SEBU7887-20
February 2013

Operation and Maintenance Manual

966H and 972H Wheel Loaders

A6J 1-Up (966H)
TAL 1-Up (966H)
A6G 1-Up (966H)
RYF 1-Up (966H)
A6D 1-Up (966H)
GTA 1-Up (972H)
LCC 1-Up (972H)
A7G 1-Up (972H)
A7J 1-Up (972H)
A7D 1-Up (972D)

i05086812

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, including human factors that can affect safety. 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 verify that you are authorized to perform this work, and 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.

A non-exhaustive list of 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. You must not use this product in any manner different from that considered by this manual without first satisfying yourself that you have considered all safety rules and precautions applicable to the operation of the product in the location of use, including site-specific rules and precautions applicable to the worksite. 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 you are authorized to perform this work, and that the product will not be damaged or become unsafe by the operation, lubrication, maintenance or repair procedures that you intend to use.

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. Cat dealers have the most current information available.

⚠ WARNING

When replacement parts are required for this product Caterpillar recommends using Cat 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.

In the United States, the maintenance, replacement, or repair of the emission control devices and systems may be performed by any repair establishment or individual of the owner's choosing.

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 Cat 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 Cat dealer for further information.

Cat Product Identification Number

Effective First Quarter 2001 the Cat 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 Cat machines and generator sets. The PIN plates and frame marking will display the 17 character PIN. The new format will look like the following:

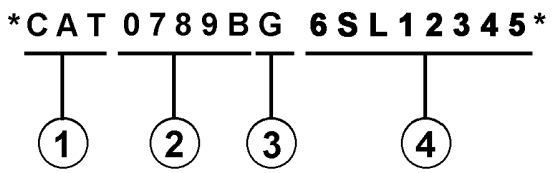

Illustration 1 g00751314

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

i03651216

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 signs. Solvents, gasoline, or harsh chemicals could loosen the adhesive that secures the warning sign. Loose adhesive will allow the warning sign 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.

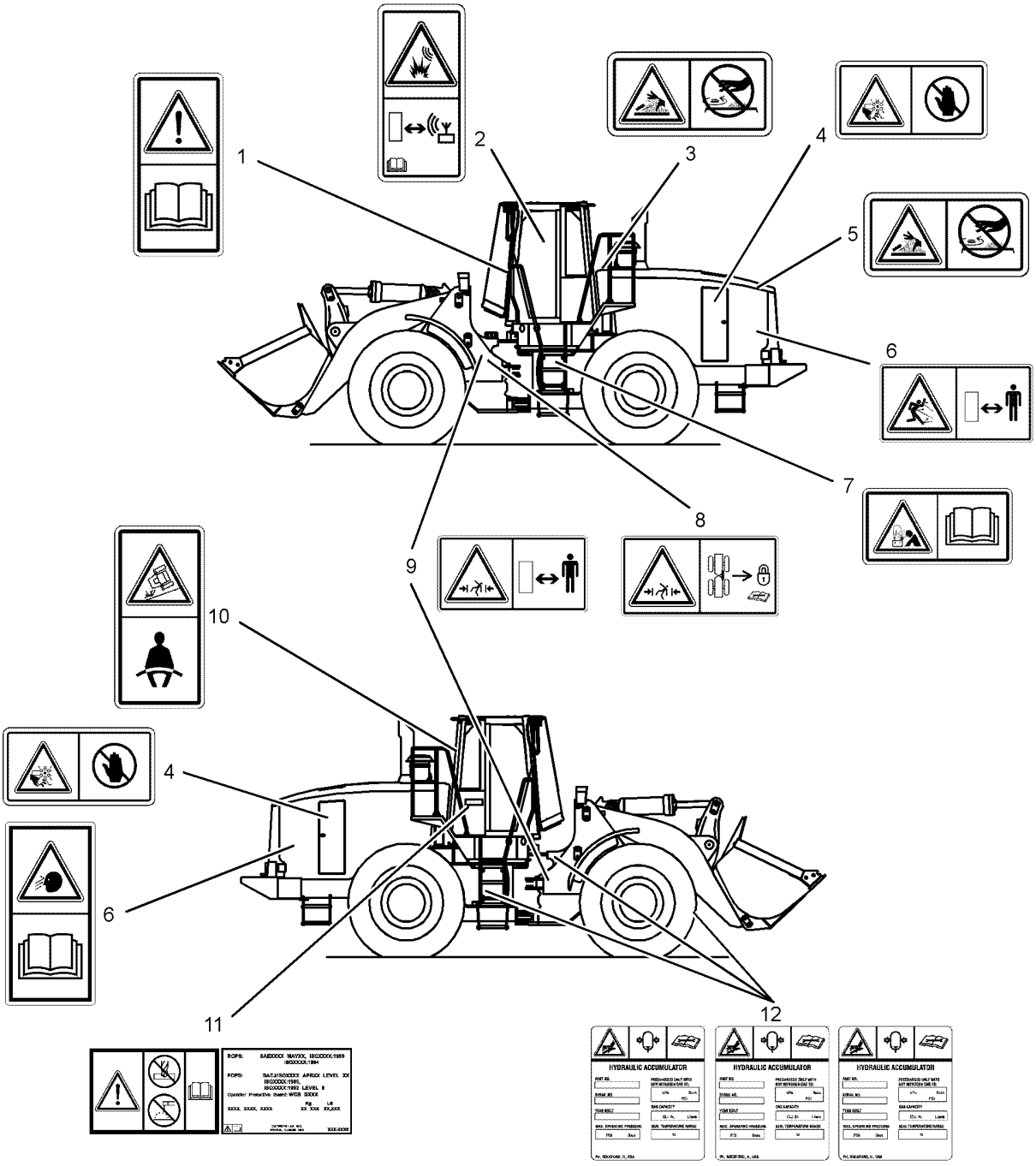

Illustration 2 g01959466

Do Not Operate (1)

This warning label is located inside the cab of the machine on the front left post.

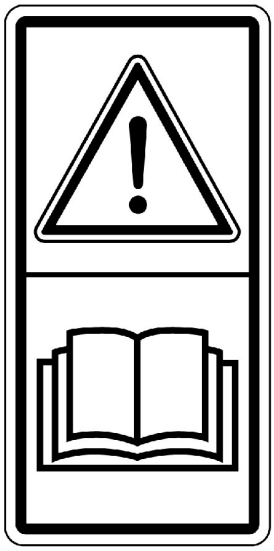

Illustration 3 g01379128

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 authorized dealer for replacement manuals. Proper care is your responsibility.

Operation Around A Blast Area (2)

If your machine is equipped with Product Link , this warning label is located in the cab on the front left post.

Illustration 4 g01222611

WARNING

This machine is equipped with a Caterpillar Product Link communication device. When electric/electronic detonators are used, this communication device should be deactivated within 12 m (40 ft) of a blast site, or within the distance mandated under applicable legal requirements. Failure to do so could cause interference with blasting operations and result in serious injury or death.

Pressurized System (3)

This warning is located next to the hydraulic tank filler cap.

Illustration 5 g01371640

WARNING

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

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

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

Rotating Fan (4)

This warning label is located behind the access door on each side of the machine.

Illustration 6 g01383892

WARNING

Keep hands clear of fan while engine is running. May cause serious injury or death.

Pressurized System (5)

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

Illustration 7 g01371640

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.

Flying Debris (6) for variable pitch fan (If Equipped)

This message is located at the rear of the hood on both sides of the machine.

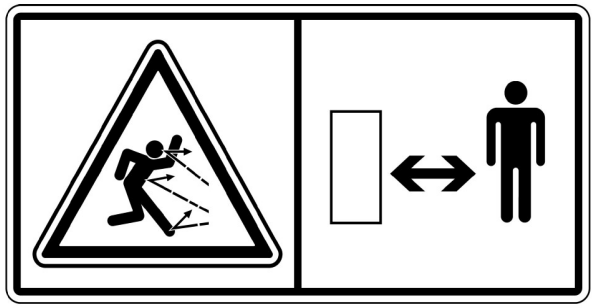

Illustration 8 g01404266

WARNING

Flying Debris Hazard! During operation of the engine fan, flying debris could be discharged from the radiator which could result in personal injury or death. Stay clear of the fan discharge area until the engine is stopped.

Battery (7)

This warning is located under the left ladder behind the top step of the ladder.

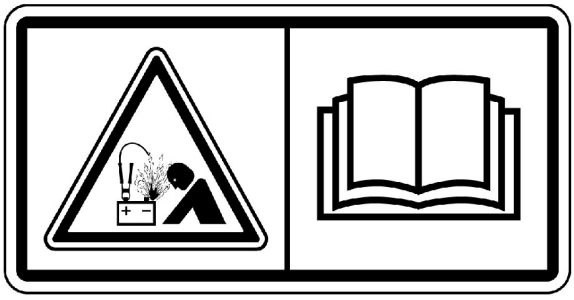

Illustration 9 g01370909

WARNING

Explosion Hazard! Improper jumper cable connections can cause an explosion resulting in serious injury or death. Batteries may be located in separate compartments. Refer to the Operation and Maintenance Manual for the correct jump starting procedure.

Refer to Operation and Maintenance Manual, “Engine Starting with Jump Start Cables” for more information.

Crush Hazard (8)

This warning is located on the side face of the loader frame near the steering frame lock.

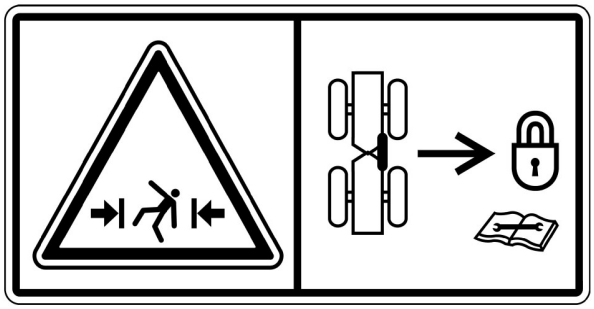

Illustration 10 g01371647

WARNING

Crushing Hazard. There is no clearance for a person in this area when the machine turns. Severe injury or death from crushing could occur. Connect the steering frame lock between front and rear frames before lifting, transporting, or servicing the machine in the articulation area.

Disconnect the steering lock and secure before resuming operation.

No Clearance (9)

This warning is located on the side face of the loader frame near the articulation hitch on both sides of the machine.

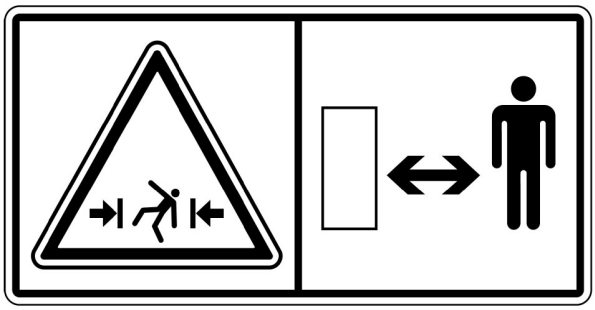

Illustration 11 g01371644

WARNING

Stay back a safe distance. No clearance for a person in this area when the machine turns. Severe injury or death from crushing could occur.

Seat Belt (10)

This warning is located inside the cab on the RH cab post.

Illustration 12 g01371636

WARNING

A seat belt should be worn at all times during machine operation to prevent serious injury or death in the event of an accident or machine overturn. Failure to wear a seat belt during machine operation may result in serious injury or death.

ROPS/FOPS Structure (11)

This warning label is located above the platform on the right side of the cab to the left of the door.

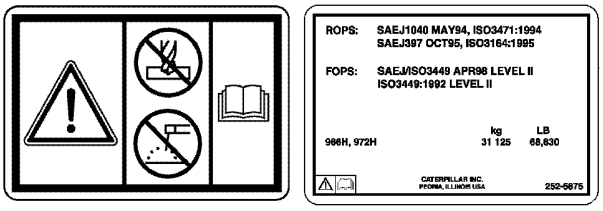

Illustration 13 g01443548

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. This will void the certification. Consult a Caterpillar dealer to determine this structure's limitations without voiding its certification.

Certification for Rollover Protective Structure (ROPS) and for Falling Object Protective Structure (FOPS)

When the ROPS or the FOPS is properly installed on a machine which is not altered to exceed the certification test mass, this structure meets the following standards for the ROPS at the time of installation: SAE J1040 MAY94, ISO 3471:1994, SAE J397 OCT95 and ISO 3164:1995. Also, the FOPS canopy meets the following standards at the time of installation: SAE/ISO3449 APR98 LEVEL II and ISO 3449:1992 LEVEL II.

High Pressure Cylinder (12)

This warning is located on the accumulator in the following three places: the service center on the right side of the machine, the right control (accumulator) in the right side of the non-engine end frame and near the main hydraulic control valve.

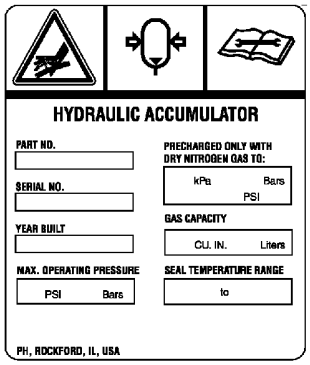

Illustration 14 g01123184

⚠ WARNING

Gas under pressure. Rapid discharge from disconnecting or disassembly could cause personal injury or death. See service manual before relieving pressure or charging.

i03653556

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.

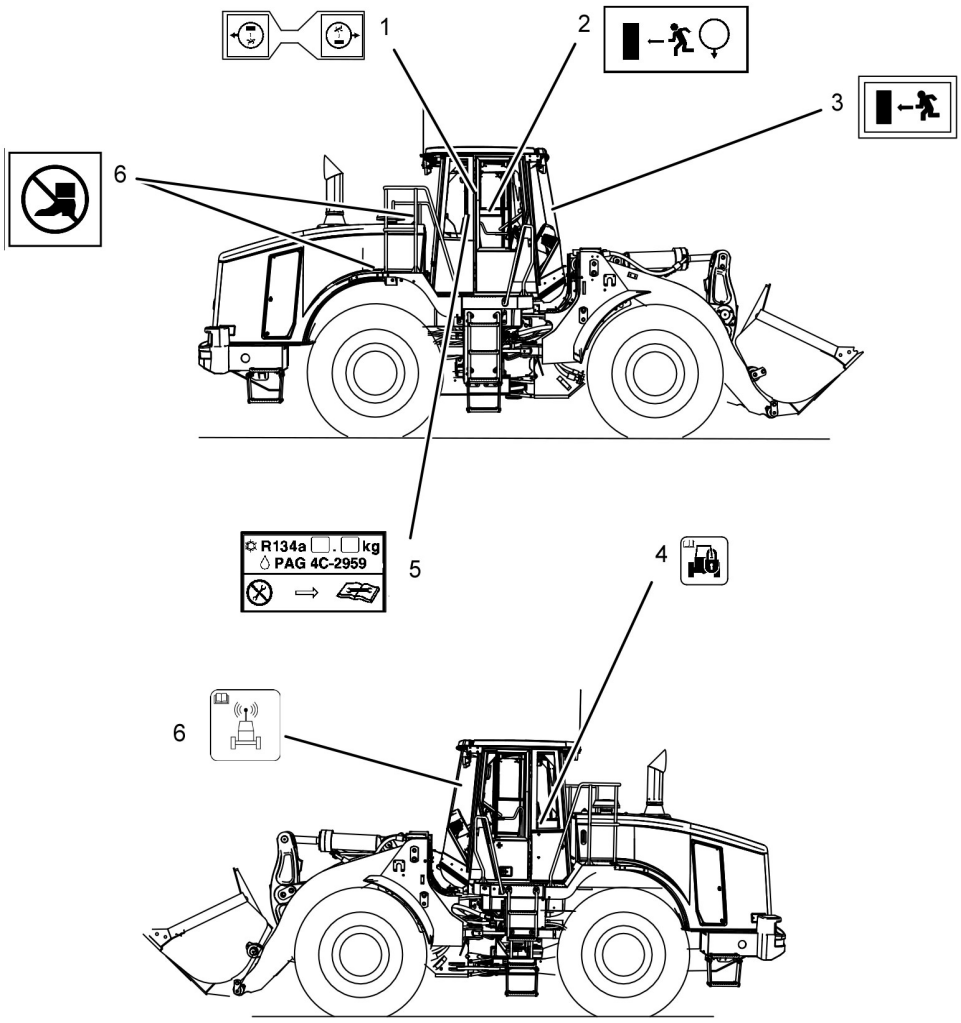

Illustration 15 g01960518

Alternate Exit (1)

This message is located on the latch of the right side window in the cab.

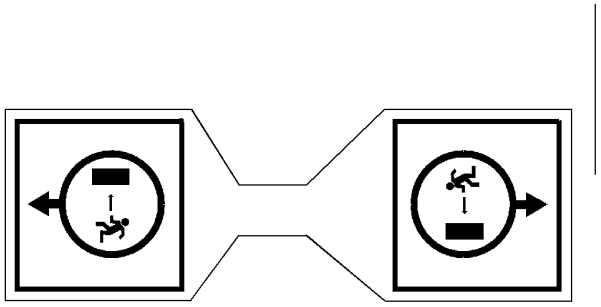

Illustration 16 g01213781

If the primary exit is blocked, pull the pin from the latch and release the latch. Push the window outward. Exit the machine through the window.

Alternate Exit (2)

This message is located on the glass of the right hand door just above the latch.

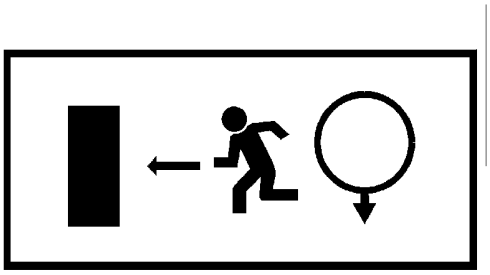

Illustration 17 g01213782

If the primary exit is blocked, pull the pin from the latch and release the latch. Push the window outward. Exit the machine through the window.

Alternate Exit (3)

If equipped,this message is located on the bracket assembly for the payload control system near the right hand door.

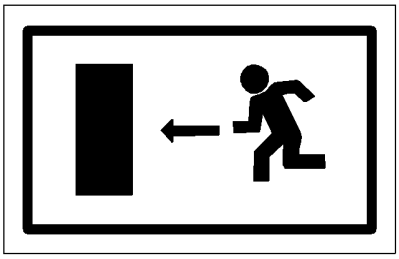

Illustration 18 g01002993

If the primary exit is blocked, exit the machine through the door on the right side of the machine.

Machine Security System (4)

If equipped, this message is located on the left side of the instrument panel above the engine start switch.

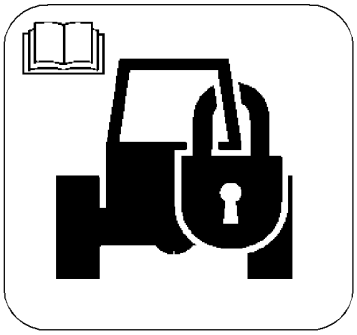

Illustration 19 g01213785

This machine is equipped with a security system. Read the Operation and Maintenance Manual before you operate the machine.

Air Conditioner (5)

This message is located inside the cab on the right rear post.

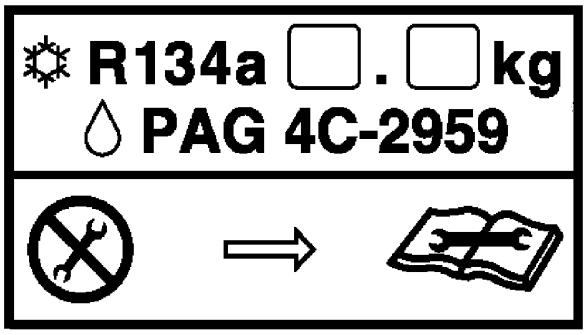

Illustration 20 g00990500

Read the service manual before you perform any maintenance on the air conditioner.**No Step(6)**

These messages are located on the fenders and on the hood behind the cab.

Illustration 21 g01206181

Do not step in these locations. Do not stand in these locations.

If your machine is equipped with Product Link the following message will be located in the cab.

Illustration 22 g01418953

i05218279

General Hazard Information

SMCS Code: 7000

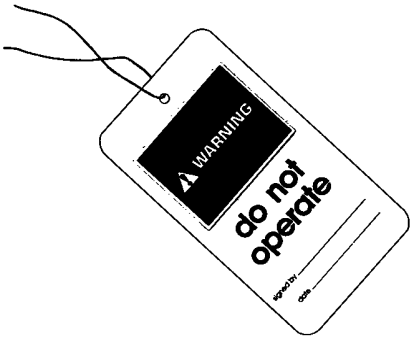

Illustration 23 g00104545
Typical example

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

⚠ WARNING

Operating the machine while distracted can result in the loss of machine control. Use extreme caution when using any device while operating the machine. Operating the machine while distracted can result in personal injury or death.

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.

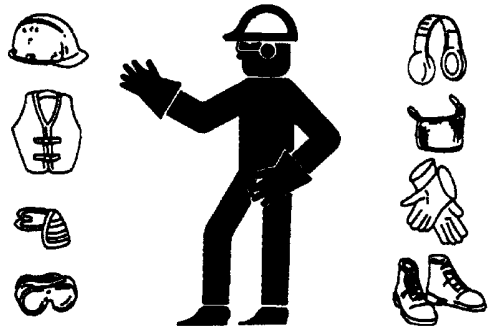

Illustration 24 g00702020

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.

When you perform maintenance above ground level, use appropriate devices such as ladders or man lift machines. If equipped, use the machine anchorage points and use approved fall arrest harnesses and lanyards.

Pressurized Air and Water

Pressurized air and/or water can cause debris and/or hot water to be blown out. The debris and/or hot water 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).

Avoid direct spraying of water on electrical connectors, connections, and components. When using air for cleaning, allow the machine to cool to reduce the possibility of fine debris igniting when re-deposited on hot surfaces.

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.

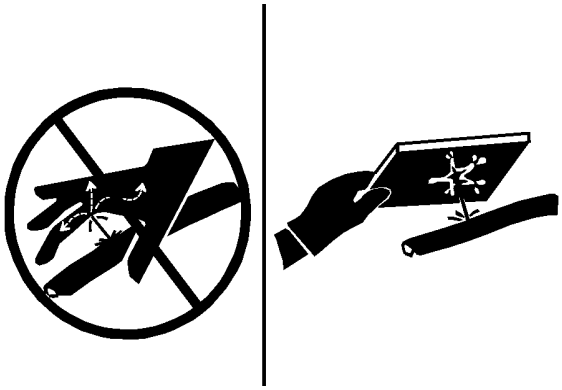

Illustration 25 g00687600

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, Cat 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.

Inhalation

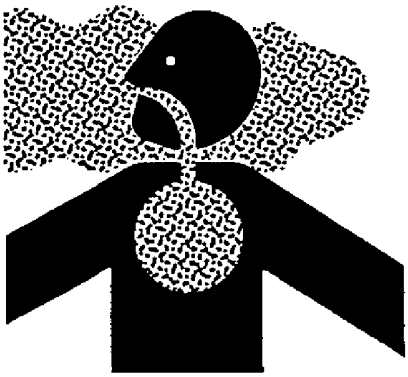

Illustration 26 g02159053

Exhaust

Use caution. Exhaust fumes can be hazardous to your health. If you operate the machine in an enclosed area, adequate ventilation is necessary.

Asbestos Information

Cat equipment and replacement parts that are shipped from Caterpillar are asbestos free. Caterpillar recommends the use of only genuine Cat 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 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. In Japan , use the requirements found in the Ordinance on Prevention of Health Impairment due to Asbestos in addition to the requirements of the Industrial Safety and Health Act .
- Obey environmental regulations for the disposal of asbestos.
- Stay away from areas that might have asbestos particles in the air.

Dispose of Waste Properly

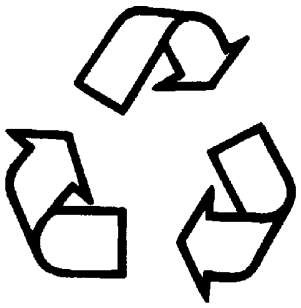

Illustration 27 g00706404

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.

i04760300

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

The liquid in a battery is an electrolyte. Electrolyte is an acid that can cause personal injury. Do not allow electrolyte to contact the skin or the eyes.

Do not smoke while checking the battery electrolyte levels. Batteries give off flammable fumes which can explode.

Always wear protective glasses when you work with batteries. Wash hands after touching batteries. The use of gloves is recommended.

i04218233

Fire Prevention and Explosion Prevention

SMCS Code: 7000

Illustration 28 g00704000

General

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

To minimize the risk of fire or explosion, Caterpillar recommends the following actions.

Always perform a Walk-Around Inspection, which may help you identify a fire hazard. Do not operate a machine when a fire hazard exists. Contact your Cat dealer for service.

Understand the use of the primary exit and alternative exit on the machine. Refer to Operation and Maintenance Manual , “Alternative Exit”.

Do not operate a machine with a fluid leak. Repair leaks and clean up fluids before resuming machine operation. Fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire. A fire may cause personal injury or death.

Remove flammable material such as leaves, twigs, papers, trash, and so on. These items may accumulate in the engine compartment or around other hot areas and hot parts on the machine.

Keep the access doors to major machine compartments closed and access doors in working condition in order to permit the use of fire suppression equipment, in case a fire should occur.

Clean all accumulations of flammable materials such as fuel, oil, and debris from the machine.

Do not operate the machine near any flame.

Keep shields in place. 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 or flame cut on tanks or lines that contain flammable fluids or flammable material. Empty and purge the lines and tanks. Then clean the lines and tanks with a nonflammable solvent prior to welding or flame cutting. Ensure that the components are properly grounded in order to avoid unwanted arcs.

Dust that is generated from repairing nonmetallic hoods or fenders may be flammable and/or explosive. Repair such components in a well ventilated area away from open flames or sparks. Use suitable Personal Protection Equipment (PPE).

Inspect all lines and hoses for wear or deterioration. Replace damaged lines and hoses. The lines and the hoses should have adequate support and secure clamps. Tighten all connections to the recommended torque. Damage to the protective cover or insulation may provide fuel for fires.

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

Illustration 29 g00704059

Use caution when you are fueling a machine. Do not smoke while you are fueling a machine. Do not fuel a machine near open flames or sparks. Always stop the engine before fueling. Fill the fuel tank outdoors. Properly clean areas of spillage.

Never store flammable fluids in the operator compartment of the machine.

Battery and Battery Cables

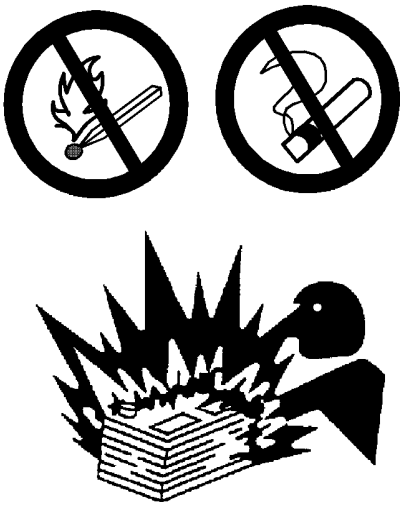

Illustration 30 g02298225

Caterpillar recommends the following in order to minimize the risk of fire or an explosion related to the battery.

Do not operate a machine if battery cables or related parts show signs of wear or damage. Contact your Cat dealer for service.

Follow safe procedures for engine starting with jump-start cables. Improper jumper cable connections can cause an explosion that may result in injury. Refer to Operation and Maintenance Manual , “Engine Starting with Jump Start Cables” for specific instructions.

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

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 in order to check the battery charge.

Daily inspect battery cables that are in areas that are visible. Inspect cables, clips, straps, and other restraints for damage. Replace any damaged parts. Check for signs of the following, which can occur over time due to use and environmental factors:

- Fraying
- Abrasion
- Cracking
- Discoloration
- Cuts on the insulation of the cable
- Fouling
- Corroded terminals, damaged terminals, and loose terminals

Replace damaged battery cable(s) and replace any related parts. Eliminate any fouling, which may have caused insulation failure or related component damage or wear. Ensure that all components are reinstalled correctly.

An exposed wire on the battery cable may cause a short to ground if the exposed area comes into contact with a grounded surface. A battery cable short produces heat from the battery current, which may be a fire hazard.

An exposed wire on the ground cable between the battery and the disconnect switch may cause the disconnect switch to be bypassed if the exposed area comes into contact with a grounded surface. This may result in an unsafe condition for servicing the machine. Repair components or replace components before servicing the machine.

⚠ WARNING

Fire on a machine can result in personal injury or death. Exposed battery cables that come into contact with a grounded connection can result in fires. Replace cables and related parts that show signs of wear or damage. Contact your Cat dealer.

Wiring

Check electrical wires daily. If any of the following conditions exist, replace parts before you operate the machine.

- Fraying
- Signs of abrasion or wear
- Cracking
- Discoloration
- Cuts on insulation
- Other damage

Make sure that all clamps, guards, clips, and straps are reinstalled correctly. This will help to prevent vibration, rubbing against other parts, and excessive heat during machine operation.

Attaching electrical wiring to hoses and tubes that contain flammable fluids or combustible fluids should be avoided.

Consult your Cat dealer for repair or for replacement parts.

Keep wiring and electrical connections free of debris.

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. Use the appropriate backup wrenches in order to tighten all connections to the recommended torque.

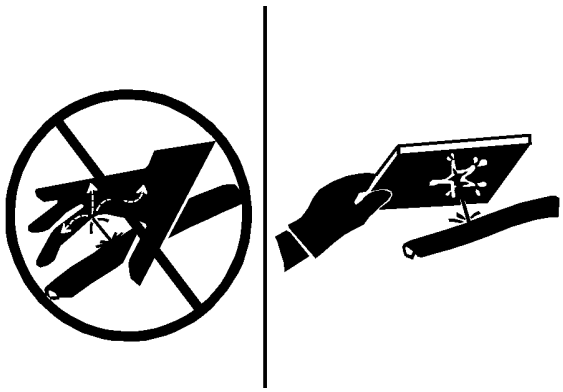

Illustration 31 g00687600

Check lines, tubes, and hoses carefully. Wear Personal Protection Equipment (PPE) in order to check for leaks. 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.

Replace the affected 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 swelling or ballooning.
- Flexible parts of the hoses are kinked.
- Outer covers have exposed 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, excessive heat, and failure of lines, tubes, and hoses.

Do not operate a machine when a fire hazard exists. Repair any lines that are corroded, loose, or damaged. Leaks may provide fuel for fires. Consult your Cat dealer for repair or for replacement parts. Use genuine Cat parts or the equivalent, for capabilities of both the pressure limit and temperature limit.

Ether

Ether (if equipped) is commonly used in cold-weather applications. Ether is flammable and poisonous.

Follow the correct cold engine starting procedures. Refer to the section in the Operation and Maintenance Manual with the label "Engine Starting" .

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

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 (120.2° 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.

Fire Extinguisher

As an additional safety measure, keep a fire extinguisher on the machine.

Be familiar with the operation of the fire extinguisher. Inspect the fire extinguisher and service the fire extinguisher regularly. Follow the recommendations on the instruction plate.

Consider installation of an aftermarket Fire Suppression System, if the application and working conditions warrant the installation.

i04025591

Fire Safety

SMCS Code: 7000

Note: Locate secondary exits and how to use the secondary exits before you operate the machine.

Note: Locate fire extinguishers and how to use a fire extinguisher before you operate the machine.

If you find that you are involved in a machine fire, your safety and that of others on site is the top priority. The following actions should only be performed if the actions do not present a danger or risk to you and any nearby people. At all times you should assess the risk of personal injury and move away to a safe distance as soon as you feel unsafe.

Move the machine away from nearby combustible material such as fuel/oil stations, structures, trash, mulch and timber.

Lower any implements and turn off the engine as soon as possible. If you leave the engine running, the engine will continue to feed a fire. The fire will be fed from any damaged hoses that are attached to the engine or pumps.

If possible, turn the battery disconnect switch to the OFF position. Disconnecting the battery will remove the ignition source in the event of an electrical short. Disconnecting the battery will eliminate a second ignition source if electrical wiring is damaged by the fire, resulting in a short circuit.

Notify emergency personnel of the fire and your location.

If your machine is equipped with a fire suppression system, follow the manufacturers procedure for activating the system.

Note: Fire suppression systems need to be regularly inspected by qualified personnel. You must be trained to operate the fire suppression system.

Use the on-board fire extinguisher and use the following procedure:

1. Pull the pin.

2. Aim the extinguisher or nozzle at the base of the fire.

3. Squeeze the handle and release the extinguishing agent.

4. Sweep the extinguisher from side to side across the base of the fire until the fire is out.

Remember, if you are unable to do anything else, shut off the machine before exiting. By shutting off the machine, fuels will not continue to be pumped into the fire.

If the fire grows out of control, be aware of the following risks:

- Tires on wheeled machines pose a risk of explosion as tires burn. Hot shrapnel and debris can be thrown great distances in an explosion.
- Tanks, accumulators, hoses, and fittings can rupture in a fire, spraying fuels and shrapnel over a large area.
- Remember that nearly all of the fluids on the machine are flammable, including coolant and oils. Additionally, plastics, rubbers, fabrics, and resins in fiberglass panels are also flammable.

i00977136

Fire Extinguisher Location

SMCS Code: 7000

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.

The recommended location for mounting the fire extinguisher is on the platform behind the cab.

If the fire extinguisher is mounted on the ROPS, strap the mounting plate to a leg of the ROPS. If the weight of the fire extinguisher is more than 4.5 kg (10 lb), mount the fire extinguisher as low as possible on one leg. Do not mount the fire extinguisher on the upper one-third area of the leg.

Note: 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 on the ROPS.

i04160129

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 from the machine. Stay out of the trajectory path. Both the force of the explosion and the flying debris can cause property damage, personal injury, or death.

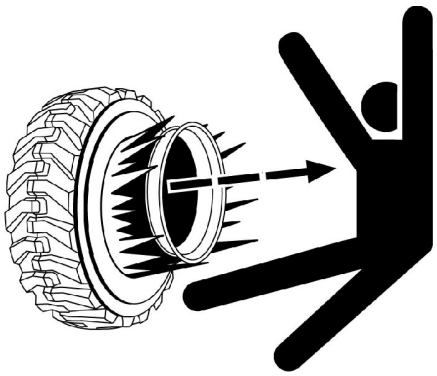

Illustration 32 g02166933

Typical example of tire is shown

Do not approach a hot or an apparently damaged tire.

Caterpillar recommends against using water or calcium as a ballast for the tires except in machines designed for this additional mass. For those applicable machines, the maintenance section will contain instructions on the correct tire inflation and filling procedures. Ballast, such as fluid in the tires, increases overall machine weight and may affect braking, steering, power train components, or the certification of the protective structure such as the ROPS. The use of tire/rim rust preventatives or other liquid additives is not required.

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.

i00934890

Before Starting Engine

SMCS Code: 1000; 7000

The steering frame lock must be in the UNLOCKED position in order to steer the machine.

Start the engine only from the operator compartment. 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.

Inspect the condition of the seat belt and the condition of mounting hardware. Replace any parts that are worn or damaged. Regardless of the 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 there is full pedal travel while 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.

i04862936

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”. If equipped, the Cat Detect Object Detection shall be adjusted according to the Operation and Maintenance Manual, “Cat Detect Object Detection” for your machine.

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 safe movement of traffic
- 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.

i03180640

Restricted Visibility

SMCS Code: 7000

The size and the configuration of this machine may result in areas that can not be seen when the operator is seated. Illustration 33 provides an approximate visual indication of areas of significant restricted visibility. Illustration 33 indicates restricted visibility areas at ground level inside a radius of 12 m (40 ft) from the operator on a machine without the use of optional visual aids. This illustration does not provide areas of restricted visibility for distances outside a radius of 12 m (40 ft).

This machine may be equipped with optional visual aids that may provide visibility to some of the restricted visibility areas. Refer to this Operation and Maintenance Manual, “Mirror” for more information on additional visibility. If your machine is equipped with cameras, refer to this Operation and Maintenance Manual, “Camera” for more information on additional visibility. For areas that are not covered by the optional visual aids, the job site organization must be utilized to minimize hazards of this restricted visibility. For more information regarding job site organization refer to Operation and Maintenance Manual, “Visibility Information”.

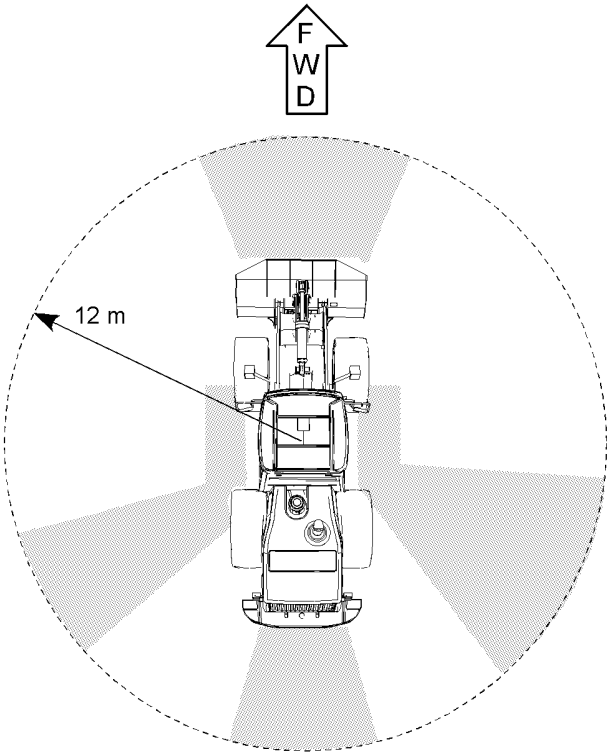

Illustration 33 g01684753

Top view of the machine

Note: The shaded areas indicate the approximate location of areas with significant restricted visibility.

i03690423

Engine Starting

SMCS Code: 1000; 7000

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

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

Move the transmission control to the NEUTRAL 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.

Briefly sound the horn before you start the engine.

Check for the presence of personnel. Ensure that all personnel are clear of the machine.

i01943255

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 doors and the windows in the open position or in the shut position.

Adjust the rear view mirrors (if equipped) for the best vision of the area near the machine.

Ensure that the horn, the backup alarm (if equipped), and all other warning devices are working properly.

Fasten the seat belt securely.

i04632311

Operation

SMCS Code: 7000

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 an additional seat with a seat belt. The rider must be seated and the seat belt must be fastened.

Never use the work tool for a work platform.

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

Carry work tools at approximately 40 cm (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.

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

Know the maximum dimensions of your machine.

Always keep the Rollover Protective Structure (ROPS) installed during machine operation.

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.

i03832349

Parking

SMCS Code: 7000

Park the machine on a level surface. If you must park on a grade, chock the machine's wheels with suitable chocks. Take into account the following:

- tire size
- machine weight
- ground conditions

Apply the service brake in order to stop the machine. Move the transmission control (lever) to the NEUTRAL position. Move the throttle control to the LOW IDLE position.

Engage the parking brake.

Lower all equipment to the ground. Activate any control locks.

Stop the engine.

Turn the engine start switch to the OFF position and remove the engine start switch key.

Always turn the battery disconnect switch to the OFF position before leaving the machine.

If the machine will not be operated for a month or more, remove the battery disconnect switch key.

i03745198

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.

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.

i04159629

Work Tools

SMCS Code: 6700

Only use work tools that are recommended by Caterpillar for use on Cat machines.

Use of work tools, including buckets, which are outside of Caterpillar's recommendations or specifications for weight, dimensions, flows, pressures, and so on. may result in less-than-optimal vehicle performance, including but not limited to reductions in production, stability, reliability, and component durability. Caterpillar recommends appropriate work tools for our machines to maximize the value our customers receive from our products. Caterpillar understands that special circumstances may lead a customer to use tools outside of our specifications. In these cases, customers must be aware that such choices can reduce vehicle performance and will affect their ability to claim warranty in the event of what a customer may perceive as a premature failure.

Work tools and work tool control systems, that are compatible with your Cat machine, are required for safe machine operation and/or reliable machine operation. If you are in doubt about the compatibility of a particular work tool with your machine, consult your Cat dealer.

Make sure that all necessary guarding is in place on the host machine and on the work tool.

Keep all windows and doors closed on the host machine. A polycarbonate shield must be used when the host machine is not equipped with windows and when a work tool could throw debris.

Do not exceed the maximum operating weight that is listed on the ROPS certification.

If your machine is equipped with an extendable stick, install the transport pin when you are using the following work tools: hydraulic hammers, augers and compactors

Always wear protective glasses. Always wear the protective equipment that is recommended in the operation manual for the work tool. Wear any other protective equipment that is required for the operating environment.

To prevent personnel from being struck by flying objects, ensure that all personnel are out of the work area.

While you are performing any maintenance, any testing, or any adjustments to the work tool stay clear of the following areas: cutting edges, pinching surfaces and crushing surfaces.

Never use the work tool for a work platform.

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.

i04001726

Sound Information and Vibration Information

SMCS Code: 7000

Sound Level Information

966H and 972H

The operator sound pressure level for a standard machine configuration, measured according to the procedures specified in ISO6396:2008, is 71 dB(A) with the cooling fan speed set at maximum value. Hearing protection may be needed when the machine is operated with windows and/or door opened or with an open operator station.

The machine sound power level for a standard machine configuration, measured according to the procedures specified in ISO6395:2008, is 111 dB(A) with the cooling fan speed set at maximum value.

The machine sound pressure level for a standard machine configuration, measured according to the procedures specified in SAEJ88 Feb2006, is 75 dB (A) for the 966H and 76 dB(A) for the 972H . The measurement was conducted under the following conditions: distance of 15 m (49.2 ft), moving forward in an intermediate gear ratio, static hydraulic cycle (with no payload) and with the cooling fan speed set at 70 percent of the maximum value.

The operator sound pressure level for a machine installed with a Low Sound package, measured according to the procedures specified in ISO6396:2008, is 69 dB(A) with the cooling fan speed set at 70 percent of the maximum value. Hearing protection may be needed when the machine is operated with windows and/or door opened or with an open operator station.

The machine sound power level for a machine installed with a Low Sound package, measured according to the procedures specified in ISO6395:2008, is 105 dB(A) with the cooling fan speed set at 70 percent of the maximum value.

Sound Level Information for Machines in European Union Countries and in Countries that Adopt the EU Directives

966H and 972H

The operator sound pressure level for a standard machine configuration, measured according to the procedures specified in ISO6396:2008, is 69 dB(A) with a cooling fan speed set at 70 percent of the maximum value. Hearing protection may be needed when the machine is operated with windows and/or door opened.

The labeled sound power level for a standard machine configuration is 107 dB(A) for the 966H and 108 dB(A) for the 972H with a cooling fan speed set at 70 percent of the maximum value, in conformance with the 2000/14/EC regulation.

The European Union Physical Agents (Vibration) Directive 2002/44/EC

Vibration Data for Wheel Loaders

Information Concerning Hand/Arm Vibration Level

When the machine is operated according to the intended use, the hand/arm vibration of this machine is below 2.5 meter per second squared.

Information Concerning Whole Body Vibration Level

This section provides vibration data and a method for estimating the vibration level for wheel loaders.

Note: Vibration levels are influenced by many different parameters. Many items are listed below.

- Operator training, behavior, mode and stress
- Job site organization, preparation, environment, weather and material
- Machine type, quality of the seat, quality of the suspension system, attachments and condition of the equipment

It is not possible to get precise vibration levels for this machine. The expected vibration levels can be estimated with the information in Table 1 in order to calculate the daily vibration exposure. A simple evaluation of the machine application can be used.

Estimate the vibration levels for the three vibration directions. For typical operating conditions, use the average vibration levels as the estimated level. With an experienced operator and smooth terrain, subtract the Scenario Factors from the average vibration level in order to obtain the estimated vibration level. For aggressive operations and severe terrain, add the Scenario Factors to the average vibration level in order to obtain the estimated vibration level.

Note: All vibration levels are in meter per second squared.

Table 1

ISO Reference Table A - Equivalent vibration levels of whole body vibration emission for earthmoving equipment.

Machine Type	Typical Operating Activity	Vibration Levels			Scenario Factors		
		X axis	Y axis	Z axis	X axis	Y axis	Z axis
Wheel Loader	load and carry motion	0,84	0,81	0,52	0,23	0,20	0,14
	mining application(1)	1,27	0,97	0,81	0,47	0,31	0,47
	transfer(2)	0,76	0,91	0,49	0,33	0,35	0,17
	V-shape motion (3)	0,99	0,84	0,54	0,29	0,32	0,14

(1) Loading at the face
(2) Travel at high speed on the job site or on public roads
(3) Loading a truck in short cycles

Note: Refer to ISO/TR 25398 Mechanical Vibration - Guideline for the assessment of exposure to whole body vibration of ride on operated earthmoving machines for more information about vibration. This publication uses data that is measured by international institutes, organizations and manufacturers. This document provides information about the whole body exposure of operators of earthmoving equipment. Refer to Operation and Maintenance Manual Supplement, SEBU8257 for more information about machine vibration levels.

The Caterpillar suspension seat meets the criteria of ISO 7096. This represents vertical vibration level under severe operating conditions. This seat is tested with the input spectral class EM3. The seat has a transmissibility factor of “SEAT<1.0”.

The whole body vibration level of the machine varies. There is a range of values. The low value is 0.5 meter per second squared. The machine meets the short term level for the design of the seat in ISO 7096. The value is 1.13 meter per second squared for this machine.

Guidelines for Reducing Vibration Levels on Earthmoving Equipment

Properly adjust machines. Properly maintain machines. Operate machines smoothly. Maintain the conditions of the terrain. The following guidelines can help reduce the whole body vibration level:

1. Use the right type and size of machine, equipment, and attachments.

2. Maintain machines according to the manufacturer's recommendations.

a. Tire pressures

b. Brake and steering systems

c. Controls, hydraulic system and linkages

3. Keep the terrain in good condition.

a. Remove any large rocks or obstacles.

b. Fill any ditches and holes.

c. Provide machines and schedule time in order to maintain the conditions of the terrain.

4. Use a seat that meets ISO 7096. Keep the seat maintained and adjusted.
   a. Adjust the seat and suspension for the weight and the size of the operator.
   b. Inspect and maintain the seat suspension and adjustment mechanisms.
5. Perform the following operations smoothly.
   a. Steer
   b. Brake
   c. Accelerate.
   d. Shift the gears.
6. Move the attachments smoothly.
7. Adjust the machine speed and the route in order to minimize the vibration level.
   a. Drive around obstacles and rough terrain.
   b. Slow down when it is necessary to go over rough terrain.
8. Minimize vibrations for a long work cycle or a long travel distance.
   a. Use machines that are equipped with suspension systems.
   b. Use the ride control system on wheel loaders.
   c. If no ride control system is available, reduce speed in order to prevent bounce.
   d. Haul the machines between workplaces.
9. Less operator comfort may be caused by other risk factors. The following guidelines can be effective in order to provide better operator comfort:
   a. Adjust the seat and adjust the controls in order to achieve good posture.
   b. Adjust the mirrors in order to minimize twisted posture.
   c. Provide breaks in order to reduce long periods of sitting.
   d. Avoid jumping from the cab.
   e. Minimize repeated handling of loads and lifting of loads.
   f. Minimize any shocks and impacts during sports and leisure activities.

Sources

The vibration information and calculation procedure is based on ISO/TR 25398 Mechanical Vibration - Guideline for the assessment of exposure to whole body vibration of ride on operated earthmoving machines. Harmonized data is measured by international institutes, organizations and manufacturers.

This literature provides information about assessing the whole body vibration exposure of operators of earthmoving equipment. The method is based on measured vibration emission under real working conditions for all machines.

You should check the original directive. This document summarizes part of the content of the applicable law. This document is not meant to substitute the original sources. Other parts of these documents are based on information from the United Kingdom Health and Safety Executive .

Refer to Operation and Maintenance Manual Supplement, SEBU8257 for more information about vibration.

Consult your local Cat dealer for more information about machine features that minimize vibration levels. Consult your local Cat dealer about safe machine operation.

Use the following web site in order to find your local dealer:

Caterpillar, Inc.
www.cat.com

i03634321

Operator Station

SMCS Code: 7000

Any modifications to the inside of the operator station should not project into the operator space or into the space for the companion seat (if equipped). The addition of a radio, fire extinguisher, and other equipment must be installed so that the defined operator space and the space for the companion seat (if equipped) is maintained. Any item that is brought into the cab should not project into the defined operator space or the space for the companion seat (if equipped). 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.

Product Information Section

General Information

i02168718

Machine Configuration

SMCS Code: 7000

Your machine has one of four configurations. Conventional steering and command control steering are available steering configurations. Control levers and joystick control are available for the hydraulic controls.

Steering Configurations

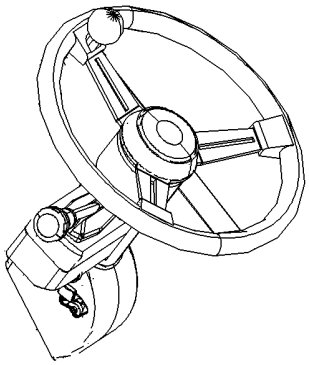

Illustration 34 g00751039

Full Steering Wheel (Conventional Steering)

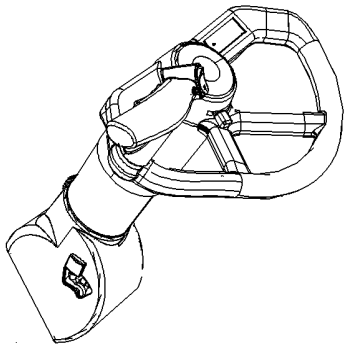

Illustration 35 g00751045

Half-circle Steering Wheel (Command Control Steering)

Steering with command control steering will be more responsive and less effort will be required for turning the steering wheel.

Configurations for the Hydraulic Controls

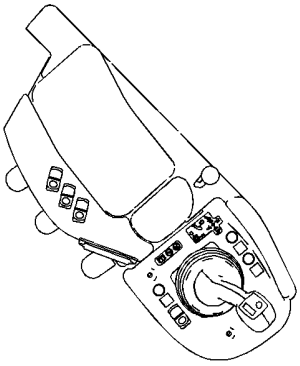

Illustration 36 g01098824

Joystick Control and Console

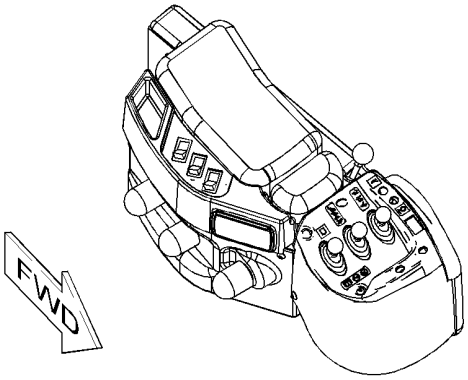

Illustration 37 g01126066

Control Levers and Console

i04001643

Specifications

SMCS Code: 7000

Intended Use

This machine is classified as a Wheel Loader as described in ISO 6165:2001. This machine normally has a front mounted bucket for the principal intended functions of digging, loading, lifting, carrying, and moving material such as earth, crushed rock, or gravel. Additional work tools allow this machine to perform other specific tasks.

Application/Configuration Restrictions

Refer to “Machine Data” below for information about maximum machine weight.

Lift arm height restrictions will be found in the Operation and Maintenance Manual for the appropriate work tool.

With full fluids, the maximum fore and aft continuous slope operation for proper lubrication is 30 degrees.

This machine is approved for use in environments with no explosive gases.

Machine Data

The 966H machines are equipped with a C11Engine. The 972H machines are equipped with a C13Engine .

Basic machine specifications are listed in the following tables.

Table 2

966HWheel Loader	
Operating Weight	23461 kg (51723 lb)
Shipping Weight	23068 kg (50856 lb)
Maximum Length	8863 mm (349 inches)
Bucket Width	3145 mm (124 inches)
Height to Top of ROPS	3580 mm (141 inches)

Table 3

972HWheel Loader	
Operating Weight	25276 kg (55724 lb)
Shipping Weight	24885 kg (54862 lb)
Maximum Length	9218 mm (363 inches)
Width	3145 mm (124 inches)
Height to Top of ROPS	3586 mm (141 inches)

i03653894

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. Attachments, 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
- air conditioner
- Ride control
- Power train Guard
- enclosed ROPS
- 80 kg (176 lb) operator
- L3 Michelin XHA tires or equivalent

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

The rated operating load is defined by SAE J818 (May 1987) and by the ISO 5998 (1986) as 50% of the full turn static tipping load.

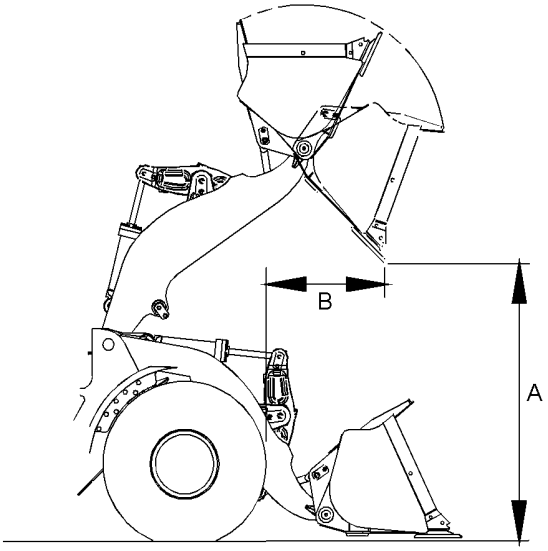

Illustration 38 g01963747

The dump clearance and the reach are given for each bucket at maximum lift height and at a 45 degree dumping angle. Dump clearance (A) is measured from the ground to the bucket edge. Reach (B) is measured from the front of the front tire to the bucket edge.

For North America , the rated operating load is defined by SAE J1197 (February 1991) as 50% of the full turn static tipping load.

