

Operation and Maintenance Manual

CS10 GC, CS11 GC, CS12 GC Vibratory Soil Compactor

T8F 1-UP (CS10GC) RK8 1-UP (CS11GC) GCS 1-UP (CS12GC) J5E 1-UP (CP11GC) M3K 1-UP (CP12GC)

Language: Original Instructions





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.



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.

NOTICE

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

Other parts may not meet certain original equipment specifications.

When replacement parts are installed, the machine owner/user should ensure that the machine remains in compliance with all applicable requirements.

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.

Product Information Section

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Foreword

Foreword

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.



WARNING – This product can expose you to chemicals including ethylene glycol, which is known to the State of California to

cause birth defects or other reproductive harm. For more information go to:

www.P65Warnings.ca.gov

Do not ingest this chemical. Wash hands after handling to avoid incidental ingestion.



WARNING - This product can expose you to chemicals including lead and lead

compounds, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to:

www.P65Warnings.ca.gov

Wash hands after handling components that may contain lead.

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 the calendar intervals provide more convenient servicing schedules and approximate the indicated service hour meter reading. Perform the recommended service at the interval that occurs first.

Under 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.

Certified Engine Maintenance

Proper maintenance and repair are 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 to render inoperative, any emission-related device or element of design installed on or in an engine or machine that is in compliance with all applicable regulations of the intended country to which it has been shipped. 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.

Product Identification Number

Effective First Quarter 2001 the Product Identification Number (PIN) has changed from 8 to 17 characters. To provide uniform equipment identification, 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 machines and generator sets. The PIN plates and frame marking will display the 17 character PIN. The new format will look like the following:

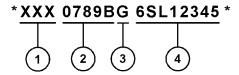


Illustration 1 g03891925

Where:

1. 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, and work tools will continue to use an 8 character Serial Number (S/N).

Safety Section

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Safety Messages

SMCS Code: 1000; 6700; 7000; 7405

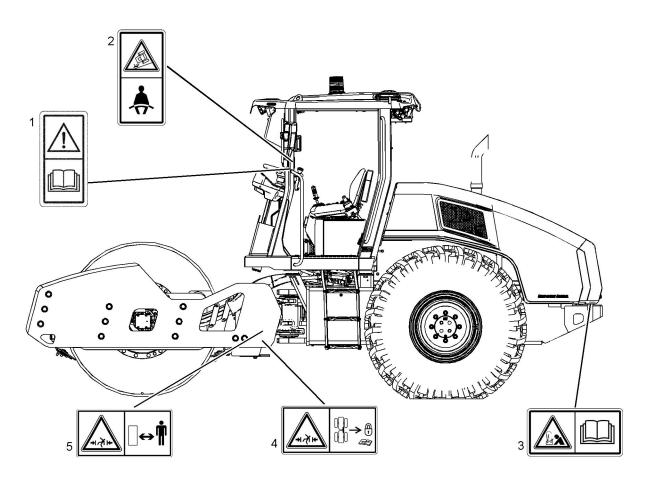


Illustration 2 g06333089

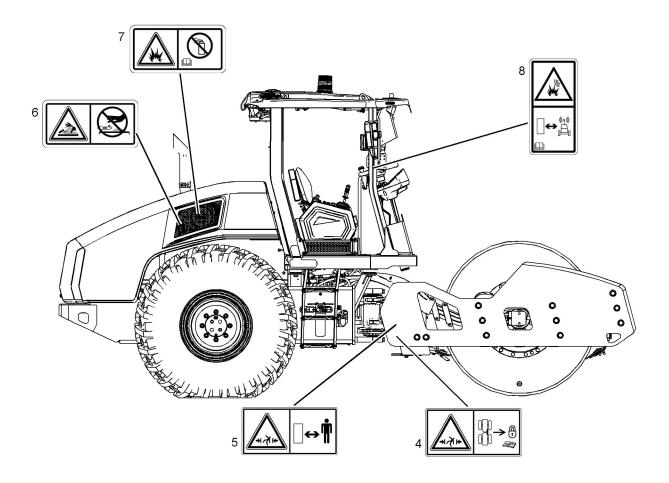
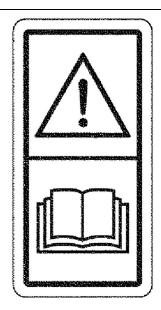


Illustration 3 g06333093

Do Not Operate (1)

This safety message is on the front left post of the cab.







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

Seat Belt (2)

This safety message is on the front left post of the cab.



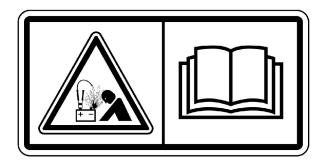
Illustration 5 g06333107

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.

Improper Connection Of Jump Start Cable (3)

This safety message is located near the battery in the engine compartment.







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.

Improper connections of the battery cables may cause an explosion.

Crush Hazard (4)

This safety message is located near the pivot area on both sides of the machine.

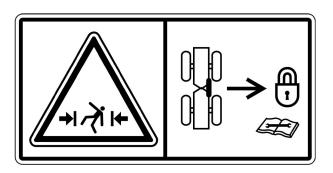


Illustration 7 g01371647

WARNING

Connect the steering frame lock between the front and the rear frames before lifting, transporting, or servicing the machine in the articulation area. Disconnect the steering frame lock and secure the steering frame lock before resuming operation. Severe injury or death could occur.

No Clearance (5)

This safety message is located near the pivot area on both sides of the machine.

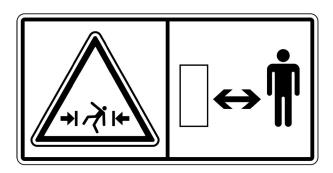


Illustration 8 g01371644



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.

Engine Coolant (6)

This safety message is in the engine compartment on the right side of the machine below the coolant tank.



Illustration 9 g01371640

A 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.

No Ether (7)

This safety message is in the engine compartment on the right side of the machine.

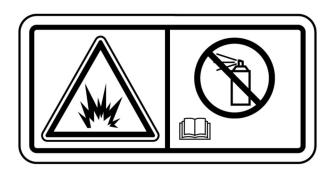


Illustration 10 g01372254

WARNING

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

Product Link (8)

This safety message is on the front right post of the cab.



Illustration 11 g06333103

WARNING

This machine is equipped with a Cat Product Link radio communication device which must be deactivated within 6.0 m (20 ft) of a blast zone. Failure to do so could result in serious injury or death.

i07475712

Additional Messages

SMCS Code: 1000; 6700; 7000; 7405

There are several specific messages on these machines. The exact location of the messages and the description of the messages are reviewed in this section. Become familiarized with all safety messages.

Make sure that all 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 message. Loose adhesive will allow the message 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. 12

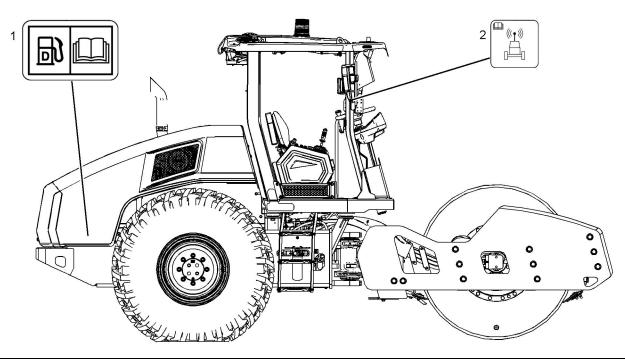


Illustration 12 g06333127

Diesel Fuel Requirements (1)

This message is next to the fuel filler cap on the right side of the machine.

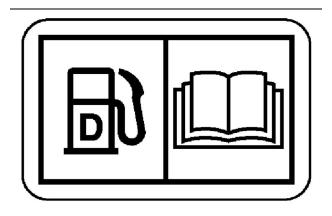


Illustration 13 g06333133

Refer to "Lubricant Viscosities" for more information.

Data Privacy (2)

This message is on the front right post in the cab.



Illustration 14 g01418953

The Product Link System (If Equipped) is a satellite communication device that transmits information regarding the machine back to Caterpillar and Caterpillar dealers and customers. All logged events and diagnostic codes that are available to the Caterpillar Electronic Technician (ET) on the CAT data link can be sent to the satellite. Information can also be sent to the Product Link System. The information is used to improve Caterpillar products and Caterpillar services.

Refer to Operation and Maintenance Manual, "Product Link" for more information.

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General Hazard Information

SMCS Code: 7000

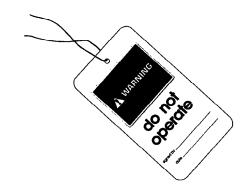


Illustration 15

a00104545

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. Warning tag SEHS7332 is 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 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 16

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 redeposited 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 machine 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.

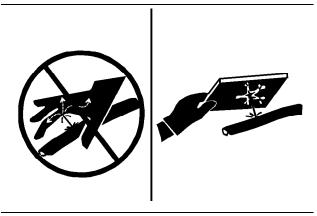


Illustration 17 g00687600

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

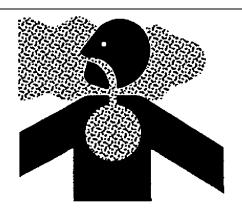


Illustration 18 g02159053

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.

Hexavalent Chromium Information

Cat equipment and replacement parts comply with applicable regulations and requirements where originally sold. Caterpillar recommends the use of only genuine Cat replacement parts.

Hexavalent chromium has occasionally been detected on exhaust and heat shield systems on Cat engines. Although lab testing is the only accurate way to know if hexavalent chromium is, in fact, present, the presence of a yellow deposit in areas of high heat (for example, exhaust system components or exhaust insulation) may be an indication of the presence of hexavalent chromium.

Use caution if you suspect the presence of hexavalent chromium. Avoid skin contact when handling items that you suspect may contain hexavalent chromium, and avoid inhalation of any dust in the suspect area. Inhalation of, or skin contact with, hexavalent chromium dust may be hazardous to your health.

If such yellow deposits are found on the engine, engine component parts, or associated equipment or packages, Caterpillar recommends following local health and safety regulations and guidelines, utilizing good hygiene, and adhering to safe work practices when handling the equipment or parts. Caterpillar also recommends the following:

- Wear appropriate personal protective equipment (PPE).
- Wash your hands and face with soap and water prior to eating, drinking, or smoking, and also during rest room breaks, to prevent ingestion of any yellow powder.
- Never use compressed air for cleaning areas suspected of containing hexavalent chromium.

Crushing Prevention and Cutting Prevention

- Avoid brushing, grinding, or cutting materials suspected of containing hexavalent chromium.
- Obey environmental regulations for the disposal of all materials that may contain or have come into contact with hexavalent chromium.
- Stay away from areas that might have hexavalent chromium particles in the air.

Dispose of Waste Properly

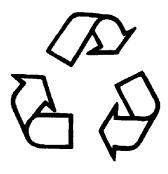


Illustration 19 g00706404

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.

i07746334

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 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 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.

i07746336

Fire Prevention and Explosion Prevention

SMCS Code: 7000



Illustration 20 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 21 g03839130

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. Do not use cell phones or other electronic devices while you are refueling. Always stop the engine before fueling. Fill the fuel tank outdoors. Properly clean areas of spillage.

Avoid static electricity risk when fueling. Ultra low sulfur diesel (ULSD) poses a greater static ignition hazard than earlier diesel formulations with a higher sulfur content. Avoid death or serious injury from fire or explosion. Consult with your fuel or fuel system supplier to ensure that the delivery system is in compliance with fueling standards for proper grounding and bonding practices.

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

Battery and Battery Cables



Illustration 22 g03839133

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 jumpstart 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. Do not use cell phones or other electronic devices 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 highpressure 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.

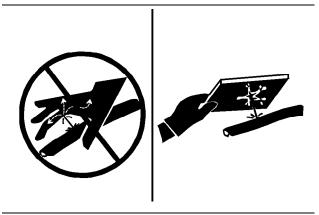


Illustration 23 g00687600

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.

Only use approved Ether canisters for the Ether dispensing system fitted to your machine, do not spray Ether manually into an engine, follow the correct cold engine starting procedures. Refer to the section in the Operation and Maintenance Manual with the label "Engine Starting".

Use ether in ventilated areas. Do not smoke while you are replacing an ether cylinder.

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.

i07041871

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 are 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. 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.

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 the fluids on the machine are flammable, including coolant and oils. Additionally, plastics, rubbers, fabrics, and resins in fiberglass panels are also flammable.

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Fire Extinguisher Location

SMCS Code: 7000; 7419

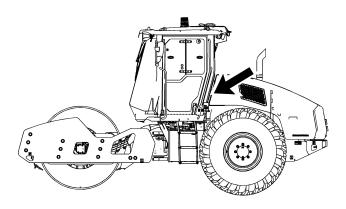


Illustration 24

q06243089

Recommended fire extinguisher location for a machine that is equipped with a cab.

Do not weld the ROPS to install the fire extinguisher. Also, do not drill holes in the ROPS to mount the fire extinguisher on the ROPS.

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.

i01943386

Tire Information

SMCS Code: 7000

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

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

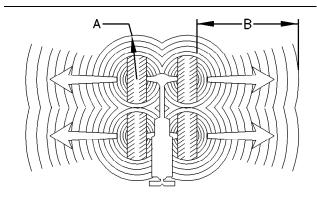


Illustration 25

g00337832

(A) At least 15 m (50 ft)

(B) At least 500 m (1500 ft)

Do not approach a warm tire. Maintain a minimum distance, as shown. Stay outside the shaded area in Illustration 25.

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.

22

i07475169

Before Starting Engine

SMCS Code: 1000; 7000

Make sure that the steering frame lock pin is stored in the UNLOCKED position. The steering frame lock pin must be unlocked to steer the machine. Start the engine only from the operator compartment. Never short across the starter terminals or across the batteries. Shorting could damage the electrical system by bypassing the engine neutral start system.

Inspect the condition of the seat belt and of the mounting hardware. Replace any parts that are worn or damaged. Regardless of appearance, replace the seat belt after 3 years of use. Do not use a seat belt extension on a retractable seat belt.

Make sure that the machine is equipped with a lighting system that is adequate for the job conditions. Make sure that all machine lights are working properly. Before you start the engine and before you move the machine, make sure that no one is underneath the machine, around the machine, or on the machine. Make sure that the area is free of personnel.

i07225753

Engine Starting

SMCS Code: 1000; 7000

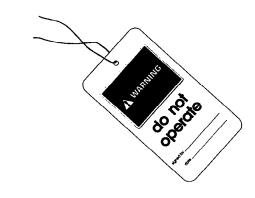


Illustration 26

g00104545

Do not start the engine or move any controls if there is a "Do Not Operate" or similar warning tag attached to the start switch or controls.

Before you start the engine, 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.

Move the parking brake switch to the "ON" position, and the propel lever into the NEUTRAL position.

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

i01361940

Before Operation

SMCS Code: 7000

Clear all personnel from the machine and from the area.

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

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

Fasten the seat belt securely.

i08473852

Visibility Information

SMCS Code: 7000

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

While the machine is in operation, constantly survey the area around the machine 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. Shut down the machine until damaged or nonfunctional visual aid(s) are repaired (if applicable) or until appropriate job sité organization is used to minimize hazards that are caused by any resulting restricted visibility. 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 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:

Operation

- 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.

i08528285

Operation

SMCS Code: 7000

Sound the horn and allow adequate time for bystanders to clear the area before moving the machine into a restricted visibility area. Follow local practices for your machine application.

Machine Operating Temperature Range

The machine must function satisfactorily in the anticipated ambient temperature limits that are encountered during operation. The minimum limits of items that will effect the safe operation of the machine to be considered are 0-100% relative humidity for -25° C (-13° F) to 49° C (120° F) temperatures unless otherwise specified in marketing functional specification.

Only operate the machine while you are 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.

Make sure that no personnel will be endangered before you move the machine.

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

- additional seat
- additional seat belt

Never use the work tool as a work platform.

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

Carry attachments approximately 40 cm (15 inches) above ground level. Do not go close to the edge of a cliff, an excavation, or an overhang.

If the machine begins to sideslip downward on a grade, 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.

Avoid operating the machine across the slope. When possible, operate the machine up the slopes and down the slopes.

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.

Limiting Conditions and Criteria

Limiting conditions are immediate issues with this machine that must be addressed prior to continuing operation.

The Operation and Maintenance Manual, Safety Section describes limiting condition criteria for replacing items such as safety messages, seat belt and mounting hardware, lines, tubes, hoses, battery cables and related parts, electrical wires, and repairing any fluid leak.

The Operation and Maintenance Manual, Maintenance Interval Schedule describes limiting condition criteria that require repair or replacement for items (if equipped) such as alarms, horns, braking system, steering system, and rollover protective structures.

The Operation and Maintenance Manual, Monitoring System (if equipped) provides information on limiting condition criteria, including a Warning Category 3 that requires immediate shutdown of the engine.

Critical Failures

The following table provides summary information on several limiting conditions found in this Operation and Maintenance Manual. The table provides criteria and required action for the limiting conditions listed. Each System or Component in this table, together with the respective limiting condition, describes a potential critical failure that must be addressed. Not addressing limiting conditions with required actions may, in conjunction with other factors or circumstances, result in a risk of personal injury or death. If an accident occurs, notify emergency personnel and provide location and description of accident.

Table 1

System or Component Name	Limiting Condition	Criteria for Action	Required Action
Line, tubes, and hoses	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.	Visible corrosion, loose, or damaged lines, tubes, or ho- ses. Visible fluid leaks.	Immediately repair any lines, tubes, or hoses that are corroded, loose, or damaged. Immediately repair any leaks as these may provide fuel for fires.
Electrical Wiring	Signs of fraying, abrasion, crack- ing, discoloration, cuts on the insulation	Visible damage to electrical wiring	Immediately replace damaged wiring
Battery cable(s)	Signs of fraying, abrasion, crack- ing, discoloration, cuts on the in- sulation of the cable, fouling, corroded terminals, damaged ter- minals, and loose terminals	Visible damage to battery ca- ble(s)	Immediately replace damaged battery cables
Operator Protective Structure	Structures that are bent, cracked, or loose. Loose, missing, or damaged bolts.	Visible damage to structure. Loose, missing, or damaged bolts.	Do not operate machine with damaged structure or loose, missing, or damaged bolts. Contact your Cat [®] dealer for inspection and repair or replacement options.
Seat Belt	Worn or damaged seat belt or mounting hardware	Visible wear or damage	Immediately replace parts that are worn or damaged.
Seat Belt	Age of seat belt	Three years after date of installation	Replace seat belt three years after date of installation
Safety Messages	Appearance of safety message	Damage to safety messages making them illegible	Replace the illustrations if illegible.
Audible Warning De- vice(s) (if equipped)	Sound level of audible warning	Reduced or no audible warning present	Immediately repair or replace audible warning devices not working properly.
Camera(s) (if equipped)	Dirt or debris on camera lens	Dirt or debris obstructing camera view	Clean camera before operating machine.
Cab Windows (if equipped)	Dirt, debris, or damaged windows	Dirt or debris obstructing operator visibility. Any damaged windows.	or replace damaged windows before operating machine.
Mirrors (if equipped)	Dirt, debris, or damaged mirror	Dirt or debris obstructing operator visibility. Any damaged mirrors.	Clean mirrors before operating machine. Repair or replace damaged mirrors before operating machine.

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Safety Section

(Table 1, contd)

System or Component Name	Limiting Condition	Criteria for Action	Required Action
Braking System	Inadequate braking performance	System does not pass Braking System - Test(s) included in Maintenance Section or in the Testing and Adjusting Manual	Contact your Cat [®] dealer to inspect and, if necessary, repair the brake system.
Cooling System	The coolant temperature is too high.	Monitoring System displays Warning Category 3	Stop the engine immediately. Check the coolant level and check the radiator for debris. Refer to Operation and Maintenance Manual, Cooling System Coolant Level - Check. Check the fan drive belts for the water pump. Refer to Operation and Maintenance Manual, Belts - Inspect/Adjust/ Replace. Make any necessary repairs.
Engine Oil System	A problem has been detected with the engine oil pressure.	Monitoring System displays Warning Category 3	If the warning stays on during low idle, stop the engine and check the engine oil level. Perform any necessary repairs as soon as possible.
Engine system	An engine fault has been detected by the engine ECM.	Monitoring System displays Warning Category 3	Stop the engine immediately. Contact your Cat ® dealer for service.
Fuel System	A problem has been detected with the fuel system.	Monitoring System displays Warning Category 3	Stop the engine. Determine the cause of the fault and perform any necessary repairs.
Hydraulic Oil System	The hydraulic oil temperature is too high.	Monitoring System displays Warning Category 3	Stop the engine immediately. Check the hydraulic oil level and check the hydraulic oil cooler for debris. Perform any necessary repairs as soon as possible.
Steering System	A problem has been detected with the steering system. (If equipped with steering system monitoring.)	Monitoring System displays Warning Category 3	Move machine to a safe location and stop the engine immediately. Contact your Cat ® dealer to inspect and, if necessary, repair the steering system.
Overall Machine	Machine service is required.	Monitoring System displays Warning Category 3	Stop the engine immediately. Contact your Cat ® dealer for service.

i06299648

Engine Stopping

SMCS Code: 1000; 7000

Do not stop the engine immediately after the machine has been operated under load. Stopping the engine immediately 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 at low idle for 5 minutes before shutdown. Running the engine allows hot areas of the engine to cool gradually.

i07475176

Parking

SMCS Code: 7000

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

Move the propel control lever to the NEUTRAL position. Engage the parking brake.

Stop the engine.

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

Note: If you are parking the machine for an extended period of time, turn the battery disconnect switch (if equipped) to the OFF position. This will prevent drainage of the battery. A battery short circuit, any current draw from certain components, and vandalism can cause drainage of the battery.

i07746366

Engine Stopping

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: Operators with lots of experience and proper equipment for specific applications are also required. Safe operation on steep slopes may also require special machine maintenance. Refer to Lubricant Viscosities and Refill Capacities in this manual for the proper fluid level requirements and intended machine use. Fluids must be at the correct levels to ensure that systems will operate properly on a slope.

i08229294

Equipment Lowering with Engine Stopped

SMCS Code: 7000-II; 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.

i08507053

Sound Information and Vibration Information

SMCS Code: 7000

Sound Level Information

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

Table 2

Sound Level		Test Method
Operator Sound Pressure Level	89 dB(A)	"ISO 6396:2008" ⁽¹⁾
Exterior Sound Power Level	111 dB (A)	"ISO 6395:2008" ⁽²⁾

- (1) The measurement was conducted at 100% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.
- (2) The measurement was conducted at 100% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds.

The sound levels listed above include both measurement uncertainty and uncertainty due to production variation.

Sound Level Information for Machines Required by the Applicable Regional Regulations

European Union Countries

- United Kingdom
- Eurasian Economic Union Countries
- Ukraine
- Countries that Adopt the "EU Directives"

The information below applies to only the machine configurations that contain regional product marking on or near the Product Identification Plate noted in the "Regional Product Marking" section of this manual.

Table 3

Declared Dynamic Operator Sound Pressure Level				
Region Sound Level Test Method				
European Union	89 dB(A)	"ISO 6396:2008" ⁽¹⁾		
United Kingdom	89 dB(A)	"ISO 6396:2008" (1)		
Eurasian Econom- ic Union	89 dB(A)	"ISO 6396:2008" ⁽¹⁾		

(1) The measurement was conducted at 100% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.

