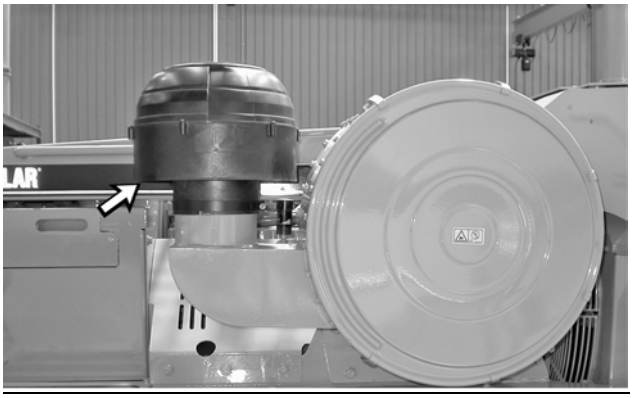


Illustration 284 g01215126

1. Stop the engine.
2. Remove the engine air precleaner.
3. Inspect the precleaner inlet screen for dirt and for trash. If the screen is dirty, clean the screen with compressed air.
4. Check the air intake precleaner rotor operation.
5. Periodically remove the precleaner and wash in water.

i02253046

Engine Crankcase Breather - Clean

SMCS Code: 1317-070

The engine crankcase breather is located in the engine valve cover.

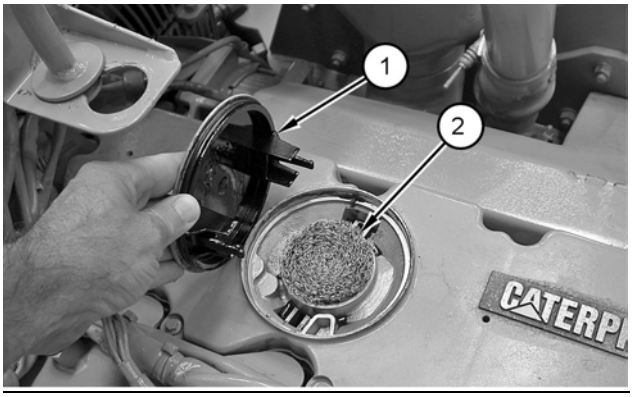


Illustration 285 g01134533

1. Remove breather assembly cover (1).
2. Check the condition of the O-ring seal on the breather assembly cover. Replace the O-ring seal if the O-ring seal is damaged.
3. Wash the breather assembly cover and element (2) in a clean, nonflammable solvent.
4. Shake the element dry or use pressure air to dry the element.
5. Install the element and breather assembly cover (1).
6. Inspect the outlet hose for damage. Replace the hose, if necessary.

i02444811

Engine Mounts - Inspect

SMCS Code: 1152-040

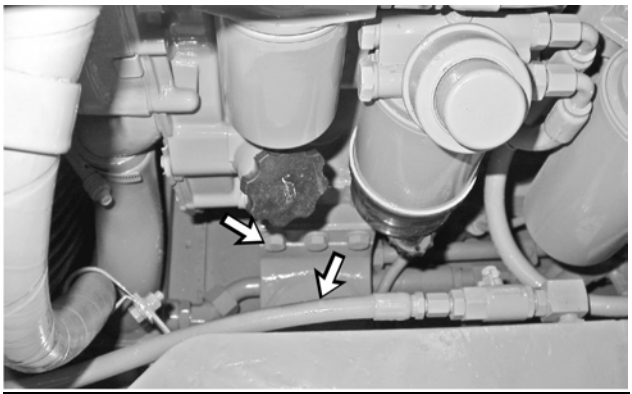


Illustration 286 g01221591

Illustration 287 g01134540

Caterpillar recommends inspecting the engine mounts for deterioration and for proper bolt torque. This will help to prevent excessive engine vibration that is caused by improper mounting.

Reference: For the proper bolt torques for the engine mounts, refer to Specifications, “C6.6 Engine Supplement”.

i02239859

Engine Oil Level - Check

SMCS Code: 1000-535-FLV

NOTICE
Do not underfill or overfill the engine crankcase with oil. Either condition can cause engine damage.

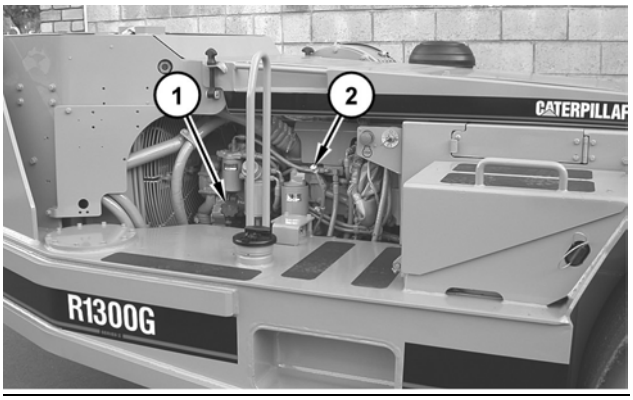


Illustration 288 g01134532

Check the engine oil level with the machine level and the parking brake engaged.

The dipstick is located on the left side of the engine.

1. Stop the engine. Maintain the oil level in the crosshatched region of engine oil dipstick (2).

2. If necessary, remove oil filler cap (1) and add oil.

3. Clean the oil filler cap and install the oil filler cap.

i02809746

Engine Oil and Filter - Change

SMCS Code: 1318-044

Note: Some commercial oils that meet API specifications may require shorter oil change intervals. The oil change intervals are determined by close monitoring of the oil condition and engine wear metals. Caterpillar prefers scheduled oil sampling as the proper method of checking engine wear metals.

Consult your Caterpillar dealer for the latest oil recommendations.

⚠ WARNING

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

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

The machine must be level and the parking brake engaged. The oil must be warm and the engine stopped.

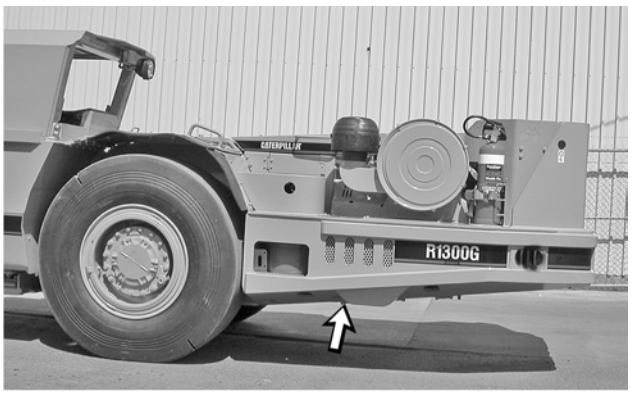


Illustration 289 g01134552

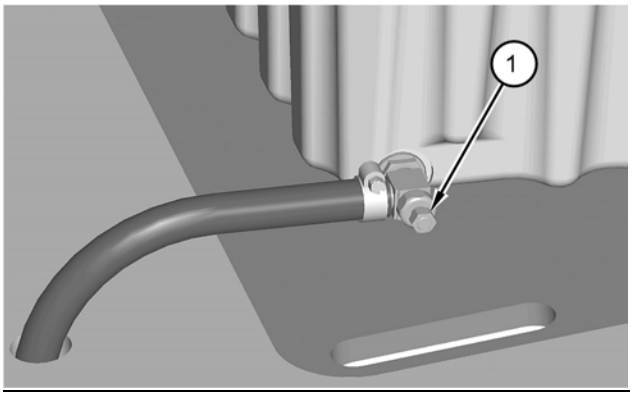


Illustration 290 g01129170

1. Open drain valve (1). Drain the oil into a suitable container.

2. Close drain valve (1).

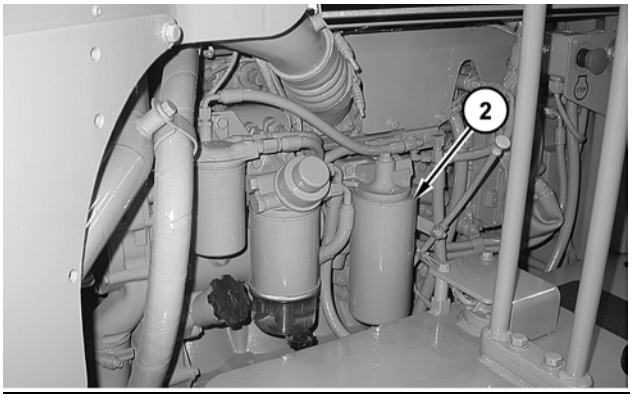


Illustration 291 g01165102

3. Use a strap type wrench to remove used oil filter element (2). Dispose of the used filter properly.

4. Clean the filter housing base. Make sure that all of the old seal is removed from the filter base.

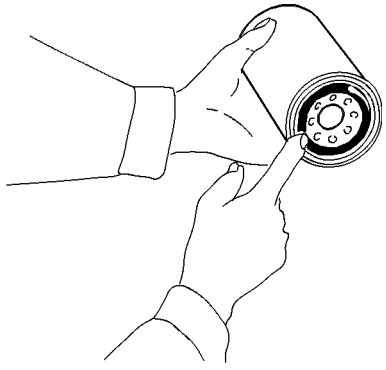


Illustration 292 g00101502

5. Apply a thin film of clean engine oil to the new filter element seal.

6. Install a new filter hand tight until the seal of the filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

Note: There are rotation index marks on the filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the filter, use the rotation index marks as a guide.

7. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Caterpillar filters, use the instructions that are provided with the filter.

Note: You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

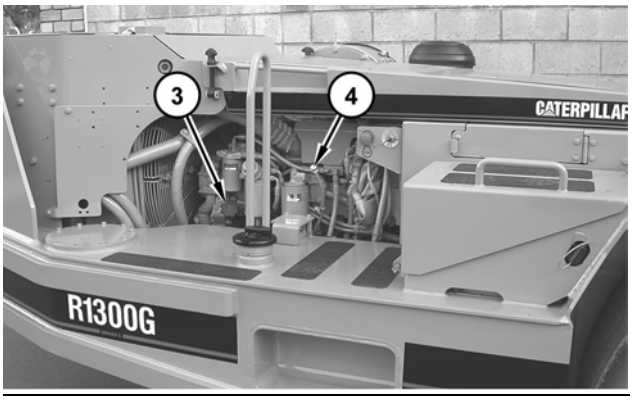


Illustration 293 g01165104

8. Remove engine oil filler cap (3). Fill the engine crankcase with new oil. Clean the filler cap and install the filler cap.

Reference: For information on lubricants and refill capacities, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities”.

9. Start the engine and run the engine at low idle for five minutes. Inspect the engine oil filter for leaks. Stop the engine.

10. Maintain the oil level in the crosshatched region of dipstick (4). Add oil, if necessary.

i02477139

Engine Valve Lash - Check/Adjust

SMCS Code: 1102-025; 1102-535

This maintenance is recommended by Caterpillar as part of a lubrication and preventative maintenance schedule in order to help provide maximum engine life.

NOTICE
Only qualified service personnel should perform this maintenance. Refer to the Service Manual or your Caterpillar dealer for the complete valve lash adjustment procedure.

Operation of Caterpillar engines with improper valve adjustments can reduce engine efficiency. This reduced efficiency could result in excessive fuel usage and/or shortened engine component life.

⚠ WARNING

Ensure that the engine can not be started while this maintenance is being performed. To help prevent possible injury, do not use the starting motor to turn the flywheel.

Hot engine components can cause burns. Allow additional time for the engine to cool before measuring/adjusting valve lash clearance.

i02477138

Engine Water Pump - Inspect

SMCS Code: 1361-040

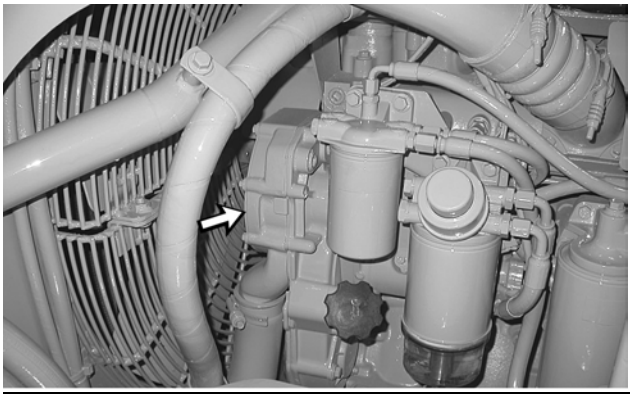


Illustration 294 g01165105

A water pump that has failed may cause severe engine overheating problems. The engine overheating problems could result in the following problems:

- Cracks in the cylinder head.
- Piston seizure.
- Other potential engine damage.

Visually inspect the water pump for leaks. If leaks are found, all of the seals on the water pump must be replaced.

Note: For further information, refer to Disassembly and Assembly, “C6.6 Engine” for the machine that is being serviced.

i02903940

Exhaust Purifier - Inspect/Clean

SMCS Code: 1089-040; 1089-070

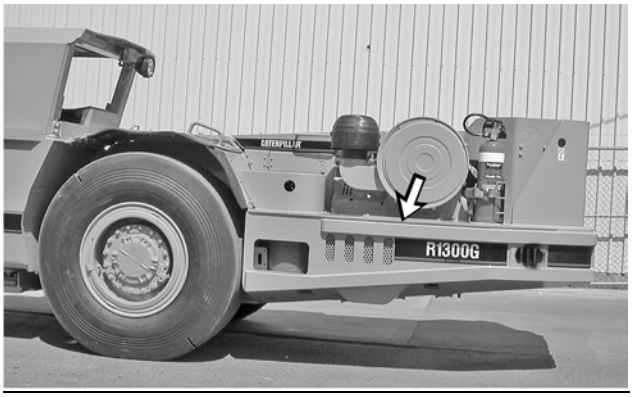


Illustration 295 g01134560

Remove the catalytic purifier cover. Inspect the catalytic purifier for damage and for leaks. If necessary, make repairs. If the catalytic purifier is damaged, consult your Caterpillar dealer.

If the engine has low power, the catalytic purifier may be blocked. Clean the catalytic purifier.