Buckets

966H General Purpose Bucket - Pin On

Table 4

Edge Type		Bolt-On Edges	Teeth and Segments	Teeth	Bolt-On Edges	Teeth and Segments	Teeth
Rated Capacity	m3	3.6	3.6	3.5	3.8	3.8	3.6
	y3	4.7	4.7	4.6	5.0	5.0	4.7
Dump Clearance at Maximum Lift and 45 Discharge	mm	3134	2984	2984	3099	2948	2948
	ft, in	10' 3	9' 9	9' 9	10' 2	9' 8	9' 8"
Reach at Maximum Lift and 45 Degree Discharge	mm	1282	1424	1424	1305	1446	1446
	ft, in	4' 2	4' 8	4' 8	4' 3	4' 8	4' 8"
Reach at Level Lift Arm and Level Bucket	mm	2652	2857	2857	2695	2900	2900
	ft, in	8' 8	9' 4	9' 4	8' 10	9' 6	9' 6"
Rated Load	kg	7245	7154	7318	7193	7101	7264
	lb	15969	15767	16128	15854	15651	16010

General Purpose Bucket - Pin On (continued)

Table 5

Edge Type		Bolt-On Edges	Teeth and Segments	Teeth	Bolt-On Edges	Teeth and Segments	Teeth
Rated Capacity	m3	4.0	4.0	3.8	4.3	4.3	4.0
	y3	5.2	5.2	5.0	5.6	5.6	5.2
Dump Clearance at Maximum Lift and 45 Discharge	mm	3066	2914	2914	3066	2914	2914
	ft, in	10' 0	9' 6	9' 6	10' 0	9' 6	9' 6"
Reach at Maximum Lift and 45 Discharge	mm	1329	1469	1469	1329	1469	1469
	ft, in	4' 4	4' 9	4' 9	4' 4	4' 9	4' 9"
Reach at Level Lift Arm and Level Bucket	mm	2737	2942	2942	2737	2942	2942
	ft, in	8' 11	9' 7	9' 7	8' 11	9' 7	9' 7"
Rated Load	kg	7150	7057	7220	7148	7041	7223
	lb	15758	15554	15912	15754	15519	15920

972H General Purpose Bucket - Pin On

Table 6

Edge Type		Bolt-On Edges	Teeth and Segments	Teeth	Bolt-On Edges	Teeth and Segments	Teeth	Bolt-On Edges	Teeth and Segments	Teeth
Rated Capacity	m3	4.0	4.0	3.8	4.3	4.3	4.0	4.5	4.5	4.3
	y3	5.2	5.2	5.0	5.6	5.6	5.2	5.9	5.9	5.6
Dump Clearance at Maximum Lift and 45 Discharge	mm	3288	3136	3136	3288	3136	3136	3248	3095	3095
	ft, in	10' 9	10' 3	10' 3	10' 9	10' 3	10' 3	10' 7	10' 1	10' 1"
Reach at Maximum Lift and 45 Discharge	mm	1281	1421	1421	1281	1421	1421	1309	1448	1448
	ft, in	4' 2	4' 7	4' 7	4' 2	4' 7	4' 7	4' 3	4' 8	4' 8"
Reach at Level Lift Arm and Level Bucket	mm	2867	3072	3072	2867	3072	3072	2917	3122	3122
	ft, in	9' 4	10' 0	10' 0	9' 4	10' 0	10' 0	9' 6	10' 2	10' 2"
Rated Load	kg	7781	7690	7855	7783	7678	7862	7681	7575	7761
	lb	17150	16949	17313	17155	16922	17329	16928	16696	17105

General Purpose Bucket - Pin On (continued)

Table 7

Edge Type		Bolt-On Edges	Teeth and Segments	Teeth	Bolt-On Edges	Teeth and Segments	Teeth
Rated Capacity	m3	4.6	4.6	4.4	5.1	5.1	4.9
	y3	6.0	6.0	5.8	6.7	6.7	6.4
Dump Clearance at Maximum Lift and 45 Discharge	mm	3232	3080	3080	3154	3000	3000
	ft, in	10' 7	10' 1	10' 1	10' 4	9' 10	9' 10"
Reach at Maximum Lift and 45 Discharge	mm	1326	1466	1466	1389	1526	1526
	ft, in	4' 4	4' 9	4' 9	4' 6	5' 0	5' 0"
Reach at Level Lift Arm and Level Bucket	mm	2939	3144	3144	3041	3246	3246
	ft, in	9' 7	10' 3	10' 3	9' 11	10' 7	10' 7"
Rated Load	kg	7830	7725	7910	7795	7694	7870
	lb	17257	17025	17433	17180	16958	17345

966H Material Handling Bucket - Pin On

Table 8

Edge Type		Bolt-On Edges	Teeth and Segments	Teeth	Bolt-On Edges	Teeth and Segments	Teeth
Rated Capacity	m3	3.8	3.8	3.6	4.0	4.0	3.8
	y3	5.0	5.0	4.7	5.2	5.2	5.0
Dump Clearance at Maximum Lift and 45 Discharge	mm	3063	2900	2900	3020	2857	2857
	ft, in	10' 0	9' 6	9' 6	9' 10	9' 4	9' 4"
Reach at Maximum Lift and 45 Discharge	mm	1162	1289	1289	1205	1331	1331
	ft, in	3' 9	4' 2	4' 2	3' 11	4' 4	4' 4"
Reach at Level Lift Arm and Level Bucket	mm	2642	2847	2847	2702	2907	2907
	ft, in	8' 8	9' 4	9' 4	8' 10	9' 6	9' 6"
Rated Load	kg	7141	7036	7217	7069	6964	7144
	lb	15738	15508	15907	15581	15349	15746

972H Material Handling Bucket - Pin On

Table 9

Edge Type		Bolt-On Edges	Teeth and Segments	Teeth	Bolt-On Edges	Teeth and Segments	Teeth
Rated Capacity	m3	4.3	4.3	4.0	4.7	4.7	4.5
	y3	5.6	5.6	5.2	6.2	6.2	5.9
Dump Clearance at Maximum Lift and 45 Discharge	mm	3207	3044	3044	3144	2981	2981
	ft, in	10' 6	9' 11	9' 11	10' 3	9' 9	9' 9"
Reach at Maximum Lift and 45 Discharge	mm	1192	1319	1319	1256	1383	1383
	ft, in	3' 10	4' 3	4' 3	4' 1	4' 6	4' 6"
Reach at Level Lift Arm and Level Bucket	mm	2882	3087	3087	2972	3177	3177
	ft, in	9' 5	10' 1	10' 1	9' 9	10' 5	10' 5"
Rated Load	kg	7647	7543	7725	7618	7528	7632
	lb	16854	16624	17025	16791	16591	16821

966H General Purpose Bucket - Fusion Quick Coupler

Table 10

Edge Type		Bolt-On Edges	Teeth and Segments	Teeth	Bolt-On Edges	Teeth and Segments	Teeth
Rated Capacity	m3	3.8	3.8	3.6	4.2	4.2	4.0
	y3	5.0	5.0	4.7	5.5	5.5	5.2
Dump Clearance at Maximum Lift and 45 Discharge	mm	3128	2978	2978	3062	2909	2909
	ft, in	10' 3	9' 9	9' 9	10' 0	9' 6	9' 6"
Reach at Maximum Lift and 45 Discharge	mm	1287	1429	1429	1334	1473	1473
	ft, in	4' 2	4' 8	4' 8	4' 4	4' 9	4' 9"
Reach at Level Lift Arm and Level Bucket	mm	2662	2867	2867	2745	2950	2950
	ft, in	8' 8	9' 4	9' 4	9' 0	9' 8	9' 8"
Rated Load	kg	7132	7042	7209	7054	6963	7129
	lb	15720	15520	15888	15548	15346	15711

972H General Purpose Bucket - Fusion Quick Coupler

Table 11

Edge Type		Bolt-On Edges	Teeth and Segments	Teeth	Bolt-On Edges	Teeth and Segments	Teeth
Rated Capacity	m3	4.2	4.2	4.0	4.8	4.8	4.6
	y3	5.5	5.5	5.2	6.3	6.3	6.0
Dump Clearance at Maximum Lift and 45 Discharge	mm	3284	3132	3132	3136	2973	2973
	ft, in	10' 9	10' 3	10' 3	10' 3	9' 9	9' 9"
Reach at Maximum Lift and 45 Discharge	mm	1286	1425	1425	1275	1402	1402
	ft, in	4' 2	4' 8	4' 8	4' 2	4' 7	4' 7"
Reach at Level Lift Arm and Level Bucket	mm	2875	3080	3080	2991	3196	3196
	ft, in	9' 5	10' 1	10' 1	9' 9	10' 5	10' 5"
Rated Load	kg	7683	7592	7760	7554	7462	7628
	lb	16932	16733	17103	16649	16447	16811

966H Material Handling Bucket - Fusion Quick Coupler

Table 12

Edge Type		Bolt-On Edges	Teeth and Segments	Teeth
Rated Capacity	m3	4.2	4.2	4.0
	y3	5.5	5.5	5.2
Dump Clearance at Maximum Lift and 45 Discharge	mm	2991	2828	2828
	ft, in	9' 9	9' 3	9' 3"
Reach at Maximum Lift and 45 Discharge	mm	1246	1373	1373
	ft, in	4' 1	4' 6	4' 6"
Reach at Level Lift Arm and Level Bucket	mm	2752	2957	2957
	ft, in	9' 0	9' 8	9' 8"
Rated Load	kg	7011	6920	7082
	lb	15452	15251	15608

972H Material Handling Bucket - Fusion Quick Coupler

Table 13

Edge Type		Bolt-On Edges	Teeth and Segments	Teeth
Rated Capacity	m3	4.6	4.6	4.4
	y3	6.0	6.0	5.8
Dump Clearance at Maximum Lift and 45 Discharge	mm	3158	2995	2995
	ft, in	10' 4	9' 9	9' 9"
Reach at Maximum Lift and 45 Discharge	mm	1253	1380	1380
	ft, in	4' 1	4' 6	4' 6"
Reach at Level Lift Arm and Level Bucket	mm	2960	3165	3165
	ft, in	9' 8	10' 4	10' 4"
Rated Load	kg	7559	7468	7631
	lb	16660	16460	16819

966H Miscellaneous Buckets

Table 14

		Rock Bucket - Pin On		Heavy Duty Rock Bucket - Pin On	Waste Bucket - Pin On
Edge Type		**Bolt-On Edges**	**Teeth and Segments**	**Teeth and Segments**	**Bolt-On Edges**
Rated Capacity	m3	3.5	3.5	3.5	6.4
	y3	4.6	4.6	4.6	8.3
Dump Clearance at Maximum Lift and 45 Discharge	mm	3093	2945	2945	2969
	ft, in	10' 1	9' 7	9' 7	9' 8
Reach at Maximum Lift and 45 Discharge	mm	1458	1649	1649	1220
	ft, in	4' 9	5' 4	5' 4	4' 0
Reach at Level Lift Arm and Level Bucket	mm	2799	3041	3041	2750
	ft, in	9' 2	9' 11	9' 11	9' 0
Rated Load	kg	7121	7054	6991	7259
	lb	15695	15546	15409	16000

972H Miscellaneous Buckets

Table 15

		Rock Pin On	Heavy Duty Rock Pin On	WastePin On
Edge Type		**Teeth and Segments**	**Teeth and Segments**	**Bolt-On Edges**
Rated Capacity	m3	4.0	4.0	6.4
	y3	5.2	5.2	8.3
Dump Clearance at Maximum Lift and 45 Discharge	mm	3055	3055	3191
	ft, in	10' 0	10' 0	10' 5"
Reach at Maximum Lift and 45 Discharge	mm	1640	1640	1173
	ft, in	5' 4	5' 4	3' 10"
Reach at Level Lift Arm and Level Bucket	mm	3281	3281	2880
	ft, in	10' 9	10' 9	9' 5"
Rated Load	kg	7571	7501	7866
	lb	16687	16533	17337

966H Forks

Note: Rated loads should be used as a guide. Attachments, 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
- air conditioner
- Ride control
- Power train Guard
- enclosed ROPS
- 80 kg (176 lb) operator
- L3 Michelin XHA tires or equivalent

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

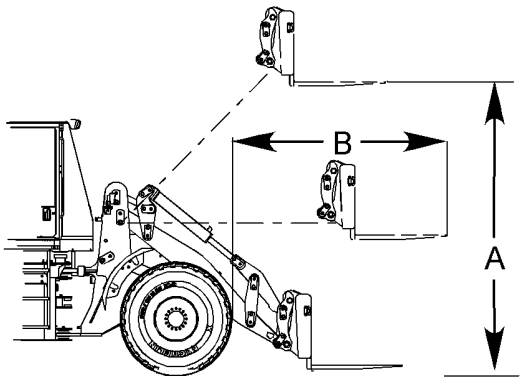

Illustration 39 g01442783

Table 16

Fork Tine Length	**mm**	**1524**	**1524**	**1829**	**1829**	**2134**	**2134**
	in	**60**	**60**	**72**	**72**	**84**	**84**
Load Center	mm	610	762	610	914	610	1067

(continued)

(Table 16, contd)

Fork Tine Length	mm	1524	1524	1829	1829	2134	2134
	in	60	60	72	72	84	84
	in	24	30	24	36	24	42
Rated Load (SAE J1197)	kg	5436	5193	5397	4936	5355	4697
	lbs	11980	11446	11894	10879	11802	10353
Rated Load (CEN EN 474-3 Rough Terrain)	kg	6523	6232	6476	5923	6426	5637
	lbs	14376	13735	14273	13054	14162	12423
Rated Load (CEN EN 474-3 Firm and Level Ground)	kg	8697	8309	8635	7739	8568	6841
	lbs	19168	18313	19031	17056	18883	15079
Maximum Overall Length	mm	9194	9194	9499	9499	9804	9804
	in	362.0	362.0	374.0	374.0	386.0	386.0
Reach with Forks at Ground Level	mm	1081	1081	1081	1081	1081	1081
	in	42.5	42.5	42.5	42.5	42.6	42.6
Ground to Top of Tine at Minimum Height and Fork Level	mm	105	105	105	105	105	105
	in	4.1	4.1	4.1	4.1	4.1	4.1
Reach with Arms Horizontal and Forks Level(B)	mm	1676	1676	1676	1676	1676	1676
	in	66.0	66.0	66.0	66.0	66.0	66.0
Reach with Fork at Maximum Height	mm	808	808	809	809	809	809
	in	31.8	31.8	31.8	31.8	31.8	31.8
Ground to Top of Tine with Arms Horizontal and Fork Level	mm	1861	1861	1861	1861	1861	1861
	in	73.3	73.3	73.3	73.3	73.3	73.3
Ground to Top of Tine at Maximum Height and Fork Level(A)	mm	3945	3945	3945	3945	3945	3945
	in	155.3	155.3	155.3	155.3	155.3	155.3

972H Forks

Table 17

Fork Tine Length	mm	1524	1524	1829	1829	2134	2134
	in	60	60	72	72	84	84
Load Center	mm	610	762	610	914	610	1067
	in	24	30	24	36	24	42
Rated Load (SAE J1197)	kg	6101	5839	6062	5563	6021	5307
	lbs	13446	12870	13361	12261	13270	11696
Rated Load (CEN EN 474-3 Rough Terrain)	kg	7321	7007	7274	6676	7225	6368
	lbs	16135	15444	16033	14714	15923	14035
Rated Load (CEN EN 474-3 Firm and Level Ground)	kg	9761	9343	9699	8901	9633	8491
	lbs	21514	20591	21377	19618	21231	18714
Maximum Overall Length	mm	9570	9570	9875	9875	10180	10180
	in	376.8	376.8	388.8	388.8	400.8	400.8
Reach with Forks at Ground Level	mm	1242	1242	1242	1242	1242	1242
	in	48.9	48.9	48.9	48.9	48.9	48.9
Ground to Top of Tine at Minimum Height and Fork Level	mm	85	85	85	85	85	85
	in	3.3	3.3	3.3	3.3	3.3	3.3
Reach with Arms Horizontal and Forks Level(B)	mm	1806	1806	1806	1806	1806	1806
	in	71.1	71.1	71.1	71.1	71.1	71.1
Reach with Fork at Maximum Height	mm	761	761	761	761	761	761
	in	30.0	30.0	30.0	30.0	30.0	30.0
Ground to Top of Tine with Arms Horizontal and Fork Level	mm	1861	1861	1861	1861	1861	1861
	in	73.3	73.3	73.3	73.3	73.3	73.3
Ground to Top of Tine at Maximum Height and Fork Level(A)	mm	4167	4167	4167	4167	4167	4167
	in	164.1	164.1	164.1	164.1	164.1	164.1

Identification Information

i03654697

Plate Locations and Film Locations

SMCS Code: 1000; 7000; 7405

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.

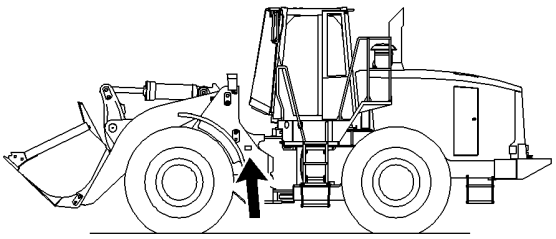

Illustration 40 g00883938

This plate is located on the left side of the front loader frame.

Machine PIN_____

SIN_____

If the machine is equipped with the certification plate for the European Union, this plate will be attached to the PIN plate. The certification plate will contain the following information:

- Power (kW) _____
- Weight (kg) _____
- Year of Manufacture

The plate for the transmission serial number is located next to the sight gauge for the transmission oil level.

Transmission Serial Number_____

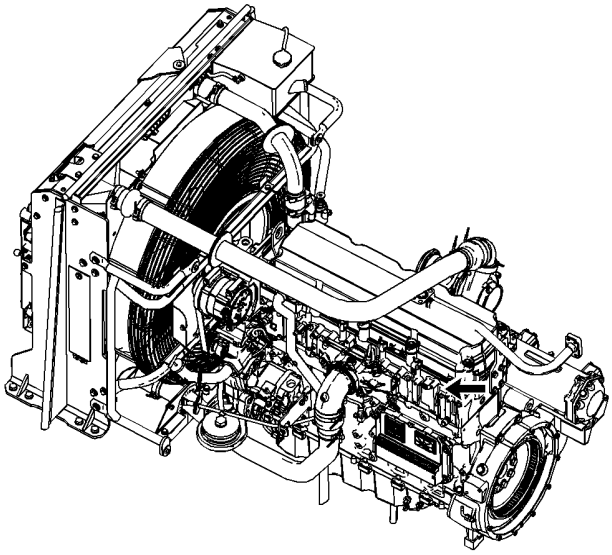

Illustration 41 g01099084

This plate is located on the right side of the engine block just above the starter.

Engine Serial Number_____

Certification

ROPS/FOPS Plate

This message is located on the panel below the side window on the right side of the cab.

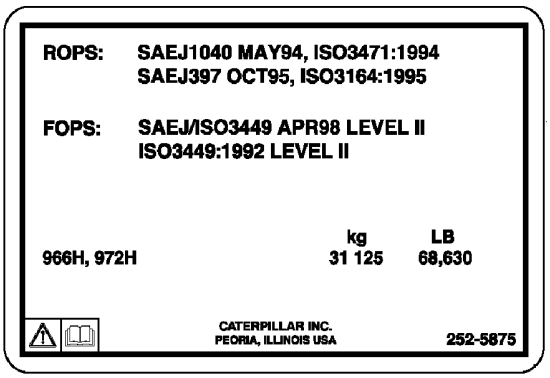

Illustration 42 g01185189

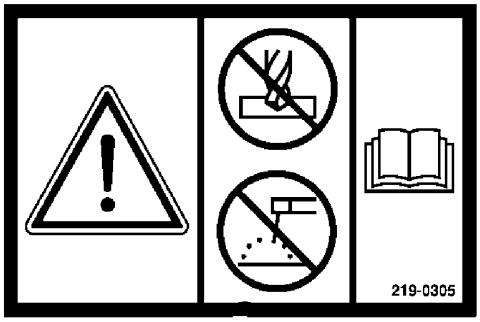

Illustration 43 g00902324

⚠ 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. This will void the certification. Consult a Caterpillar dealer to determine this structure's limitations without voiding its certification.

This machine has been certified to the standards that are listed on the certification plate. The maximum mass of the machine, which includes the operator and the attachments without a payload, should not exceed the mass on the certification plate.

Sound

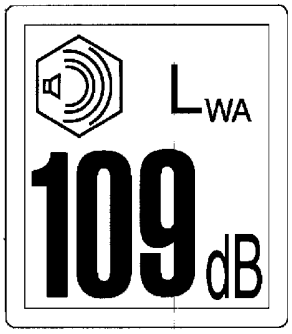

Illustration 44 g00933634

A typical example of this film is shown. Your machine may have a different value.

If equipped, the certification film is used to verify the environmental sound certification of the machine to the requirements of the European Union. The value that is listed on the label indicates the guaranteed exterior sound power level L_{WA} at the time of manufacture for the conditions that are specified in 2000/14/EC.

Italian Roading Homologation

This plate is located on the right side of the machine behind the front tire.

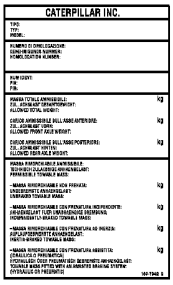

Illustration 45 g00937218

The following information is stamped on the TUV/ homologation plate:

- “Model” _____
- “Homologation number” _____
- “PIN” _____
- “Allowed total weight” _____
- “Allowed front axle weight” _____
- “Allowed rear axle weight” _____
- “Permissible towable mass” _____
- “Unbraked towable mass” _____
- “Independently-braked towable mass” _____
- “Inertia-braked towable mass” _____
- “Towable mass fitted with an assisted braking system (hydraulic or pneumatic)” _____

Machine Security System

This message is located on the control group for the machine security system. The control group is located in the engine compartment.

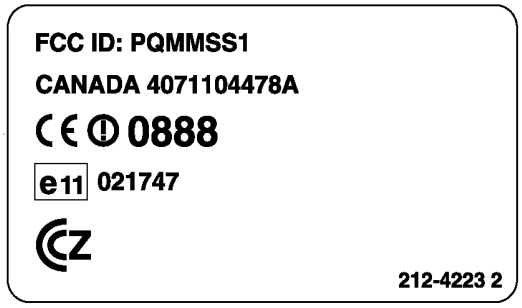

Illustration 46 g00995393

Consult your Caterpillar dealer with any questions that concern the operation of the MSS in a specific country.

i04687649

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

Certification Label for Emissions

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

Consult your Cat dealer for an Emission Control Warranty Statement.

This label is located on the engine valve cover.

i03772655

Declaration of Conformity

SMCS Code: 1000; 7000

Table 18

An EC Declaration of Conformity document was provided with the machine if it was manufactured to comply with specific requirements for the European Union. In order to determine the details of the applicable Directives, review the complete EC Declaration of Conformity provided with the machine. The extract shown below from an EC Declaration of Conformity for machines that are declared compliant to 2006/42/EC applies only to those machines originally "CE" marked by the manufacturer listed and which have not since been modified.

EC DECLARATION OF CONFORMITY OF MACHINERY

Manufacturer: Caterpillar Inc., 100 N.E. Adams Street, Peoria, Illinois 61629, USA

Person authorized to compile the Technical File and to communicate relevant part (s) of the Technical File to the Authorities of European Union Member States on request:

Standards & Regulations Manager,Caterpillar France S.A.S 40 ,
Avenue Leon-Blum, B.P. 55, 38041 Grenoble Cedex 9, France

I, the undersigned, _____, hereby certify that the construction equipment specified hereunder

Description:	Generic Denomination:	Earth moving Equipment
	Function:	Wheeled loader
	Model/Type:	966H Wheel Loader 972H Wheel Loader
	Serial Number:	
	Commercial Name:	Caterpillar

Fulfils all the relevant provisions of the following Directives

Directives	Notified Body	Document No.
2006/42/EC	N/A	
2000/14/EC amended by 2005/88/EC, Note (1)		
2004/108/EC	N/A	

Note (1) Annex -_____ Guaranteed Sound Power Level -____dB (A)
Representative Equipment Type Sound Power Level - ____dB (A)
Engine Power per ____-____ kW Rated engine speed - ____ rpm
Technical Documentation accessible through person listed above authorized to compile the Technical File

Done at: **Signature**

Date: **Name/Position**

Note: The above information was correct as of June 2009, but may be subject to change, please refer to the individual declaration of conformity issued with the machine for exact details.

Operation Section

Before Operation

i04021647

Mounting and Dismounting

SMCS Code: 7000

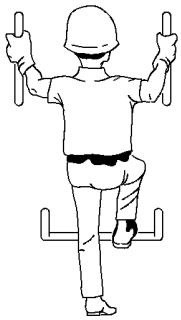

Illustration 47 g00037860

Typical example

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 all necessary repairs.

Face the machine whenever you get on the machine and whenever you get off 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.

Do not mount a moving machine. Do not dismount a moving machine. Never jump off the machine. Do not carry tools or supplies when you try to mount the machine or when you try to dismount the machine. 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.

Machine Access System Specifications

The machine access system has been designed to meet the intent of the technical requirements in ISO 2867 Earth-moving Machinery – Access Systems. The access system provides for operator access to the operator station and to conduct the maintenance procedures described in Maintenance section.

Alternate Exit

Machines that are equipped with cabs have alternate exits. For additional information, see Operation and Maintenance Manual, “Alternate Exit”.

i03653544

Daily Inspection

SMCS Code: 1000; 7000

For a maximum service life of the machine, complete a thorough walk-around inspection before you mount the machine and before you start the engine.

Inspect the area around the machine and under the machine. Look for loose bolts, trash buildup, oil, coolant leakage, broken parts, or worn parts.

Note: Watch closely for leaks. If you observe a leak, find the source of the leak and correct the leak. If you suspect a leak or you observe a leak, check the fluid levels more frequently.

Inspect the condition of the equipment and of the hydraulic components.

Check the condition of the tires. Adjust the inflation pressure, if necessary.

Check all of the oil levels, all of the coolant levels, and all of the fuel levels.

Remove any trash buildup and debris. Make all necessary repairs before you operate the machine.

Make sure that all covers and guards are securely attached.

Adjust the mirrors for the correct rear view of the machine.

Grease all of the fittings that need to be serviced on a daily basis.

Daily, perform the procedures that are applicable to your machine:

- Operation and Maintenance Manual, “Backup Alarm - Test”
- Operation and Maintenance Manual, “Cooling System Coolant Level - Check”
- Operation and Maintenance Manual, “Engine Oil Level - Check”
- Operation and Maintenance Manual, “Fuel System Primary Filter (Water Separator) - Drain”
- Operation and Maintenance Manual, “Hydraulic System Oil Level - Check”
- Operation and Maintenance Manual, “Quick Coupler - check”
- Operation and Maintenance Manual, “Seat Belt - Inspect”
- Operation and Maintenance Manual, “Transmission Oil Level - Check”
- Operation and Maintenance Manual, “Windows - Clean”

i04844149

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.

The steering frame lock is located on the left side of the machine.

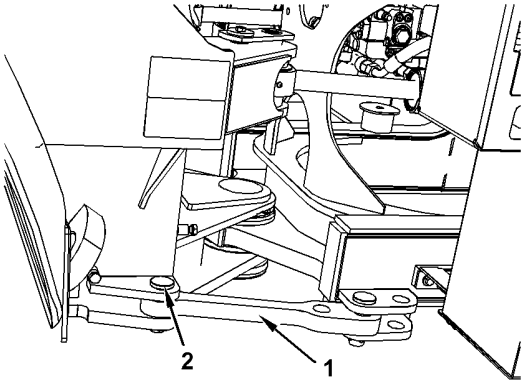

Illustration 48 g02924976

Connect steering frame lock (1) when the machine is being lifted and when the machine is being transported. Also connect the steering frame lock if you are performing service work near the articulation joint. Install pin (2) in order to secure the steering frame lock.

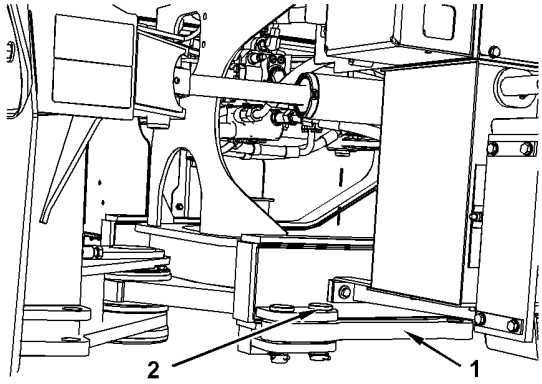

Illustration 49 g02924977

Separate steering frame lock (1) before the machine is operated.

Move the steering frame lock into the unlocked position and install pin (2).

Machine Operation

i03654709

Alternate Exit

SMCS Code: 7310

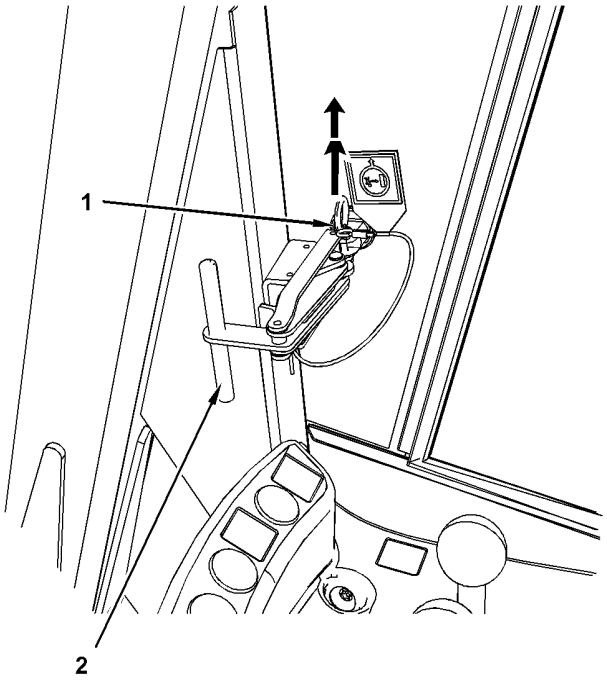

Illustration 50 g01961157

The right side cab window can be used as an alternate exit. The window can only be opened from the inside of the cab.

Pull latch (2) backward and push the latch outward in order to open the window to the partial open position. Remove pin (1) from the window and push the window to the fully open position.

i02163386

Seat

SMCS Code: 7312

Note: The operator's seat that is provided with this machine is in compliance with the appropriate class of ISO 7096.

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.

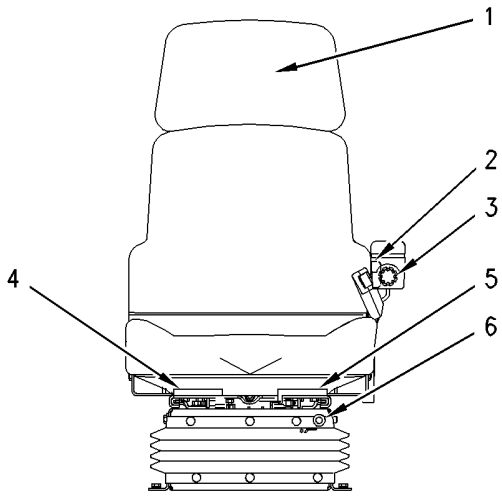

Illustration 51 g00886240

Backrest (1) – Pull up on the backrest in order to remove extension (1).

Lumbar Support (2) – Rotate the knob clockwise in order to increase support to the lower back. Rotate the knob counterclockwise in order to decrease support to the lower back.

Rotate knob (3) in order to adjust the angle of the armrest in the operating position.

Seat Backrest Angle Adjustment (4) – Pull the lever upward. Hold the lever upward and adjust the backrest to the desired angle. Release the lever in order to lock the backrest into position.

Fore and Aft Position (5) – Pull the lever upward. 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.

Mechanical Suspension

Seat Height (6) – Pull the lever upward. Hold the lever upward and move the seat to the desired height. Release the lever in order to lock the seat into position.

Air Suspension (If Equipped)

Seat Height (6) – Push in on air valve knob (6) in order to raise the height of the seat. Pull out on the air valve knob (6) in order to lower the height of the seat.

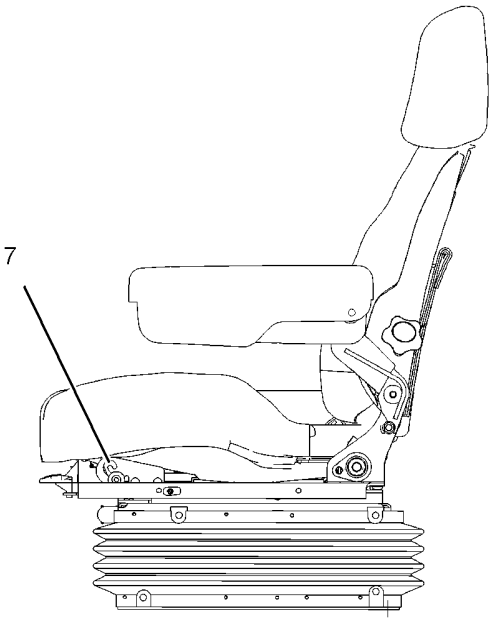

Illustration 52 g01105067

Cushion Angle Adjustment (7) – In order to raise the angle of the seat, pull upward on the front of the seat and push the seat rearward. In order to lower the angle of the seat, pull upward and pull forward.

i04200349

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 and ISO 6683 standards. Consult your Cat 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

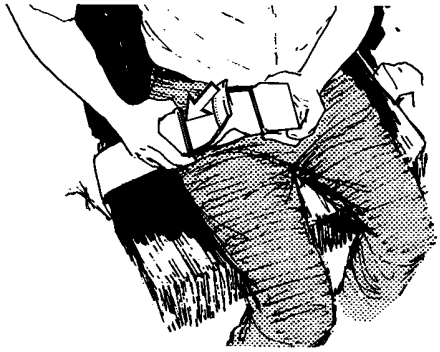

Illustration 53 g00100709

1. Unfasten the seat belt.

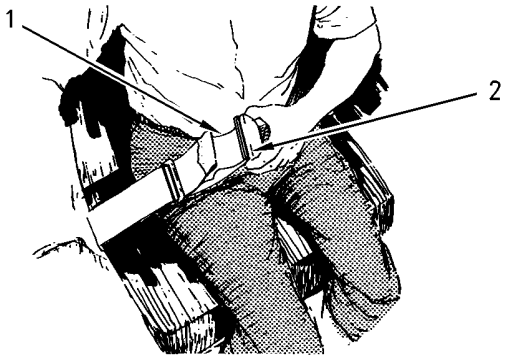

Illustration 54 g00932817

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

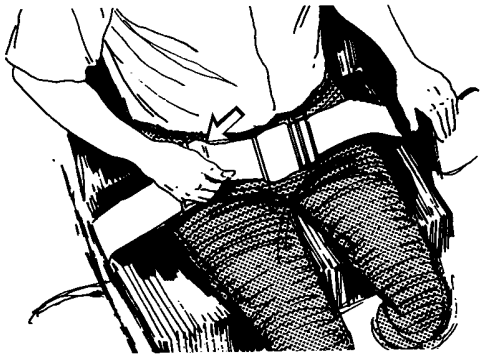

Illustration 55 g00100713

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

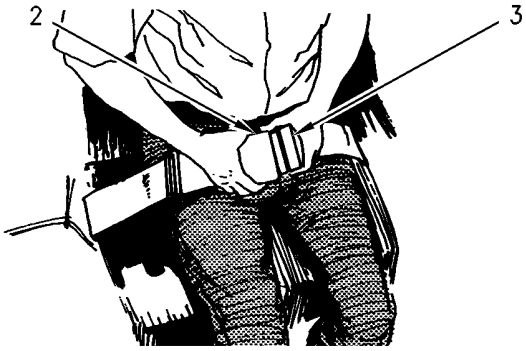

Illustration 56 g00932818

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

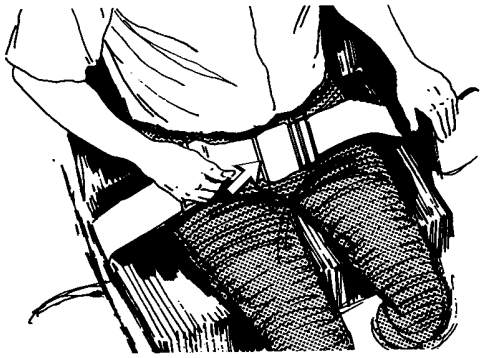

Illustration 57 g00100717

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

Seat Belt Adjustment for Retractable Seat Belts

Fastening The Seat Belt

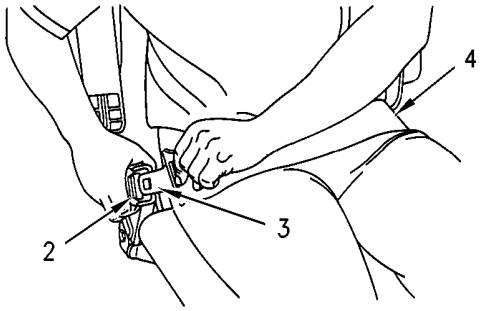

Illustration 58 g00867598

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

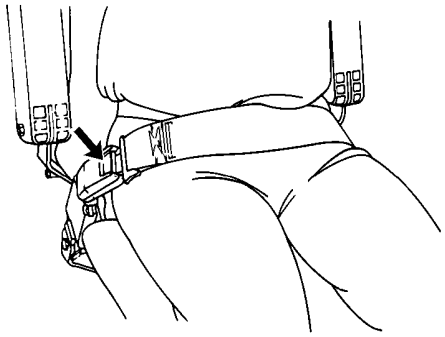

Illustration 59 g00039113

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 Cat dealer for longer seat belts and for information on extending the seat belts.

i03641800

Mirror
(If Equipped)

SMCS Code: 7319

⚠ WARNING

Adjust all mirrors as specified in the Operation and Maintenance Manual. Failure to heed this warning can lead to personal injury or death.

⚠ WARNING

Slips and falls can result in personal injury. Use the machine's access systems when adjusting the mirrors. If the mirrors cannot be reached using the machine access systems follow the instructions found within the Operation and Maintenance Manual, "Mirror" in order to access the mirrors.

Note: Your machine may not be equipped with all of the mirrors that are described in this topic.

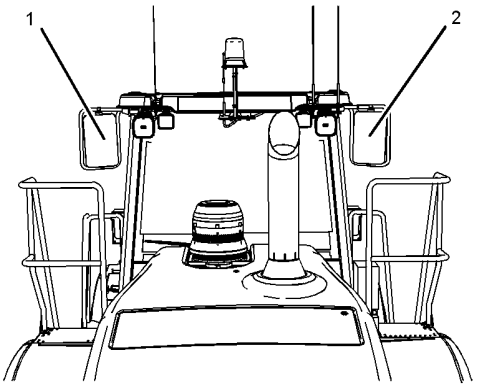

Illustration 60 g01625347

(1) Left Outside Mirror
(2) Right Outside Mirror

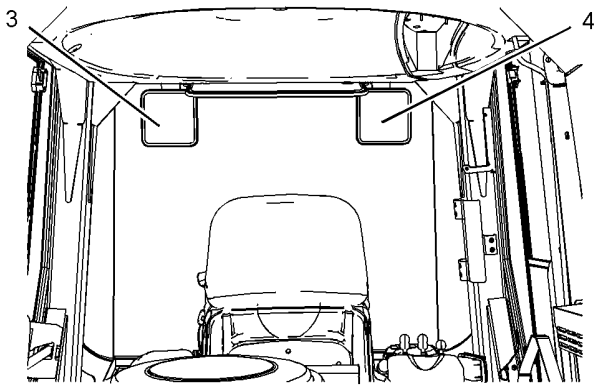

Illustration 61 g01625349

(3) Left Inside Mirror
(4) Right Inside Mirror

Mirrors provide additional visibility around your machine. Make sure that the mirrors are in proper working condition and that the mirrors are clean. Adjust all mirrors at the beginning of each work period and adjust the mirrors when you change operators.

The appropriate organization of the job site is also recommended in order to minimize hazards due to visibility. Refer to this Operation and Maintenance Manual, "Visibility Information" for more information about the mirrors.

Modified Machines or machines that have additional equipment or attachments may influence your visibility.

Mirror Adjustment

- Park the machine on a level surface.
- Lower the work tool to the ground.
- Move the hydraulic lockout control to the LOCKED position. Refer to Operation and Maintenance Manual, “Operator Controls” for more information about the lockout control.
- Stop the engine.
- Adjust rear view mirrors in order to provide visibility behind the machine at a maximum distance of 30 m (98 ft) from the rear corners of the machine.

Note: You may need to use hand tools in order to adjust certain types of mirrors.

Left Outside Mirror (1)

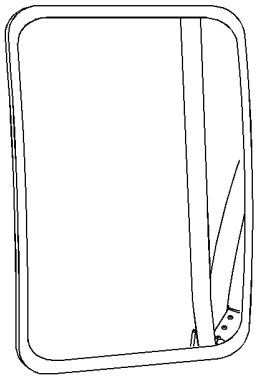

Illustration 62 g01631656

If equipped, adjust the left outside mirror (1) so that an area of at least 1 m (3.3 ft) from the rear of the machine can be seen from the operator seat.

Right Outside Mirror (2)

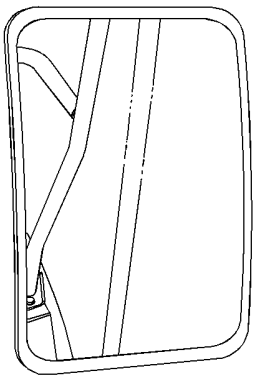

Illustration 63 g01631673

If equipped, adjust the right outside mirror (2) so that an area of at least 1 m (3.3 ft) from the side of the machine can be seen from the operator seat. Additionally, provide as much visibility to the rear as possible.

Left Inside Mirror (3)

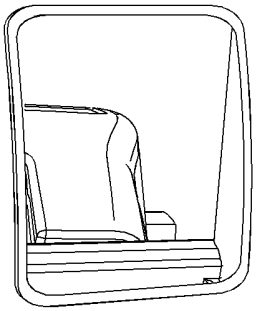

Illustration 64 g01631674

If equipped, adjust the left inside mirror (3) so that an area of at least 1 m (3.3 ft) from the side of the machine can be seen from the operator seat. Additionally, provide as much visibility to the rear as possible.

Right Inside Mirror (4)

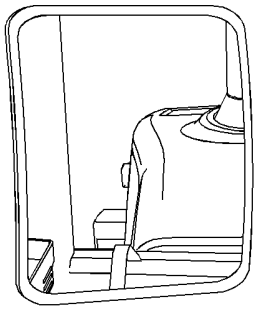

Illustration 65 g01631675

If equipped, adjust the right inside mirror (4) so that an area of at least 1 m (3.3 ft) from the side of the machine can be seen from the operator seat. Additionally, provide as much visibility to the rear as possible.

Rear of Machine (If Equipped)

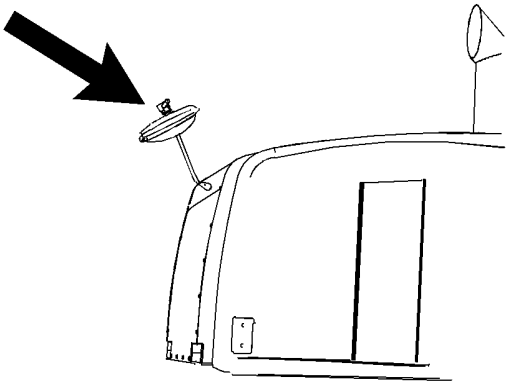

Illustration 66 g01954656

Adjust the mirrors on the machine before you begin operation. Do not climb on the machine in order to adjust the mirrors. The rear mirror may be adjusted by raising the hood. You may also use a ladder in order to properly align the mirror.

Use the following procedure in order to adjust the mirror on rear of the machine:

1. Position the machine on level ground free from obstructions.
2. The support arm for the mirror should be in the RAISED position.

Note: The support arm for the mirror should be in the LOWEST position for shipping the machine. Lower the arm and secure the arm during the transportation of the machine in order to prevent damage to the mirror.

3. Loosen the two hex head screws on the back of the mirror in order to adjust the angle of the mirror.
4. Adjust the mirror in order to enable the operator to see a point 1.5 m (4.9 ft) above the ground and 1 m (3.3 ft) away from the rear of the machine.
5. Tighten the screws to 3 ± 0.5 N·m (2.2 ± 0.4 lb ft).

i03842690

Operator Controls

SMCS Code: 7300; 7301; 7451

Note: Your machine may not be equipped with all of the controls that are discussed in this topic.

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

Illustrations guide the operator through correct procedures of checking, starting, operating and stopping the machine. Operating techniques that are outlined in this publication are basic. Skill and techniques develop as the operator gains knowledge of the machine and the capabilities of the machine.

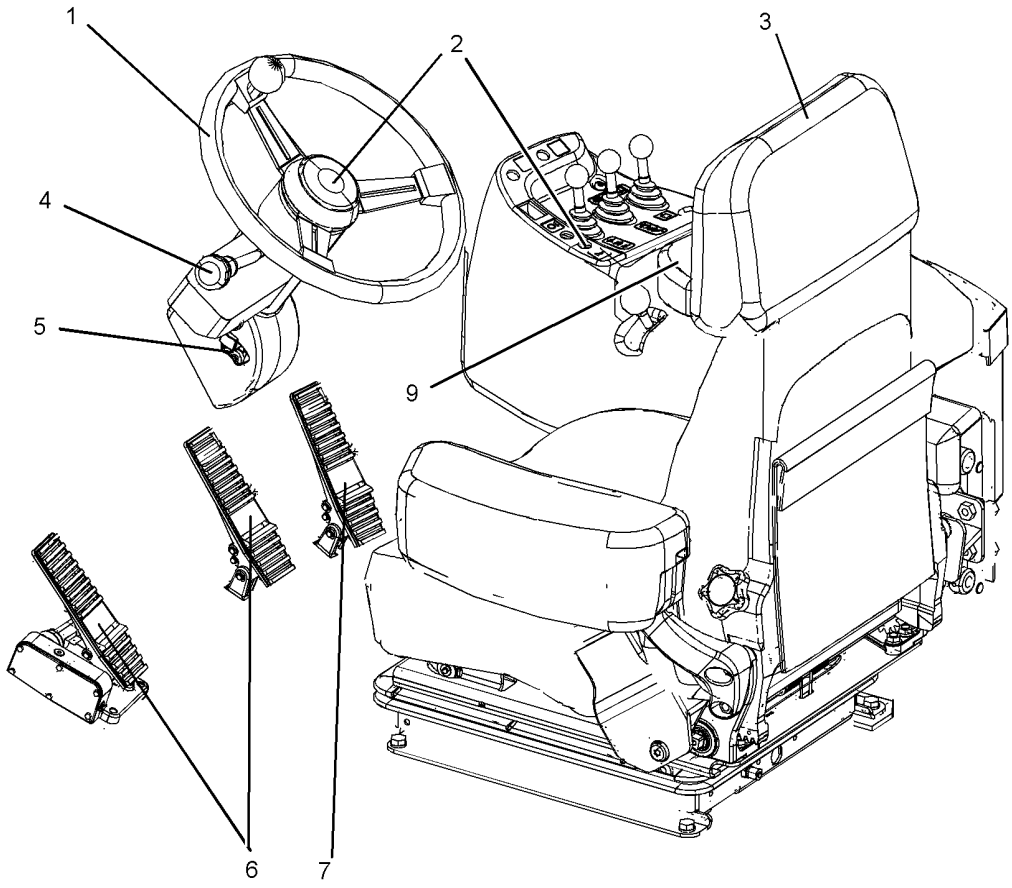

Illustration 67 g01126052

Conventional steering

(1) Steering Control
(2) Horn
(3) Seat
(4) Transmission Control
(5) Tilt Control for the Steering Wheel
(6) Service Brake Controls
(7) Governor Control
(9) Hydraulic Control Support

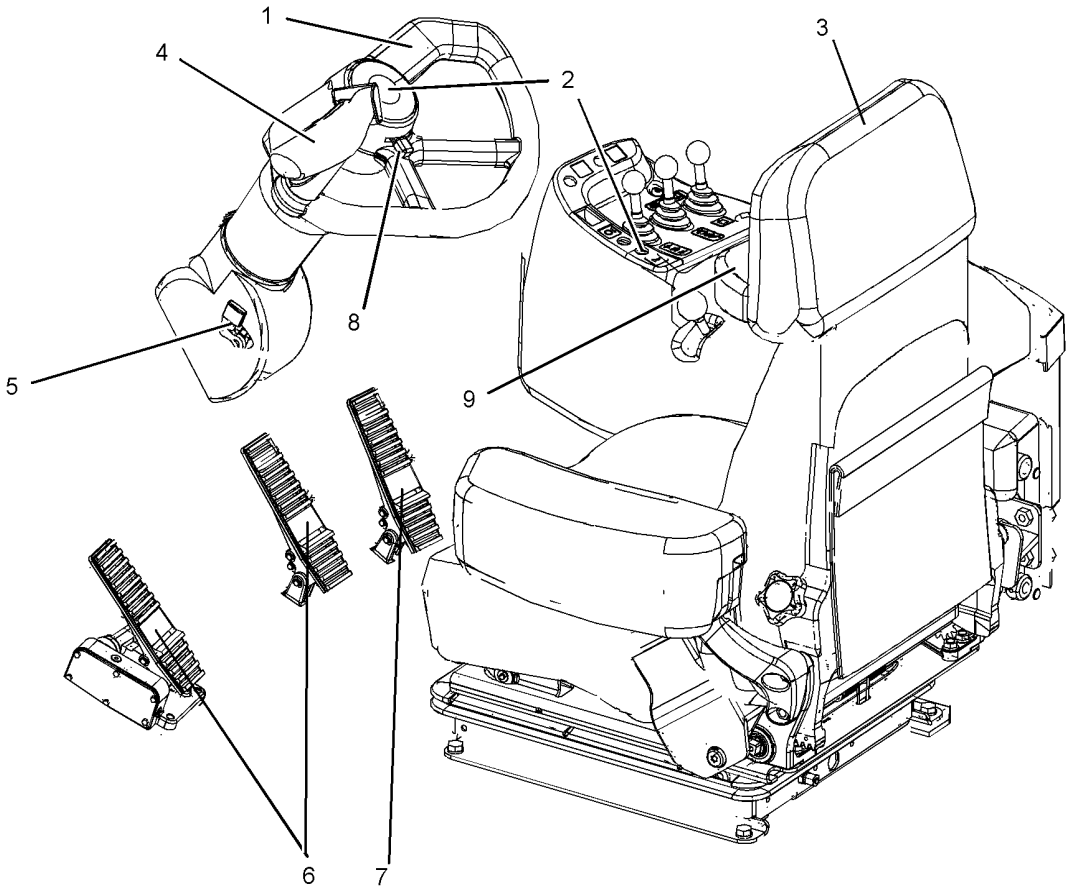

Illustration 68 g01123709

Command Control Steering

(1) Steering Control
(2) Horn
(3) Seat
(4) Transmission Control
(5) Tilt Control for the Steering Wheel
(6) Service Brake Controls
(7) Governor Control
(8) Telescopic Control for the Steering Wheel
(9) Hydraulic Control Support

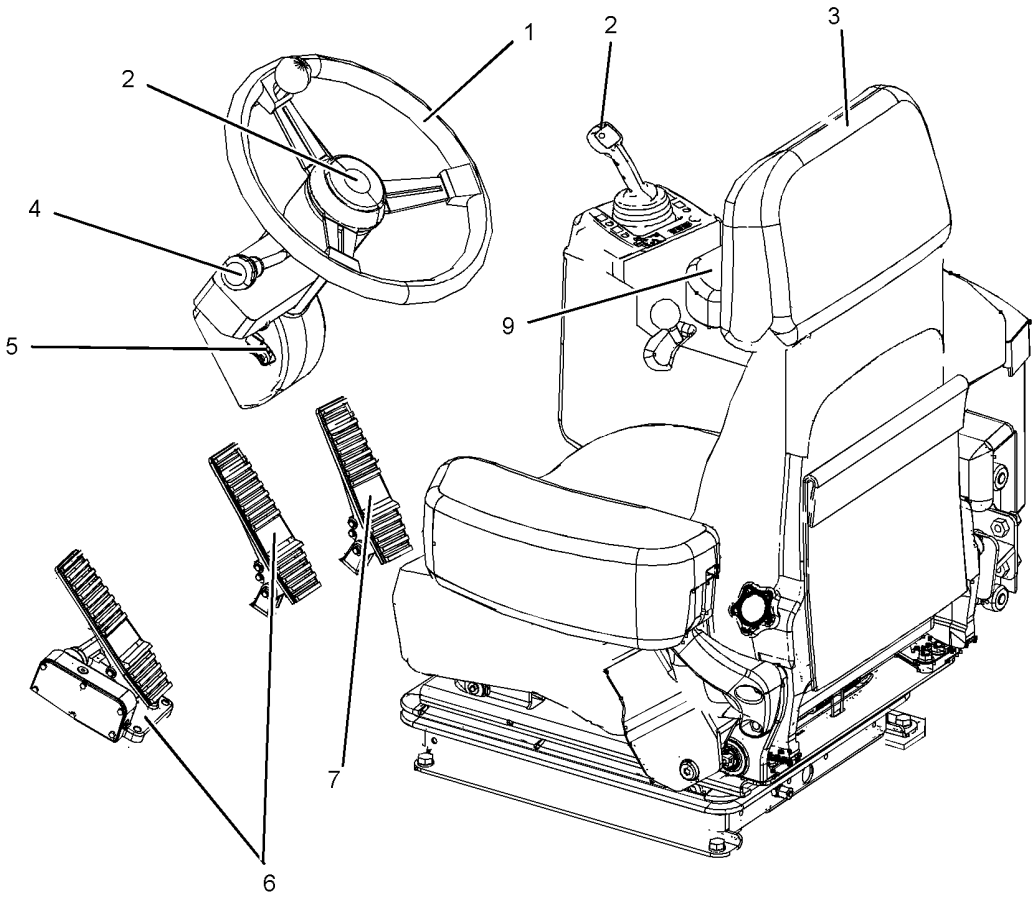

Illustration 69 g01961195

Conventional Steering with Joystick

(1) Steering Control
(2) Horn
(3) Seat
(4) Transmission Control
(5) Tilt Control for the Steering Wheel
(6) Service Brake Controls
(7) Governor Control
(9) Hydraulic Control Support

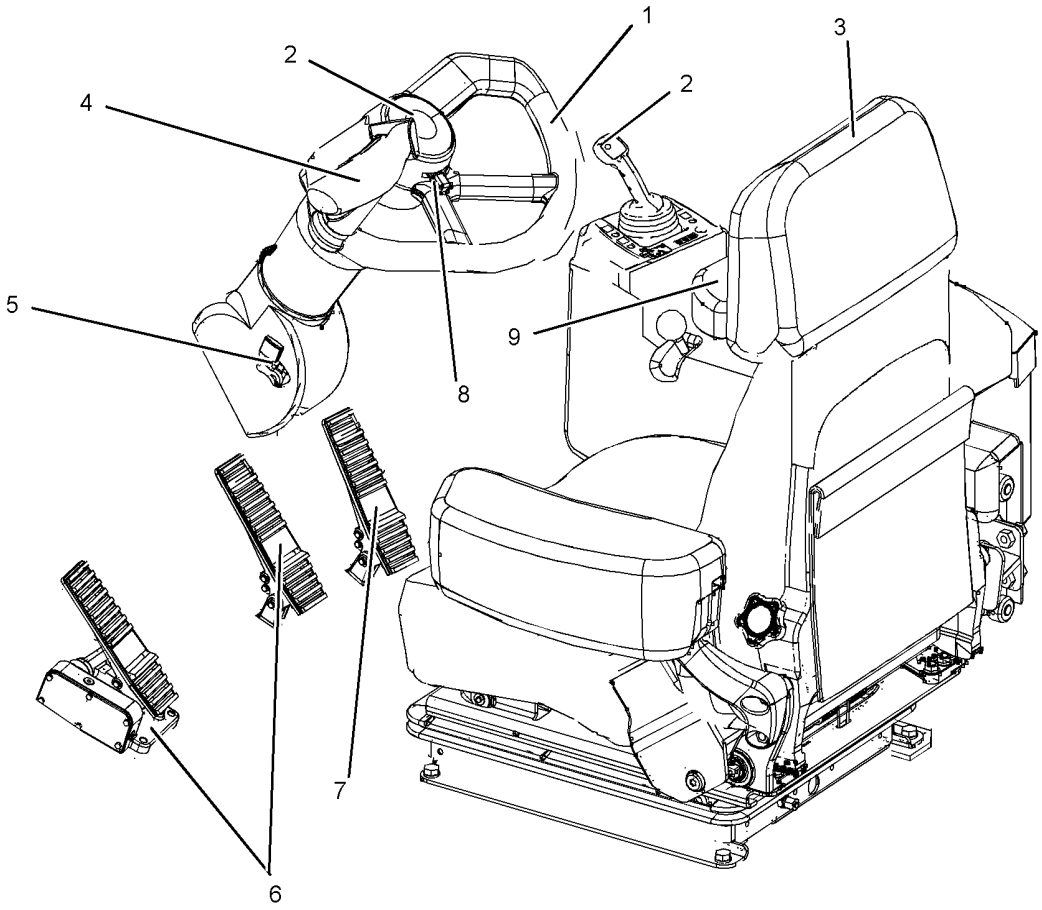

Illustration 70 g01961196

Command Control Steering with Joystick

(1) Steering Control
(2) Horn
(3) Seat
(4) Transmission Control
(5) Tilt Control for the Steering Wheel
(6) Service Brake Controls
(7) Governor Control
(8) Telescopic Control for the Steering Wheel
(9) Hydraulic Control Support

Steering Control (1)

Your machine may be equipped with conventional steering or command control steering. Command control steering will be more responsive than conventional steering.

The steering wheel will self-center as you release the wheel on machines that are equipped with command control steering. However, the machine will not straighten as the steering wheel moves to the center position. You must steer the machine in the opposite direction in order to straighten the machine.

Horn (2)

Press the center of the steering wheel in order to sound the horn.

Also, there is a button for the horn on the right hand console. If your machine is equipped with a joystick, there is also a button for the horn on the joystick.

Seat (3)

For information regarding the adjustment of the seat and the features of the seat, refer to Operation and Maintenance Manual, “Seat”.

Transmission Control (4)

Direction Selection

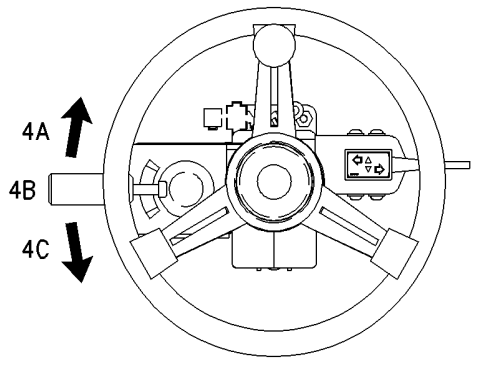

Illustration 71 g00999329

Forward/Neutral/Reverse lever on the steering column

The direction for machines that are equipped with conventional steering is determined by the position of the lever that is located on the left side of the steering column or by the alternate forward/neutral/reverse switch that is located next to the bucket controls.

The direction for machines that are equipped with command control steering is determined by the position of the select switch that is located on the left side of the steering wheel.

(4A)FORWARD – Push the switch to the left in order to place the transmission in FORWARD.

(4B)NEUTRAL – Push the switch to the middle position in order to place the transmission in NEUTRAL.

(4C)REVERSE – Push the switch to the right in order to place the transmission in REVERSE.

Alternate Forward/Neutral/Reverse Switch (If Equipped)

Your machine may be equipped with one of the following options.

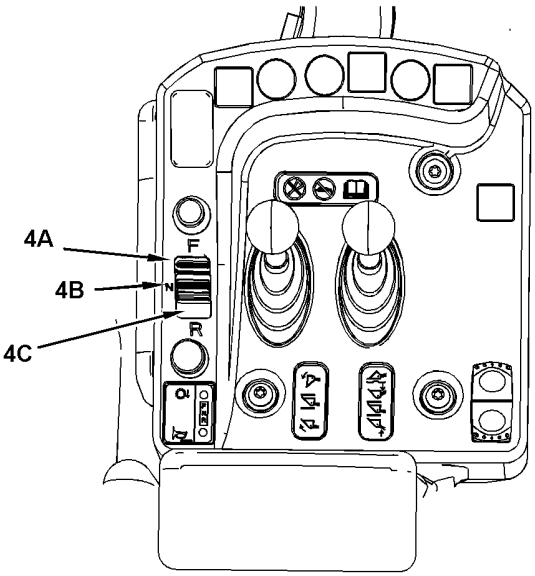

Illustration 72 g01961481

Forward/Neutral/Reverse Switch on the right hand console

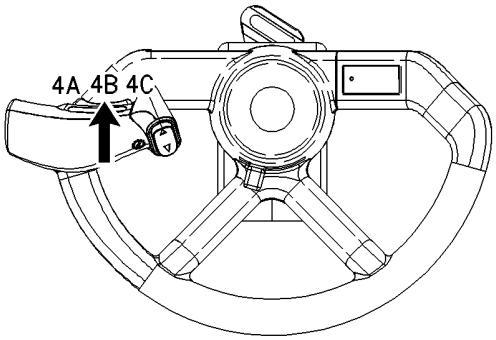

Illustration 73 g00999332

Forward/Neutral/Reverse Switch with Command Control steering

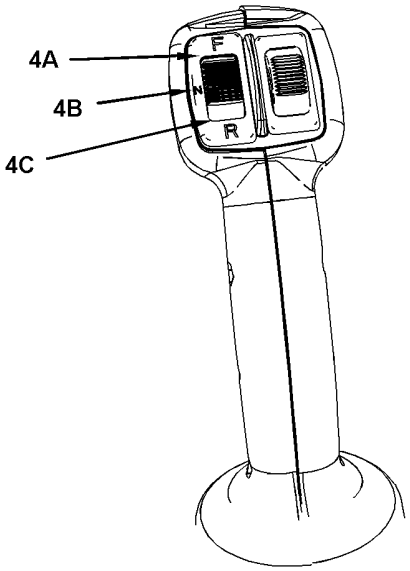

Illustration 74 g01970634

Forward/Neutral/Reverse Switch on the joystick

Once the machine is started, the NEUTRAL lamp should be on. The machine may be placed into gear either by using the shifter or the forward/neutral/reverse switch. In order to use the shifter, ensure that the forward/neutral/reverse switch is in the NEUTRAL position. Use the shifter to select the direction. The appropriate direction indicator should illuminate.

In order to use the forward/neutral/reverse switch, place the shifter in the NEUTRAL position. Select the direction that is desired by using the forward/neutral/reverse switch. The appropriate direction indicator should illuminate.

The transmission will be placed in the NEUTRAL position if both the shifter and the forward/neutral/reverse switch indicate a state that is not NEUTRAL during operation. The NEUTRAL lamp will be OFF. Both the shifter and the forward/neutral/reverse switch must be placed in the NEUTRAL position before normal operation can resume.

Speed Selection

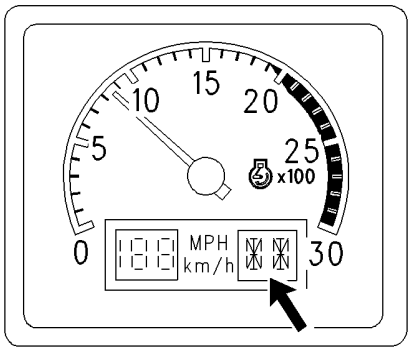

Illustration 75 g00884219

The speed of the machine will be displayed on the front dash.

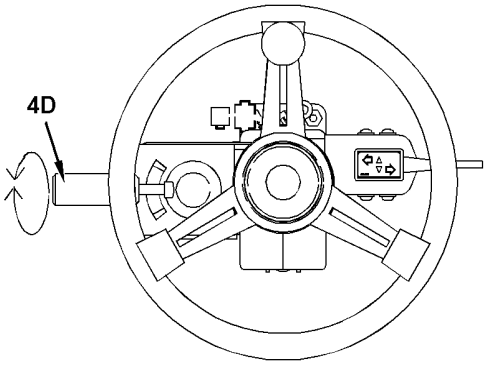

Illustration 76 g01974161

Conventional steering

The speed of the machines that are equipped with conventional steering is selected by rotating the switch(4D) that is located on the left side of the steering column. Rotate the switch forward or backward in order to increase or decrease the speed of the transmission.

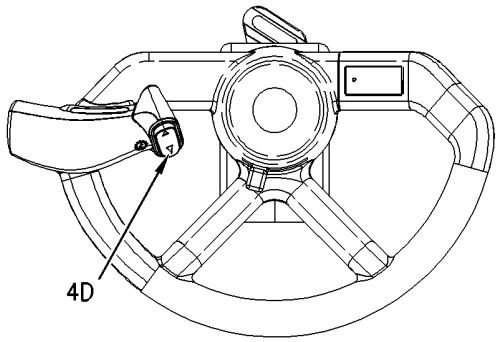

Illustration 77 g00999339
Command control steering

The speed of the machines that are equipped with command control steering is selected by using switch (4D) that is located on the left side of the steering wheel. Press the top of switch (4D) in order to increase the transmission speed. Press the bottom of switch (4D) in order to decrease the speed of the transmission. The transmission has four speeds.