Table 4

Declared Exterior Sound Power Level					
Region Sound Level Test Method					
European Union	111 dB(A)	"ISO 6395:1988" ⁽¹⁾			
United Kingdom	111 dB(A)	"ISO 6395:1988" ⁽¹⁾			
Eurasian Econom- ic Union	111 dB(A)	"ISO 6395:2008" ⁽¹⁾			
Ukraine	111 dB(A)	"ISO 6395:1988" ⁽¹⁾			

⁽¹⁾ The measurement was conducted at 100% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds.

The declared sound levels listed above include both measurement uncertainty and uncertainty due to production variation.

The machine sound power level meets the criteria that are specified in the applicable regional regulation. For example:

- "European Directive 2000/14 EC" amended by "2005/88/EC"
- "United Kingdom 2001 No. 1701" amended by "2005 No. 3525"
- "Ukraine Technical Regulation of the Noise Emission in the Environment by Equipment for Use Outdoors"

The criteria are specified on the certificate of the conformance and the accompanying labels.

Vibration Information Applicable to Regional Regulations

- "European Union Directive: 2002/44/EC -Physical Agents (Vibration)"
- "United Kingdom: 2005 No. 1093 The Control of Vibration at Work Regulation 2005"

Vibration Data for Single Drum Vibratory Compactors

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 m/s2.

Information Concerning Whole Body Vibration Level

This section provides vibration data and a method for estimating the vibration level for a single drum vibratory compactor.

The expected vibration levels can be estimated with the information in Table 5 to calculate the daily vibration exposure. A simple evaluation of the machine application can be used. 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 to obtain the estimated vibration level. For aggressive operations and severe terrain, add the scenario factors to the average vibration level to obtain the estimated vibration level.

Table 5

"ISO Referen	"ISO Reference Table A - Equivalent vibration levels of whole body vibration emission for earthmoving equipment."						
Machine	Typical Operating	Vibration Levels			Sc	cenario Facto	rs
Туре	Type Activity		Y axis	Z axis	X axis	Y axis	Z axis
Single Drum Vi-	Compaction (Boulder)	0.47	0.53	0.41	0.17	0.22	0.12
bratory Compactor	Compaction (Silt)	0.29	0.28	0.28	0.08	0.17	0.11

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.

Guidelines for Reducing Vibration Levels on Earthmoving Equipment

Vibration levels are influenced by many different parameters, such as: operator training, operator behavior, operator mode and stress, job site organization, job site preparation, job site environment, job site weather, job site material, machine type, quality of the seat, quality of the suspension system, attachments, and condition of the 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:

- Use the right type and size of machine, equipment, and attachments.
- Maintain machines according to the manufacturers recommendations: tire pressures and brake and steering systems, controls, hydraulic system, and linkages.
- 3. Keep the terrain in good condition by performing the following items: remove any large rocks or obstacles, fill any ditches and holes and provide machines and schedule time to maintain the conditions of the terrain.
- 4. Keep the seat maintained and adjusted by doing the following: adjust the seat and suspension for the weight and the size of the operator and inspect and maintain the seat suspension and adjustment mechanisms.
- **5.** Perform the following operations smoothly: steer, brake, accelerate, and shift the gears.
- 6. Move the attachments smoothly.
- 7. Adjust the machine speed and the route to minimize the vibration level by doing the following: drive around obstacles and rough terrain and slow down when necessary to go over rough terrain.

- 8. Minimize vibrations for a long work cycle or a long travel distance by doing the following: use machines that are equipped with suspension systems, if no ride control system is available, reduce speed to prevent bounce and haul the machines between workplaces.
- 9. Less operator comfort may be caused by other risk factors. The following guidelines can be effective to provide better operator comfort: adjust the seat and adjust the controls to achieve good posture, adjust the mirrors to minimize twisted posture, provide breaks to reduce long periods of sitting, avoid jumping from the cab, minimize repeated handling of loads and lifting of loads and minimize any shocks and impacts during sports and leisure activities.

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 to find your local dealer:

Caterpillar, Inc. www.cat.com

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Operator Station

SMCS Code: 7000; 7301; 7325

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.

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Guards

(Operator Protection)

SMCS Code: 7150

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

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

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

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

The ROPS/FOPS Structure (if equipped) on your machine is specifically designed, tested and certified for that machine. Any alteration or any modification to the ROPS/FOPS Structure could weaken the structure. This places the operator into an unprotected environment. Modifications or attachments that cause the machine to exceed the weight that is stamped on the certification plate also place the operator into an unprotected environment. Excessive weight may inhibit the brake performance, the steering performance and the ROPS. The protection that is offered by the ROPS/FOPS Structure will be impaired if the ROPS/FOPS Structure has structural damage. Damage to the structure can be caused by an overturn, a falling object, a collision, etc.

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

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

Other Guards (If Equipped)

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

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

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

- · Demolition applications
- Rock quarries
- · Forestry products

Additional guards may be required for specific applications or work tools. The Operation and Maintenance Manual for your machine or your work tool will provide specific requirements for the guards. Refer to Operation Maintenance manual, "Demolition" for additional information. Consult your Cat dealer for additional information.

Product Information Section

General Information

i08341516

Specifications

SMCS Code: 7000

Intended Use

This roller is a self-propelled vibratory compactor. This roller consists of metallic cylindrical bodies (drums) that are used for compaction. This roller is used to compact materials such as crushed rock, earth, asphalt, or gravel through rolling and/or vibrating action of the roller.

Expected Life

The expected life, defined as total machine hours, of this machine is dependent upon many factors including the machine owner's desire to rebuild the machine back to factory specifications. The expected life interval of this machine is 5000 service hours. The expected life interval corresponds to the service hours to engine overhaul or replacement. Service hours to engine overhaul or replacement may vary based on overall machine duty cycle. At the expected life interval, remove the machine from operation and consult your Cat ® dealer for inspect, repair, rebuild, install remanufactured, install new components, or disposal options and to establish a new expected life interval. If a decision is made to remove this machine from service, refer to Operation and Maintenance Manual, "Decommissioning and Disposal".

The following items are required to obtain an economical expected life of this machine:

- Perform regular preventive maintenance procedures as described in the Operation and Maintenance Manual.
- Perform machine inspections as described in the Operation and Maintenance Manual and correct any problems discovered.
- Perform system testing as described in the Operation and Maintenance Manual and correct any problems discovered.
- Ensure that all service letters are addressed in the time intervals described in the letters.
- Ensure that machine application conditions comply with Caterpillar's recommendations.

- Ensure that the operating weight does not exceed limits set by manufacturer.
- Ensure that all frame cracks are identified, inspected, and repaired to prevent further development.
- Ensure that all frame cracks are identified, inspected, and repaired to prevent further development.

Application/Configuration Restrictions

- · Use only in non-explosive gas environments.
- Use machine only with approved tools and guards in place.
- Not for use in underground applications.

• Towing trailers is prohibited.

Specifications

Table 6

	CS1		/ibratory Compactor Opera Based on Standard Machir ull Fluids and 80 kg(177 lb	ne	
	Model		Weight Total	Weight Front	Weight Rear
		Standard	9471 kg (20880 lb)	5722 kg (12615 lb)	3749 kg (8265 lb)
		Standard W/ Weight Kit	10484 kg (23113 lb)	7062 kg (15569 lb)	3422 kg (7544 lb)
	Sun Canopy	Shell Kit (Oval Pad)	11228 kg (24753 lb)	7359 kg (16224 lb)	3870 kg (8532 lb)
		Shell Kit (Square Pad)	11387 kg (25104 lb)	7518 kg (16574 lb)	3870 kg (8532 lb)
		Shell Kit Bumper W/O Shell	9713 kg (21413 lb)	5843 kg (12882 lb)	3870 kg (8532 lb)
		Standard	9596 kg (21156 lb)	5768 kg (12716 lb)	3828 kg (8439 lb)
		Standard W/ Weight Kit	10610 kg (23391 lb)	7108 kg (15670 lb)	3501 kg (7718 lb)
CS10 GC	ROPS/FOPS	Shell Kit (Oval Pad)	11354 kg (25031 lb)	7405 kg (16325 lb)	3950 kg (8708 lb)
		Shell Kit (Square Pad)	11513 kg (25382 lb)	7564 kg (16676 lb)	3950 kg (8708 lb)
		Shell Kit Bumper W/O Shell	9838 kg (21689 lb)	5889 kg (12983 lb)	3949 kg (8706 lb)
Cab		Standard	9743 kg (21480 lb)	5823 kg (12838 lb)	3920 kg (8642 lb)
		Standard W/ Weight Kit	10757 kg (23715 lb)	7164 kg (15794 lb)	3593 kg (7921 lb)
	Cab	Shell Kit (Oval Pad)	11501 kg (25355 lb)	7460 kg (16446 lb)	4041 kg (8909 lb)
		Shell Kit (Square Pad)	11660 kg (25706 lb)	7619 kg (16797 lb)	4041 kg (8909 lb)
		Shell Kit Bumper W/O Shell	9985 kg (22013 lb)	5944 kg (13104 lb)	4041 kg (8909 lb)
		Standard	10803 kg (23817 lb)	5988 kg (13201 lb)	4816 kg (10617 lb)
Sun Canopy CS11 GC	Standard W/ Weight Kit	12230 kg (26963 lb)	7582 kg (16715 lb)	4649 kg (10249 lb)	
	Sun Canopy	Shell Kit (Oval Pad)	12561 kg (27692 lb)	7624 kg (16808 lb)	4937 kg (10884 lb)
		Shell Kit (Square Pad)	12720 kg (28043 lb)	7783 kg (17159 lb)	4937 kg (10884 lb)
		Shell Kit Bumper W/O Shell	11045 kg (24350 lb)	6109 kg (13468 lb)	4937 kg (10884 lb)
		Standard	10929 kg (24094 lb)	6034 kg (13303 lb)	4895 kg (10792 lb)
	ROPS/FOPS	Standard W/ Weight Kit	11460 kg (25265 lb)	7374 kg (16257 lb)	4568 kg (10071 lb)
		Shell Kit (Oval Pad)	12687 kg (27970 lb)	7670 kg (16909 lb)	5017 kg (11061 lb)
		Shell Kit (Square Pad)	12846 kg (28321 lb)	7829 kg (17260 lb)	5017 kg (11061 lb)

(Table 6, contd)

Table 6, contd)					
		Shell Kit Bumper W/O Shell	11171 kg (24628 lb)	6154 kg (13567 lb)	5016 kg (11058 lb)
		Standard	11076 kg (24418 lb)	6089 kg (13424 lb)	4987 kg (10994 lb)
		Standard W/ Weight Kit	12503 kg (27564 lb)	7683 kg (16938 lb)	4820 kg (10626 lb)
	Cab	Shell Kit (Oval Pad)	12834 kg (28294 lb)	7726 kg (17033 lb)	5109 kg (11263 lb)
		Shell Kit (Square Pad)	12993 kg (28645 lb)	7885 kg (17383 lb)	5109 kg (11263 lb)
		Shell Kit Bumper W/O Shell	11318 kg (24952 lb)	6210 kg (13691 lb)	5109 kg (11263 lb)
		Standard	12230 kg (26963 lb)	7582 kg (16715 lb)	4649 kg (10249 lb)
		Shell Kit (Oval Pad)	12976 kg (28607 lb)	7879 kg (17370 lb)	5097 kg (11237 lb)
	Sun Canopy	Shell Kit (Square Pad)	13135 kg (28958 lb)	8038 kg (17721 lb)	5097 kg (11237 lb)
		Shell Kit Bumper W/O Shell	11460 kg (25265 lb)	6363 kg (14028 lb)	5097 kg (11237 lb)
		Standard	12356 kg (27240 lb)	7627 kg (16815 lb)	4728 kg (10423 lb)
		Shell Kit (Oval Pad)	13101 kg (28883 lb)	7925 kg (17472 lb)	5176 kg (11411 lb)
CS12 GC	ROPS/FOPS	Shell Kit (Square Pad)	13260 kg (29233 lb)	8084 kg (17822 lb)	5176 kg (11411 lb)
		Shell Kit Bumper W/O Shell	11585 kg (25541 lb)	6409 kg (14129 lb)	5176 kg (11411 lb)
		Standard	12503 kg (27564 lb)	7683 kg (16938 lb)	4820 kg (10626 lb)
		Shell Kit (Oval Pad)	13249 kg (29209 lb)	7980 kg (17593 lb)	5268 kg (11614 lb)
	Cab	Shell Kit (Square Pad)	13408 kg (29560 lb)	8139 kg (17943 lb)	5268 kg (11614 lb)
		Shell Kit Bumper W/O Shell	11733 kg (25867 lb)	6464 kg (14251 lb)	5268 kg (11614 lb)

Identification Information

i08507066

Plate Locations and Film Locations

SMCS Code: 1000; 7000

The Product Information 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.

The regional certification plate is used to verify that the product conforms to all the requirements that were established by a country or a group of countries. The product is tested by a certified testing group to verify conformance.

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

Product Identification Number (PIN)

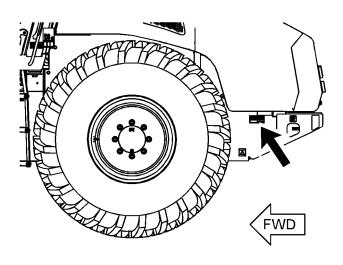


Illustration 27 g06690125

The Product Identification Number (PIN) is on the right side of the machine, near the ladder. This plate will have the following information:

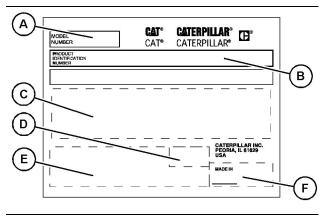


Illustration 28 g06573140

Manufacturer Name and Address _____

Model Number (A) ___

PIN (B) _____

Month and/or Year of Manufacture (If Required) (D)

Service Information Plate (C) _____

Regional Certification Plate (If Required) (E)

Country of Origin Info Plate (If Required) (F)____

Local regulation may require documentation of the month and/or year of manufacture in the Operation and Maintenance Manual. Comply with these regulations.

Regional Product Marking (If Equipped)

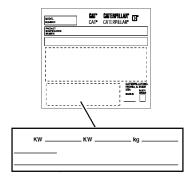


Illustration 29 g06650998

Regional marking plate

This plate is positioned on the bottom-left side of the PIN plate or near the PIN plate.

Product Information Section Emissions Certification Film

Note: The regional marking plate or plates are installed on machines that meet the applicable requirements that were effective at that time and may differ from the one shown above.

Regional product marking may include one or more of the following:

CE

CE mark

UK

UKCA mark



EAC mark



Gulf Standardization Organization (GSO) mark



Ukraine mark

The following information may be stamped onto the regional product marking plate. For quick reference, record this information in the spaces that are provided below:

- Engine Power Primary Engine (kW)___
- Engine Power for Additional Engine (If Equipped)
- Typical Machine Operating Weight (kg)
- Month and/or Year of Manufacture______
- Machine Type_

Eurasian Economic Union

Manufacturer Information

Manufacturer:

Caterpillar Paving Products Inc., 9401 85 th Avenue North Brooklyn park MN, 55445-2199

Entity authorized by the manufacturer at the territory of Eurasian Economic Union:

Caterpillar Eurasia LLC 75, Sadovnicheskaya Emb. Moscow 115035, Russia

Sound Certification

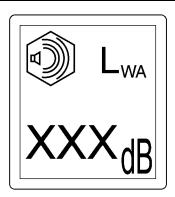


Illustration 30

g06675270

Sound certification film

A typical example of this film is shown.

A certification film is used to verify the environmental sound certification on machines that are certified to the regional requirements. A film installed on your machine will have a value. The value that is listed on the film indicates the guaranteed exterior sound power level ($L_{\mbox{\tiny wa}}$) at the time of manufacture for the conditions that are specified in the following sound test procedures:

- "ISO 6395:1988"
- "European Union 2000/14/EC" amended by "2005/ 88/EC"
- "United Kingdom 2001 No. 1701" amended by "2005 No. 3525"

i08756279

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

Consult your Cat dealer for an Emission Control Warranty Statement.

The emission certification film is located on the engine or inside the engine enclosure.

Declaration of Conformity (European Union)

SMCS Code: 1000; 7000

Table 7

An EU 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 EU Declaration of Conformity provided with the machine. The extract shown below from an EU 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.

ORIGINAL EU DECLARATION OF CONFORMITY

Manufacturer: CATERPILLAR PAVING PRODUCTS INC. 9401 85th Ave. North Brooklyn Park, MN 55445 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 38000 Grenoble, France I, the undersigned, , hereby certify that the construction equipment specified hereunder Description: Generic Denomination: Paving Equipment Function: Vibratory Roller Model/Type: CS10 GC, CS11 GC, CS12 GC

Serial Number:

Commercial Name: Caterpillar

Fulfills 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)		
2014/30/EU	N/A	

	Guaranteed Sound Power LeveldB (A) Annex VI Representative Equipment Type Sound Power LeveldB (A) [Engine Power per ISO 14396kW, Rated engine speedrpm Technical Documentation accessible through person listed above authorized to	to compile the Technical File
Done at:		Signature
Date:		Name/Position

Note: The above information was correct as of June 2021, but may be subject to change. Refer to the individual declaration of conformity issued with the machine for exact details.

Declaration of Conformity (Great Britain)

SMCS Code: 1000; 7000

Table 8

A Declaration of Conformity document was provided with the machine if it was manufactured to comply with specific requirements for the Great Britain. In order to determine the details of the applicable legislation, review the complete Declaration of Conformity provided with the machine. The extract shown below from a Great Britain Declaration of Conformity for machines that are declared compliant to 2008 No. 1597 applies only

to those machines originally "UKCA" marked by the manufacturer listed and which have not since been modified. **DECLARATION OF CONFORMITY** Manufacturer: CATERPILLAR PAVING PRODUCTS INC. 9401 85th Ave. North Brooklyn Park, MN 55445 USA Person authorized to compile the Technical File and to communicate relevant part (s) of the Technical File to the Authorities on request: Standards & Regulations Manager, Caterpillar France S.A.S, 40 Avenue Leon-Blum 38000 Grenoble, France I, the undersigned, , hereby certify that the construction equipment specified hereunder Description: Generic Denomination: Paving Equipment Function: Vibratory Roller Model/Type: CS10 GC, CS11 GC, CS12 GC Serial Number: Commercial Name: Caterpillar Fulfills all the relevant provisions of these regulations and/or other enactments listed below:

Legislation	Approved Body	Document No.
2008 No. 1597	N/A	
2016 No. 1091	N/A	
2001 No. 1701 amended by 2005 No. 3525, Note (1)	Note (2)	

Note (1) Guaranteed Sound Power LeveldB (A) Annex VI Representative Equipment Type Sound Power LeveldB (A) [Engine Power perkW, Rated engine speedrpm Technical Documentation accessible through person listed above authorized to compile the Technical File Note (2) If applicable, information related to Approved Body. Signature	ate:			Name/Position
Representative Equipment Type Sound Power LeveldB (A) [Engine Power per kW, Rated engine speed rpm Technical Documentation accessible through person listed above authorized to compile the Technical File	one at:			Signature
Representative Equipment Type Sound Power LeveldB (A) [Engine Power per kW, Rated engine speed rpm	Note	te (2) If applicable, information related to Ap	pproved Body.	
	Note	Representative Equipment Type Sour [Engine Power per kW, Ra	nd Power LeveldB (A) ated engine speed rpm	o compile the Technical File

Note: The above information was correct as of June 2021, but may be subject to change. Refer to the individual declaration of conformity issued with the machine for exact details.

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Operation Section

Operation Section

Before Operation

i04021647

Mounting and Dismounting

SMCS Code: 7000



Illustration 31

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".

i01905956

Before Operation

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.

Make sure that the engine air filter service indicator is not in the red zone.

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

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

- Backup Alarm Test
- Cooling System Level Check

- Engine Air Filter Service Indicator Inspect
- Engine Oil Level Check
- · Hydraulic System Oil Level Check
- Indicators and Gauges Test
- · Neutral Start Switch Test
- · Seat Belt Inspect

i07179181

Steering Frame Lock

SMCS Code: 7506

MARNING

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

Install the steering frame lock pin (1) between the front frame and the rear frame before you lift the machine and before you transport the machine on another vehicle. Also install the steering frame lock pin before you perform maintenance near the center of the machine.

In order to install the steering frame lock pin, the machine must be in the straight ahead position.

- 1. Move the machine into position.
- 2. Apply the parking brake.
- **3.** Turn the engine start switch key to the OFF position. Remove the key.
- **4.** Remove the retaining pin (1) from the primary steering lock pin (2). This frees the primary steering lock pin (2) to move from the storage position (highest position) into steer lock position (lowest position).

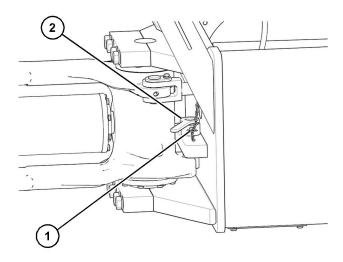


Illustration 32 g06243662

The steering frame lock is shown in the locked position.

5. Installing the primary steering lock pin will hold the front frame and the rear frame rigid.

Note: When you disengage the steering lock (2), you must put the steering lock pin in the STORAGE position. The steering frame lock pin(2) is held in the STORAGE position by a retaining pin (1). When you install the retaining pin (1), make sure that the retaining pin(1) is fully installed.

Machine Operation

i07475181

i08327384

Alternate Exit

SMCS Code: 7308; 7310



g06628859

If necessary, open the cab window to exit the cab. Unlatch the window, and swing the window open to provide an exit.

Seat

SMCS Code: 7312; 7324

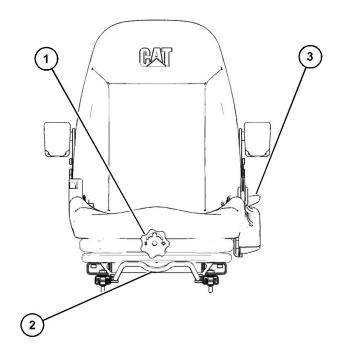


Illustration 34

g06243706

- (1) Seat Suspension Adjustment Knob (If Equipped)
- (2) Fore/Aft Lever
- (3) Seat Recline Lever (If Equipped)

To adjust the suspension of the seat, turn knob (1). Turn knob (1) clockwise to increase the stiffness of the suspension of the seat. Turn knob (1) counterclockwise to decrease the stiffness of the suspension of the seat.

The seat can be moved in either the forward direction or the rearward direction. Pull lever (2) upward and hold the lever (2) to move the seat to the desired position. To lock the seat, release lever (2).

The seat back can be adjusted up or down. Pull lever (3) up to release the seat back and adjust to desired position. Release lever (3) to lock desired position.

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

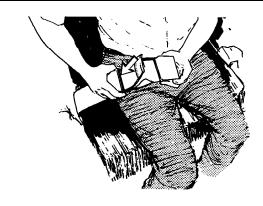


Illustration 35 g00100709

1. Unfasten the seat belt.

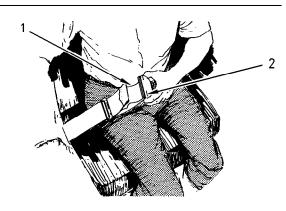


Illustration 36 g00932817

- 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

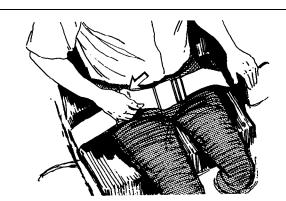


Illustration 37 g00100713

- **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.