Reference: For information on cleaning the catalytic purifier, refer to the System Operation, Testing and Adjusting, Emission Control Systems for Caterpillar Underground Machines, “Exhaust Purifier - Test”.

i02239863

Fire Suppression System - Check (If Equipped)

SMCS Code: 7401-535

Reference: For detailed information on the fire suppression system service procedures, refer to the fire system manufacturer's service information.

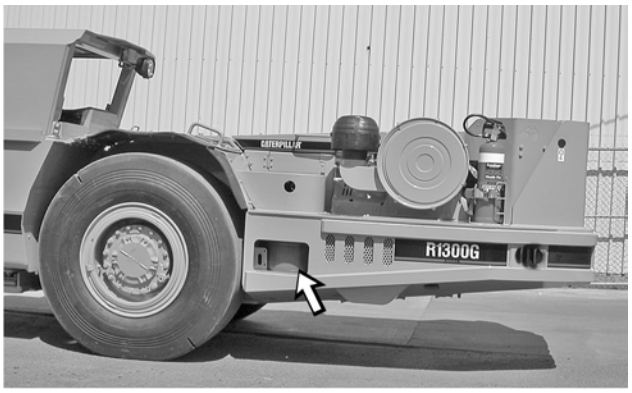


Illustration 296 g01134561

Foam type fire suppression system

Perform fire suppression system checks and service procedures in accordance with the fire suppression system manufacturer's service information.

i02666492

Fuel System Magnetic Filter - Clean

SMCS Code: 1261-070

WARNING

Do not loosen any high pressure fuel lines when the engine is running. The high pressure in the fuel lines can cause personal injury or death. Wait 60 seconds after the engine has stopped to allow pressure to purge before any service or repair is performed on the engine fuel lines.

WARNING

Personal injury or death can result if spilled fuel ignites. Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

To help prevent possible injury, turn the battery disconnect switch to the OFF position when changing fuel filters or water separator elements. Clean up fuel spills immediately.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

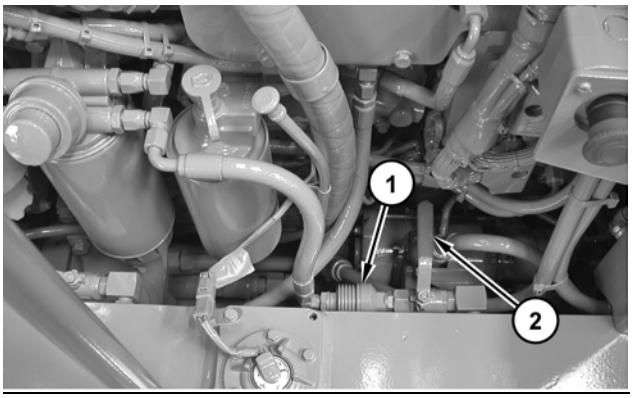


Illustration 297 g01339997

1. Turn fuel tap (2) to the OFF position.
2. Remove magnetic filter (1).

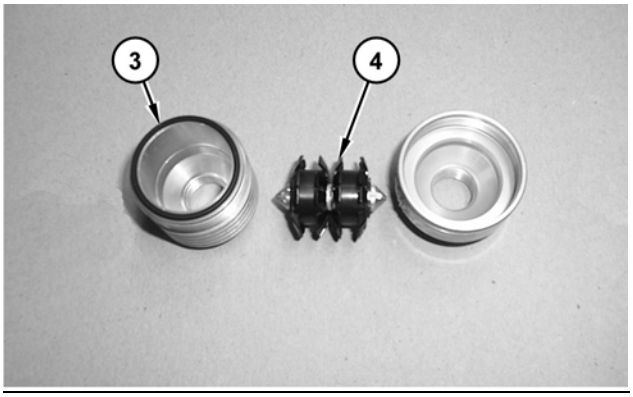


Illustration 298 g01339996

3. Remove magnet (4) from magnetic filter (1).
4. Wash magnet (4) in clean, nonflammable solvent.
5. Inspect seal (3). If seal (3) is damaged, replace the seal.
6. Assemble magnetic filter (1).

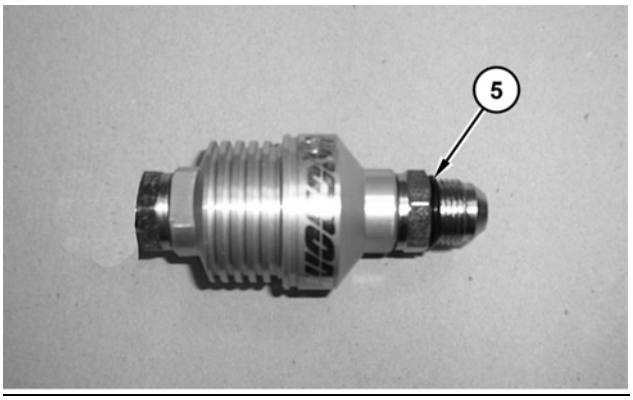


Illustration 299 g01341268

7. Inspect O-ring seal (5). If O-ring seal (5) is damaged, replace the O-ring seal. Install the magnetic filter.
8. Turn fuel tap (2) to the ON position.
9. Prime the fuel system.

   Reference: For information on priming the fuel system, refer to the Operation and Maintenance Manual, “Fuel System - Prime”.

10. Start the engine and inspect the filter for leaks. Make any necessary repairs.

i02239864

Fuel System - Prime

SMCS Code: 1250-548

After changing the fuel filters or if the engine fuel system is run dry, prime (purge) the fuel system to fill the fuel filters and remove air bubbles from the system.

⚠ WARNING

Do not loosen any high pressure fuel lines when the engine is running. The high pressure in the fuel lines can cause personal injury or death. Wait 60 seconds after the engine has stopped to allow pressure to purge before any service or repair is performed on the engine fuel lines.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

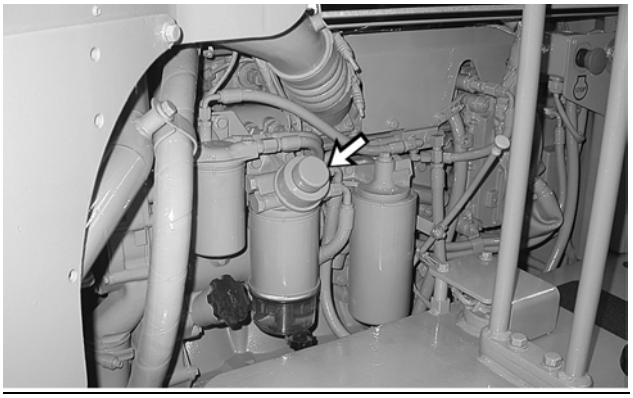


Illustration 300 g01134562

1. Operate the fuel priming pump many times until increased resistance is felt.

NOTICE
Do not crank the engine continuously for more than 30 seconds. Allow the starting motor to cool for two minutes before cranking the engine again.

2. Start the engine. After the engine has started, operate the engine at low idle for a minimum of five minutes. If the engine will not start, further priming is necessary.

Note: Operating the engine for this period of time will help ensure that the fuel system is free of air.

Note: Do not loosen the high pressure fuel line in order to purge air from the fuel system. This procedure is not required.

i02274173

Fuel System Primary Filter (Water Separator) - Drain

SMCS Code: 1263-543

⚠ WARNING

Personal injury or death can result if spilled fuel ignites. Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

To help prevent possible injury, turn the battery disconnect switch to the OFF position when changing fuel filters or water separator elements. Clean up fuel spills immediately.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Illustration 301 g01138874

The drain valve is located on the bottom of the fuel system primary filter.

1. Open the drain valve and allow the water and sediment to drain into a suitable container.

2. Close the drain valve.

i02809747

Fuel System Primary Filter (Water Separator) - Replace

SMCS Code: 1261-510; 1263-510

Replace the primary element when the engine has a loss of power or when the exhaust smoke is black.

⚠ WARNING

Do not loosen any high pressure fuel lines when the engine is running. The high pressure in the fuel lines can cause personal injury or death. Wait 60 seconds after the engine has stopped to allow pressure to purge before any service or repair is performed on the engine fuel lines.

⚠ WARNING

Personal injury or death can result if spilled fuel ignites. Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

To help prevent possible injury, turn the battery disconnect switch to the OFF position when changing fuel filters or water separator elements. Clean up fuel spills immediately.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

NOTICE
Do not fill fuel filters with fuel before installing them. The fuel will not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts. The fuel system should be primed prior to starting the engine.

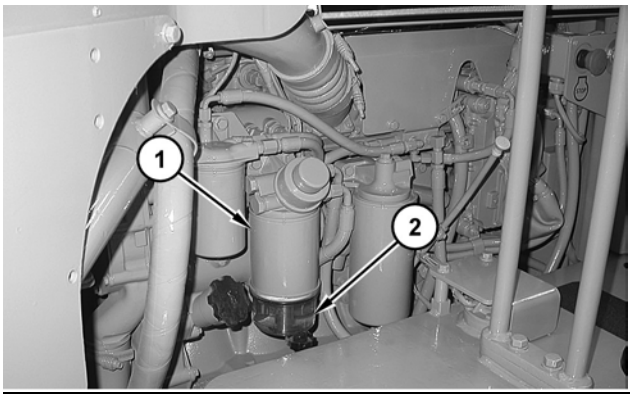


Illustration 302 g01138547

1. Remove fuel filter assembly (1) from the base with a strap-type wrench.

2. Remove bowl (2) and the seal from the filter element and discard the used filter. Inspect the seal. If the seal is damaged, use a new one.

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

4. Wash bowl (2) in clean, nonflammable solvent.

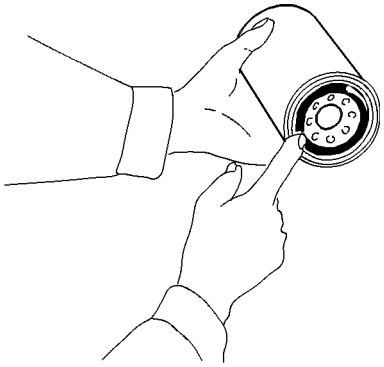


Illustration 303 g00101502

5. Lubricate the sealing surface of the new filter element with clean diesel fuel.

6. Install the seal and bowl (2) on the new primary filter element.

7. Install a new filter hand tight until the seal of the filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

Note: There are rotation index marks on the filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the filter, use the rotation index marks as a guide.

8. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Caterpillar filters, use the instructions that are provided with the filter.

Note: You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

9. Prime the fuel system.

   Reference: For information on priming the fuel system, refer to the Operation and Maintenance Manual, “Fuel System - Prime” for the machine that is being serviced.

10. Start the engine and inspect the filter for leaks. Make any necessary repairs. If the engine has a loss of power or the exhaust smoke is still black, replace the secondary filter.

    Reference: For information on replacing the secondary fuel filter, refer to the Operation and Maintenance Manual, “Fuel System Secondary Filter - Replace” for the machine that is being serviced.

i02662473

Fuel System Secondary Filter - Replace

SMCS Code: 1261-510-SE

⚠ WARNING

Do not loosen any high pressure fuel lines when the engine is running. The high pressure in the fuel lines can cause personal injury or death. Wait 60 seconds after the engine has stopped to allow pressure to purge before any service or repair is performed on the engine fuel lines.

⚠ WARNING

Personal injury or death can result if spilled fuel ignites. Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

To help prevent possible injury, turn the battery disconnect switch to the OFF position when changing fuel filters or water separator elements. Clean up fuel spills immediately.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Do not fill fuel filters with fuel before installing them. The fuel will not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts. The fuel system should be primed prior to starting the engine.

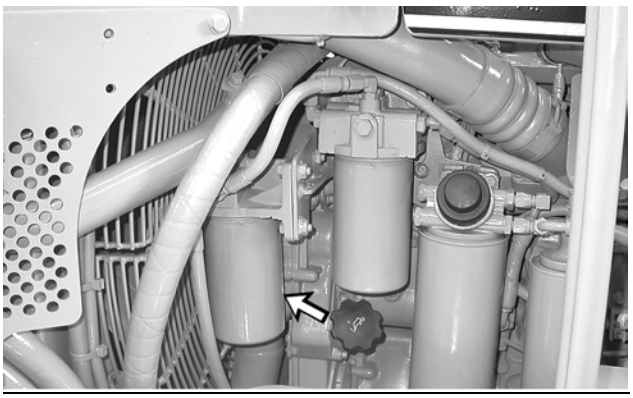


Illustration 304 g01339978

1. Remove the fuel filter element with a strap-type wrench. Discard the used filter element.
2. Clean the filter housing base. Make sure that all of the old seal is removed.

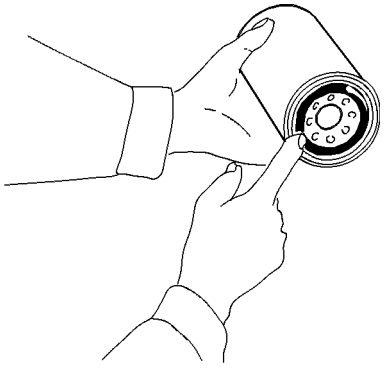


Illustration 305 g00101502

3. Lubricate the sealing surface of the new filter element with clean diesel fuel.
4. Install a new filter hand tight until the seal of the filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

Note: There are rotation index marks on the filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the filter, use the rotation index marks as a guide.

5. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Caterpillar filters, use the instructions that are provided with the filter.

Note: You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

6. Prime the fuel system.

   Reference: For information on priming the fuel system, refer to the Operation and Maintenance Manual, “Fuel System - Prime” for the machine that is being serviced.

7. Start the engine and inspect the filter for leaks. Make any necessary repairs.

i02666377

Fuel System Third Filter - Replace

SMCS Code: 1261-510-SE; 1261-510

⚠ WARNING

Do not loosen any high pressure fuel lines when the engine is running. The high pressure in the fuel lines can cause personal injury or death. Wait 60 seconds after the engine has stopped to allow pressure to purge before any service or repair is performed on the engine fuel lines.

⚠ WARNING

Personal injury or death can result if spilled fuel ignites. Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

To help prevent possible injury, turn the battery disconnect switch to the OFF position when changing fuel filters or water separator elements. Clean up fuel spills immediately.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Do not fill fuel filters with fuel before installing them. The fuel will not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts. The fuel system should be primed prior to starting the engine.