Note: The transmission can shift automatically or the transmission can shift manually.

Reference: Refer to Operation and Maintenance Manual, “Autoshift Control” for more information.

The transmission can also be downshifted by using the left service brake pedal or the transmission may be downshifted by using the downshift switch on the control panel or on the joystick.

Reference: Refer to Operation and Maintenance Manual, “Service Brake Control” for more information.

Tilt Control for the Steering Wheel (5)

To adjust the steering column, push forward on the steering column tilt lever and move the steering column to the desired position. Release the lever in order to lock the steering column in the desired position.

Service Brake Control (6)

Reference: Refer to Operation and Maintenance Manual, “Service Brake Control” for more information.

Governor Control (7)

Depress the pedal in order to increase the speed of the engine. Release the pedal in order to allow the speed of the engine to decrease.

Telescopic Control for the Steering (8)

This control is available on machines which are equipped with command control steering.

Rotate the lever counterclockwise in order to move the steering wheel to the desired height. Rotate the lever clockwise in order to lock the steering wheel in the desired position.

Hydraulic Control Support (9)

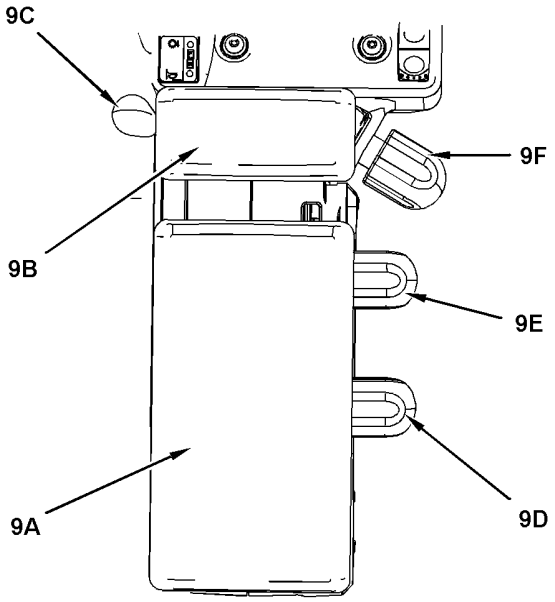

Illustration 78 g01961480
Support on the right hand console

Control lever (9C) allows fore and aft movement of entire armrest (9). Control knobs (9D) and (9E) allow tilt and vertical movement of hydraulic control support (9A). Control knob (9F) allows vertical movement of support (9B).

Front Dashboard

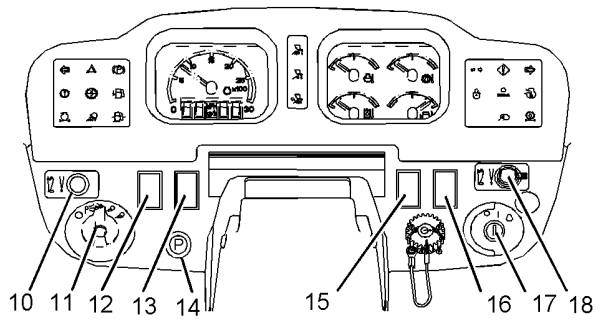

Illustration 79 g01112235

(10) Lighter
(11) Light switch
(12) HID Lights (If Equipped)
(13) Continuous Flow Control (If Equipped)
(14) Parking brake control
(15) Beacon Switch (If Equipped)
(16) Hazard Switch (If Equipped)
(17) Engine Start Switch
(18) 12 Volt Power Receptacle

Lighter (10)

Lighter – The lighter can be used as a 12V power receptacle. This power receptacle can be used to power automotive electrical equipment or accessories. Remove the lighter before use.

Light Switch (11)

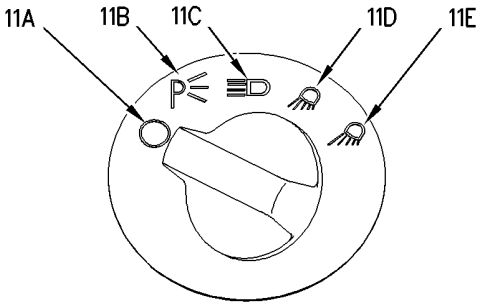

Illustration 80 g00999380

OFF(11A) – Turn the knob to the OFF position in order to shut off all of the lights.

Parking Lights and Cab Interior Lights (11B) – Turn the knob to position (11B) in order to turn on both the parking lights and the interior cab lights.

Roading Lights (11C) – Turn the knob to position (11C) in order to turn on the roading lights.

Front Floodlights (11D) – Turn the knob to position (11D) in order to turn on the front floodlights.

Rear Floodlights (11E) – Turn the knob to position (11E) in order to turn on the rear floodlights.

HID Lights (12) (If Equipped)

HID Lights –

Press the top of the switch in order to turn on the front and rear HID lights.

Place the switch into the MIDDLE position in order to turn on the front HID lights only.

Press the bottom of the switch in order to turn off the lights.

Continuous Flow Control (13) (If Equipped)

Continuous Flow – The continuous flow control supplies continuous flow of hydraulic fluid to the auxiliary hydraulic circuit without continuously holding the auxiliary hydraulic control. Move the lever or the thumb wheel for the auxiliary control to the desired flow rate. Press the continuous flow switch and release the continuous flow switch. Immediately release the auxiliary control lever or the thumb wheel after you release the continuous flow switch. The continuous flow function will not be activated if the operator does not release the auxiliary control lever or the thumb wheel within one second of releasing the continuous flow switch. Move the auxiliary control lever, the thumb wheel, or the continuous flow switch in order to stop the flow to the auxiliary hydraulic circuit.

Parking Brake Control (14)

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

Parking Brake – Knob (14) is located to the left of the steering column. Use the parking brake after the machine is stopped and the transmission is put in neutral.

Pull knob (14) outward in order to engage the parking brake. Push knob (14) inward in order to disengage the parking brake.

Parking Brake Operation

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.

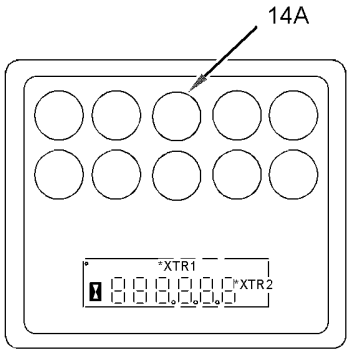

Illustration 81 g01124161

If the brakes lose oil pressure, an alert indicator for the brakes will flash and an action alarm will sound.

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

The action light will also flash when the lights on the monitoring system flash.

NOTICE
Moving the machine with the parking brake engaged can cause excessive wear or damage to the brake.

If necessary, have the brake repaired before operating the machine.

Beacon Switch (15) (If Equipped)

Rotating Beacon (15) – Press the top of switch (15) in order to turn on the rotating beacon. Press the bottom of switch (15) in order to turn off the rotating beacon.

Hazard Switch (16) (If Equipped)

Hazard Flasher – Press switch (16) for the hazard flashers. Both turn signal lights will flash simultaneously.

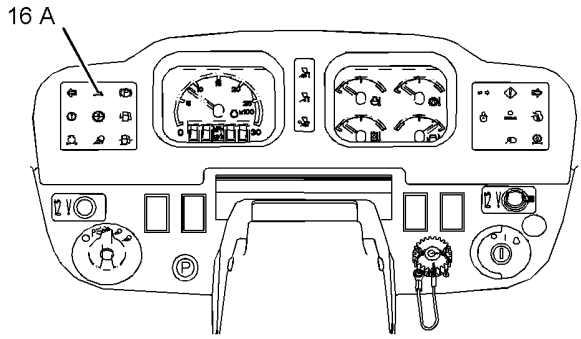

Illustration 82 g01112303

Indicator light (16A) on the front dash panel will flash when the hazard flasher is activated.

Engine Start Switch (17)

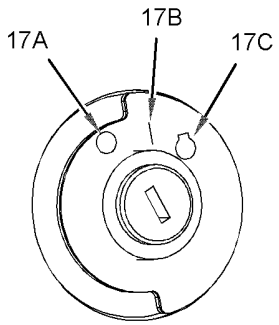

Illustration 83 g01123822

OFF(17A) – 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 cab, 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.

ON(17B) – To activate the electrical circuits in the cab, turn the engine start switch key clockwise to the ON position.

START(17C) – 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.

12 Volt Power Receptacle (18)

Power receptacle – The 12V power receptacle can be used to power automotive electrical equipment or accessories. Remove the cap before use.

Upper Right Hand Switch Panel

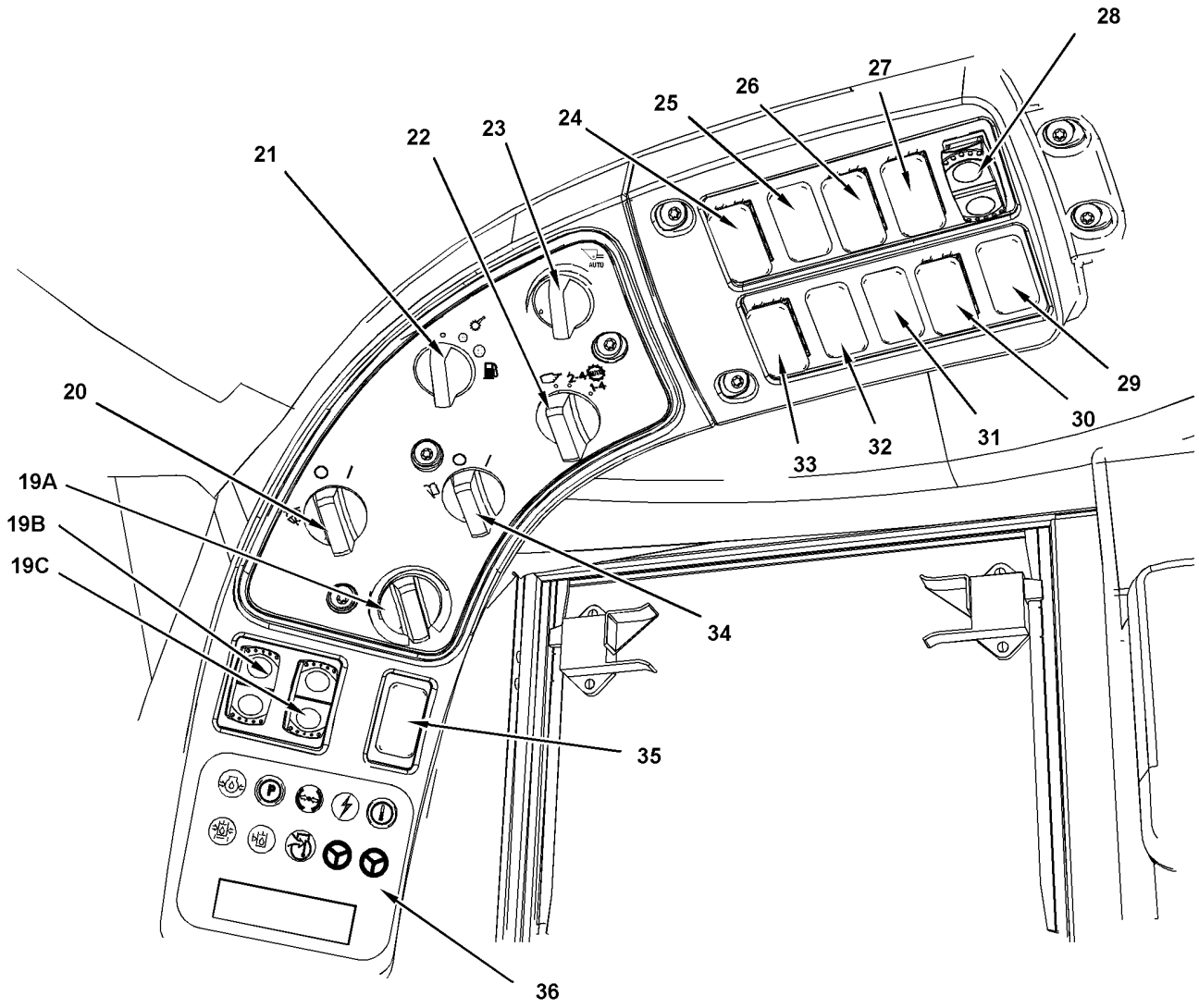

Illustration 84 g01961769

(19A) Temperature Control for the Heating and Air Conditioning
(19B) Heating and Air Conditioning
(19C) Fan Control
(20) Front Window Wiper/Washer Switch
(21) Variable Shift Control
(22) Autoshift Control
(23) Autodig Control (If Equipped)
(24) Autodig Mode Select Switch (If Equipped)
(25) Autodig Kickout Set Switch (If Equipped)
(26) Auto Reverse Fan
(27) Quick Coupler (If Equipped)
(28) Lift and Tilt Kickout Switch
(29) Heated Mirror (If Equipped)
(30) Bucket/Fork Selector Control (If Equipped)
(31) Secondary Steering (If Equipped)
(32) Transmission Neutralizer Override Switch
(33) Ride Control (If Equipped)
(34) Rear Window Wiper/Washer Switch
(35) Selector for the Monitor
(36) Monitor

Heating and Air Conditioning Controls (19)

The heating and air conditioning controls are located on the switch panel in the upper right side of the cab.

Temperature Control – Temperature control knob (19A) is a rotary switch. Turn knob (19A) clockwise for warmer air. Turn knob (19A) counterclockwise for cooler air.

Heater – Press the top of switch (19B) in order to turn on the heater.

Air Conditioner – Press the bottom of switch (19B) in order to turn on the air conditioner.

Place switch (19B) into the middle position in order to turn off the heater and air conditioner.

Fan Speed Switch (19C) – The switch controls the speed of the blower fan motor for the heating and air conditioning system.

LOW – Press in the bottom of switch (19C) in order to turn on the fan blower at the lowest speed.

MEDIUM – Place switch (19C) into the middle position in order to turn on the fan blower at the medium speed.

HIGH – Press in the top of switch (19C) in order to turn on the fan blower at the highest speed.

Defrost – Press the bottom of switch (19B) in order to turn on the air conditioner. Set fan speed switch (19C) to the desired speed. Adjust temperature control knob (19A) so that the windows remain free of moisture.

Front Window Wiper/Washer Switch (20)

Turn the knob in order to turn on the window wiper. Push the knob in order to activate the window washer.

Note: The machine is equipped with intermittent front wipers. There are several positions that will affect the wipers.

Turn the knob clockwise from the OFF position for the desired setting (INTERMITTENT, LOW or HIGH). The delay speed of the wipers can be adjusted by turning the knob clockwise through the INTERMITTENT position.

Variable Shift Control (21) (If Equipped)

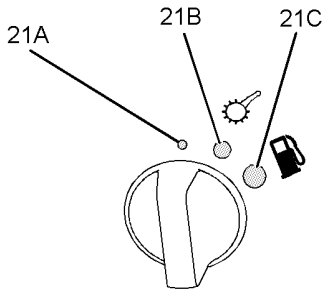

Illustration 85 g01525744

The variable shift control is located on the switch panel. The variable shift control will change the transmission's characteristic of the shift points. The transmission can be set to shift sooner as the machine is accelerating. The transmission can be set to shift later as the machine is accelerating.

Rotate the switch clockwise into economy mode (21C). The transmission will shift at a lower rpm. This position is the most fuel efficient position. This position will provide the most comfort for the operator.

Rotate the switch counterclockwise to standard mode (21A). The rpm of the engine will now be higher when the transmission shifts.

An intermediate position (21B) is also available . As the switch is rotated clockwise, the transmission will continue to shift at a lower rpm.

Autoshift Control (22)

Reference: Refer to Operation and Maintenance Manual, “Autoshift Control” for more information about autoshift control.

Autodig Control (23) (If Equipped)

For more information regarding the Autodig System, refer to Operation and Maintenance Manual, “Aggregate Autodig”.

Autodig Mode Select Switch (24) (If Equipped)

For more information regarding the Autodig System, refer to Operation and Maintenance Manual, “Aggregate Autodig”.

Autodig Kickout Set Switch (25) (If Equipped)

For more information regarding the Autodig System, refer to Operation and Maintenance Manual, “Aggregate Autodig”.

Auto Reversing Fan (26)

If equipped, switch (23) provides a manual override control that will initiate the purge cycle in order to clean debris from the cooling system. Press the top of the switch and release the switch in order to manually activate the reversing fan. Then, the cycle will reset the timer for the automatic purge cycle.

Note: Two manually initiated purge cycles cannot be within less than 3 minutes of each other.

Note: The auto-purge cycle is set to a factory default of one purge in a 20 minute cycle. Consult the dealer in order to modify the frequency. The minimum auto-purge cycle is 1 purge in a 3 minute cycle and the maximum auto-purge cycle is 1 purge in a 60 minute cycle.

Quick Coupler (27) (If Equipped)

⚠ WARNING

Improper engagement of work tools could result in injury or death.

Do not operate this machine until you have positive indication that the coupler pins are fully engaged.

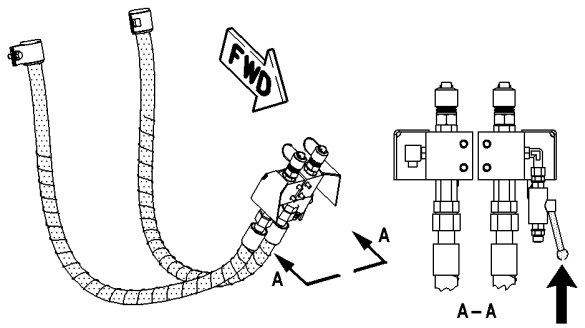

Illustration 86 g00767990

Move the diverter valve lever to the coupler position in order to provide flow to the coupler.

Engage – Press the bottom of the switch in order to engage the coupler pins. The switch will remain in the engaged position.

Disengage – Press the red tab on the bottom of the switch in order to release the switch. The top of the switch can then be pressed in order to disengage the coupler pins.

To make sure that the coupler pins are fully engaged into the attachment, tilt the attachment downward onto the ground and apply slight downward pressure. Then, back up the machine. If there is movement between the attachment and the coupler pins, the attachment is not installed properly.

Note: Operating instructions for specific attachments are not provided. The function of the control lever is dependent upon the installation of an Auxiliary Equipment Manufacturer's attachment.

Lift and Tilt Kickout Switch (28) Standard Machines

Upper Position

Lift Kickout – To set the lift kickout, raise the work tool to the desired position above the midway point. Then depress the top of switch. The boom will return to the programmed position when the raise detent is activated and the boom is below the kickout position.

Lower Kickout – To set the lower kickout, lower the work tool to the desired position below the midway point. Then depress the top of switch. The boom will return to the programmed position when the float detent is activated and the boom is at least a foot above the kickout position.

Note: If the boom is 305 mm (12 inch) or less above the lower kickout position, placing the lift control lever in the float detent will cause the work tool to float and the work tool will hit the ground.

Bottom Position

Tilt Kickout Position – In order to set the rotation of the tiltback for the work tool, position the work tool at the desired position and press the bottom of switch.

Lift and Tilt Kickout Switch (28) for IT Machine

Upper Position

Lift Kickout – To set the lift kickout, raise the work tool to the desired position above the midway point. Then depress the top of switch. The boom will return to the programmed position when the raise detent is activated and the boom is below the kickout position.

Lower Kickout – To set the lower kickout, lower the work tool to the desired position below the midway point. Then depress the top of switch. The boom will return to the programmed position when the float detent is activated and the boom is at least a foot above the kickout position.

Note: If the boom is 305 mm (12 inch) or less above the lower kickout position, placing the lift control lever in the float detent will cause the work tool to float and the work tool will hit the ground.

Middle Position

To turn off the tilt kickout, move the switch to the middle position.

Bottom Position

Tilt Kickout – To turn on the tilt kickout, depress the bottom of tilt kickout switch.

Note: Select the correct tool with the bucket/fork selector switch (30), in order to select the correct tilt kickout.

Heated Mirror (29) (If Equipped)

Heated Mirror – If equipped, the heated mirror switch is used in order to activate the heated mirrors.

Bucket/Fork Selector Control (30) (If Equipped)

Use with IT Machines

After selecting the tilt kickout switch (28) to the ON position, use the bucket/fork selector switch (30). This switch selects the use of a bucket or the use of forks.

Upper Position – Press the top of switch in order to select the bucket positioner.

Bottom Position – Press the bottom of switch in order to select the fork positioner.

Note: The kickout position for the bucket or fork positioner can be adjusted manually for the desired kickout positions.

Secondary Steering (31) (If Equipped)

Reference: Refer to Operation and Maintenance Manual, “Secondary Steering” for more information.

Transmission Neutralizer Override Switch (32)

Override for the Transmission Neutralizer – The transmission neutralizer override switch is located on the switch panel on the upper right side of the cab. The transmission neutralizer override switch is a momentary contact switch.

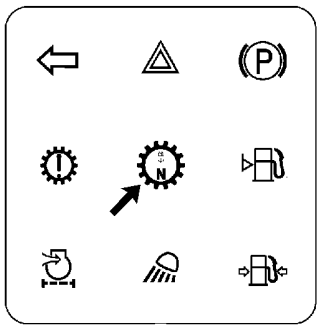

Illustration 87 g01112345

The transmission neutralizer is always enabled whenever the machine is started. Depress the transmission neutralizer override switch in order to disable the transmission neutralizer. The “NEUTRAL LOCK” light in the dash will be illuminated. Depressing the left service brake pedal will not neutralize the transmission. If the machine is shutdown, the transmission neutralizer override switch must be pressed again in order to disable the transmission neutralizer.

Depress the transmission neutralizer override switch again in order to enable the transmission neutralizer. The “NEUTRAL LOCK” light in the dash will not be illuminated. Depressing the left service brake pedal will neutralize the transmission while applying the service brakes. This will allow the operator to press the accelerator pedal in order to increase engine speed for better hydraulic response.

Ride Control (33) (If Equipped)

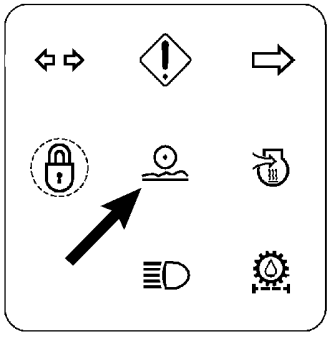

Illustration 88 g01971536

Ride Control –

Automatic Ride Control – Push the top of the switch in order to turn on the automatic ride control.

The ride control system will automatically turn ON if the ground speed exceeds 9.6 km/h (6 mph). The ride control system will automatically turn OFF if the ground speed is less than 9.6 km/h (6 mph) and if the bucket is being operated. The forward activation speed and reverse activation speed can be adjusted by a qualified service technician.

Push the middle of the ride control switch in order to turn off the ride control.

The ride control system should be in the automatic mode or in the OFF position during loading operations.

Service Mode for Ride Control – Push the bottom of the switch in order to turn on the manual ride control. When the ride control switch is in the manual position, the ride control system will be operational at all times. This position is used as a service mode. Operators should not operate the machine in the Service Mode.

Reference: Refer to Hydraulic System, RENR4395, “Ride Control System” for more information.

Rear Window Wiper/Washer Switch (34)

Turn the knob in order to turn on the window wiper. Push the knob in order to activate the window washer.

Turn knob (34) clockwise from the OFF position for the desired setting (LOW or HIGH).

Monitor Switch (35)

Display Mode Switch – Press the top of this switch in order to toggle between machine hours, engine rpm, machine miles driven, and fault codes.

Payload Control System (36) (If Equipped)

For more information on the Payload Control System , refer to Operation and Maintenance Manual, SEBU8092, Payload Control System (PCS).

Implement Controls beside the Right Hand Armrest

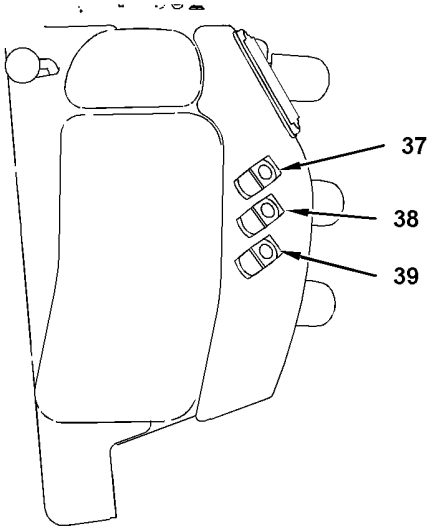

Illustration 89 g01971282

(37) Implement Function (If Equipped)
(38) Hydraulic Lockout
(39) Fine Modulation

Implement Function (37) (If Equipped)

The implement function select switch is located on the hydraulic control support. The implement function select switch allows the operator to select one of two functions for the auxiliary control.

Hydraulic Lockout (38)

Hydraulic Lockout – Push the red locking tab forward and press the top of the switch in order to lock the hydraulic controls. Push the red locking tab forward and press the bottom of the switch in order to unlock the hydraulic controls.

Note: The detents will not function unless the hydraulic lockout control is in the UNLOCKED position.

Fine Modulation (39)

Fine Modulation – Machines may be equipped with a switch for fine modulation. This switch controls the shift speed of the main hydraulic spool. Activating this switch will allow better control in certain applications.

Push the red locking tab forward and press the top of the switch in order to enable fine modulation. Press the bottom of the switch in order to disable fine modulation.

Work Tool Controls

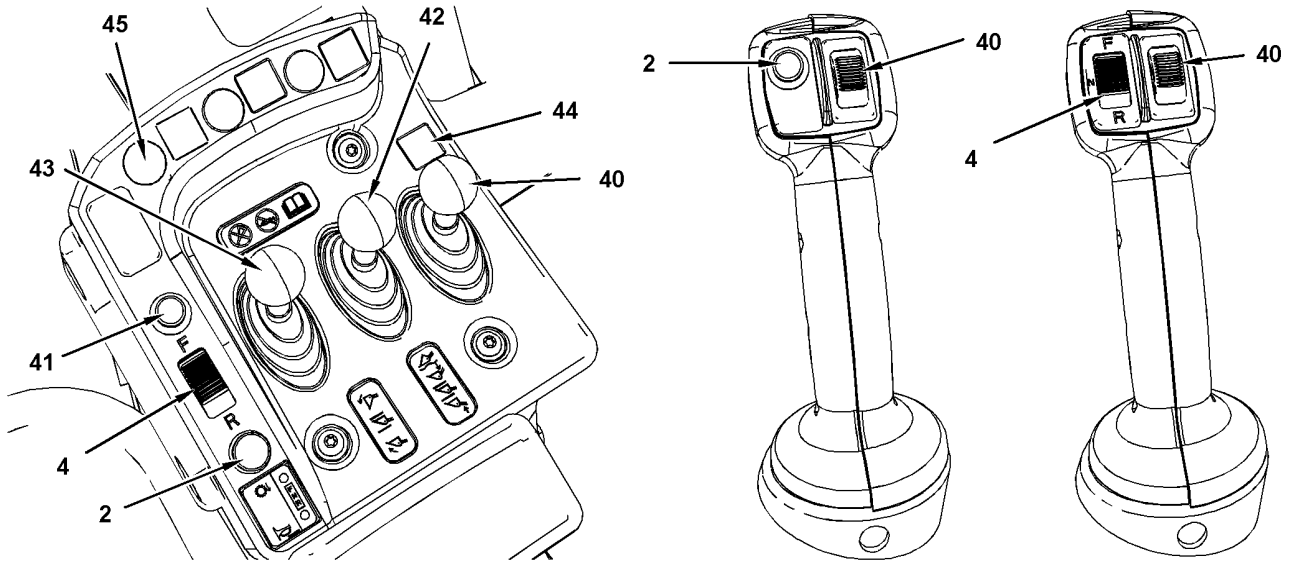

Illustration 90 g01961213

Implement Controls

(2) Horn Button
(4) Transmission Control (If Equipped)
(40) Auxiliary Control (If Equipped)
(41) Transmission Downshift
(42) Lift Control
(43) Tilt Control
(44) PCS Store Button (If Equipped)
(45) Autodig Trigger Switch (If Equipped)

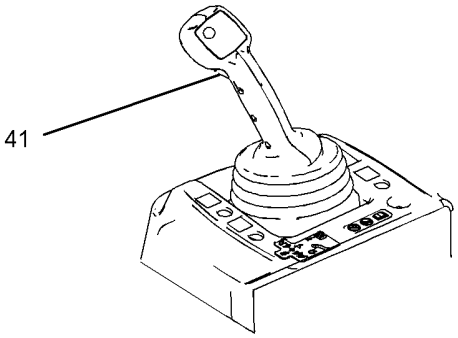

Illustration 91 g01131337

Refer to Operation and Maintenance Manual, “Autoshift Control” for more information.

(41) Transmission Downshift Switch on the Joystick

Auxiliary Control (40) (If Equipped)

This lever is used for the following implements (if equipped):

- Multipurpose bucket
- Side dump bucket
- Auxiliary hydraulics
- Logging fork clamp

Multipurpose Bucket Control

CLOSE – Move the lever to position 1 in order to close the bucket.

HOLD – The lever will return to position 2 when the lever is released from position 1 or from position 3. The attachment will remain in the selected position.

OPEN – Move the lever to position 3 in order to open the bucket.

Side Dump Bucket Control

DUMP – Move the lever to position 1 in order to dump the bucket.

HOLD – The lever will return to position 2 when the lever is released from position 1 or from position 3. The attachment will remain in the selected position.

RETURN – Move the lever to position 3 in order to lower the bucket.

Auxiliary Control

Left auxiliary hydraulic line – Move the lever to position 1 in order to pressurize the left supply line.

HOLD – The lever will return to position 2 when the lever is released from position 1 or from position 3. The left supply line and the right supply line will not be pressurized when the lever is in position 2.

Right auxiliary hydraulic line – Move the lever to position 3 in order to pressurize the right supply line.

Note: Operating instructions for specific attachments are not provided. The function of the control lever is dependent upon the installation of an Auxiliary Equipment Manufacturer's attachment.

Logging Fork Clamp Control

CLOSE – Move the lever to position 1 in order to close the logging fork clamp.

HOLD – The lever will return to position 2 when the lever is released from position 1 or from position 3. The attachment will remain in the selected position.

OPEN – Move the lever to position 3 in order to open the logging fork clamp.

Auxiliary Control with Joystick (40) (If Equipped)

This thumb wheel is used for the following implements (if equipped):

- Multipurpose bucket
- Side dump bucket
- Auxiliary hydraulics
- Logging fork clamp

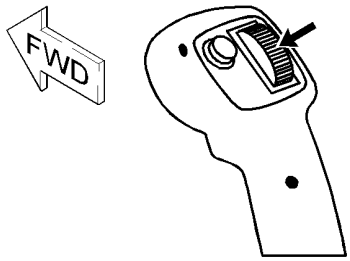

Illustration 92 g01113517

Joystick Control

Refer to the previous descriptions for each implement.

Lift Control (42)

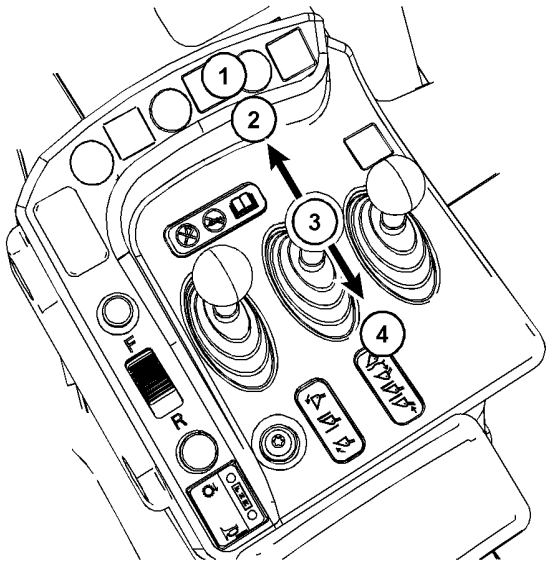

Illustration 93 g01974494

FLOAT(1) – Push the lever forward into the soft detent. The attachment will follow along the contour of the ground.

The lever will return to the HOLD position when the lever is released. The attachment will remain in the FLOAT position until the lever is moved at least 6° from the HOLD position.

Note: If the attachment is greater than 305 mm (12 inch) from the lower kickout position, a kickout will occur when the lift control lever is placed in the float position. If the attachment is less than 305 mm (12 inch) from the lower kickout position, then placing the lift control lever in the float detent will cause the attachment to float to the ground.

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 in order to lower the attachment. The lever will return to the HOLD position when the lever is released.

HOLD(3) – The lever will return to the HOLD position when the lever is released from the RAISE position or from the LOWER position. The attachment will remain in the selected position.

RAISE(4) – Pull the lever backward in order to raise the attachment. The lever will return to the HOLD position when the lever is released.

The control lever is detented in the fully raised position. When the lever is moved into the soft detent, the operator will feel an increased resistance from the lever. Once in the detent, the lever should be released in order to automatically return to the HOLD position. The attachment will continue to raise until the attachment reaches the lift kickout height. In order to manually override the detent, the lever must be moved at least 6° from the HOLD position. The detent will not be activated if the lever is held in the detent position for more than 1 second.

The control lever is detented in the FLOAT position. When the lever is moved into the soft detent, the operator will feel an increased resistance from the lever. Once in the detent position, the lever should be released in order to automatically return to the HOLD position. The attachment will continue to lower until the attachment reaches the kickout height. In order to manually override the detent, the lever must be moved at least 6° from the HOLD position. The detent will not be activated if the lever is held in the detent position for more than 1 second.

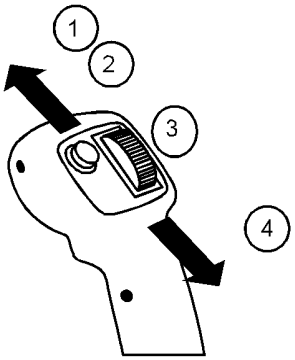

Illustration 94 g01115228

Joystick Control

FLOAT(1) – Push the joystick forward into the soft detent. The attachment will follow along the contour of the ground.

The joystick will return to the HOLD position when the joystick is released. The attachment will remain in the FLOAT position until the joystick is moved at least 6° from the HOLD position.

Note: If the attachment is greater than 305 mm (12 inch) from the lower kickout position, a lower kickout will occur when the joystick control is placed in the FLOAT position. If the attachment is less than 305 mm (12 inch) from the lower kickout position, then placing the lift control lever in the float detent will cause the attachment to float to the ground.

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 joystick forward in order to lower the attachment. The joystick will return to the HOLD position when the joystick is released.

HOLD(3) – The joystick will return to the HOLD position when the joystick is released from the RAISE position or from the LOWER position. The attachment will remain in the selected position.

RAISE(4) – Pull the joystick backward in order to raise the attachment. The joystick will return to the HOLD position when the joystick is released.

The joystick control is detented in the fully raised position. When the joystick is moved into the soft detent, the operator will feel an increased resistance from the joystick. Once in the detent, the joystick should be released in order to automatically return to the HOLD position. The attachment will continue to raise until the attachment reaches the lift kickout height. In order to manually override the detent, the joystick must be moved at least 6° from the HOLD position. The detent will not be activated if the joystick is held in the detent position for more than 1 second.

The joystick control is detented in the FLOAT position. When the joystick is moved into the soft detent, the operator will feel an increased resistance from the joystick. Once in the detent position, the joystick should be released in order to automatically return to the HOLD position. The attachment will continue to lower until the attachment reaches the kickout height. In order to manually override the detent, the joystick must be moved at least 6° from the HOLD position. The detent will not be activated if the joystick is held in the detent position for more than 1 second.

Note: If the attachment is greater than 305 mm (12 inch) from the lower kickout position, a lower kickout will occur When the joystick control is placed in the FLOAT position. If the attachment is less than 305 mm (12 inch) from the lower kickout position, then placing the lift control lever in the float detent will cause the attachment to float to the ground.

Tilt Control (43)

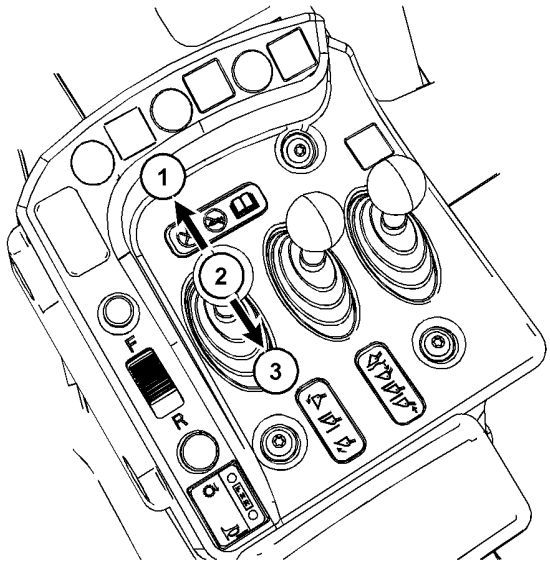

Illustration 95 g01974517

DUMP(1) – Push the lever forward in order to dump a load from the bucket.

HOLD(2) – When you release the lever, the lever will return the HOLD position. The bucket will remain in the selected position.

TILT BACK(3) – Pull the lever backward in order to tilt the bucket backward.

The control lever is detented in the full TILT BACK position. When the lever is moved into the soft detent, the operator will feel an increased resistance from the lever. Once in the detent, the lever should be released in order to automatically return to the HOLD position. The attachment will continue to tilt back until the attachment reaches the digging angle that is preset by the tilt kickout. In order to manually override the detent, the lever must be moved at least 6° from the HOLD position. The detent will not be activated if the lever is held in the detent position for more than 1 second.

The control lever is detented in the full DUMP position. When the control lever is moved into the soft detent, the operator will feel an increased resistance from the lever. Once in the detent, the lever should be released in order to automatically return to the HOLD position. The attachment will continue to dump until the attachment reaches the digging angle that is preset by the tilt kickout. In order to manually override the detent, the control lever must be moved at least 6° from the HOLD position. The detent will not be activated if the lever is held in the detent position for more than 1 second.

Note: A machine with ride control may experience partial lowering of the lift arms when the lever is held in the DUMP position with the bucket against the bucket stops and the lift arms are fully raised. To avoid partial lowering of the lift arms, return the lever to the HOLD position. An optional feature can be enabled to help prevent this situation. Enable Dump Stop Snubbing by using Cat Electronic Technician .

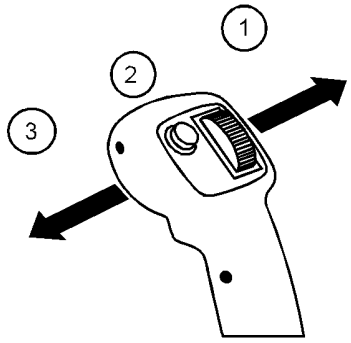

Illustration 96 g01444722
Joystick Control

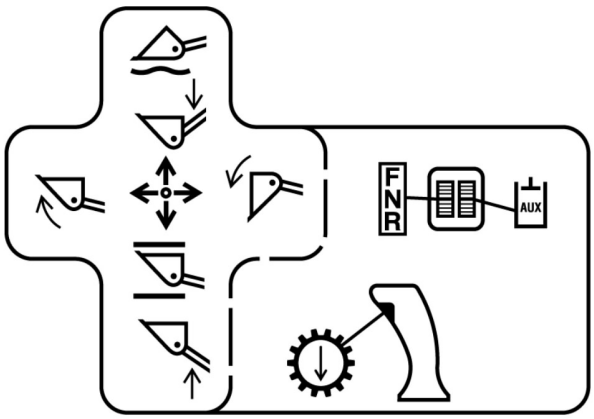

Illustration 97 g01962793

These instructions are located next to the joystick.

DUMP(1) – Move the joystick to the right in order to dump a load from the bucket.

HOLD(2) – When you release the joystick, the joystick will return the HOLD position. The bucket will remain in the selected position.

TILT BACK(3) – Move the joystick to the left in order to tilt the bucket backward.

The joystick control is detented in the full TILT BACK position. When the joystick is moved into the soft detent, the operator will feel an increased resistance from the joystick. Once in the detent, the joystick should be released in order to automatically return to the HOLD position. The attachment will continue to tilt back until the attachment reaches the digging angle that is preset by the tilt kickout. In order to manually override the detent, the joystick must be moved at least 6° from the HOLD position. The detent will not be activated if the joystick is held in the detent position for more than 1 second.

The joystick control is detented in the full DUMP position. When the joystick is moved into the soft detent, the operator will feel an increased resistance from the joystick. Once in the detent, the joystick should be released in order to automatically return to the HOLD position. The attachment will continue to dump until the attachment reaches the digging angle that is preset by the tilt kickout. In order to manually override the detent, the joystick must be moved at least 6° from the HOLD position. The detent will not be activated if the joystick is held in the detent position for more than 1 second.

Note: A machine with ride control may experience partial lowering of the lift arms when the joystick is held in the DUMP position with the bucket against the bucket stops and the lift arms are fully raised. To avoid partial lowering of the lift arms, return the joystick to the HOLD position.

Autodig Trigger Switch (44) (If Equipped)

Reference: Refer to Operation and Maintenance Manual, “Aggregate Autodig” for more information on the autodig system.

Directional Turn Signal (If Equipped)

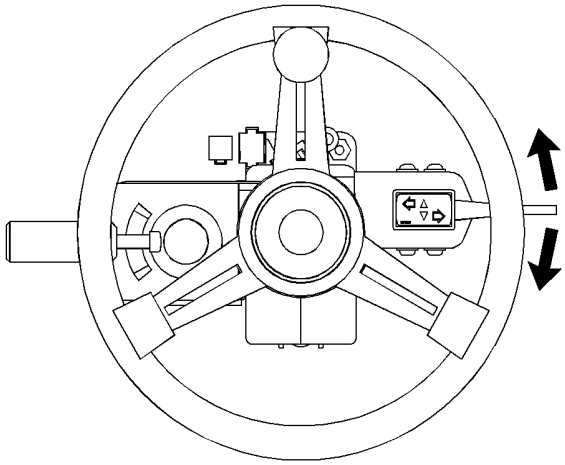

Illustration 98 g01961594

Turn signal with Conventional steering

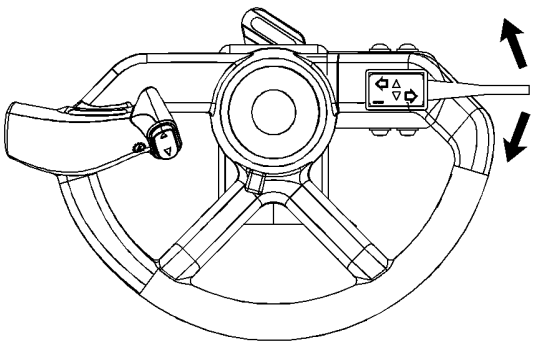

Illustration 99 g01961596

Turn signal with Command control steering

A turn signal lever may be mounted on the right side of the steering column.

Directional Turn Signal – To activate the left turn signal, push the turn signal lever forward. To activate the right turn signal, pull the turn signal lever rearward. Move the turn signal lever to the center position in order to deactivate either turn signal.

An indicator light on the front dash panel will flash when the turn signal is activated.

Machine Security System (If Equipped)

NOTICE
This machine is equipped with a Caterpillar Machine Security System (MSS) and may not start under certain conditions. Read the following information and know your machine's settings. Your Caterpillar dealer can identify your machine settings.

Machine Security System (MSS) – Machines that are equipped with a Cat Machine Security System (MSS) can be identified by a decal in the operator station. MSS is designed to prevent theft of the machine or unauthorized operation.

Basic Operation

MSS may be programmed to read a standard Caterpillar key or an electronic key. The electronic key contains an electronic chip within the plastic housing for the key. Each key emits a unique signal to the MSS. The keys can be identified by a gray housing or a yellow housing. MSS can have programmed settings to require an electronic key or a standard Caterpillar key for starting during certain periods of time.

When the key start switch of the machine is turned to the ON position, the ECM will read the unique ID that is stored in the electronic key. The ECM will then compare this ID to the list of authorized keys. The following table tells the operator the status for starting the machine. The status light is located near the key start switch.

Table 19

Green light	The machine will start.
Red light	The key is not authorized.

Note: MSS will not shut down the machine after the machine has started.

Security Management

The MSS has the capability to allow you to program the system to automatically activate at different time periods with different keys. The MSS can also be programmed to reject a specific electronic key after a selected date and time. When you turn the key to the OFF position and the MSS is active, you have a 30 second interval in order to restart the machine with an unauthorized key. Also if the machine stalls, there is a 30 second interval for restarting the machine. This 30 second interval is counted from the time of turning the key to the OFF position.

Note: Know your machine's settings because the use of an electronic key is no guarantee that the machine can be restarted.

An expiration date can be set for each electronic key that is contained in the list of keys for the machine. The key will no longer start the machine when the internal clock in the security system passes the expiration date. Each entry in the list of keys can have a different expiration date.

Spare keys are available from your dealer. Before a key can operate the machine, the MSS must be set to accept that particular key. Consult your Caterpillar dealer for information on additional features of the MSS.

Engine Idle Shutdown (If Equipped)

This function shuts down the engine after the operator is not operating the machine for a period of time. This function does not shut down other systems, such as AC, which can run down the battery after idle shutdown. This function can be enabled or disabled by a Caterpillar dealer technician. Engine Idle Shutdown may be required for local regulations.

The Engine Idle Shutdown (EIS) shuts down the engine if the following conditions are met:

- Engine coolant temperature must have been warm prior to last start.
- The parking brake is applied.
- The left service brake is released.
- The throttle pedal is released.
- Gear is in neutral.
- The implement is not active.

Engine Idle Shutdown – The action lamp will light and an alarm will sound 20 seconds before the engine shuts down.

An operator can activate any of the controls listed above in order to cancel the shut down. The recommended option for the operator is to use the left brake pedal in order to cancel a shutdown.

i02101862

Service Brake Control

SMCS Code: 4251; 4265; 4269; 4800

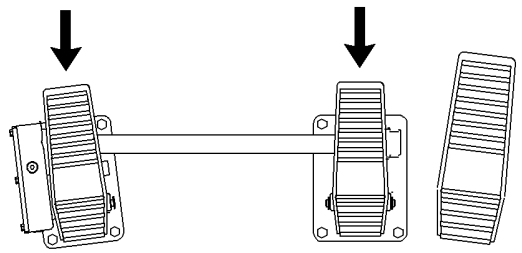

Illustration 100 g00904188

Right Service Brake Pedal

The right service brake pedal is used to slow down the machine's ground speed when the operator does not wish to have the transmission downshift aggressively.

The right service brake pedal is normally used for braking when the autoshift transmission control is downshifting adequately.

Left Brake Pedal

The left service brake pedal provides three braking functions:

- Aggressive Automatic Downshifting of the Transmission
- Neutralization of the Transmission
- Conventional Braking

The left brake pedal is used to initiate automatic downshifting of the transmission at higher ground speeds than the standard automatic downshifting.

When the left service brake pedal is depressed beyond a certain point, automatic downshifting and neutralization of the transmission will occur for all positions of the autoshift switch. The automatic downshifting and the neutralizing of the transmission saves wear on the service brakes, axles, and components of the power train.

Use the left brake pedal for most conditions when adequate traction is available.

Left Brake Pedal Operation

The functions of the left brake pedal depend on the position of the left brake pedal and on the position of the autoshift switch.

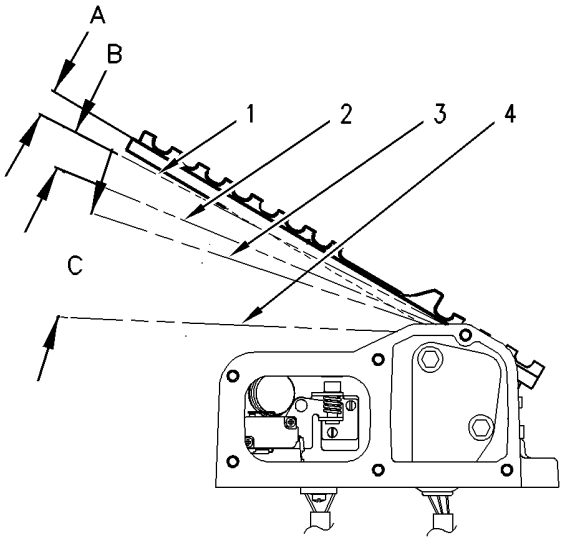

Illustration 101 g00904123

(A) Initial Travel
(B) Downshifting and Service Brake Application
(C) Additional Travel (application of service brakes)
(1) Calibrated Initial Brake Pressure Point
(2) Set Point for Neutralization
(3) Pedal Position for Stopping the Machine
(4) Maximum Pedal Travel (full application of service brakes)

Initial travel (A) of the left brake pedal will cause the transmission to aggressively downshift. The transmission will downshift to the lowest available speed. The lowest available speed depends on the position of the autoshift switch. Refer to Table 20 for the lowest available speed. Each downshift of the transmission will reduce the speed of the machine. The transmission will downshift at higher speeds than the normal automatic downshift speeds. The transmission will only downshift if an engine overspeed will not occur. The transmission will not upshift until the left brake pedal is fully released.

The transmission will be engaged again after the left brake pedal is released 4 degrees from maximum pedal position (3). This will only happen if the transmission was neutralized. The service brakes will still be applied. This will allow the transmission to be engaged when the brakes are applied. This will help to prevent unwanted movement while you are on a slope.

Note: You should wait at least one second after releasing the left brake pedal to 4 degrees before completely releasing the pedal. This will allow the transmission to fully engage.

Depressing the left pedal will neutralize the transmission again.

Note: The left brake pedal requires calibration if the pedal was replaced. The neutralization of the transmission can also be adjusted.

Reference: For more information on calibration of the left brake pedal, refer to Power Train Testing and Adjusting, “Position Sensor (Left Brake Pedal) Calibrate”.

Command Control Steering

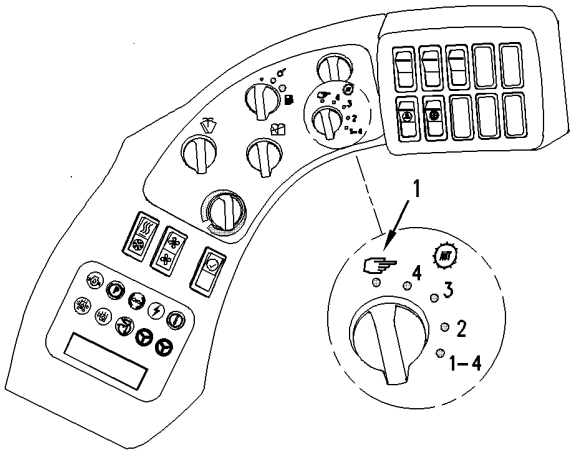

Illustration 102 g00904125

Autoshift Switch

Table 20

Modes of Operation for the Transmission Neutralizer					
Autoshift Switch	**Manual Mode (1)**	**4**	**3**	**2**	**1-4**
Shift Pattern	**4th-3rd-2nd**	**4th-3rd-2nd**	**3rd-2nd**	**None**	**4th-3rd-2nd-1st**
Neutralizer Gear	**2nd**	**2nd**	**2nd**	**2nd**	**1st**

When the left brake pedal is fully released, the transmission will return to normal operation. The transmission will remain in the current speed if the autoshift switch is in MANUAL(1).

Conventional Steering

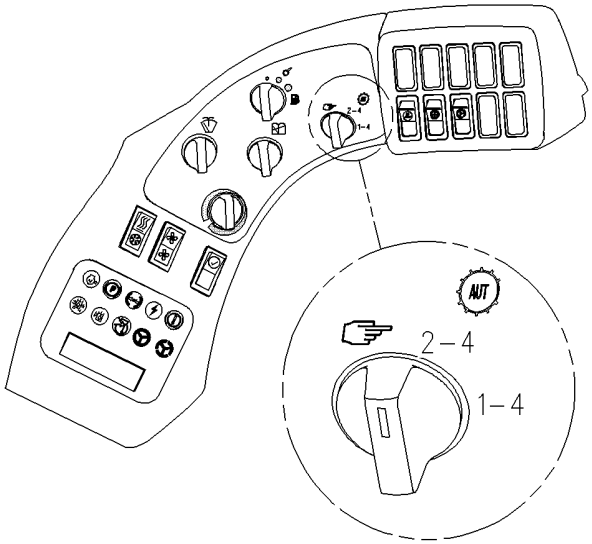

Illustration 103 g00889068

Autoshift Switch

Table 21

Modes of Operation for the Transmission Neutralizer			
Autoshift Switch	**Manual Mode**	**2-4**	**1-4**
Shift Pattern	**4th-3rd-2nd**	**4th-3rd-2nd**	**4th-3rd-2nd-1st**
Neutralizer Gear	**2nd**	**2nd**	**1st**

When the left brake pedal is fully released, the transmission will return to normal operation. The transmission will upshift to the selected speed by way of the transmission control on the steering column.

i03876155

Autoshift Control

SMCS Code: 4800; 7451-ZS

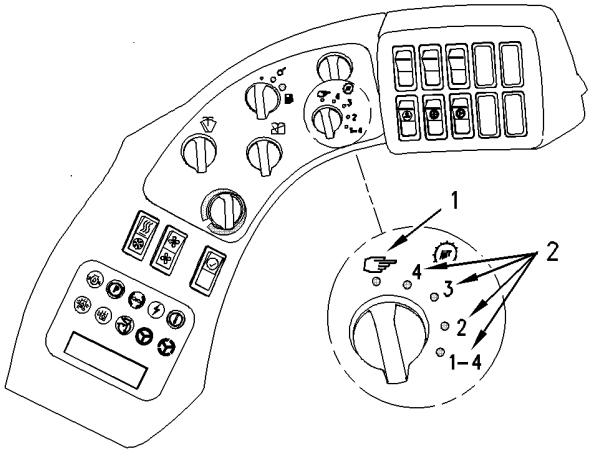

Illustration 104 g00888770

Autoshift Selector with Command Control Steering

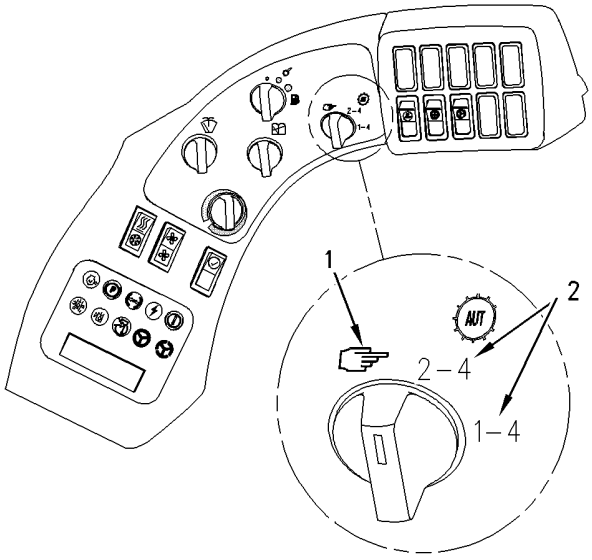

Illustration 105 g00888822

Autoshift Selector with Conventional Steering

The autoshift switch determines if the transmission will be shifted manually or if the transmission will be shifted automatically. The autoshift switch also determines the functionality of the left service brake pedal.

Reference: For additional information about the functionality of the left service brake pedal, refer to the Operation and Maintenance Manual, “Service Brake Control” for the machine that is being serviced.

Manual Shifting

Move the autoshift switch into the MANUAL position (1). Depressing the left service brake pedal will cause the transmission to downshift. If the transmission neutralizer has not been disabled, the transmission will also neutralize as the machine slows down.

The operator must use the transmission speed selector in order to change transmission speeds.

Automatic Shifting (Command Control Steering)

Move the autoshift switch into one of the four automatic positions (2).

When the autoshift switch is in the 2, 3, or 4 position, the lowest automatic speed for the transmission is SECOND speed. The transmission will shift into SECOND after a change in direction. You can press the downshift button to get to FIRST speed. When the autoshift switch is in the 1 through 4 position, the lowest automatic speed for the transmission is FIRST speed. The transmission will shift into SECOND after a change in direction.

Note: The machine can be electronically configured by a Caterpillar dealer to start in FIRST after a change in direction.

Depressing the left service brake pedal will cause the transmission to downshift. If the transmission neutralizer has not been disabled, the transmission will also neutralize. Fully releasing the left service brake pedal will allow the machine to return to automatic shifting.

Automatic Shifting (Conventional Steering)

Move the autoshift switch into one of the two automatic positions (2).

When the autoshift switch is in the 2 through 4 position, the lowest automatic speed for the transmission is SECOND speed. The transmission will shift into SECOND after a change in direction. You can press the downshift button to get to FIRST speed. When the autoshift switch is in the 1 through 4 position, the lowest automatic speed for the transmission is FIRST speed. The transmission will shift into SECOND after a change in direction.

Note: The machine can be electronically configured by a Caterpillar dealer to start in FIRST after a change in direction.

Depressing the left service brake pedal will cause the transmission to downshift. If the transmission neutralizer has not been disabled, the transmission will also neutralize. Fully release the left service brake pedal in order to return to automatic shifting.

Downshifting (Command Control Steering)

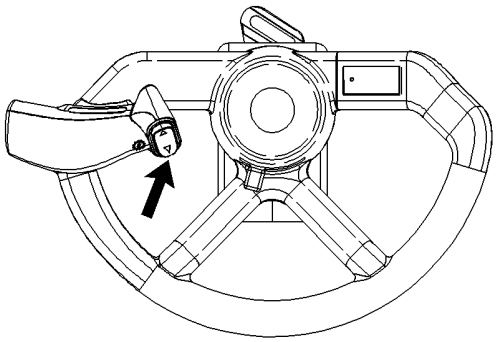

Illustration 106 g00888840

Transmission speed selector with command control steering

Manual Shifting

Press the bottom of the transmission speed selector that is located on the left side of the steering wheel in order to downshift the transmission. The transmission speed selector can be used to downshift from SECOND to FIRST in order to load the bucket. The transmission will shift into FIRST speed in order to back away from the pile.

Automatic Shifting

The transmission speed selector is located on the left side of the steering wheel. Press the bottom of the transmission speed selector in order to downshift the transmission. The transmission speed selector can be used to downshift from SECOND to FIRST in order to load the bucket. The machine will remain in FIRST speed until either the machine changes direction or the operator manually upshifts the machine.

Note: The transmission will only downshift if an engine overspeed will not occur.

Downshifting (Conventional Steering)

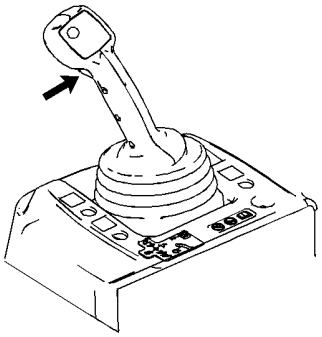

Illustration 107 g01136837

Downshift Switch for Machines That are Equipped with a Joystick

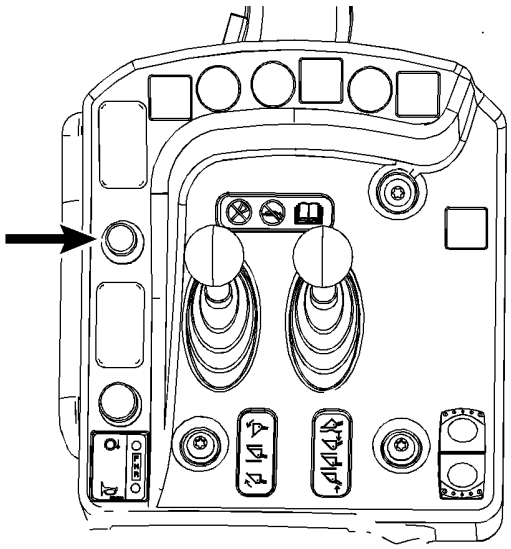

Illustration 108 g01974853

Downshift Switch for Machines that are Equipped With Levers

Manual Shifting

The downshift switch can be used to downshift the machine from SECOND to FIRST in order to load the bucket. The downshift switch is active when the transmission speed selector lever is set to SECOND speed. The transmission will remain in the downshifted speed for three seconds after the switch is released. The transmission will then shift back into SECOND. The transmission will shift into FIRST if the direction of the machine is changed within the three second interval.