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Operation Section

Fastening The Seat Belt

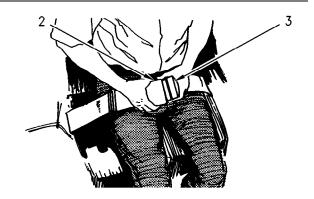
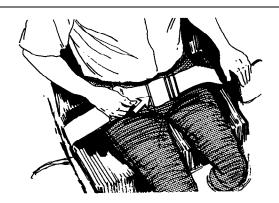


Illustration 38 g00932818

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



Seat Belt

Illustration 39 g00100717

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

Seat Belt Adjustment for Retractable Seat Belts

Fastening The Seat Belt

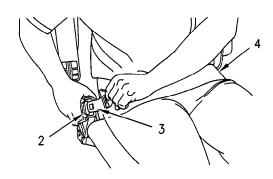


Illustration 40 g00867598

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

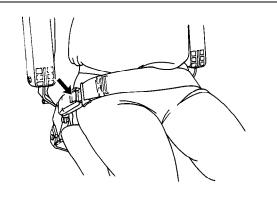


Illustration 41 g00039113

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.

i08315191

Mirror

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 the mirrors that are described in this topic.

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.

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

Mirror Adjustment

- Park the machine on a level surface.
- Stop the engine.
- Adjust rear view mirrors to provide visibility behind the machine at a maximum distance of 30 m (98 ft) from the rear corners of the machine.

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Note: Hand tools may be needed to adjust the mirrors. Refer to Specifications, SENR3130, "Torque Specifications" for the recommended torque.

Cab Mirrors

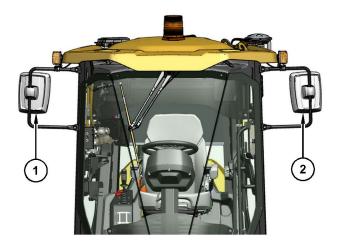


Illustration 42

g06626935

- (1) Right side rear view mirror
- (2) Left side rear view mirror

Right Side Rear View Mirror (1)



Illustration 43

g06626942

Adjust the right side rear view mirror (1) so that the right side of the machine can be seen. Also adjust the right side rear view mirror to see the following:

- A view of at least 1 m (3.3 ft) from the side of the machine can be seen from the operator seat.
- See an object on the ground at a distance of 30 m (98 ft) from the rear corner of the compactor.

Left Side Rear View Mirror (2)



Illustration 44

g06626949

Adjust the left side rear view mirror (2) so that the left side of the machine can be seen. Also adjust the left side rear view mirror to see the following:

• A view of at least 1 m (3.3 ft) from the side of the machine can be seen from the operator seat.

 See an object on the ground at a distance of 30 m (98 ft) from the rear corner of the compactor.

ROPS Mirrors

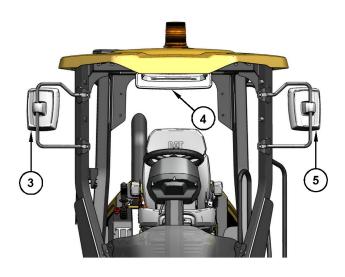


Illustration 45

g06626974

- (3) Right side rear view mirror
- (4) Center rear view mirror
- (5) Left side rear view mirror

Right Side Rear View Mirror (3)

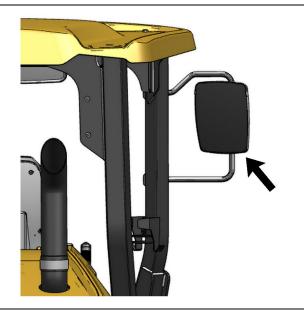


Illustration 46

g06626978

Adjust the right side rear view mirror (3) so that the right side of the machine can be seen. Also adjust the right side rear view mirror to see the following:

- A view of at least 1 m (3.3 ft) from the side of the machine can be seen from the operator seat.
- See an object on the ground at a distance of 30 m (98 ft) from the rear corner of the compactor.

Center Rear View Mirror (4)

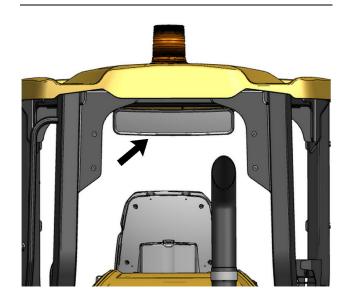


Illustration 47

g06626983

Adjust the center rear view mirror (4) so that the rear of the machine can be seen. Also adjust the center rear view mirror to see the following:

- A view of at least 1 m (3.3 ft) from the rear of the machine can be seen from the operator seat.
- See an object on the ground at a distance of 30 m (98 ft) from the rear of the compactor.

M0085517-07 45
Operation Section

Mirror

Left Side Rear View Mirror (5)

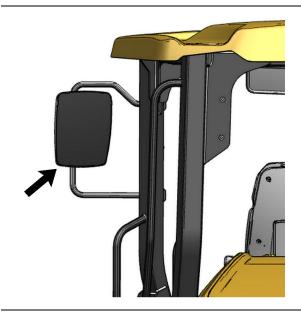


Illustration 48 g06626986

Adjust the left side rear view mirror (5) so that the left side of the machine can be seen. Also adjust the left side rear view mirror to see the following:

• A view of at least 1 m (3.3 ft) from the side of the machine can be seen from the operator seat.

Operation Section **Operator Controls**

• See an object on the ground at a distance of 30 m (98 ft) from the rear corner of the compactor.

i08340551

Operator Controls

SMCS Code: 7000; 7300; 7301; 7451

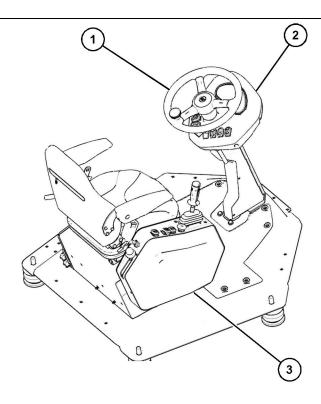
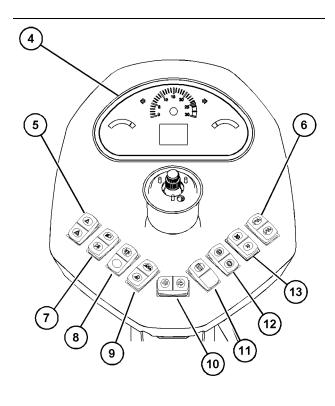


Illustration 49 g06255147

Operator Station

(1) Steering wheel (2) Steering console

(3) Right console



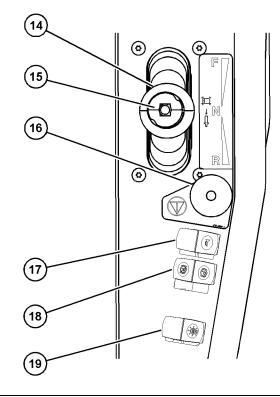
g06255151 Illustration 50

Operator Console Switches

- (4) Information display

- (4) Information display
 (5) Hazard switch
 (6) Vibration amplitude switch
 (7) Roading light / Parking light switch
 (8) Rotating beacon switch

- (9) Work lights switch
 (10) Turn signals switch
 (11) Information (Display switch)
 (12) Propel speed range control
 (13) Auto / Manual vibration switch



g06255198 Illustration 51

Right Console (Top)

- (14) Propel control(15) Vibratory on/off control(16) Emergency stop knob

- (17) Horn (18) Parking brake switch
- (19) Glow plugs

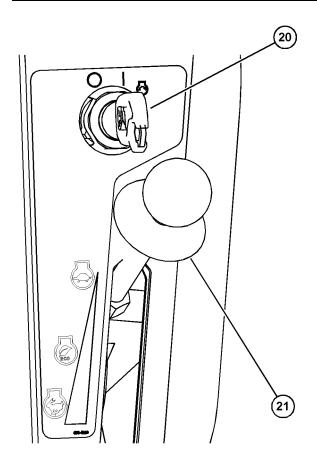


Illustration 52

Right Console (Side)

(20) Key switch

(21) Engine throttle

Steering Wheel (1)

Controls the direction of the machine

Steering Console (2)

The steering console holds the steering wheel, control switches, gauge cluster, and indicator lights.

Right Console (3)

Right console contains more machine controls.

Information Display (4)



Information Display – For information regarding the indicator display, refer to **Operation and Maintenance Manual,** Information Display.

Hazard Light Switch (5)



Hazard Lights - Press the top of the switch to turn on the hazard lights. Press the bottom of the switch to turn off the hazard lights.

Vibratory Amplitude Control (6)

The vibratory amplitude control is on the operator console to the right of the steering wheel. The control is used to select one of three settings: LOW amplitude, HIGH amplitude and OFF.



g06255201

HIGH - To achieve HIGH amplitude, depress the front of the vibratory control.

OFF – To stop the vibration system, move the vibratory control to the center position.



LOW - To achieve LOW amplitude, depress the rear of the vibratory control.

Roading Light / Parking Light Switch (7)



Roading Light Switch - Enable this switch to activate the roading lights.



Parking Light Switch – Enable this switch to activate the parking lights.

Rotating Beacon (If Equipped) (8)



Beacon - Move the switch forward to turn on the beacon. Move the switch rearward to turn off the beacon.

Light Switches (9)



Light Switch – Move the switch forward to turn on the floodlights. Move the switch to the center to turn off the

floodlights. Move the switch rearward to turn on the floodlights.

Turn Signal (If Equipped) (10)



Right Turn Signal - Push the switch right activate the right turn signal.



Left Turn Signal – Push the switch left to activate the left turn signal.

Information Display Switch (11)



Information Display Switch – Enable this switch to show information in the display readout

Travel Speed (12)



Propel Speed Range Control - The propel speed range control is located to the right of the steering wheel. The control allows the machine to operate in the HIGH range or the LOW range.



LOW - To place the machine in LOW range, move the propel speed range control downward. LOW range reduces

the overall speed of the machine, but the torque of the machine will increase.



HIGH - To place the machine in HIGH range, move the propel speed range control upward. HIGH range increases

the speed of the machine, but the torque of the machine will decrease. HIGH range is used to move the machine from one job site to another job site.

Note: Before you start up a slope or down a slope. LOW range is recommended for optimal performance and maximum control. Do not change the propel speed range control while you go downhill.

Auto / Manual Vibration (13)



Auto Vibration - Select this side of the switch to place the machine into auto drum vibration mode.



Manual Vibration - Select this side of the switch to place the machine into manual drum vibration mode.

Propel Control (14)

FWD – Push the propel control lever away from the operator to move the compactor forward. To cause the machine to move faster, push the lever farther.

STOP – Move the propel control lever to the center STOP position to stop the machine.

REV – Pull the propel control lever toward the operator to move the machine in reverse. To cause the machine to move faster, pull the lever farther.

Note: If you release the propel control lever, the propel control lever will stay in the same position.

Vibratory On/Off Control (15)

Vibratory Control – Depress the button on top of the Propel handle to toggle the drum vibration on/off.

Emergency Stop Knob (16)

NOTICE

Perform a walk around inspection after actuation of a shutdown device.

Take necessary corrective action to resolve the cause of the shutdown.

Ensure that no additional damage has been done or could occur before returning to operation.

50 M0085517-07



Emergency Stop Knob – To stop the machine and the engine, push the knob downward. To release the emergency stop knob, pull the knob upward.

Horn (17)



Horn – The horn button is on the right console. Depress the horn button to sound the horn. Use the horn for alerting personnel or for signaling personnel.

Parking Brake (18)



Parking Brake - This indicator illuminates when the parking brake is engaged. The indicator should flash during start-up. If this indicator is illuminated, disengage the parking brake before attempting to move the machine.

Switch for Glow Plugs (19)

Glow Plugs – Press and hold the top portion of the switch for 20 seconds to heat the glow plugs. Release the switch and start the engine. Refer to "Engine Starting" for more information on starting the engine.

Engine Start Switch (20)

OFF - To disconnect the electrical power to the engine and to the machine, turn the switch in a counterclockwise direction to the OFF position. Turn the switch to the OFF position before trying to restart the engine. Turn the switch to the OFF position to stop the engine.

ON - To activate the cab circuits, turn the switch to the ON position. When the switch is released from the START position, the switch will return to the ON position.



START – Turn the engine start switch to the START position to crank the engine. Release the key when the engine starts.

Note: If the engine does not start, return the switch to the OFF position before returning to the START position.

For more information, refer to "Engine Starting".

Throttle Control (21)



Throttle Control - The throttle control is a lever with three detent positions -LOW, ECO, and HIGH IDLE.



LOW - To decrease the engine speed to low speed, move the lever upward to the front of the machine to the LOW position.



ECO - To optimize fuel economy, move lever into the center ECO position.



HIGH - To increase the engine speed to high speed, move the lever downward toward the rear of the machine to the HIGH position.

Note: To start the vibratory system, the throttle control must be placed in the HIGH or ECO position.

i07182011

Battery Disconnect Switch

SMCS Code: 1411

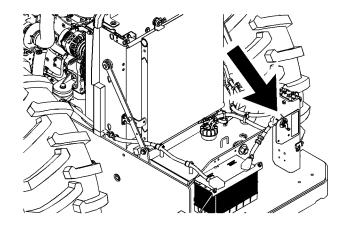


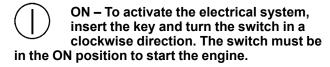
Illustration 53

g06244395

The battery disconnect switch is located in the engine compartment.



OFF - To deactivate the electrical system, turn the switch to the OFF position.



The functions of the battery disconnect switch and the engine start switch are different. When the battery disconnect switch is turned to the OFF position, the entire electrical system is disabled. When the engine start switch is turned to the OFF position, the battery remains connected to the electrical system.

Remove the key when you leave the machine for an extended period of time or when you service the electrical system.

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 to check the battery disconnect switch for proper operation:

- 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.

i09605793

Monitoring System

SMCS Code: 1900; 5258; 7400; 7402; 7450; 7451;

7490

Indicators

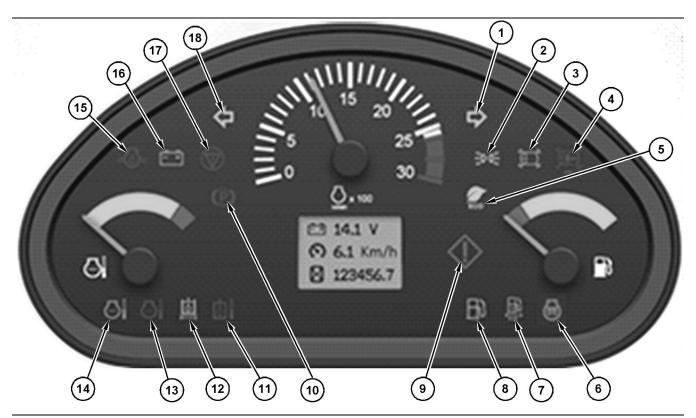


Illustration 54 g07512029



Left Turn Indicator (1) - Illuminates when left turn indicator (1) is activated



Position Light (2) – Position light (2) indicates the status of the work lights on the machine



Vibration Indicator (3) - Indicates that the vibration system is active



Decoupling Indicator (4) - Indicates when the drum is decoupling from the ground



ECO Mode Light (5) - ECO mode light (5) illuminates when the throttle position in is the ECO Mode.



Glow Plug Indicator (6) - Glow plug indicator (6) will illuminate when the glow plugs are active.



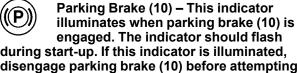
Fuel System Water Separator Indicator (7) - The alert indicator indicates the fuel/water separator needs to be drained. Action lamp (9) will also illuminate and an audible alarm will sound. Stop the engine and investigate the cause of the fault. Refer to "Stopping the Engine" for more information.



Low Fuel Indicator (8) - The fuel level gauge will indicate in the red zone when the fuel level is 12.5% of the tank



Action Lamp (9) - Action lamp (9) indicates a malfunction in the machine system.



during start-up. If this indicator is illuminated, disengage parking brake (10) before attempting to move the machine. Refer to "Operator Controls" for more information.

Hydraulic Oil Temperature Indicator (11) - Hydraulic oil temperature indicator (11) will illuminate when the hydraulic oil reaches 115 °C (239 °F). Action lamp (9) will also illuminate. Operation of the hydraulic functions must be reduced to allow the hydraulic fluid to cool. An audible alarm will sound once with two. short beeps.

Hydraulic Oil Filter Bypass Indicator (12) - Hydraulic oil filter bypass indicator (12) will illuminate when the hydraulic oil temperature is above 32 °C (89.6 °F) and hydraulic oil is bypassing the hydraulic filter. Action lamp (9) will also illuminate. An audible alarm will sound once with two, short beeps.

Engine Coolant Temp Level 1 (13) -When the temperature reaches 113 °C (235.4 °F) the ISO symbol for engine temp shall be displayed. The color shall be amber and located in light position L12.

Engine Coolant Temp Level 2 (14) -When the temperature reaches 114 °C (237.2 °F) the ISO symbol for engine temp shall be displayed. The color shall be red and located in light position L13.

oil pressure (15) is low, the following will happen: the alert indicator will illuminate, action lamp (9) will flash, and an audible alarm will sound. If this alert indicator illuminates, stop the machine immediately. Stop the engine, engage the parking brake, and investigate the cause. Refer to "Operator Controls" for more information.

Engine Oil Pressure (15) - When engine

Charging System Indicator (16) - The alert indicator illuminates if there is a malfunction in the electrical charging system. If this alert indicator illuminates, the system voltage is too low for normal machine operation.



Emergency Stop (17) - Illuminates when emergency stop (17) button is activated



Right Turn Indicator (18) - Illuminates when right turn indicator (18) is activated

Gauges



Illustration 55

q07512297

Engine Coolant Temp Level 3 (19) -When the temperature reaches 116 °C (240.8 °F) the two ISO symbol for engine temp shall be displayed. The amber and red lights in position L12 and L13 shall be displayed and the alarm shall be triggered.



Tachometer (20) - Tachometer (20) will indicate the engine RPM.

Fuel Gauge (21) - Low fuel indicator (8) will illuminate and an audible alarm will sound when the fuel level is at 12.5% of the tank capacity. Low fuel indicator (8) will flash when there is a fault with the fuel level sender.

LCD Display (22)

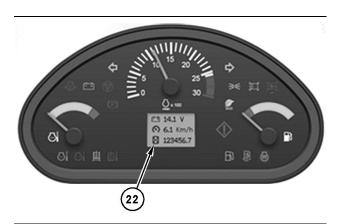


Illustration 56

q07512300

LCD Display (22) - LCD display (22) will display the hour meter.

Vibratory Operation

i07183982

Operation Information

SMCS Code: 1000; 7000

WARNING

Operate the engine at full rpm for maximum braking, steering and propel control response. Operation below full throttle will adversely affect response.

When climbing a steep grade, the propel control lever must be moved SLOWLY in order to avoid engine stall and possible loss of machine control.

Set the throttle control to the HIGH position. Attain the desired travel speed before you engage the vibratory system. To achieve optimum compaction, low range should be used.

Stop the vibration system when you travel over concrete or pavement that is hard.

NOTICE

The bearings in the vibratory reservoir for the weight shaft are lubricated by rotating the drum assembly. Turning the vibratory system on with the machine not propelling may shorten the vibratory bearing life.

Begin the first pass of the compaction along the side of the work. Gradually make subsequent passes toward the center. Overlap the previous pass by 200 mm (8.0 inch) to eliminate uncompacted areas.

NOTICE

Before changing the vibratory amplitude selection, the system must be completely stopped.

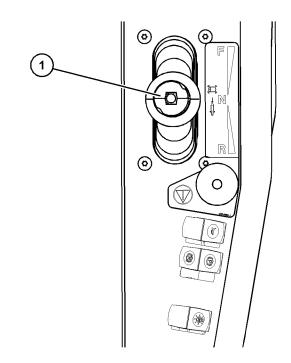


Illustration 57 g06244423

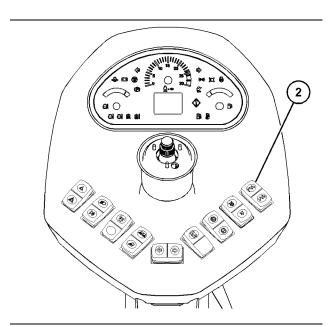


Illustration 58

g06244455

High Amplitude

To increase the height of the drum movement, place the vibratory system in high amplitude.

High amplitude is used in the following situations:

- The job site requires higher compacting force to meet the required density.
- To compact material with a depth of 250 mm (10.0 inch) or more, use high amplitude.

Note: Once you have achieved the desired density of the material, continued operation at high amplitude can crush the aggregate.

Note: Every job site is different due to the various conditions of the soil. Moisture content and the type of material vary from job site to job site. To determine the amplitude that is needed, establishing a test location at each job site is recommended.

- **1.** To place the vibratory system in high amplitude, depress the top of vibratory amplitude control (2) downward.
- 2. Move the propel lever to the FWD position or the REV position.
- 3. Start the vibratory system by pressing vibratory on/ off control (1). The control is on the top of the propel lever.
- 4. To stop the vibratory system, press vibratory on/off control (1).
- **5.** Return the propel control to the STOP position.

Low Amplitude

To decrease the height of the drum movement, place the vibratory system in low amplitude.

Low amplitude is used in the following situations:

- When operating the machine in high amplitude and the drum separates from the soil, use low amplitude to reach the desired soil density.
- The thickness of the material is less than 250 mm (10.0 inch).
- · Objects such as sewer systems or water systems may be damaged due to high amplitude.
- 1. To place the vibratory system in low amplitude, depress the bottom of vibratory amplitude control (2) downward.
- 2. Move the propel lever to the FWD position or the REV position.
- 3. Start the vibratory system by pressing vibratory on/ off control (1). The control is on the top of the propel lever.
- 4. To stop the vibratory system, press vibratory on/off control (1).

5. Return the propel control to the STOP position.

i07219651

Backup Alarm

SMCS Code: 7406



Backup Alarm - The backup alarm will sound when the propel lever is in the **REVERSE** position. The backup alarm alerts any personnel that the machine is backing

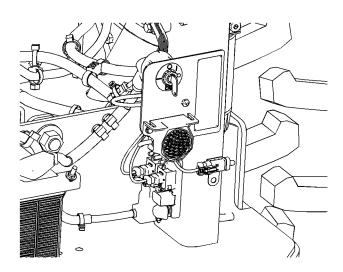


Illustration 59 g06256325

The backup alarm is on the rear of the machine.

Engine Starting

i07475206

Engine Starting

SMCS Code: 1000; 7000

NOTICE

Do not crank the engine for more than 30 seconds. If the engine does not start, allow the starter to cool for two minutes before cranking again. The engine start switch must be turned to the OFF position before trying to restart.

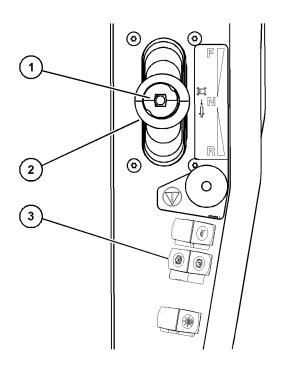


Illustration 60 g06244465

- 1. Move propel control (2) to the NEUTRAL position.
- 2. Push parking brake switch (3) toward the right of the machine.