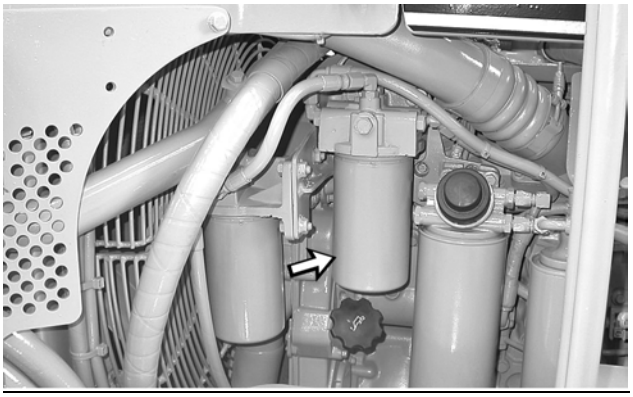


Illustration 306 g01337762

1. Remove the fuel filter element with a strap-type wrench. Discard the used filter.

2. Clean the filter housing base. Make sure that all of the old seal is removed.

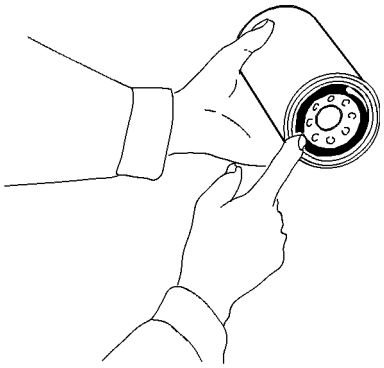


Illustration 307 g00101502

3. Lubricate the sealing surface of the new filter element with clean diesel fuel.

4. Install a new filter hand tight until the seal of the filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

Note: There are rotation index marks on the filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the filter, use the rotation index marks as a guide.

5. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Caterpillar filters, use the instructions that are provided with the filter.

Note: You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

6. Prime the fuel system.

   Reference: For information on priming the fuel system, refer to the Operation and Maintenance Manual, “Fuel System - Prime” for the machine that is being serviced.

7. Start the engine and inspect the filter for leaks. Make any necessary repairs.

i02240656

Fuel Tank Cap and Strainer - Clean

SMCS Code: 1273-070-STR; 1273-070-Z2

Note: Machines equipped with an optional fast-fill fuel system do not contain a breather filter element in the fuel cap. Perform Steps 3 and 5 only to standard machines without the fast-fill fuel system.

Illustration 308 g01138881

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

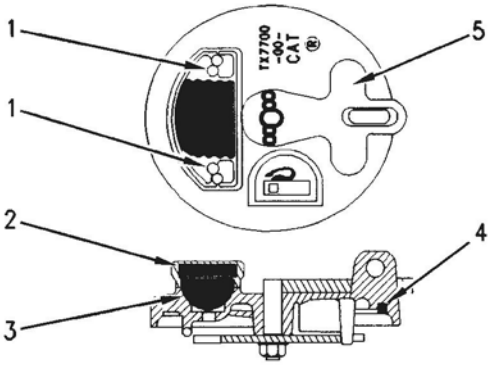


Illustration 309 g00906284

1. Lift lever (5) and turn the lever counterclockwise until the lever stops. Lift the cap straight up to remove the cap.

2. Inspect seal (4) for damage. Replace the seal, if necessary.

3. Remove screws (1), filter assembly (2), valve (3) and gaskets.

4. Wash the cap in a clean, nonflammable solvent.

5. Install a new filter kit in the cap. Install the components in reverse order.

Illustration 310 g01138882

6. Remove the strainer from the filler opening.

7. Wash the strainer in a clean, nonflammable solvent.

8. Install the strainer in the filler opening.

9. Install the fuel tank cap.

i02240676

Fuel Tank Water and Sediment - Drain

SMCS Code: 1273-543-M&S

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

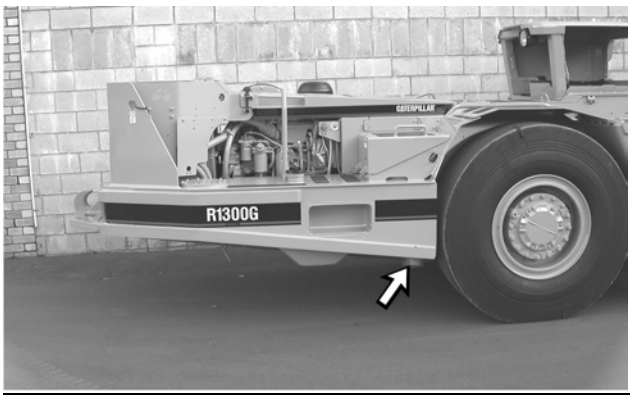


Illustration 311 g01138890

The drain valve is located on the right side of the machine under the fuel tank.

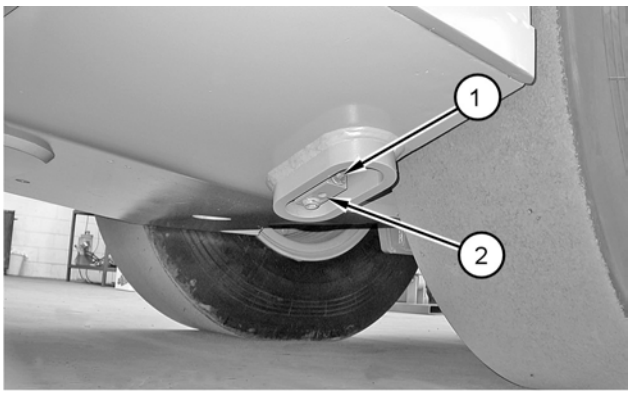


Illustration 312 g01138889

1. Open (turn counterclockwise) drain valve (1) and allow the water and sediment to drain out of opening (2) into a suitable container.
2. Close drain valve (1).

i02240688

Fuses - Replace

SMCS Code: 1417-510

Fuses – Fuses protect the electrical system from damage caused by overloaded circuits. Replace the fuse if the element separates. If the element of a new fuse separates, check the circuit. Repair the circuit, if necessary.

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

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

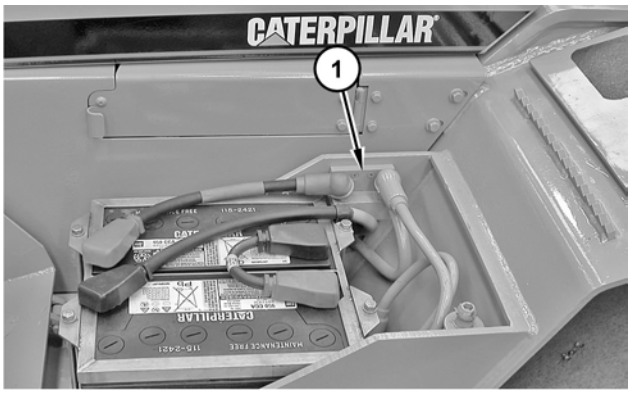


Illustration 313 g01138894
View of the battery compartment

(1) 325 Amp - Fuse.

i01928883

Hydraulic System Oil - Change

SMCS Code: 5050-044

WARNING

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

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Operate the machine for a few minutes in order to warm the hydraulic system oil.

Park the machine on level ground. Lower the bucket to the ground and apply slight downward pressure. Engage the parking brake and stop the engine.

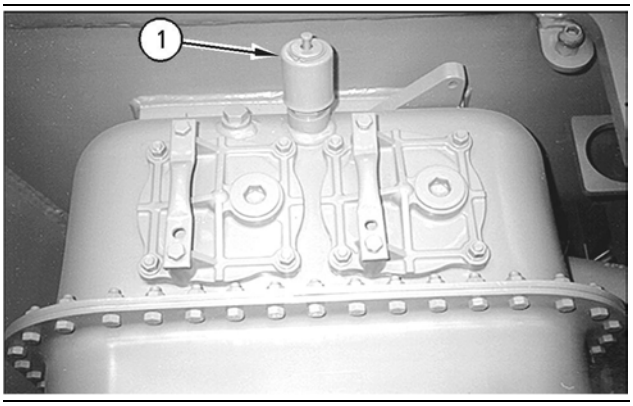


Illustration 314 g01003361

1. Relieve the hydraulic tank pressure by pushing on top of breaker relief valve (1) before removing the oil filler cap.

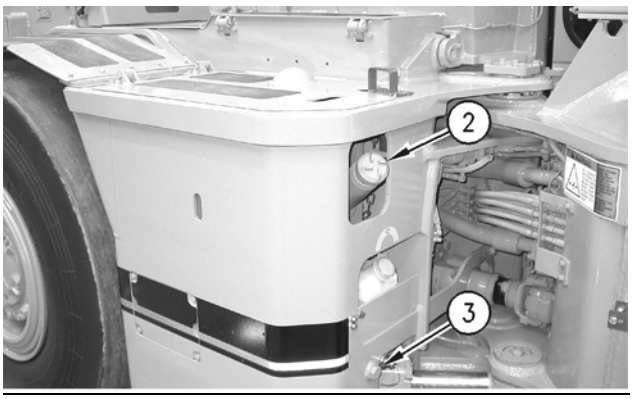


Illustration 315 g01003362

2. Remove oil filler cap (2) slowly to relieve any remaining pressure.

3. Remove hydraulic tank drain plug (3). Drain the oil into a suitable container.

4. Clean the drain plug and install the drain plug.

5. Change the hydraulic system oil filters.

   Reference: For the correct procedure, refer to the Operation and Maintenance Manual, “Hydraulic System Oil Filter - Replace” for the machine that is being serviced.

6. Remove the strainer from the hydraulic oil filler tube.

7. Wash the oil filler cap and the strainer in clean, nonflammable solvent. Allow the oil filler cap and the strainer to dry.

8. Inspect the oil filler cap gasket. Use a new gasket if the used gasket is damaged. Install the strainer in the filler tube.

9. Fill the hydraulic tank with clean oil. Make sure that the oil level is at the “FULL” mark on the sight gauge. Install the filler cap.

   Reference: For information on lubricants and refill capacities, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.

10. Start the engine and run the engine at low idle. Check for leaks.

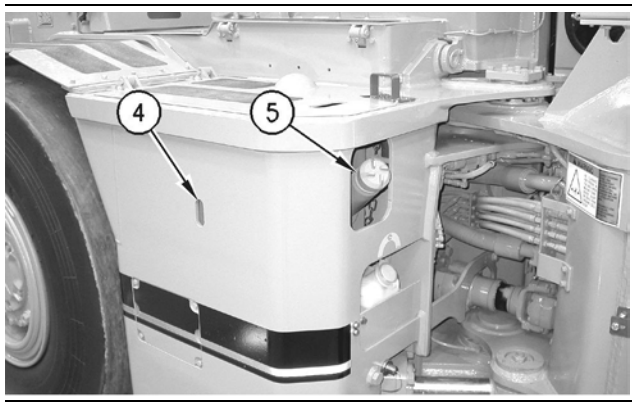


Illustration 316 g01003365

11. Maintain the oil level above the “ADD COLD” mark in sight gauge (4). Add more oil, if necessary through filler tube (5).

Note: The oil must be free of bubbles. If bubbles are present in the oil, air is entering the hydraulic system. Inspect the hydraulic suction line hoses and the hose clamps.