Note: The transmission will only downshift if an engine overspeed will not occur.

Automatic Shifting

The downshift switch can be used to downshift from SECOND to FIRST in order to load the bucket. The downshift switch is located near the bucket controls. The downshift switch is located on the joystick on machines that are equipped with a joystick. The downshift switch is active when the autoshift switch is in the automatic modes (2). The transmission will remain in the downshifted speed for five seconds after the switch is released. Then, automatic shifting will resume.

i03646537

Battery Disconnect Switch

SMCS Code: 1411

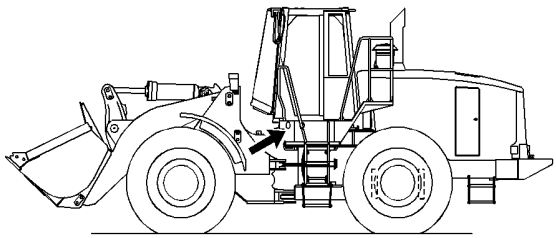

Illustration 109 g01105336

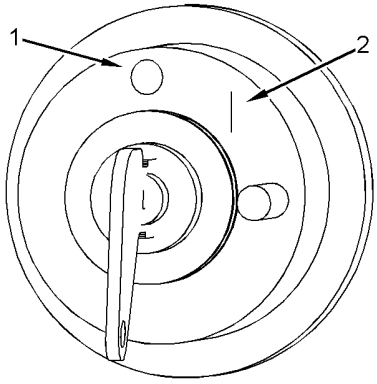

Illustration 110 g01099181

The battery disconnect switch is located on the left side of the machine.

Disconnect Switch ON(2) – To activate the electrical system, insert the battery disconnect switch key and turn the key clockwise. The key for the battery disconnect switch must be turned to the ON position before you start the engine.

Disconnect Switch OFF(1) – 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. To disable the entire electrical system, turn the battery disconnect switch to the OFF position. 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 machine or when the machine will not be used for an extended period of a month or more. This will help to prevent 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.

To ensure that no damage to the engine occurs, verify that the engine is fully operational before cranking the engine. Do not crank an engine that is not fully operational.

Perform the following procedure in order to check the battery disconnect switch for proper operation:

1. With the battery disconnect switch in the ON position, verify that electrical components in the operator compartment are functioning. Verify that the hour meter is displaying information. Verify that the engine will crank.
2. Turn the battery disconnect switch to the OFF position.
3. Verify that the following items are not functioning: electrical components in the operator compartment, hour meter and engine cranking. If any of the items continue to function with the battery disconnect switch in the OFF position, consult your Caterpillar dealer.

i02818209

Backup Alarm

SMCS Code: 7406

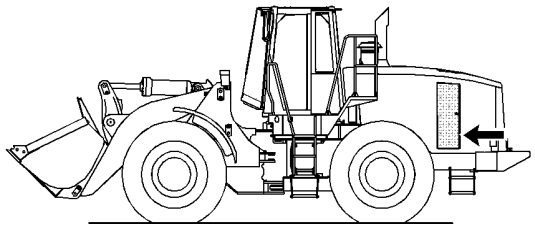

Illustration 111 g01105102

Backup Alarm – The alarm will sound when the transmission direction control switch is in the REVERSE position. The backup alarm is used to alert people behind the machine when the machine is backing up.

i04404686

Monitoring System

SMCS Code: 7490; 7601

Reference: Refer to Service Manual, SENR1394, Caterpillar Monitoring System for detailed service information.

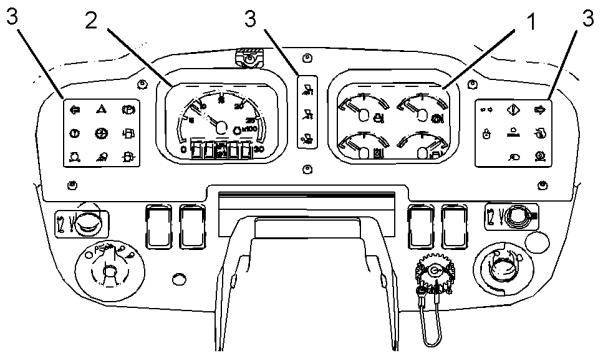

Illustration 112 g01099810

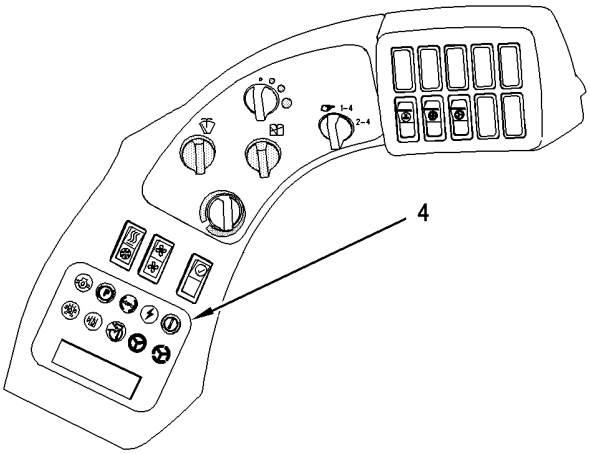

Illustration 113 g00999626

The Caterpillar Monitoring System is an electronic monitoring system that continuously monitors machine systems. The monitoring system consists of the following displays: quad gauge module (1), speedometer/tachometer display (2), indicator display (3) and main display module (4).

Quad Gauge Module

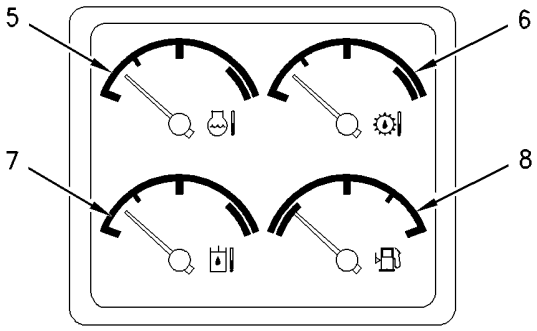

Illustration 114 g00995828

Coolant Temperature (5) – This gauge indicates excessive coolant temperature. If the gauge needle is in the red area, stop the machine and investigate the cause of the fault.

Transmission Oil Temperature (6) – This gauge indicates excessive transmission oil temperature. If the gauge needle is in the red area, reduce the load on the machine. If the gauge needle is in the red area and the action light continues to flash after approximately 5 minutes, stop the machine and investigate the cause of the fault.

Hydraulic Oil Temperature (7) – This gauge indicates excessive hydraulic oil temperature. If the gauge needle is in the red area, reduce the load on the system. If the gauge needle remains in the red area, stop the machine and investigate the cause of the fault.

Fuel Level (8) – This gauge indicates the amount of fuel in the fuel tank. If the gauge needle is in the red zone, the fuel tank is low on fuel. Refuel the machine as soon as possible.

Speedometer/Tachometer Display

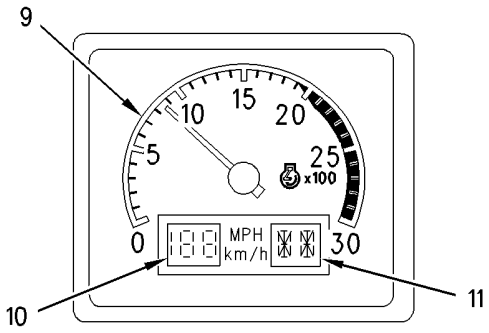

Illustration 115 g00995829

Tachometer (9) – The tachometer displays the engine rpm during operation.

Speedometer (10) – The speedometer displays the machine ground speed in mph or in km/h.

Gear/Direction Readout (11) – The gear readout displays the selected transmission gear and the selected direction.

Indicators

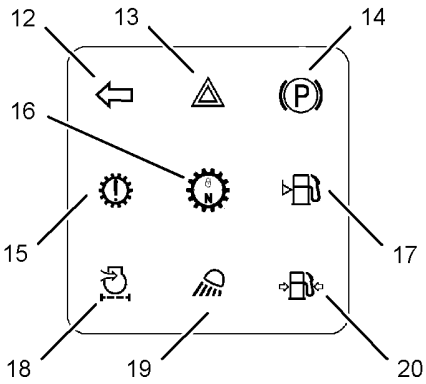

Illustration 116 g01098001

Left Turn Signal (12) – This indicator illuminates when the left turn signal is activated.

Hazard Lights (13) – This indicator illuminates when the hazard lights are activated.

Parking Brake (14) – This indicator illuminates when the parking brake is engaged. The indicator should flash during start-up.

Transmission Failure(15) – This indicator illuminates when a serious problem exists in the electronic system of the transmission. Immediately stop the machine. Stop the engine. Investigate the cause.

Transmission Neutralizer (16) – This indicator illuminates when the transmission neutralizer is deactivated.

Fuel Level (17) – This indicator illuminates when the machine is low on fuel. Refuel the machine as soon as possible.

Engine Air Filter (18) – This indicator illuminates when the engine air filter is clogged.

Floodlights (19) – This indicator illuminates when the floodlights are on.

Fuel Pressure (20) – This indicator illuminates when the fuel pressure is extremely high or extremely low. If this indicator flashes during operation, stop the machine immediately and engage the parking brake. Stop the engine and investigate the cause of fault.

If your machine is equipped with the Autodig System, the following indicators will be in the center of the dashboard.

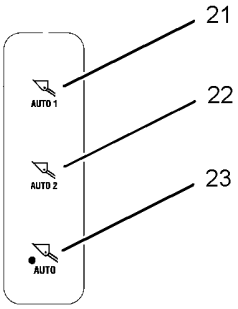

Illustration 117 g01099583

Automatic Pile Detection (21) – This indicator illuminates when the autodig system is in the automatic pile detection mode. Automatic pile detection mode is the default mode for the autodig system.

Operator Triggered Mode (22) – This indicator illuminates when the autodig system is in the operator triggered mode.

Record Mode (23) – This indicator illuminates when the autodig system is in the record mode.

Reference: Refer to Operation and Maintenance Manual, “Aggregate Autodig” for more detailed information.

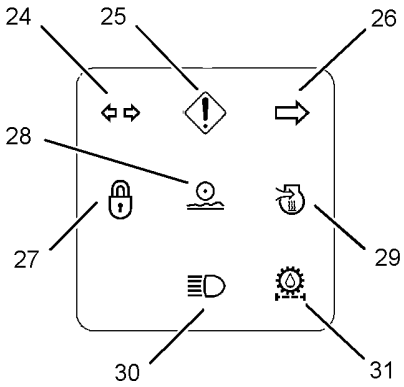

Illustration 118 g01099619

Roading Lights (24) – This indicator illuminates when the roading lights are activated.

Action Light (25) – This indicator illuminates when a fault has been detected by the monitoring system.

Right Turn Signal (26) – This indicator illuminates when the right turn signal is activated.

Engine Lockout(27) – This indicator illuminates when the engine lockout has been activated. The indicator will also be illuminated when the machine lockout is activated.

Ride Control (28) – This indicator illuminates green when the ride control is activated. This indicator illuminates amber when the ride control is in automatic mode.

Air Inlet Heater (29) – This indicator illuminates when the air inlet heater is activated.

High Beam Lights (30) – This indicator illuminates when the high beams are on.

Transmission Oil Filter (31) – This indicator illuminates when the transmission oil filter is clogged.

Main Display Module

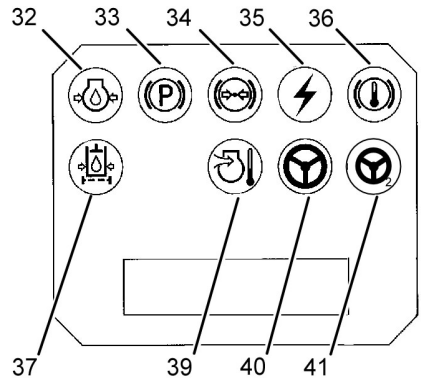

Illustration 119 g02152521

Engine Oil Pressure (32) – This indicator indicates low 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.

Parking Brake (33) – This indicator illuminates when the parking brake is engaged. The indicator should flash during start-up.

Brake Oil Pressure (34) – This indicator indicates low oil pressure to the brakes. 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 (35) – This indicator illuminates when there is a malfunction in the electrical system. The system voltage is 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, then increase the engine speed. This increase will generate more output from the alternator. If the alert indicator for the electrical system turns off within 1 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.

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 indicator 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.

Front and Rear Axle Oil Temperature (36) (if equipped) – This indicator illuminates when the axle oil temperature is high. If the alert indicator comes on, change operating techniques or park the machine in order to allow the axle to cool down. If the situation continues, consult your Caterpillar dealer.

Hydraulic Oil Filter (37) – This indicator illuminates when the hydraulic oil filter is plugged. 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.

High Inlet Air Temperature (39) – The air inlet temperature is too high. If the indicator illuminates, change operating techniques or park the machine in order to allow the air cooler to cool down. If the situation continues, consult your Caterpillar dealer.

Primary Steering (40) – This indicator illuminates when the oil pressure for the primary steering is low. The indicator may also indicate a failure of the primary steering. The secondary steering (if equipped) should be automatically activated. 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.

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

Note: Secondary steering only works while the machine is moving. Directional changes can be made when the machine operates under secondary steering.

Secondary Steering (41) (if equipped) – This indicator illuminates when the secondary steering is functioning. When you turn the engine start switch to the ON position, the alert indicator for the secondary steering will come on for 3 seconds. Then, the alert indicator will go off. If the alert indicator for the secondary steering does not come on, investigate the cause of the fault. Do not operate the machine until the fault has been corrected.

Warning Categories

The Caterpillar Monitoring System provides three warning categories. The first category requires only operator awareness. The second warning category requires an operator response. The third warning category requires immediate shutdown of the machine.

Table 22

WARNING OPERATION					
	Warning Indications (1)				
Warning Category	Alert Indicator Flashes(3)	Action Lamp Flashes(4)	Action Alarm Sounds	Operator Action Required	Possible Result(2)
1	X			No immediate action is required. The system needs attention soon.	No damage will occur to the machine. Minor reductions in machine performance may occur.
2	X	X (4)		Change machine operation or perform maintenance to the system.	Severe damage to components can occur.
3	X	X (4)	X (5)	Immediately perform a safe engine shutdown.	Injury to the operator or severe damage to components can occur.

(1) The active warning indications are marked with an X.
(2) Possible result, if the operator takes no action.
(3) The alert indicator flashes at a 10 Hz rate.
(4) The action lamp will flash.
(5) The action alarm sounds.

Functional Test

The Caterpillar Monitoring System performs an automatic internal test when the machine is activated. Turning the engine start switch from the OFF position to the ON position will activate the test.

The test verifies proper operation of the outputs (displays, indicator lamps, and audible alarms).

The internal circuits are automatically checked.

The operator must observe the outputs in order to determine whether the displays are operating properly. The length of time for the test is approximately 3 seconds.

During this test, the alert indicators flash. Also, the display window shows the following information:

- All units of measurement (degrees Celsius, kPa, miles, km, rpm, and liters)
- “X10” indicator
- Symbol for hour meter
- “8.8.8.X.8.8.” on the digital readout

The tachometer and the gauge needles ramp straight up. Then, the gauge needles go to the right and to the left. The gauge needles then go to the final position.

- The gear/direction readout shows an asterisk.
- The digital speedometer shows “188” mph and km/h.
- The indicator lamp is on continuously.
- The audible alarm sounds once.

The display then goes into the Normal Mode of operation or the display scrolls through the modes if the service input and the clear input are grounded or the operator switch input is grounded.

i03655407

Payload Control System (PCS) (If Equipped)

SMCS Code: 7494

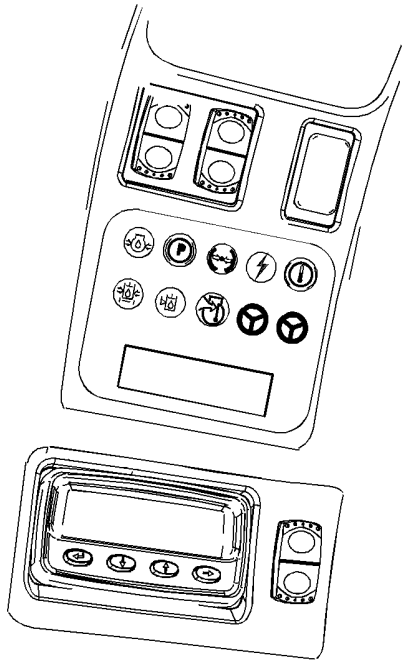

Illustration 120 g01981913

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

The Payload Control System (PCS) is an electronic system that will provide an accurate weight of the material that is loaded by a wheel loader.

Messenger Display

The Messenger display is the main interface between the operator and the PCS. The Messenger display is used for the following purposes:

- Display the bucket payload weight and display the truck payload weight.
- Display system messages to the operator
- Navigate through the menus.
- Adjust settings.
- Enter data.

The Messenger display consists of an LCD screen and four push buttons. See Illustration 121 .

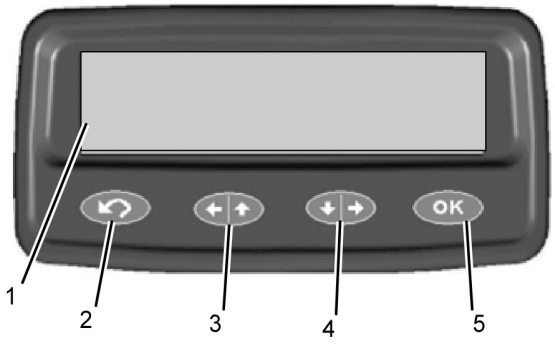

Illustration 121 g01304775

Components in the display of the Messenger

(1) LCD screen
(2) Back button
(3) Up/left button
(4) Down/right button
(5) OK button

Display Buttons

The display has four navigation buttons. The buttons are located below the LCD screen. The four buttons are the following:

- Back button
- Up/left button
- Down/right button
- OK button

Function of the Display Buttons

The function of each button is described below.

Back Button

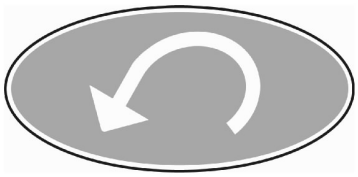

Illustration 122 g01322949

Back button

The back button (2) is used for the following purposes:

- Exit the currently selected menu.
- Remove the last selected character from a data entry screen.
- Alternate between the main weigh screen and the menu selection screen

Up/Left Button

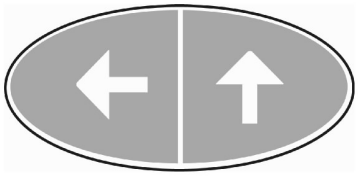

Illustration 123 g01322948

Up/left button

The Up/left button (3) is used for the following purposes:

- Highlight the previous menu item.
- Highlight the previous list selection item.
- Highlight the next character or the next action item that is on the left side of a data entry screen.

Down/Right Button

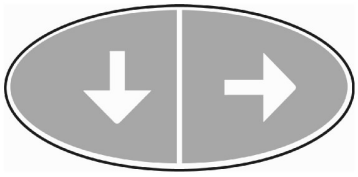

Illustration 124 g01322950

Down/right button

The down/right button (4) is used for the following purposes:

- Highlight the next menu item.
- Highlight the next list selection item.
- Highlight the next character or the action item that is on the right side of a data entry screen.

OK Button

Illustration 125 g01322951

OK button

The OK button (5) is used for the following purposes:

- Enter the highlighted menu.
- Select the highlighted list selection item.
- Select the highlighted character on a data entry screen.
- Select the highlighted action on a data entry screen.
- Acknowledge a popup event or a diagnostic.

Additional Functions

Three additional functions can be performed by pressing a combination of the buttons simultaneously. The functions and the combination of buttons are described below.

Enter the Simple Calibration Update Screen

Enter the simple calibration update screen by pressing the back and up/left buttons simultaneously.

Enter the Weigh Screen

Enter the weigh screen from any menu screen by pressing the up/left and down/right buttons simultaneously.

Enter the Standby Screen

Enter the standby Screen from the weigh screen by pressing the down/right and OK buttons simultaneously. Press any button in order to move from the Standby screen to the weigh screen.

Basic Operation of the Messenger

Selecting An Item From the Menu

Press the OK button in order to select one of the menu items. The title of the menu is shown in a banner along the top of the display. The options that are available for each menu item will then be displayed. The options may be displayed individually or the options may be displayed in groups. If a down arrow appears, pressing the down/right button will highlight the next option. The down arrow is displayed in the left most column of the display. If an up arrow appears pressing the up/left button will highlight the previous option. The up arrow is displayed in the left most column of the display. Press the OK button in order to select a menu option. Press the back button in order to move up to the previous menu.

Reweigh / Clear/Zero Switch

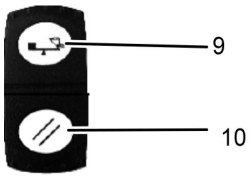

Illustration 126 g01680581

Reweigh / clear/zero switch

(9) Reweigh switch
(10) Clear/zero switch

The reweigh / clear/zero switch is a rocker switch. The reweigh / clear/zero switch is located to the right of the display of the Messenger. See Illustration 126 .

The upper half of the switch functions as the reweigh switch(9). The lower half functions as the clear switch and the zero switch(10). This switch is used for the following three functions:

- Reweighing a bucket
- Clearing the display
- Zeroing the system

Store Switch

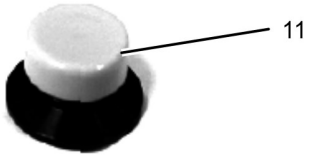

Illustration 127 g01680594

Store switch

(11) Store switch

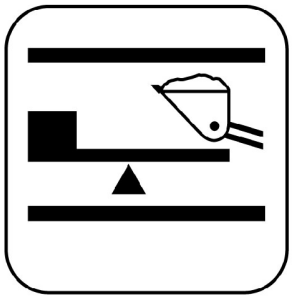

Illustration 128 g01962780

The store switch (11) is a push button switch that is located on the implement control pod. The store switch is shown in Illustration 127 . The following can be performed with the store switch:

- Storing the current truck information in the Electronic Control Module (ECM) memory
- Resetting the truck weight and bucket weight to zero

Weighing Materials

The steps that are used in order to obtain an accurate weight are listed below.

Perform the following before weighing the material:

1. Exercise the pins by raising the bucket at least three times.

2. Set the raise kickout at least 5% above the end of weigh point.

Note: The default end of weigh point is 65%.

3. Zero the system at the typical operating engine speed.

Avoid the following actions while the bucket is being lifted:

- Extreme changes in engine speed
- Directional shifts
- Harsh turning or jerky turning

Perform the following in order to weigh a bucket of material:

1. Load the bucket with material.

2. Fully rack back the bucket.

3. Set the engine rpm to the normal operating speed.

4. Make sure that the bucket is below the start of weigh point.

Note: The default start of weigh point is 50% of the lift arm height.

5. Move the lift lever smoothly into the FULL DETENT position and raise the bucket.

The material will be weighed as the bucket travels through the weigh range. When weighing is complete, the top line of the display will show the weight of the material in the bucket. The bottom line of the display will show the accumulated weight of material in the truck.

Additional Features

Reference: More complete information is available from your Caterpillar dealer. Refer to Operation and Maintenance Manual, SEBU8092, “Payload Control System” for additional features. For information about earlier versions of the Payload Control System , refer to Operation and Maintenance Manual, SEBU7012, “Payload Control System”.

i04589911

Product Link

SMCS Code: 7606

S/N: GTA1–Up

S/N: A6D1–Up

S/N: A7D1–Up

S/N: RYF1–Up

S/N: A6G1–Up

S/N: A7G1–Up

S/N: A6J1–Up

S/N: A7J1–Up

S/N: TAL1–Up

Note: Your machine may be equipped with the Product Link system.

The Product Link121SR system utilizes satellite technology to communicate machine information. The Product Link 420/421 and 522/523 are cellular based communication devices that transmit machine information. This information is communicated to Caterpillar , Cat dealers and Caterpillar customers. Product Link systems contain Global Positioning System (GPS) satellite receivers.

The capability of two-way communication between the machine and a remote user is available with the Product Link121SR, 420/421, and 522/523 system. The remote user can be a dealer or a customer. At any time, a user can request updated information from a machine such as hours of use or the location of the machine. Also, the system parameters for Product Link 121SR, 420/421, and 522/523 systems can be changed.

Data Broadcasts

Data concerning this machine, the condition of the machine, and the operation of the machine is being transmitted by Product Link to Caterpillar and/or Cat dealers. The data is used to serve the customer better and to improve upon Caterpillar products and services. The information transmitted may include: machine serial number, machine location and operational data, including but not limited to: fault codes, emissions data, fuel usage, service meter hours, software and hardware version numbers and installed attachments.

Caterpillar and/or Cat dealers may use this information for various purposes. Refer to the following list for possible uses:

- Providing services to the customer and/or the machine
- Checking or maintaining Product link equipment
- Monitoring the health of the machine or performance
- Helping maintain the machine and/or improve the efficiency of the machine
- Evaluating or improving Caterpillar products and services
- Complying with legal requirements and valid court orders
- Performing market research
- Offering the customer new products and services

Caterpillar may share some or all of the collected information with Caterpillar affiliated companies, dealers, and authorized representatives. Caterpillar will not sell or rent collected information to any other third party and will exercise reasonable efforts to keep the information secure. Caterpillar recognizes and respects customer privacy. For more information, please contact your local Cat dealer.

Operation in a Blast Site for Product Link

The Product Link radio transmitter must be disabled by the minimum distance mandated under all applicable legal requirements, or the following Caterpillar recommended distance from the site, whichever is greater: 12 m (40 ft) for Product Link121SR and 321SR and 3 m (10 ft) for Product Link 420/421 and 522/523.

The following are suggested methods to disable the Product Link121SR system or the Product Link522/523 system: (a) Install a Product Link disconnect switch in the machine cab that will allow the Product Link121SR system or the Product Link522/523 system module to be shut off. Refer to Special Instruction, REHS2365, “An Installation Guide for the Product Link PL121SR and for the PL300” and Special Instruction, REHS2368, “Installation Procedure For Product Link PL522/523 (Cellular)” for more details and installation instructions. Or, (b) Disconnect the Product Link121SR system or the Product Link522/523 module from the main power source by disconnecting the wiring harness at the Product Link module.

For Product Link devices with an internal battery back-up without a radio disable feature including the PL420 system: Do not operate an asset with this type of device within a blast site. Product Link should not be operated within the minimum mandated or recommended distance from a blast site perimeter.

The following Product Link system specifications are provided in order to aid in conducting any related hazard assessment. Ensure compliance with all local regulations:

- The transmit power rating for the Product Link 121SR transmitter is 5 to 10 W.
- The operating frequency range for the Product Link 121SR system is 148 to 150 MHz
- The transmit power rating for the Product Link 522/523 transmitter is approximately 1 W.
- The operating frequency range for the Product Link 522/523 system is 824 to 849 MHz, 880 to 915 MHz, 1710 to 1785 MHz, and 1850 to 1910 MHz.
- The transmit power rating for the Product Link 420/421 system is 2 w for 850 MHz and 900 MHz and 1 w for 1800 MHz and 1900 MHz.

Consult your Cat dealer if there are any questions.

Information for the initial installation of the Product Link121SR system is available in Special Instruction, REHS2365, “An Installation Guide for the Product Link PL121SR and for the PL300”. Information for the initial installation of the Product Link 522/523 system is available in Special Instruction, REHS2368, “Installation Procedure For Product Link PL522/523 (Cellular)”.

Operation, configuration and troubleshooting information for the Product Link 121SR system can be found in the Systems Operation, Troubleshooting, Testing and Adjusting, RENR7911, Product Link 121/321.

Operation, configuration and troubleshooting information for the Product Link 522/523 system can be found in the Systems Operation, Troubleshooting, Testing and Adjusting, RENR8143, Product Link - PL522/523.

Information for the initial installation of the Product Link 420 system is available in Special Instruction, REHS5595, “Installation Procedure for Product Link PL420 Retrofit”.

Information for the initial installation of the Product Link 421 system is available in Special Instruction, REHS5596, “Installation Procedure for Product Link PL421 Retrofit”.

Regulatory Compliance

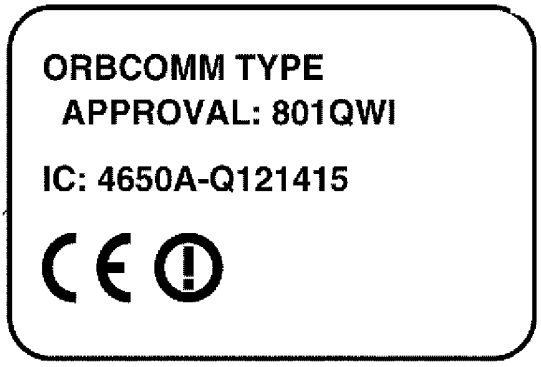

Illustration 129 g01131982

NOTICE

Transmission of information using Product Link is subject to legal requirements that may vary from location to location, including, but not limited to, radio frequency use authorization. The use of Product Link must be limited to those locations where all legal requirements for the use of the Product Link communication network have been satisfied.

If a machine outfitted with Product Link is located in or relocated to a location where (i) legal requirements are not satisfied or (ii) transmitting or processing of such information across multiple locations would not be legal, Caterpillar disclaims any liability related to such failure to comply and Caterpillar may discontinue the transmission of information from that machine.

Consult your Cat dealer with any questions that concern the operation of the Product Link in a specific country.

EC DECLARATION OF CONFORMITY OF MACHINERY

Manufacturer: CATERPILLAR INC., 100 N.E. ADAMS STREET, PEORIA, IL 61626, U.S.A.

Person authorised to compile the Technical File and to communicate relevant part(s) of the Technical File to the Authorities of European Union Member States on request:
Standards & Regulations Manager, Caterpillar France S.A.S 40, Avenue Leon-Blum B.P.55 F38041, Grenoble Cedex 9

I, the undersigned, Michael R Verheyen, hereby certify that the construction equipment specified hereunder

Description:	Generic Denomination:	Earth-moving Equipment
	Function:	Asset Management
	Model/Type:	PL121SR
	Commercial Name:	Product Link

Fulfils all the relevant provisions of the following Directives

Directives	Notified Body	Document No.
2004/108/EC	..... N/A	PL121SR-PEO101
1999/5/EC	..... N/A	PL121SR-PEO101

Harmonised Standards Taken Into Consideration: EN 13309, EN 301 389-1, EN 301 489-02, EN 55022, EN 60950-1, EN 301 721

Done at
CATERPILLAR INC.
100 N.E. Adams Street
AB 5410
Peoria, IL 61629 U.S.A.
Date
2010-06-10

Signature

Name / Position
Michael R Verheyen / Product Manager

Illustration 130 g02348438

产品中有毒有害物质或元素的名称及含量						
CAT 522						
部件名称 (Part Name)	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
内部接线 (Internal Cables)	O	O	O	O	O	O
电路板 (Printed Circuit Assembly)	X	O	O	O	O	O
金属封入物 (Metal Enclosure)	O	O	O	O	O	O
所有硬件 (Hardware)	O	O	O	O	O	O
SIM卡 (SIM Card)	O	O	O	O	O	O
螺母，螺栓，螺丝，垫片，紧固件 (Nuts, bolts, screws, washers, Fasteners)	O	O	O	O	O	O
密封垫 (Gaskets)	O	O	O	O	O	O
标签(Labels)	O	O	O	O	O	O

O: 该部品所有均质材料的有毒有害物质含有量，不可超过SJ/T11363-2006标准所规定的限度量要求。
X: 该部品中最少有一项均质材料的有毒有害物质含有量，超过SJ/T11363-2006标准所规定的限度量要求。

制造业日期代码信息 (Manufacturing Date Code Information)
产品序列号格式: XXXYZAAABB
xxx= 产品制造缩略历的日期
Y=此年产品生产的年的最后一个数字
例如: 24219005RN
242= 8月30日
1=2001 年

Illustration 131 g02657277

Trimble

Trimble Navigation Limited
935 Stewart Drive
Post Office Box 3642
Sunnyvale, CA 94085

Industry Canada Declaration of Conformity

Trimble Navigation Limited declares, under sole responsibility, that the following products conform to Class B digital apparatus complies with Canadian ICES-003.

Product Name: Trimble MTS523, Caterpillar 523, Trimble MTS522, Caterpillar 522, Trimble MTS521
Product Description: Telematics with M2M cell and GPS Receiver

Antenna used in MTS500 family of telematics has overall antenna gain which complies with limits per Cinterion requirements for GSM antennas in Canada.

S = 850/(150*10) 0.56667 mW/cm^2
R = 20 cm
P = 1771 mW
Maximum Gain = 2.06 dBi

Laird antenna: TRP GSM strongest measurements: Frequency 848.8 Mhz, Antenna Port Power 33 dBm, Maximum Gain 0.255211 dBi, Maximum Power / Peak EIRP 33.2552 dBm

Mobile Mark Antenna: CVS-900/1900 uses CVS RG-174 cable:
Antenna transmission gains up to 2.5dB, based on data based on Azimuth plot. However, cable loss of 0.34dB/ft and data sheet specify 8 foot cable, resulting in 2.5 – (8* 0.34) = -0.22 db maximum gain.

Both product antennas comply with FCC requirements.

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This document is maintained under Trimble part number 78356-00-DC, and the technical file is maintained under Trimble part number 78356-00-CE at:

Manufacturer: Trimble Navigation Limited, 935 Stewart Drive
Post Office Box 3642, Sunnyvale, CA 94085-3642, USA

Declaration Approved:

Signature

July 13, 2010
Date

Name: Chuck Maniscalco
Title: Director of Engineering
Trimble Navigation Limited
935 Stewart Drive, Post Office Box 3642, Sunnyvale, CA 94085-3642, USA
Telephone: (408) 481-8000

FCC DoC Rev A

Trimble

Trimble Navigation Limited
935 Stewart Drive
Post Office Box 3642
Sunnyvale, CA 94085

FCC Declaration of Conformity

Trimble Navigation Limited declares, under sole responsibility, that the following product(s) conforms to FCC Part 15 Subpart B Section 15.109:

Product Name: Trimble MTS523, Caterpillar 523, Trimble MTS522, Caterpillar 522, Trimble MTS521

Product Description: Telematics with M2M cell and GPS Receiver

This device complies with Part 15 class B of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This document is maintained under Trimble part number 78356-00-DC, and the technical file is maintained under Trimble part number 78356-00-CE at:

Manufacturer: Trimble Navigation Limited, 935 Stewart Drive
Post Office Box 3642, Sunnyvale, CA 94085-3642, USA

Declaration Approved:

Chuck Maniscalco — Signature

July 13, 2010 — Date

Name: Chuck Maniscalco
Title: Director of Engineering
Trimble Navigation Limited
935 Stewart Drive, Post Office Box 3642, Sunnyvale, CA 94085-3642, USA
Telephone: (408) 481-8000

Trimble MTS500 FCC DoC Rev A

Trimble

Trimble Navigation Limited
935 Stewart Drive, Post Office Box 3642, Sunnyvale, CA 94085-3642

CE Declaration of Conformity

Trimble Navigation Limited declares, under sole responsibility, that the following product(s):

Product Name: **Trimble MTS523, Trimble MTS522, Trimble MTS521, Caterpillar 523, Caterpillar 522**

Product Description: Telematics

Complies with the essential requirements of the R&TTE Directive 1999/5/EC, as described in Article 10, using the following particular standards in full or in part:

Article 3.1a - EMC:	EN 55022 : 2006 +A1:2007
Article 3.1b - EMC:	EN 55024 : 1998 +A1 :2001 +A2 :2003
	ISO 7637-2 : 2004
	EN 301 489-1 v1.8.1
	EN 301 489-3 v.1.4.1
	EN 301 489-7 v1.3.1
Article 3.2 - R&TTE:	TS 51.010-1 v8.3.0 [3GPP]
	EN 300 440-2 V1.2.1 [GPS]
	EN 301 511 V9.0.2 [GSM/GPRS]
Article 3.1a - Safety:	EN 60950-1 : 2006
	EN 62311 : 2008

Mark First Applied: 2009

This document is maintained under Trimble part number 78356-00-DC, and the technical file is maintained under Trimble part number 78356-00-CE at:

Manufacturer: Trimble Navigation Limited, 935 Stewart Drive
Post Office Box 3642, Sunnyvale, CA 94085-3642, USA

Declaration Approved:

Chuck Maniscalco — Signature

July 13, 2010 — Date

Name: Chuck Maniscalco
Title: Director of Engineering
Trimble Navigation Limited
935 Stewart Drive, Post Office Box 3642, Sunnyvale, CA 94085-3642, USA
Telephone: (408) 481-8000

MTS500 series CE DoC Rev A

Illustration 134 g02346208

Trimble

Trimble Navigation Limited
935 Stewart Drive
Post Office Box 3642
Sunnyvale, CA 94088-3642

CE Declaration of Conformity

Trimble Navigation Limited declares, under sole responsibility, that the following product(s) conforms to the particular standards listed below.

Product Name: PL420

This product conforms to the following standards, and therefore complies with the requirements of the R&TTE Directive 1999/5/EC, which specifies compliance with the essential requirements of EMC Directive 2004/108/EC and Low Voltage Directive 73/23/EEC:

Health (R&TTE, Art 3.1a):	EN 60950-1:2006
EMC (R&TTE, Art 3.1b):	EN 301 489-1 V1.8.1 EN 301 489-3 V1.4.1 EN 301 489-7 V1.3.1
Radio Spectrum (R&TTE, Art 3.2):	EN 300 440-1 V1.3.1 EN 300 440-2 V1.1.2 EN 301 511 V9.0.2
Mark First Applied:	2011

This document is maintained under part number 84988-78-DC, and the technical file is maintained under part number 84988-78-CE (including Health and EMC update report files to the original technical file (part number 80300-XX-CE)) at:

Trimble Navigation Limited, 935 Stewart Drive
Post Office Box 3642, Sunnyvale, CA 94088-3642, USA

Declaration Approved:

Signature

9/19/2011
Date

Name: Paul Montgomery
Title: Director of Engineering, Advanced Devices Division
Trimble Navigation Limited
935 Stewart Drive, Post Office Box 3642, Sunnyvale, CA 94088-3642, USA
Telephone: (408) 481-8000

European Contact: Trimble GmbH
Am Prime Parc 11
65479 Raunheim
GERMANY

84988-78-DC, PL420 DoCs Rev C.doc

Trimble Navigation Limited
935 Stewart Drive
Post Office Box 3642
Sunnyvale, CA 94088-3642

FCC Declaration of Conformity

Trimble Navigation Limited declares, under sole responsibility, that the following product(s) conforms to FCC Part 15 Subpart B Section 15.109:

Product Name: PL420

This device complies with Parts 15B, 22 and 24, of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This document is maintained under part number 84988-78-DC, and the technical file is maintained under part number 84988-78-CE (including Health and EMC update report files to the original technical file (part number 80300-XX-CE)) at:

Trimble Navigation Limited, 935 Stewart Drive
Post Office Box 3642, Sunnyvale, CA 94088-3642

Declaration Approved:

Signature

9/19/2011
Date

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Trimble Navigation Limited
935 Stewart Drive
Post Office Box 3642
Sunnyvale, CA 94088-3642
Telephone: (408) 481-8000

i03180601

Camera

SMCS Code: 7347; 7348

Rear View Camera (If Equipped)

The rear view camera system consists of a camera that is located in the middle of the rear top hood panel and a "VIDEO MODE SETTING" menu on the monitor.

Note: The rear view camera system has been set up by the factory or by a Caterpillar dealer in order to provide views which comply with specified guidelines. Consult your Caterpillar dealer before any adjustments are made to the system.

For more information refer to Operation and Maintenance Manual, "Monitoring System".

i02498234

Automatic Lubrication System (If Equipped)

SMCS Code: 7540

The Caterpillar Automatic TWIN Greasing System

Reference: Refer to System Operation, RENR 6331 for more information on the Automatic TWIN Greasing System.

The lubrication system consists of the following items:

- Grease pump with integrated control unit
- Distribution blocks with metering units
- Indicator fault light or an optional mode switch with an integrated lamp

The lubrication system will automatically lubricate all of the points that are connected to the system. The system is on a timed cycle.

Operator Controls

Illustration 137 g01059732

(1) TWIN display – operator control

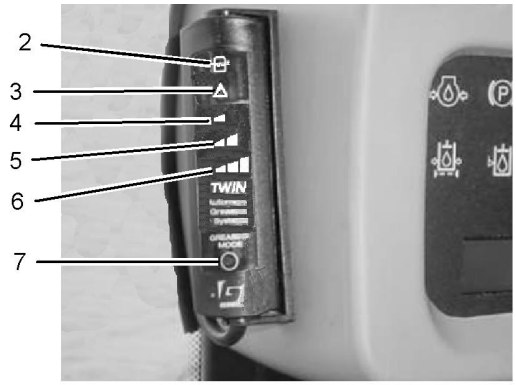

Illustration 138 g01059602

(2) Low Level – The grease reservoir needs to be refilled.

(3) Error – The system is out of operation. This is caused by an empty reservoir or a system failure. The system can be reset with the test button on the pump, after the grease reservoir is refilled or repairs have been made.

(4) Long grease interval – Forty Five Minute Interval

(5) Normal grease interval – Thirty Minute Interval

(6) Short grease interval – Fifteen Minute Interval

To select the required grease interval, press the mode button (7) repeatedly until the corresponding LED illuminates.

Location of Grease Points

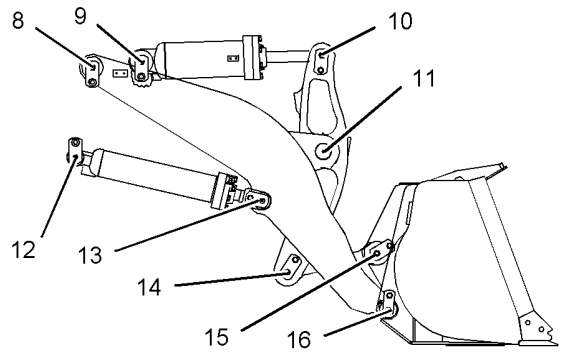

Illustration 139 g01056045

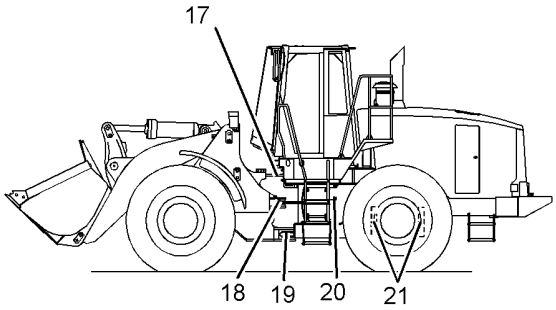

Illustration 140 g01056074

The lubrication system will automatically lubricate the following points:

- The linkage pin (8) through the linkage pin (16) for the loader bucket
- The articulation hitch (17) and (19)
- The steering cylinder pins (18) and (20)
- The axle oscillating bearings (21)

i03671560

Aggregate Autodig
(If Equipped)

SMCS Code: 5741

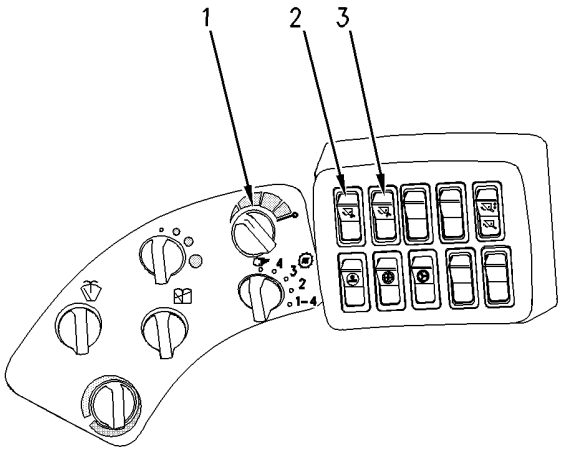

Illustration 141 g00810525

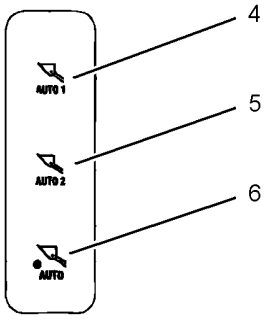

Illustration 142 g01099863

The autodig system is designed to perform the operations of a loading cycle of an aggregate mix with minimal effort by the operator. Loading this type of material is generally repetitive and a high level of skill is required to maintain a consistent level of productivity during such loading cycles. This feature will fully load a bucket at consistent loading times.

Autodig System – The autodig system is only available on machines that are equipped with electrohydraulic bucket controls and command control steering.

Each position of dig mode switch (1) is programmed with the appropriate transmission speed for loading various types of material. The autodig system will only function up to the third speed. The autodig system will downshift the transmission to the proper speed. Only settings one and two are allowed in second speed. All nine settings are allowed in first speed.

Note: If the transmission is in first speed and dig mode switch (1) is programmed for second speed, the autodig system will not upshift the transmission.

Kickout – Kickout set switch (3) will record the position of the lift linkage at the end of a loading cycle. If the kickout height has been set successfully, one beep will be heard. If setting the kickout height is unsuccessful, multiple beeps will be heard.

Operating Modes of the Autodig System

Dig mode switch (1) allows the operator to select different settings for different types of material for loading. Rotate the switch counterclockwise in order to load light material. Rotate the switch clockwise in order to load heavy material. Intermediate positions are available. The settings for the first nine positions are preset. An operator's own discretion is advised.

Operator Mode Switch – Press the top of operating mode switch (2) in order to turn on the autodig system.

One beep will be heard. This will indicate that the system is in the automatic pile detection mode. The switch will return to the center position. Press the top of switch in order to toggle the autodig system to the operator triggered mode. Two beeps will be heard. Press the top of switch again in order to toggle the autodig system to the record mode. Three beeps will be heard.

Press the bottom of operating mode switch in order to turn off the autodig system.

Automatic Pile Detection Mode

The autodig system will be set to the automatic pile detection mode upon initial activation. This means that the loading cycle will automatically begin when the bucket contacts the pile. Indicator (4) will light and one beep will be heard when the autodig system is in the automatic pile detection mode.

The operator does not need to move the bucket controls during automatic loading. Lower the bucket to the ground. Drive the machine into the pile. Do not move any of the controls. The autodig system will automatically load the bucket. An audible alarm will briefly sound at the beginning of the loading cycle and at the end of the loading cycle. The machine can now be driven to the hauling unit.

Operator Triggered Mode

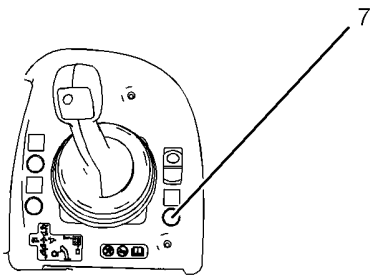

Illustration 143 g01116225

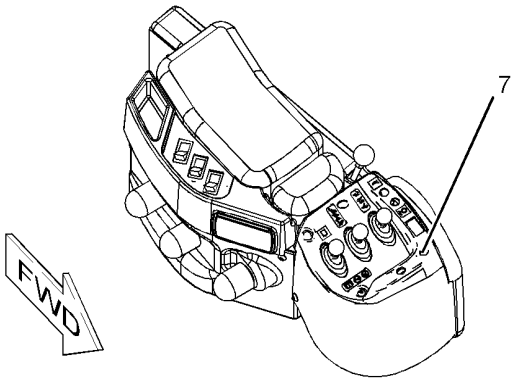

Illustration 144 g01132686

The operator may desire to start the autodig system manually.

1. Rotate dig mode switch (1) in order to select the desired load setting.
2. Toggle the top of operating mode switch (2) in order to place the system in the operator triggered mode. Two beeps will be heard. Indicator (5) will light.
3. With the autodig system in the operator triggered mode, drive into the pile. Press trigger switch (7) in order to activate the loading cycle. An audible alarm will briefly sound at the beginning of the loading cycle and at the end of the loading cycle. The machine may be driven to the hauling unit when the lift cycle is completed.

Record Mode

The operator may record a load cycle that will be used in place of the preset load cycle. Position “10” is dedicated to the record mode.

Record Steps

1. Place dig mode switch (1) into the tenth position by rotating the switch fully clockwise.
2. Toggle the top of operating mode switch (2) until three beeps are heard. Indicator (6) will illuminate on the dash. This indicates that the system is in the record mode.
3. Position the machine in front of the pile with the bucket in the dig position.
4. In order to begin recording, press trigger switch (7). The trigger switch is located near the bucket controls. A loading cycle must be performed within 20 seconds of pressing the trigger switch.
5. Enter the pile and load the bucket manually. While the bucket is being loaded indicator (6) will flash slowly. The record mode will capture the lowest active speed. This speed will be used during the loading cycle.
6. After loading the bucket, press trigger switch (7) to complete recording of the loading cycle. Loading the bucket plus pressing the switch must be done within 20 seconds. If the trigger switch is not pressed in this time, the loading cycle will go back to the previously recorded cycle or the default.
7. If the commands were recorded successfully the autodig system will automatically return to the automatic pile detection mode. One long beep indicates an unsuccessful recording.

Playback Steps

1. Toggle operation mode switch (2) until the desired mode is selected.
2. Choose position “10” on dig mode switch (1).
3. Keep the same parameters as you approach the pile. Do not touch the bucket levers, the neutralizer pedal, or the directional controls until the bucket is fully racked back or the lift arms have reached the autodig system's kickout height.
4. If the operator triggered mode has been selected it will be necessary to press trigger switch (7) as you enter the pile.
5. At any time, the operator may take control by moving the lift lever, the tilt lever, or the joystick.

Note: The initial settings for the tenth position are identical to the settings for the ninth position. The tenth position can no longer be set back to the default parameters after the record mode has been utilized.

i03864175

Hood Tilt

SMCS Code: 7251-T2; 7275

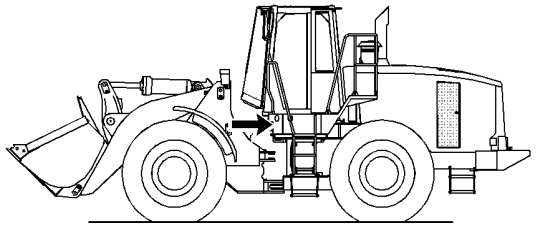

Illustration 145 g01099226

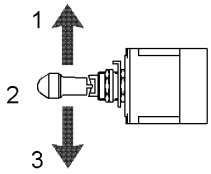

Illustration 146 g01123573

⚠ WARNING

Ensure the area behind the machine is clear before you tilt the engine hood. Failure to clear the area could result in serious injury. Maintain a clear area behind the machine while the hood is in the raised position.

⚠ WARNING

Do not perform any service work in the engine compartment unless the engine hood is in the fully raised position. Failure to do so could result in serious injury. Secure the engine hood in the fully raised position before performing any service work in the engine compartment.

The switch that controls the engine hood is located in a compartment on the left side of the machine.

1. Open the access door.

2. Pull up on the toggle switch. Move the toggle switch to position (1) in order to raise the hood . Release the toggle switch. The toggle switch will return to the middle position (2).

3. Pull up on the toggle switch. Move the toggle switch to position (3) in order to lower the hood. Hold the switch in this position until the hood is fully closed. Release the toggle switch. The toggle switch will return to the middle position.

Note: Do not continue to hold the toggle switch in the open or in the closed position after movement of the hood has stopped. When audible clicks are heard, release the toggle switch. Failure to release the toggle switch will result in damage to the actuator.

Manual Operation

The hood can be operated manually by using a socket head and an air wrench to turn the shaft of the lift motor. The manual control is located on the right rear side of the machine.

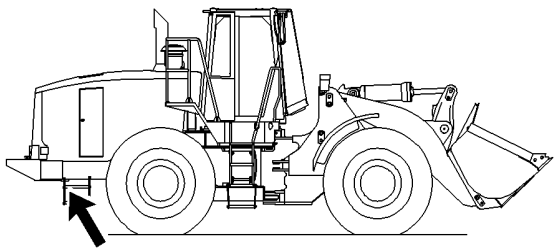

Illustration 147 g00882974

1. Remove two bolts. Remove the cover.

2. Insert a socket head through the hole and onto the shaft of the lift motor. Turn the shaft clockwise in order to raise the hood. Turn the shaft counterclockwise in order to lower the hood.

i03657701

Roading Fender Control (If Equipped)

SMCS Code: 7252

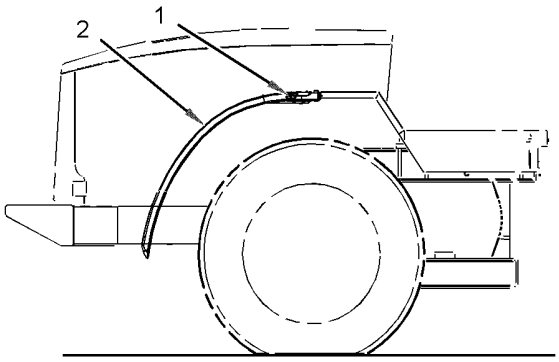

Illustration 148 g01101600

1. Push lever (1) in order to unlock roading fender (2).

2. Swing the roading fender away from the machine in order to access the engine compartment.

3. The roading fender has a lock in order to hold the fender in the OPEN position. The lock will prevent inadvertent movement of the roading fender. Release the lock in order to move the roading fender.

4. Move the roading fender back to the machine and lock the roading fender in the OPERATING position.

i05260624

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 release the parking brake, depress the service brake pedal in order to keep the machine from moving.
- Drive the machine forward for best visibility and for best control.
- Reduce the engine speed when you maneuver in tight quarters and when you are going over a hill.

Machine Operating Temperature Range

The standard machine configuration is intended for use within an ambient temperature range of −40 °C (−40 °F) to 43 °C (110 °F). Special configurations for different ambient temperatures may be available. Consult your Cat dealer for additional information on special configurations of your machine.

Downhill Operation

Maintain a ground speed that is slow enough for the conditions. Before you operate 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 not 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. Overspeed can result in damage to the engine, the hydraulic pump and/or the power train. Use the right service brake pedal or the engine brake (if equipped) in order to slow the machine until a lower gear can be selected. Select the lower gear and proceed.

The brake oil can overheat in the following conditions:

- Use of the right service brake continuously in order to control travel speed.
- Use of the right service brake pedal in order to stop at high speeds

Overheating can result in significant wear and/or damage to the right service brake pedal and final drive.

Note: The left service brake pedal may be used for downhill braking. The left service brake pedal will downshift the transmission to a lower gear. The left service brake pedal will not downshift the transmission to a lower gear if an engine overspeed would result.

Changing Direction and Speed

Speed changes at full engine speed and directional changes at full engine speed are possible. However, when you change directions, deceleration will maximize the comfort of the operator. In order to control the throttle, use the left brake pedal to decelerate. Deceleration will also maximize the service life of power train components.

Engine Idle Management System

The Engine Idle Management System is designed to help maximize fuel efficiency. “EIMS” allows flexibility to manage idle speeds. The “EIMS” engine software comes with four idle control settings: “hibernate mode”, work mode, low voltage mode and warm-up mode.

Hibernate Mode

If your machine has higher idle time, “hibernate mode” will provide lower fuel consumption, reduced sound level, and reduced emissions levels. Fuel consumption savings will vary by the model of the machine and work cycle. The “hibernate mode” is engaged after 10 seconds and the following conditions are met:

- The transmission is in neutral.
- The parking brake is set.
- The throttle pedal is depressed 5% or less.
- Current is greater than 0.8 amp in the fan.

Note: The “EIMS hibernate” engine idle speed can be adjusted by your dealer. The programmable range for the “hibernate mode” is 600 rpm to 825 rpm.

The machine will return to the engine idle speed for work mode with the release of the parking brake, a directional shift of the machine, or a push of the governor pedal.

Work Mode

The work mode is the low idle speed of the machine during normal operation. The engine idle speed for work mode may be set in order to meet the requirements of the application.

Note: “EIMS work mode” engine idle speed can be adjusted by your dealer. The programmable range for the work mode is 650 rpm to 1000 rpm.

Low Voltage Mode

High electrical loads from attachments may cause a high electrical current drain on the battery. The low voltage mode is designed to reduce the risk of fully discharging the batteries. This feature is standard on all machines with “EIMS” software. The low voltage mode is engaged after 5 minutes when the following conditions are met:

- The transmission is in neutral.
- The parking brake is set.
- The throttle pedal is depressed 5% or less.

The “EIMS” software will monitor battery voltage. When the battery voltage drops below 24.5 volts, the engine speed will increase to 1100 rpm in order to charge the battery. The machine will return to the engine idle speed for work mode with the release of the parking brake, a directional shift of the machine, or a push of the governor pedal.

Warm Up Mode

The warm-up mode is designed to keep the engine and the machine warmer in cold-weather operations. The warm-up mode is engaged after 10 minutes and the following conditions are met:

- The feature is enabled in the software.
- The transmission is in neutral.
- The parking brake is set.
- The throttle pedal is depressed 5% or less.

The “EIMS” software will monitor coolant and inlet manifold temperature. When the coolant temperature drops below 70 °C (158 °F) and the inlet manifold temperature drops below 5 °C (41 °F), the engine idle speed will increase to 1000 rpm. The machine will disengage warm-up mode when the coolant temperature reaches 80 °C (176 °F). The machine will return to the engine idle speed for work mode with the release of the parking brake, a directional shift of the machine, or a push of the governor pedal.

After the first time “warm up mode” has been engaged, the following conditions will activate warm-up mode:

- 1 minute elapsed time
- The coolant temperature goes below 70 °C (158 °F).

The “EIMS” software will increase engine speed to 1000 rpm.

The default setting for the warm-up mode is enabled.

Note: Consult your Cat dealer in order to change the warm-up mode.

i01676264

Changing Direction and Speed

SMCS Code: 1000; 7000

Speed changes at full engine speed and directional changes at full engine speed are possible. However, when you change directions, deceleration will maximize the comfort of the operator. In order to control the throttle, use the left brake pedal to decelerate. Deceleration will also maximize the service life of power train components.

i01732114

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.

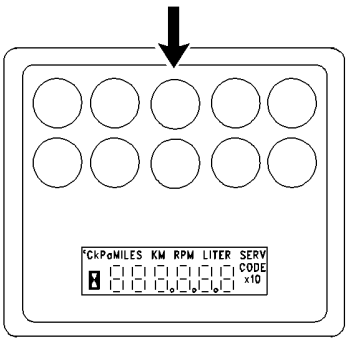

Illustration 149 g00888993

The alert indicator for the brakes is on the dash panel.

If the brakes lose oil pressure, an alert indicator for the brakes will flash and an action alarm will sound.

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

The action light will also flash when the lights on the monitoring system flash.

NOTICE

Moving the machine with the parking brake engaged can cause excessive wear or damage to the brake.