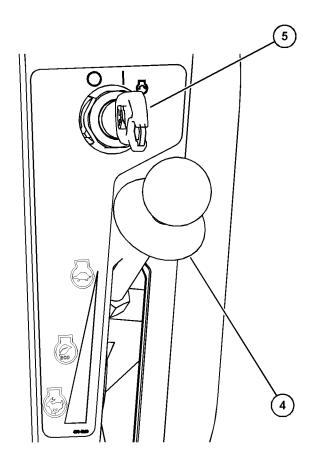


Illustration 61 g06244482

- 3. Pull throttle control (4) upward to the LOW throttle detent position.
- **4.** Turn key (5) to the ON position.
- 5. Press the switch for the glow plug for 20 seconds to heat the glow plugs.

Note: If the engine is already warm from previous operation, the glow plugs do not need to be heated.

- **6.** Briefly sound the horn before you start the engine.
- 7. To crank the engine, turn key (5) to the START position. When the engine starts, release the key.

Note: Refer to the Operation and Maintenance Manual, "Engine and Machine warmup" for further information.

i07184108

Engine and Machine Warm-Up

SMCS Code: 1000; 7000

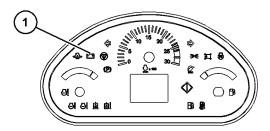


Illustration 62 g06256355

NOTICE

If the indicator for the engine oil 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.
- **2.** Look at the gauges and the indicator lights frequently during operation.

If the alternator indicator lamp (1) remains illuminated, inspect the machine for the cause of the trouble. If the gauges do not respond properly, inspect the machine for the trouble. Before moving the machine, repair all problems.

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

Observe the following recommendations during the warmup period for the engine:

- In temperatures above 0°C (32°F), the warmup period is 5 minutes.
- In temperatures below 0°C (32°F), the warmup period is 15 minutes or a longer time.
- In temperatures below -18°C (0°F), more time is required if the hydraulic performance is sluggish.

Parking

i07475207

Stopping the Machine

SMCS Code: 7000

NOTICE

Park the machine on a level surface. If it is necessary to park on a grade, securely block the tires and the drum.

Do not apply the parking brake while the machine is moving unless an emergency exists.

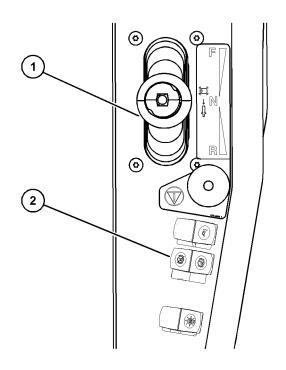


Illustration 63 g06244584

- 1. Move propel control (1) to the NEUTRAL position.
- **2.** Push parking brake switch (2) toward the right of the machine.

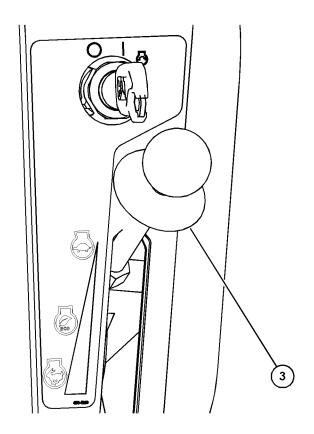


Illustration 64 g06244581

Move throttle control (3) upward to the LOW position.

i08340549

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.

Follow the stopping procedure outlined below, in order to allow the engine to cool and prevent excessive temperatures in the turbocharger center housing, which could cause oil coking problems.

NOTICE

Perform a walk around inspection after actuation of a shutdown device.

Take necessary corrective action to resolve the cause of the shutdown.

Ensure that no additional damage has been done or could occur before returning to operation.

- 1. Before stopping the engine, allow the engine to run at low idle with no load for 5 minutes. This procedure allows the hot areas of the engine to cool gradually and the procedure will extend the life of the engine.
- **2.** Turn the engine start switch to the OFF position. Remove the key.
- **3.** Be sure that all the controls are in the OFF position. Be sure that all the controls are in the proper position for parking the machine.

Engine Shutdown Knobs

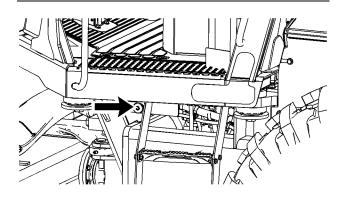


Illustration 65 g06332703

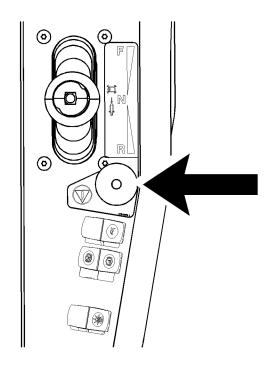


Illustration 66 g06244760

There is one engine shutdown knob on the left side of the machine and one engine shutdown knob located near the propel control. Push the knob down to stop the engine. Pull out the knob to disable the engine shutdown. 60 M0085517-07

Operation Section
Stopping the Engine if an Electrical Malfunction Occurs

Note: The engine will turn over but will not start if either engine shutdown knob is pushed down. To reset the machine, turn the engine start switch (OFF). Pull out both engine shutdown knobs. Turn the engine start switch ON.

i07184486

Stopping the Engine if an Electrical Malfunction Occurs

SMCS Code: 1000; 7000

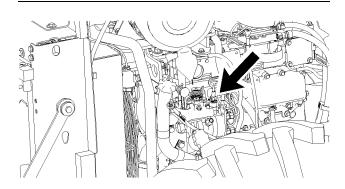


Illustration 67

g06244808

Remove the wire connector to stop the engine.

Note: Do not operate the machine again until the malfunction has been corrected.

i07184583

Leaving the Machine

SMCS Code: 7000

- Use the steps and the handholds to dismount the machine. Face the machine to dismount the machine.
- **2.** Always turn the battery disconnect switch to the OFF position before leaving the machine.
- **3.** If the machine will not be operated for a month or more, remove the battery disconnect switch key.
- **4.** Close all access covers and doors. If your machine is equipped with a vandalism guard, install the vandalism guard before you leave the machine.

i07735116

Machine Storage and Specified Storage Period

SMCS Code: 7000

Machine Storage

The Safety Section of this Operation and Maintenance Manual contains storage information for fuels, lubricants, and ether (if equipped).

The Operation Section of this Operation and Maintenance Manual contains information for short-term storage of this machine, including engine shutdown, parking, and instructions for leaving the machine.

For detailed steps on long-term storage refer to Special Instruction, SEHS9031, "Storage Procedure for Caterpillar Products".

Specified Storage Period

The specified storage period of this machine is 1 year.

After the specified storage period has expired, consult your Cat dealer for inspect, repair, rebuild, install remanufactured, or install new components, and disposal options, and to establish a new specified storage period.

If a decision is made to remove the machine from service, refer to Decommissioning and Disposal for further information.

Transportation Information

i07475224

Shipping the Machine

SMCS Code: 7000; 7500

For the basic specifications of the machine, refer to the Operation and Maintenance Manual, "Specifications".

Investigate the travel route for overpass clearances. Make sure that there is adequate clearance for the machine that is being transported.

Remove ice, snow, or other slippery material from the loading dock and from the truck bed before you load the machine onto the transport machine. Removing ice, snow, or other slippery material will help to prevent the machine from slipping in transit.

Note: Obey all laws that govern the characteristics of a load (height, weight, width, and length). Observe all regulations that govern wide loads.

When you move the machine to a colder climate, make sure that the cooling system has the proper antifreeze.

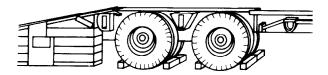


Illustration 68 g00303463

- **1.** Before you load the machine, chock the trailer wheels or the rail car wheels, as shown.
- **2.** Move the machine into position.
- 3. Apply the parking brake for the machine.
- Turn the engine start switch key to the OFF position. Remove the key.

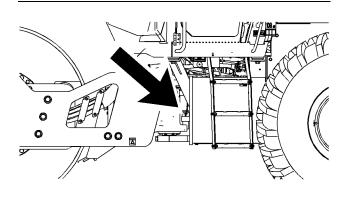


Illustration 69

q06244831

- Install the steering frame lock pin. The pin will hold the front frame and the rear frame rigid.
 - Refer to the Operation and Maintenance Manual, "Steering Frame Lock" for further information.
- **6.** Block the machine, and tie down the machine. Refer to the Operation and Maintenance Manual, "Lifting and Tying Down the Machine" for more information.
- 7. Lock the doors and the access covers. Attach any vandalism protection. Cover the operator seat. Refer to the Operation and Maintenance Manual, "Leaving The Machine" for further information.

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, PERJ1017, "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.

- 8. To protect the cooling systems, mix a solution of antifreeze and water. The solution should provide protection to the lowest expected outside temperature. Drain the excess coolant into a suitable container.
- **9.** Perform a walk-around inspection and measure the fluid levels in the various compartments.

i02001115

Roading the Machine

SMCS Code: 7000; 7500

Inflate the tires to the correct pressure. Refer to the Operation and Maintenance Manual, "Tire Inflation Pressure Adjustment".

Perform a walk around inspection of the machine. Measure the fluid levels in the various compartments.

Check with the proper officials in order to obtain the required licenses.

Install any required flags, signals, or lights.

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

i08455117

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.

NOTICE

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

Note: Make sure that the loading areas, shipping platform and contact surfaces are clean, free from ice and snow, and other slippery surfaces.

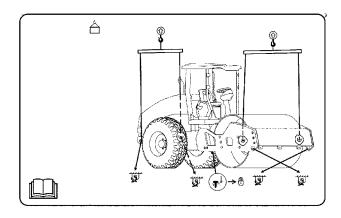


Illustration 70
Shipping film

g06671534

Lifting the Machine

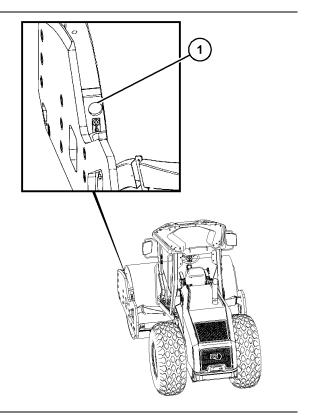


Illustration 71 g06677075

(1) Front lifting point to the left side of machine

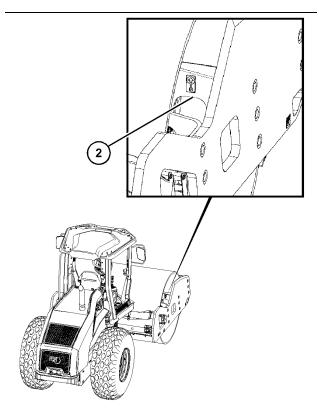


Illustration 72 g06681769

(2) Front lifting point to the right side of machine.



Lifting Point – To lift the machine, attach the lifting devices to the lifting points.

This machine is equipped with four lifting points. There are two lifting points in the front of the machine. The front lifting points are inside the machine frame and drum area on each side. The rear lifting points are on the machine frame just behind the rear axle. Each approved lifting point is identified by a label depicting a lifting hook. Refer to Illustration 71, Illustration 72 and Illustration 76 for lifting points.

Note: Only utilize locations identified with lifting point films. Do not use any other locations including handles, steps, or work tools to lift the machine.

When lifting the machine, use properly rated cables and properly rated slings to lift the machine. Utilize a spreader bar sufficient in size to prevent the lifting cables or lifting straps from contacting 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 may vary. Refer to "Specifications" for the dimensions and weight of the machine.

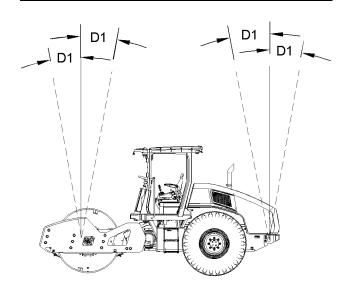


Illustration 73
Left side view of the machine
(D1) Maximum fore / aft angle

g06671003

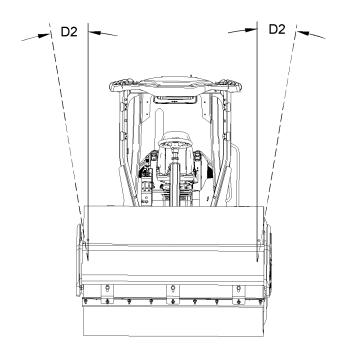


Illustration 74
Front view of the machine
(D2) Maximum lateral angle

g06671034

Table 9

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Front Lifting Points			Rear Lifting Points		
Minimum Break- ing Load	Maximum Fore / Aft Angle (D1)	Maximum Lateral Angle (D2)	Minimum Break- ing Load	Maximum Fore / Aft Angle (D1)	Maximum Lateral Angle (D2)
204 kN (45861.2 lb)	12 degrees	15 degrees	98 kN (22031.4 lb)	25 degrees	15 degrees

Refer to Table 9 for cable capacities and cable orientations limits.

Remove any structures that may obstruct the lifting cable routing between the lifting points and spreader bar.

Position the crane or lifting device to lift the machine in a level position.

Do not allow any personnel in the area around the machine.

- 1. To hold the yoke rigid, install the steering frame lock pin. Refer to "Steering Frame Lock" for more information.
- 2. Attach two lifting cables to the rear of the machine. There is one lifting eye on each side of the rear of the machine. Refer to Illustration 76.
- 3. Attach two lifting cables to the front of the machine. There is one eye on each side of the front of the machine. Refer to Illustration 71 and Illustration 72
- **4.** Connect the four lifting cables to the spreader bars. The spreader bars must be centered over the machine. Refer to Illustration 70.

Note: Use the front eyes and the rear eyes that are provided on the lower frame of your machine. When necessary, use a clevis or corner protection to prevent contact with sharp edges.

- **5.** If equipped, secure any attachments.
- **6.** Lift the machine. Move the machine to the desired position.

When the machine is positioned, place the blocks behind the tires.

Tying Down the Machine

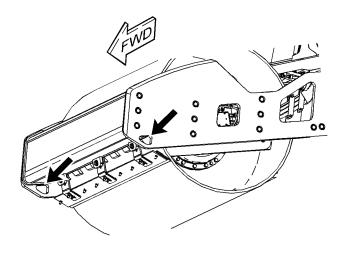


Illustration 75 g06671481

Front view of the machine Tying down and retrieval points

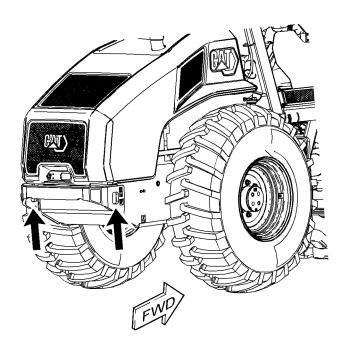


Illustration 76 g06671486

Rear view of the machine Lifting, tying down and retrieval points



Tie Down Point – To tie down the machine, attach the tie-downs to the tie-down points.

The machine is equipped with four tie-down points.

Note: Use only the specified location for tying down the machine. The positions are identified on the machine by a label depicting a tie-down symbol. Do not use any other location including handles, steps, or work tools to 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. Refer to "Specifications" for the dimensions and weight of the machine.

Note: There may be more than one way to tie down the machine. Local regulations should be used to determine the best method. Obey all local and regional governmental regulations.

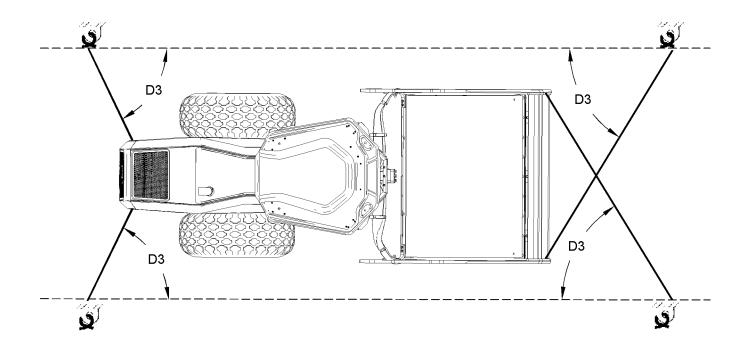


Illustration 77 g06671101

Top view of the machine

(D3) Horizontal angle

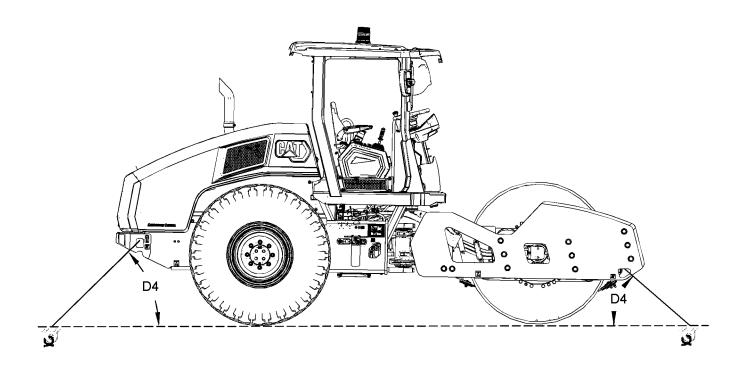


Illustration 78 g06677019

Right side view of the machine

(D4) Vertical angle

Table 10

Tie Down Points	Minimum Breaking Load (KN)	Horizontal Angle, Range Limits (D3)	Vertical Angle, Range Lim- its (D4)
Front	209 kN (46985.3 lb)	45 to 60 degrees	10 to 30 degrees
Rear	214 kN (48109.3 lb)	45 to 60 degrees	25 to 35 degrees

Refer to the Table 10 for cable capacities and cable orientations limits.

- 1. To hold the yoke rigid, install the steering frame lock pin. Refer to "Steering Frame Lock" for more information.
- Secure the machine at the tie-down positions. Use properly rated cables and shackles for tying down the machine.
- **3.** Use the front eyes and the rear eyes that are provided on the lower frame of your machine. When necessary, use a clevis or corner protection to prevent contact with sharp edges.
- **4.** Avoid routing cables over tires. Avoid contact with the work tool to prevent false tension.

Install tie downs at all specified positions for the machine.

Machine Retrieval

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.

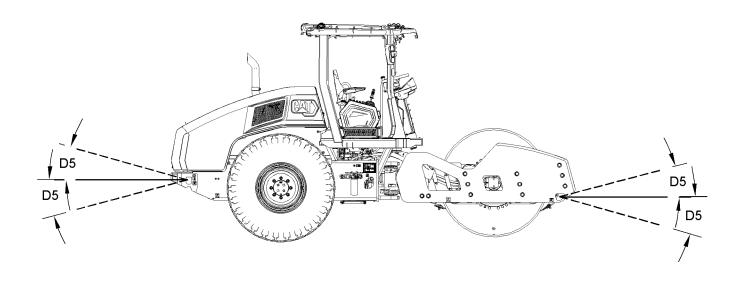
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WARNING

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.



g06681588 Illustration 79

Front and rear straight retrieval angle range

(D5) 15 degrees

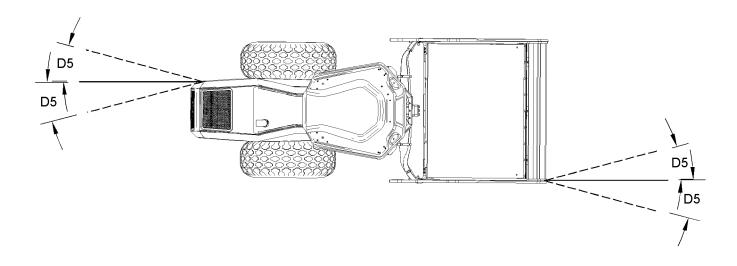


Illustration 80 g06681598

Top view of the machine
Front and rear side retrieval angle range

(D5) 15 degrees

The machine is equipped with four retrieval points. There are two retrieval points in the front and two retrieval points in the back of the machine frame. Refer to Illustration 75 and Illustration 76.

Before towing, make sure that the tow line or tow bar is in good condition. Make sure that the tow line or the tow bar has enough strength for the procedure that is being involved. The strength of the tow line or the tow bar should be at least 150 percent more than the gross weight of the machine. This towing procedure is true for a disabled machine that is stuck in mud and for towing on a grade.

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.

Quick machine movement could overload and break the tow line or the tow bar. Gradual, smooth machine movement works better.

Note: Keep the tow line as low as possible. Do not exceed an angle of 15 degree from the straight ahead position. Refer to Illustration 79 and Illustration 80.

Running Engine

If the engine is running, the machine can be towed for a short distance under certain conditions. The brakes and the steering system must be operable.

 Block the drum and block the tires securely in order to prevent movement of the machine. Do not remove the blocking until the tow vehicle has been positioned and the tow lines are in place.

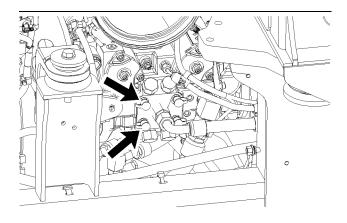


Illustration 81 g02817359

2. Install a balance line between ports "ma" and "mb" of the propel pump.

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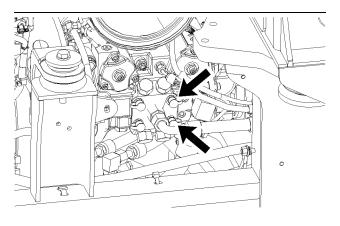


Illustration 82 g02817377

- **3.** Install a balance line between ports "ma" and "mb" of the propel pump.
- 4. Attach the towing machine.
- 5. Remove the blocks.
- **6.** Start the engine. Refer to "Engine Starting" for more information.
- **7.** Release the parking brake. Refer to "Operator Controls" for more information.
- **8.** Steer the machine that is towed in the direction of the tow line.
- **9.** When the disabled machine is in place, set the parking brake.
- **10.** Stop the engine and remove the key. Refer to "Stopping the Engine" for more information.
- 11. Block the machine.
- 12. Remove the tow lines.
- 13. Remove the balance lines.

Stopped Engine

A WARNING

Shutting off the engine will result in the loss of machine steering and the machines brakes will be applied.

NOTICE

Release the parking brake to prevent excessive wear and damage to the braking system when towing.

The procedure for manual release of the parking brake is outlined in the Operation and Maintenance Manual, "Parking Brake Manual Release".

When the engine is stopped, additional steps may be required before the machine is towed in order to avoid damaging the power train, the steering system, and the brakes.

- Block the drum and block the tires securely in order to prevent the movement of the machine. Do not remove the blocking until the tow vehicle has been positioned and the tow lines are in place.
- 2. Install the steering frame lock pin. Refer to "Steering Frame Lock" for further information on the steering frame lock.
- **3.** Disconnect the cylinders for steering from the hitch. Secure the cylinders to the main frame of the machine.

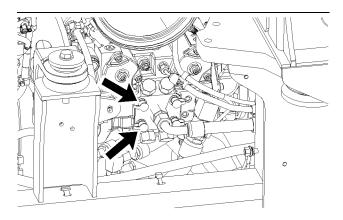


Illustration 83 g02817359

4. Install a balance line between ports "ma" and "mb" of the propel pump.

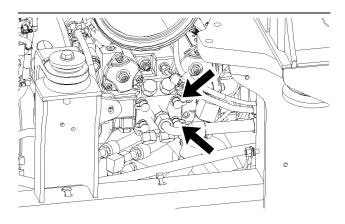


Illustration 84 g02817377

- **5.** Install a balance line between ports "ma" and "mb" of the propel pump.
- **6.** Connect the parking brake release pump. Refer to "Parking Brake Manual Release" for more information.

- 7. Attach the tow lines to the disabled machine.
- 8. Attach the tow line to the tow vehicle.

Note: Move the tow vehicle so that there is slight tension on the tow line. This will maintain movement of the disabled machine when the parking brake is released.