12. Stop the engine.

13. If necessary, tighten any loose clamps or any loose connections. Replace any damaged hoses.

i01928889

Hydraulic System Oil Filter - Replace

SMCS Code: 5068-510

⚠ WARNING

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

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

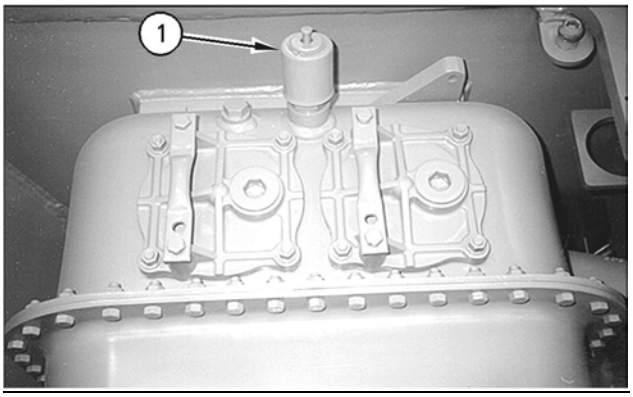


Illustration 317 g01003586

1. Relieve the hydraulic tank pressure by pushing on top of breaker relief valve (1) before changing the filters.

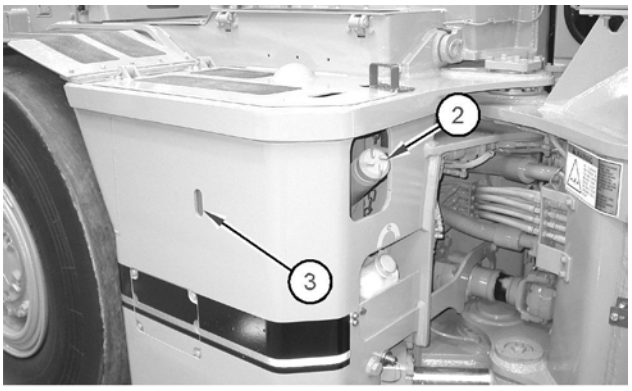


Illustration 318 g01003584

2. Remove oil filler cap (2).

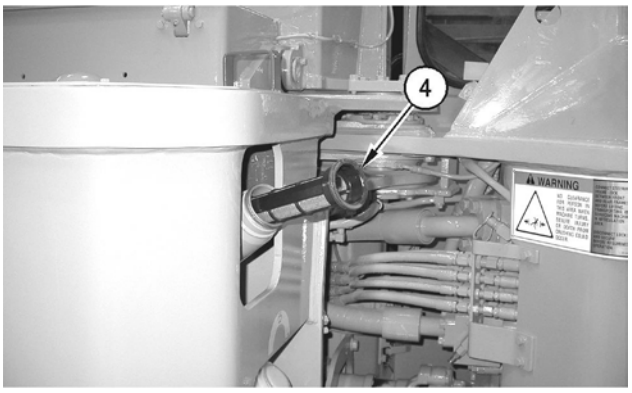


Illustration 319 g01003372

3. Remove hydraulic tank oil filler strainer (4). Wash the strainer in clean, nonflammable solvent.

4. Install filler strainer (4) in the filler tube.

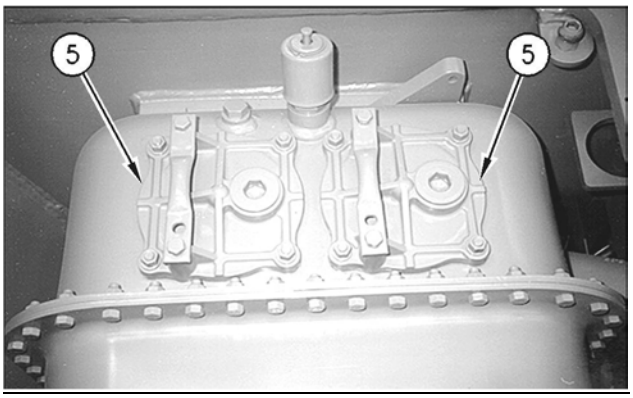


Illustration 320 g01003603

5. Remove filter element covers (5).

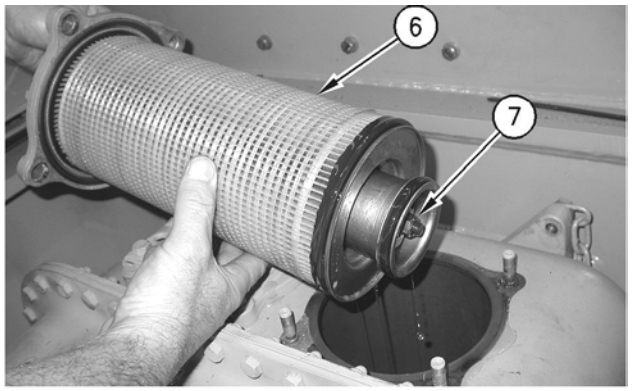


Illustration 321 g01003582

6. Remove locknut (7) retaining each filter element.

7. Remove and discard filter element (6) from each filter element cover.

8. Inspect each cover seal for damage. Replace the cover seals, if necessary.

9. Install new filter elements to each filter element cover. Tighten the locknuts to a torque of 10 ± 1.5 N·m (7 ± 1 lb ft).

10. Install filter element covers (5).

11. Inspect the oil filler cap gasket. Replace the gasket if it is damaged.

12. Maintain the hydraulic oil level above the “ADD COLD” mark in sight gauge (3) with the engine stopped and the bucket level on the ground. Add oil, if necessary through the filler tube.

13. Install oil filler cap (2).

i01929319

Hydraulic System Oil Level - Check

SMCS Code: 5050-535-FLV

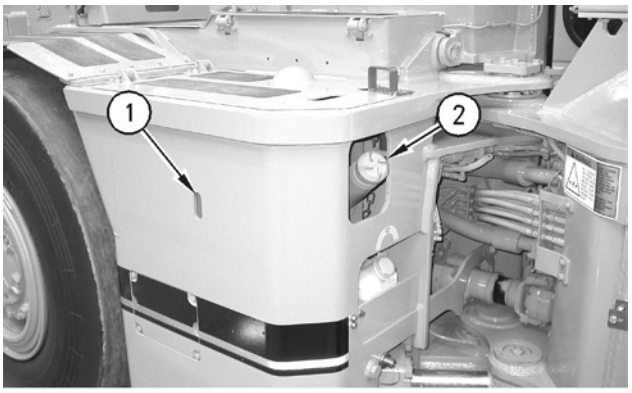


Illustration 322 g01003618

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

1. Maintain the oil level above the “ADD COLD” mark in sight gauge (1) with the engine stopped and the bucket level on the ground.

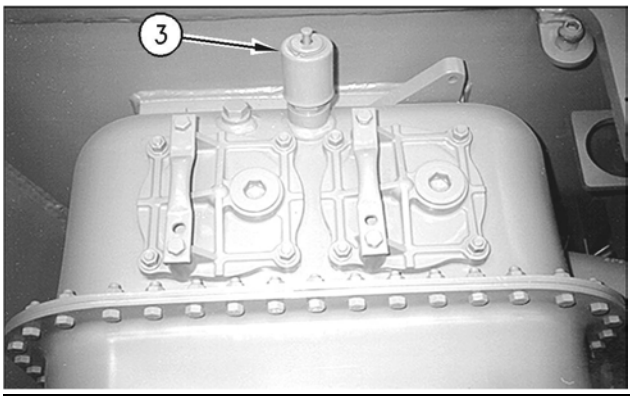


Illustration 323 g01003619

2. Open the hydraulic tank access cover located on the upper right side of the machine.

3. Relieve the hydraulic tank pressure by pushing on top of breaker relief valve (3) before removing the filler cap.

4. Remove oil filler cap (2) slowly to relieve any remaining pressure. Add oil, if necessary, through the filler tube.

5. Clean the oil filler cap and install the oil filler cap.

i01929320

Hydraulic Tank Breaker Relief Valve - Clean

SMCS Code: 5118-070

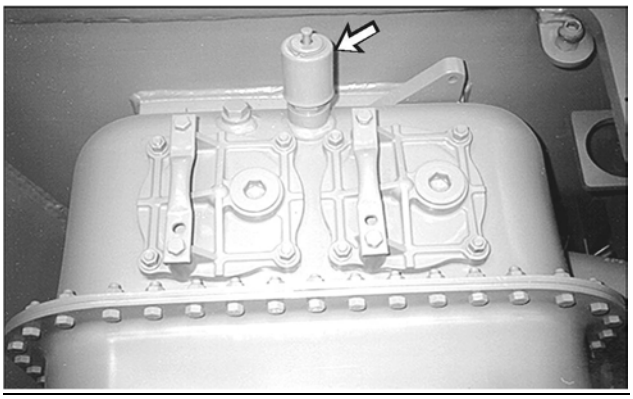


Illustration 324 g01003620

1. Depress the button on the top of the breaker relief valve in order to relieve any pressure in the hydraulic tank.
2. Remove the breaker relief valve.
3. Clean the breaker relief valve in a clean, nonflammable solvent. Shake the breaker relief valve dry or use pressure air.
4. Install the breaker relief valve.

i02490750

Indicators and Gauges - Test

SMCS Code: 7000-081; 7450-081

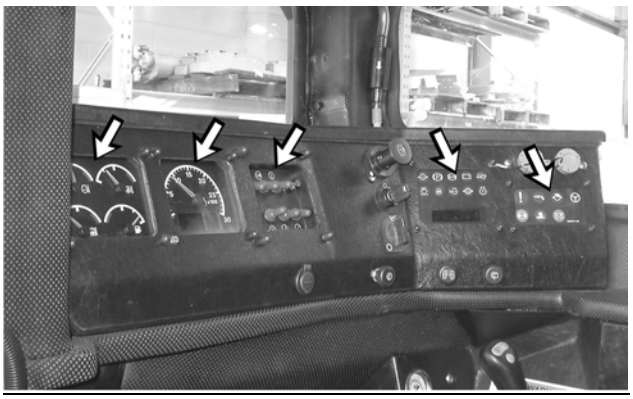


Illustration 325 g01244504

Before you operate the machine, perform the following checks and make any necessary repairs:

- Look for broken lenses on the gauges. Also, look for broken indicator lights, broken switches and other broken components in the operator's station.
- Move the engine start switch key to the ON position and check the Caterpillar Monitoring System self test.

Reference: For information on the Caterpillar Monitoring System self test, refer to the Operation and Maintenance Manual, "Caterpillar Monitoring System - Self Test" for the machine that is being serviced.

- Make sure the parking brake is engaged. Start the engine.
- Check for oil leaks. Repair any oil leaks around the covers or around the hoses.
- Look for inoperative gauges.
- Turn on all machine lights. Check for proper operation.
- Sound the horn.
- Stop the engine.

i01929306

Lift Arm and Cylinder Bearings - Lubricate

SMCS Code: 5102-086-BD; 6107-086-BD

NOTICE
Check that the lines attached to all the remote grease fittings are undamaged. If the grease lines are split, grease will not reach the components that require lubricating. Machine damage will result.

Wipe off the fittings before any lubricant is applied.

⚠ WARNING

No clearance for person in this area when bucket control group lowers. Severe injury or death from crushing could occur. Be sure that the bucket control group safety pins are installed before working under or near the bucket control group.

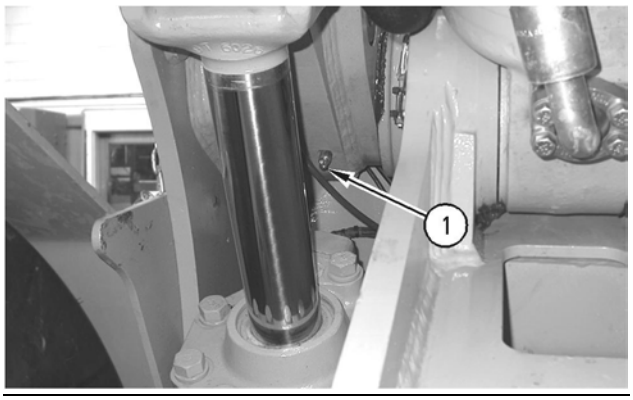


Illustration 326 g01005452

1. Apply lubricant through one fitting (1) on each side of the machine for the rear lift arm bearing (2 points).

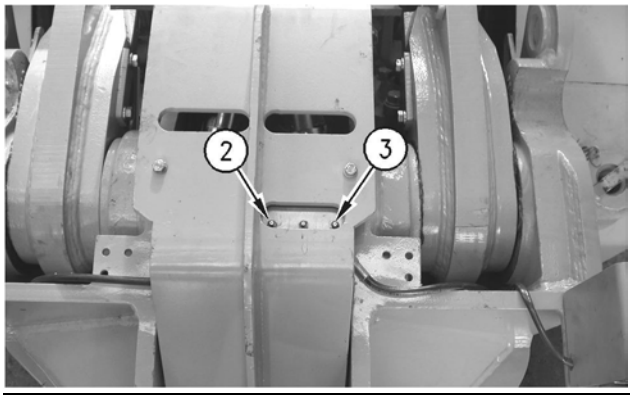


Illustration 327 g01005451

2. Apply lubricant through remote mounted fitting (2) for the bearing at the head end of the left lift cylinder.

3. Apply lubricant through remote mounted fitting (3) for the bearing at the head end of the right lift cylinder.

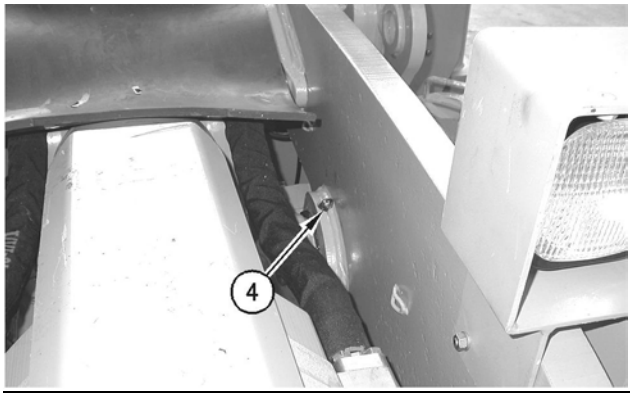


Illustration 328 g01005453

4. Apply lubricant through one fitting (4) on each side of the machine for the bearing at the rod end of the lift cylinder (2 points).

i01773398

Oil Filter - Inspect

SMCS Code: 1308-507; 3067-507; 5068-507

Inspect a Used Filter for Debris

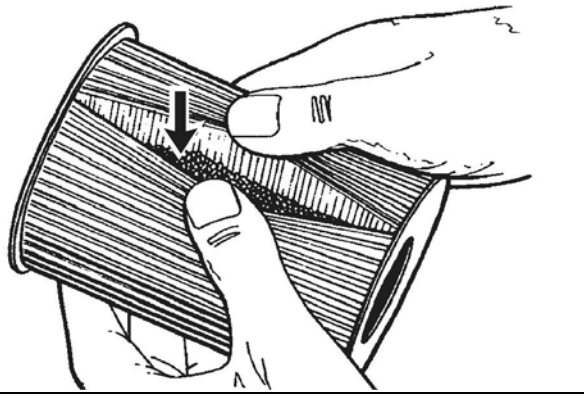


Illustration 329 g00907074

The Element is Shown with Debris

Use a 4C-5084 Filter Cutter to cut the filter element open. Spread apart the pleats and inspect the element for metal and for other debris. An excessive amount of debris in the filter element can indicate a possible failure.

If metals are found in the filter element, a magnet can be used to differentiate between ferrous and nonferrous metals.

Ferrous metals can indicate wear on steel parts and on cast iron parts.

Nonferrous metals can indicate wear on the aluminium parts of the engine, such as main bearings, rod bearings or turbocharger bearings.

Small amounts of debris may be found in the filter element. This could be caused by friction and by normal wear. Consult your Caterpillar dealer to arrange for further analysis if an excessive amount of debris is found.

Using an oil filter element that is not recommended by Caterpillar can result in severe engine damage to engine bearings, to the crankshaft, and to other parts. This can result in larger particles in unfiltered oil. The particles could enter the lubricating system and the particles could cause damage.

i02431110

Pressure Sensor (Transmission Oil) - Test

SMCS Code: 1408-081-PXS

Perform the following test to check that the pressure sensor is functioning correctly.

Note: Before testing the operation of the pressure sensor, test the holding ability of the machine parking brake.

Reference: For more information on testing the parking brake holding ability, refer to the Operation and Maintenance Manual, “Braking System - Test”.

1. Be sure the area around the machine is clear of personnel and obstructions.
2. Block the wheels.
3. Start the engine and raise the bucket slightly.