If necessary, have the brake repaired before operating the machine.

i03671757

Secondary Steering
(If Equipped)

SMCS Code: 7000

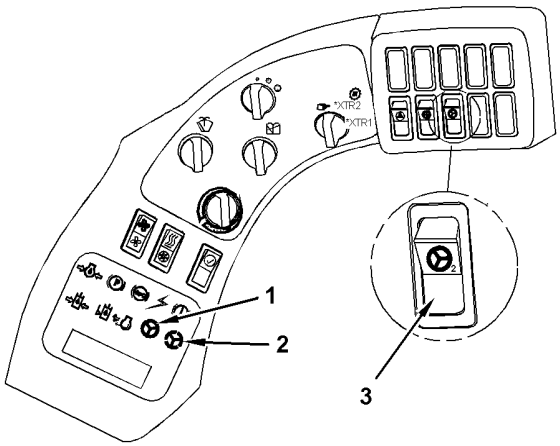

Illustration 150 g01972218

Alert indicator (1) indicates a failure of the primary steering. When alert indicator (2) flashes, the secondary steering system is active. When the alert indicators come on and the action alarm sounds, steer the machine immediately to a convenient location and stop the machine. Stop the engine and investigate the cause of the failure. Do not operate the machine until the cause of the failure has been corrected.

The Caterpillar Monitoring System will perform a self test of the secondary steering during engine start-up. Alert indicator (2) will come on for three seconds in order to verify the pressurization of the secondary steering system. The action alarm will sound until the end of the self test or until the engine is started.

The secondary steering system can be tested manually. Push secondary steering switch (3) in order to determine whether the secondary steering system and the alert indicator are functional. When the secondary steering switch is pushed, the secondary steering motor will run. Alert indicator (2) will come on and the action alarm will sound. If alert indicator (2) does not come on or the action alarm does not sound, do not operate the machine.

Engine Starting

i02694916

Engine Starting

SMCS Code: 1000; 7000

1. Make sure that the transmission control is in the NEUTRAL position.

2. Move the steering column to the desired position.

3. Engage the parking brake.

4. Fasten the seat belt.

5. Make sure that the control levers are in the HOLD position.

6. Before the engine is started, check for the presence of bystanders or maintenance personnel. Ensure that all personnel are clear of the machine. Briefly sound the forward horn before you start the engine.

7. Turn the engine start switch to the START position in order to start the engine.

Note: Do not depress the accelerator pedal during engine starting.

8. Release the engine start switch key after the engine starts.

Note: Machines with conventional steering and electrohydraulic controls refer to “Engine Starting for Conventional Steering with Electrohydraulic Controls”.

NOTICE
Do not crank the engine for more than 30 seconds. Allow the starter to cool for two minutes before cranking again. Turbocharger damage can result if the engine rpm is not kept low until the oil gauge display verifies that the oil pressure is sufficient.

Engine Starting with Ether Starting Aid (If Equipped)

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

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

Wait approximately two seconds before injecting again.

Use ether for cold starting purposes only.

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

Turbocharger damage can result, if the engine rpm is not kept low until the engine oil light/gauge verifies the oil pressure is sufficient.

1. Follow Step 1 through Step 7 of the Engine Starting Procedure.

A premeasured amount of ether will be automatically injected if the ambient conditions call for starting aid.

2. Release the engine start switch key after the engine starts.

For starting below −18°C (0°F), the use of one of the following cold weather starting aids is recommended:

- Coolant heater
- Fuel heater
- Jacket water heater
- Extra battery capacity

Reference: At temperatures below −23°C (−10°F), consult your Caterpillar dealer for additional information or refer to Special Publication, SEBU5898, Cold Weather Recommendations.

Engine Starting for Conventional Steering with Electrohydraulic Controls

Neutral Start

In order to start the machine, the following items must be in the NEUTRAL position:

- The shift lever that is mounted on the column
- The forward/neutral/reverse switch that is mounted next to the implement controls
- The parking brake

Special Operating Modes

The shifter must be in the NEUTRAL position in order to start the machine. The forward/neutral/reverse switch must be in the NEUTRAL position in order to start the machine. If either device is not in NEUTRAL position the machine will not start and the neutral lamp will be OFF.

i01916324

Engine and Machine Warm-Up

SMCS Code: 1000; 7000

After the engine has been started, allow the monitoring system to complete the self test.

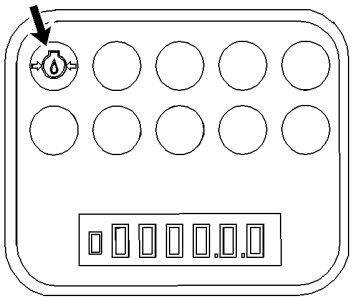

Illustration 151 g00998329

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 the attachment controls and disengage the attachment controls.
2. Look at the indicators and the gauges frequently during operation.

The hydraulic oil will warm up faster, if the bucket control is held in the CLOSE 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 up more rapidly.

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

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.

Parking

i01358133

Stopping the Machine

SMCS Code: 7000

NOTICE
Do not engage the secondary brake while the machine is moving unless the primary service brake fails.

The use of the secondary brake as a service brake in regular operation will cause severe damage to the brake system.

1. Park the machine on a level surface. If it is necessary to park on a grade, block the wheels.
2. Apply the service brakes in order to stop the machine.
3. Move the transmission control to the NEUTRAL position.
4. Engage the parking brake.
5. Lower the work tool to the ground and apply slight downward pressure.

i00982184

Stopping the Engine

SMCS Code: 1000; 7000

NOTICE
Stopping the engine immediately after it has been working under load, can result in overheating and accelerated wear of the engine components.

See the following stopping procedure, to allow the engine to cool, and to prevent excessive temperatures in the turbocharger center housing, which could cause oil coking problems.

1. While the machine is stopped, run the engine for five minutes at low idle. This allows hot areas of the engine to cool gradually.
2. Turn the engine start switch to the OFF position and remove the key.

i03696092

Stopping the Engine if an Electrical Malfunction Occurs

SMCS Code: 1000; 7000

Turn the engine start switch into the OFF position. If the engine does not stop, an electrical malfunction exists.

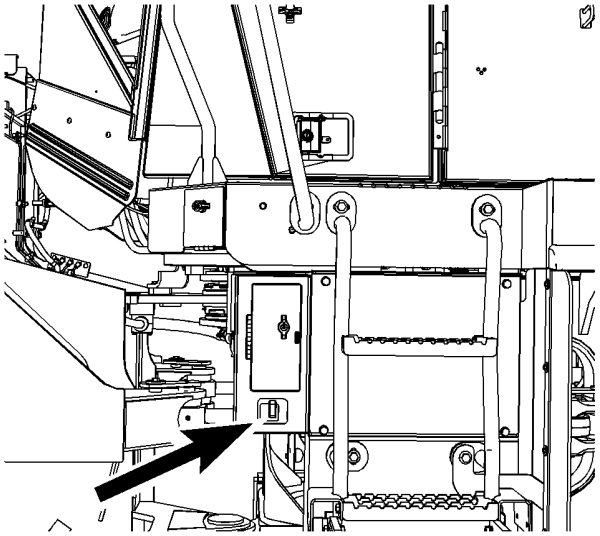

Illustration 152 g01987858

An emergency shutdown switch is located on the left side of the machine next to the battery box. Move the switch upward in order to stop the engine.

i02184463

Equipment Lowering with Engine Stopped

SMCS Code: 7000

1. Turn the engine start switch to the ON position.
2. Move the hydraulic lockout control to the UNLOCKED position.
3. Push the lift control to the LOWER position in order to lower the bucket or the work tool to the ground. The lift control will return to the HOLD position when the control lever is released.
4. Move the hydraulic lockout control to the LOCKED position.
5. Turn the engine start switch to the OFF position.

Note: If the work tools will not lower, the pilot supply on/off solenoid may be inoperable. In this case, proceed to Step 6.

⚠ WARNING

Personal injury or death may occur from failure to adhere to the following warnings.

Keep all personnel away from the boom drop area when lowering the boom with the engine stopped.

Keep all personnel away from the front linkage when lowering the boom.

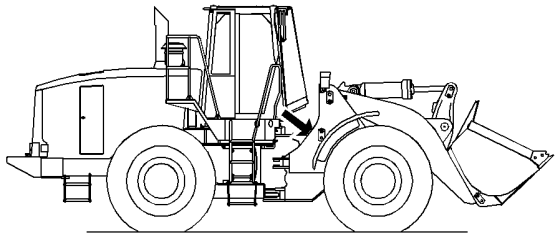

Illustration 153 g01105125

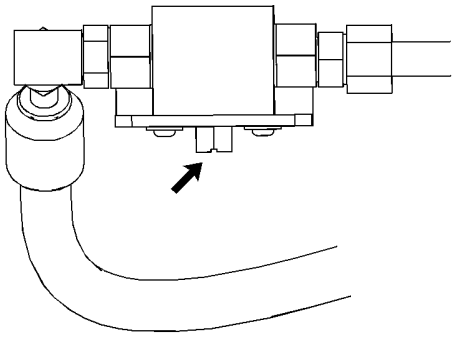

Illustration 154 g01105280

6. A ball valve is located near the right rear of the main control valve. This ball valve is used for manually lowering the work tool. **Slowly turn the square stem in the clockwise direction.** The square stem should be rotated 90 degrees. After the work tool is resting on the ground, rotate the square stem counterclockwise.

i03832351

Leaving the Machine

SMCS Code: 7000

1. Use the steps and the handholds when you get off the machine. Face the machine and use both hands. Make sure that the steps are clear of debris before you dismount.

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

3. Remove all flammable debris in order to reduce a fire hazard. Dispose of all debris properly.

4. Always turn the battery disconnect switch to the OFF position before leaving the machine.

5. If the machine will not be operated for a month or more, remove the battery disconnect switch key.

6. Install all covers and all vandalism protection locks.

Transportation Information

i01671778

Shipping the Machine

SMCS Code: 7000; 7500

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

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.

Obey the appropriate laws that govern the parameters of the load (weight, width, and length).

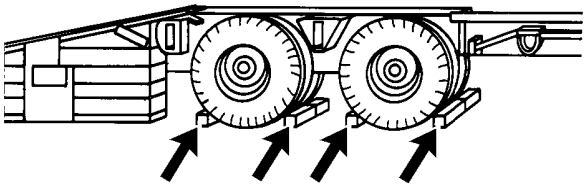

Illustration 155 g00863991
Properly chocked trailer wheels

1. Chock the trailer wheels or the rail car wheels before you load the machine.
2. After the machine is positioned, connect the steering frame lock in order to hold the front frame and the rear frame in place.
3. Lower the bucket or the work tool to the floor of the transport vehicle. Move the transmission control to the NEUTRAL position.
4. Engage the parking brake.
5. Turn the engine start switch to the OFF position. Remove the engine start switch key.
6. Move all of the control levers in order to relieve any trapped pressure.
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 (if equipped) should not rotate when the engine is not operating. Damage to the turbocharger can result.

i01998604

Roading the Machine

SMCS Code: 7000

Check with the proper officials in order to obtain the required licenses and other similar items before roading the machine.

Complete a thorough daily inspection before you mount the machine and before you start the engine.

Reference: For more information, refer to Operation and Maintenance Manual, “Daily Inspection”.

Carry the work tool as low to the ground as possible. Disable the controls for the work tool when the machine is roaded.

Limitations for TON-kilometer per hour (TON-mile per hour) must be obeyed. Before roading, consult your tire dealer for recommended tire pressures and for speed limitations of the tires.

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 more information, refer to the Operation and Maintenance Manual, “Tire Inflation Information”.

When you road 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.

i02901173

Implement Restraint (Roading)

SMCS Code: 6001; 6107; 7000

The United Kingdom requires all machines that have a height that is greater than 3 m (9.8 ft) or machines that have elevating equipment that can exceed 3 m (9.8 ft) in height to be equipped with a locking device that cannot be operated from the cab.

The restraint is provided with the machine in order to restrain the lift arm in the travel position. Install the restraint between the lift arm and the work tool when you are travelling on public roads. Use the restraint only in accordance with the following instructions:

- The restraint does not replace any existing form of restraint that is provided with this machine.
- The restraint does not supersede any existing form of restraint that is provided with this machine.
- The restraint does not replace any existing feature that will disable the machine.
- All existing restraining devices must continue to be used in accordance with the Operation and Maintenance Manual.
- Keep the restraint with the machine at all times. Inspect the restraint regularly for damage. Any damaged components should be replaced immediately.
- Do not operate the lift arm while the restraint is installed. Activate the hydraulic lockout control after the restraint is installed. Activating the hydraulic lever lock will neutralize the pilot system operation.
- Use the restraint only when you are roading the machine. The restraint must not be used for any other function or operation.
- After you reach your destination, remove the restraint before you operate the lift arm.

Installation of the Implement Restraint

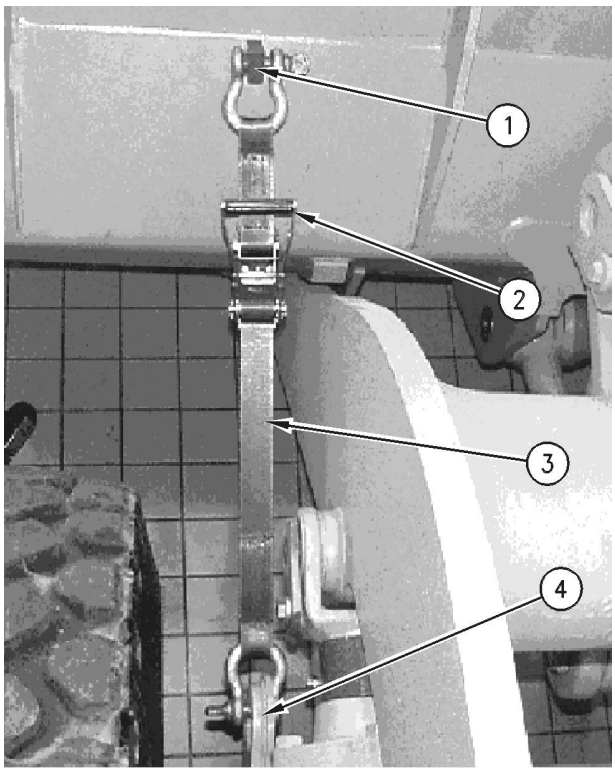

Illustration 156 g00587686

(1) Block on Work Tool
(2) Restraint Ratchet
(3) Restraint
(4) Lifting Eye on Loader Frame

1. Position the lift arm in position for machine roading.

2. Attach one end of the restraint (3) to the block (1) that is located on the work tool.

3. Attach the opposite end of the restraint (3) to the lifting eye (4) on the left side of the loader frame.

4. Secure the restraint with the ratchet (2). Tighten the ratchet in order to remove excess slack. Do not overtighten the restraint.

5. Release the ratchet by pulling the locking plate toward the handle.

i04747950

Lifting and Tying Down the Machine

SMCS Code: 7000; 7500

⚠ WARNING

Improper lifting and improper tie-downs can allow the load to shift or fail and cause injury or damage. Use only properly rated cables and slings with lift and tie down points provided.

Follow the instructions in Operation and Maintenance Manual, “Lifting and Tying Down the Machine” for the proper technique for securing the machine. Refer to Operation and Maintenance Manual, “Specifications” for specific weight information.

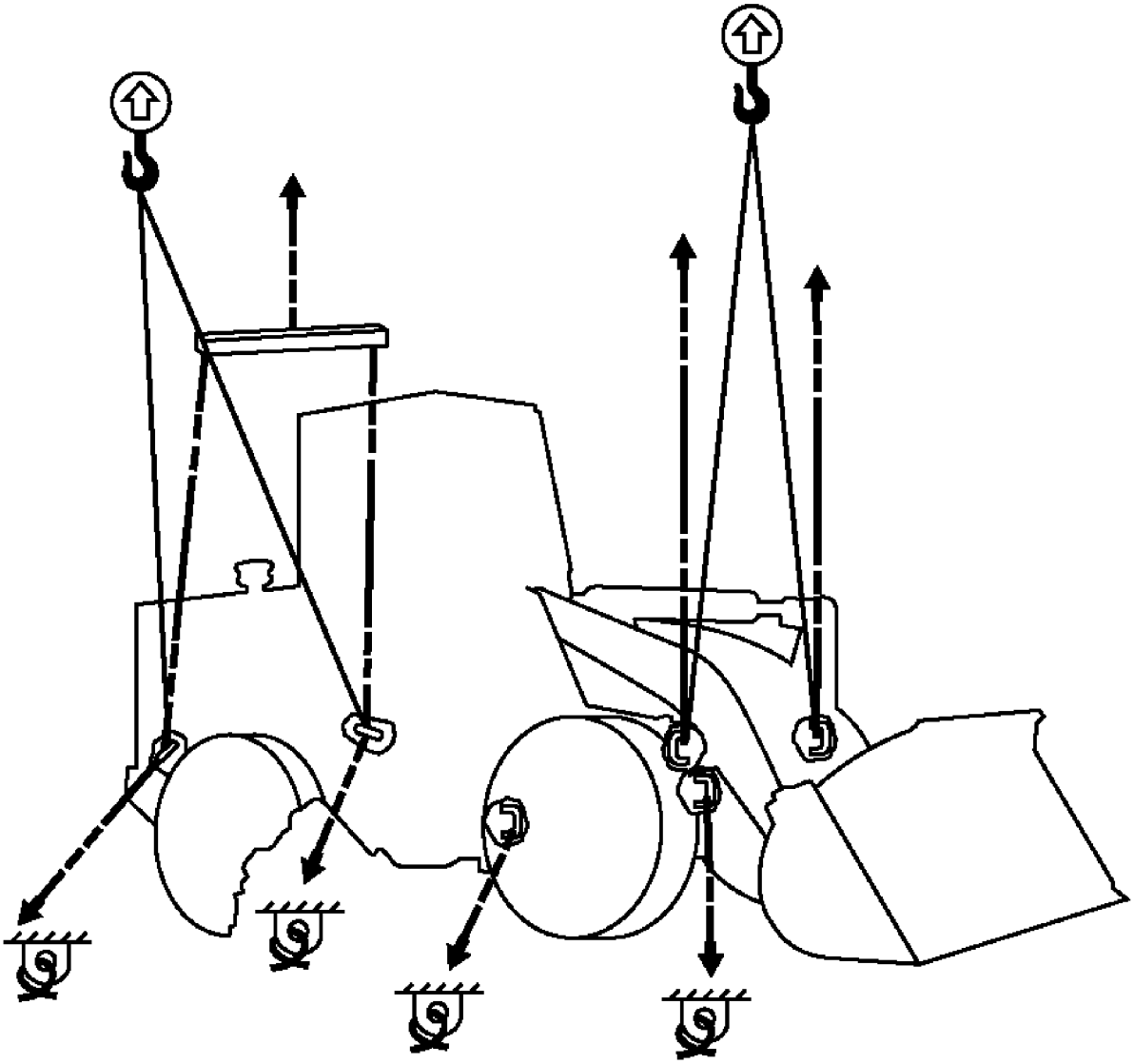

Illustration 157 g02537822

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.

Note: Do not use handles or steps in order to lift or tie down the machine.

Note: The machine shipping weight that is listed is the weight of the most common configuration of the machine. If attachments have been installed on your machine, the weight of your machine and the center of gravity of your machine may vary.

Reference: Refer to Operation and Maintenance Manual, “Specifications” for the dimensions and weight of the machine.

Lifting Point – In order to lift the machine, attach the lifting devices to the lifting points.

Tie Down Point – In order to tie down the machine, attach the tie-downs to the tie down points.

Use properly rated cables and properly rated slings to lift the machine.

Position the crane or the lifting device in order to lift the machine in a level position.

The width of the spreader bar must be sufficient to prevent the lifting cables or the lifting straps from contacting the machine.

1. Engage the parking brake before you sling the machine and before you secure the machine with tie-downs.
2. Install the frame lock pin prior to lifting the machine.

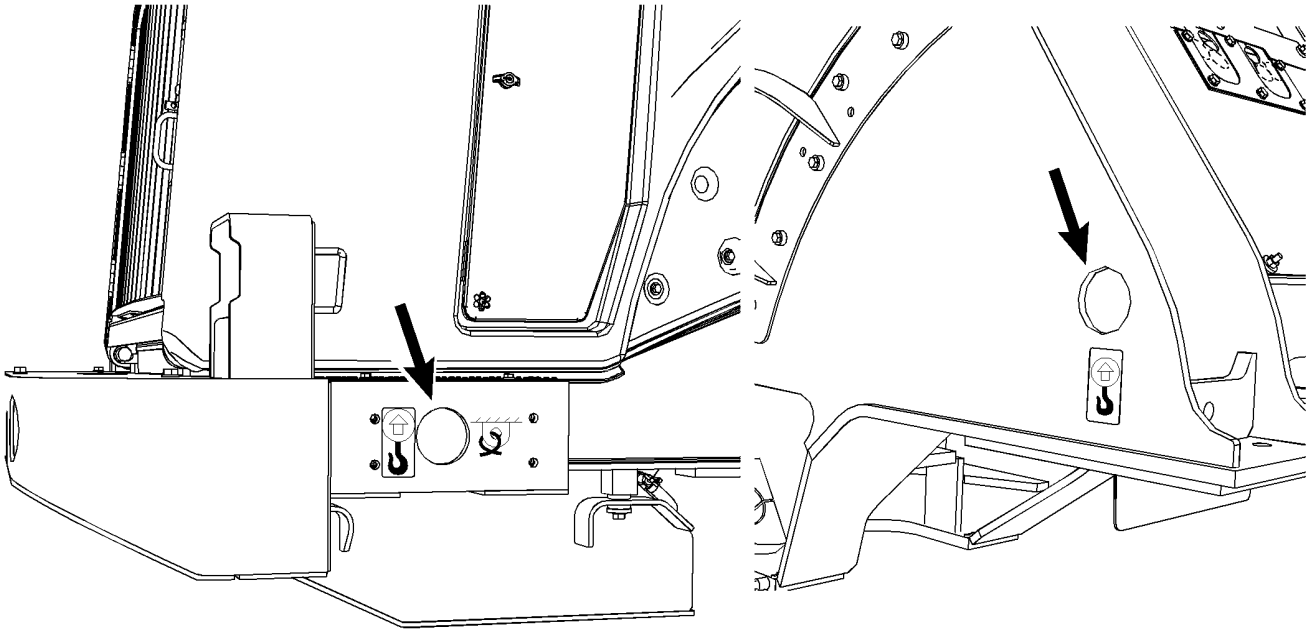

Illustration 158 g02868396
Lifting Eyes (Note that the tires are not shown for clarity)

3. Attach two lifting cables to the rear of the machine. There is one lifting eye on each side of the rear of the machine. The lifting eyes are identified by a label that shows a hook.
4. Attach two lifting cables to the front of the machine. There is one eye on each side of the front of the machine. The lifting eyes are identified by a label that shows a hook.
5. Connect the four lifting cables to the spreader bars. The spreader bars must be centered over the machine.
6. If equipped, secure any attachments.
7. Lift the machine. Move the machine to the desired position.
8. When the machine is positioned, place the blocks behind the tires.

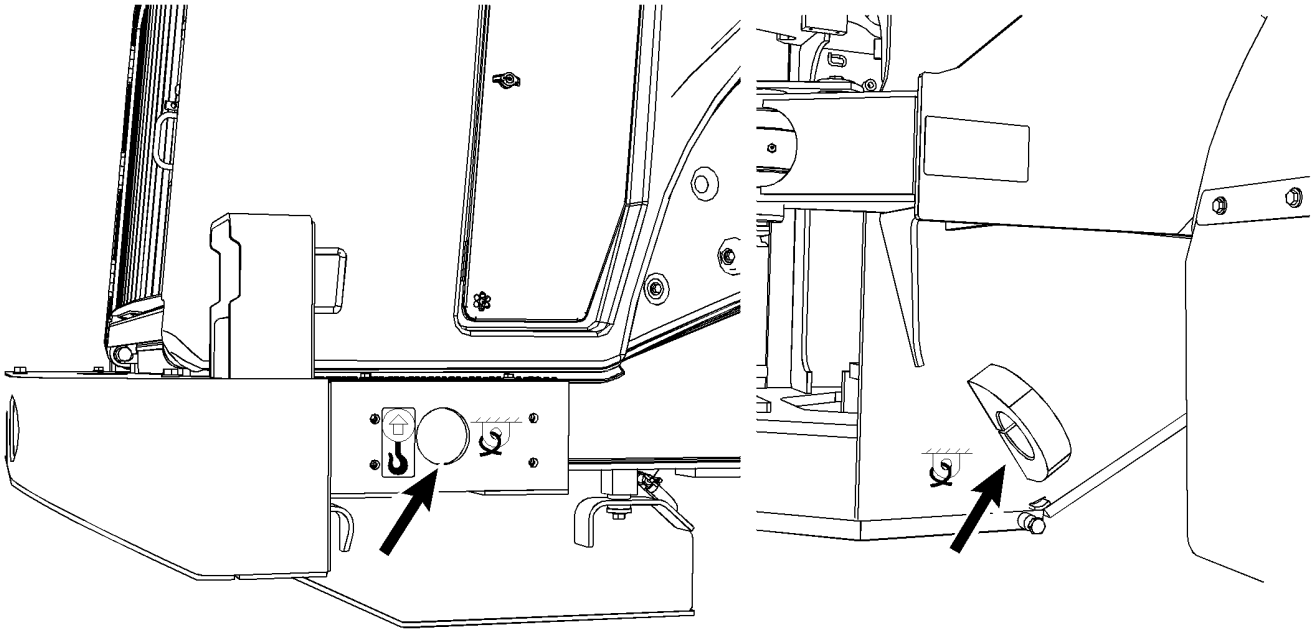

Illustration 159 g02868416

Tie-down Positions (Note that the tires are not shown for clarity)

9. Secure the machine at the tie-down positions. The positions are identified on the machine by a label. There is one tie-down position on each side of the rear of the machine. There is one tie-down position on each side of the front of the machine to the rear of the front tire.

Use properly rated cables to tie down the machine.

Check all of the laws that govern the load characteristics (height, weight, width, and length).

Reference: For shipping instructions, refer to Operation and Maintenance Manual, “Shipping the Machine”.

Towing Information

i04316522

Machine Retrieval

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.

⚠ WARNING

Personal injury or death can result from 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.

NOTICE
This machine is not designed to allow for towing of attachments. The hitch is for machine retrieval only.

To perform the towing procedure properly, use the following recommendations.

This machine is equipped with spring-applied, oil pressure released parking brakes. If the engine or the brake oil system is inoperable, the parking brakes are applied and the machine cannot be moved.

Use these towing instructions for moving a disabled machine over a short distance of 8 kilometers (5 miles) or less. Do not move the machine faster than 3 km/h (2 mph). Move the machine to a convenient location for repair. Always haul the machine if long distance moving is required.

Shielding must be provided on the towing machine in order to protect the operator in case the tow line 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 tow line or the tow bar. Make sure that the tow line or the tow bar is sturdy enough for towing 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.

Do not use a chain for pulling. A chain link may break causing personal injury. Use a wire rope that has 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 and break the tow line or the tow bar. Gradual, smooth machine movement works better.

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.

Connect a larger machine or additional machines to the disabled machine in order to provide sufficient control and sufficient braking. Control of the disabled machine must be maintained at all times.

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.

Any towed machine with a load must be equipped with a braking system that can be operated from the operator compartment.

Consult your Cat dealer for more information about towing a disabled machine.

Towing with a Running Engine

If the engine is running, the machine can be towed for a short distance under certain conditions. The power train and the steering system must be operable. **Tow the machine for a short distance only.** For example, pull the machine out of mud or 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 a Stopped Engine

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, “Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

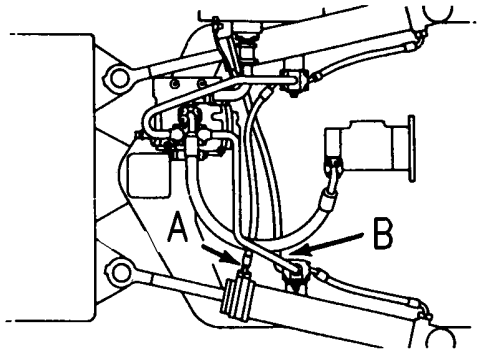

Illustration 160 g00286064

(A) Rod end. (B) Head end.

Perform the following steps before you tow the machine.

1. Reverse the hydraulic steering hose connections on one cylinder only allowing the steering cylinders to move freely.

Note: Make sure that the cylinder hoses are connected correctly before you operate the machine again. The steering system will not function if the hose connections are reversed.

2. If failure of the internal transmission or of the drive train is suspected, remove the center drive shaft and remove the rear drive shaft.

Reference: For the removal procedure for the drive shafts, refer to the Disassembly and Assembly manual for the power train or consult your Cat dealer.

3. Release the parking brake in order to prevent excessive wear and damage to the parking brake system while the machine is being towed.

Reference: For information about the manual release of the parking brake, refer to Operation and Maintenance Manual, “Parking Brake Manual Release”.

4. Fasten the tow bar or the tow line between the disabled machine and the towing machine.

5. Tow the machine slowly. Do not exceed 3 km/h (2 mph).

i01412935

Parking Brake Manual Release

SMCS Code: 4267; 7000

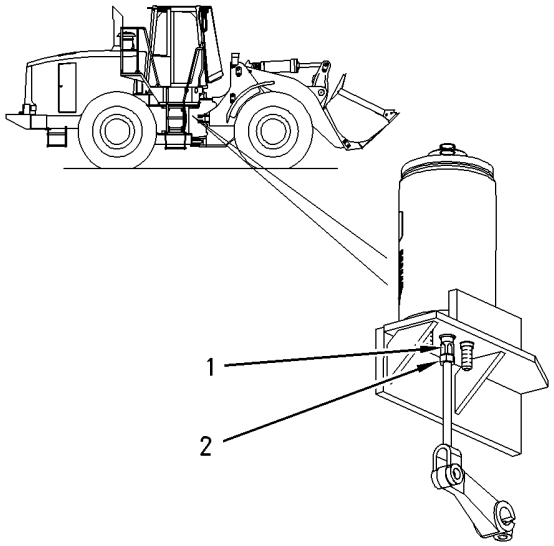

Illustration 161 g00743860

The parking brake actuator is mounted inside the front loader frame on the right side of the machine.

1. Chock the wheels in order to keep the machine from rolling when the parking brake is released.

2. Connect the steering frame lock.

3. Loosen locknut (2) by 18 mm (3/4 inch). Turn rod (1) until the rod moves out enough to totally release the parking brake.

Note: Before you park the machine, the parking brake must be engaged again.

Engine Starting (Alternate Methods)

i02185603

Engine Starting with Auxiliary Start Receptacle

SMCS Code: 1463

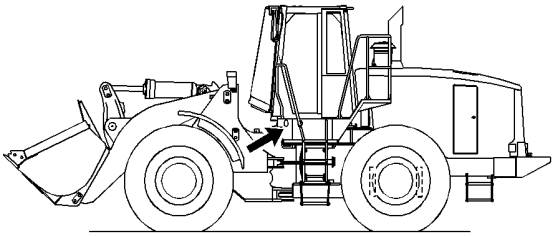

Illustration 162 g01105336

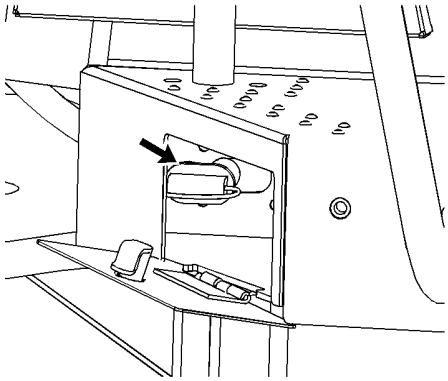

Illustration 163 g01105344

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. Move the transmission direction control lever on the stalled machine to NEUTRAL. Engage the hydraulic lockout control. Engage the parking brake. Lower all work tools to the ground. Move all controls to HOLD.

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.

i02187454

Engine Starting with Jump Start Cables

SMCS Code: 1000; 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.

Refer to Special Instruction, Battery Test Procedure, SEHS7633, available from your Caterpillar dealer, for complete testing and charging information.

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.)

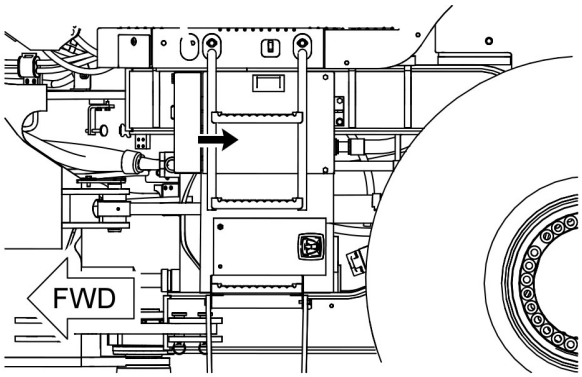

Illustration 164 g01108694

6. The batteries are located on the left side of the machine. Remove the bolts that secure the access panel for the batteries. Remove the access panel.

7. 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.

8. Route the jump start cables around the steps and away from the mounting and dismounting paths. 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.

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

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

11. 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.

12. 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.)

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

14. Attempt to start the stalled engine.

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

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

Maintenance Section

Tire Inflation Information

i02096880

Tire Inflation with Nitrogen

SMCS Code: 4203

Caterpillar recommends 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.

Reference: For tire inflation instructions, refer to Special Instruction, SMHS7867, Nitrogen Tire Inflation Group.

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

i02284174

Tire Inflation Pressure

SMCS Code: 4203; 7500

The tire inflation pressure for machines that are shipped from the factory is suitable for shipping only. Always obtain the proper tire inflation pressures for your machine from the tire supplier before placing the machine into operation. The recommended tire inflation pressures for the front tires and for the rear tires will vary for each application.

Proper tire inflation pressure and maintenance of the tire inflation pressure is critical for optimum tire life. The tire inflation pressure should always be obtained from the tire supplier due to changes in the technology of tires, equipment, and job applications.

Reference: Refer to the latest edition of Special Publication, “Caterpillar Performance Handbook” for general information on tire inflation pressure.

i02610518

Tire Inflation Pressure Adjustment

SMCS Code: 4203

Always obtain the proper tire inflation pressures and maintenance recommendations for the tires on your machine from your tire supplier. 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 Special Publication, SEBU5898, “Cold Weather Recommendations for All Caterpillar Machines” in order to adjust tire inflation pressures.

Lubricant Viscosities and Refill Capacities

i04606856

Lubricant Viscosities (Fluids Recommendations)

SMCS Code: 7581

General Information for Lubricants

When you are operating the machine in temperatures below−20°C (−4°F), refer to Special Publication, SEBU5898, Cold Weather Recommendations. This publication is available from your Cat dealer.

For cold-weather applications where transmission oil SAE 0W-20 is recommended, Cat Cold Weather TDTO is recommended.

Caterpillar has determined that Wheel Loaders equipped with the High Ambient Cooling Attachment can operate with Cat HYDO Advanced 10 Hydraulic System Oil in ambient temperatures from −20° C (−4° F) to 50° C (122° F).

Refer to the “Lubricant Information” section in the latest revision of the Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations for a list of Cat engine oils and for detailed information. This manual may be found on the Web at Safety.Cat.com.

The footnotes are a key part of the tables. Read ALL footnotes that pertain to the machine compartment in question.

Selecting the Viscosity

In order to select the proper oil for each machine compartment, refer to the “Lubricant Viscosity for Ambient Temperature” table. Use the oil type AND oil viscosity for the specific compartment at the proper ambient temperature.

The proper oil viscosity grade is determined by the minimum ambient temperature (the air in the immediate vicinity of the machine). Measure the temperature when the machine is started and while the machine is operated. In order to determine the proper oil viscosity grade, refer to the “Min” column in the table. This information reflects the coldest ambient temperature condition for starting a cold machine and for operating a cold machine. Refer to the “Max” column in the table for operating the machine at the highest temperature that is anticipated. Unless specified otherwise in the “Lubricant Viscosities for Ambient Temperatures” tables, use the highest oil viscosity that is allowed for the ambient temperature.

Machines that are operated continuously should use oils that have the higher oil viscosity in the final drives and in the differentials. The oils that have the higher oil viscosity will maintain the highest possible oil film thickness. Refer to “General Information for Lubricants” article, “Lubricant Viscosities” tables, and any associated footnotes. Consult your Cat dealer if additional information is needed.

NOTICE
Not following the recommendations found in this manual can lead to reduced performance and compartment failure.

Engine Oil

Cat oils have been developed and tested in order to provide the full performance and life that has been designed and built into Cat engines.

Cat DEO-ULS multigrade and Cat DEO multigrade oils are formulated with the correct amounts of detergents, dispersants, and alkalinity in order to provide superior performance in Cat diesel engines where recommended for use.

Note: SAE 10W-30 is the preferred viscosity grade for the 3116, 3126, C7, C-9, and C9 diesel engines when the ambient temperature is between -18° C (0° F) and 40° C (104° F).

Table 23

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Engine Crankcase	Cat DEO-ULS Cold Weather	SAE 0W-40	−40	40	−40	104
	Cat DEO-ULS Cat DEO	SAE 10W-30	−18	40	0	104
	Cat DEO-ULS Cat DEO	SAE 15W-40	−9.5	50	15	122

When fuels of sulfur level of 0.1 percent (1000 ppm) or higher are used, Cat DEO-ULS may be used if S·O·S oil analysis program is followed. Base the oil change interval on the oil analysis.

Note: Failure to follow oil analysis recommended oil change interval may result in reduced engine component life.

Hydraulic Systems

Refer to the “Lubricant Information” section in the latest revision of the Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations for detailed information. This manual may be found on the Web at Safety.Cat.com.

The following are the preferred oils for use in most Cat machine hydraulic systems:

- Cat HYDO Advanced 10 SAE 10W
- Cat HYDO Advanced 30 SAE 30W
- Cat BIO HYDO Advanced

Cat HYDO Advanced fluids have a 50% increase in the standard oil drain interval for machine hydraulic systems (3000 hours versus 2000 hours) over second and third choice oils when you follow the maintenance interval schedule for oil filter changes and for oil sampling that is stated in the Operation and Maintenance Manual for your particular machine. 6000 hour oil drain intervals are possible when using S·O·S Services oil analysis. Consult your Cat dealer for details. When switching to Cat HYDO Advanced fluids, cross contamination with the previous oil should be kept to less than 10%.

Second choice oils are listed below.

- Cat MTO
- Cat DEO
- Cat DEO-ULS
- Cat TDTO
- Cat TDTO Cold Weather
- Cat TDTO-TMS
- Cat DEO-ULS Cold Weather

If noise is a problem in the hydraulic system, 1U-9891 oil additive may be used in the hydraulic system. This additive is a friction modifier that helps reduce the noise level.

Table 24

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Hydraulic System	Cat HYDO Advanced 10 (1) Cat TDTO	SAE 10W	−20	40	−4	104

(continued)

(Table 24, contd)

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	**Oil Type and Performance Requirements**	**Oil Viscosities**	**°C**		**°F**	
			Min	**Max**	**Min**	**Max**
	Cat HYDO Advanced 30 Cat TDTO	SAE 30	0	50	32	122
	Cat BIO HYDO Advanced	ISO 46 Multi-Grade	−30	45	−22	113
	Cat MTO Cat DEO-ULS Cat DEO	SAE10W-30	−20	40	−4	104
	Cat DEO-ULS Cat DEO	SAE15W-40	−15	50	5	122
	Cat TDTO-TMS	Multi-Grade	−15	50	5	122
	Cat DEO-ULS Cold Weather	SAE0W-40	−40	40	−40	104
	Cat TDTO Cold Weather	SAE 0W-20	−40	40	−40	104

(1) −20° C (−4° F) to 50° C (122° F) if equipped with the High Ambient Cooling Attachment

Transmission and Axles

Refer to the “Lubricant Information” section in the latest revision of the Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations for detailed information. This manual may be found on the Web at Safety.Cat.com.

When you are operating the machine in temperatures below−20°C (−4°F), refer to Special Publication, SEBU5898, Cold Weather Recommendations. This publication is available from your Cat dealer.

Table 25

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	**Oil Type and Performance Requirements**	**Oil Viscosities**	**°C**		**°F**	
			Min	**Max**	**Min**	**Max**
Power Shift Transmission	**Cat TDTO Cold Weather**	SAE 0W-20	−40	10	−40	50
	Cat TDTO	SAE 10W	−20	10	−4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122
	Cat TDTO-TMS	Multi-Grade	−20	43	4	110
Drive Axles	**Cat TDTO Cold Weather**	SAE 0W-20	−40	0	−40	32
	Cat TDTO	SAE 10W	−25	15	−13	59
		SAE 30	−20	43	−4	110
		SAE 50	10	50	50	122
	Cat TDTO-TMS	Multi-Grade	−30	43	−22	110

Special Lubricants

Grease

In order to use a non-Cat grease, the supplier must certify that the lubricant is compatible with Cat grease.

Each pin joint should be flushed with the new grease. Ensure that all old grease is removed. Failure to meet this requirement may lead to failure of a pin joint.

Table 26

Recommended Grease						
Compartment or System	GreaseType	NLGI Grade	°C		°F	
			Min	Max	Min	Max
External Lubrication Points	Cat Advanced 3Moly	NLGI Grade 2	−20	40	−4	104
	Cat Ultra 5Moly	NLGI Grade 2	−30	50	−22	122
		NLGI Grade 1	−35	40	−31	104
		NLGI Grade 0	−40	35	−40	95
	Cat Arctic Platinum	NLGI Grade 0	−50	20	−58	68
	Cat Desert Gold	NLGI Grade 2	−20	60	−4	140
Steering Column(1) Drive Shaft Universal Joints(2) Drive Shaft Support Bearing	Cat Multipurpose Grease	NLGI Grade 2	−30	40	−22	104

(1) HMU Steering
(2) 980 Drive Shaft is maintenance free.

Grease for the Autolube System

The grease used with the automatic lubrication system must not contain any graphite or PTFE.

Note: Pumpability is based on US Steel Mobility and Lincoln Ventmeter Tests. Performance may vary depending on lubrication equipment and the length of the lines.

Reference: Refer to Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations for additional information about grease. This manual may be found on the Web at Safety.Cat.com.

Table 27

Recommended Grease for the Autolube System				
Compartment or System	GreaseType	NLGI Grade	°C	°F
			Min	Min
Cat Autolube System	Cat 3Moly Grease	NLGI Grade 2	−18	0
	Cat Ultra 5Moly	NLGI Grade 2	−7	20
		NLGI Grade 1	−18	0
		NLGI Grade 0	−29	−20
	Cat Arctic Platinum	NLGI Grade 0	−43	−45
	Cat Desert Gold	NLGI Grade 2	2	35

Diesel Fuel Recommendations

Diesel fuel must meet “Caterpillar Specification for Distillate Fuel” and the latest versions of ASTM D975 or EN 590 in order to ensure optimum engine performance. Refer to Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations for the latest fuel information and for Cat fuel specification. This manual may be found on the Web at Safety.Cat.com.

The preferred fuels are distillate fuels. These fuels are commonly called diesel fuel, furnace oil, gas oil, or kerosene. These fuels must meet the “Caterpillar Specification for Distillate Diesel Fuel for Off-Highway Diesel Engines”. Diesel Fuels that meet the Caterpillar specification will help provide maximum engine service life and performance.

Misfueling with fuels of high sulfur level can have the following negative effects:

- Reduce engine efficiency and durability
- Increase the wear
- Increase the corrosion
- Increase the deposits
- Lower fuel economy
- Shorten the time period between oil drain intervals (more frequent oil drain intervals)
- Increase overall operating costs
- Negatively impact engine emissions

Failures that result from the use of improper fuels are not Caterpillar factory defects. Therefore the cost of repairs would not be covered by a Caterpillar warranty.

Caterpillar does not require the use of ULSD in off road and machine applications that are not Tier 4/ Stage IIIB certified engines. ULSD is not required in engines that are not equipped with after treatment devices.

Follow operating instructions and fuel tank inlet labels, if available, in order to ensure that the correct fuels are used.

Refer to Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations for more details about fuels and lubricants. This manual may be found on the Web at Safety.Cat.com.

Fuel Additives

Cat Diesel Fuel Conditioner and Cat Fuel System Cleaner are available for use when needed. These products are applicable to diesel and biodiesel fuels. Consult your Cat dealer for availability.

Biodiesel

Biodiesel is a fuel that can be made from various renewable resources that include vegetable oils, animal fat, and waste cooking oil. Soybean oil and rapeseed oil are the primary vegetable oil sources. In order to use any of these oils or fats as fuel, the oils or fats are chemically processed (esterified). The water and contaminants are removed.

U.S. distillate diesel fuel specification ASTM D975-09a includes up to B5 (5 percent) biodiesel. Currently, any diesel fuel in the U.S. may contain up to B5 biodiesel fuel.

European distillate diesel fuel specification EN 590 includes up to B5 (5 percent) and in some regions up to B7 (7 percent) biodiesel. Any diesel fuel in Europe may contain up to B5 or in some regions up to B7 biodiesel fuel.

Note: Up to B20 biodiesel blend level is acceptable for use in Medium Wheel Loader engines.

When biodiesel fuel is used, certain guidelines must be followed. Biodiesel fuel can influence the engine oil, aftertreatment devices, non-metallic, fuel system components, and others. Biodiesel fuel has limited storage life and has limited oxidation stability. Follow the guidelines and requirements for engines that are seasonally operated and for standby power generation engines.

In order to reduce the risks associated with the use of biodiesel, the final biodiesel blend and the biodiesel fuel used must meet specific blending requirements.

All the guidelines and requirements are provided in the latest revision of Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations. This manual may be found on the Web at Safety.Cat.com.

Coolant Information

The information provided in this “Coolant Recommendation” section should be used with the “Lubricants Information” provided in the latest revision of Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations. This manual may be found on the Web at Safety.Cat.com.

The following two types of coolants may be used in Cat diesel engines:

Preferred – Cat ELC (Extended Life Coolant)

Acceptable – Cat DEAC (Diesel Engine Antifreeze/ Coolant)

NOTICE

Never use water alone as a coolant. Water alone is corrosive at engine operating temperatures. In addition, water alone does not provide adequate protection against boiling or freezing.

i03656918

Capacities (Refill)

SMCS Code: 7560

Table 28

Approximate Refill Capacities 966H and 972H			
Compartment or System	**Liters**	**US Gal**	**Imp Gal**
Cooling System	39.0	10.3	8.6
Fuel Tank	380	100	83.6
Engine Crankcase	35	9.25	7.7
Transmission	44	11.6	9.7
Hydraulic Tank(1)	110	29	24.2
Two-Valve Hydraulic System(2)	198	52.3	43.6
Three-Valve Hydraulic System(2)	203	53.6	44.7
Front Drive Axle(3)	64	16.9	14.1
Rear Drive Axle(3)	64	16.9	14.1
Automatic Lubrication System Tank	4	1	.88

(1) This capacity is only for the hydraulic tank.
(2) This capacity includes the hydraulic tank, the hydraulic lines, and all hydraulic components.
(3) The amount that is shown includes 1 L (0.3 US gal) of 1U-9891Hydraulic Oil Additive.

i04311449

S·O·S Information

SMCS Code: 1348; 1350; 3080; 4070; 4250; 4300; 5050; 7542

S·O·S Services is a highly recommended process for Cat customers to use in order to minimize owning and operating cost. Customers provide oil samples, coolant samples, and other machine information. The dealer uses the data in order to provide the customer with recommendations for management of the equipment. In addition, S·O·S Services can help determine the cause of an existing product problem.

Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluid Recommendations” for detailed information concerning S·O·S Services.

Refer to the Operation and Maintenance Manual, “Maintenance Interval Schedule” for a specific sampling location and a service hour maintenance interval.

Consult your Cat dealer for complete information and assistance in establishing an S·O·S program for your equipment.

Maintenance Support

i05200132

System Pressure Release

SMCS Code: 1250-553-PX; 1300-553-PX; 1350-553-PX; 3000-553-PX; 4250-553-PX; 4300-553-PX; 5050-553-PX; 6700-553-PX; 7540-553-PX

⚠ WARNING

Personal injury or death can result from sudden machine movement.

Sudden movement of the machine can cause injury to persons on or near the machine.

To prevent injury or death, make sure that the area around the machine is clear of personnel and obstructions before operating the machine.

Coolant System

⚠ 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.

To relieve the pressure from the coolant system, turn off the machine. Allow the cooling system pressure cap to cool. Remove the cooling system pressure cap slowly in order to relieve pressure.

Hydraulic System

⚠ WARNING

Hydraulic oil pressure can remain in the hydraulic system on this machine after the engine and pump have been stopped. Serious injury can result if this pressure is not released before any service is done on the hydraulic system. In order to prevent possible injury, release the hydraulic system pressure before working on any fitting, hose, or hydraulic component.

Lower all work tools to the ground before service is started. If the hydraulic system must be serviced, tested, or adjusted with the work tool in the raised position, the work tool and lift cylinders must be supported properly.

Always move the machine to a location away from the travel of other machines. Be sure that other personnel are not near the machine when the engine is running and tests or adjustments are being made.

⚠ WARNING

Escaping fluid under pressure, even a pinhole size leak, can penetrate body tissue, causing serious injury, and possible death. If fluid is injected into your skin, it must be treated immediately by a doctor familiar with this type of injury.

Always use a board or cardboard when checking for a leak.

Note: Use this procedure to drain pressure from all accumulators and release trapped pressure in all systems.

1. Park the machine on a hard, smooth, level surface. The location should also be dry and free of debris.
2. Permit only one operator on the machine. All other personnel should be kept away from the machine.
3. If the machine is equipped with a ride control system, place the ride control system into “Service”.mode. Refer to “Ride Control” in this Operation and Maintenance, “Operator Controls” section.

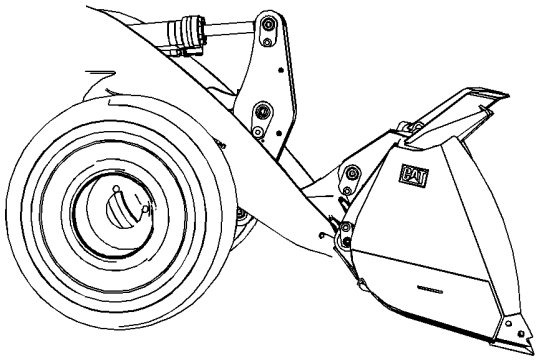

Illustration 165 g02727672

4. Position the bucket or the work tool just above the ground at a slight downward angle. This position will ensure that the head end of the lift cylinders is pressurized.

5. Engage the parking brake.

6. Turn the engine start switch to the OFF position.

7. When the engine has stopped, turn the engine start switch back to the ON position so the pilot oil can reach the main valve.

8. Move the implement lockout switch to the UNLOCKED position.

9. Move the lift control lever to the FLOAT position and the tilt control lever to the TILT BACK position at the same time. This action allows the bucket or the work tool to tilt back while the boom is lowered.

The bottom of the bucket or the work tool should rest flat on the ground. The weight of the linkage should be supported by the ground. The pressure from the head end of the lift cylinders and from the ride control accumulator is now vented to the hydraulic tank.

10. When the bucket or the work tool has settled to the ground, move both control levers to the HOLD position. Cycle the control levers through all positions several times in order to purge any remaining pressure from the implement hydraulic system. This action will completely drain the pilot accumulator.

11. Turn the engine start switch to the OFF position.

12. Slowly loosen the hydraulic tank filler cap in order to release the pressure from the hydraulic tank.

13. After all of the pressure has been released, tighten the hydraulic tank filler cap. The hydraulic system pressure has now been released. Hydraulic lines and components can now be removed.

Release Procedure (Steering System, Braking System, and Quick Coupler) (If Equipped)

⚠ WARNING

Personal injury can result from hydraulic oil pressure and hot oil.

Hydraulic oil pressure can remain in the hydraulic system after the engine has been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic system.

Make sure all of the work tools have been lowered to the ground, and the oil is cool before removing any components or lines. Remove the oil filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand.

⚠ WARNING

Escaping fluid under pressure, even a pinhole size leak, can penetrate body tissue, causing serious injury, and possible death. If fluid is injected into your skin, it must be treated immediately by a doctor familiar with this type of injury.

Always use a board or cardboard when checking for a leak.

1. Park the machine on a hard, smooth, level surface. The location should also be dry and free of debris.

2. Straighten the machine and install the steering link.

3. Lower the bucket to the ground and stop the engine.

4. Engage the parking brake.

5. Turn the engine start switch to the OFF position.

6. Turn the steering wheel fully to the left and fully to the right several times to relieve the pressure in the steering system.

7. Depress the brake pedal repeatedly in order to release any pressure in the braking system. When no more resistance is felt and no pressure release is heard, the braking system, and Quick Coupler pressure is released.

8. Slowly loosen the hydraulic tank filler cap in order to release the pressure from the hydraulic tank.

9. After all of the pressure has been released, tighten the hydraulic tank filler cap. The hydraulic system pressure has now been released. Hydraulic lines and components can now be removed.

i03636245

Welding on Machines and Engines with Electronic Controls

SMCS Code: 1000; 7000

Do not weld on any protective structure. If it is necessary to repair a protective structure, contact your Caterpillar dealer.

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 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 and components from the debris and the spatter which is created from welding.

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

i05262188

Maintenance Interval Schedule

SMCS Code: 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. All adjustments, the use of proper lubricants, fluids, filters, and the replacement of components due to normal wear and aging are included. 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. Refer to the maintenance procedure for any other exceptions that may change the maintenance intervals.

Note: The aftertreatment system can be expected to function properly for the useful life of the engine (emissions durability period), as defined by regulation. All prescribed maintenance requirements must be followed.

Note: Before each consecutive interval is performed, all maintenance from the previous interval must be performed.

Note: If Cat HYDO Advanced hydraulic oils are used, the hydraulic oil change interval is extended substantially. S·O·S services may extend the oil change even longer. Consult your Cat dealer for details.

The following guidelines should be followed if the service hours are not met:

Items listed between 10 and 100 service hours should be performed at least every 3 months.

Items listed between 250 and 500 service hours should be performed at least every 6 months.

Items listed between 1000 service hours and 2500 service hours should be performed at least every year.

When Required

Every 10 Service Hours or Daily

Every 50 Service Hours or Weekly

Every 100 Service Hours or 2 Weeks

Initial 250 Service Hours

Every 250 Service Hours

Every 250 Service Hours or Monthly

Every 250 Service Hours or 3 Months

Initial 500 Hours (for New Systems, Refilled Systems, and Converted Systems)

Every 500 Service Hours

Every 500 Service Hours or 3 Months

Every 1000 Service Hours

Every 1000 Service Hours or 6 Months

Every 2000 Service Hours or 1 Year

Every Year

Every 3000 Service Hours

Every 3 Years

Every 6000 Service Hours or 3 Years

Every 12 000 Service Hours or 6 Years

i02613559

Articulation Bearings - Lubricate

SMCS Code: 7057-086-BD; 7065-086-BD; 7066-086-BD

⚠ WARNING

Crushing Hazard. Connect the steering frame lock between front and rear frames before servicing the machine in the articulation area. Disconnect the steering frame lock and secure it in the stored position before resuming operation. Failure to do so could result in serious injury or death.

Refer to Operation and Maintenance Manual"Steering Frame Lock"..... before entering the articulation joint.

Wipe all fittings before applying grease.

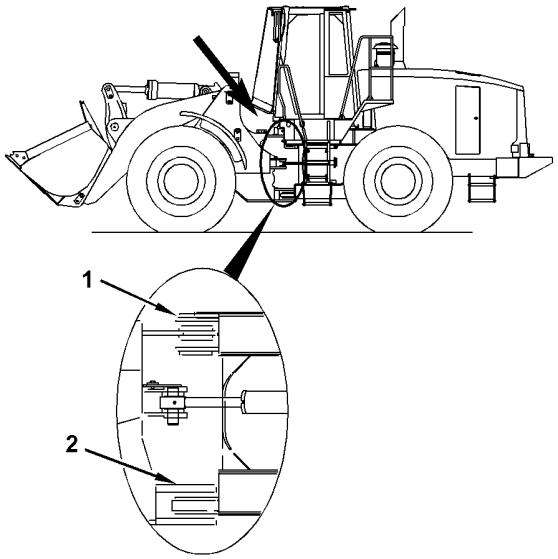

Illustration 166 g01236829

Apply grease to one fitting on the upper pivot bearing (1) and one fitting on the lower pivot bearing (2).

i04155776

Automatic Lubrication Grease Tank - Fill
(Autolube - If Equipped)

SMCS Code: 7540-544-TNK

The Automatic TWIN Greasing System

Reference: Refer to System Operation, RENR 6331 for more information on the Automatic TWIN Greasing System.

⚠ WARNING

A pressure hazard is present. Severe personal injury or death can result from removing hoses or fittings that are under pressure. Relieve the pressure in the system before you remove hoses or fittings.

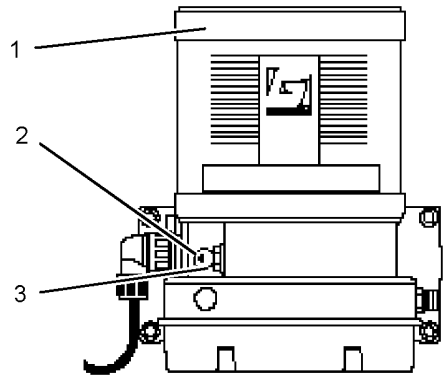

Illustration 167 g01068678

(1) Reservoir
(2) Dust Cap
(3) Fill Location

Grease reservoir (1) is located near the rear fender on the right side of the machine.

Filling the Reservoir

1. Remove the dust cap (2) from the grease reservoir (1).
2. Clean the filler tube assembly (3) and the coupling on the filler assembly. Clean the filter located behind the coupling. Refer to Operation and Maintenance Manual, “Automatic Lubrication Filler Filter - Clean”.
3. Install the filler assembly onto the filler tube assembly (3).
4. Fill the grease reservoir (1) with grease to the maximum level which is indicated on the grease reservoir (1).

Reference: For the correct type of grease, refer to Operation and Maintenance Manual, “Lubricant Viscosities”.

Note: If a different brand of grease is used, check for combatability. If the new grease is not combatable with the grease in the reservoir, the system must be purged. Refer to System Operation, RENR 6331 for more information about purging the system.

5. Remove the filler assembly and install the dust cap (2).

i03657089

Axle Oscillation Bearings - Lubricate

SMCS Code: 3268-086-BD; 3278-086-BD

⚠ WARNING

Crushing Hazard. Connect the steering frame lock between front and rear frames before servicing the machine in the articulation area. Disconnect the steering frame lock and secure it in the stored position before resuming operation. Failure to do so could result in serious injury or death.

Refer to Operation and Maintenance Manual“Steering Frame Lock”..... before entering the articulation joint.

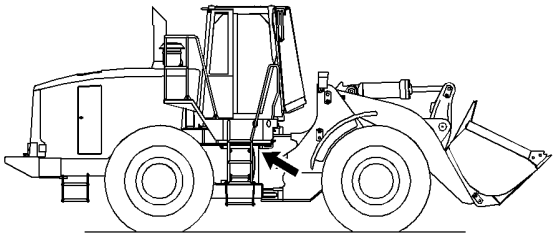

Illustration 168 g01103093

Open the access panel on the right side of the machine in front of the steps.