- **9.** Remove the steering lock pin. Refer to "Steering Frame Lock" for further information on the steering frame lock.
- 10. Remove the blocks from the drum and the tires.
- **11.** Manually release the parking brake. Refer to "Parking Brake Manual Release" for more information.
- **12.** Slowly tow the disabled machine to the desired destination.
- 13. Block the drum and block the tires securely.
- **14.** Disconnect the parking brake release pump. Refer to "Parking Brake Manual Release" for more information.
- **15.** Install the steering frame lock. Refer to "Steering Frame Lock" for further information on the steering frame lock.
- **16.** Detach the towing machine and the tow lines.
- 17. Remove the balance lines
- **18.** Connect the cylinders for the steering to the hitch.
- **19.** Remove the steering lock pin. Refer to "Steering Frame Lock" for further information on the steering frame lock.

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i07475232

Towing the Machine

Towing Information

SMCS Code: 7000

⋒ WARNING

Improper hookup and towing is dangerous and could result in injury or death to yourself or others.

The towing connection must be rigid, or towing must be done by two machines of the same size as the towed machine. If two machines are used, connect a machine on each end of the towed machine.

If only one machine is used for towing, that machine must be larger than the towed machine.

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

These towing instructions are for moving a disabled machine for a short distance at low speed. Move the machine at a speed of 2 km/h (1.2 mph) or less to a convenient location for repair. These instructions are only for emergencies. Always haul the machine if long distance moving is required.

Shielding must be provided on both machines. This will protect the operator if the tow line or the tow bar breaks.

Do not allow an operator to be on the machine that is being towed unless the operator can control the steering and/or the braking.

Before towing, make sure that the tow line or the tow bar is in good condition. Make sure that the tow line or the tow bar has enough strength for the towing procedure that is involved. The strength of the towing line or of the tow bar should be at least 150 percent of the gross weight of the towing machine. This is true for a disabled machine that is stuck in the mud and for towing on a grade.

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

Quick machine movement could overload the tow line or the tow bar. This could cause the tow line or the tow bar to break. Gradual, steady machine movement will be more effective.

Normally, the towing machine should be as large as the disabled machine. Make sure that the towing machine has enough brake capacity, enough weight, and enough power. The towing machine must be able to control both machines for the grade that is involved and for the distance that is involved.

You must provide sufficient control and sufficient braking when you are moving a disabled machine downhill. This may require a larger towing machine or more machines that are connected to the rear. This will prevent the machine from rolling away out of control.

All situation requirements cannot be listed. Minimal towing machine capacity is required on smooth, level surfaces. On inclines in poor condition or on surfaces in poor condition, maximum towing machine capacity is required.

Attach the towing device and the machine before you release the brakes.

Consult your Caterpillar dealer for towing a disabled machine.

Carefully follow all the instructions in this section.

Running Engine

If the engine is running, the machine can be towed for a short distance under certain conditions. The brakes and the steering system must be operable.

Note: If there is a failure in the propel system, refer to Operation and Maintenance Manual, "Towing the Machine - Stopped Engine" for information.

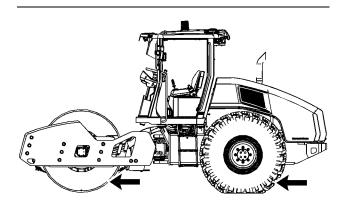


Illustration 85

g06332716

 Block the drum and block the tires securely to prevent movement of the machine. Do not remove the blocking until the tow vehicle has been positioned and the tow lines are in place.

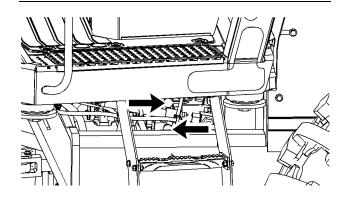


Illustration 86 g06332718

- **2.** Remove the dust caps from the test fittings at ports Ma and Mb on the propel pump.
- **3.** Install jumper hose between the quick disconnect test fittings.
- 4. Attach the towing machine.
- **5.** Remove the blocks.
- 6. Start the engine.
- 7. Release the parking brake.
- **8.** Steer the machine that is towed in the direction of the tow line.
- **9.** When the disabled machine is in place, set the parking brake.
- 10. Stop the engine and remove the key.
- 11. Block the machine.
- 12. Remove the tow lines.
- **13.** Remove jumper hose between the quick disconnect test fittings.

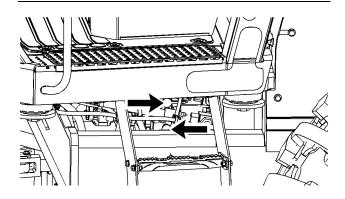


Illustration 87 g06332718

14. Reinstall the dust caps on test fittings at ports Ma and Mb on the propel pump.

Stopped Engine

WARNING

Shutting off the engine will result in the loss of machine steering and the machines brakes will be applied.

When the engine is stopped, more steps may be required before the machine is towed to avoid damaging the power train, the steering system, and the brakes.

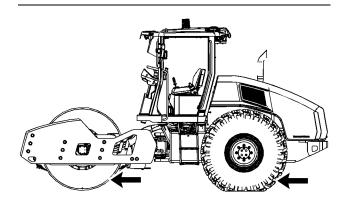


Illustration 88 g06332716

- Block the drum and block the tires securely to prevent the movement of the machine. Do not remove the blocking until the tow vehicle has been positioned and the tow lines are in place.
- Install the steering frame lock pin. Refer to the Operation and Maintenance Manual, "Steering Frame Lock" for further information on the steering frame lock.

WARNING

Personal injury or death can result from a brake malfunction.

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

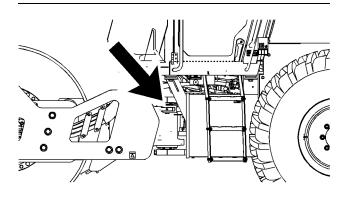


Illustration 89 g06245236

Disconnect the steering cylinders from the hitch. Secure the cylinders to the main frame of the machine.

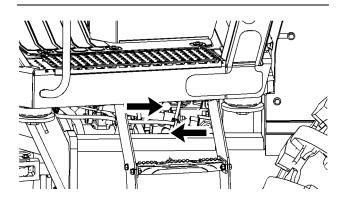


Illustration 90 g06332718

- **4.** Remove the dust caps from the test fittings at ports Ma and Mb on the propel pump.
- Install jumper hose between the quick disconnect test fittings.
- **6.** Connect the parking brake release pump. Refer to the Operation and Maintenance Manual, "Parking Brake Manual Release" for more information.
- 7. Attach the tow lines to the disabled machine.
- 8. Attach the tow line to the tow vehicle.

Note: Move the tow vehicle so that there is slight tension on the tow line. This will maintain movement of the disabled machine when the parking brake is released.

- 9. Remove the steering lock pin.
- 10. Remove the blocks from the drum and the tires.

NOTICE

Release the parking brake to prevent excessive wear and damage to the braking system when towing.

The procedure for manual release of the parking brake is outlined in the Operation and Maintenance Manual, "Parking Brake Manual Release".

- 11. Manually release the parking brake. Refer to the Operation and Maintenance Manual, "Parking Brake Manual Release" for more information.
- **12.** Slowly tow the disabled machine to the desired destination.
- 13. Block the drum and block the tires securely.
- 14. Disconnect the parking brake release pump.
- 15. Install the steering frame lock.
- **16.** Remove jumper hose between the quick disconnect test fittings.

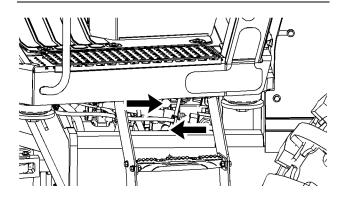


Illustration 91 g06332718

- 17. Reinstall the dust caps on test fittings at ports Ma and Mb on the propel pump.
- 18. Detach the towing machine and the tow lines.
- **19.** Connect the cylinders for the steering to the hitch.

20. Remove the steering lock pin.

i07475242

Parking Brake Manual Release

SMCS Code: 4267; 4354

MARNING

Personal injury or death can result from a brake malfunction. Do not operate the machine if the brake was applied due to a malfunction of the brake system.

Correct any problem before attempting to operate the machine.

Note: There are parking brakes on the final drive planetary (drum) and final drive planetary (axle).

1. To prevent the machine from moving, block the drum and block the tires securely.

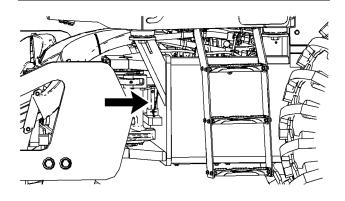


Illustration 92 g06332721

- **2.** To hold the front frame and the rear frame rigid, install the steering frame lock pin.
- **3.** The brakes can be released when you use the following procedure.

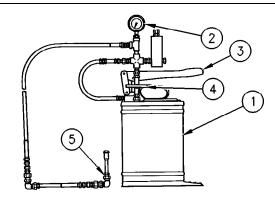


Illustration 93 g00040674

- **4.** To release the brakes, use the FT-1973 Adapter Group and the FT-1845 Pump Group.
- **5.** Connect the brake release hose to the FT-1973 Adapter Group (5).
- **6.** Turn the handle (4) of the bypass to the CLOSED position.
- 7. Observe the opening pressure of the relief valve (2) while you operate the pump handle (3).

NOTICE

Possible brake piston seal damage could result without checking the relief valve. The opening pressure must be checked and adjusted before making a connection.

8. Adjust the opening pressure to 2413 ± 69 kPa (350 ± 10 psi). Turn the handle (4) of the bypass to the OPEN position.

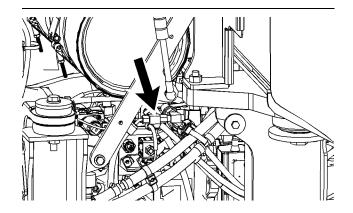


Illustration 94 g03839040

9. Disconnect the T junction with both brake lines attached. To prevent the loss of fluid, plug the brake lines.

Disconnect the T junction with both brake lines attached. Cap or plug the pump port Ps and attach brake release line (from pump) into the TEE fitting to prevent the loss of fluid.

- 10. Connect the 8T-2857 Brake Release Adapter to the T junction that connects to both brake lines. Install the remainder of the FT-1973 Adapter Group (5) to the pump pressure hose.
- 11. Place the pump near the operator.
- **12.** Turn the handle (4) for the bypass to the CLOSED position.
- **13.** Operate the pump handle to produce a pressure rise. The seal is seated when the pressure rises to the maximum value.
- **14.** When the engine is stopped, more steps are required before the machine is towed. Refer to the Operation and Maintenance Manual, "Towing the Machine" for more information.
- 15. The machine can be towed.

Tow the machine for short distances only. Tow the machine at a slow speed of less than 2 km/h (1.2 mph).

Engine Starting (Alternate Methods)

i07475250

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 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.

Always connect the battery positive (+) to battery positive (+) and the battery negative (-) to battery negative (-).

Jump start only with an energy source with 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.

NOTICE

When starting from another machine, make sure that the machines do not touch. This can 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 12 volt starting system. Use only the same voltage for jump starting. Use of a higher voltage damages the electrical system.

Use of Jump-Start Cables

- Make the initial determination of the machines failure to crank.
- 2. 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.
- Move the transmission of the stalled machine into the STOP position. Engage the parking brake. Move all controls to the HOLD position.
- **4.** Turn the engine start switch on the stalled machine to the OFF position. Turn off all accessories.
- Turn on the battery disconnect switch on the stalled machine.
- 6. Move the machine that is being used as a power source so that the jump-start cables can reach the stalled machine. DO NOT ALLOW THE MACHINES TO CONTACT EACH OTHER.
- 7. Stop the engine on the machine that is being used as a power source. If you are using an auxiliary power source, turn off the charging system.
- **8.** Connect the positive jump-start cable to the positive battery terminal on the stalled machine.
 - Do not allow positive cable clamps to contact any metal except for the positive battery terminal.
- Connect the positive jump-start cable to the positive terminal of the boost source. Use the procedure from Step 8 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, the fuel tank, the fuel lines, the hydraulic lines, or moving parts.
- **12.** Start the engine on the machine that is being used as a power source. If you are using an auxiliary power source, energize the charging system on the auxiliary power source.
- **13.** Wait for a minimum of two minutes while the batteries in the stalled machine partially charge.
- **14.** Attempt to start the stalled engine. Refer to Operation and Maintenance Manual, "Engine Starting".

Operation Section
Engine Starting with Jump Start Cables

- **15.** Immediately after you start the stalled engine, disconnect the jump-start cables from the machine that is being used as a power source. First disconnect the negative battery cable. Then disconnect the positive battery cable.
- **16.** Disconnect the other end of the jump-start cables from the stalled machine.
- **17.** When the engine is running and the charging system is in operation, conclude the failure analysis on the starting charging system of the stalled machine, as required.

Maintenance Section

Maintenance Access

i07475253

Access Doors and Covers

SMCS Code: 7251; 7263; 7273-573; 7273-572; 7273

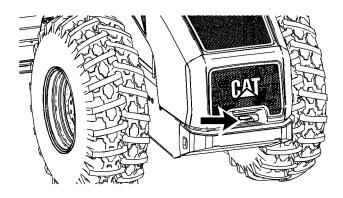


Illustration 95 g06332725

Use the handle to unlatch the hood for the engine. Opening the hood will allow access to the engine and major components.

Tire Inflation Information

i02828698

Tire Shipping Pressure

SMCS Code: 4203; 7500

The tire inflation pressures that are shown in the following table are the shipping pressures. The shipping pressures will vary from the operating pressures for the machine. Adjust the tire pressures before operating the machine.

Table 11

Ply Rating	Maximum Shipping Pressure
8	200 kPa (30 psi)
10	200 kPa (30 psi)
12	200 kPa (30 psi)
14	200 kPa (30 psi)

i08042643

Tire Inflation Pressure Adjustment

SMCS Code: 4203

The tire pressure in a warm shop area (18° to 21°C (65° to 70°F) average temperature) 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.

When you operate the machine in freezing temperatures, see Operation and Maintenance Manual, SEBU5898, "Cold-Weather Recommendations".

Tire Inflation Pressures

Refer to the Operation and Maintenance Manual, "Tire Inflation - Check" for the procedure on checking the tire pressure.

Since operating conditions can vary, inflate the tires to the following pressures:

Table 12

Ply Rating	Low-Pressure Limit	Normal Operating Pressure	High- Pressure Limit	Maximum Shipping Pressure
8	12	16	16	30
10	12	16	20	30

(Table 12, contd)

Ply Rating	Low-Pres- sure Limit	Normal Operating Pressure	High- Pressure Limit	Maximum Shipping Pressure
12	12	16	24	30
14	12	16	28	30

Tire Ballast

Fill each tire with 30 percent calcium chloride and 70 percent water according to the table below.

Table 13

Machine	Ballast Quantity		
CS10 GC	77 L (81.4 qt) or 345 L (365 qt)		
CS11 GC & CS12 GC	430 L (454.4 qt)		

(continued)

Lubricant Viscosities and Refill Capacities

i08798773

Lubricant Viscosities (Fluids Recommendations)

SMCS Code: 1000; 7000; 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.

Refer to the lubricant information section in the latest revision of the Operation and Maintenance Manual, 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

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. 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" table, 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 to provide the full performance and life that has been designed and built into Cat engines.

Cat DEO-ULS or oils that meet the Cat ECF-3 specification and the API CJ-4 are required for use in the applications listed below. Cat DEO-ULS and oils meeting Cat ECF-3 specification and the API CJ-4 and ACEA E9 oil categories have been developed with limited sulfated ash, phosphorus, and sulfur. These chemical limits are designed to maintain the expected aftertreatment devices life, performance, and service interval. If oils meeting the Cat ECF-3 specification and the API CJ-4 specifications are not available, oils meeting ACEA E9 may be used. ACEA E9 oils meet the chemical limits designed to maintain aftertreatment device life. ACEA E9 oils are validated using some but not all ECF-3 and API CJ-4 standard engine performance tests. Consult your oil supplier when considering use of an oil that is not Cat ECF-3 or API CJ-4 qualified.

Failure to meet the listed requirements will damage aftertreatment-equipped engines and can negatively impact the performance of the aftertreatment devices. The Diesel Particulate Filter (DPF) will plug sooner and require more frequent DPF ash service intervals.

Typical aftertreatment systems include the following:

- Diesel Oxidation Catalysts (DOC)
- Selective Catalytic Reduction (SCR)
- Lean NOx Traps (LNT)

Other systems may apply.

Table 14

82

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance	Oil Viscosities	°C		°F	
Compartment of Gystem	Requirements		Min	Max	Min	Max
	Cat DEO-ULS Cold Weather	SAE 0W-40	-40	40	-40	104
Engine Crankcase	Cat DEO-ULS SYN	SAE 5W-40	-30	50	-22	122
Liigiile Grankcase	Cat DEO-ULS	SAE 10W-30	-18	40	0	104
		SAE 15W-40	-9.5	50	15	122

Hydraulic Systems

Refer to the "Lubricant Information" section in the latest revision of the Operation and Maintenance Manual, 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 20 SAE 20W
- 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 SYN
- Cat DEO SYN
- Cat DEO-ULS Cold Weather

Table 15

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance	Oil Viscosities	0	С	0	F
Compartment of System	Requirements	Oil viscosities	Min	Max	Min	Max
	Cat HYDO Advanced 10 Cat TDTO	SAE 10W	-20	40	-4	104
	Cat HYDO Advanced 20 Cat TDTO	SAE 20	-5	45	23	113
	Cat HYDO Advanced 30 Cat TDTO SAE 30		10	50	50	122
	Cat BIO HYDO Advanced	"ISO 46" Multi-Grade	-30	45	-22	113
Hydraulic System	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 SYN Cat DEO SYN SAE 5W-40		-25	40	-13	104
	Cat DEO-ULS Cold Weather	SAE0W-40	-40	40	-40	104
	Cat TDTO Cold Weather	SAE 0W-20	-40	40	-40	104

Soil Compactors

Refer to the "Lubricant Information" section in the latest revision of the Operation and Maintenance Manual, 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.

Do not use SAE 50 viscosity grade oil in ICM-controlled transmissions. Do not use SAE 50 viscosity grade oil for the hydraulic drive winch case.

Where recommended for use, Cat TDTO SAE 50 or TO-4 SAE 50 is preferred in most applications, particularly continuous operation. If the ambient temperature is below -15 °C (5 °F), warm up the oil prior to operation. The oil must be maintained to a temperature above -15 °C (5 °F) during operation. If the ambient temperature is below -15 °C (5 °F), perform the procedures in the Operation and Maintenance Manual, Engine and Machine warmup prior to operation. If the ambient temperature is below -25 °C (-13 °F), consult your Cat dealer for instructions. Failure to warm up the oil prior to operation will damage the machine.

Do not use API GL-5 or API GL-4 Gear Oils for the Vibratory support, the Final Drive Planetary (Drum), or the Eccentric Weight Housing. 4C-6767 Synthetic Oil is a premium PAO (Polyalpaolefin) synthetic gear and bearing lubricant with no viscosity improvers. This lubricant has an ISO viscosity grade of 220, and a minimum viscosity index of 152. Commercial oil selected for this application should have a full synthetic base stock with no viscosity improvers, an ISO viscosity grade of 220, and a minimum viscosity index of 150.

For low temperatures, do not use API GL-5 or API GL-4 Gear Oils for the Vibratory support, the Final Drive Planetary (Drum), or the Eccentric Weight Housing. Select a commercial full synthetic gear and bearing lubricant with no viscosity improvers and with ISO 68 viscosity grade. This lubricant should have a minimum viscosity index of 145, and have a minimum pour point of -47 °C (-53 °F).

Table 16

Lubricant Viscosities for Ambient Temperatures							
Compartment or System	Oil Type and Category	Oil Viscosities	°C		°F		
Compartment or Cystem	On Type and Category	On viscosities	Min	Max	Min	Max	
	Cat HYDO Advanced 10 Cat TDTO	SAE 10W	-20	40	-4	104	
	Cat HYDO Advanced 30 Cat TDTO	SAE 30	0	50	32	122	
	Cat BIO HYDO Advanced	"ISO 46" Multi-Grade	-30	45	-22	113	
Drum Cooling Oil	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 SYN Cat DEO SYN	SAE 5W-40	-25	40	-13	104	
	Cat DEO-ULS Cold Weather	SAE0W-40	-40	40	-40	104	
	Cat TDTO Cold Weather	SAE 0W-20	-40	40	-40	104	
Axle - Differential and	Cat Gear Oil	SAE 80W-90					
Planetaries	Cat Synthetic Gear Oil	SAE 75W-140					
	Cat 4C-6767	synthetic ISO 220	-20	50	-4	122	
Vibratory Support	Cat TDTO commercial TO-4	SAE 50	-11	50	12	122	
	commercial synthetic	synthetic ISO 68	-47	21	-53	70	
	Cat 4C-6767	synthetic ISO 220	-20	50	-4	122	
Final Drive Planetary (Drum)	Cat TDTO commercial TO-4	SAE 50	-11	50	12	122	
	commercial synthetic	synthetic ISO 68	-47	21	-53	70	
Econtrio Weight Haveign	Cat 4C-6767	synthetic ISO 220	-20	50	-4	122	
Eccentric Weight Housing	commercial synthetic	synthetic ISO 68	-47	21	-53	70	

Special Lubricants

Grease

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 17

Recommended Grease						
Compartment or System	Grease Type	NLGI Grade	°C		°F	
Compartment or System	Grease Type		Min	Max	Min	Max
External Lubrication Points	Cat Advanced 3 Moly	NLGI Grade 2	-20	40	-4	104

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	Recommended Grease					
Compartment or System	Grosso Typo	NI CI Crede	°C	;	°F	
Compartment of System	Grease Type	NLGI Grade	Min	Max	Min	Max
		NLGI Grade 2	-30	50	-22	122
	Cat Ultra 5 Moly	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⁾	Cat Multipurpose Grease	NLGI Grade 2	-30	40	-22	104

(1) HMU Steering

Diesel Fuel Recommendations

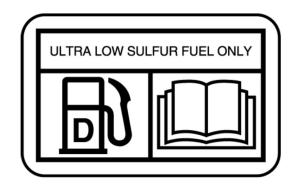


Illustration 96
NACD Film

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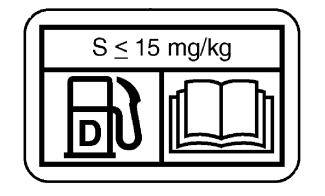


Illustration 97

EAME Film

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Diesel fuel must meet "Caterpillar Specification for Distillate Fuel" and the latest versions of "ASTM D975" or "EN 590" to ensure optimum engine performance. Refer to Operation and Maintenance Manual, 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

NOTICE

Ultra Low Sulfur Diesel (ULSD) fuel 0.0015 percent (≤15 ppm (mg/kg)) sulfur is required by regulation for use in engines certified to nonroad Tier 4 standards (U.S. EPA Tier 4 certified) and that are equipped with exhaust aftertreatment systems.

European ULSD 0.0010 percent (≤10ppm (mg/kg)) sulfur fuel is required by regulation for use in engines certified to European nonroad Stage IIIB and newer standards and are equipped with exhaust aftertreatment systems.

Misfueling with fuels of higher sulfur level will invalidate the warranty and have the following negative effects:

- Shorten the time interval between aftertreatment device service intervals (cause the need for more frequent service intervals)
- Adversely impact the performance and life of aftertreatment devices (cause loss of performance)
- Reduce engine efficiency and durability
- · Increase the wear
- · Increase the corrosion
- Increase the deposits
- · Lower fuel economy

Maintenance Section
Fluids Recommendations

- Shorten the time period between oil drain intervals (more frequent oil drain intervals)
- · Increase overall operating costs

Failures that result from the use of improper fuels are not Cat factory defects. Therefore the cost of repairs would not be covered by a Cat 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. For Tier 4/Stage IIIB/Stage IV certified engines always follow operating instructions. Fuel tank inlet labels are installed to ensure that the correct fuels are used.