Illustration 330 g00996201

4. Move the parking brake control to the OFF position in order to disengage the parking brake.

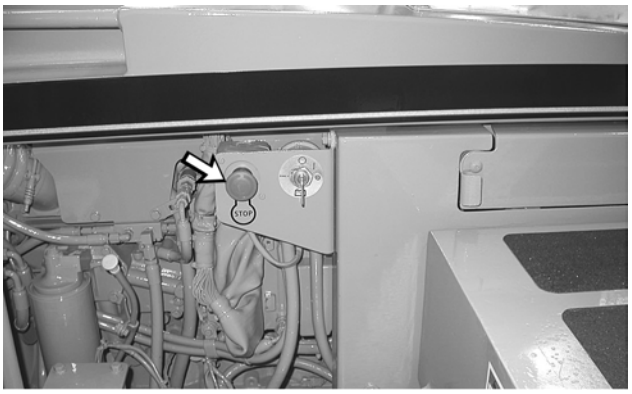


Illustration 331 g01164735

5. Move the engine shutdown switch to the OFF position. The engine will stop.

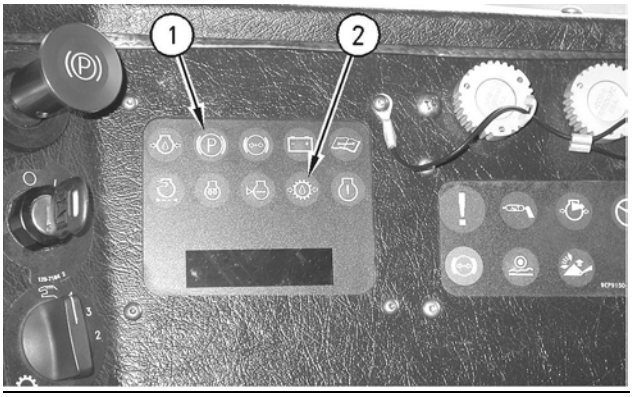


Illustration 332 g01003909

6. Parking brake indicator (1) will come on and flash. Transmission oil pressure indicator (2) will come on and flash.
7. If the transmission oil pressure indicator or the parking brake indicator did not come on, investigate the cause or consult your Caterpillar dealer.

i02431111

Radiator Core - Clean

SMCS Code: 1353-070-KO

To access the radiator for cleaning, perform the following procedure.

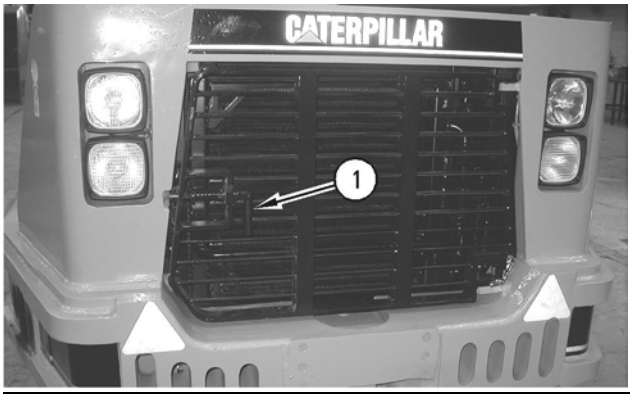


Illustration 333 g01003917

1. Release latch (1) and open the grille at the rear of the machine.

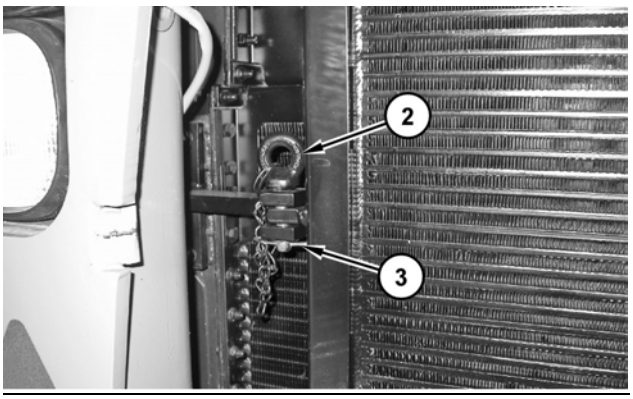


Illustration 334 g01214701

2. Remove pins (2) and (3) from the hydraulic oil cooler mounting bracket.

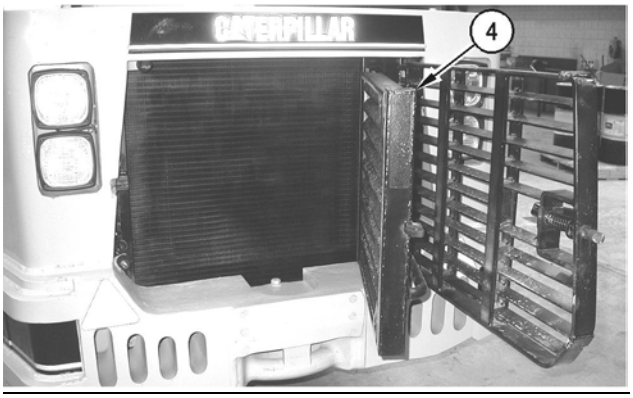


Illustration 335 g01003924

3. Swing hydraulic oil cooler (4) away from the radiator. This will allow access to the radiator for cleaning.

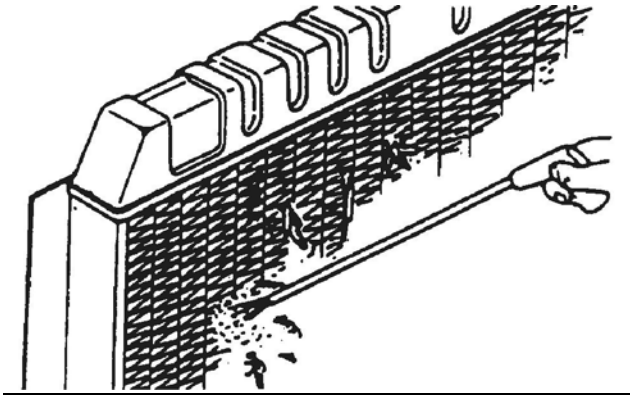


Illustration 336 g00907092

4. You can use compressed air, high pressure water or steam to remove dust and other debris from the radiator core. However, the use of compressed air is preferred.

Note: Care must be taken when you are using high pressure water. High pressure water can cause damage to the radiator. Using a water spray nozzle on the pressure washer which will disperse the water pressure is preferred.

5. After cleaning, swing the oil cooler back towards the radiator and install pins (2) and (3).

6. Close the grille.

Reference: For the complete procedure for cleaning the radiator core, refer to Special Publication, SEBD0518, “Know Your Cooling System” for the machine that is being serviced.

i01773405

Rear Axle Trunnion Bearings - Inspect

SMCS Code: 3268-040-BD

Inspect the rear axle trunnion bearings for excessive wear.

Reference: For information on the rear axle trunnion bearings, refer to the Specifications, “Power Train” for the machine that is being serviced.

Replace any parts that are worn or damaged.

i02431112

Rear Axle Trunnion Bearings - Lubricate

SMCS Code: 3268-086-BD

NOTICE
Check that the lines attached to all the remote grease fittings are undamaged. If the grease lines are split, grease will not reach the components that require lubricating. Machine damage will result.

Wipe off the fittings before any lubricant is applied.

The fittings are located in the right side of the machine articulating hitch.

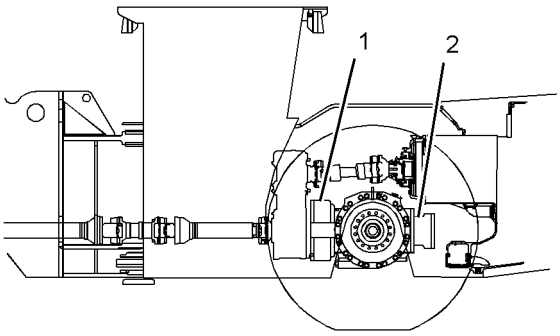


Illustration 337 g01214702

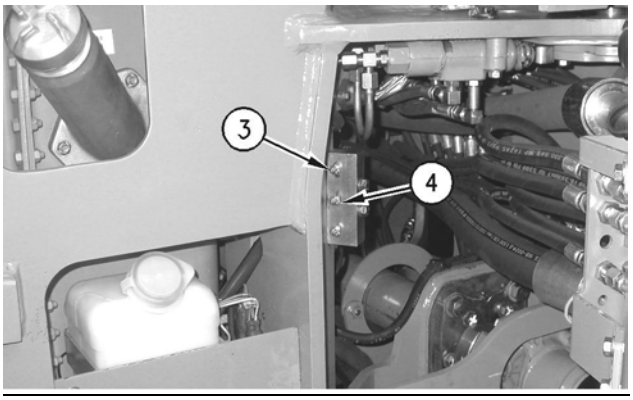


Illustration 338 g01005156

1. Apply lubricant through remote mounted fitting (3) for front trunnion bearing (1).
2. Apply lubricant through remote mounted fitting (4) for rear trunnion bearing (2).

i02450766

Refrigerant Dryer - Replace

SMCS Code: 1808-510; 1808; 7322-510; 7322-535; 7322-710

WARNING

Personal injury can result from contact with refrigerant.

Contact with refrigerant can cause frost bite. Keep face and hands away to help prevent injury.

Protective goggles must always be worn when refrigerant lines are opened, even if the gauges indicate the system is empty of refrigerant.

Always use precaution when a fitting is removed. Slowly loosen the fitting. If the system is still under pressure, release it slowly in a well ventilated area.

Personal injury or death can result from inhaling refrigerant through a lit cigarette.

Inhaling air conditioner refrigerant gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting air conditioner refrigerant gas, can cause bodily harm or death.

Do not smoke when servicing air conditioners or wherever refrigerant gas may be present.

Use a certified recovery and recycling cart to properly remove the refrigerant from the air conditioning system.

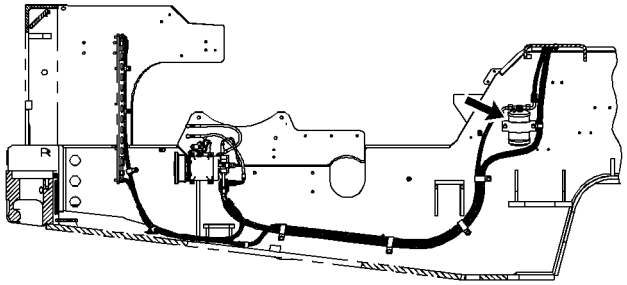


Illustration 339 g01223599

The refrigerant dryer is located on the left side of the rear frame. The dryer contains the desiccant that dries the liquid refrigerant.

The moisture indicator is located on the dryer. The indicator should be checked at the end of each shift. If the color is blue, the system is dry. If the color is pink, the system contains moisture. The dryer must be changed.

Note: The “R-134a” refrigerant dryer should be replaced annually. Extremely humid operating conditions may require more frequent replacement of the dryer. The dryer should also be replaced if the air conditioning system has been leaking or if the system has been opened for service repair.

Note: The dryer should be changed once per year even though the indicator remains blue.

Reference: Refer to Service Manual, SENR5664, “Air Conditioning and Heating R-134a” for the correct procedure.

i01929792

Ride Control Accumulator - Check (If Equipped)

SMCS Code: 5077-535-R6

Illustration 340 g00947096

The ride control accumulator reduces the fore and aft pitching motion of the machine. If the machine seems to be bouncing excessively, check the charge in the ride control accumulator.

Note: Special tools and equipment are required to test the accumulator.

Reference: For the correct testing and charging procedures for the ride control accumulator, refer to the hydraulic system, Systems Operation, Testing and Adjusting, “Ride Control Accumulator - Test and Charge” for the machine that is being serviced or consult your Caterpillar dealer.

i02431115

Rim - Inspect

SMCS Code: 4209-040

Illustration 341 g01214707

The interval for inspection of the rim and the rim components is determined by the work-site conditions and machine usage. The work-site conditions and machine usage may include but are not limited to:

- Ground conditions
- Corrosive environments
- Operating cycles

Harsh operating cycles or harsh environments can shorten the service life of the rim and the rim components. Reduce the interval for inspection in harsh operating cycles or in harsh environments.

Inspect the rim and the rim components for damage, cracks and wear. Replace any rims or rim components that are damaged. Replace any rims or rim components that are cracked. Replace any rims or rim components that are worn.

For further information, consult your Caterpillar dealer.

i02242458

Rollover Protective Structure (ROPS) - Inspect

SMCS Code: 7325-040

NOTICE
Do not attempt to straighten the ROPS structure. Do not repair the ROPS by welding reinforcement plates to the structure.

If there are any cracks in the welds, in the castings, or in any metal section of the ROPS, consult your Caterpillar dealer for repairs.

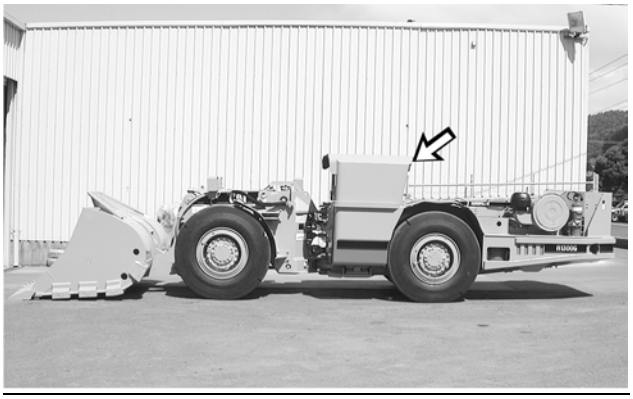


Illustration 342 g01130206

Inspect the ROPS for bolts that are loose or damaged. Use original equipment parts only to replace bolts that are damaged or missing. Tighten the mounting bolts to the correct torque.

Reference: For the correct bolt torques, refer to the Power Train Specifications, “Cab Mounting” for the machine that is being serviced.

Note: Apply thread lubricant to all ROPS bolt threads before installation. Failure to apply lubricant can result in improper bolt torque.

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

Do not repair the ROPS by welding reinforcement plates to the ROPS. Consult your Caterpillar dealer for repair of cracks in any welds, in any castings, or any metal section of the ROPS.

Ensure any certification labels are firmly fixed and legible.

i02429589

Seat Belt - Inspect

SMCS Code: 7327-040

Always check the condition of the seat belt and the condition of the seat belt mounting hardware before you operate the machine. Replace any parts that are damaged or worn before you operate the machine.