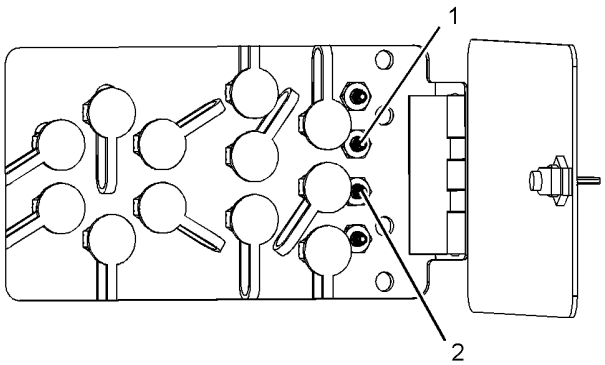

Illustration 169 g01105565

Wipe all fittings before lubricating.

Grease fitting (1) will lubricate the axle pivot bearing that is on the front of the rear axle. Grease fitting (2) will lubricate the axle pivot bearing that is on the rear of the rear axle.

Note: 5P - 0960 Molybdenum Grease is preferred.
1P - 0808 Multipurpose Grease grease may be used.

i04404608

Backup Alarm - Test
(If Equipped)

SMCS Code: 7406-081

The backup alarm is on the rear of the machine.

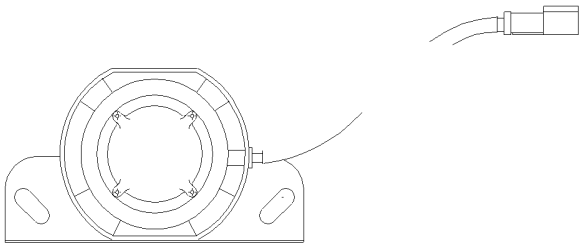

Illustration 170 g01043892

Turn the engine start switch to the ON position in order to perform the test.

Apply the service brake. Place the transmission into REVERSE.

The backup alarm should sound immediately. The backup alarm will continue to sound until the transmission is placed into NEUTRAL or into FORWARD.

i02170472

Battery - Clean

SMCS Code: 1401-070

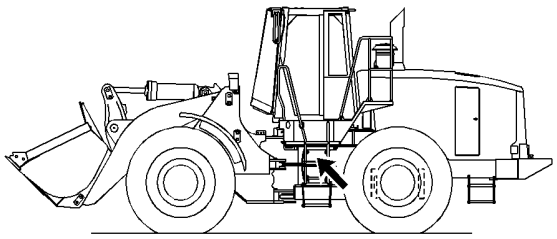

Illustration 171 g01100143

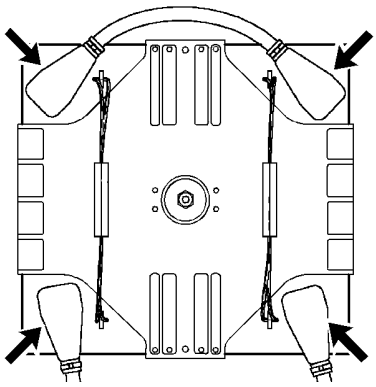

Illustration 172 g01100147

Open the battery compartment on the left side of the machine under the platform. Remove the battery hold-down.

Clean the battery terminals and the surfaces of the batteries with a clean cloth. Coat the battery terminals with petroleum jelly. Make sure that the battery cables are installed securely.

Replace the battery hold-down. Refer to Operation and Maintenance Manual, “Battery Hold-Down - Tighten” for the correct torque. Close the battery compartment.

i02185798

Battery Hold-Down - Tighten

SMCS Code: 7257-527

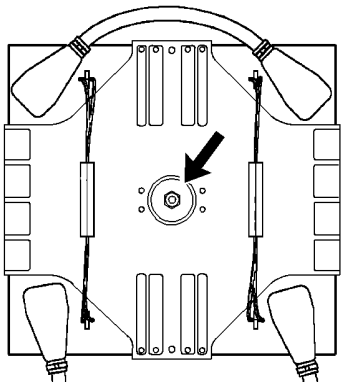

Illustration 173 g00882014

Open the battery compartment on the left side of the machine under the platform.

Over time, the vibration of an operating machine can cause the battery hold-down to loosen. To help to prevent loose batteries and the possibility of loose cable connections, tighten the locknut in the center of the hold-down to a torque of 14 ± 3 N·m (10 ± 2 lb ft).

i03657099

Battery or Battery Cable - Inspect/Replace

SMCS Code: 1401-040; 1401-510; 1402-040; 1402-510

⚠ WARNING

Personal injury may occur from failure to properly service the batteries.

Batteries give off flammable fumes that can explode. Electrolyte is an acid and can cause personal injury if it contacts the skin or eyes.

Prevent sparks near the batteries. Sparks could cause vapors to explode. Do not allow jumper cable ends to contact each other or the engine. Improper jumper cable connections can cause an explosion.

Always wear protective glasses when working with batteries.

1. Turn the engine start switch key OFF. Turn all of the switches OFF.
2. Turn the battery disconnect switch OFF. Remove the key.
3. Disconnect the negative battery cable from the disconnect switch.

Note: Do not allow the disconnected battery cable to contact the disconnect switch.

4. Disconnect the negative battery cable at the battery.
5. Disconnect the positive battery cable at the battery.
6. Inspect the battery terminals for corrosion. Inspect the battery cables for wear or damage.
7. Make any necessary repairs. If necessary, replace the battery cables or the battery.
8. Connect the positive battery cable at the battery.
9. Connect the negative battery cable at the battery.
10. Connect the battery cable at the battery disconnect switch.
11. Install the key and turn the battery disconnect switch ON.

Recycle the Battery

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

i03657235

Belt - Inspect/Adjust/Replace

SMCS Code: 1397-025; 1397-040; 1397-510

Your machine is equipped with a single serpentine belt. Stop the engine. Open the rear hood. The belt is located on the front of the engine.

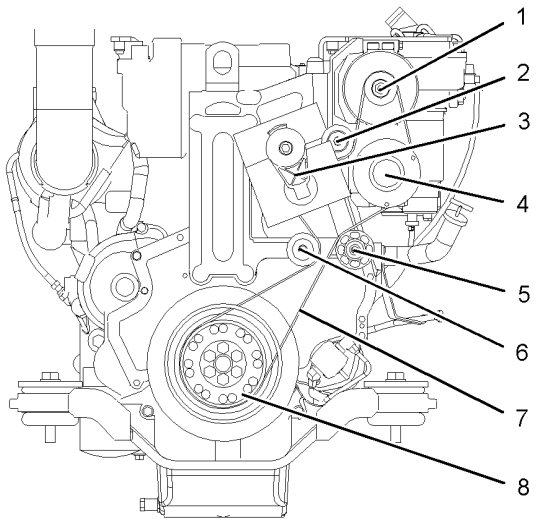

Illustration 174 g01100124

(1) Alternator
(2) Idler
(3) Tensioner
(4) Compressor
(5) Idler
(6) Idler
(7) Serpentine Belt
(8) Crankshaft Pulley

Tensioner (3) keeps the correct tension on belt (7). Insert a ratchet with a square drive into tensioner (3). Rotate the tensioner counterclockwise in order to relieve tension on the belt. Remove the belt.

Install the new belt. Be sure that the new belt is routed correctly, as shown. Rotate the tensioner counterclockwise in order to install the new belt. Release the tensioner when the new belt is installed. The correct tension will automatically be applied.

i05092713

Brake Accumulator - Check

SMCS Code: 4263-535

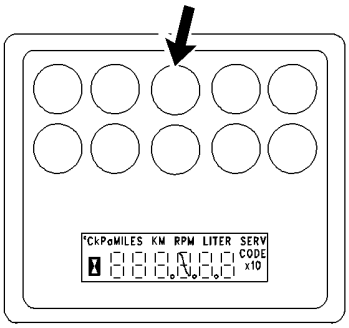

Illustration 175 g00882020

1. Turn the engine start switch to the ON position. The alert indicator for brake oil pressure should come on if the braking system is not at normal operating pressure.

2. Start the engine. Run the engine at half speed for 2 minutes in order to increase the accumulator pressure. The alert indicator for brake oil pressure should go off.

3. Stop the engine by turning the machine start switch to off. Wait 5 seconds then turn machine start switch to on, but do not start the engine. Wait for the display monitor to go through startup, key on level checks, and operator selection. Apply the service brakes (fully depress the pedal) for a duration of one second. Release the pedal for a duration of one second. Repeat the application and release process until the alert indicator for brake oil presure comes on. This will decrease the accumulator pressure. A minimum of five applications of the service brake pedal are required.

4. If the alert indicator comes on after less than five applications of the brake, measure the accumulator precharge pressure. An authorized Caterpillar dealer can measure the nitrogen gas pressure in the accumulator. Use only dry nitrogen gas for recharging.

i01732078

Brake Discs - Check

SMCS Code: 4255-535

Reference: For the correct procedure, refer to the Testing and Adjusting Service Manual of the braking system for your machine or consult your Caterpillar dealer.

i01739721

Braking System - Test

SMCS Code: 4251-081; 4267-081

- Fasten the seat belt before you test the brakes.
- Park the machine on a dry, level surface.
- Check the area around the machine. Make sure that the machine is clear of personnel and clear of obstacles.
- Make sure that the steering frame lock is in the unlocked position.

The following tests are used to determine whether the braking system is functional. These tests are not intended to measure the maximum brake holding effort. The required brake holding effort for sustaining a machine at a specific engine rpm varies from one machine to another machine. The variations include differences in the engine setting, the power train efficiency, the brake holding ability, etc.

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. Start the engine. Raise the implement slightly. Apply the service brake. Release the parking brake.
2. Move the transmission control to THIRD SPEED FORWARD while the service brakes are applied. Make sure that the autoshift control is in the OFF position.
3. Gradually increase the engine speed to high idle. The machine should not move.
4. Reduce the engine speed to low idle. Move the transmission direction control to the NEUTRAL position. Engage the parking brake. Lower the implement to the ground. Stop the engine.

If the machine moved during the test, consult your Caterpillar dealer for a brake inspection. Make any necessary repairs before the machine is returned to operation.

Parking Brake Holding Ability Test

⚠ WARNING

Personal injury can result if the machine moves while testing.

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

This test is performed when the parking brake is engaged. If the machine begins to move, compare the engine rpm to the engine rpm of a prior test. This will indicate the amount of system deterioration.

1. Start the engine. Raise the implement slightly. Engage the parking brake.
2. Move the transmission control to THIRD SPEED FORWARD. Make sure that the autoshift control is in the OFF position.

   The parking brake indicator light should come on.
3. Gradually increase the engine speed to high idle. The machine should not move.
4. Reduce the engine speed to low idle. Move the transmission direction control to the NEUTRAL position. Lower the implement to the ground. Stop the engine.

If the machine moved during the test, consult your Caterpillar dealer for a brake inspection. Make any necessary repairs before the machine is returned to operation.

i03657238

Bucket Cutting Edges - Inspect/Replace

SMCS Code: 6801-040; 6801-510

⚠ WARNING

Personal injury or death can result from bucket falling.

Block the bucket before changing bucket cutting edges.

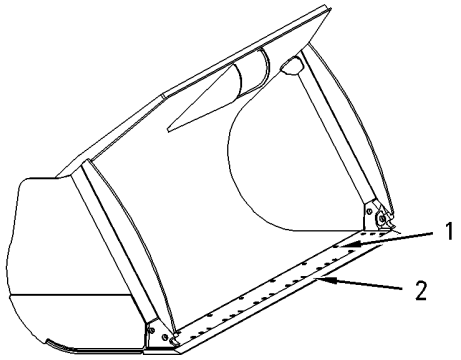

Illustration 176 g00764365

(1) Bolts for Cutting Edge
(2) Cutting Edge

Check the cutting edges and the end bits for wear and for damage. Use the following procedure to service the cutting edges and the end bits:

1. Raise the bucket and place blocking under the bucket.
2. Lower the bucket onto the blocking. Stop the engine.
3. Remove bolts (1), cutting edge (2) and the end bits.
4. Clean all contact surfaces.
5. If the opposite side of the cutting edge is not worn, use the opposite side of the cutting edge. The end bits are not reversible.

   If both sides are worn, install a new cutting edge.
6. Install bolts (1). Tighten the bolts to the specified torque.

Reference: Refer to Specifications, SENR3130, “Ground Engaging Tool (G.E.T.) Fasteners”.

7. Start the engine. Raise the bucket and remove the blocking. Lower the bucket to the ground.
8. After a few hours of operation, check the bolts for proper torque.

Bucket Wear Plates

⚠ WARNING

Personal injury or death can result from the bucket falling.

Block the bucket before changing bucket wear plates.

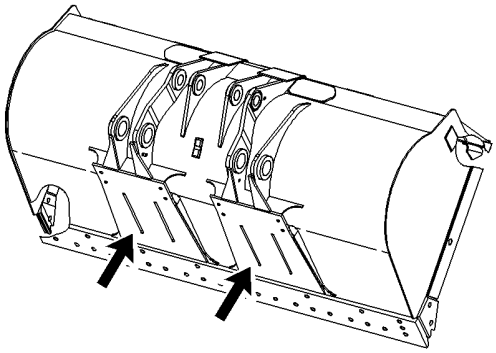

Illustration 177 g00879740

Inspect the wear plates. Replace the wear plates before damage to the bottom of the bucket occurs. Consult your Caterpillar dealer for replacement of wear plates.

i04878904

Bucket Hinge and Lift Arm Clearance Shims - Inspect/Adjust/Replace

SMCS Code: 6001-025-CLR; 6001-040-CLR; 6001-510-Z4; 6119-025-CLR; 6119-040-CLR; 6119-510-Z4

Inspect the Linkage

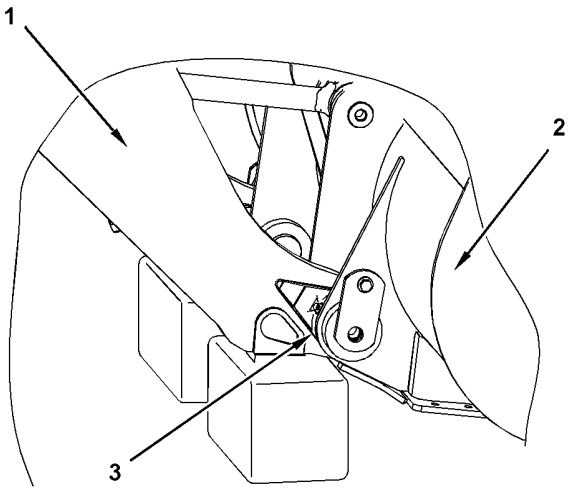

Illustration 178 g03003577

(1) Lift Arm
(2) Bucket
(3) Inspection Points for the Bucket Hinge.

Periodically inspect the bucket linkage. The gap between the bucket and the linkage should not exceed the thinnest shim that is available for the bucket assembly.

1. Lower the lift arm assembly (1) to suitable blocking. Rest the bucket (2) on the ground.
2. Use a gauge to measure the gap at the hinge.
3. If the measurement exceeds the required amount, new shims must be installed.

Installing Shims for the Hinge on the Bucket

Note: Refer to the Disassembly and Assembly Manual, “Bucket - Remove” for the correct procedure for removing the pins in the linkage.

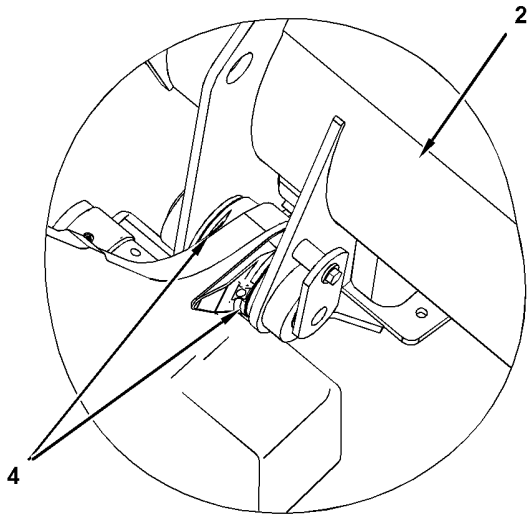

Illustration 179 g01345720

(2) Bucket
(4) Install washers on lift arm.

Install washers and pin assembly to the bucket. When possible, use washers on both sides of the lift arm to reduce the gap between the lift arm and the hinges on the bucket.

Note: Refer to the Disassembly and Assembly Manual, “Bucket - Install” for the correct procedure for installing the pins in the linkage.

i03657090

Bucket Linkage and Loader Cylinder Bearings - Lubricate

SMCS Code: 5102-086-BD; 5104-086-BD; 6107-086-BD

⚠ WARNING

Crushing Hazard. Connect the steering frame lock between front and rear frames before servicing the machine in the articulation area. Disconnect the steering frame lock and secure it in the stored position before resuming operation. Failure to do so could result in serious injury or death.

Refer to Operation and Maintenance Manual“Steering Frame Lock”..... before entering the articulation joint.

Wipe off the fittings before any lubricant is applied.

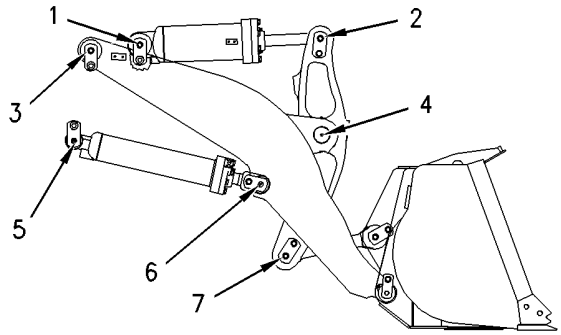

Illustration 180 g01001072

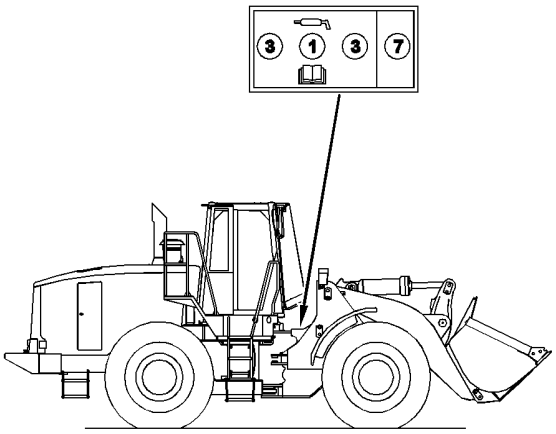

Illustration 181 g01259751

To lubricate pins (1) and (3), apply grease through the remote fittings that are located on the right side of the machine near the articulation joint.

The pins (2), (4), (5), (6), and (7) do not have remote grease fittings. These pins have standard grease fittings.

i01924084

Bucket Lower Pivot Bearings - Lubricate

SMCS Code: 6101-086-BD; 6107-086-BD

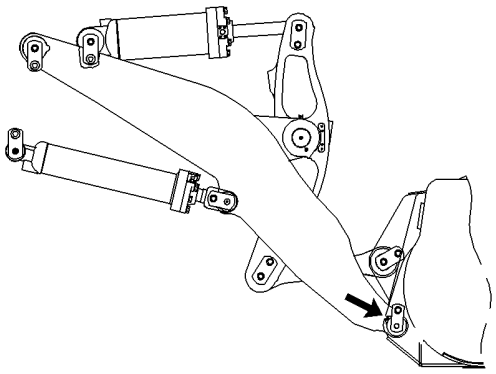

Illustration 182 g01001411

Wipe off all fittings before any lubricant is applied.

Apply lubricant through one fitting on each side of the machine.

i03657242

Bucket Tips - Inspect/Replace

SMCS Code: 6805-040; 6805-510

⚠ WARNING

Personal injury or death can result from the bucket falling.

Block the bucket before changing bucket tips.

Bucket Tips

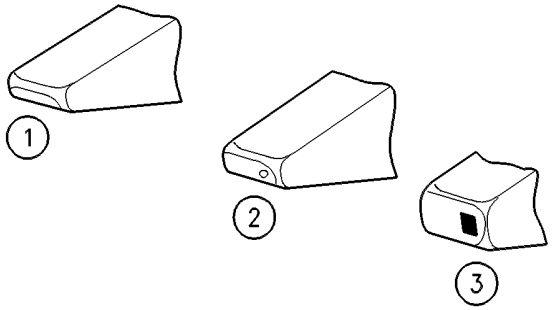

Illustration 183 g00101352

(1) Usable
(2) Replace the tip.
(3) Replace the tip.

Check the bucket tips for wear. If the bucket tip has a hole, replace the bucket tip.

1. Remove the pin from the bucket tip. The pin can be removed by one of the following methods.

- Use a hammer and a punch from the retainer side of the bucket to drive out the pin.
- Use a Pin-Master . Follow Step 1.a. through Step 1.c. for the procedure.

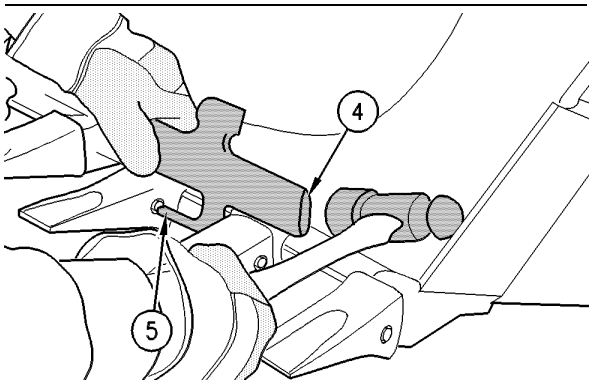

Illustration 184 g00590670

(4) Back of Pin-Master
(5) Extractor

a. Place the Pin-Master on the bucket tooth.

b. Align extractor (5) with the pin.

c. Strike the Pin-Master at the back of the tool (4) and remove the pin.

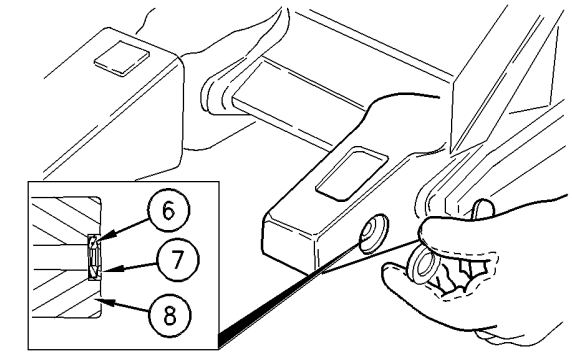

Illustration 185 g00590819

(6) Retainer
(7) Retaining washer
(8) Adapter

2. Clean the adapter and the pin.

3. Fit retainer (6) into retaining washer (7). Install this assembly into the groove that is in the side of adapter (8).

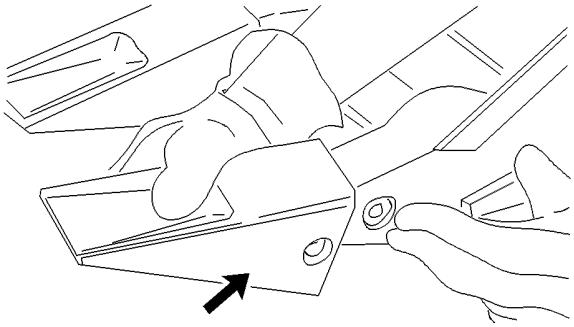

Illustration 186 g00101359

4. Install the new bucket tip onto the adapter.

Note: The bucket tip can be rotated by 180 degrees in order to allow greater penetration or less penetration.

5. Drive the pin through the bucket tip. The pin can be installed by using one of the following methods:

- From the other side of the retainer, drive the pin through the bucket tip, the adapter, and the retainer.
- Use a Pin-Master . Follow Step 5.a. through Step 5.e. for the procedure.

Note: To correctly install the pin into the retainer, the pin must be driven in from the right side of the tooth. Improper installation of the pin can result in the loss of the bucket tip.

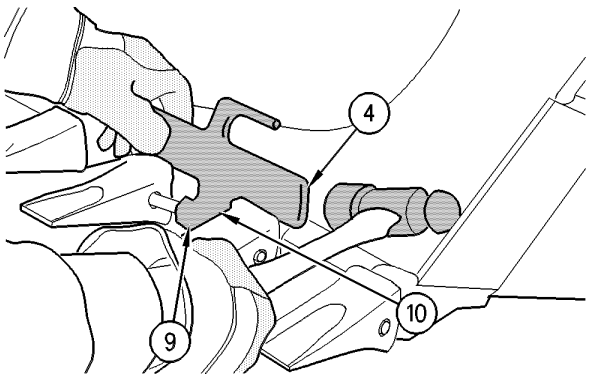

Illustration 187 g00590666

(4) Back of Pin-Master
(9) Pin setter
(10) Pin holder

a. Insert the pin through the bucket tooth.

b. Place the Pin-Master over the bucket tooth and locate the pin in the hole of holder (10).

c. Strike the tool with a hammer at the back of the tool (4) in order to start the pin.

d. Slide pin holder (10) away from the pin and rotate the tool slightly in order to align pin setter (9) with the pin.

e. Strike the end of the tool until the pin is fully inserted.

6. After you drive the pin, make sure that the retainer fits snugly into the pin groove.

K-Series Tip

Removal

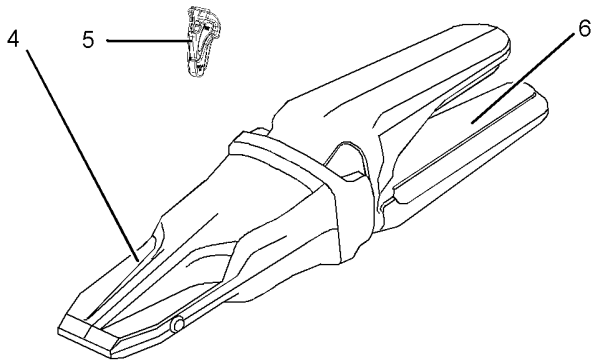

Illustration 188 g01389463

Note: Retainers are often damaged during the removal process. Caterpillar recommends the installation of a new retainer when bucket tips are rotated or replaced.

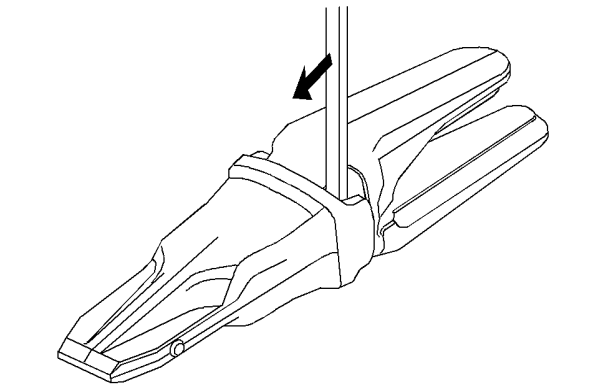

Illustration 189 g01175361

1. Use a pry bar in order to disengage retainer (5).

2. Use the pry bar in order to remove retainer (5) from bucket tip (4).

3. Remove bucket tip (4) from adapter (6) with a slight counterclockwise rotation.

4. Clean adapter (6).

Installation

1. Clean the adapter and the area around the latch, if necessary.

2. Install the new bucket tip onto the adapter with a slight clockwise rotation.

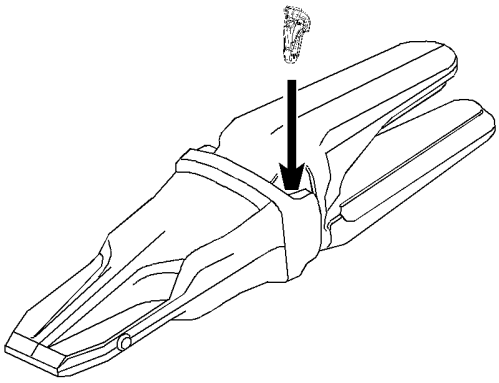

Illustration 190 g01124736

3. Install the retainer. Make sure that the retainer's latch catches under the tip pocket.

4. Make sure that the latch is properly seated by trying to remove the bucket tip.

i01924086

Bucket Upper Pivot Bearings - Lubricate

SMCS Code: 6101-086-BD; 6107-086-BD

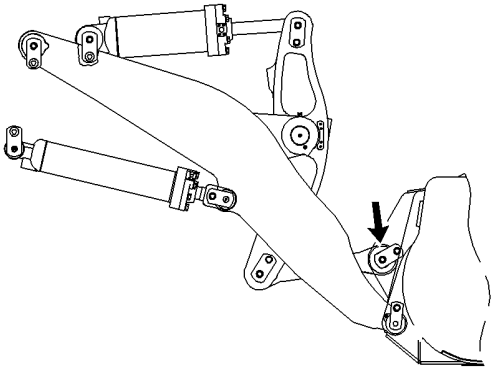

Illustration 191 g01001416

Wipe off the fitting before any lubricant is applied.

Apply lubricant through the fitting.

i01449996

Cab Air Filter - Clean/Replace

SMCS Code: 7342-070; 7342-510

Note: Clean the cab air filters more often if the machine is being operated in dusty conditions.

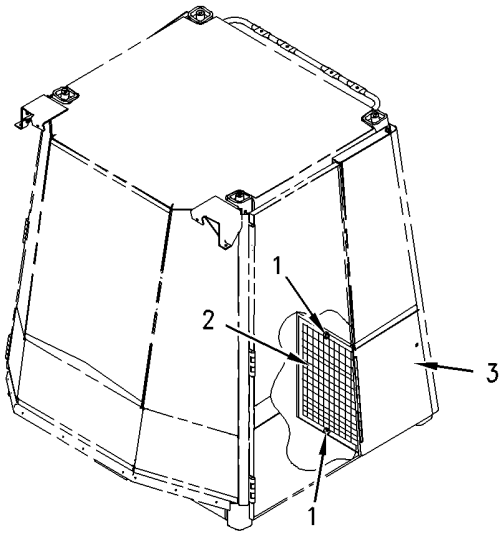

Illustration 192 g00759048

1. Remove the filter cover behind the seat. Two threaded knobs (1) are used in order to remove the cover. Remove the filter element (2).

2. Open the access door (3) on the left side of the cab. Remove the filter element.

3. Clean the filter elements with pressure air or wash the filter elements in warm water with a nonsudsing household detergent.

4. If water and detergent are used to clean the filter elements, rinse the filter elements in clean water and allow the filter elements to air dry thoroughly.

Note: If either filter element is damaged, install a new filter element.

5. Install the filter elements. Install the filter cover and close the access door.

i02816405

Camera - Clean (If Equipped)

SMCS Code: 7348-070

In order to maintain sufficient vision, keep the Work Area Vision System (WAVS) camera lens and the display clean.

Display

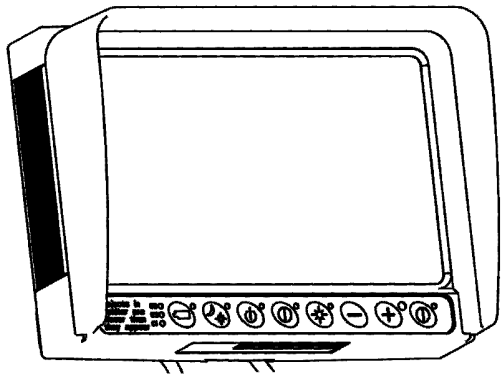

Illustration 193 g01223034
WAVS display

Use a soft, damp cloth in order to clean the display. The display has a soft plastic surface that can be easily damaged by an abrasive material. **The display is not sealed. Do not immerse the display with liquid.**

Camera

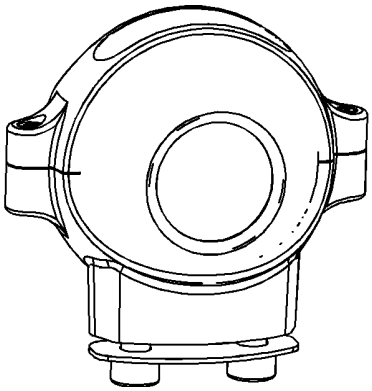

Illustration 194 g01223051
The WAVS camera is located on the rear of the machine in the center of the fan guard.

Use a damp cloth or water spray in order to clean the camera lens. The camera is a sealed unit. The camera is not affected by high pressure spray.

The camera is equipped with an internal heater to help counteract the effects of condensation, snow, or ice.

Note: For more information on WAVS, refer to Operation and Maintenance Manual, SEBU8157, Work Area Vision System.

i03696954

Circuit Breakers - Reset

SMCS Code: 1420-529

The circuit breaker panel is located on the left side of the machine under the front of the cab next to the battery box.

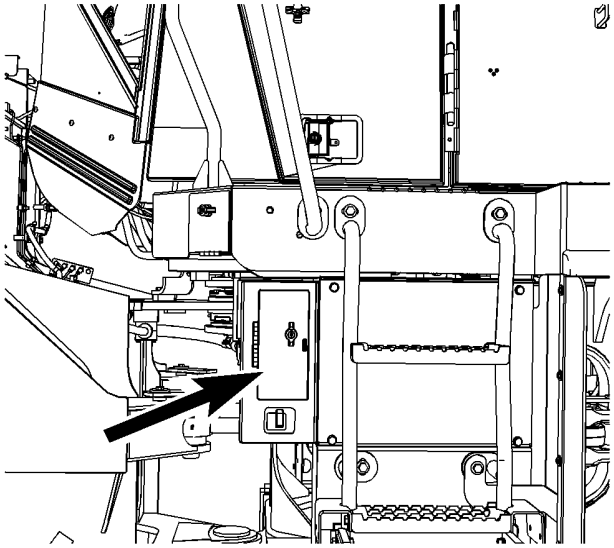

Illustration 195 g01988115

Depress the button in order to reset the circuit breakers. If the circuit is functioning properly, the button will remain depressed. If the button will not remain depressed, check the appropriate electrical circuit.

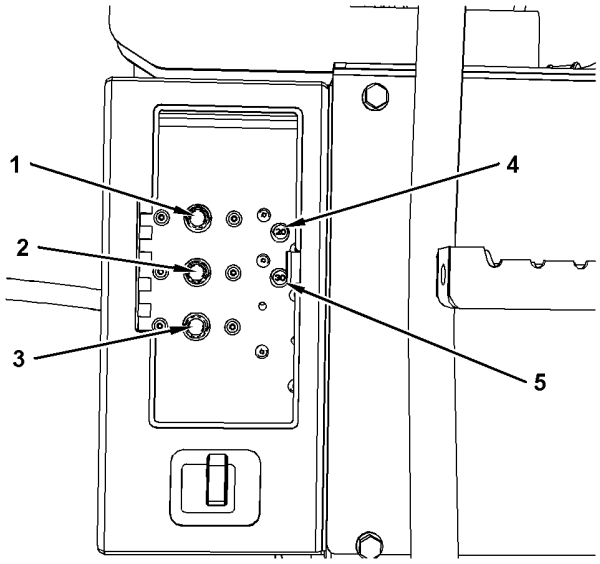

Illustration 196 g01988117

(1) 50 Amp Circuit Breaker
(2) 90 Amp Circuit Breaker
(3) 80 Amp Circuit Breaker
(4) 20 Amp Circuit Breaker
(5) 30 Amp Circuit Breaker

i01921776

Cooling System Coolant (ELC) - Change

SMCS Code: 1350-044-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 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.

Reference: For information about adding Extender to your cooling system, refer to Operation and Maintenance Manual, “Cooling System Coolant Extender (ELC) - Add” or consult your Caterpillar dealer.

If an Extended Life Coolant was previously used, flush the cooling system with clean water. No other cleaning agents are required. Use the following procedure to change the Extended Life Coolant.

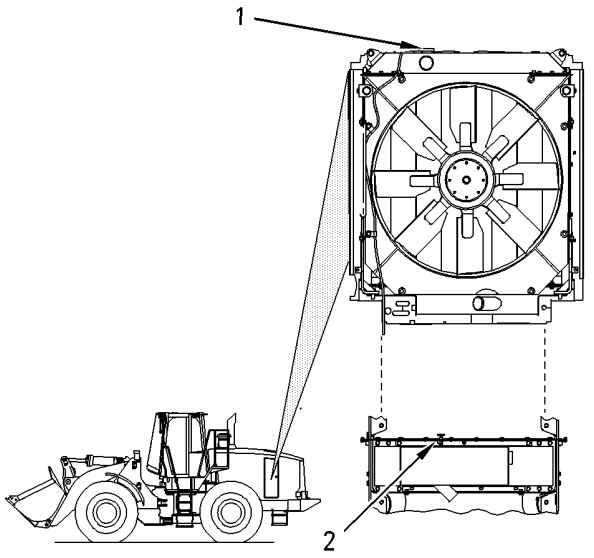

Illustration 197 g00807153

The cooling system pressure cap (1) is located under the engine hood at the rear of the machine.

1. Slowly loosen the cooling system pressure cap in order to relieve any system pressure.
2. Open the access door on the left side of the machine in order to access coolant drain valve (2). Open the drain valve at the bottom of the radiator. Allow the coolant to drain into a suitable container.
3. Flush the cooling system with clean water until the draining water is clean. Close drain valve (2).
4. Replace the water temperature regulator.

Reference: Refer to Operation and Maintenance Manual, “Cooling System Water Temperature Regulator - Replace” for the correct procedure.

NOTICE
Topping off or mixing Cat ELC with other products that do not meet Caterpillar EC-1 specifications reduces the effectiveness of the coolant and shortens coolant service life.

Use only Caterpillar products or commercial products that have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants. Use only Extender with Cat ELC.

Failure to follow these recommendations can result in shortened cooling system component life.

5. Add the Extended Life Coolant.

Reference: Refer to Operation and Maintenance Manual, “Capacities (Refill)” for the capacity of the cooling system.

6. Start the engine. Run the engine without the cooling system pressure cap until the water temperature regulator opens and the coolant level stabilizes.

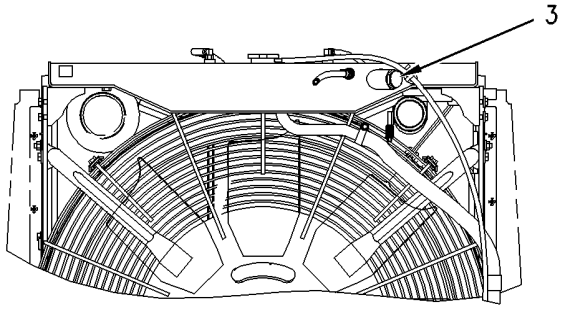

Illustration 198 g01000160

7. Maintain the coolant level in sight gauge (3) on the upper radiator.

8. Install the cooling system pressure cap. Stop the engine.

i01921794

Cooling System Coolant Extender (ELC) - Add

SMCS Code: 1352-544-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 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.

NOTICE
Topping off or mixing Cat ELC with other products that do not meet Caterpillar EC-1 specifications reduces the effectiveness of the coolant and shortens coolant service life.

Use only Caterpillar products or commercial products that have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants. Use only Extender with Cat ELC.

Failure to follow these recommendations can result in shortened cooling system component life.

When a Caterpillar Extended Life Coolant (ELC) is used, an Extender must be added to the cooling system.

Use a 8T-5296 Coolant Test Kit to check the concentration of the coolant.

Reference: For additional information about the addition of Extender, refer to Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations or consult your Caterpillar dealer.

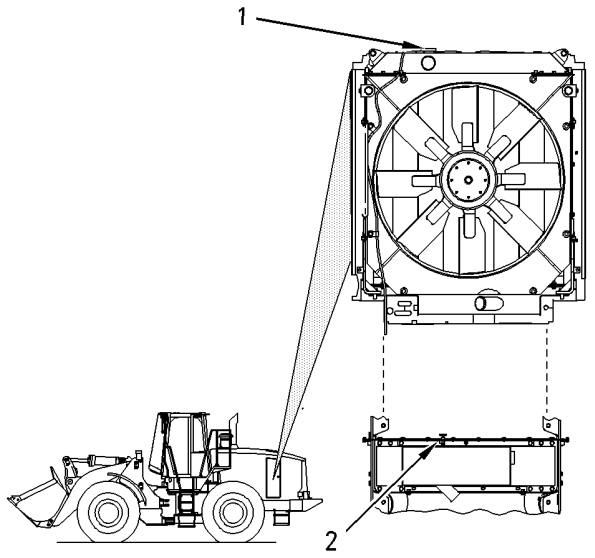

Illustration 199 g00807153

Cooling system pressure cap (1) is located under the hood at the rear of the machine. Tilt the hood in order to access the cooling system pressure cap.

1. Slowly loosen the cooling system pressure cap in order to relieve any system pressure. Remove the cooling system pressure cap.
2. If necessary, drain enough coolant from the radiator in order to allow the addition of the Extender to the cooling system. The cooling system drain valve (2) is located on the lower left side of the radiator.
3. Add 1.18 L (40 fl oz) of Extender to the cooling system.

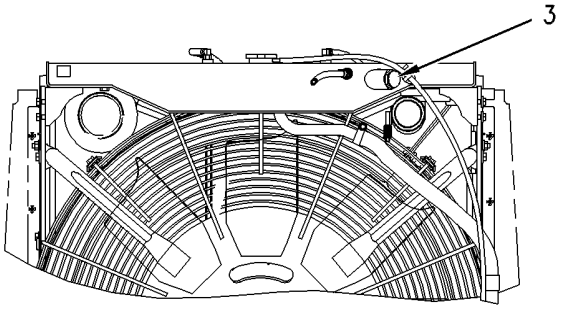

Illustration 200 g01000160

4. Check the coolant level at sight gauge (3).

Reference: Refer to Operation and Maintenance Manual, “Cooling System Coolant Level - Check” for the correct procedure.

5. Install the cooling system pressure cap. Close the engine hood.

i01921821

Cooling System Coolant Level - Check

SMCS Code: 1350-535-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.

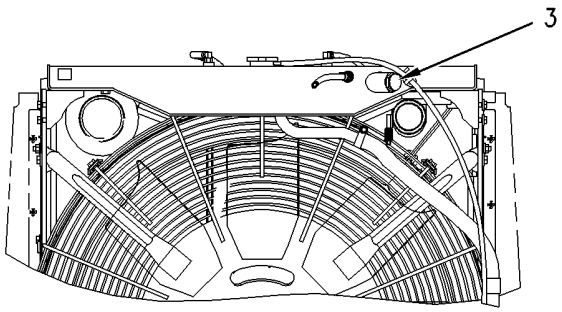

Illustration 201 g01000175

Open the access door on the left side of the machine. Coolant level sight gauge (1) is located on the top radiator.

Maintain the coolant level within the sight gauge. Add coolant, if necessary.

Note: If it is necessary to add coolant daily, inspect the cooling system for leaks.

i02375131

Cooling System Coolant Sample (Level 1) - Obtain

SMCS Code: 1350-008; 1395-008; 7542

Note: It is not necessary to obtain a Coolant Sample (Level 1) if the cooling system is filled with Cat ELC (Extended Life Coolant). Cooling systems that are filled with Cat ELC should have a Coolant Sample (Level 2) that is obtained at the recommended interval that is stated in the Maintenance Interval Schedule.

Note: Obtain a Coolant Sample (Level 1) if the cooling system is filled with any other coolant instead of Cat ELC . This includes the following types of coolants.

- Commercial long life coolants that meet the Caterpillar Engine Coolant Specification -1 (Caterpillar "EC−1")
- Cat Diesel Engine Antifreeze/Coolant (DEAC)
- Commercial heavy-duty coolant/antifreeze

NOTICE
Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contaminate may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

Note: Level 1 results may indicate a need for Level 2 Analysis.

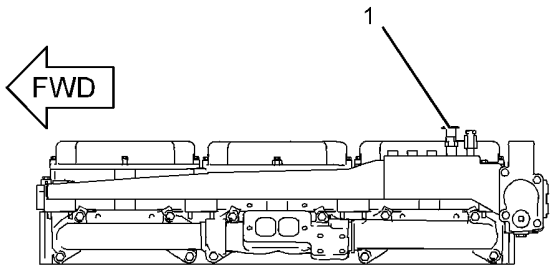

Illustration 202 g01185306
Left side of machine

The sampling valve (1) for the cooling system is located on top of the engine toward the front of the engine on the left side of the machine.

Obtain the sample of the coolant as close as possible to the recommended sampling interval. In order to receive the full effect of S·O·S analysis, you must establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent samplings that are evenly spaced. Supplies for collecting samples can be obtained from your Caterpillar dealer.

Use the following guidelines for proper sampling of the coolant:

- Complete the information on the label for the sampling bottle before you begin to take the samples.
- Keep the unused sampling bottles stored in plastic bags.
- Obtain coolant samples directly from the coolant sample port. You should not obtain the samples from any other location.
- Keep the lids on empty sampling bottles until you are ready to collect the sample.
- Place the sample in the mailing tube immediately after obtaining the sample in order to avoid contamination.
- Never collect samples from expansion bottles.
- Never collect samples from the drain for a system.

Submit the sample for Level 1 analysis.

For additional information about coolant analysis, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

i02375133

Cooling System Coolant Sample (Level 2) - Obtain

SMCS Code: 1350-008; 1395-008; 7542

NOTICE
Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contaminate may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

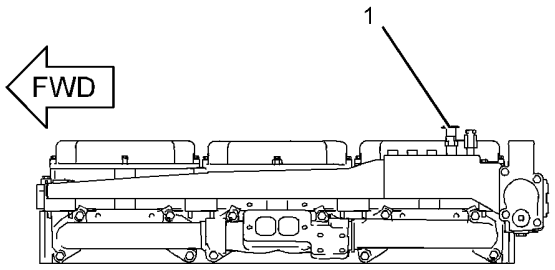

Illustration 203 g01185306

Left side of the machine

The sampling valve (1) for the cooling system is located on top of the engine toward the front of the engine on the left side of the machine.

Obtain the sample of the coolant as close as possible to the recommended sampling interval. Supplies for collecting samples can be obtained from your Caterpillar dealer.

Refer to Operation and Maintenance Manual, “Cooling System Coolant Sample (Level 1) - Obtain” for the guidelines for proper sampling of the coolant.

Submit the sample for Level 2 analysis.

Reference: For additional information about coolant analysis, refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” or consult your Caterpillar dealer.

i02186511

Cooling System Water Temperature Regulator - Replace

SMCS Code: 1355-510; 1393-010

⚠ 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
Failure to replace the engine's thermostat on a regularly scheduled basis could cause severe engine damage.

NOTICE
Caterpillar engines incorporate a shunt design cooling system and require operating the engine with a thermostat installed.

If the thermostat is installed wrong, it will cause the engine to overheat. Inspect gaskets before assembly and replace if worn or damaged.

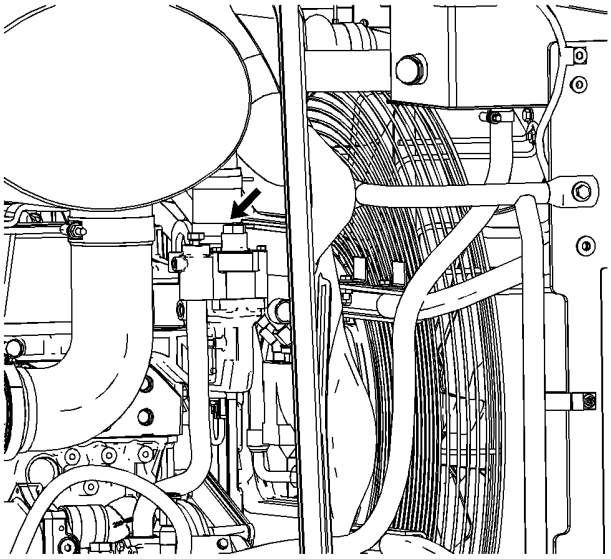

Illustration 204 g01105775

Replace the water temperature regulator in order to reduce the chance of problems with the cooling system.

Replace the water temperature regulator and the seals while the cooling system is completely drained or while the coolant is drained to a level that is below the water temperature regulator housing.

Note: If you are only replacing the water temperature regulator, drain the coolant to a level that is below the water temperature regulator housing.

Reference: Refer to Disassembly and Assembly, RENR9214, C11 and C13 Engines for Caterpillar Built Machines for the correct procedure for replacing the water temperature regulator.

i02164355

Differential and Final Drive Oil - Change

SMCS Code: 3278-044; 4011-044

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.

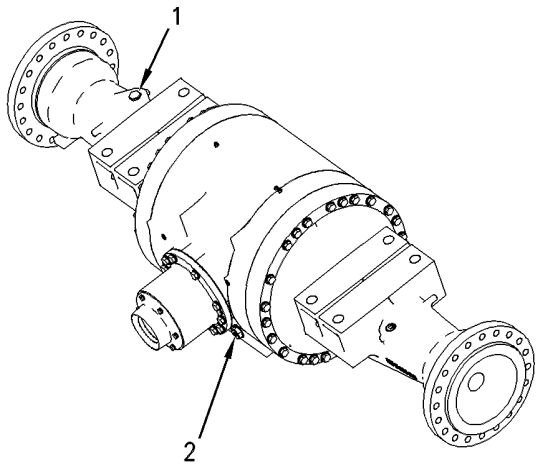

Illustration 205 g00287529

Front axle

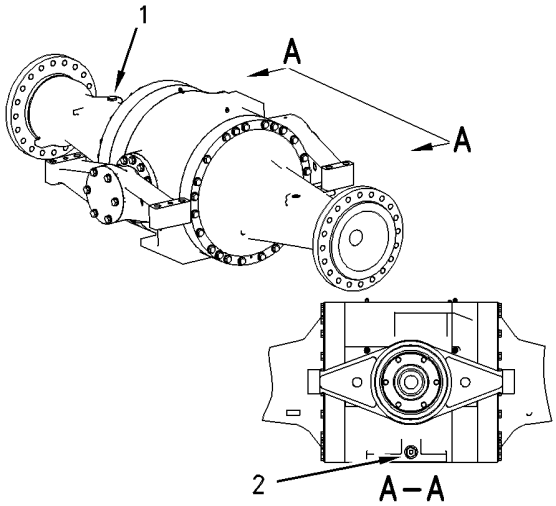

Illustration 206 g00287531

Rear axle

Note: The axle housings are equipped with ecology drain valves.

1. Remove drain plugs (2). Attach a hose to a suitable drain adapter. Install the adapter in the drain valve and allow the oil to drain into a suitable container.
2. Clean the drain plugs and install the drain plugs.
3. Wipe off dipstick/fill plugs (1) and the surfaces around dipstick/fill plugs (1).
4. Remove the dipstick/fill plugs. Fill each axle with 1.0 L (1.06 qt) of 1U-9891 Hydraulic Oil Additive. Fill the axles with oil.

Reference: Refer to Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the type of lubricant and for the refill capacity.

5. Clean the dipstick/fill plugs and install the dipstick/fill plugs.
6. Run the machine on level ground for a few minutes in order to equalize the oil level in the axle. Check the oil level in the axle.

Reference: Refer to Operation and Maintenance Manual, “Differential and Final Drive Oil Level - Check” for the correct procedure.

i01102280

Differential and Final Drive Oil Level - Check

SMCS Code: 3278-535-FLV; 4011-535-FLV

Note: Before you measure the oil level, operate the machine for a few minutes in order to equalize the oil level.

1. Park the machine on level ground. Lower the bucket and apply slight downward pressure. Engage the parking brake. Stop the engine.

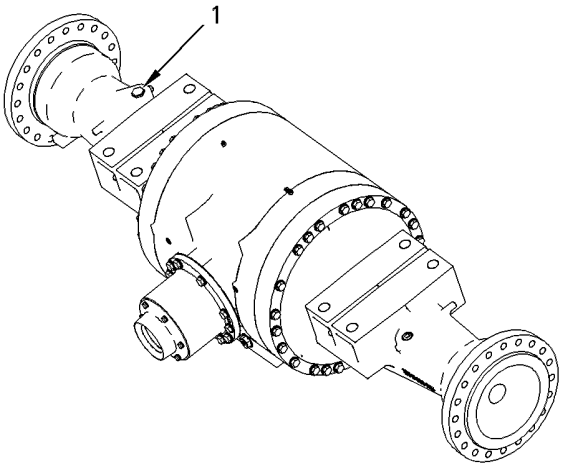

Illustration 207 g00285312
Front Axle

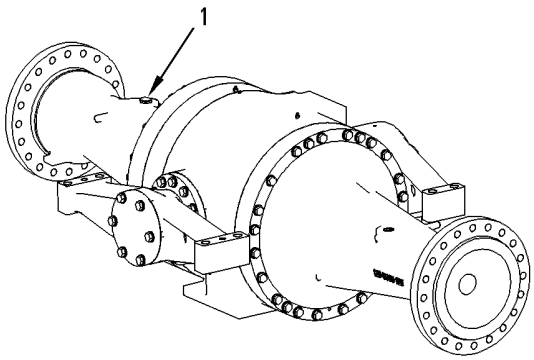

Illustration 208 g00287527
Rear Axle

2. Remove dipstick/fill plug (1) on the left side of the axle. 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 plug is installed completely before you check the oil level. If the plug is not installed completely, an incorrect oil level reading can occur.

3. Remove dipstick/fill plug (1) again and check the oil level. Maintain the oil level between the ADD mark and the FULL mark. Add oil, if necessary.

Reference: Refer to Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the type of lubricant and for the refill capacity.

4. Clean the plug and install the plug.

i01921974

Differential and Final Drive Oil Sample - Obtain

SMCS Code: 3278-008; 4011-008; 4070-008; 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 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.

1. Operate the machine for a few minutes before obtaining the oil sample. This will thoroughly mix the differential oil for a more accurate sample.

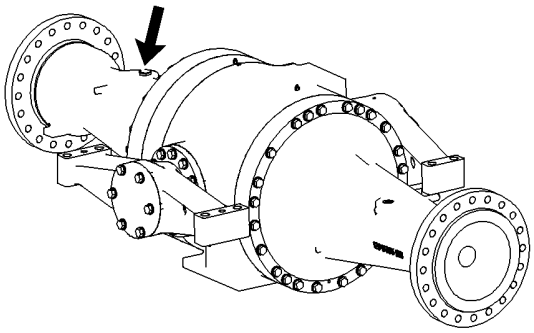

Illustration 209 g00884056
Rear axle

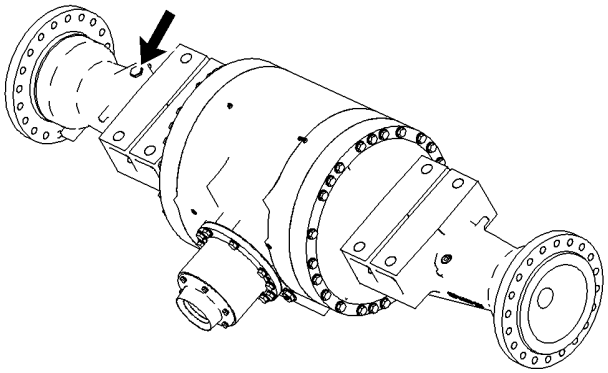

Illustration 210 g00884059
Front axle

2. The differential and final drives are not equipped with sampling valves. Obtaining an oil sample will require the use of a vacuum pump or equivalent in order to extract the oil from the component. Extract the oil through the filler openings on the differential and final drives.

3. Complete any additional required work. Fill the differential and final drives with oil, as required. Install the dipstick/fill plugs.

Reference: For more information, refer to Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations, “S·O·S Oil Analysis” and Special Publication, PEHP6001, “How To Take A Good Oil Sample”.

i03657243

Drive Shaft Spline (Center) - Lubricate

SMCS Code: 3253-086-SN

Wipe all of the fittings before you apply grease to the fittings.

NOTICE
To prevent damage to the seal, articulate the machine full right or left, before lubricating the splines.

1. Start the engine. Raise the bucket. Release the parking brake. Articulate the machine to the right or to the left in order to properly lubricate the splined shaft.

2. Lower the bucket to the ground. Engage the parking brake. Stop the engine.

Note: Since the steering frame lock cannot be connected in this case, remove the engine start switch key and turn the battery disconnect switch to the OFF position.

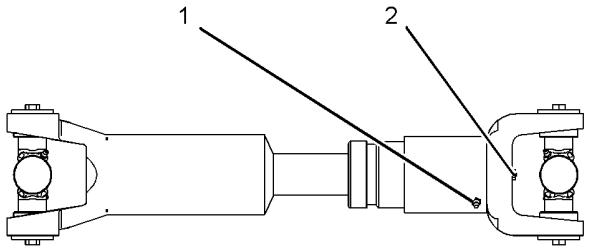

Illustration 211 g01106848

3. Apply grease to the fitting (1). Apply grease until the relief (2) overruns.

Note: 5P - 0960 Molybdenum Grease is preferred. 1P - 0808 Multipurpose Grease may be used.

4. Start the engine. Raise the bucket. Release the parking brake. Reposition the machine in a straight direction without articulation.

5. Lower the bucket to the ground. Apply a slight down pressure. Engage the parking brake. Stop the engine.

i04040803

Drive Shaft Support Bearing - Lubricate

SMCS Code: 3267-086-BD

This procedure is to lubricate the drive shaft support bearings that have a grease fitting. Some previous drive shaft support bearings are lubricated for life. Drive shaft support bearings that are lubricated for life do not have grease fittings.

Note: For better access, articulate the machine to the right or to the left. Because the steering frame lock cannot be connected, remove the engine start switch key. Turn the battery disconnect switch to the OFF position in order to keep the machine from being articulated.

In order to lubricate the drive shaft support bearing, remove the plug if a grease zerk is not installed. Install a grease zerk. **Do not grease the drive shaft support bearing more than the recommended interval.**

NOTICE
Do not over grease the drive shaft support bearing. The excess grease may get into the brake area. Damage to the brakes or the loss of the brakes may occur. Take precautions in order to avoid getting grease in the adjacent brake area.

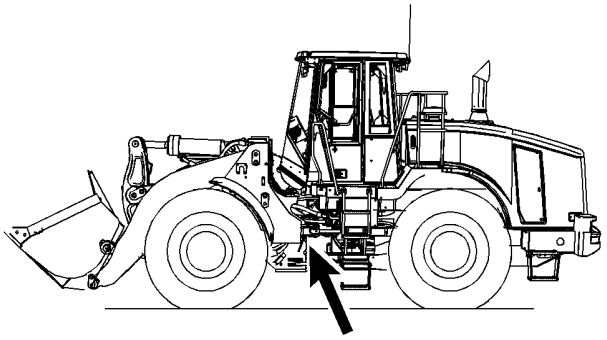

Illustration 212 g01962154

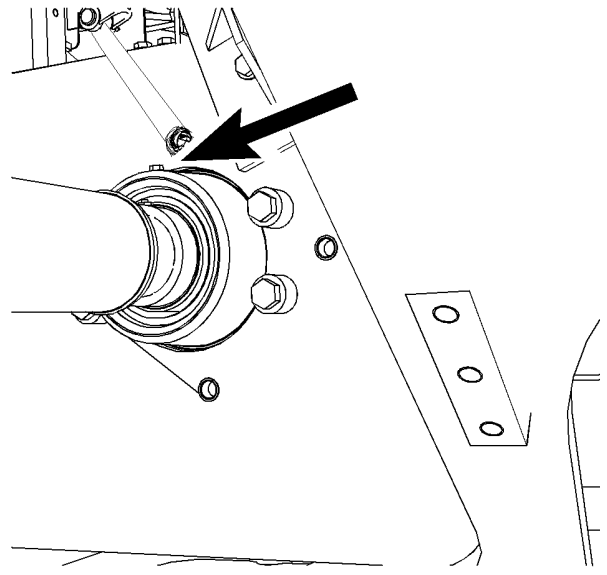

Illustration 213 g02247513

Wipe off the fitting before any lubricant is applied.

Apply lubricant through the fitting on the drive shaft support bearing. Refer to Operation and Maintenance Manual“Lubricant Viscosities” .. for the proper grease.

i02571972

Drive Shaft Universal Joints - Lubricate

SMCS Code: 3251-086

Note: Do not grease the universal joints more than the recommended interval.