Refer to Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more details about fuels, lubricants, and Tier 4 requirements. 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. 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: The diesel portion used in the biodiesel blend must be Ultra Low Sulfur Diesel (15 ppm sulfur or less, per "ASTM D975"). In Europe, the diesel fuel portion used in the biodiesel blend must be sulfur free diesel (10 ppm sulfur or less, per "EN 590"). The final blend must have 15 ppm sulfur or less.

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.

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 Operation and Maintenance Manual, 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 Operation and Maintenance Manual, 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.

Standard Factory Fill Fluids

Table 18

Standard Factory Fill Fluids ⁽¹⁾					
Compartment or System	Oil Vissosities	۰	С	0	F
Compartment or System	Oil Viscosities	Min	Max	Min	Max
Engine Crankcase	SAE 10W-30	-18	40	0	104
Hydraulic Systems	Cat HYDO Advanced 10	-20	40	-4	104
Axle - Differential and Planetaries	SAE 80W-90	-20	43	-4	110
Vibratory Support	synthetic ISO 220(2)	-20	50	-4	122
Final Drive Planetary (Drum)	synthetic ISO 220(2)	-20	50	-4	122
Eccentric Weight Housing	synthetic ISO 220(2)	-20	50	-4	122

⁽¹⁾ The machine is delivered from the factory with the designated fluids.

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Capacities (Refill)

SMCS Code: 1000; 6320; 7000; 7560

Table 19

Approximate Refill Capacities					
Compartment or System	I Litere LIIS Gallon I		Imperial Gallon		
Cooling System	18.5	4.90	4.10		
Fuel Tank	248	65.5	54.5		
Engine Oil with filter	9.5	2.50	2.10		
Hydraulic Tank (Only)	23	6.1	5.0		
Differential Center Housing	7.5	2.00	1.60		
Axle Gear Reducer	0.6	0.16	0.13		
Vibratory Bearing Reservoir (POD)	13	3.4	2.9		
Vibratory Support Box	0.85	0.220	0.190		
Drum Drive Gearbox	2.3	0.60	0.50		

(continued)

(Table 19, contd)

Wheel End Planetary	1.0	0.26	0.21
Drum Cooling Oil(1)	21	5.6	4.6

⁽¹⁾ The drum cooling oil is for cooling purposes only. The maintenance interval does not require the drum cooling oil to be changed.

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S-O-S Information

SMCS Code: 1348; 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.

The effectiveness of S·O·S Services is dependent on timely submission of the sample to the laboratory at recommended intervals.

⁽²⁾ Do not use API GL-5 or API GL-4 Gear Óils for the Vibratory support, the Final Drive Planetary (Drum), or the Eccentric Weight Housing. 4C-6767 (185-4759) Synthetic Oil is a premium PAO (Polyalpaolefin) synthetic gear and bearing lubricant with no viscosity improvers. This lubricant has an ISO viscosity grade of 220, and a minimum viscosity index of 152. Commercial oil selected for this application should have a full synthetic base stock with no viscosity improvers, an ISO viscosity grade of 220, and a minimum viscosity index of 150.

S·O·S Information

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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 $S\!\cdot\!O\!\cdot\!S$ program for your equipment.

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Maintenance Support

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System Pressure Release

SMCS Code: 1250; 1250-553-PX; 1300; 1300-553-PX; 1350; 1350-553-PX; 3000-553-PX; 4250-553-PX; 4300-553-PX; 5050; 5050-553-PX; 5070; 5612; 5612-553-PX; 5615-553-PX; 6700-553-PX; 7000; 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.

Engine Oil System

To relieve the pressure from the engine oil system, turn off the engine.

Fuel System

To relieve the pressure from the fuel system, turn off the engine.

High Pressure Fuel Lines

WARNING

Contact with high pressure fuel may cause fluid penetration and burn hazards. High pressure fuel spray may cause a fire hazard. Failure to follow these inspection, maintenance and service instructions may cause personal injury or death.

The high-pressure fuel lines are the fuel lines that are between the high-pressure fuel pump and the high-pressure fuel manifold and the fuel lines that are between the fuel manifold and cylinder head. These fuel lines are different from fuel lines on other fuel systems because of the following differences:

- The high-pressure fuel lines are constantly charged with high pressure.
- The internal pressures of the high-pressure fuel lines are higher than other types of fuel system.

Before any service or repair is performed on the engine fuel lines, perform the following tasks:

- 1. Turn off the engine.
- 2. Wait for 10 minutes.

Note: Fuel pressure can be monitored by Caterpillar Electronic Technician (ET).

Do not loosen the high-pressure fuel lines in order to purge trapped air from the fuel system.

Hydraulic System

MARNING

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 attachments have been lowered, 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.

- 1. Shut off the engine.
- 2. Apply the parking brake.
- **3.** Slowly loosen the filler cap in order to release the pressure in the hydraulic tank.
- 4. Tighten the filler cap.

5. The pressure in the hydraulic system has been released. Lines and components can be removed.

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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 Cat dealer.

Proper welding procedures are necessary 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 to prevent heat related damage. The following steps should be followed 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 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 to weld the materials together.

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Prepare the Machine for Maintenance

SMCS Code: 1000; 7000

1. Move the machine to a dry, level, solid surface that is free of any debris.

Note: The surface must be solid enough to support the weight of the machine and any tooling that is used to support the machine.

- 2. Put the machine in park. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.
- 3. Ensure that the pressure is released from any closed system that will be opened during the maintenance procedure. Refer to Operation and Maintenance Manual, "System Pressure Release" for more information.

Maintenance with the Engine Running

For maintenance that requires the engine to be running, perform the following:

1. Run the engine at an idle.

Maintenance without the Engine Running

For maintenance that does not require the engine to be running, perform the following:

1. Move the engine start switch to the OFF position. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.

Maintenance with Electrical System Disabled

For maintenance that requires the electrical system to be disabled, perform the following:

- 1. Move the engine start switch to the OFF position. Refer to Operation and Maintenance Manual, "Operator Controls" for more information.
- Move the battery disconnect switch to the OFF position. Refer to Operation and Maintenance Manual, "Battery Disconnect Switch" for the proper procedure.

Maintenance Interval Schedule	" Radiator Core - Clean"	
SMCS Code : 1000; 7000	" Wheel Nuts - Tighten"	
Ensure that all safety information, warnings, and	" Window Washer Reservoir - Fill"	
instructions are read and understood before any operation or any maintenance procedures are	" Window Wiper - Inspect/Replace" 138	
performed.	" Windows - Clean"	
The user is responsible for the performance of maintenance. All adjustments, the use of proper lubricants, fluids, filters, and the replacement of	Every 10 Service Hours or Daily	
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.	" Backup Alarm - Test"	
	" Cooling System Coolant Level - Check" 100	
	" Engine Air Filter Service Indicator - Inspect" 111	
Products that operate in severe operating conditions	"Engine Oil Level - Check"	
or that experience abnormally high fuel consumption, may require more frequent maintenance. Refer to the	"Fuel System Water Separator - Drain" 122	
maintenance procedure for any other exceptions that may change the maintenance intervals.	" Hydraulic System Oil Level - Check" 127	
Note: Before each consecutive interval is performed,	" Indicators and Gauges - Test"	
all maintenance from the previous interval must be performed.	" Neutral Start Switch - Test"	
The following guidelines should be followed if the	" Seat Belt - Inspect"	
service hours are not met:	Every 50 Service Hours	
Items listed between 10 and 100 service hours should be performed at least every 3 months.	"Cab Air Filter - Clean/Replace"96	
Items listed between 250 and 500 service hours	" Fuel Tank Water and Sediment - Drain" 124	
should be performed at least every 6 months.	"Steering Cylinder Ends - Lubricate"	
Items listed between 1000 service hours and 2500 service hours should be performed at least every year.	"Tire Inflation - Check"	
When Required	Initial 250 Service Hours	
"Battery - Clean/Check"	" Axle Oil (Rear) - Change"	
"Battery - Recycle"	" Final Drive Planetary (Axle) Oil - Change" 116	
"Battery or Battery Cable - Inspect/Replace" 95	" Final Drive Planetary (Drum) Oil - Change" 118	
"Drum Cooling Oil - Change"	Every 250 Service Hours	
"Drum Scrapers - Inspect/Adjust/Replace" 105	" Axle Oil Level (Rear) - Check"	
"Engine Air Filter Primary Element - Clean/	"Belts - Inspect/Adjust/Replace"96	
Replace"	"Engine Oil Sample - Obtain"	
"Engine Air Filter Secondary Element - Replace"	" Final Drive Planetary (Axle) Oil Level - Check"	
" Engine Compartment - Clean"	"Final Drive Planetary (Drum) Oil - Check" 118	
"Film (Product Identification) - Clean"	"Isolation Mounts - Inspect"	
" Fuel System - Prime"	, ·	

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"Vibratory Support Oil Level - Check" 136	"Refrigerant Dryer - Replace"131
Every 500 Service Hours	Every 3 Years
" Axle Oil Sample - Obtain"	" Seat Belt - Replace"
"Cooling System Coolant Sample (Level 1) - Obtain"	Every 3000 Service Hours
"Engine Oil and Filter - Change"	"Cooling System Water Temperature Regulator - Replace"
"Fuel System Primary Filter (Water Separator) - Replace"	" Eccentric Weight Housing Oil - Change" 106
"Fuel System Secondary Filter - Replace" 121	" Engine Water Pump - Inspect"
"Hydraulic System Oil Sample - Obtain" 127	" Hydraulic System Oil - Change"
"Parking Brake - Check"	Every 6000 Service Hours
Every 1000 Service Hours	" Cooling System Coolant Extender (ELC) - Add"
"Axle Oil (Rear) - Change"	Every 12 000 Service Hours
"Cooling System Pressure Cap - Clean/ Replace"	"Cooling System Coolant (ELC) - Change" 97
"Engine Mounts - Inspect"	Cooling System Coolant (ELC) - Change 97
" Engine Valve Lash - Check"	
"Final Drive Planetary (Axle) Oil - Change" 116	
"Final Drive Planetary (Axle) Oil Sample - Obtain"	
"Final Drive Planetary (Drum) Oil - Change" 118	
"Final Drive Planetary (Drum) Oil Sample - Obtain"	
"Fuel Tank Cap Filter and Strainer - Replace/ Clean"	
"Hydraulic System Oil Filter - Replace" 126	
"Hydraulic Tank Breather - Replace" 128	
"Rollover Protective Structure (ROPS) - Inspect"	
"Vibratory Support Oil - Change"	
"Vibratory Support Oil Sample - Obtain" 137	
Every 2000 Service Hours	
"Cooling System Coolant Sample (Level 2) - Obtain"	
"Crankshaft Vibration Damper - Inspect" 104	

Axle Oil (Rear) - Change

SMCS Code: 3260-044; 3278; 3278-044

WARNING

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

Note: Refer to "Prepare the Machine for Maintenance" title in the Operation and Maintenance Manual.

Note: Refer to "General Hazard Information" title in the Operation and Maintenance Manual for information regarding containing fluid spillage.

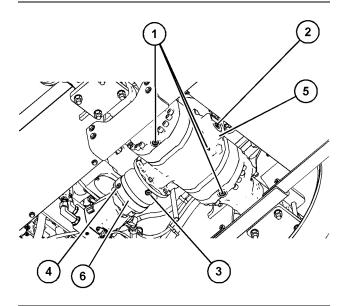


Illustration 98 g06583609

- (1) Differential compartment drain plugs
- (2) Differential level/fill plug
- (3) Axle gear reducer drain plug
- (4) Axle gear reducer level/fill plug
- (5) Differential compartment section
- (6) Axle gear reducer

Note: On certain versions of the axle, the axle gear reducer (6) is a separate housing from the rear differential compartment section (5). Be sure to fill/check both compartments.

1. Run the machine and operate the machine for five minutes before you change the oil. This will suspend any foreign particles that are present in the oil. Running the machine will also provide a more accurate Scheduled Oil Sampling (S·O·S) analysis.

2. Remove the three differential compartment drain plugs (1) from the back and bottom side of the differential compartment section (5). Remove the axle gear reducer drain plug (3) from the axle gear reducer (6).

Note: Drain the oil into a suitable container. Dispose of the used oil in an appropriate manner.

- **3.** Remove differential level/fill plug (2) which is on the rear side of the differential compartment section (5).
 - Remove axle gear reducer level/fill plug (4) which is on the left side of the axle gear reducer (6).
- **4.** Clean all plugs and inspect the O-ring seal. If wear or damage is identified, replace the oil fill/drain plug and /or the O-ring seal.
- **5.** Install the three differential compartment drain plugs (1) to the differential compartment section (5). Install the axle gear reducer drain plug (3) to the axle gear reducer (6).
- **6.** Add 0.3 L (0.08 US gal) of 197-0017 Axle and Brake Oil Additive to the differential compartment section (5). Consult your Cat ® dealer for more information. Add the appropriate oil to the differential compartment section (5) and the axle gear reducer (6). Maintain the level of the oil to the bottom of the hole for the differential level/fill plug (2). Refer to "Lubricant Viscosities" title in the Operation and Maintenance Manual for more information.
- 7. Install the differential level/fill plug (2) to the differential compartment section (5). Install axle gear reducer level/fill plug (4) to the axle gear reducer (6).

Axle Oil Level (Rear) - Check

SMCS Code: 3260-535-FLV; 3278-535; 3278

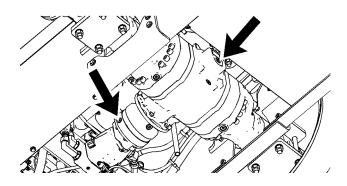


Illustration 99

g06333174

Note: Always check the oil level when the machine is parked on a level surface.

 Remove the level/fill plug. Maintain the oil level to the bottom of the level/fill plug opening. If necessary, add oil.

Note: When you add oil, allow the oil to settle to verify the oil level.

2. Clean the level/fill plug. Install the plug.

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Axle Oil Sample - Obtain

SMCS Code: 3260-008; 3278-008; 7542

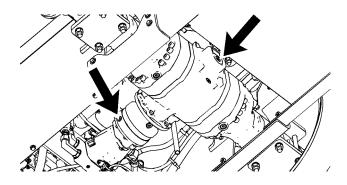


Illustration 100

g06333174

Obtain an oil sample of the differential oil through the oil level/fill plugs shown.

Refer to the Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining an oil sample.

i02855591

Backup Alarm - Test

SMCS Code: 7406-081

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

Turn the engine start switch to the ON position in order to perform the test.

Move the propel control lever to the REVERSE position.

The backup alarm should start to sound immediately. The backup alarm will continue to sound until the transmission control lever is moved to the STOP position or to the FORWARD position.

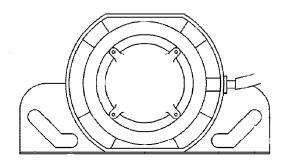


Illustration 101

g00930005

If the backup alarm does not sound, make the necessary repairs immediately. Do not operate a machine without a backup alarm.

Battery - Clean/Check

SMCS Code: 1401-070; 1401-535; 1402-535; 1402-070

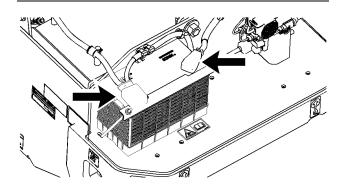


Illustration 102

g06245465

Note: The battery that is supplied with the machine is a maintenance free battery. You do not need to check the level of the electrolyte in the maintenance free battery.

Check the following items:

- Clean the top of the battery with a clean cloth.
- Clean the battery terminals. Coat the battery terminals with petroleum jelly.
- Tighten the battery retainers on the batteries.

i08316356

Battery - Recycle

SMCS Code: 1401-561

Always recycle a battery. Never discard a battery.

Always return used batteries to one of the following locations:

- A battery supplier
- · An authorized battery collection facility
- Recycling facility

i07186589

Battery or Battery Cable - Inspect/Replace

SMCS Code: 1401-510; 1401-040; 1402-040; 1402-510

- **1.** Turn the engine start switch to the OFF position. Turn all switches to the OFF position.
- Turn the battery disconnect switch to the OFF position. Remove the battery disconnect switch key.

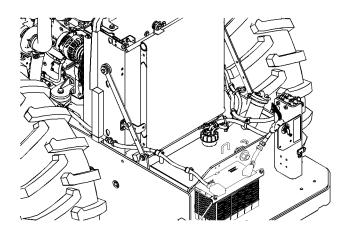


Illustration 103

g06245511

- **3.** The battery compartment is at the rear of the machine in the engine compartment.
- 4. Remove the covers for the Battery.
- **5.** At the battery disconnect switch, disconnect the negative battery cable that is connected to the frame.

Note: Do not allow the disconnected battery cables to contact the disconnect switch. Do not allow the disconnected battery cables to contact the other cables. Do not allow the disconnected battery cables to contact the opposite terminal of either battery.

- **6.** Disconnect the negative battery cable at the battery.
- **7.** Disconnect the positive battery cable from the battery.
- **8.** Remove the positive cable from the starter motor.

96

- **9.** Perform the necessary repairs. Replace the cables or the Battery, as needed.
- **10.** Reverse the above steps to reconnect the battery.
- **11.** Connect the battery cable at the battery disconnect switch.
- 12. Install the battery disconnect switch key.
- 13. Install the battery compartment covers.
- **14.** Turn the battery disconnect switch to the ON position.

i07475848

Belts - Inspect/Adjust/Replace

SMCS Code: 1357-510; 1357-040; 1357-025

Your engine is equipped with a fan drive belt. For maximum engine performance and maximum utilization of your engine, inspect the belts for wear and for cracking. Check the belt tension. Adjust the belt tension to minimize belt slippage. Belt slippage will decrease the belt life. Belt slippage will also cause poor performance of the alternator and of any driven equipment.

If new belts are installed, recheck the belt adjustment after 30 minutes of operation. If two belts or more are required for an application, replace the belts in belt sets. If only one belt of a matched set is replaced, the new belt will carry more load. This is because the older belts are stretched. The additional load on the new belt could cause the new belt to break.

Inspect

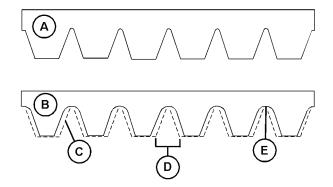


Illustration 104 g06114636

- (A) New belt
- (B) Worn belt

Inspect the condition of the serpentine belt. Over time the belt ribs will lose material (C). The space between the ribs will increase (D). The loss of material will cause the pulley sheave to contact the belt valley. This will lead to belt slippage and accelerated wear (E). Replace the belt if the belt is worn or frayed.

Adjust/Replace

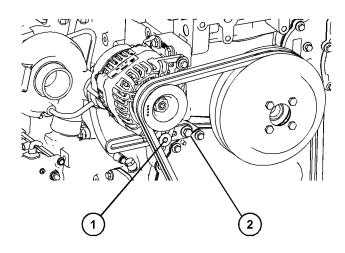


Illustration 105 g06245576

- To check the belt tension, apply 110 N (25 lb) of force midway between the pulleys. Correctly adjusted belts will deflect 14 to 20 mm (1/2 to 3/4 inch).
- 2. To adjust the alternator belt, loosen bracket bolt (2) and mounting bolt (1) on the alternator bracket.
- **3.** To achieve the correct adjustment, move the alternator inward or move the alternator outward, as required.
- 4. Tighten mounting bolt (1) and bracket bolt (2).

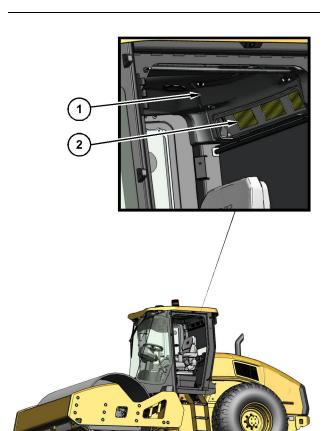
i08325796

Cab Air Filter - Clean/Replace (If Equipped)

SMCS Code: 7311-070; 7311-040; 7311-070-FI; 7311-510-FI; 7311; 7342-070-FI; 7342-510; 7342; 7342-070; 7342-510-FI; 7521

Refer to "Prepare the Machine for Maintenance".

The cab air filter is on the upper back wall of the operator station.



Cooling System Coolant (ELC) - Change

SMCS Code: 1395-044-NL

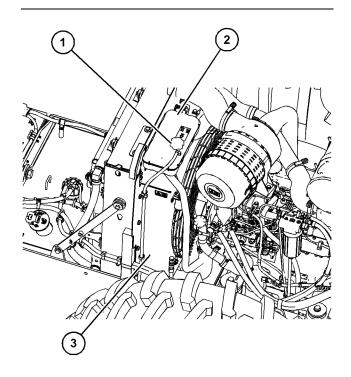


Illustration 106

g06628389

- (1) Cover (2) Filter element
- 1. Pull cover (1) off the rear wall.
- 2. Remove filter element (2).
- 3. To remove the air filter, pull DOWNWARD on the
- 4. Clean the air filter with a maximum of 200 kPa (30 psi).
- 5. After cleaning the air filter, inspect the air filter. If the air filter is damaged or badly contaminated, replace with a new air filter.
- 6. Install the filter in the reverse order of the previous steps.

Illustration 107

g06246308

Coolant System Overview

- (1) Expansion Tank Cap
- (2) Expansion Tank
- (3) Radiator

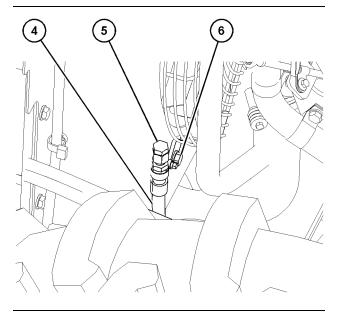


Illustration 108 g06246302

Coolant Drain Hose

(4) Drain Hose

98

- (5) Drain Hose Plug
- (6) Drain Hose Retaining Bolt

Note: Drain the coolant whenever the coolant is dirty. Drain the coolant when foam is observed.

- **1.** Stop the engine. Allow the cooling system to cool completely.
- 2. Open the hood for the engine. Refer to the Operation and Maintenance Manual, "Access Doors and Covers" for further information.

WARNING

Personal injury can result from hot coolant, steam and alkali.

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

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

Do not attempt to tighten hose connections when the coolant is hot, the hose can come off causing burns.

Cooling System Coolant Additive contains alkali. Avoid contact with skin and eyes.

Slowly loosen, and remove expansion tank cap (1).

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, PERJ1017, "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.

- **4.** Remove bolt (6) holding drain hose in storage location. Remove drain hose plug (5) to allow the coolant to drain into a suitable container.
- 5. Reinstall drain hose plug (5). Fill the expansion tank and radiator to the full line with a solution which consists of clean water and of cooling system cleaner. The concentration of the cooling system cleaner in the solution should be between 6 percent and 10 percent.
- 6. Install expansion tank cap (1).
- 7. Close the hood for the engine.
- Start the engine. Run the engine for 90 minutes. Stop the engine. Allow the cooling system to cool completely.
- 9. Slowly loosen and remove expansion tank cap (1).
- **10.** Remove drain hose plug (5) to allow the cooling system cleaner to drain into a suitable container.
- **11.** While the engine is stopped, flush the system with water. Flush the system until the draining water is transparent.
- **12.** Reinstall drain hose plug (5). Move drain hose back to the storage position and reinstall retaining bolt (6).