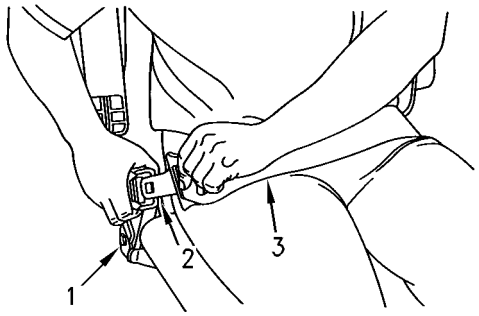


Illustration 343 g00932801
Typical example

Check the seat belt mounting hardware (1) for wear or for damage. Replace any mounting hardware that is worn or damaged. Make sure that the mounting bolts are tight.

Check buckle (2) for wear or for damage. If the buckle is worn or damaged, replace the seat belt.

Inspect the seat belt (3) for webbing that is worn or frayed. Replace the seat belt if the seat belt is worn or frayed.

Consult your Caterpillar dealer for the replacement of the seat belt and the mounting hardware.

Note: Within three years of the date of installation or within five years of the date of manufacture, replace the seat belt. Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.

If your machine is equipped with a seat belt extension, also perform this inspection procedure for the seat belt extension.

i02429594

Seat Belt - Replace

SMCS Code: 7327-510

Within three years of the date of installation or within five years of the date of manufacture, replace the seat belt . Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.

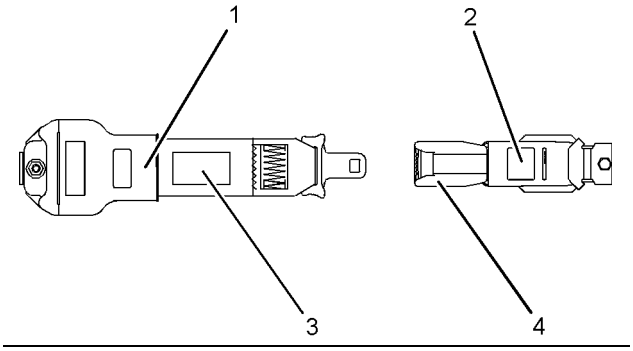


Illustration 344 g01152685

(1) Date of installation (retractor)
(2) Date of installation (buckle)
(3) Date of manufacture (tag) (fully extended web)
(4) Date of manufacture (underside) (buckle)

Consult your Caterpillar dealer for the replacement of the seat belt and the mounting hardware.

If your machine is equipped with a seat belt extension, also perform this replacement procedure for the seat belt extension.

i02444818

Service Inspection

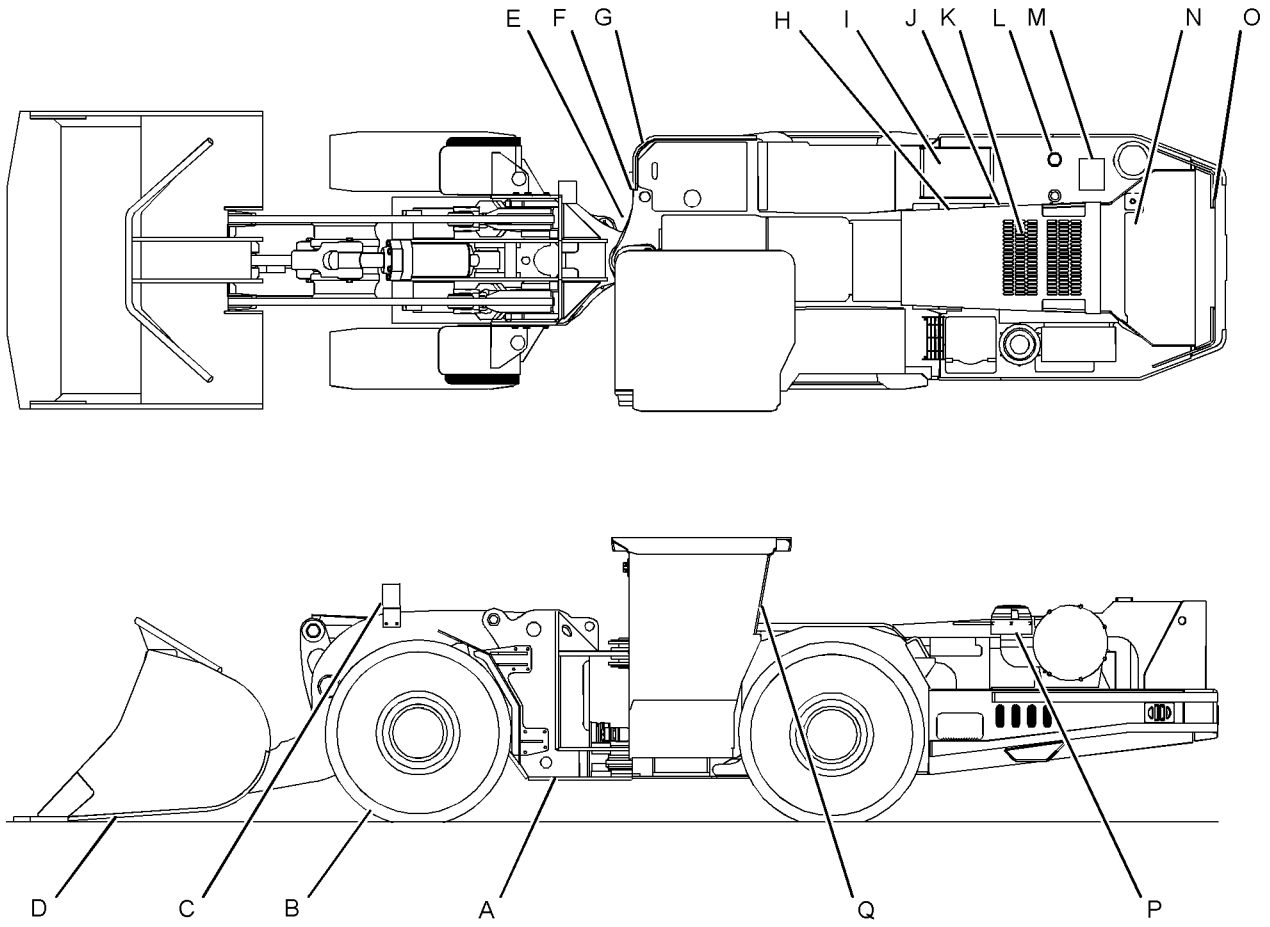
SMCS Code: 7000

For maximum service life of the machine, make a thorough service inspection when you perform lubrication and maintenance work. Look around the machine and under the machine. Inspect the condition of all major components. Check all grease fittings. Look for the following discrepancies:

- loose bolts
- trash buildup
- oil, coolant, or fuel leaks
- broken parts or worn parts
- cracks in the frames

Remove any trash and any debris. As needed, adjust the tire inflation. Make any necessary repairs. Make sure that all loose connections and all parts are tightened to the specified torques. Replace any missing parts before starting the engine or before operating the machine.

Inspect the machine for leaks. If leaks are observed, find the source of the leak and correct the leak. If leaks are suspected, check the fluid levels more frequently than the recommended intervals.

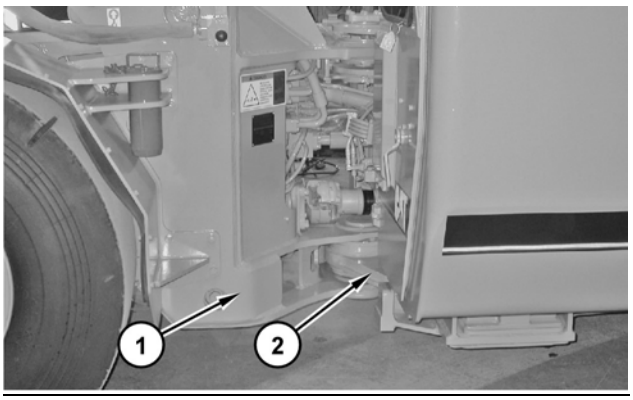


g01130207

Illustration 345

Inspection points for the service inspection

(A) Frame
(B) Tires
(C) Front lights
(D) Bucket and linkage
(E) Steering hydraulic system
(F) Window washer bottle
(G) Hydraulic system
(H) Power train
(I) Handholds and steps
(J) Ground level controls
(K) Engine
(L) Fuel tank
(M) Automatic lubrication system (if equipped)
(N) Cooling system
(O) Rear lights
(P) Engine air precleaner
(Q) Rollover Protective Structure (ROPS)



g01221571

Illustration 346

(A) Inspect front frame (1) and rear frame (2). Check for cracks or damage.

(B) Inspect tires for cuts, gouges and proper inflation. Remove large rocks from the treads. Look for abnormal wear or uneven wear that may indicate mechanical problems elsewhere. Make sure that you check the inside of the tire for damage or for wear. Inspect the tire treads for damage. If necessary, repair the tires.

Look for damaged rims. Replace any missing valve caps. Check the wheels for nuts that are loose or missing.

Note: Rust behind a nut may indicate that the nut is loose. Shiny metal areas around a nut may indicate that the nut is loose.

Inspect the axles, the differentials, the wheel brakes and the final drives for leaks. Check for damaged bolts, loose bolts or missing bolts. Tighten loose bolts and replace missing bolts.

(C) Inspect the front lights for broken lamps, lenses and proper operation. Replace broken lamps and lenses.

(D) Inspect the bucket and the linkages for wear and for damage.

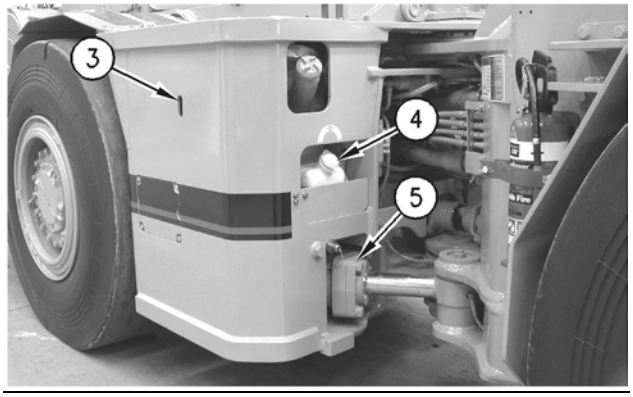


Illustration 347 g01004867

(E) Inspect the steering hydraulic system for leaks, worn hoses and damaged lines. If necessary repair leaks, worn hoses and damaged lines. Inspect steering cylinder (5) and the steering cylinder mounts. Inspect the articulating hitch for wear, damage, and loose or missing bolts. If necessary, make repairs.

(F) Check the fluid level in window washer bottle (4).

(G) Inspect the hydraulic system. Check for leaks, worn hoses and damaged lines. Repair any leaks, worn hoses and damaged lines.

Check the oil level in the hydraulic tank in sight gauge (3). Make sure that the filler cap is installed. Inspect the tank covers for damaged bolts, loose bolts or missing bolts. Tighten loose bolts and replace missing bolts. Check the welds and mounting brackets for the hydraulic tank. Inspect the tank for leaks or for damage. If necessary, make repairs.

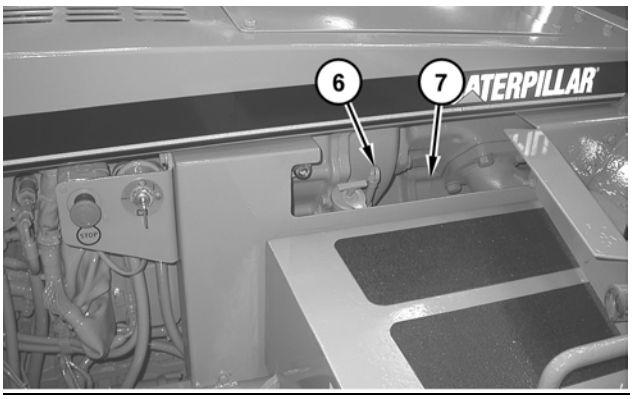


Illustration 348 g01165097

(H) Inspect the hydraulic systems for the torque converter and for transmission (7). Use dipstick (6) to check the transmission oil level. Check for leaks from the torque converter and from the transmission. Check for worn hoses and for damaged lines. Repair any leaks, worn hoses and damaged lines.

(I) Inspect the steps, the walkways and the handholds. Remove any debris. Repair any damage or replace any damaged parts.

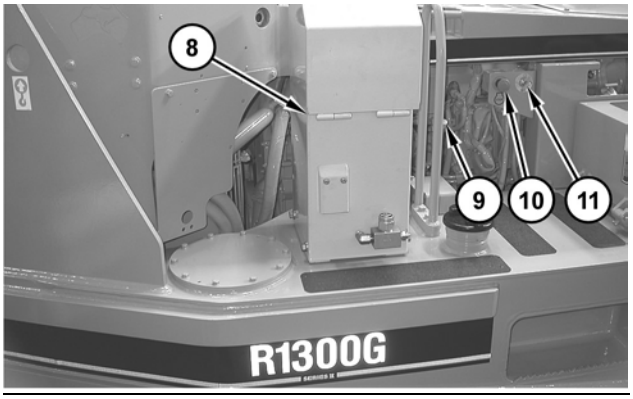


Illustration 349 g01165099

(J) Inspect the ground level controls for proper operation. Replace a damaged or worn battery disconnect switch (11). Replace a damaged or worn engine shutdown switch (10).

(K) Inspect the engine for any obvious component damage. Use dipstick (9) to check the engine oil level. Check for oil leaks, coolant leaks, and exhaust leaks. Check the belt of the engine for proper tension and for good condition.

(L) Inspect the fuel tank. Make sure that the filler cap is installed correctly. Look for any leaks or damage to the fuel tank.

(M) Inspect the automatic lubrication system (if equipped). Inspect reservoir (8) for leaks. Fill reservoir (8) with lubricant. Check all of the grease fittings.

Reference: For more information about the automatic lubrication system, refer to the Operation and Maintenance Manual, “Automatic Lubrication Grease Tank - Fill (If Equipped)” for the machine that is being serviced.