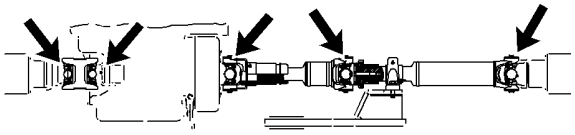

Illustration 214 g01069141

1. Wipe off the grease fittings before lubricating.
2. Lubricate all five grease fittings on the universal joints. Refer to Operation and Maintenance Manual“Lubricant Viscosities”..... for the proper grease.

i02061807

Electronic Unit Injector - Inspect/Adjust

SMCS Code: 1251-025; 1251-040; 1290-025; 1290-040

⚠ WARNING

The Electronic Control module produces high voltage. To prevent personal injury make sure the Electronic Control Module is not powered and the unit injector solenoids are disconnected.

NOTICE

The camshafts must be correctly timed with the crankshaft before an adjustment of the unit injector lash is made. The timing pins must be removed from the camshafts before the crankshaft is turned or damage to the cylinder block will be the result.

The operation of Caterpillar engines with improper adjustments of the electronic unit injector can reduce engine efficiency. This reduced efficiency could result in excessive fuel usage and/or shortened engine component life.

Adjust the electronic unit injector at the same interval as the valve lash adjustment.

Refer to your machine's Service Manual or your Caterpillar dealer for the complete adjustment procedure.

i02187095

Engine Air Filter Primary Element - Clean/Replace

SMCS Code: 1054-070-PY; 1054-510-PY

1. The rear hood should be opened in order to access the air filter. The air filter is located on the right side of the machine.

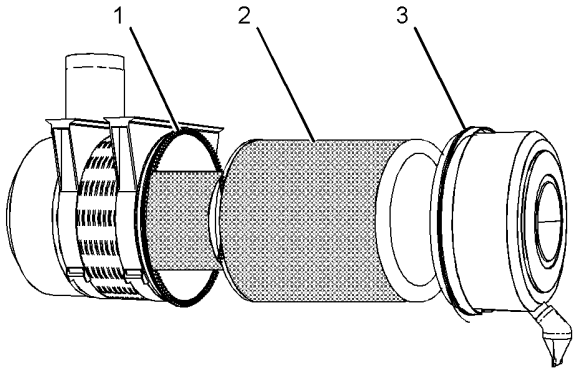

Illustration 215 g01105972

2. Remove the cover on air filter housings (3).
3. Remove primary element (2) from the air filter housing.
4. Clean the inside of air filter housing (1).
5. Inspect the primary element. If the pleats, the gaskets, or the seals are damaged, discard the element. Replace a damaged primary element with a clean primary element.

Cleaning Primary Air Filter Elements

NOTICE
Caterpillar recommends certified air filter cleaning services available at participating Caterpillar dealers. The Caterpillar cleaning process uses proven procedures to assure consistent quality and sufficient filter life.

Observe the following guidelines if you attempt to clean the filter element:

Do not tap or strike the filter element in order to remove dust.

Do not wash the filter element.

Use low pressure compressed air in order to remove the dust from the filter element. Air pressure must not exceed 207 kPa (30 psi). Direct the air flow up the pleats and down the pleats from the inside of the filter element. Take extreme care in order to avoid damage to the pleats.

Do not use air filters with damaged pleats, gaskets, or seals. Dirt entering the engine will cause damage to engine components.

The primary air filter element can be used up to six times if the element is properly cleaned and the element is inspected. When the primary air filter element is cleaned, check for rips or tears in the filter material. The primary air filter element should be replaced at least one time per year. This replacement should be performed regardless of the number of cleanings.

NOTICE
Do not clean the air filter elements by bumping or tapping. This could damage the seals. Do not use elements with damaged pleats, gaskets, or seals. Damaged elements will allow dirt to pass through. Engine damage could result.

Visually inspect the primary air filter elements before cleaning. Inspect the air filter elements for damage to the seal, the gaskets, and the outer cover. Discard any damaged air filter elements.

There are two common methods that are used to clean primary air filter elements:

- Pressurized air
- Vacuum cleaning

Pressurized Air

Pressurized air can be used to clean primary air filter elements that have not been cleaned more than two times. Pressurized air will not remove deposits of carbon and oil. Use filtered, dry air with a maximum pressure of 207 kPa (30 psi).

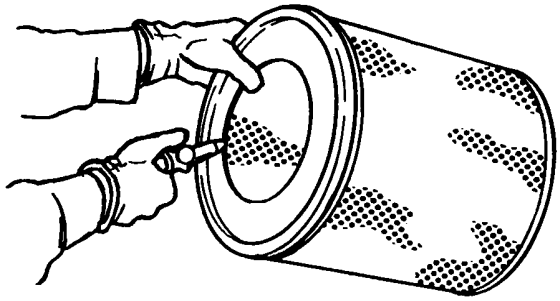

Illustration 216 g00281692

Note: When the primary air filter elements are cleaned, always begin with the clean side (inside) in order to force dirt particles toward the dirty side (outside).

Aim the hose so that the air flows inside the element along the length of the filter in order to help prevent damage to the paper pleats. Do not aim the stream of air directly at the primary air filter element. Dirt could be forced further into the pleats.

Vacuum Cleaning

Vacuum cleaning is another method for cleaning primary air filter elements which require daily cleaning because of a dry, dusty environment. Cleaning with pressurized air is recommended prior to vacuum cleaning. Vacuum cleaning will not remove deposits of carbon and oil.

Inspecting the Primary Air Filter Elements

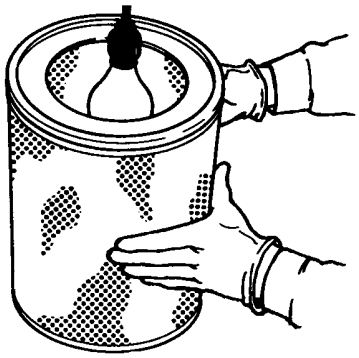

Illustration 217 g00281693

Inspect the clean, dry primary air filter element. Use a 60 watt blue light in a dark room or in a similar facility. Place the blue light in the primary air filter element. Rotate the primary air filter element. Inspect the primary air filter element for tears and/or holes. Inspect the primary air filter element for light that may show through the filter material. If it is necessary in order to confirm the result, compare the primary air filter element to a new primary air filter element that has the same part number.

Do not use a primary air filter element that has any tears and/or holes in the filter material. Do not use a primary air filter element with damaged pleats, gaskets or seals. Discard damaged primary air filter elements.

Storing Primary Air Filter Elements

If a primary air filter element that passes inspection will not be used, the primary air filter element can be stored for future use.

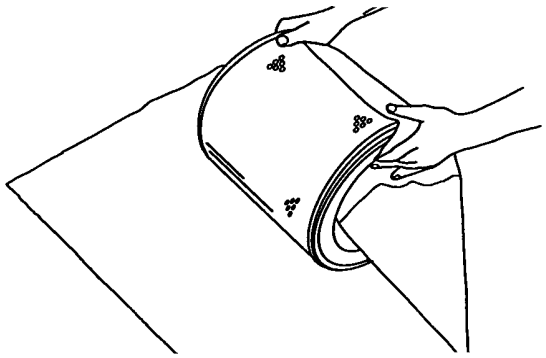

Illustration 218 g00281694

Do not use paint, a waterproof cover, or plastic as a protective covering for storage. An airflow restriction may result. To protect against dirt and damage, wrap the primary air filter elements in Volatile Corrosion Inhibited (VCI) paper.

Place the primary air filter element into a box for storage. For identification, mark the outside of the box and mark the primary air filter element. Include the following information:

- Date of cleaning
- Number of cleanings

Store the box in a dry location.

i01693619

Engine Air Filter Secondary Element - Replace

SMCS Code: 1054-510-SE

NOTICE
Service the air filter 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.

Note: Replace the secondary element when you service the primary element for the third time. If a clean primary element has been installed and a warning for the air filter still occurs, replace the secondary element. Also if the exhaust smoke remains black and a clean primary element has been installed, replace the secondary element.

1. Remove the primary element.

Reference: Refer to Operation and Maintenance Manual, “Engine Air Filter Primary Element - Clean/ Replace” for the correct procedure.

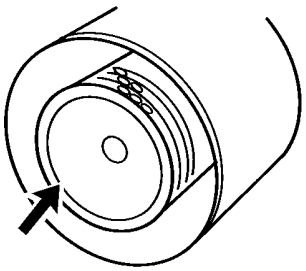

Illustration 219 g00864077

2. Remove the secondary element.

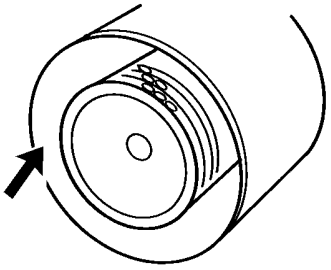

Illustration 220 g00864079

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

4. Inspect the gasket between the air inlet pipe and the air cleaner housing. Replace the gasket if the gasket is damaged.

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

6. Install a clean primary element and the cover for the air cleaner housing.

7. Close the access door.

8. Repeat the procedure for the other air cleaner.

i02197033

Engine Crankcase Breather - Clean

SMCS Code: 1317-070

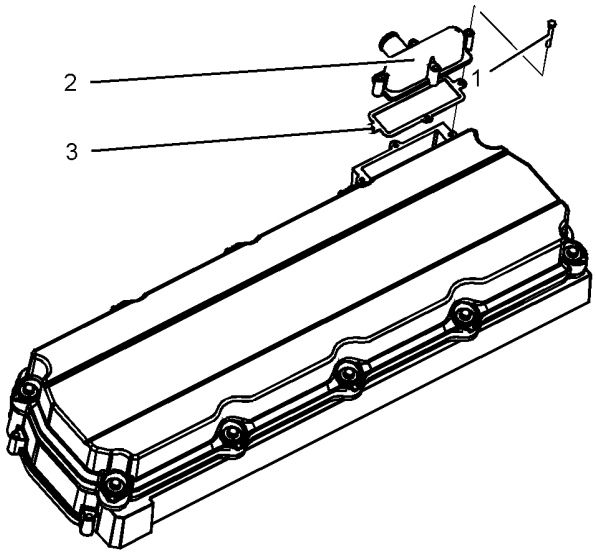

Illustration 221 g01109682

Open the hood on the rear of machine in order to access the engine compartment. The crankcase breather is located on the right side of the engine.

1. Remove the four bolts (1) that hold the breather (2) onto the cover. Remove the breather.

2. Check the condition of the cover seal (3). Replace the seal if the seal is damaged.

3. Wash the breather (2) and the filter element in a clean nonflammable solvent. The filter element is located inside the breather.

4. Shake the breather or use pressure air in order to dry the breather.

5. Inspect the breather hose for damage. Replace the breather hose if it is necessary.

6. Install the breather assembly. Install the hose and install the hose clamp.

7. Close the access door.

i02188149

Engine Oil Level - Check

SMCS Code: 1000-535-FLV

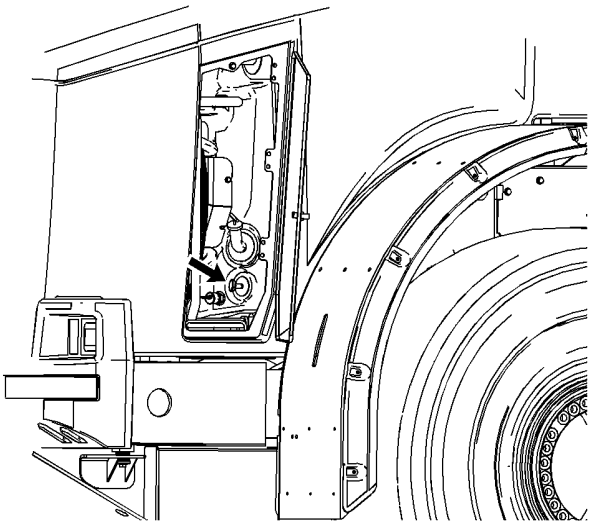

Illustration 222 g01106343

Open the service door that is located on the right side of the machine. The oil level dipstick is located in the service door.

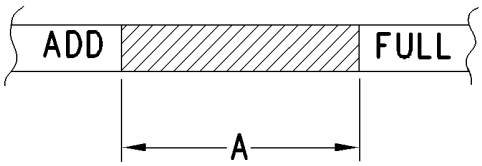

Illustration 223 g00746755

Maintain the oil level between the FULL mark and ADD mark on the dipstick. Check the level of the engine oil while the engine is shut off. Add oil, if necessary.

i02188187

Engine Oil Sample - Obtain

SMCS Code: 1348-008; 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 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.

1. Operate the machine for a few minutes before obtaining the oil sample. This will thoroughly mix the engine oil for a more accurate sample.

2. Open the engine hood.

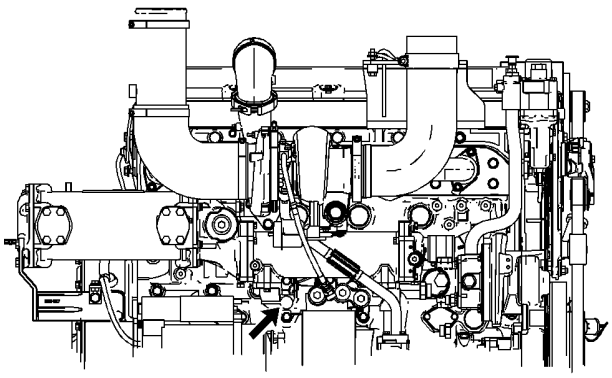

Illustration 224 g01106355

3. Use the sampling valve in order to obtain a sample of engine oil.

4. Close the engine hood.

Reference: For more information, refer to Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations, “S·O·S Oil Analysis” and Special Publication, PEHP6001, “How To Take A Good Oil Sample”.

i03649999

Engine Oil and Filter - Change

SMCS Code: 1318-510

Selection of the Oil Change Interval

NOTICE
A 500 hour engine oil change interval is available, provided that the operating conditions and recommended multigrade oil types are met. When these requirements are not met, shorten the oil change interval to 250 hours, or use an S·O·S Services oil sampling and analysis program to determine an acceptable oil change interval.

If you select an interval for oil and filter change that is too long, you may damage the engine.

The normal engine oil change interval is listed in this Operation and Maintenance Manual, “Maintenance Interval Schedule”.

Abnormally harsh operating cycles or harsh environments can shorten the service life of the engine oil. Arctic temperatures, corrosive environments, or extremely dusty conditions may require a reduction in engine oil change intervals. Also refer to Special Publication, SEBU5898, Cold Weather Recommendations for All Caterpillar Machines. Poor maintenance of air filters or of fuel filters requires reduced oil change intervals. Consult your Caterpillar dealer for more information if this product will experience abnormally harsh operating cycles or harsh environments.

Adjustment of the Oil Change Interval

Note: Your Caterpillar dealer has additional information on these programs.

Cat oil filters are recommended.

Program A

Verification for an Oil Change Interval of 500 Hours

This program consists of three oil change intervals of 500 hours. Oil sampling and analysis is done at 250 hours and 500 hours for each of the three intervals for a total of six oil samples. The analysis includes oil viscosity and infrared (IR) analysis of the oil. If all of the results are satisfactory, the 500 hour oil change interval is acceptable for the machine in that application. Repeat Program A if you change the application of the machine.

If a sample does not pass the oil analysis, take one of these actions:

- Shorten the oil change interval to 250 hours.
- Proceed to Program B.
- Change to a preferred oil type in the “Lubricant Viscosities for Ambient Temperatures” Table in this Operation and Maintenance Manual

Program B

Optimizing Oil Change Intervals

Begin with a 250 hour oil change interval. The oil change intervals are adjusted by increments. Each increment is an additional 50 hours. Periodic oil sampling and analysis is done during each interval. The analysis includes oil viscosity and infrared (IR) analysis of the oil. Repeat Program B if you change the application of the machine.

If an oil sample does not pass the analysis, shorten the oil change interval, or change to a preferred multigrade oil type in the listing above.

References

Reference: Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations

Reference: Special Publication, SEBU5898, Cold Weather Recommendations for All Caterpillar Machines

Reference: Special Publication, PEDP7035, Optimizing Oil Change Intervals

Reference: Special Publication, PEDP7036, S·O·S Fluid Analysis

Reference: Special Publication, PEDP7076, Understanding the S·O·S Oil Analysis Tests

Procedure for Changing the Oil

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. Open the engine hood.

2. The drain plug is located on the left side of the engine oil pan toward the rear of the machine. Open the oil drain valve and allow the oil to drain into a suitable container. Close the drain valve.

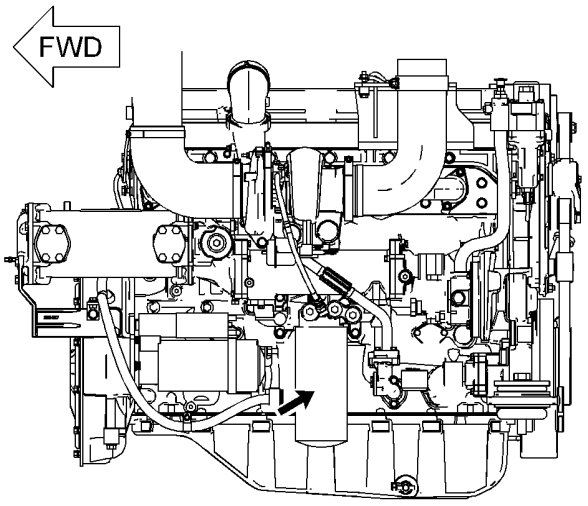

Illustration 225 g01109909

3. Use a strap type wrench to remove the engine oil filter from the right side of the engine. Inspect the oil filter.

4. Clean the filter mounting base. Make sure that all of the used gasket has been completely removed.

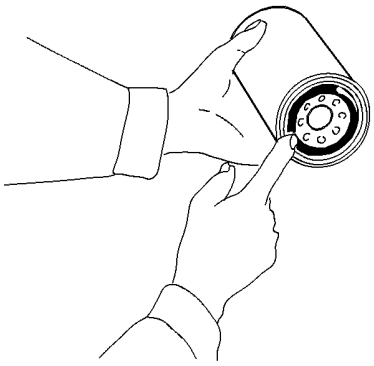

Illustration 226 g00101318

5. Apply a thin coat of oil to the seal on the new engine oil filter. Install a new engine oil filter hand tight until the seal of the engine oil 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 engine oil filter that are spaced 90 degrees or 1/4 or a turn away from each other. When you tighten the engine oil filter, use the rotation index marks as a guide.

6. 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.

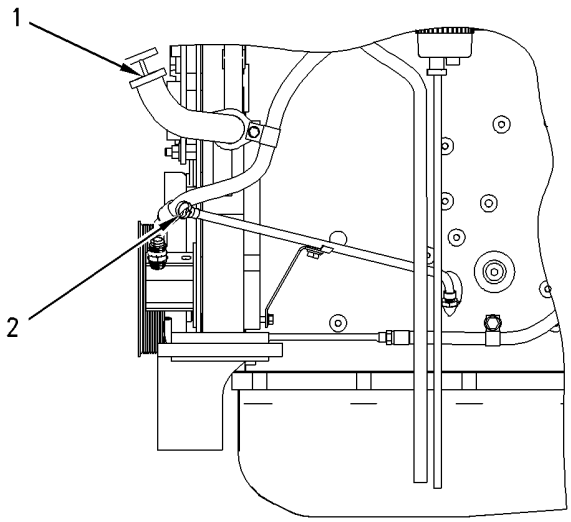

Illustration 227 g00806758

7. Remove oil filler cap (1) on the right side of the engine. Fill the crankcase with new oil.

Reference: Refer to Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the correct type of oil and for the correct amount of oil.

8. Clean the oil filler cap and install the oil filler cap.

9. Start the engine and allow the oil to warm. Check for any oil leaks.

10. Check the oil level on dipstick (2).

Reference: Refer to Operation and Maintenance Manual, “Engine Oil Level - Check” for the correct procedure.

11. Close the engine hood and stop the engine.

i04538255

Engine Valve Lash - Check

SMCS Code: 1105-535

In order to perform the valve lash adjustment, refer to Systems Operation, Testing and Adjusting, “Engine Valve Lash - Inspect/Adjust”.

Note: A qualified mechanic should adjust the engine valve lash because special tools and training are required.

i02770364

Engine Valve Rotators - Inspect

SMCS Code: 1109-040

WARNING

When inspecting the valve rotators, protective glasses or face shield and protective clothing must be worn, to prevent being burned by hot oil or spray.

WARNING

Electrical shock hazard. The electronic unit injector system uses 90-120 volts.

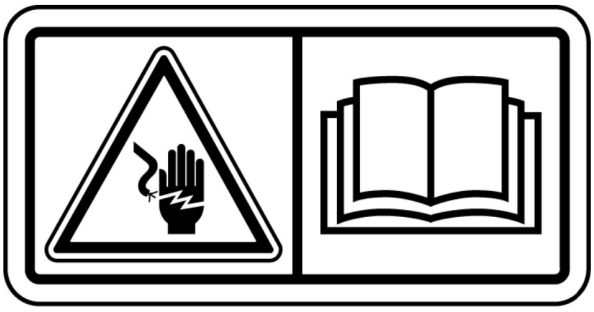

Illustration 228 g01372247

1. Start the engine. Run the engine at low idle.

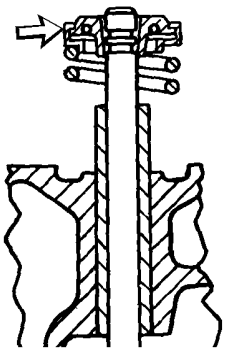

Illustration 229 g00038585

2. Watch the top surface of each valve rotator. Whenever an inlet valve closes or an exhaust valve closes, each valve rotator should turn.

3. If a valve rotator fails to rotate, consult your Caterpillar dealer for service.

Note: Caterpillar recommends replacing valve rotators that are operating improperly. An improperly operating valve rotator will shorten valve life because of accelerated wear on the valves.

Note: If a damaged valve rotator is not replaced, some valve face guttering could result. Metal particles from the valve could fall into the cylinder. This could cause damage to the piston head and to the cylinder head.

i04844134

Ether Starting Aid Cylinder - Replace
(If Equipped)

SMCS Code: 1456-510-CD

i01715517

WARNING

Ether is poisonous and flammable.

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

Use ether only in well ventilated areas.

Do not smoke while changing ether cylinders.

Use ether with care to avoid fires.

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

Do not store ether cylinders in direct sunlight or at temperatures above 49 °C (120 °F).

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

Keep ether cylinders out of the reach of unauthorized personnel.

To avoid possible injury, be sure the brakes are applied and all controls are in HOLD or NEUTRAL when starting the engine.

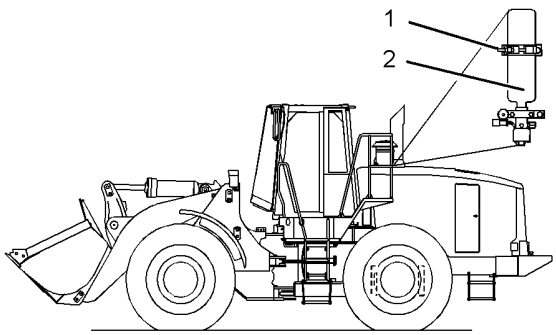

Illustration 230 g02976804

1. Open the access door. The ether starting aid cylinder is mounted on the left side of the machine next to the air cleaner.

2. Loosen retaining clamp (1) and unscrew ether starting aid cylinder (2).

3. Remove the gasket. Install the new gasket that is provided with each new ether starting aid cylinder.

4. Install new ether starting aid cylinder (2) hand tight. Tighten retaining clamp (1) securely.

5. Close the engine hood.

Fuel System - Prime

SMCS Code: 1250-548

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: The volume of the air in the water separator is small. Usually, it is not necessary to prime the fuel system if only the water separator element was changed.

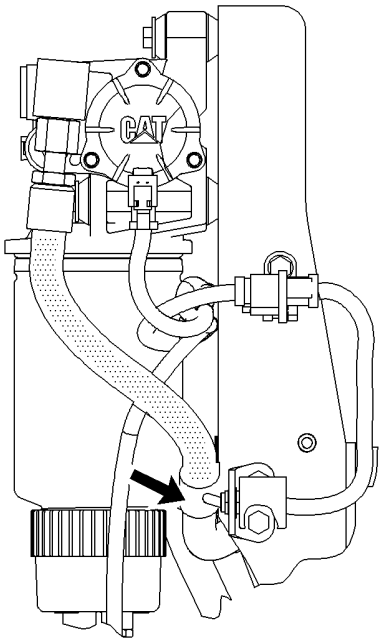

Illustration 231 g00882774

1. Stop the engine and open the engine hood. The fuel priming pump is located above the primary fuel filter on the right side of the machine. This machine is equipped with an electric fuel priming pump. The toggle switch for the pump is located on the filter base. Operate the fuel pump for approximately 60 seconds.

2. Start the engine.

Note: Additional priming may be needed if you are priming because of the following circumstances:

- The engine will not start.
- The engine starts but the engine continues to misfire.
- The engine starts but the engine continues to emit smoke.
- The engine has run out of fuel.
- The fuel injectors have been removed from the engine.

Operate an electric fuel pump for approximately 30 seconds for this additional priming.

i01715535

Fuel System Primary Filter (Water Separator) - Drain

SMCS Code: 1263-543

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.

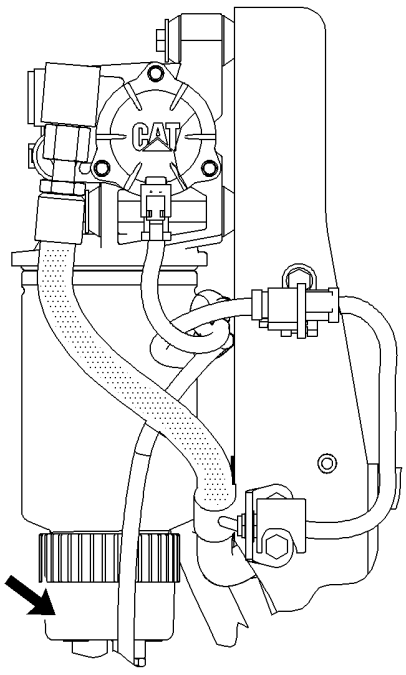

Illustration 232 g00882783

1. Open the engine hood. The water separator is located on the bottom of the primary fuel filter on the right side of the machine.

2. Open the drain valve on the bottom of the water separator bowl. Allow the water and the fuel to drain into a suitable container.

3. Close the drain valve.

Note: The water separator is under suction during normal engine operation. Tighten the drain valve securely in order to prevent air leakage into the fuel system.

4. Close the engine hood.

i02250381

Fuel System Primary Filter (Water Separator) Element - Replace

SMCS Code: 1260-510; 1263-510-FQ

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.

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.

1. Open the engine hood. The primary fuel filter is located on the right side of the machine.

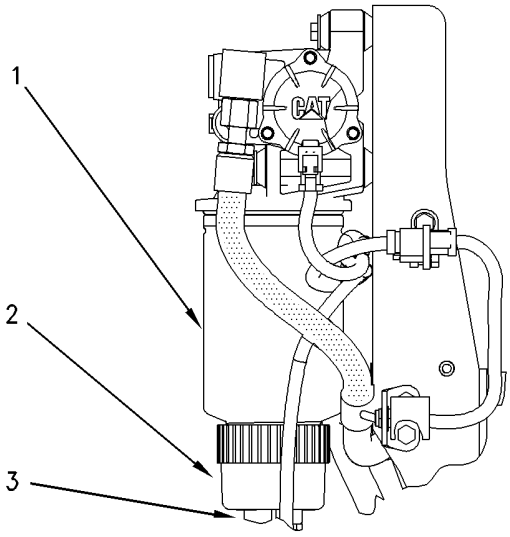

Illustration 233 g00806773

2. Open drain valve (3) on the bottom of water separator bowl (2). Allow the water and the fuel to drain into a suitable container.

3. Use a strap type wrench in order to remove the primary fuel filter (1). Unscrew the sediment bowl from the fuel filter.

4. Clean the water separator bowl and the O-ring groove.

Note: The water separator bowl is reusable. Do not discard the water separator bowl.

5. Inspect the O-ring seal on the water separator bowl. Replace the O-ring seal, if necessary.

6. Lubricate the O-ring seal with clean diesel fuel or with engine oil. Place the O-ring seal in the water separator bowl.

7. Install the water separator bowl onto the new filter element until the filter element is snug.

8. Apply a thin coat of clean diesel fuel to the seal on the new filter. Install the new fuel filter hand tight until the seal of the fuel 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 fuel filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the fuel filter, use the rotation index marks as a guide.

9. 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.

10. Close drain valve (1).

Note: The water separator element is under suction during normal engine operation. Tighten the drain valve securely in order to prevent air leakage into the fuel system.

11. Prime the fuel system in order to fill the water separator element with fuel.

Reference: Refer to Operation and Maintenance Manual, “Fuel System - Prime” for the correct procedure.

12. Close the engine hood.

i02187930

Fuel System Secondary Filter - Replace

SMCS Code: 1261-510-SE

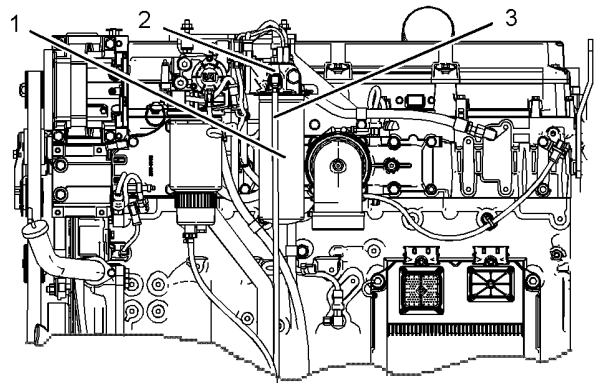

Illustration 234 g01106196

1. Open the hood. Secondary fuel filter (1) is located on the right side of the machine.

2. Open drain valve (2) in order to allow fuel to flow from the filter. The fuel will flow out of hose (3). Catch the fuel in a suitable container and dispose of the fuel properly. Close the drain valve. Remove the fuel filter. Dispose of the used filter properly.

3. Clean the filter mounting base. Make sure that all of the used gasket is removed.

4. Lubricate the seal of a new fuel filter with clean diesel fuel. Install the new fuel filter hand tight until the seal of the fuel 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 fuel filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the fuel 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.

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

6. Prime the fuel system.

Reference: Refer to Operation and Maintenance Manual, “Fuel System - Prime” for the correct procedure.

7. Close the engine hood.

i02877580

Fuel Tank Cap and Strainer - Clean

SMCS Code: 1273-070-Z2; 1273-070-STR

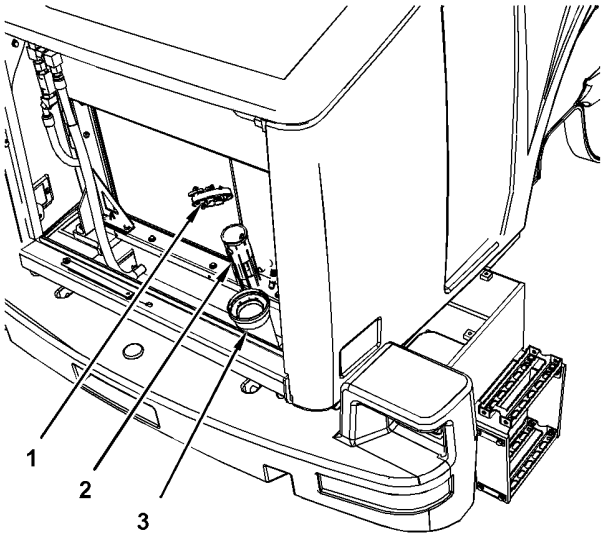

Illustration 235 g01432093

(1) Cap
(2) Strainer
(3) Fuel Tank

Open the rear grill in order to access the fuel tank cap.

1. Remove the fuel tank cap.

2. Inspect the seal for damage. If the seal is damaged, replace the cap.

3. Remove the strainer from the filler tube.

4. Wash the fuel tank cap and the strainer in a clean, nonflammable solvent.

5. Install the strainer.

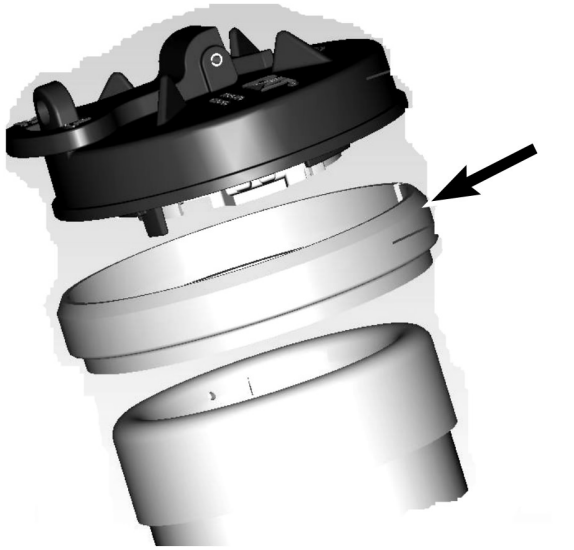

Illustration 236 g01431287

6. Inspect the fuel cap boot(if equipped). If the fuel cap boot is damaged, replace the fuel cap boot. If your machine does not have a fuel cap boot, contact your Caterpillar dealer for information about the fuel cap boot.

7. Wash the fuel cap boot in a clean, nonflammable solvent.

8. Install the fuel cap boot and the fuel tank cap.

i03657251

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 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.

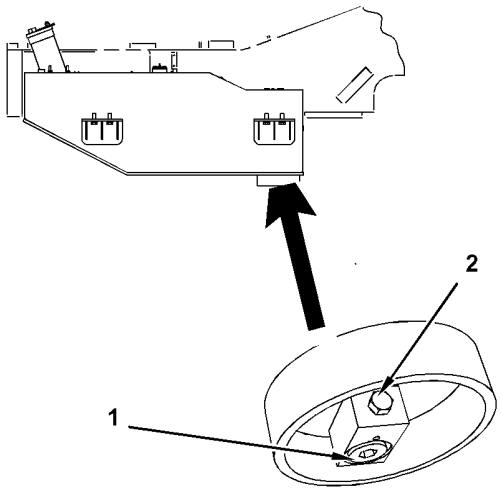

Illustration 237 g01962163

The drain valve is under the fuel tank at the rear of the machine.

1. Loosen the bolt (2) on the side of the drain.

2. Allow the water and the sediment to drain into a suitable container.

3. Tighten the bolt on the side of the drain.

i02200478

Fuses - Replace

SMCS Code: 1417-510

NOTICE
Replace 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.

Fuses – The fuses protect the electrical system from a circuit that has been overloaded. Change a fuse if the element separates. If the element of a new fuse separates, check the circuit. Repair the circuit, if necessary.

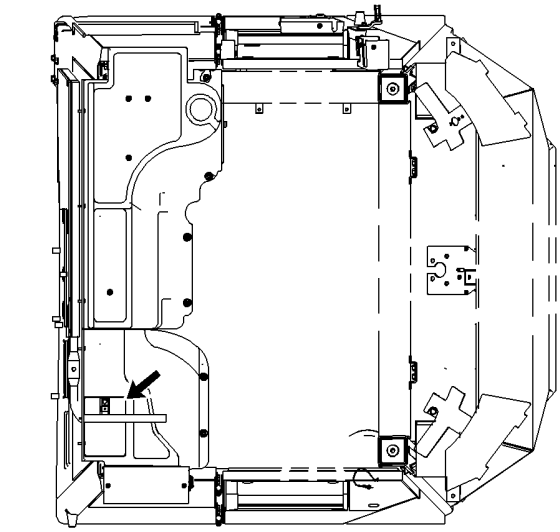

Illustration 238 g01000750

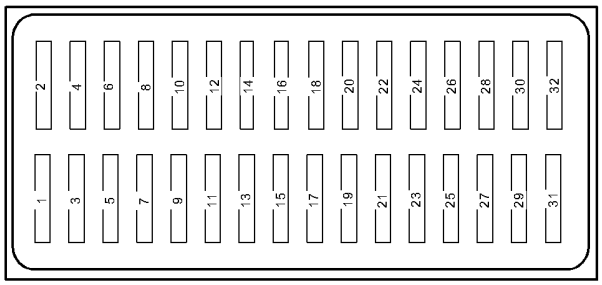

Illustration 239 g01078009

The fuses are located in the cab on the right side of the operator seat.

(1) Axle Oil Cooler Clutch .....20 Amperes

(2) HMU Shift Handle .....10 Amperes

(3) HVAC Blower .....20 Amperes

(4) Quick Coupler .....10 Amperes

(5) Rear Cab Floodlights .....15 Amperes

(6) Spare .....10 Amperes

(7) Secondary Steering .....10 Amperes

(8) ECM Switched Power .....10 Amperes

(9) Front Cab Floodlights .....15 Amperes

(10) Beacon and Heated Mirrors .....10 Amperes

(11) Turn Signal Flasher, Front Flood Relays, and Rear Flood Relays .....10 Amperes

(12) Machine Security System and Product Link ... 10 Amperes

(13) LH Indicator Display and RH Indicator Display .....10 Amperes

(14) Tilt Position Sensor and Lift Position Sensor .....10 Amperes

(15) Lever Sensors and LH Brake Pedal Sensor ... 10 Amperes

(16) Air Seat and Heated Seat .....10 Amperes

(17) EMS, Quad Gauge, Tachometer, and Backlights .....10 Amperes

(18) Wiper and Washer for the Front and the Rear Windows .....10 Amperes

(19) Payload Control System (PCS) .....10 Amperes

(20) Voltage Converter for Radio .....10 Amperes

(21) Voltage Converter Memory (Attachment) ..... 10 Amperes

(22) Engine ECM .....15 Amperes

(23) Transmission ECM .....15 Amperes

(24) Implement ECM .....15 Amperes

(25) ECAP and Center Dash Indicator Display ..... 10 Amperes

(26) LH Tail and Clearance Lights .....10 Amperes

(27) Hood Actuator .....10 Amperes

(28) Stop Lamps .....10 Amperes

(29) Horn .....10 Amperes

(30) Voltage Converter Memory (Standard) ..... 10 Amperes

(31) Key Start Switch and Product Link ..... 10 Amperes

(32) Dome Lamps .....10 Amperes

i02245859

High Intensity Discharge Lamp (HID) - Replace
(If Equipped)

SMCS Code: 1434-510

WARNING

HID lamps operate at very high voltages. To avoid electrical shock and personal injury, disconnect power before servicing HID lamps.

WARNING

HID bulbs become very hot during operation. Before servicing, remove power from lamp for at least five minutes to ensure lamp is cool.

NOTICE
Although HID bulb materials may change over time, HID bulbs produced at the time of the printing of this manual contain mercury. When disposing of this component, or any waste that contains mercury, please use caution and comply with any applicable laws.

1. Remove the electrical power from the high intensity discharge lamp (HID). The electrical power must be removed from the HID lamp for at least five minutes, in order to ensure that the bulb is cool.

2. Disassemble the housing for the HID lamp in order to have access to the bulb.

Note: On some HID lamps, the bulb is an integral part of the lens assembly. The bulb is not removed separately from the lens assembly. Replace the entire lens assembly on these HID lamps.

3. Remove the bulb from the HID lamp.

4. Install the replacement bulb in the HID lamp.

If the bulb is an integral part of the lens assembly, install the replacement lens assembly in the HID lamp.

Note: In order to avoid failure to the bulb that is premature, avoid touching the bulb's surface with your bare hands. Clean any fingerprints from the bulb with alcohol prior to operation.

5. Reassemble the housing for the HID lamp. Ensure that any printing on the lens is oriented correctly with respect to the HID lamp's mounting position on the machine.

6. Reattach the electrical power to the HID lamp.

7. Check the HID lamp for proper operation.

Note: Consult your Caterpillar dealer for additional information on HID lamps.

i04546258

Hood Tilt Actuator - Lubricate

SMCS Code: 7275-086

Wipe all fittings before lubricating.

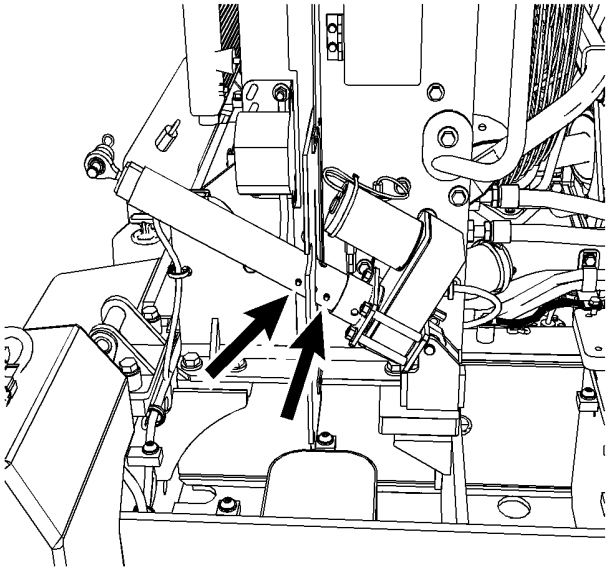

Illustration 240 g02148446
Hood tilt actuator (the hood is removed for clarity)

1. Fully raise the engine hood. The hood tilt actuator is located on the right side at the rear of the machine.

2. Fully extend the cylinder and wipe off the inner post with a clean cloth. Then, lubricate the entire length of the inner post.

3. Wipe off both fittings on the cylinder. Then, apply the lubricant through the two fittings until the lubricant escapes back through each fitting.

4. Fully close the engine hood.

i03657272

Hydraulic System Biodegradable Oil Filter Element - Replace
(If Equipped)

SMCS Code: 5068-510

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.

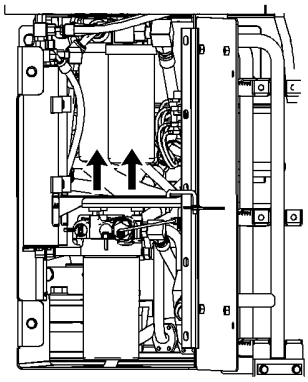

Illustration 241 g01108153

The hydraulic filters are located on the right side of the machine under the platform. There are two hydraulic oil filters. Each filter must be replaced during this procedure.

1. Use a strap type wrench to remove each filter element. Dispose of the used filter elements properly.

2. Clean the filter mounting bases. Make sure that all of the used seals are completely removed.

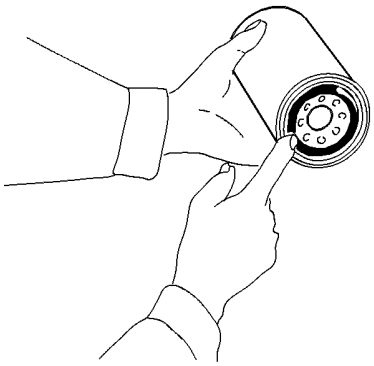

Illustration 242 g00101318

3. Apply a thin coat of hydraulic oil to the seals on the new filters. Install each new hydraulic oil filter hand tight until the seals of the hydraulic oil filters contact each filter base. Note the position of the index marks on each filter in relation to a fixed point on each filter base.

Note: There are rotation index marks on each hydraulic oil filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the hydraulic oil filters, use the rotation index marks as a guide.

4. Tighten each filter according to the instructions that are printed on each 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.

5. Start the engine and run the engine at low idle. Inspect the hydraulic system for leaks.

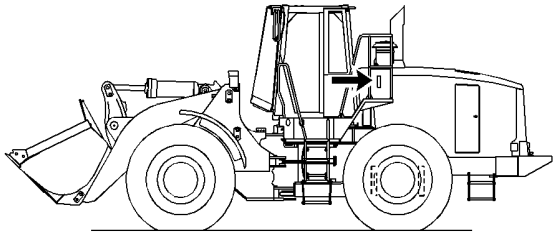

Illustration 243 g01185406

6. Maintain the oil level above the "ADD COLD" mark on the sight gauge. Add hydraulic oil, if necessary.

i03563580

Hydraulic System Oil - Change

SMCS Code: 5056-044

Selection of the Oil Change Interval

Your machine may be able to use a 4000 hour interval for the hydraulic oil. The hydraulic oil is in the system that is not integral to the service brakes, the clutches, the final drives, or the differentials. The standard change interval is 2000 hours. The oil should be monitored during intervals of 500 hours. The extended 4000 hour interval can be used if the following criteria are met.

HYDO Advanced 10

Cat HYDO Advanced 10 is the preferred oil for use in most Caterpillar machine hydraulic and hydrostatic transmission systems when ambient temperature is between −20 °C (−4 °F) and 40 °C (104 °F). Cat HYDO Advanced 10 has an SAE viscosity grade of 10W. **Cat HYDO Advanced 10 has a 50% increase in the standard oil drain interval** (up to 3000 hours) for machine hydraulic systems over second and third choice oils when you follow the maintenance interval schedule for oil filter changes and for oil sampling that is stated in the Operation and Maintenance Manual. 6000 hour oil drain intervals are possible when using S·O·S Services oil analysis. When you switch to Cat HYDO Advanced 10, cross contamination with the previous oil should be kept to less than 10%. Consult your Cat dealer for details about the benefits from the improved performance designed into Cat HYDO Advanced 10 .

Oil Filters

Caterpillar oil filters are recommended. The interval for changing the oil filter should be 500 hours.

Oil

The 6000 hour interval for changing the oil is specific to HYDO Advanced 10 .

The 4000 hour interval for changing the oil is for the following oil types.

- Caterpillar Hydraulic Oil (HYDO)
- Caterpillar Transmission and Drive Train Oil (TDTO)
- Caterpillar TDTO-TMS
- Caterpillar Diesel Engine Oil
- Caterpillar Biodegradable Hydraulic Oils (HEES)
- Caterpillar Multipurpose Tractor Oil (MTO)
- Heavy-duty diesel engine oils with a minimum zinc content of 900 ppm

If Caterpillar oils cannot be used, use heavy-duty oils with the following classification: Caterpillar ECF-1, API CG-4, API CF and TO-4. These oils must have a minimum zinc additive of 0.09 percent (900 ppm).

Note: Industrial hydraulic oils are not recommended in Caterpillar hydraulic systems.

Monitoring the Condition of the Oil

The oil should be monitored during intervals of 500 hours. Caterpillar's standard SOS Fluids Analysis or an equivalent oil sampling program should be used.

The current guidelines for cleanliness of the oil should be observed. Refer to “Measured Data”.

If an oil sampling program is not available, the standard 2000 oil change interval should be used.

Measured Data

The following information should be monitored through sampling of the oil:

- Significant changes in wear metals should be monitored. These metals include iron, copper, chromium, lead, aluminum, and tin.
- Significant changes in the following additives should be monitored: zinc, calcium, magnesium and phosphorus.
- Contaminants should not be present. These contaminants include fuel and antifreeze. Water content should be .5 percent or less.
- The silicon level should not exceed 15 parts per million for new oil. The particle counts should be monitored.
- The recommended level of cleanliness for Caterpillar machines that are operated in the field is ISO 18/15 or cleaner. The cleanliness should be monitored by particle count analysis. The levels of contamination should not exceed the normal by more than two ISO codes. Action should be taken in order to determine the cause of the contamination. The system should be returned to the original levels of contamination.
- There should not be significant changes in sodium, silicon, copper, and potassium.
- The allowable level of oxidation is 40 percent (0.12 Abs units).
- The kinematic viscosity of 100 °C (212 °F) oil should not exceed a change of more than 2 cSt from new oil.

Procedure for Changing the Hydraulic Oil

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 in order to warm the hydraulic oil.
2. Park the machine on level ground. Lower the attachment to the ground and apply slight downward pressure. Engage the parking brake and stop the engine.

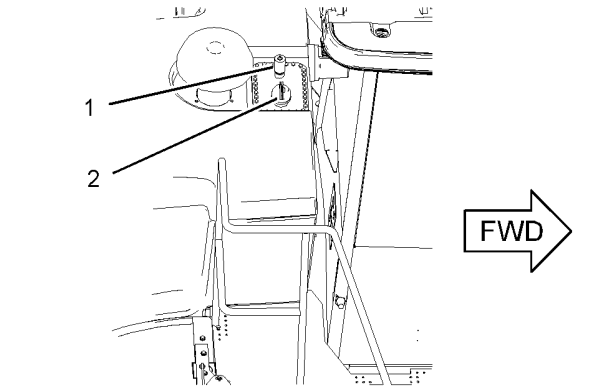

Illustration 244 g01185530

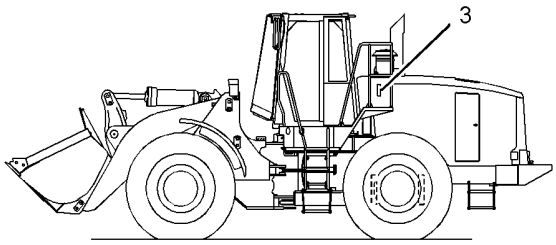

Illustration 245 g01185539

3. The hydraulic tank is behind the cab of the machine. Press the button on breaker relief valve (1) in order to relieve any tank pressure.

4. Remove hydraulic tank filler cap (2) and the filler strainer. The filler strainer is located right beneath the hydraulic tank filler cap. Wash the filler cap and the strainer in a clean, nonflammable solvent. Install the strainer.

5. Inspect the gasket on the hydraulic tank filler cap for damage. Replace the gasket, if necessary.

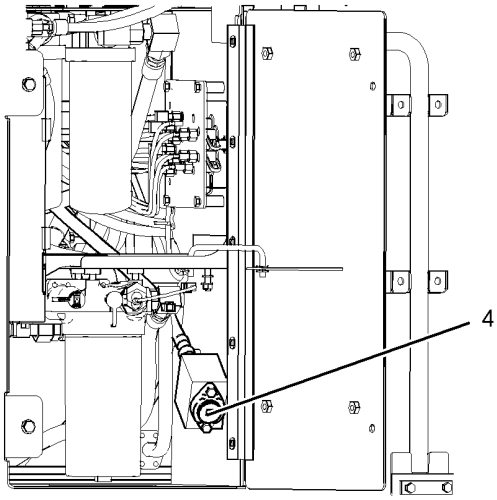

Illustration 246 g01108775

6. The hydraulic tank has a remote drain plug which is located on the right side of the machine under the platform. Remove drain plug (4). Wash the drain plug in a clean, nonflammable solvent.

7. The hydraulic tank is equipped with an ecology drain valve. Attach a hose to a suitable drain adapter. Install the adapter in the drain valve and allow the oil to drain into a suitable container.

8. After you have drained the oil, remove the adapter from the drain opening.

NOTICE
Never start the engine while the hydraulic oil tank is being drained or while the hydraulic oil tank is empty. Excessive wear and damage to the hydraulic components can occur.

9. Close the drain valve. Install the drain plug.

10. Change the hydraulic oil filter.

Reference: Refer to Operation and Maintenance Manual, “Hydraulic System Oil Filter - Replace” for the correct procedure.

11. Fill the hydraulic tank with clean oil. Make sure that the oil level is at the “FULL” mark on sight gauge (3). Install the filler cap.

Reference: Refer to Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the correct type of oil and for the correct amount of oil.

12. Start the engine and run the engine for at least ten seconds. Then, stop the engine and add hydraulic oil to the tank until the oil level is at the "FULL" mark on the sight gauge. Install the filler cap.

13. Start the engine and run the engine at low idle. Cycle the implements so that all hydraulic systems are filled with oil.

Note: If the alert indicator for a low oil level comes on, stop the engine and immediately add oil to the hydraulic tank. The oil level should not be below the suction ports in the hydraulic tank while the engine is running.

14. Add hydraulic oil to the tank until the oil level is at the "FULL" mark on the sight gauge.

15. Stop the engine. Top off the hydraulic tank so that the oil level is at the "FULL" mark on the sight gauge. Install the filler cap.

Note: The oil must be free of air bubbles. If air bubbles are present in the hydraulic oil, air is entering the hydraulic system. Inspect the hydraulic suction line and the hose clamps.

16. If necessary, tighten any loose clamps or any loose connections. Replace any damaged hoses.

i02375329

Hydraulic System Oil Filter - Replace

SMCS Code: 5068-510

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.

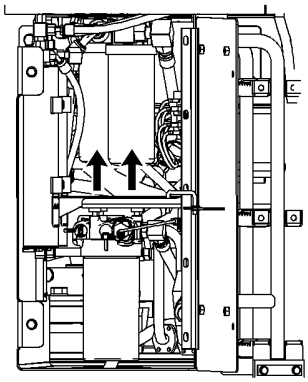

Illustration 247 g01108153

The hydraulic filters are located on the right side of the machine under the platform. There are two hydraulic oil filters. Each filter must be replaced during this procedure.

1. Use a strap type wrench to remove each filter element. Dispose of the used filter elements properly.

2. Clean the filter mounting bases. Make sure that all of the used seals are completely removed.

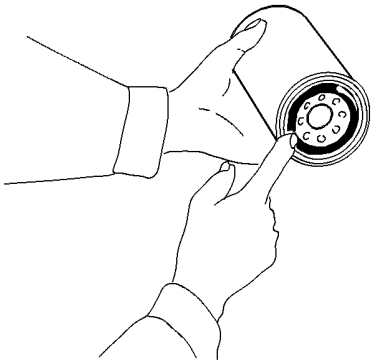

Illustration 248 g00101318

3. Apply a thin coat of hydraulic oil to the seals on the new filters. Install each new hydraulic oil filter hand tight until the seals of the hydraulic oil filters contact each filter base. Note the position of the index marks on each filter in relation to a fixed point on each filter base.

Note: There are rotation index marks on each hydraulic oil filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the hydraulic oil filters, use the rotation index marks as a guide.

4. Tighten each filter according to the instructions that are printed on each filter. Use the index marks as a guide. For non-Caterpillar filters, use the instructions that are provided with the filters.

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.

5. Start the engine and run the engine at low idle. Inspect the hydraulic system for leaks.

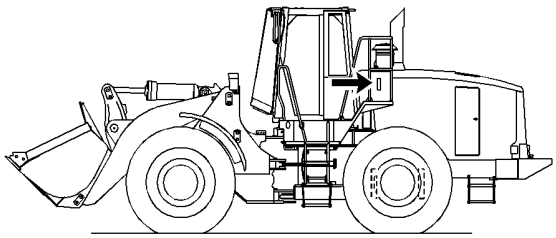

Illustration 249 g01185406

6. The oil gauge and the hydraulic oil filler are on the left side of the machine above the platform. Maintain the oil level above the "ADD COLD" mark on the sight gauge. Add hydraulic oil, if necessary.

i02375341

Hydraulic System Oil Level - Check

SMCS Code: 5056-535-FLV

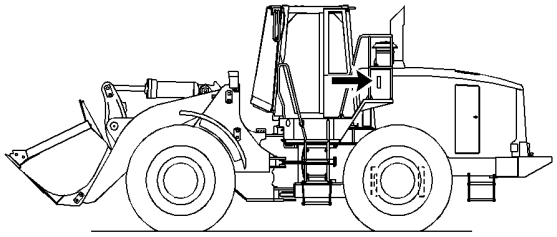

Illustration 250 g01185406

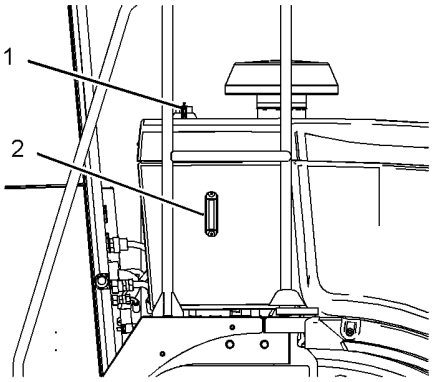

Illustration 251 g01185435

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

The lift arms must be lowered with the bucket flat in order to check the hydraulic oil. Check the hydraulic oil level while the engine is stopped. Maintain the oil level above the "ADD COLD" mark on sight gauge (2). If necessary, remove filler cap (1) slowly and add oil.

i02375351

Hydraulic System Oil Sample - Obtain

SMCS Code: 5050-008; 5056-008; 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.

1. Operate the machine for a few minutes before obtaining the oil sample. Operate the hydraulic controls. This will thoroughly mix the hydraulic oil for a more accurate sample.

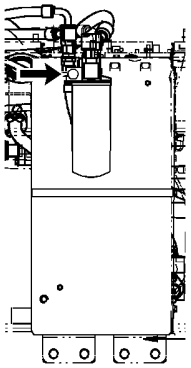

Illustration 252 g01185445

2. If the machine is equipped with conventional oil, open the access door to the service center on the right side of the machine. The hydraulic oil filter is above the shelf. The sampling valve for the hydraulic oil is located on the hydraulic oil filter base.

3. If the machine is equipped with biodegradable hydraulic oil, open the access door to the service center on the right side of the machine. The hydraulic oil filter is above the shelf. The sampling valve for the hydraulic oil is located on the hydraulic oil filter base.

4. Use the in-line sampling valve in order to obtain a sample of hydraulic oil.

5. Close the access door to the service center on the right side of the machine.

Reference: For more information, refer to Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations, “S·O·S Oil Analysis” and Special Publication, PEHP6001, “How To Take A Good Oil Sample”.

i02375419

Hydraulic Tank Breaker Relief Valve - Clean

SMCS Code: 5118-070

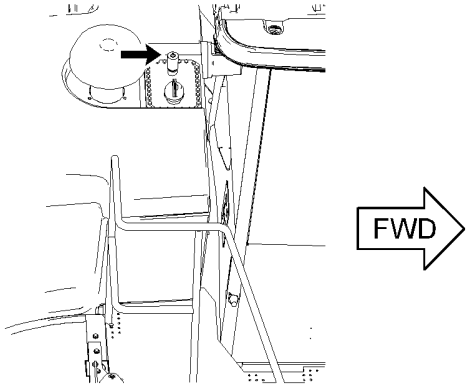

Illustration 253 g01185542

The hydraulic tank breaker relief valve is located on the top of the hydraulic tank behind the cab of the machine.

1. Press the button on the top of the hydraulic breaker in order to relieve the pressure in the hydraulic tank. Remove the hydraulic tank breaker relief valve.

2. Clean the hydraulic tank breaker relief valve in a clean, nonflammable solvent. Shake the breaker relief valve dry or use pressure air to dry the breaker relief valve.

3. Install the hydraulic tank breaker relief valve.

i03657276

Logging Fork Clamp - Lubricate
(If Equipped)

SMCS Code: 6113-086-BD; 6410-086-BD

Wipe off all fittings before any lubricant is applied.

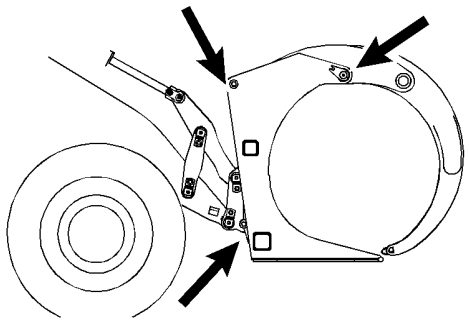

Illustration 254 g01962679

Apply lubricant through three fittings on each side of the logging fork.

There is a total of six fittings.

i02106227

Oil Filter - Inspect

SMCS Code: 1308-507; 3004-507; 3067-507; 5068-507

Inspect a Used Filter for Debris

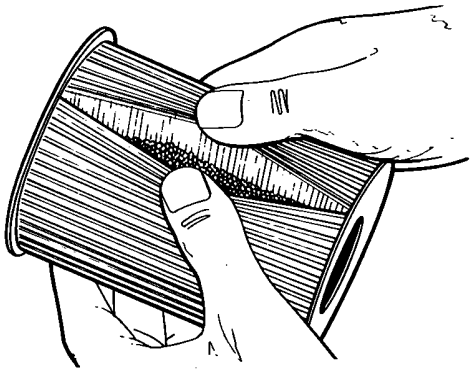

Illustration 255 g00100013

The element is shown with debris.