NOTICE

Mixing Extended Life Coolant (ELC) with other products reduces the effectiveness of the coolant and shortens coolant life. Use only Caterpillar products or commercial products that have passed the Caterpillar EC-1 specifications for premixed or concentrate coolants. Use only Caterpillar Extender with Caterpillar ELC. Failure to follow these recommendations could result in the damage to cooling systems components.

If ELC cooling system contamination occurs, refer to Operation and Maintenance, "Extended Life Coolant (ELC)" under the topic ELC Cooling System Contamination.

13. Add the coolant solution. See the following topics:

- Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" "Cooling System Specifications"
- Operation and Maintenance Manual, "Capacities (Refill)"

Note: If you are using Caterpillar antifreeze, do not add the supplemental coolant additive at this time.

- **14.** Start the engine. Run the engine without the expansion tank cap until the thermostat opens and the coolant level stabilizes.
- 15. Fill the expansion tank up to the full line.
- **16.** Replace expansion tank cap (1) if the gasket is damaged. Install expansion tank cap (1).
- **17.** Maintain the level of the coolant to the full line on expansion tank (2).
- 18. Stop the engine.
- **19.** Close the hood for the engine.

i07187767

Cooling System Coolant Extender (ELC) - Add

SMCS Code: 1352-544-NL

WARNING

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

Steam can cause personal injury.

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

Remove the fill cap slowly to relieve pressure.

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

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.

Refer to the Special Publication, SEBU6250, "Caterpillar Machines Fluids Recommendations" "Cooling System Specifications" for more information about the addition of Extender.

NOTICE

Topping off or mixing Cat ELC with other products that do not meet Caterpillar EC-1 specifications reduces the effectiveness of the coolant, shortens coolant service life, and may cause premature wear to components.

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.

- Stop the engine. Allow the cooling system to completely cool.
- 2. Open the engine compartment.

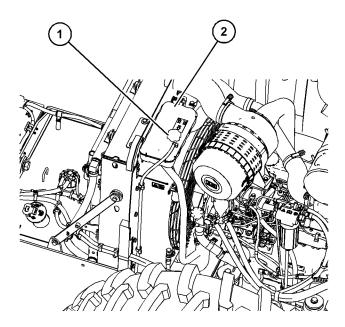


Illustration 109

g06246363

- (1) Expansion Tank Cap
- (2) Expansion Tank
- **3.** Remove the cap for expansion tank (1).
- 4. Add the recommended amount of extender to the coolant system. Refer to the Special Publication, SEBU6250, "Caterpillar Machines Fluids Recommendations" "Cooling System Specifications" for the proper amount.
- **5.** Maintain the level of the coolant to the full line on cooling system expansion tank (2).

Note: The radiator must remain completely full in order for the expansion tank to work properly.

- 6. Install the cap for the expansion tank (1).
- **7.** Close the engine compartment.

i07187806

Cooling System Coolant Level - Check

SMCS Code: 1350-535-FLV

A WARNING

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

Steam can cause personal injury.

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

Remove the fill cap slowly to relieve pressure.

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

1. Open the engine compartment.

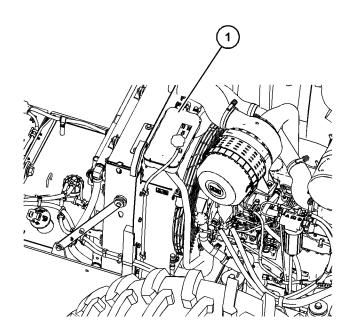


Illustration 110 g06246372

- 2. Maintain the level of the coolant in shunt tank (1) to the level line.
- 3. Close the engine compartment.

i07187812

Cooling System Coolant Sample (Level 1) - Obtain

SMCS Code: 1350-008; 1395-554; 1395-008; 7542; 7542-008

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.



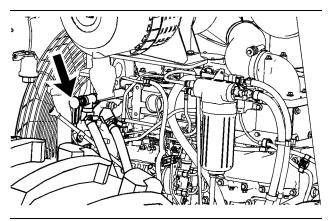


Illustration 111 g06247524

Refer to the Operation and Maintenance Manual, "Access Doors and Covers" for the location of the service points.

Obtain the sample of the coolant as close as possible to the recommended sampling interval. To receive the full effect of S·O·S analysis, you must establish a consistent trend of data. 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 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.

Cooling System Coolant Sample (Level 2) - Obtain

SMCS Code: 1350-008; 1395-008; 1395-554; 7542; 7542-008

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.

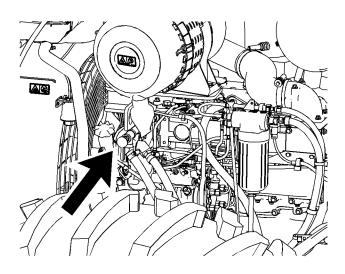


Illustration 112 g06256600

Refer to the Operation and Maintenance Manual, "Access Doors and Covers" for the location of the service points.

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.

For additional information about coolant analysis, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

Cooling System Pressure Cap - Clean/Replace

SMCS Code: 1382-510; 1382-070

Note: To access the areas required to perform this procedure, a portable access system (ladder, stair assembly, man lift, or other portable access system) that is suitable and compliant to local regulations may be necessary.

1. Open the engine compartment.

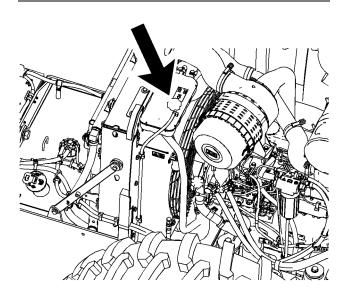


Illustration 113 g06246500

2. The cooling system pressure cap is on the top of the shunt tank.

MARNING

Personal injury can result from hot coolant, steam and alkali.

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

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

Do not attempt to tighten hose connections when the coolant is hot, the hose can come off causing burns.

Cooling System Coolant Additive contains alkali. Avoid contact with skin and eyes.

- Remove the cooling system pressure cap slowly to relieve pressure.
- 4. Inspect the cooling system pressure cap for foreign material, for deposits, and for damage. Clean the cooling system pressure cap with a clean cloth. If the cooling system pressure cap is damaged, replace the cooling system pressure cap.
- **5.** Install the cooling system pressure cap.
- **6.** Close the engine compartment.

i07187967

Cooling System Water Temperature Regulator -Replace

SMCS Code: 1355-510; 1393-010

Note: To access the areas required to perform this procedure, a portable access system (ladder, stair assembly, man lift, or other portable access system) that is suitable and compliant to local regulations may be necessary.

Replace the water temperature regulator regularly to reduce the chance of unscheduled downtime and of problems with the cooling system.

The water temperature regulator should be replaced after the cooling system has been cleaned. Replace the water temperature regulator when the cooling system is drained. Replace the water temperature regulator when the cooling system coolant is drained to a level below the water temperature regulator housing.

NOTICE

Failure to replace the engine's water temperature regulator on a regularly scheduled basis could cause severe engine damage.

Note: If you are only replacing the water temperature regulator, drain the cooling system coolant to a level that is below the water temperature regulator housing.

1. Open the engine compartment.

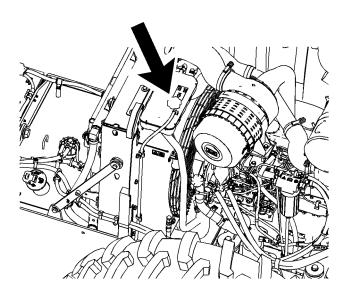


Illustration 114 g06246500

WARNING

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

Steam can cause personal injury.

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

Remove the fill cap slowly to relieve pressure.

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

2. Remove the cooling system pressure cap to relieve the pressure in the cooling system.

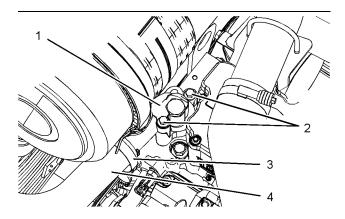


Illustration 115 g02842999

- **3.** Loosen hose clamp (3) and remove hose (4) from water temperature regulator housing (1).
- **4.** Remove bolts (2) from water temperature regulator housing (1) and remove water temperature regulator housing (1).
- **5.** Remove the gasket and remove the water temperature regulator from the water temperature regulator housing. Make a note of the orientation of the old regulator.

NOTICE

The water temperature regulators may be reused if the water temperature regulators are within test specifications, are not damaged, and do not have excessive buildup of deposits.

NOTICE

Since Caterpillar engines incorporate a shunt design cooling system, it is mandatory to always operate the engine with a water temperature regulator.

Depending on load, failure to operate with a water temperature regulator could result in either an overheating or an overcooling condition.

NOTICE

If the water temperature regulator is installed incorrectly, it will cause the engine to overheat.

- **6.** Install a new water temperature regulator. Orient the regulator in the same manner as the old regulator. Install a new gasket. Install the water temperature regulator housing.
- **7.** Install the water temperature regulator housing and the hose. Tighten the hose clamp.

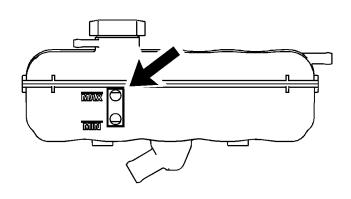


Illustration 116 g06256609

- **8.** Add the cooling system coolant. Maintain the level of the coolant to the top of the radiator and to the full line on the expansion tank.
- **9.** Inspect cooling system pressure cap and the gasket for damage. Replace the pressure cap if the pressure cap or the gasket are damaged.
- 10. Install the cooling system pressure cap.
- 11. Close the engine compartment.

i01900991

Crankshaft Vibration Damper - Inspect

SMCS Code: 1205-040

A WARNING

Accidental machine starting can cause injury or death to personnel working on the machine.

To avoid accidental machine starting, turn the battery disconnect switch to the OFF position and remove the key. If the machine is not equipped with a battery disconnect switch, disconnect the battery cables from the battery and tape the battery clamps.

Place a do not operate tag at the battery disconnect switch location to inform personnel that the machine is being worked on.

The Crankshaft Vibration Damper is located under the hood on the right side of the machine.

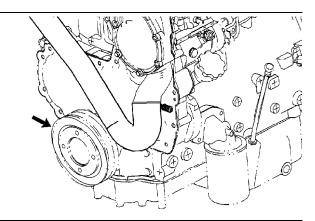


Illustration 117 g00944099

Typical example

The Crankshaft Vibration Damper

Damage to the crankshaft vibration damper or failure of the crankshaft vibration damper can increase torsional vibrations. This can result in damage to the crankshaft and to other engine components. A deteriorating damper can cause excessive gear train noise at variable points in the speed range.

The damper is mounted to the crankshaft on the front of the engine.

Visually inspect the crankshaft vibration damper for damage.

Check the bolts for proper tightness.

Close the hood.

Refer to the Service Manual or consult your Caterpillar dealer for information about damper replacement.

Drum Cooling Oil - Change

SMCS Code: 6605-044-OC

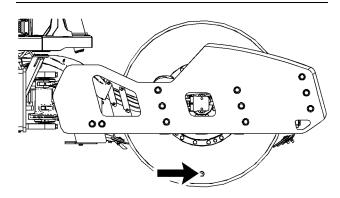


Illustration 118

g06333213

Note: Clean the area around the fill/drain plug before servicing the drum.

The drum cooling oil requires service when the disassembly of the drum or the assembly of the drum is needed.

Rotate the fill/drain plug to the bottom of the drum. Remove the drain plug. Pump the oil out of the drum.

Use the drain plug opening to fill the cavity. Install the plug after adding the correct amount of oil. The oil will be near the bottom of the opening.

To check the level of the oil, rotate the drum so the plug is at the bottom of the drum. Remove the plug. Maintain the oil to the bottom of the opening.

Refer to the Operation and Maintenance Manual, "Lubricant Viscosities" and the Operation and Maintenance Manual, "Capacities (Refill)".

i07475906

Drum Scrapers - Inspect/ Adjust/Replace

SMCS Code: 6607-025; 6607-510; 6607-040

Smooth Drum Scrapers

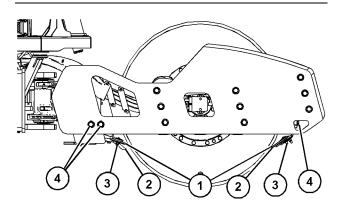


Illustration 119

g06333223

- (1) Scraper
- (2) Support Bracket
- (3) Lower Adjustment Bolt
- (4) Upper Adjustment Bolt

Adjust Scraper

There is one steel scraper on the front of the drum, and one on the rear.

Adjust the steel scraper to 25 ± 5 mm (0.98 ± 0.19 inch) from the drum surface.

- Inspect scraper (1). Clean the scraper of dirt and debris.
- **2.** Loosen bolts (3) and (4) that are holding the rear scraper blade and the backing plate to the bracket.
- **3.** Loosen bolts (3) and (4) that hold the front scraper blade and the backing plate to the bracket.
- 4. Adjust flexible scraper blade (1) toslightly come into contact with the surface of the drum. Adjust scraper blades (1) and support bracket (2) together.

5. Tighten bolts (3) and (4).

i09548028

Eccentric Weight Housing Oil - Change

SMCS Code: 6606-044-OC

WARNING

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

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, PERJ1017, "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.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Change the Oil

- Run the machine and operate the machine for 5 minutes before you change the oil. This will suspend any foreign particles that are present in the oil. Running the machine will also provide a more accurate Scheduled Oil Sampling (S·O·S) analysis.
- 2. Take an oil sample from each eccentric weight housing. There is one eccentric weight housing on each side of the drum. No flushing is necessary, if the oil sample cleanliness rating is equal or lower than ISO 23/21. The flushing procedure should be performed if an oil sample cleanliness rating is higher than ISO 23/21.

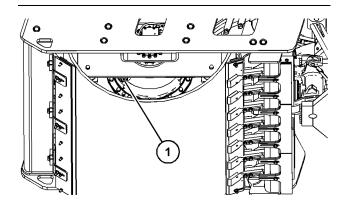


Illustration 120

q06333227

(1) Drain/fill plug

- **3.** Rotate the drum until drain/fill plug (1) is at the bottom of the housing.
- **4.** Place a suitable container under drain/fill plug (1). Remove drain/fill plug (1). Drain the housing completely. Repeat this step for both housings.
- 5. Clean drain/fill plug (1). Install drain/fill plug (1).

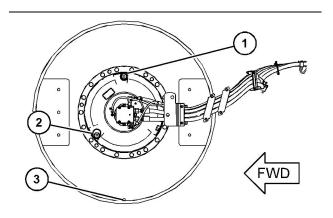


Illustration 121

g06775736

- (1) Drain/fill plug
- (2) Level check plug
- (3) Indicator bar
- **6.** Rotate the drum until indicator bar (3) is at the bottom of the drum.
- 7. Remove drain/fill plug (1).
- 8. Remove level check plug (2). Fill the housing with oil. Refer to the "Lubricant Viscosities". Refer to "Capacities (Refill)". Maintain the level of the oil to the bottom of the level check opening.
- 9. Clean drain/fill plug (1) and level check plug (2). Install drain/fill plug (1) and level check plug (2). Refer to Specifications, SENR3130, "Torque Specifications" for torque information.

10. Repeat this procedure for the other eccentric weight housing.

Flush the Housing

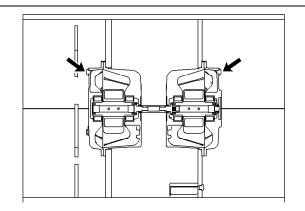


Illustration 122 g00661129

- 1. There are two eccentric weight housings. The housings are on each side of the drum. Perform the following procedure on each housing.
- 2. Drain the oil from the eccentric weight housings.
- **3.** Pump 151 L (40 US gal) of a suitable hydraulic oil into a 208 L (55 US gal) drum.

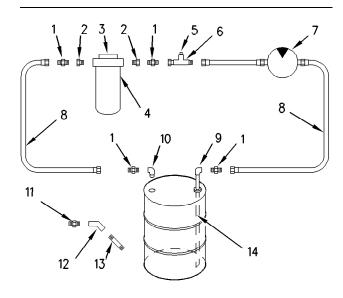


Illustration 123 g00684344

- (1) 8C-6875 Connector
- (2) 8B-5774 Reducer Bushing
- (3) 9U-6989 Head
- (4) 9U-6983 Filter Element
- (5) 6V-3965 Nipple Assembly
- (6) 8T-4834 Swivel Orifice Tee
- (7) 127-8781 Filter Cart
- (8) 2.4 m (8 ft) of 25 mm (1 inch) hose
- (9) 3B-6498 Élbow
- (10) 3L-7024 Street Elbow
- (11) 127-0593 Connector
- (12) 3B-7728 Elbow
- (13) 3B-7265 Pipe Nipple
- (14) 940 mm (37 inch) of 25 mm (1 inch) pipe
- **4.** Use the 127-8781 Filter Cart to flush the oil in the 208 L (55 US gal) drum. Filter the oil for 30 minutes. The particle count of the clean oil must be a maximum of ISO 18/13.
- 5. Raise the machine. The drum and tires must not be in contact with the ground or the floor. Support the machine on stands. Refer to the Operation and Maintenance Manual, "Additional Messages" for the location on jacking up the machine.
- **6.** Start the engine. Release the parking brake and rotate the drum until the fill/drain plug is at the top of the housing. Apply the parking brake and stop the engine.
- **7.** Remove the plug. Install the valve and fitting assembly that is appropriate for your machine.

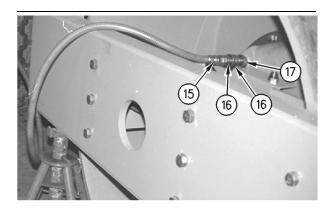


Illustration 124 g00698763

- a. Assemble the 126-7187 Adapter (17) into the male end of the 5R-3796 Quick Coupling Assembly (16). Install the adapter into the hole for the oil fill/drain plug. Assemble the 8T-0198 Seal Connector (15) onto the female end of the quick coupler.
- **8.** Fill the housing with 22 L (6 US gal) gallons of clean oil. Remove the adapter and install the oil fill/drain plug.
- 9. Run the first flush cycle.
 - a. Start the engine. Release the brake.
 - b. Set the travel speed control to low speed. To rotate the drum, move the propel control.
 - Set the vibratory amplitude control to the LOW position.
 - d. Turn on the vibratory system. Run the vibratory system for 5 seconds. Turn off the vibratory system. Repeat the cycle for 3 minutes.

Note: For each cycle, do not run the vibratory system more than 5 seconds.

- e. Stop the drum. Position the drum to drain the housings.
- 10. Install the transfer cart. Pump the oil out of the housings. Cycle the oil through the filter for 30 minutes. Cycle the oil until the oil is cleaned to a rating of ISO 18/13 or better.
- 11. Install the transfer cart to the housings. Pump the oil into the housings. Remove the adapter and install the oil fill/drain plug. For the second cycle, repeat steps 9a through 9d. After the second cycle, take an oil sample before filtering the oil. No further flushing is necessary, if the oil sample cleanliness rating is equal or lower than ISO 18/13. Another flushing is necessary, if the oil sample cleanliness rating is higher than ISO 18/13.

Note: If no further flushing is necessary, adjust the oil level so that the housing is filled to the correct oil level.

- **12.** When the flushing is complete, rotate the drum to the position to drain the housings. Remove the valve and fitting assembly. Drain as much of the oil as possible.
- 13. Rotate the drum until the fill/drain plug is at the top. Remove the level check plug. Fill the drum to the correct level. Refer to "Capacities (Refill)". Refer to the Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" "Lubricant Information".

Note: The new oil must have an oil sample cleanliness rating that is equal or lower than ISO 18/13.

i01953476

Engine Air Filter Primary Element - Clean/Replace

SMCS Code: 1054-510-PY; 1054-070-PY

NOTICE

Service the air cleaner only with the engine stopped. Engine damage could result.

Service the air cleaner filter element when the yellow piston on the engine air filter service indicator enters the red zone or the indicator reads 63.5 cm (25 inch) of water. Refer to Operation and Maintenance Manual, "Engine Air Filter Service Indicator - Inspect".

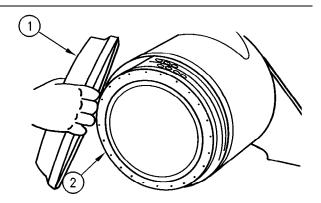


Illustration 125

g00102316

- 1. Remove cover (1) for the air filter housing.
- **2.** Remove primary filter element (2) from the air filter housing.
- 3. Clean the inside of the air filter housing.

- 4. If the machine is equipped with a vacuator valve, clean the vacuator valve on the cover for the air filter housing.
- **5.** Install a clean primary air filter element. Install the cover for the air filter housing.

Note: Refer to "Cleaning Primary Air Filter Elements".

- 6. Reset the engine air filter service indicator.
- 7. Close the access door.

If the yellow piston in the indicator moves into the red zone after starting the engine or the exhaust smoke is still black after installation of a clean primary filter element, install a new primary filter element. If the piston remains in the red zone replace the secondary 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 if the element is properly 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).

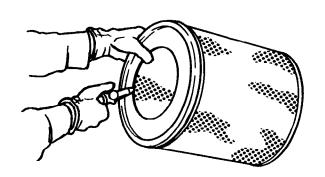


Illustration 126

q00281692

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

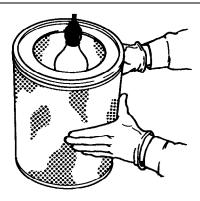


Illustration 127 g00281693

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.

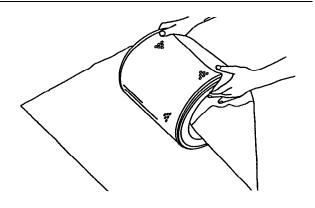


Illustration 128 g00281694

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.

i07476004

Engine Air Filter Secondary Element - Replace

SMCS Code: 1054-510-SE

NOTICE

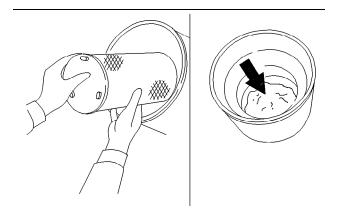
Always replace the secondary filter element. Never attempt to reuse the secondary filter element by cleaning the element.

When the primary filter element is replaced, the secondary filter element should be replaced.

The secondary filter element should also be replaced if the exhaust smoke is still black.

- 1. Open the hood.
- See Operation and Maintenance Manual, "Engine Air Filter Primary Element - Clean/Replace".
 Remove the air cleaner cover from the air cleaner housing. Remove the primary filter element from the air cleaner housing.

Illustration 129



- 3. Remove the secondary filter element.
- **4.** Cover the air inlet opening. Clean the inside of the air cleaner housing.
- **5.** Remove the cover from the air inlet opening.
- 6. Install the new secondary filter element.
- 7. Install the primary filter element.
- **8.** Install the air cleaner cover and close the latches securely.
- 9. Close the access door.

i07476014

q00101451

Engine Air Filter Service Indicator - Inspect

SMCS Code: 7452-040

1. Open the engine compartment.

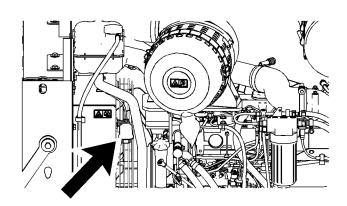


Illustration 130

q06247231

This is the location of the engine air filter service indicator.