(N) Check the coolant level in the cooling system. Inspect the cooling system for leaks, worn hoses and debris. Repair any leaks and damaged hoses. Remove any debris that could block the air flow through the radiator.

Reference: For more information about cleaning the radiator core, refer to the Operation and Maintenance Manual, “Radiator Core - Clean” for the machine that is being serviced.

(O) Inspect the rear lights for broken lamps, lenses and proper operation. Replace broken lamps and lenses.

Illustration 350 g01244509

(P) Check engine air precleaner (12) for accumulated debris. If necessary, clean the engine air precleaner.

Reference: Refer to the Operation and Maintenance Manual, “Engine Air Precleaner - Clean” for the machine that is being serviced.

(Q) Inspect the Rollover Protective Structure (ROPS) for cracks in welds, castings or any metal section on the ROPS. Check the mounting bolts and the mounting pads for damage. Consult your Caterpillar dealer for necessary repairs. Inspect the operator station. Check the Caterpillar Monitoring System for diagnostic codes. Correct any discrepancies.

i01929783

Steering Cylinder Bearings - Lubricate

SMCS Code: 4303-086-BD

NOTICE
Check that the lines attached to all the remote grease fittings are undamaged. If the grease lines are split, grease will not reach the components that require lubricating. Machine damage will result.

Wipe off the fittings before any lubricant is applied.

Illustration 351 g01005154

1. Apply lubricant through one fitting for the bearing at the rod end of the steering cylinder.

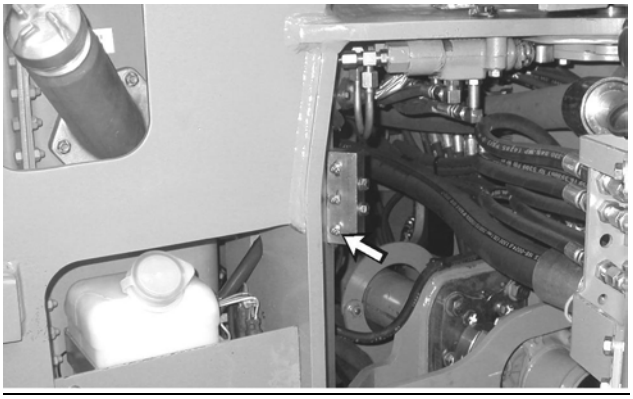


Illustration 352 g01005155

2. Apply lubricant through the remote mounted fitting for the bearing at the head end of the steering cylinder.

i02475895

Steering Lockout (STIC Steering) - Test

SMCS Code: 3034-081

1. Move the machine to an open area away from personnel and obstructions.
2. Park the machine on a surface that is hard and level.
3. Engage the parking brake.
4. Depress the service brake pedal to apply the service brakes. Disengage the parking brake.
5. Raise the bucket slightly.

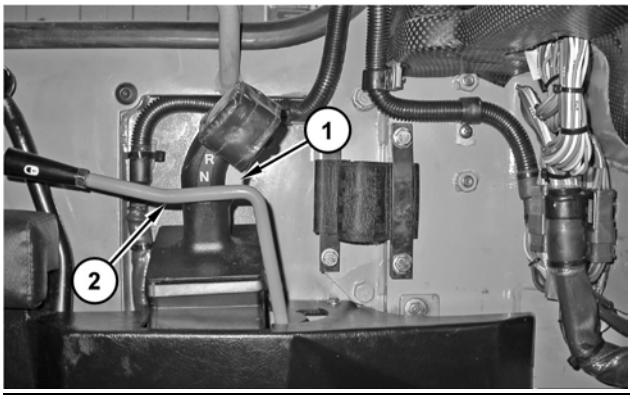


Illustration 353 g01235825

6. With steering and transmission lock lever (2) in the LOCKED position (as shown), attempt to steer the machine in a left and right direction. The machine should not steer.
7. Move transmission direction control (1) to either the FORWARD position or the REVERSE position. The transmission should not engage.
8. Lower the bucket to the ground. Engage the parking brake and stop the engine.
9. Move the steering and transmission lock lever to the UNLOCKED position.
10. Open the operator station door approximately 150 mm to 200 mm (5.90 inch to 7.87 inch). Steering and transmission lock lever (2) should move to the LOCKED position.
11. Close the operator station door.

NOTICE
If the machine steered or the transmission engaged while testing the steering lockout or the steering and transmission lock lever did not move to the LOCKED position while testing the steering lockout, contact your Caterpillar dealer. Have the dealer inspect and repair the steering lockout before returning the machine to operation.

i01929796

Steering Stop - Check

SMCS Code: 7188-535

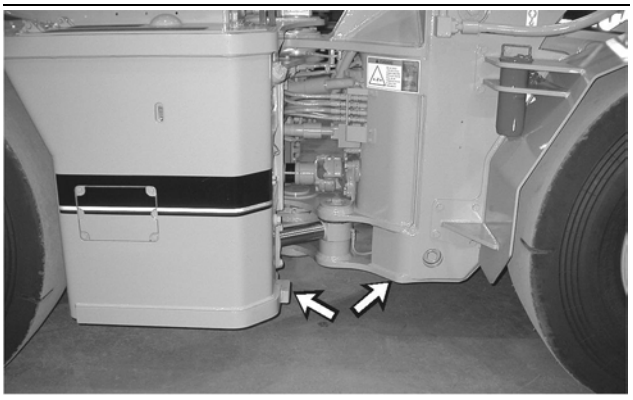


Illustration 354 g01003927

Check the clearance between the front frame and the rear frame steering stops.

Reference: For additional information about the correct procedure, refer to Steering System, Systems Operation, Testing and Adjusting, “Neutralizer Valve” for the machine that is being serviced.

i01929784

Tilt Cylinder and Tilt Lever Bearings - Lubricate

SMCS Code: 5104-086-BD; 6116-086-BD

NOTICE
Check that the lines attached to all the remote grease fittings are undamaged. If the grease lines are split, grease will not reach the components that require lubricating. Machine damage will result.

Wipe off the fittings before any lubricant is applied.

Illustration 355 g01005178

1. Apply lubricant through one fitting for the bearing at the center pivot of the tilt lever.

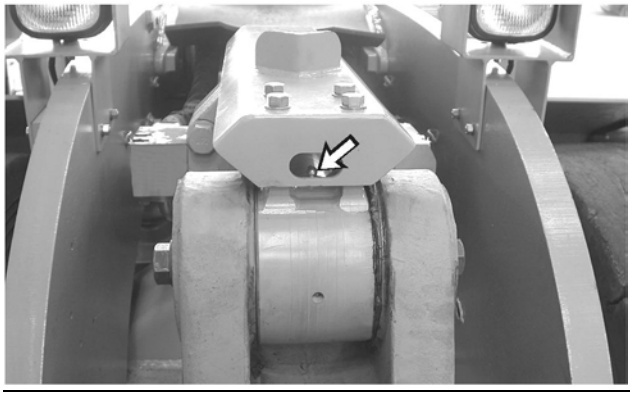


Illustration 356 g01005179

2. Apply lubricant through one fitting for the bearing at the rod end of the tilt cylinder.

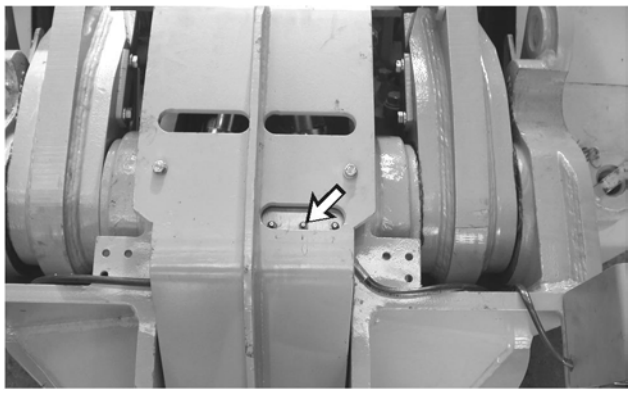


Illustration 357 g01005181

3. Apply lubricant through the remote mounted fitting for the bearing at the head end of the tilt cylinder.

i02242488

Tilt Linkage Bearings - Lubricate

SMCS Code: 6117-086-BD

Wipe off the fittings before any lubricant is applied.

Illustration 358 g01130249

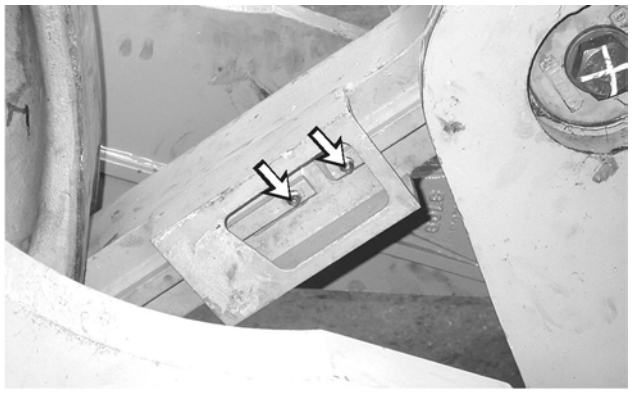


Illustration 359 g01003616

1. Apply lubricant through one fitting for each of the bucket tilt linkage bearings (2 points).

i02242489

Tire Inflation - Check

SMCS Code: 4203-535-AI; 4203-535-PX

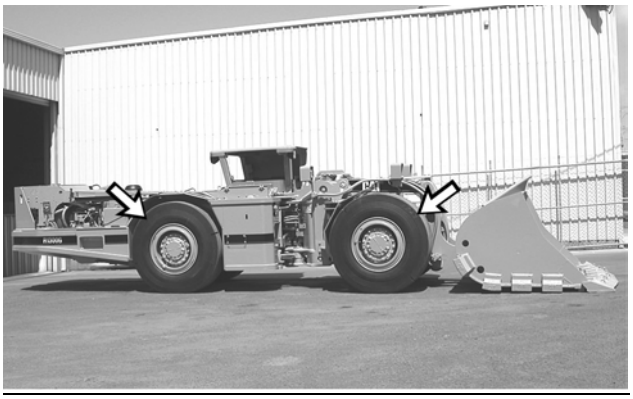


Illustration 360 g01130251

Measure the tire pressure on each tire. Consult your Caterpillar dealer for correct load rating and for the correct operating pressures.

Inflate the tires, if necessary.

Reference: For additional information about tire inflation, tire pressures, and tire inflation pressure adjustment, refer to the Operation and Maintenance Manual, “Tire Inflation Information” for the machine that is being serviced.

i02490751

Transmission Oil - Change

SMCS Code: 3030-044

⚠ WARNING

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

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

1. Operate the machine for a few minutes in order to warm the transmission oil.

2. Park the machine on a level surface. Lower the bucket to the ground and apply slight downward pressure. Engage the parking brake. Stop the engine.

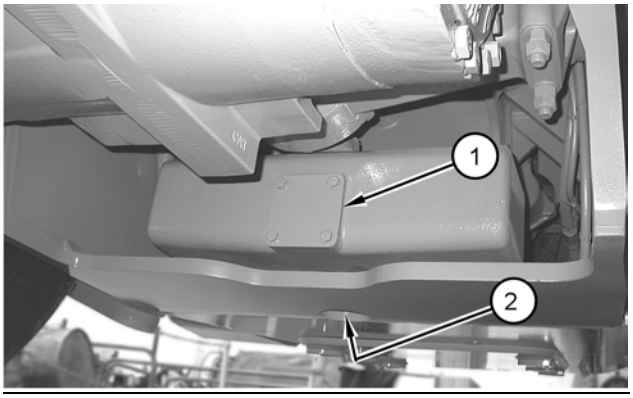


Illustration 361 g01130252

3. Remove drain plug (2) (not shown) and drain the oil into a suitable container. Clean the drain plug and install the drain plug.

4. Change the transmission oil filter element.

   Reference: For the correct procedure, refer to the Operation and Maintenance Manual, “Transmission Oil Filter - Replace” for the machine that is being serviced.

5. Remove the four bolts, cover (1) and the seal that hold the magnetic screen assembly in place.

6. Remove the magnetic screen assembly from the torque converter housing.

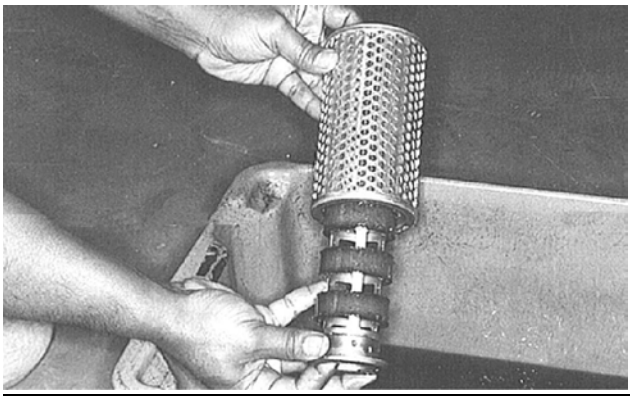


Illustration 362 g00950233

7. Remove the magnetic tube assembly from the screen.

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

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

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

10. Clean the cover. Inspect the cover seal. Replace the seal if it is damaged.

11. Insert the magnets in the screen.

12. Insert the screen, tube and magnets in the torque converter housing.

13. Install the seal, the cover and the four bolts.

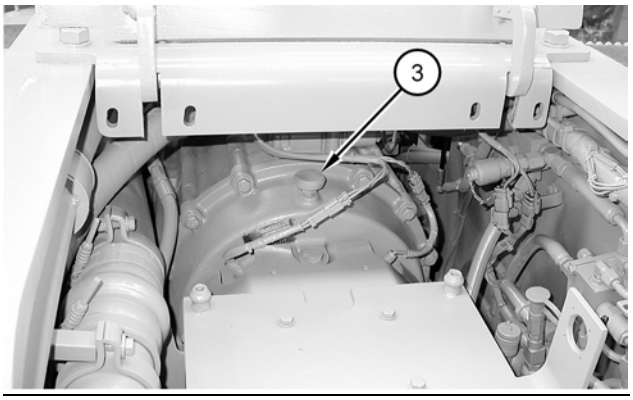


Illustration 363 g01130253

14. Remove transmission breather (3). Wash the transmission breather in clean, nonflammable solvent. Install the breather.