Use a 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 metals and nonferrous metals.

Ferrous metals can indicate wear on steel parts and on cast iron parts.

Nonferrous metals can indicate wear on the aluminum 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 in order 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.

i04004068

Pallet Fork - Inspect

SMCS Code: 6136-040

Descriptions of the Fork Tine

Parts

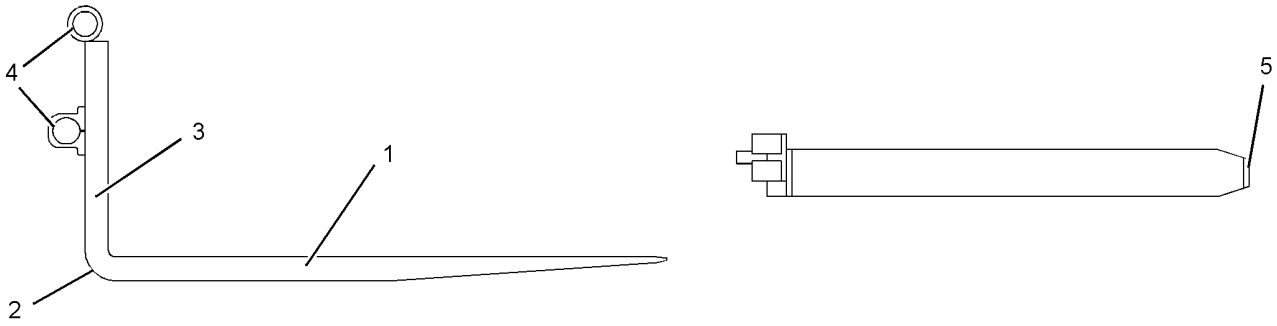

Illustration 256 g01598401

(1) Blade – The horizontal part of the fork tine that supports the load

(2) Heel – The radius on the fork tine that connects the blade to the shank

(3) Shank – The vertical part of the fork tine that has the hooks that support the fork tines attached.

(4) Hook or Hanger – Carriers that mount the fork tines to the carriage

(5) Tip – The free end of the blade

Surfaces

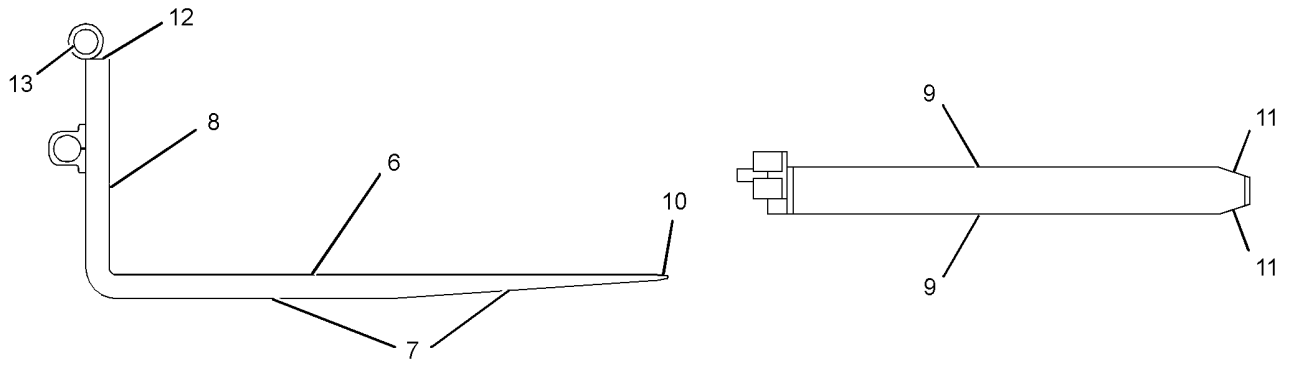

Illustration 257 g01598403

(6) Upper Face of the Blade – The upper surface of the blade that carries the load

(7) Bottom of Heel – The lower surface of the blade that includes the tapers

(8) Front Face of Shank – The distance for the load center is measured from the front face of the shank and the face of the shank contacts the load.

(9)Flanks – The side faces of the blade and the shank.

(10)Blade Bevel – The upper and lower surfaces of the tip on the blade that are tapered for easy insertion of the fork tines

(11)Tip Flanks – The side surfaces of the tip on the blade that are tapered for easy insertion of the fork tines

(12) Top of Shank – The upper surface on the shank

(13) Shaft – The tubes that are mounted on the fork tines for mounting the fork tines to the carriage

Dimensions

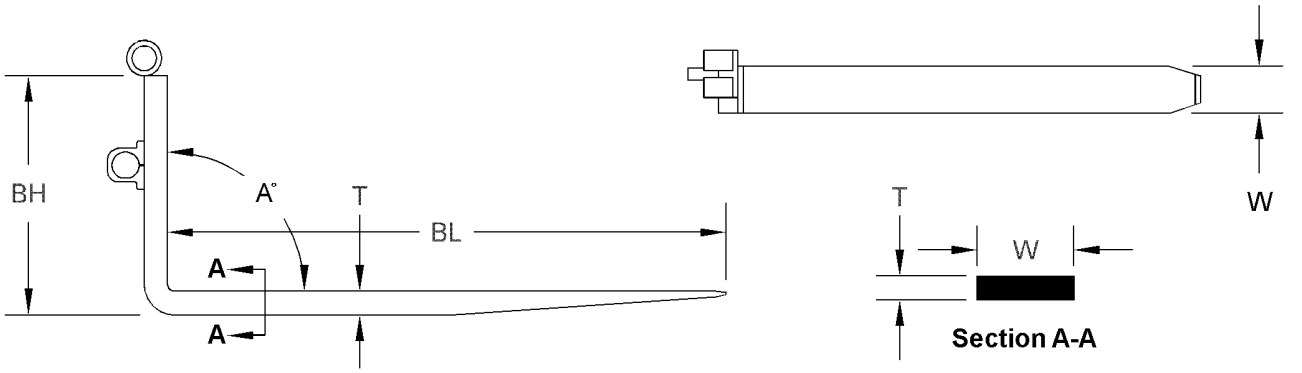

Illustration 258 g01598405

(T) Thickness – The thickness of the blade at the closest point to the heel

(W) Width – The width of the blade at the closest point to the heel

(BH) Back Height – The distance from the bottom of the blade to the top of the shank

(BL) Length – The length of the blade is measured from the front face on the shank to the tip on the blade.

(A) Angle – The angle from the upper surface of the blade to the front face of the shank.

Inspection of the Fork Tines

Check the fork tines daily for any twisting or bending of the fork tines. If any twisting or bending is observed, the fork tines should be changed prior to any lifting operation. If the fork tines are damaged, consult your Cat dealer.

Check the fork tines for wear or for damage. Inspect the welds, the locks, the shafts, and the fork tines for damage. If the components are damaged, consult your Cat dealer. Refer to , “Daily Inspection” for additional information.

Blade Thickness

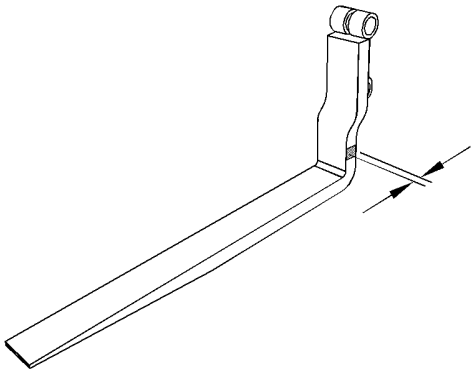

Illustration 259 g01600073

1. Measure the thickness of the shank. Ensure that the measuring device is held square across the shank in order to acquire an accurate measurement.

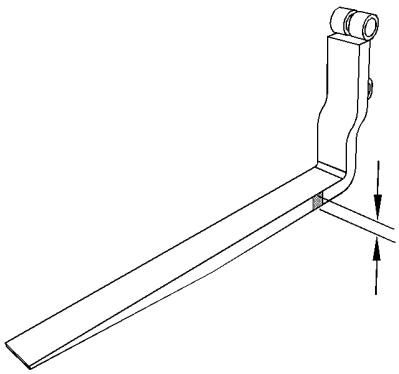

Illustration 260 g01600074

2. Measure the blade of the fork tine near the heel. Ensure that the measuring device is held square across the blade in order to acquire an accurate measurement.
3. Compare the measurement of the blade and the measurement of the shank.
4. If the difference in measurements is less than 10%, the fork tine can remain in service.
5. If the difference in measurements is greater than 10%, the fork tine must be taken out of service. Fork tine wear that is greater than 10%, represents a 20% reduction in the capacity of the fork tine.

Consult your Cat dealer for additional information.

Angle of the Heel

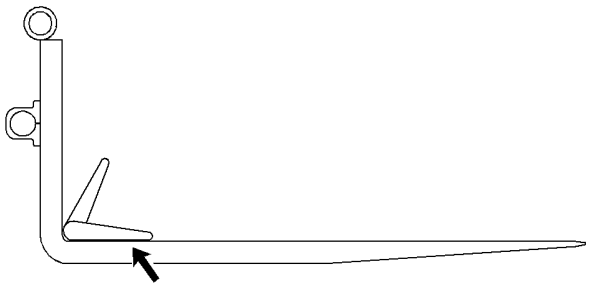

Illustration 261 g01600075

1. Place a measuring device in the top inside area of the heel on top of the blade. Ensure that the measuring device is held flat against the blade in order to acquire an accurate measurement.

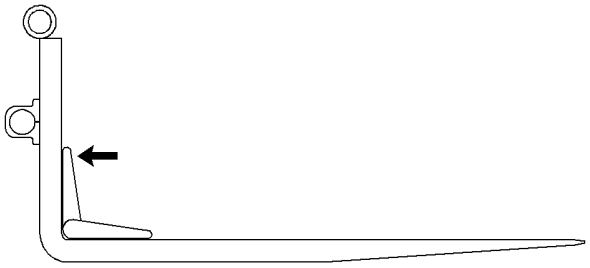

Illustration 262 g01600076

2. Move the upper arm of the measuring device toward the face of the shank. Ensure that the measuring device is held flat against the face of the shank in order to acquire an accurate measurement.
3. Check the angle that was measured with the device for the angle of the heel.
4. If the angle is between 87 degrees and 93 degrees, the fork tine can remain in service.
5. If the angle is less than 87 degrees or greater than 93 degrees, the fork tine must be taken out of service. The fork tines must be inspected for the following conditions:
   - permanent deformation
   - stress cracks
   - other defects

Consult your Cat dealer for additional information.

i03082842

Pallet Fork - Lubricate

SMCS Code: 6136-086

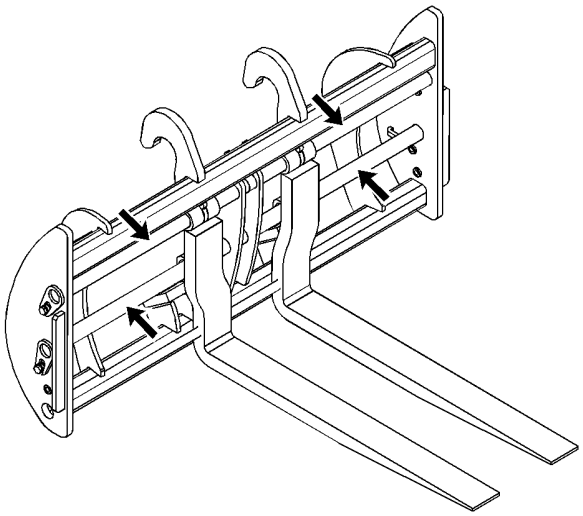

Illustration 263 g01563105
typical example

1. Coat the shafts with grease.

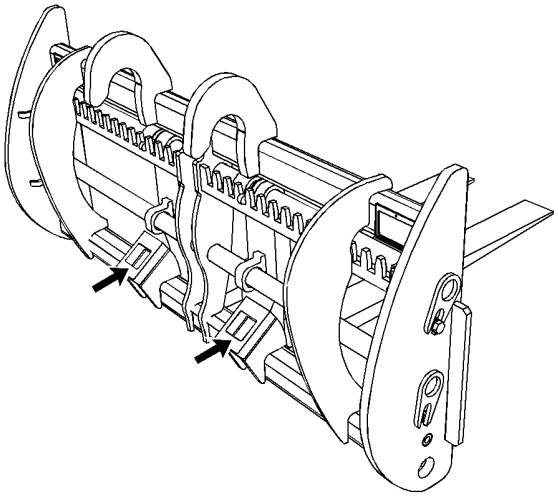

Illustration 264 g01563115
typical example

2. Coat the mounting holes for the quick coupler with grease.

Reference: Refer to Operation and Maintenance Manual , SEBU6250, Caterpillar Machine Lubricant Recommendations for information on lubricants.

i03657277

Quick Coupler - Check (If Equipped)

SMCS Code: 6129-535

When you install a work tool on the quick coupler, inspect the engagement of the coupler pins. If there is play between the coupler pins and the corresponding bores, inspect the coupler pins and the bores for damage or wear.

If there is play between the quick coupler and the hooks of the work tool, inspect the quick coupler and the hooks for wear or for damage.

Make any necessary repairs before you operate the work tool.

i03657285

Quick Coupler - Lubricate (If Equipped)

SMCS Code: 6129-086

Note: Refer to Operation and Maintenance Manual, “Lubricant Viscosities” for more information on the types of grease to use. Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for more information on grease.

Wipe off all lubricant fittings before you apply lubricant through the lubricant fittings.

Do not lubricate the wedge and the wear plates. Friction is needed in order to hold the wedge in place during backfilling.

i04039311

Radiator Core - Clean

SMCS Code: 1353-070-KO

Ensure that the engine is off before you perform this procedure.

1. Open the radiator grill at the rear of the machine.

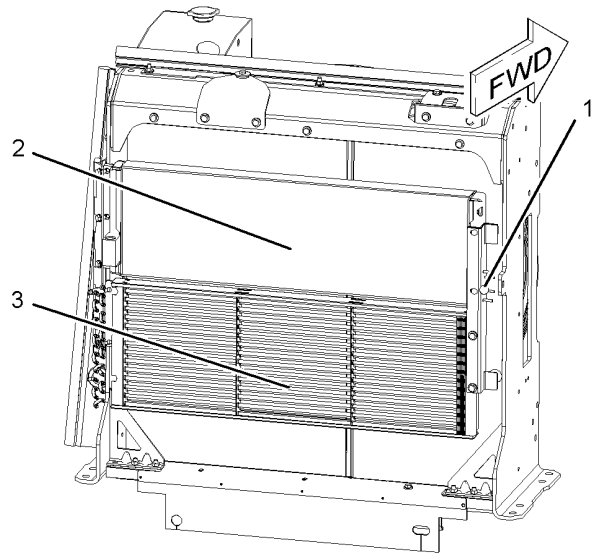

Illustration 265 g01107157

2. Use the control knob (1) in order to release the hydraulic oil cooler. Swing hydraulic oil cooler (2) and condenser (3) away from the radiator.

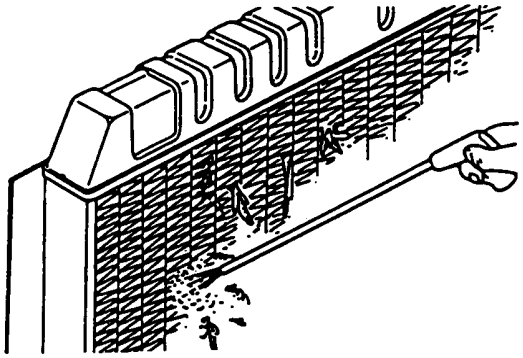

Illustration 266 g00101939

3. You can use compressed air, high-pressure water, or steam to remove dust and other debris from the radiator fins. The maximum air pressure for cleaning purposes must be reduced to 205 kPa (30 psi). The maximum water pressure for cleaning purposes must be below 275 kPa (40 psi). However, the use of compressed air is preferred. Refer to Operation and Maintenance Manual, “General Hazard Information” for Safety information about using pressurized air and water.

4. Swing the hydraulic oil cooler and the air conditioner condenser (if equipped) back into the operating position.

5. Close the radiator grill.

i02894326

Receiver Dryer (Refrigerant) - Replace

SMCS Code: 7322-510

⚠ 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.

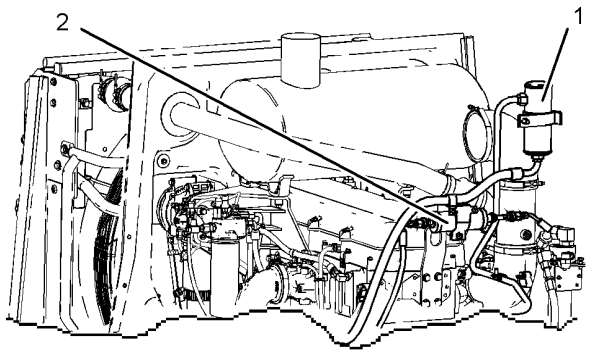

Illustration 267 g01107270

(1) Refrigerant accumulator
(2) Refrigerant dryer

Access refrigerant accumulator (1) from the left side of the machine. Access in-line refrigerant dryer (2) from the right side of the machine.

Refer to Service Manual, SENR5664, “Refrigerant Accumulator - Remove and Install” for the replacement procedure of accumulator (1).

Refer to Service Manual, SENR5664, “In-Line Refrigerant Dryer - Remove and Install” for the replacement procedure of refrigerant dryer (2).

Note: When you operate the machine in a climate with high humidity, replace the in-line refrigerant dryer after every 1000 service hours or 6 months.

i02747279

Ride Control Accumulator - Check

SMCS Code: 5077-535-R6

Note: When the ride control accumulator is properly charged, the bouncing motion of the machine is reduced by the ride control accumulator.

1. Put a typical load in the bucket.

2. Press the bottom of the ride control switch in order to activate the ride control function.

3. Drive the machine over a rough road surface.

If the machine bounces too much or the accumulator piston striking the stop can be heard, consult your Caterpillar dealer or refer to Service Manual Testing and Adjusting, “Ride Control Accumulator - Test and Charge”.

i03657286

Roading Fender Hinges - Lubricate
(If Equipped)

SMCS Code: 7252-086-RNG

Wipe off the fitting before any lubricant is applied.

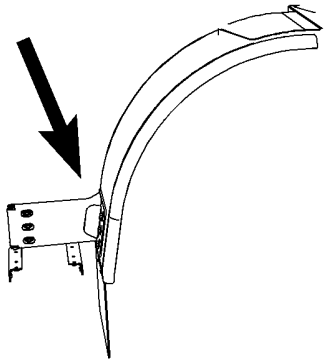

Illustration 268 g01963400

Open the roading fender. Apply lubricant through one fitting on the hinge. There is one hinge on each side of the machine.

i01457460

Rollover Protective Structure (ROPS) - Inspect

SMCS Code: 7323-040; 7325-040

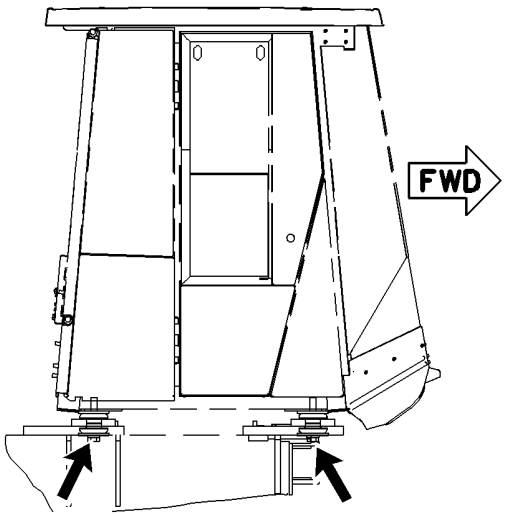

Illustration 269 g00762107

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 four cab mounting bolts to a torque of 850 ± 100 N·m (629 ± 74 lb ft).

Note: Apply oil to all bolt threads before installation. Failure to apply oil can result in improper bolt torque.

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 in any metal section of the ROPS.

i04423622

Seat Belt - Inspect

SMCS Code: 7327-040

Always inspect 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.

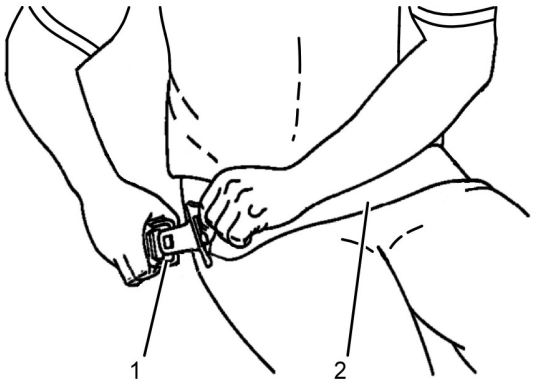

Illustration 270 g02620101

Typical example

Inspect buckle (1) for wear or for damage. If the buckle is worn or damaged, replace the seat belt.

Inspect seat belt (2) for webbing that is worn or frayed. Replace the seat belt if the webbing is worn or frayed.

Inspect all seat belt mounting hardware for wear or for damage. Replace any mounting hardware that is worn or damaged. Make sure that the mounting bolts are tight.

If your machine is equipped with a seat belt extension, also perform this inspection procedure for the seat belt extension.

Contact your Cat dealer for the replacement of the seat belt and the mounting hardware.

Note: The seat belt should be replaced within 3 years of the date of installation. A date of installation label is attached to the seat belt retractor and buckle. If the date of installation label is missing, replace belt within 3 years from the year of manufacture as indicated on belt webbing label, buckle housing, or installation tags (non-retractable belts).

i04421974

Seat Belt - Replace

SMCS Code: 7327-510

The seat belt should be replaced within 3 years of the date of installation. A date of installation label is attached to the seat belt retractor and buckle. If the date of installation label is missing, replace belt within 3 years from the year of manufacture as indicated on belt webbing label, buckle housing, or installation tags (non-retractable belts).

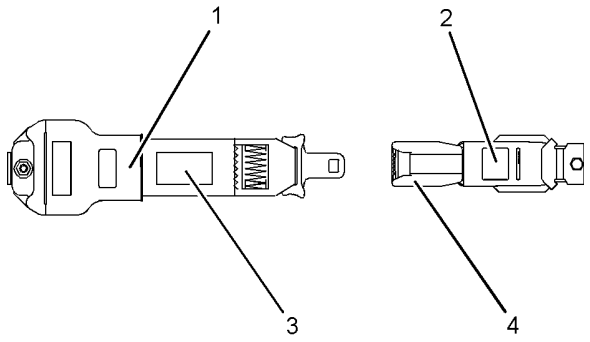

Illustration 271 g01152685

Typical Example

(1) Date of installation (retractor)
(2) Date of installation (buckle)
(3) Year of manufacture (tag) (fully extended Web)
(4) Year of manufacture (underside) (buckle)

Consult your Cat dealer for the replacement of the seat belt and the mounting hardware.

Determine age of new seat belt before installing on seat. A manufacture label is on belt webbing and imprinted on belt buckle. Do not exceed install by date on label.

Complete seat belt system should be installed with new mounting hardware.

Date of installation labels should be marked and affixed to the seat belt retractor and buckle.

Note: Date of installation labels should be permanently marked by punch (retractable belt) or stamp (non-retractable belt).

If your machine is equipped with a seat belt extension, also perform this replacement procedure for the seat belt extension.

i03694709

Secondary Steering - Test

SMCS Code: 4300-081-SE; 4300-081-SST; 4324-081; 4324

⚠ WARNING

The service brake must be checked in order to ensure proper operation before you test the supplemental steering system.

Personal injury, death, or property damage could occur if the supplemental steering system is tested and the service brake is not operational.

Test the service brake before you test the supplemental steering system.

Perform the following procedure if your machine is equipped with a ground driven supplemental steering and if the procedure is required by local regulations.

Ensure that there are no hazards in the test area. The test area must be unobstructed and level. Operate the machine in second gear.

Ensure that all air tanks and accumulators are properly charged. Ensure that there is no load in the work tool. Position the machine with the bucket or the work tool in the CARRY position with the machine in neutral. Release the parking brake. Apply the service brakes and put the engine at low idle. Ensure that The area around the machine is clear of personnel. Shift the transmission to second gear forward and slowly release the service brakes. Moderately increase the engine speed to high idle. Shift the transmission to neutral. Turn the ignition to the OFF position. Allow the machine to coast.

While the machine is in motion, turn the machine to the left and to the right. If the machine responds to the steering input, the supplemental steering system is operating. Stop the machine with the service brakes. Apply the parking brake. The machine can then be returned to normal operation.

If there is no response to the steering input, the supplemental steering system is not operating. Stop the machine immediately. Repair the supplemental steering system before returning the machine to service.

i02197967

Service Brake Wear Indicator - Check

SMCS Code: 4255-535-IND

Reference: For information about checking the service brake wear indicator, refer to Testing and Adjusting, “Braking System” for the machine that is being serviced or consult your Caterpillar dealer.

i02837395

Steering Column Play - Check

SMCS Code: 4310-535; 4338-535

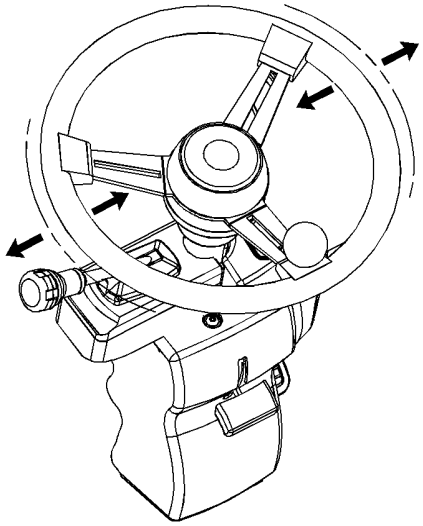

Illustration 272 g01411297

1. Hold the steering wheel with both hands.
2. Try to move the steering wheel from one side to the other side. The maximum allowed movement in the steering column should not exceed 25 mm (1.0 inch). If this movement exceeds this value please contact your Caterpillar dealer for the required service.

i02585698

Steering Column Spline (Command Control Steering) - Lubricate

SMCS Code: 4310-086-SN; 4338-086-SN

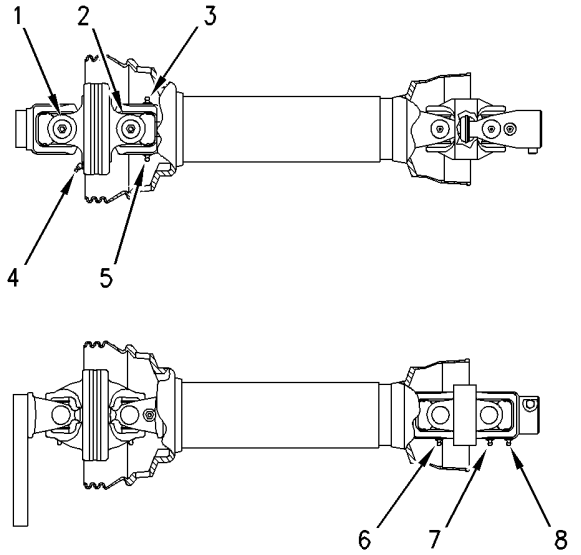

Illustration 273 g00812993

1. Remove the steering shaft from the machine.

Reference: Refer to Disassembly and Assembly Manual for the removal procedure and for the installation procedure.

2. Wipe off all of the fittings before any lubricant is applied.

3. Refer to Operation and Maintenance Manual, “Lubricant Viscosities”for the proper grease to use. Apply the grease through fittings (1), (2), (3), (4), (5), (6), (7), and (8).

4. Install the steering shaft on the machine.

i03657300

Steering Column Spline (HMU Steering) - Lubricate

SMCS Code: 4310-086-SN; 4338-086-SN

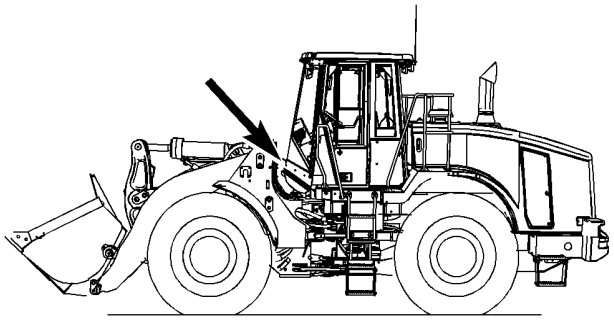

Illustration 274 g01962195

The metering pump is located under the cab.

WARNING

Crushing Hazard. Connect the steering frame lock between front and rear frames before servicing the machine in the articulation area. Disconnect the steering frame lock and secure it in the stored position before resuming operation. Failure to do so could result in serious injury or death.

Refer to Operation and Maintenance Manual“Steering Frame Lock”..... before entering the articulation joint.

Note: Do not disconnect any hydraulic lines from the metering pump.

Use the following steps to lubricate the splines on the steering column:

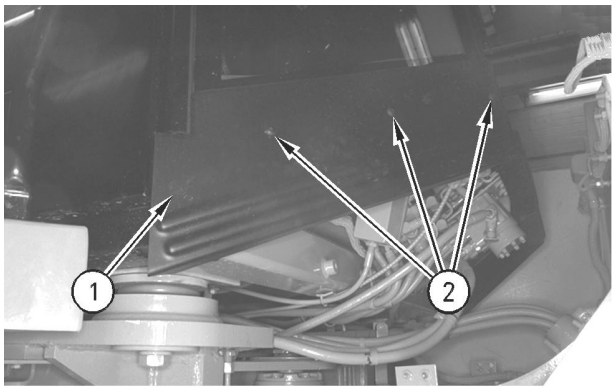

Illustration 275 g01294342

(1) Panel
(2) Bolts

1. Remove five bolts (2) and panel (1) from each side of the machine.

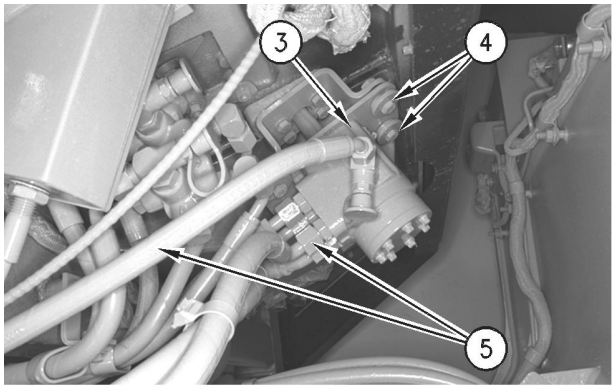

Illustration 276 g01294346

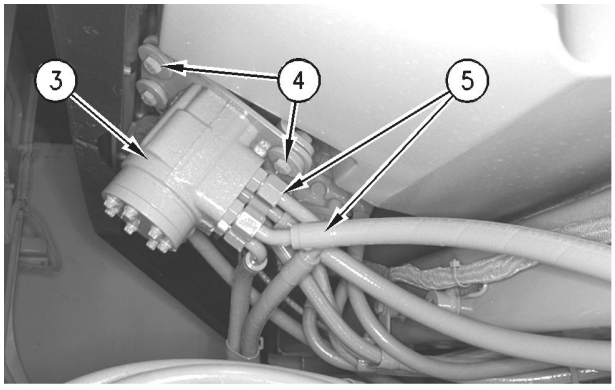

Illustration 277 g01294352

2. Support the metering pump (3). Do not loosen the hose couplings (5).

3. Loosen the four bolts (4) that hold the pump.

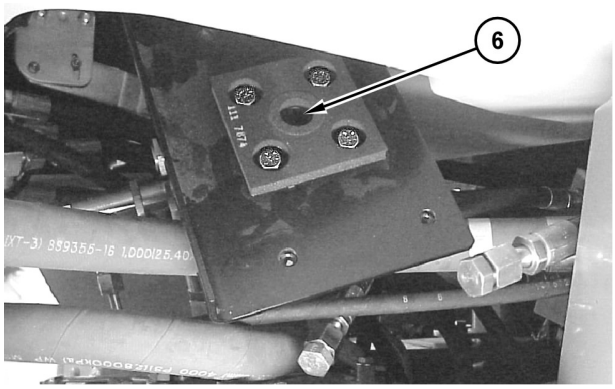

Illustration 278 g01294357

4. Lower the pump in order to expose the splines (6).

5. Clean the male splines on the steering column. Clean the female splines in the pump.

6. Apply proper grease to the splines. Refer to Operation and Maintenance Manual“Lubricant Viscosities” ..... for selecting the proper grease.

7. Push the pump into position.

8. Tighten the four bolts that hold the pump.

9. Test the steering system.

i05262162

Steering Cylinder Bearings - Lubricate

SMCS Code: 4303-086-BD

⚠ WARNING

Crushing Hazard. Connect the steering frame lock between front and rear frames before servicing the machine in the articulation area. Disconnect the steering frame lock and secure it in the stored position before resuming operation. Failure to do so could result in serious injury or death.

Refer to Operation and Maintenance Manual“Steering Frame Lock”..... before entering the articulation joint.

⚠ WARNING

Crushing Hazard. Insure that the machine ignition switch is in the OFF position and that the parking brake is engaged before entering the articulation area. Failure to do so could result in serious injury or death.

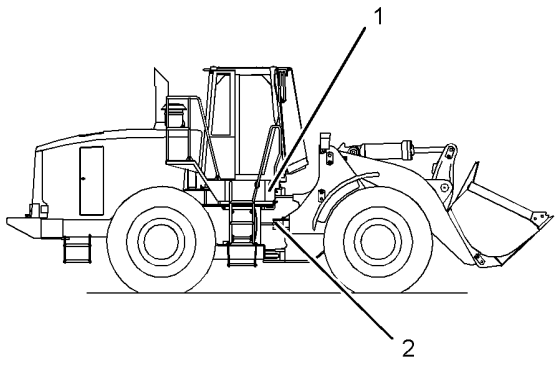

Illustration 279 g01105600

(1) Remote location of the grease fittings for the head ends

(2) Location of the grease fittings for the rod ends

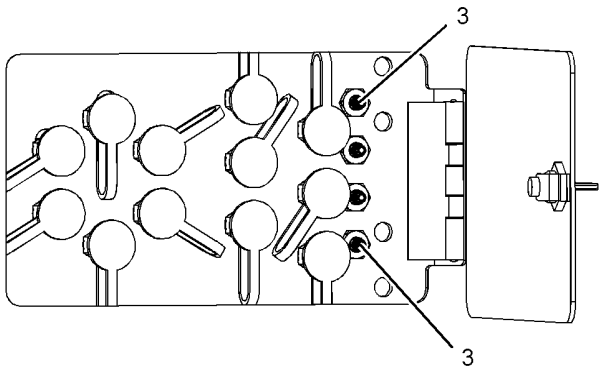

Illustration 280 g03349999

Remote location of the grease fittings for the rod ends

Wipe off the fittings before any lubricant is applied. The rod end of the steering cylinders are lubricated by using standard grease fittings (2).

The head ends of the steering cylinders are lubricated by using remote grease fittings (3) that are located on the right side of the machine in front of the steps.

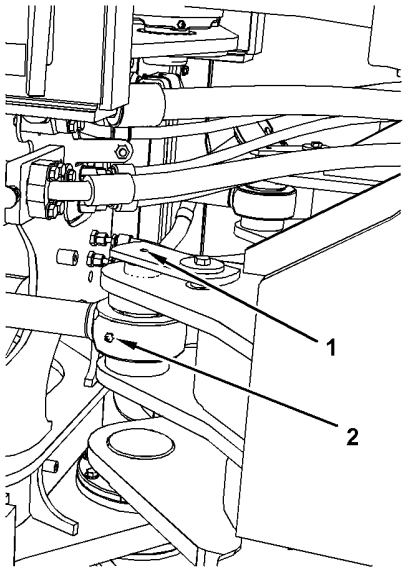

Illustration 281 g03349973

(1) Location of the grease fitting for the rod ends (If equipped)
(2) Location of the grease fitting for the rod ends

The rod ends of the steering cylinders are lubricated by grease fittings on the cylinder (2). Some machines may have an additional fitting on the steering pin (1) which require service.

i05121573

Steering Pilot Oil Screen (Command Control Steering) - Clean/Replace
(If Equipped)

SMCS Code: 4304-070-Z3; 4304-510-Z3

⚠ WARNING

Crushing Hazard. Connect the steering frame lock between front and rear frames before servicing the machine in the articulation area. Disconnect the steering frame lock and secure it in the stored position before resuming operation. Failure to do so could result in serious injury or death.

Refer to Operation and Maintenance Manual“Steering Frame Lock”..... before entering the articulation joint.

⚠ WARNING

Personal injury can result from working with cleaning solvent.

Because of the volatile nature of many cleaning solvents, extreme caution must be exercised when using them. If unsure about a particular cleaning fluid, refer to the manufacturer's instructions and directions.

Always wear protective clothing and eye protection when working with cleaning solvents.

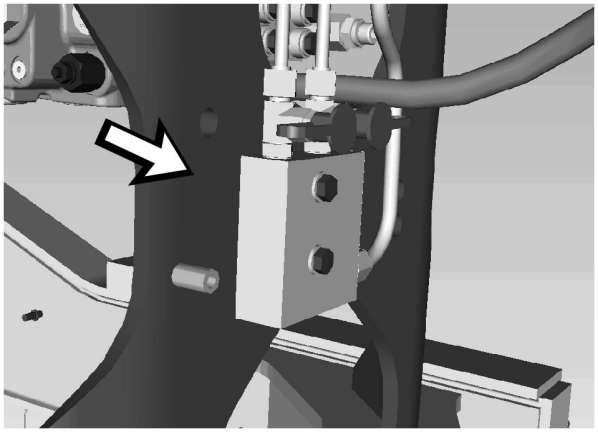

Illustration 282 g03282677

The screen group for the steering oil is located in the articulation joint near the steering neutralizer valve on the right side.

1. Disconnect hoses that are connected to the screen group .
2. Remove the two connectors that are attached to the block.
3. Use an allen wrench in order to remove the two screens from screen group .
4. Wash the screens in a clean, nonflammable solvent.
5. Dry each screen with pressure air. Inspect each screen for damage. Replace the screen if the screen is damaged.
6. Install the screens. Install the connectors and connect the hoses.

i03657340

Steering Pilot Oil Screen (Command Control Steering) - Clean/Replace
(If Equipped)

SMCS Code: 4304-070-Z3; 4304-510-Z3

S/N: GTA1–Up

S/N: LCC1–Up

S/N: A7D1–Up

S/N: RYF1–Up

S/N: A6G1–Up

S/N: A7G1–Up

S/N: A6J1–Up

S/N: A7J1–Up

S/N: TAL1–Up

⚠ WARNING

Crushing Hazard. Connect the steering frame lock between front and rear frames before servicing the machine in the articulation area. Disconnect the steering frame lock and secure it in the stored position before resuming operation. Failure to do so could result in serious injury or death.

Refer to Operation and Maintenance Manual“Steering Frame Lock”..... before entering the articulation joint.

⚠ WARNING

Personal injury can result from working with cleaning solvent.

Because of the volatile nature of many cleaning solvents, extreme caution must be exercised when using them. If unsure about a particular cleaning fluid, refer to the manufacturer's instructions and directions.

Always wear protective clothing and eye protection when working with cleaning solvents.

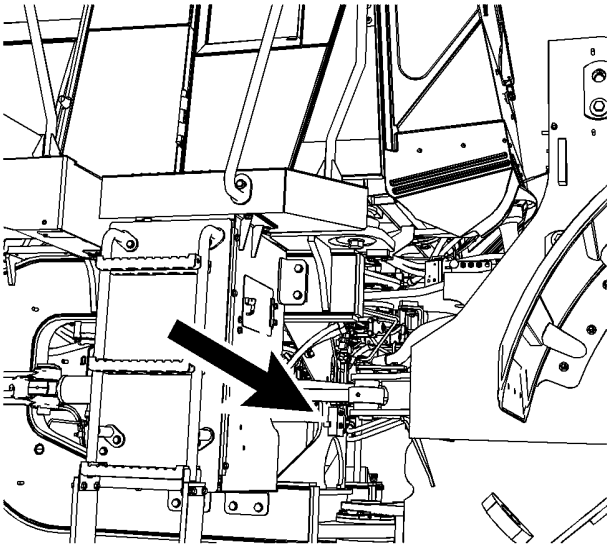

Illustration 283 g01962461

The screen group (3) is located behind the cab.

1. Disconnect hoses (1) and (2) that are connected to the screen group (3).
2. Remove the two connectors that are attached to the block.
3. Use an allen wrench in order to remove the two screens from screen group (3).
4. Wash the screens in a clean, nonflammable solvent.
5. Dry each screen with pressure air. Inspect each screen for damage. Replace the screen if the screen is damaged.
6. Install the screens. Install the connectors and connect the hoses.

i02305841

Tire Inflation - Check

SMCS Code: 4203-535-AI

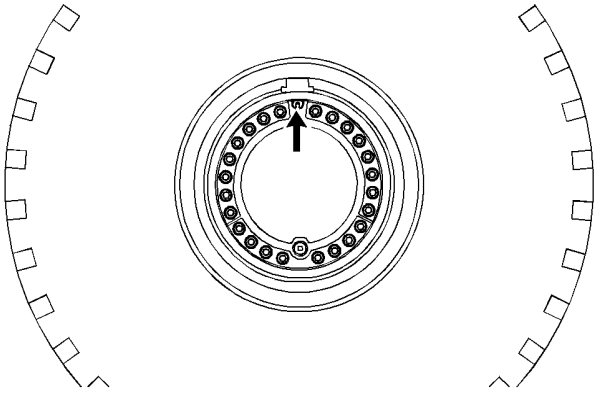

Illustration 284 g01160201

Always obtain proper tire inflation pressures and maintenance recommendations for the tires on your machine from your tire supplier. Measure the tire pressure on each tire.

Inflate the tires with nitrogen , if necessary.

Reference: Refer to the “Tire Inflation Information” section of the Operation and Maintenance Manual for more information.

i02189470

Transmission Oil - Change

SMCS Code: 3030-044

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.

1. Operate the engine in order to warm the transmission oil. Park the machine on level ground. Lower the bucket and apply slight downward pressure.
2. Engage the parking brake. Stop the engine.

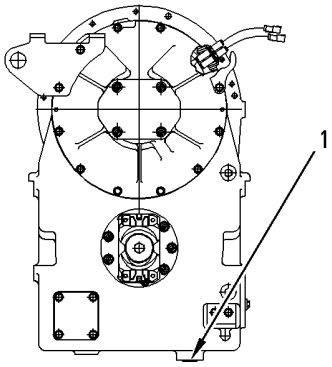

Illustration 285 g01002772

3. Remove drain plug (1) on the bottom of the transfer case.

4. Change the transmission oil filter.

Reference: Refer to Operation and Maintenance Manual, “Transmission Oil Filter - Replace” for the correct procedure.

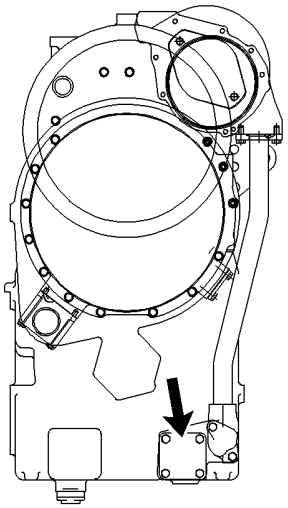

Illustration 286 g00884724

5. The magnetic strainer is on the right rear side of the transfer case. Remove the four bolts, the cover and the seal that holds the magnets and the screen in place.

6. Remove the screen and the magnets from the transfer case housing.

7. Wash the screen in a clean, nonflammable solvent. Use a bristle brush or pressure air to clean the screen. Clean the magnets. Replace any damaged magnets.

8. Clean the cover. Inspect the cover seal. Replace the cover seal if the seal is damaged.

9. Insert the magnets and the screen into the transfer case housing. Install the seal, the cover and the four bolts.

10. Clean the transmission oil drain plug and install the transmission oil drain plug.

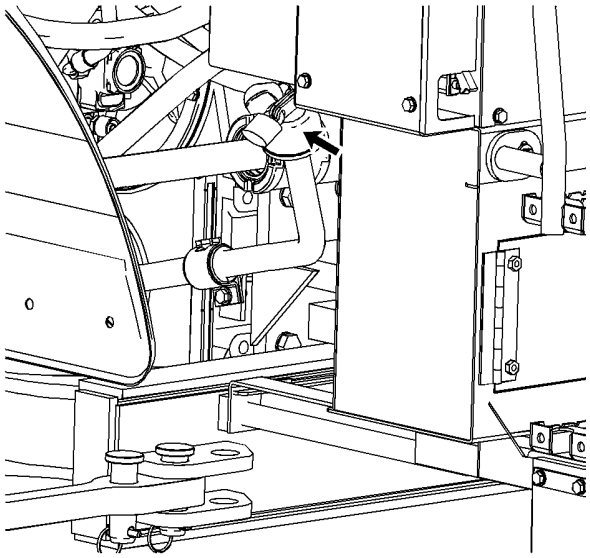

Illustration 287 g01106816

11. Remove the oil filler cap on the left side of the machine and fill the transmission with oil.

Reference: Refer to Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the type of lubricant and for the refill capacity.

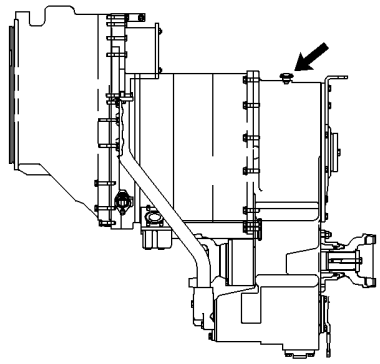

Illustration 288 g01002778

12. Remove the breather from the top of the transfer case. Wash the breather in a clean, nonflammable solvent. Install the breather.

13. Start and run the engine at low idle. Inspect the machine for leaks. Slowly operate the transmission controls in order to circulate the transmission oil.

14. Check the transmission oil level.

Reference: Refer to Operation and Maintenance Manual, “Transmission Oil Level - Check” for the correct procedure.

i02194865

Transmission Oil Filter - Replace

SMCS Code: 3004-510; 3067-510

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.

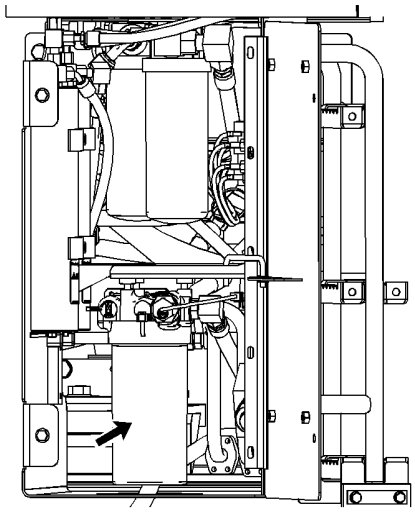

Illustration 289 g01108389

The transmission oil filter is located on the right side of the machine under the platform.

1. Operate the machine in order to warm the oil. Park the machine on level ground. Lower the bucket to the ground and apply slight downward pressure.

2. Engage the parking brake and stop the engine.

3. Open the access panel.

4. Remove the filter housing drain plug and allow the oil in the filter to drain into a suitable container.

5. Use a strap type wrench to remove the filter housing.

6. Remove the used filter element. Dispose of the used filter element properly.

7. Clean the filter housing and the filter housing base with a clean, nonflammable solvent.

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

9. Install the new filter element into the transmission filter housing. Clean the filter housing drain plug and install the drain plug.

10. Start the engine. Slowly operate the transmission controls in order to circulate the transmission oil. Check the machine for oil leaks.

11. Check the transmission oil level.

Reference: Refer to Operation and Maintenance Manual, “Transmission Oil Level - Check” for the correct procedure.

i01468938

Transmission Oil Level - Check

SMCS Code: 3030-535-FLV

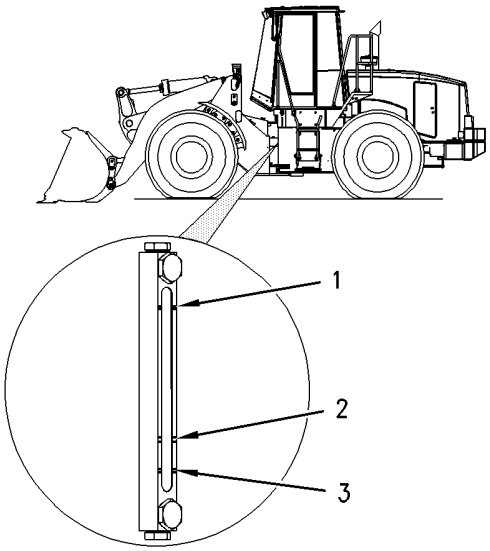

Illustration 290 g00766406

The sight gauge for the transmission oil level is located on the left side of the machine near the articulation joint.

1. Operate the machine for a few minutes in order to warm the transmission oil.
2. Park the machine on a hard, level surface. Put the transmission control into the NEUTRAL position. Lower the bucket to the ground with a slight downward pressure. Engage the parking brake.

Note: Before the machine is started, the transmission oil level should be above “MIN START” mark (1) on the upper end of the sight gauge.

3. Check the oil level while the engine is running at low idle.

   While the engine is running at low idle, the transmission oil level should be between the “MIN” mark (3) and the “MAX” mark (2).

4. If necessary, remove the filler cap and add oil.

i02195036

Transmission Oil Sample - Obtain

SMCS Code: 3080-008; 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 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.

1. Operate the machine for a few minutes before obtaining the oil sample. This will thoroughly mix the transmission oil for a more accurate sample.

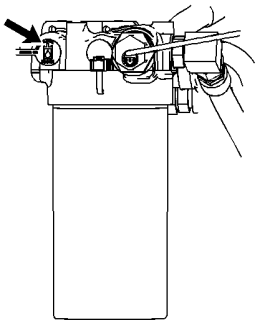

Illustration 291 g01108497

2. The sampling valve for the transmission oil is located on the transmission oil filter base on the right side of the machine under the platform. Use the in-line sampling valve in order to obtain a sample of transmission oil.

Reference: For more information, refer to Special Publication, SEBU6250, Caterpillar Machine Fluids Recommendations, “S·O·S Oil Analysis” and Special Publication, PEHP6001, “How To Take A Good Oil Sample”.

i02189520

Window Washer Reservoir - Fill

SMCS Code: 7306-544

NOTICE
When operating in freezing temperatures, use Caterpillar nonfreezing window washer solvent or equivalent. System damage can result from freezing.

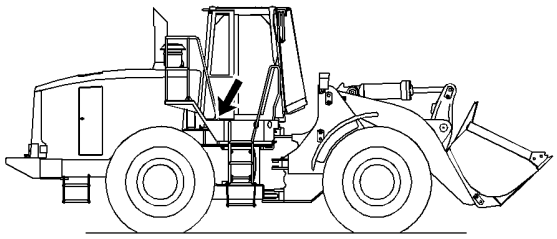

Illustration 292 g01106828

Window Washer Reservoir – The window washer reservoir is located under an access door on the platform on the right side of the machine. Fill the window washer reservoir through the filler opening.

i03657573

Window Wiper - Inspect/ Replace

SMCS Code: 7305-040; 7305-510

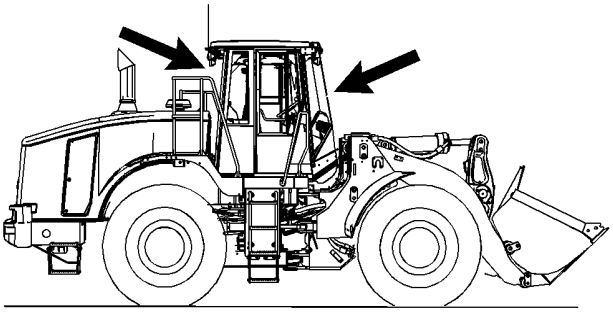

Illustration 293 g01962467

Inspect the condition of the wiper blades on the front window and on the rear window. Replace the wiper blades if the wiper blades are worn or damaged or if streaking occurs.

i04412316

Windows - Clean

SMCS Code: 7310-070

Clean the outside of the windows from the ground, unless handholds are available.

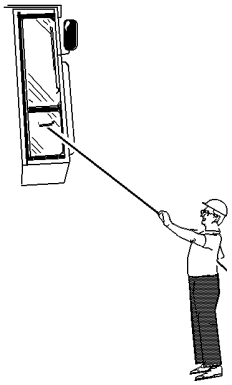

Illustration 294 g00566124
Typical example

Cleaning Methods

Commercial Window Cleaner

Apply the cleaner with a soft cloth. Rub the window with moderate pressure until all the dirt is removed. Allow the cleaner to dry. Wipe off the cleaner with a clean soft cloth.

Soap and Water

Use a clean sponge or a soft cloth. Wash the windows with a mild soap or with a mild detergent. Also use plenty of lukewarm water. Rinse the windows thoroughly. Dry the windows with a moist chamois or with a moist cellulose sponge.

Stubborn Dirt and Grease

Wash the windows with a good grade of naphtha, of isopropyl alcohol, or of Butyl Cellosolve. Then, wash the windows with soap and with water.

Polycarbonate Windows (If equipped)

Wash polycarbonate windows with a mild soap or detergent. Never use a cleaning solvent on polycarbonate windows.

Wash polycarbonate windows with warm water and a soft sponge, or damp cloth. Never use a dry cloth or paper towels on polycarbonate windows.

Rinse the windows with a sufficient amount of clean water.

Reference Information Section

Reference Materials

i03657602

Reference Material

SMCS Code: 1000; 7000

Cooling System

Special Publication, PMEP5027, Label - ELC Radiator Label

Special Publication, PEHJ0067, Product Data Sheet for Caterpillar ELC

Special Publication, PEHP9554, Product Data Sheet for Caterpillar DEAC (Diesel Engine Antifreeze/ Coolant)

Special Publication, SEBD0518, Know Your Cooling System

Special Publication, SEBD0970, Coolant and Your Engine

Grease

Data Sheet, NEHP6010, Cat Ultra 5Moly Grease (NLGI grade 1 and grade 2)

Data Sheet, NEHP6011, Cat Arctic Platinum Grease (NLGI grade 0)

Data Sheet, NEHP6012, Cat Desert Gold Grease (NLGI grade 2)

Data Sheet, NEHP6015, Cat High Speed Ball Bearing Grease (NLGI grade 2)

Special Publication, PEGJ0035, Grease Selection Guide

Data Sheet, PEHJ0088, Cat Multipurpose Grease (NLGI grade 2)

Data Sheet, PEHP0002, Cat Advanced 3Moly Grease (NLGI grade 2)

Systems Operation, RENR6331, Test and Adjust: Wheel Loaders Automatic Lubrication System

Hydraulic Oil

Special Publication, PEGP6028, Caterpillar Hydraulic Systems Management Guide

Special Publication, PEHJ0009, Product Data Sheet for Caterpillar Hydraulic Oil (HYDO) (SAE 10W)

Special Publication, PEHP6047, Product Data Sheet for Caterpillar Biodegradable Hydraulic Oil (HEES)

Miscellaneous Publications

Power Train Disassembly and Assembly, RENR6422, Tire and Rim - Remove and Install

Special Publication, PECP9067, One Safe Source

Special Publication, PEDP9131, Fluid Contamination - The Silent Thief

Special Publication, PEWJ0074, Cat Filter & Fluid Application Guide

Special Publication, SEBD0400, Dictionary of Pictographic Symbols

Special Publication, SEBD0717, Diesel Fuels and Your Engine

Special Publication, SEBF1015, Improving Component Durability - Final Drives and Differentials

Special Publication, SEBU6250, Caterpillar Machine Fluid Recommendations

Special Publication, SEBU5898, Cold Weather Recommendations

Special Publication, SENR5664, Air Conditioning and Heater R-134a for All Caterpillar Machines

Special Publication, SENR9620, Improving Fuel System Durability

Special Publication, SMBU6981, Emissions Control Warranty Information

Special Instruction, SMHS7867, Nitrogen Tire Inflation Group

Special Instruction, REHS2365, An Installation Guide for Product Link PL121SR and PL300

System Operation, Troubleshooting, Testing and Adjusting, RENR7911, Product Link PL121SR and for the PL300

System Operation, Troubleshooting, Testing and Adjusting, RENR5885, Product Link PL151/201

Oil

Special Publication, PEHP3050, Product Data Sheet for Caterpillar Multipurpose Tractor Oil (MTO)

Special Publication, PEHP6001, How to Take a Good Oil Sample

Special Publication, PEHJ0007, Product Data Sheet for Caterpillar Arctic TDTO (SAE 0W-20) (synthetic blend)

Special Publication, PEHJ0008, Product Data Sheet for Caterpillar Arctic DEO (SAE 0W-30)

Special Publication, PEHJ0030, Product Data Sheet for Caterpillar Synthetic Gear Oil (SAE 75W-140)

Special Publication, PEHJ0059, Product Data Sheet for Caterpillar DEO (SAE 10W-30)

Special Publication, PEHP7506, Product Data Sheet for Caterpillar TDTO (SAE 10W, SAE 30, SAE 50)

Special Publication, PEHP7508, Product Data Sheet for Caterpillar Gear Oil (GO) (SAE 80W-90 and SAE 85W-140)

Special Publication, PEHP7062, Product Data Sheet for Caterpillar DEO Synthetic (SAE 5W-40)

Special Publication, PEHP9530, Product Data Sheet for Caterpillar FDAO (SAE 60)

Special Publication, PEHP9570, Product Data Sheet for Caterpillar FDAO Synthetic (Multigrade)

Special Publication, PELJ0179, Caterpillar Engine Crankcase Fluid-1 Specifications (Cat ECF-1)

Special Publication, PEHP8035, Product Data Sheet for TDTO Transmission Multi-Season (TMS)

Special Publication, SEBD0640, Oil and Your Engine

Parts Manuals

Parts Manual, SEBP3743, 966HWheel Loader
S/N: A6D

Parts Manual, SEBP3744, 972HWheel Loader
S/N: A7D

Parts Manual, SEBP3847, 966HWheel Loader
S/N: A6G

Parts Manual, SEBP3848, 972HWheel Loader
S/N: A7G

Parts Manual, SEBP5424, 966HWheel Loader
S/N: TAL

Parts Manual, SEBP5426, 966HWheel Loader
S/N: RYF

Parts Manual, SEBP5425, 972HWheel Loader
S/N: GTA

Parts Manual, XEBP8558, 966HWheel Loader
S/N: A6J

Parts Manual, XEBP8559, 972HWheel Loader
S/N: A7J

ROPS/FOPS Structure

Special Publication, SEBD1587, What ROPS/FOPS Certification Means

Special Publication, SEHS6929, Inspection, Maintenance and Repair of ROPS and Attachment Installation Guidelines

Safety Manuals

Safety Manual, SEBU5407, Safety Manual

Operation and Maintenance Manual, SEBU8257, The European Union Physical Agents (Vibration) Directive 2002/44/EC

S·O·S Information

Special Publication, PEDP7036, S·O·S Services

Special Publication, PEHP7052, Making the Most of S·O·S Services

Special Publication, PEHP7057, S·O·S Coolant Analysis

Special Publication, PEHP7076, Understanding S·O·S Services Tests

Specifications Manuals

Specifications Manual, SENR3130, Torque Specifications

Tools

Special Publication, NENG2500, Caterpillar Dealer Service Tool Catalog

Additional Reference Material

SAE J183, Classification This can normally be found in the SAE handbook.

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.

Engine Manufacturers Association, Engine Fluids 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

i03989612

Decommissioning and Disposal

SMCS Code: 1000; 7000

When the product is removed from service, local regulations for the product decommissioning will vary. Disposal of the product will vary with local regulations. Consult the nearest Cat dealer for additional information.

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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:	_____	_____	_____