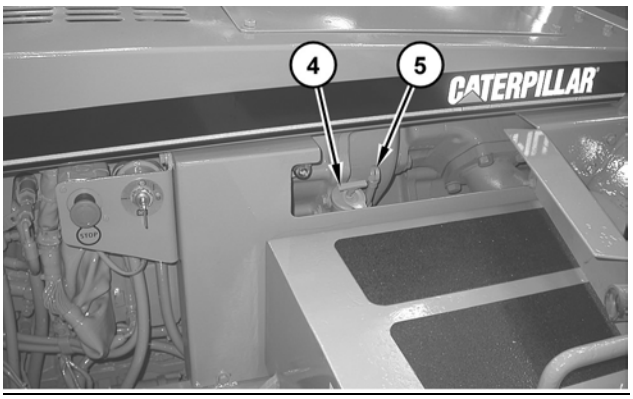


Illustration 364 g01164441

15. Remove oil filler cap (4) and fill the transmission with oil.

Reference: For information on lubricants and refill capacities, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.

16. Start and run the engine at low idle. Inspect the machine for leaks.

17. Apply the service brakes. Use the right brake pedal only.

18. Disengage the parking brake. Slowly operate the transmission controls in order to circulate the transmission oil.

19. Move the transmission directional control to the NEUTRAL position. Engage the parking brake.

20. Maintain the transmission oil level between the “LOW” and “FULL” marks on dipstick (5).

21. Remove oil filler cap (4) and add oil, if necessary.

22. Clean and install oil filler cap (4).

23. Stop the engine.

i02809752

Transmission Oil Filter - Replace

SMCS Code: 3067-510

The machine must be level, the parking brake engaged and the engine stopped.

⚠ WARNING

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

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

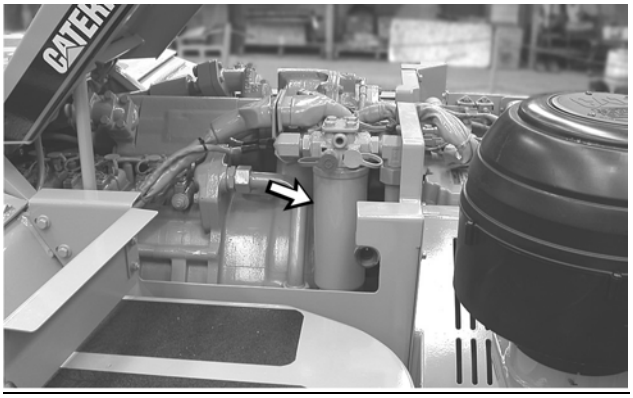


Illustration 365 g01130411

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

1. Use a strap type wrench in order to remove the transmission oil filter. Dispose of the used oil filter properly.

2. Clean the filter mounting base. Remove all of the used filter gasket from the filter mounting base.

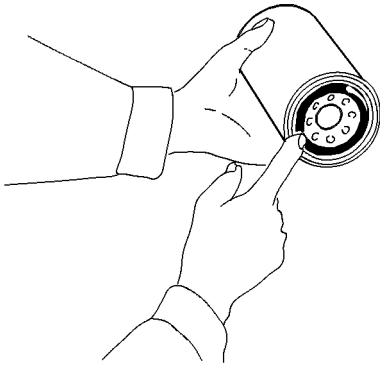


Illustration 366 g00101502

3. Lubricate the sealing surface of the new filter element with clean transmission oil.

4. Install a new filter hand tight until the seal of the filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

Note: There are rotation index marks on the filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the filter, use the rotation index marks as a guide.

5. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Caterpillar filters, use the instructions that are provided with the filter.

Note: You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

6. Start and run the engine at low idle. Apply the service brakes. Use the right brake pedal only.

7. Disengage the parking brake. Slowly operate the transmission controls in order to circulate the transmission oil.

8. Move the transmission directional control to the NEUTRAL position. Engage the parking brake.

9. Inspect the transmission oil filter for leaks.

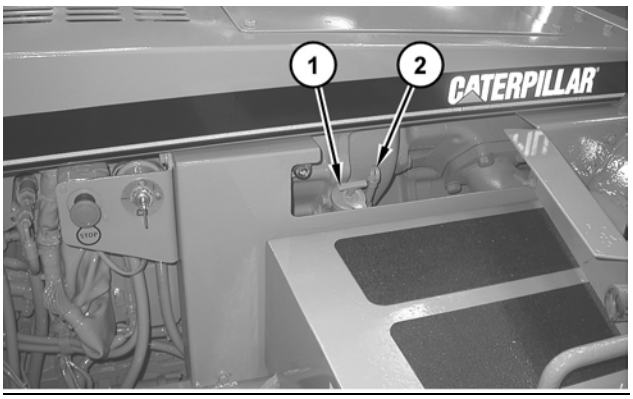


Illustration 367 g01164438

10. Maintain the transmission oil level between the “LOW” and “FULL” marks on dipstick (2) with the engine running at low idle.

11. Remove oil filler cap (1) and add oil, if necessary.

Reference: For information on lubricants and refill capacities, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.

12. Clean and install oil filler cap (1).

13. Stop the engine.

i02242591

Transmission Oil Level - Check

SMCS Code: 3030-535-FLV

Check the transmission oil level with the machine on a level surface, the parking brake engaged, and the oil at normal operating temperature.

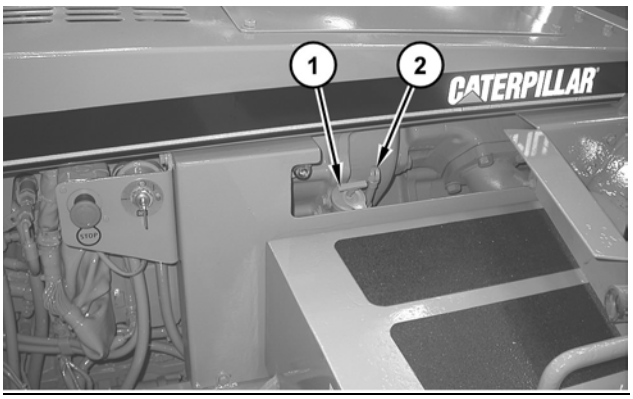


Illustration 368 g01164438

1. While the engine is running at low idle, maintain the oil level between the “LOW” and “FULL” marks on dipstick (2).

2. If necessary, remove oil filler cap (1) and add oil.

Reference: For information on lubricants and refill capacities, refer to the Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the machine that is being serviced.

3. Clean the filler cap and install the filler cap.

i01894393

Turbocharger - Inspect

SMCS Code: 1052-040

Periodic inspection and cleaning is recommended for the turbocharger compressor housing (inlet side).

If the turbocharger fails during engine operation, damage to the turbocharger compressor wheel and/or to the engine may occur. Damage to the turbocharger compressor wheel can cause additional damage to the pistons, the valves, and the cylinder head.

NOTICE
Turbocharger bearing failures can cause large quantities of oil to enter the air inlet and exhaust systems. Loss of engine lubricant can result in serious engine damage.

Minor leakage of a turbocharger housing under extended low idle operation should not cause problems as long as a turbocharger bearing failure has not occurred.

When a turbocharger bearing failure is accompanied by a significant engine performance loss (exhaust smoke or engine rpm up at no load), do not continue engine operation until the turbocharger is repaired or replaced.

A periodic inspection of the turbocharger can minimize unscheduled downtime and the chance for potential damage to other engine parts.

Note: Turbocharger components require precision clearances with proper balancing in order to support high operating speeds. Severe Service Applications can accelerate component wear. Therefore, more frequent inspections of the cartridge are required.

Removal and Installation

For options regarding the inspection, removal, installation, repair and replacement, consult your authorized Caterpillar service center. Refer to the Service Manual for this engine for the procedure and specifications.

i01930335

Window - Clean (If Equipped)

SMCS Code: 7310-070; 7340-070

Illustration 369 g01004270

Use commercially available window cleaning solutions in order to clean the windows. Clean the outside windows from the ground unless handholds are available. Use a mop or use a similar device with a long handle to clean the windows from the ground.

i01930337

Window Washer Bottle - Fill (If Equipped)

SMCS Code: 7306-544-KE

NOTICE
When operating in freezing temperatures, use Caterpillar nonfreezing window washer solvent or equivalent. System damage can result from freezing.

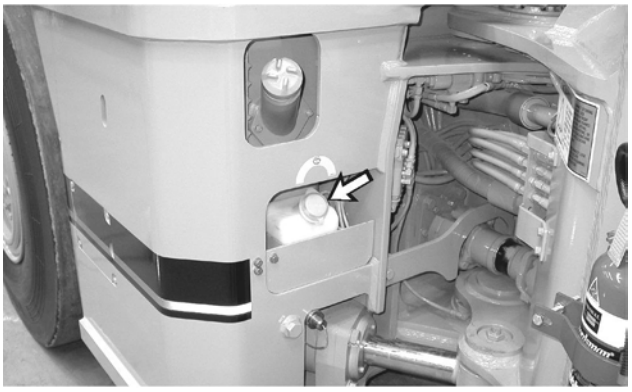


Illustration 370 g01004274

The window washer bottle is located near the hydraulic tank on the right side of the machine. Remove the cap and fill the window washer bottle. Refit the cap.

i01930336

Window Wiper - Inspect/Replace (If Equipped)

SMCS Code: 7305-040; 7305-510

Illustration 371 g01004273

Inspect the condition of the wiper blades. Replace the wiper blades if the wiper blades are worn or damaged. If the wiper blades streak the window, replace the wiper blades.

Reference Information Section

Reference Materials

i02903938

Reference Material

SMCS Code: 1000; 7000

Caterpillar Reference Material

The following literature can be obtained through any Caterpillar dealer.

Operation and Maintenance Manual Supplement, SEBU8257, “The European Union Physical Agents (Vibration) Directive 2002/44/EC”

Service Manual, SENR5664, “Air Conditioning and Heating R-134a for All Caterpillar Machines”

Service Parts, PECP9067, “One Safe Source”

Special Instruction, REHS0354, “Charging System Troubleshooting”

Special Instruction, SEHS6929, “Inspection, Maintenance and Repair of ROPS and Attachment Installation Guidelines”

Special Publication, SEBD1587, “What ROPS/FOPS Certification Means”

Special Publication, SMBU6981, “Emissions Control Warranty Information for US, Canada, and California”

Specifications, SENR3130, “Torque Specifications”

Special Publication, PEHP0002, “Product Data Sheet for Multipurpose Lithium Complex Grease with Molybdenum (MPGM)”

Special Publication, PEHP3050, “Product Data Sheet for Caterpillar Multipurpose Tractor Oil (MTO)”

Special Publication, PEHP7506, “Product Data Sheet for Caterpillar Transmission/Drive Train Oil (TDTO)”

Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog”

Special Publication, SEBD0640, “Oil and Your Engine”

Special Publication, SEBD0717, “Diesel Fuels and Your Engine”

Operation and Maintenance Manual, SEBU5898, “Cold Weather Recommendations”

Special Publication, PEHP7076, “Understanding the S·O·S Services Test”

Special Publication, PEHP6001, “How to Take a Good Oil Sample”

Special Publication, PEHP7057, “S·O·S Coolant Analysis”

Special Publication, SEBD0518, “Know Your Cooling System”

Special Publication, SEBD0970, “Coolant and Your Engine”

Special Instruction, PMEP5027, “ELC Coolant/Antifreeze Label”

Special Instruction, SEHS7332, “Do Not Operate Warning Tag”

Special Instruction, SEHS7633, “Battery Test Procedure”

Special Instruction, SMHS7867, “Nitrogen Tire Inflation Group”

Special Instruction, SEHS9031, “Storage Procedure for Caterpillar Products”

Operation and Maintenance Manual, SEBU6250, “Caterpillar Machine Fluids Recommendations”

Service Manual, RENR8531, “R1300GII Load Haul Dump”

Parts Manual, SEBP3608, “R1300GII Load Haul Dump”

Service Sheet, RENR8550, “R1300GII Load Haul Dump”

Systems Operation, Testing and Adjusting, RENR8598, “Emission Control Systems for Caterpillar Underground Machines”

Service Manual, RENR8594, “Machining Dimensions and Welding Information for Load Haul Dumps”

Systems Operation, Testing and Adjusting, RENR4671, “Automatic Lubrication System - Hydraulic Type”

Operation and Maintenance Manuals are available in other languages. Consult your Caterpillar dealer about obtaining these Operation and Maintenance Manuals.

Additional Reference Material

ASTM D2896, “TBN Measurements” This can normally be obtained from your local technological society, from your local library, or from your local college.

SAE J313, “Diesel Fuels” This can be found in the SAE handbook. Also, this publication can be obtained from your local technological society, from your local library, or from your local college.

SAE J754, “Nomenclature” This can normally be found in the SAE handbook.

SAE J183, “Classification” This can normally be found in the SAE handbook.

Engine Manufacturers Association, “Lubricating Oils Data Book”

Engine Manufacturers Association
Two North LaSalle Street, Suite 2200
Chicago, Illinois, USA 60602
E-mail: ema@enginemanufacturers.org
(312) 827-8700
Facsimile: (312) 827-8737

i01777502

Decommissioning and Disposal

SMCS Code: 1000; 7000

Disposal of your machine will vary with local regulations. Consult your nearest Caterpillar dealer for additional information on disposal.

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Product and Dealer Information

Note: For product identification plate locations, see the section “Product Identification Information” in the Operation and Maintenance Manual.

Delivery Date: _____

Product Information

Model: _____

Product Identification Number: _____

Engine Serial Number: _____

Transmission Serial Number: _____

Generator Serial Number: _____

Attachment Serial Numbers: _____

Attachment Information: _____

Customer Equipment Number: _____

Dealer Equipment Number: _____

Dealer Information

Name: _____ Branch: _____

Address: _____

_____

_____

	Dealer Contact	Phone Number	Hours
Sales:	_____	_____	_____
Parts:	_____	_____	_____
Service:	_____	_____	_____

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