- Start the engine. Run the engine at high idle. If the yellow piston in the engine air filter service indicator enters the red zone, service the air cleaner.
- **3.** Press the bottom of the indicator to reset the indicator after the air cleaner has been serviced.

Note: See the Operation and Maintenance Manual, "Engine Air Filter Primary Element - Clean/Replace". See the Operation and Maintenance Manual, "Engine Air Filter Secondary Element - Replace".

4. Close the engine compartment.

i01404793

Engine Compartment - Clean

SMCS Code: 1000-070

NOTICE

Before spraying the engine compartment with high pressure water turn off the engine and allow the engine to cool. Do not spray water directly on a hot fuel injection pump or damage may occur.

Use a commercially available engine degreaser in order to clean the engine compartment. Use caution and minimize the water around bearings and electrical connections.

Engine Mounts - Inspect

SMCS Code: 1152-040

Engine vibration can be caused by improper mounting of the engine. Engine vibration can be caused by loose engine mounts or deteriorated engine mounts.

1. Open the engine compartment.

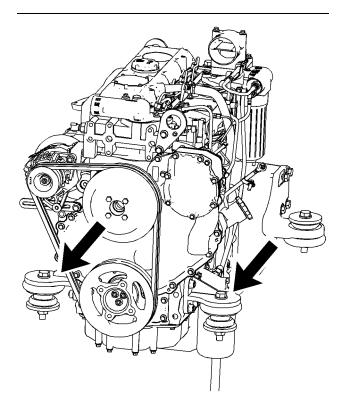


Illustration 131 g06247232

Front Engine Mounts

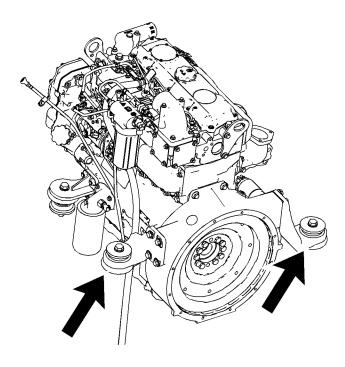


Illustration 132

g06247233

Rear Engine Mounts

- 2. Inspect the engine mounts for deterioration.
- **3.** Replace any engine mount that is deteriorated.
- **4.** Inspect the engine mounts for correct bolt torque.
- **5.** Tighten the mounts if the mounts are loose.
- **6.** Close the engine compartment.

i07189431

Engine Oil Level - Check

SMCS Code: 1348-535-FLV

NOTICE

Do not under fill or overfill engine crankcase with oil. Either condition can cause engine damage.

Stop the engine to check the oil level. DO NOT check the oil level when the engine is running.

Park the machine on a level surface.

1. Open the engine compartment.

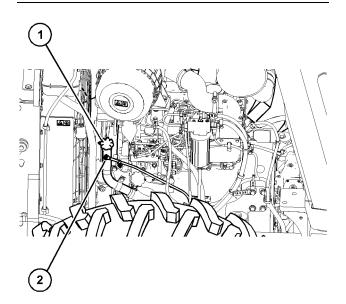


Illustration 133 q06247249

2. Remove dipstick (2). Wipe the dipstick with a clean cloth. Insert the dipstick. Remove the dipstick and note the oil level. Insert the dipstick.

Note: Refer to the Operation and Maintenance Manual, "Lubricant Viscosities" for more information on the correct grade of engine oil to use. Refer to Operation and Maintenance Manual, "Capacities (Refill)" for the correct amount of oil that is used when the oil is changed. The correct amount of oil determines the correct level of the oil in the FULL range on the dipstick.

NOTICE

Do not overfill the crankcase. The oil level must not reach the top of the **FULL** range mark or above the **FULL** range mark.

3. Maintain the oil level on the dipstick between the FULL RANGE mark and the ADD OIL mark. Add oil if the oil level is too low.

Note: Operating your engine with the oil level above the FULL mark in the FULL Range could cause the crankshaft to dip into the oil. This could result in excessively high operating temperatures. The high operating temperatures could result in reduced lubricating characteristics of the oil. This could cause damage to the bearings and loss of engine power.

4. If the oil level is correct, close the engine compartment.

Add The Engine Oil

1. Remove oil filler cap (1).

- 2. Add the oil so that the oil is at the correct level.
- 3. Clean the oil filler cap. Install the oil filler cap.
- **4.** Close the engine compartment.

i07189449

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Engine Oil Sample - Obtain

SMCS Code: 1000-008

₩ WARNING

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

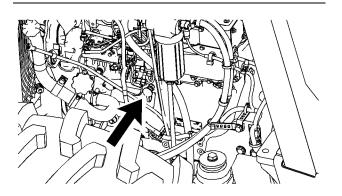


Illustration 134 g06247273

Obtain a sample of the engine oil from engine oil sampling valve (1) that is on the engine oil filter housing.

Refer to the Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining an oil sample.

i07189494

Engine Oil and Filter - Change

SMCS Code: 1318-510

Run the engine to warm up the oil. Stop the engine before you drain the oil. When the oil is warm the waste particles are suspended in the oil. The waste particles will be removed when the oil is drained.

As the oil cools, the waste particles settle to the bottom of the oil pan. The waste particles will not be removed if the oil is too cool.

The waste particles can recirculate through the engine lubrication system if the recommended procedure is not followed.

1. Open the engine compartment.

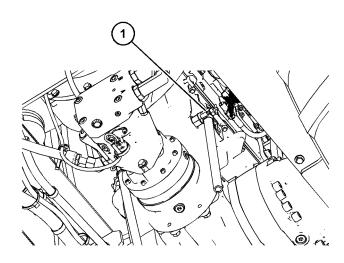


Illustration 135 g06247469 (1) Drain valve

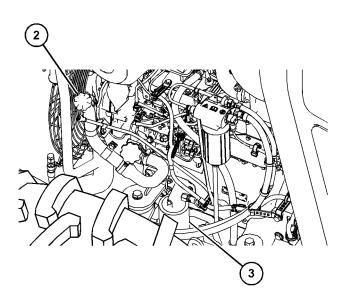


Illustration 136 g06247493

- (2) Oil filler cap
- (3) Filter element
- Place a suitable container under the drain valve. Open drain valve (1). Refer to the Operation and Maintenance Manual, "General Hazard Information" for information that pertains to containing fluid spillage.
- 3. Allow the oil to completely drain.
- 4. Close drain valve (1).

5. Remove filter element (3).

Note: Dispose of the used filter element according to local regulations.

- **6.** Clean the filter housing base. All the old filter seal must be removed from the filter housing base.
- Apply a thin coat of engine oil to the seal of the new filter element.
- 8. Install the new filter by hand. When the seal contacts the base, tighten the filter element for an extra 3/4 turn. This will tighten the filter sufficiently.
 - Every new oil filter has rotation index marks that are spaced at 90 degree increments. Use the rotation index marks as a guide for tightening the oil filter.
- 9. Remove oil filler cap (2). Fill the crankcase with new oil. See Operation and Maintenance Manual, "Capacities (Refill)". See Operation and Maintenance Manual, "Lubricant Viscosities". Clean the oil filler cap and install the oil filler cap.

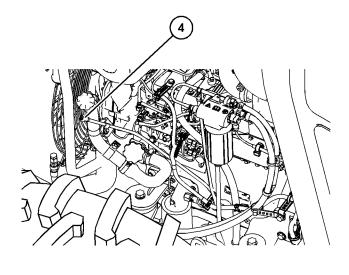


Illustration 137 g06247496 (4) Dipstick

- Before you start the engine, check the oil level on dipstick (4). The oil level must be within the FULL RANGE on the dipstick.
- **11.** Start the engine. Run the engine for two minutes. Inspect the machine for leaks. Stop the machine.
- 12. Wait for ten minutes to allow the oil to drain back into the crankcase. Check the oil level. Maintain the oil level within the FULL RANGE on the dipstick.

13. Close the engine compartment.

i01897328

Engine Valve Lash - Check

SMCS Code: 1105-535

Note: A qualified service person should perform the valve lash check and/or the valve lash adjustment. Special tools and training are required.

Refer to your machine's Service Manual for complete instructions.

i07190641

Engine Water Pump - Inspect

SMCS Code: 1361-040

A water pump that has failed might cause severe engine overheating. Severe engine overheating could result in the following problems:

- · Cracks in the cylinder head
- · Piston seizure
- Other potential engine damage

Open the engine compartment.

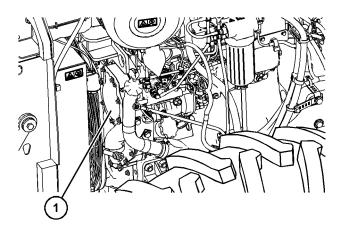


Illustration 138 g06247521

Water pump (1) is on the engine block at the front of the engine.

Visually inspect the water pump for leaks. If leaks are found, all the seals must be replaced.

i08192490

Film (Product Identification) - Clean

SMCS Code: 7405-070; 7557-070

Prepare the machine for maintenance. Refer to Operation and Maintenance Manual, "Prepare the Machine for Maintenance".

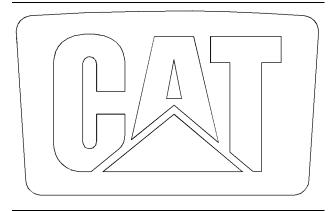


Illustration 139 g02174985

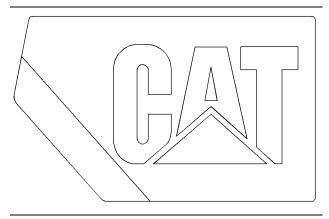


Illustration 140 g02175297

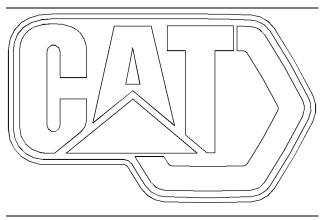


Illustration 141 g0639402

Typical example of the Product Identification Films.

Cleaning of the Films

Make sure that all of the product identification films are legible. Make sure that the recommended procedures are used in order to clean the product identification films. Ensure that all the product identification films are not damaged or missing. Clean the product identification films or replace the films.

Hand Washing

116

Use a wet solution with no abrasive material that contains no solvents and no alcohol. Use a wet solution with a "pH" value between 3 and 11. Use a soft brush, a rag, or a sponge in order to clean the product identification films. Avoid wearing down the surface of the product identification films with unnecessary scrubbing. Ensure that the surface of the product identification films is flushed with clean water and allow the product identification films to air dry.

Power Washing

Power washing or washing with pressure may be used in order to clean product identification films. However, aggressive washing can damage the product identification films.

Excessive pressure during power washing can damage the product identification films by forcing water underneath the product identification films. Water lessens the adhesion of the product identification film to the product, allowing the product identification film to lift or curl. These problems are magnified by wind. These problems are critical for the perforated film on windows.

To avoid lifting of the edge or other damage to the product identification films, follow these important steps:

- Use a spray nozzle with a wide spray pattern.
- A maximum pressure of 83 bar (1200 psi)
- A maximum water temperature of 50° C (120° F)
- Hold the nozzle perpendicular to the product identification film at a minimum distance of 305 mm (12 inch).

 Do not direct a stream of water at a sharp angle to the edge of the product identification film.

i07190671

Final Drive Planetary (Axle) Oil - Change

SMCS Code: 4050-044-OC

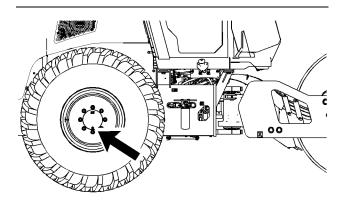


Illustration 142 g06247545

1. Position one final drive so that the oil fill/drain plug is at the bottom.

Note: Refer to Operation and Maintenance Manual, "General Hazard Information" for information on Containing Fluid Spillage.

- **2.** Remove the oil fill/drain plug. Allow the oil to drain into a suitable container.
- Clean the plug and inspect the O-ring seal. If wear or damage is evident, replace the oil fill/drain plug and/or the O-ring seal.
- 4. Install the oil fill/drain plug.
- **5.** Rotate the final drive so that the oil fill/drain plug is horizontal.
- **6.** Fill the final drive to the bottom of the opening on the oil fill/drain plug. See Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Capacities (Refill)".
- 7. Install the oil fill/drain plug.
- **8.** Perform Step 1 to Step 7 on the other final drive. Use a different container for the oil so that the oil samples from the final drives will be separate.
- **9.** Completely remove the oil that has spilled onto surfaces.

- Start the engine. Operate the machine in the FORWARD direction and in the REVERSE direction.
- 11. Apply the parking brake.
- 12. Stop the engine. Check the oil level.
- **13.** Check the drained oil for metal chips or for particles. If there are any chips or particles, consult your Caterpillar dealer.
- **14.** Properly dispose of the drained material. Obey local regulations for the disposal of the material.

Final Drive Planetary (Axle) Oil Level - Check

SMCS Code: 4050-535-FLV

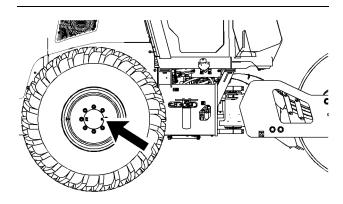


Illustration 143 q06247548

 Position the machine so that the oil fill/drain plug is horizontal.

Note: Refer to Operation and Maintenance Manual, "General Hazard Information" for information on Containing Fluid Spillage.

- 2. Remove the oil fill/drain plug.
- **3.** Check the oil level. The oil should be near the bottom of the oil fill/drain plug.
- 4. Add oil through the oil fill/drain plug, if necessary.

Note: Do not overfill the final drive.

- Clean the oil fill/drain plug. Inspect the O-ring seal. Replace the O-ring seal if the O-ring seal is worn or damaged.
- 6. Install the oil fill/drain plug.
- 7. Repeat the procedure for the other final drive.

i07190692

Final Drive Planetary (Axle) Oil Sample - Obtain

SMCS Code: 4050-008

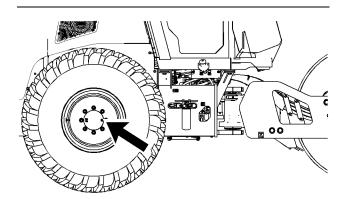


Illustration 144 g06247548

Obtain the oil sample when you change the oil.

Refer to the Operation and Maintenance Manual, "General Hazard Information" for information that pertains to fluid spillage.

Refer to the Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining an oil sample.

Final Drive Planetary (Drum) Oil - Change

SMCS Code: 4050-044-OC; 5655-044-OC

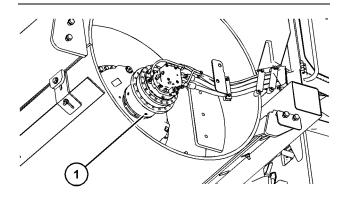


Illustration 145 g06248093

Some components have been removed to show the planetary plugs.

(1) Drain Plug

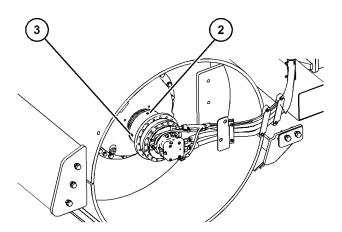


Illustration 146

g06248088

Some components have been removed to show the planetary plugs.

- (2) Fill Plug
- (3) Check Plug

The final drive planetary is on the left side of the drum.

- Run the machine and operate the machine for 5 minutes before you change the oil. This will suspend any foreign particles that are present in the oil. Running the machine will also provide a more accurate S·O·S analysis.
- 2. Rotate drum until drain plug is at the lowest position. Remove drain plug (1). Drain the oil into a suitable container. Dispose of the oil in an acceptable manner. Refer to the Operation and Maintenance Manual, "General Hazard Information" for information that pertains to containing fluid spillage.
- 3. After the oil is drained, install drain plug (1).
- 4. Remove level check plug (3) and filler plug (2).
- **5.** Refer to the Operation and Maintenance Manual, "Lubricant Viscosities and Capacities (Refill)".
- **6.** Fill the planetary until the oil is at the bottom of level check plug (3).

Note: After you fill the final drive with oil, wait for 5 minutes. Check the oil level. If the oil level has lowered, add more oil until the oil is at the bottom of level check plug (3).

7. Clean plugs (2) and (3). Install plugs (2) and (3).

i07192463

Final Drive Planetary (Drum) Oil - Check

SMCS Code: 4050-535-FLV; 5655-535-FLV

The final drive planetary is on the left side of the drum.

Note: When you add oil to the planetary gearbox, wait for a minute before you check the oil level. The oil in the planetary gearbox must settle to obtain an accurate measurement.

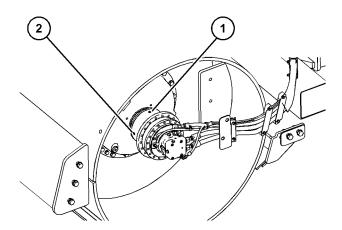


Illustration 147 q06248179

- 1. Remove level check plug (2). Check the level of the oil in the planetary. Maintain the level of the oil at the bottom of the opening for level check plug (2).
- 2. If the oil level is low, remove filler plug (1).
- 3. Add oil to maintain the oil level.
- 4. Clean plugs (1) and (2). Install plugs (1) and (2).

i07192472

Final Drive Planetary (Drum) Oil Sample - Obtain

SMCS Code: 4050-008; 5655-008

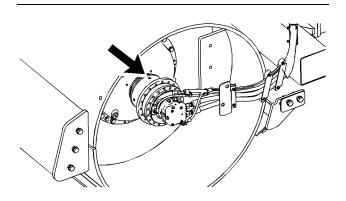


Illustration 148 g06248188

Obtain the oil sample according to the Operation and Maintenance Manual, "Maintenance Interval Schedule".

Refer to the Operation and Maintenance Manual, "General Hazard Information" for information that pertains to containing fluid spillage.

Refer to the Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining an oil sample.

i07476016

Fuel System - Prime

SMCS Code: 1250-548

If air enters the fuel system, the air must be purged from the fuel system before the engine can be started. Air can enter the fuel system when the following events occur:

- The fuel tank is empty or the fuel tank has been partially drained.
- The low-pressure fuel lines are disconnected.
- · A leak exists in the low-pressure fuel system.
- · The fuel filter is replaced.
- A new injection pump is installed.

Use one of the following procedures to remove air from the fuel system:

NOTICE

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

Engines with Electric Priming Pumps

There are many different types of electric priming pumps. These fuel pumps can be put into two categories. Remotely mounted fuel priming pump and secondary fuel filter mounted priming pump.

120

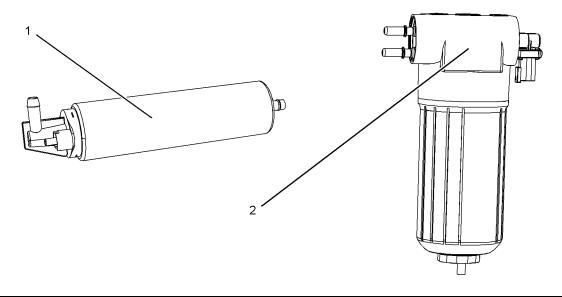


Illustration 149 g03721131

(1) Typical example of a remotely mounted priming pump.

(2) Typical example of a priming pump mounted on a secondary fuel filter.

Priming the Fuel Injection Pump for a Variable Speed Engine

- 1. Turn the engine start switch to the START position and release. The electric priming pump will begin to prime the system. Allow 180 seconds for the electric priming pump to prime the system.
- 2. Turn the engine start switch to the OFF position and then start the engine with the throttle in the low idle position. Operate the engine at idle with no load for 60 seconds and then shutdown the engine.
- 3. Wait 30 seconds and start the engine. This procedure will remove any air that could be trapped within the fuel injection pump. Check for leaks in the fuel system.

Refer to this Operation and Maintenance Manual, "Starting the Engine" for more information.

Priming the Fuel Injection Pump for a **Constant Speed Engine**

- 1. Turn the engine start switch to the START position and release. The electric priming pump will begin to prime the system. Allow 180 seconds for the electric priming pump to prime the system.
- 2. Turn the engine start switch to the OFF position and then start the engine. Operate the engine with no load for 60 seconds and then shutdown the engine.

3. Wait 30 seconds and start the engine. This procedure will remove any air that could be trapped within the fuel injection pump. Check for leaks in the fuel system.

Refer to this Operation and Maintenance Manual, "Starting the Engine" for more information.

i07476019

Fuel System Primary Filter (Water Separator) - Replace

SMCS Code: 1261-510; 1263-510

- 1. Shut off engine, and turn off battery disconnect switch.
- 2. Open the engine compartment.

The water separator element is located in the engine compartment next to the fuel tank filler cap.

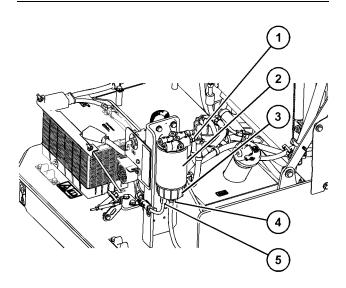


Illustration 150 q06248956

- (1) Supply fuel from tank
- (2) Filter
- (3) Drain bowl
- (4) Drain
- (5) Sensor
- Place a suitable container under the water separator. Clean the outside of the water separator.
- Open drain (4). Allow the fluid to drain into the container.
- **5.** Tighten drain (4) and valve (1) by hand pressure only.
- **6.** Remove the wiring harness from sensor (5) on the bottom of glass bowl (3).
- 7. Remove glass bowl (3) from filter (2).
- 8. Use a Caterpillar strap wrench to remove filter (2). Discard the old seals and the canister in a safe place.
- 9. Clean glass bowl (3).
- 10. Install a new filter.

Note: Do not fill the fuel filter before you install the fuel filter.

a. Install a new filter hand tight until the seal of the filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

Note: There are rotation index marks on the filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the filter, use the rotation index marks as a guide.

- b. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide.
- **11.** Install glass bowl (3) on the filter. Ensure that the sensor is in the correct position.
- 12. Install the wiring harness to the sensor (5).
- **13.** Be sure to dispose of the fuel in a safe place.
- **14.** Prime the fuel system.
- 15. Start the engine.
- 16. Check for leaks.
- 17. Close the engine compartment.

i07476025

Fuel System Secondary Filter - Replace

SMCS Code: 1261-510-SE

MARNING

Personal injury can result from air pressure.

Personal injury can result without following proper procedure. When using pressure air, wear a protective face shield and protective clothing.

Maximum air pressure at the nozzle must be less than 205 kPa (30 psi) for cleaning purposes.

MARNING

Personal injury can result when using cleaner solvents.

To help prevent personal injury, follow the instructions and warnings on the cleaner solvent container before using.

WARNING

Personal injury or death can result from a fire.

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

Clean up all leaked or spilled fuel. Do not smoke while working on the fuel system.

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

NOTICE

Do not pre-fill the fuel filter with fuel before you install the fuel filter. Contaminated fuel **WILL DAMAGE** the fuel system components.

NOTICE

Severe working conditions can shorten the life of the fuel system. Severe conditions refer to a dusty environment and/or dirty fuel. Under severe conditions, reduce the maintenance interval to 250 service hours.

To keep the engine in optimum condition, it is important to keep the fuel free from contamination. As fuel system contamination usually occurs during refueling, the following points should be observed:

- Only use clean fuel of the correct grade from a reliable source.
- Do not refuel from contaminated containers or containers that are not suitable for fuel storage.
- Do not use contaminated equipment.
- Regularly clean the outside of the fuel filler cap and the area around the fuel filler cap.
- Only use Caterpillar approved fuel filters. The use of Caterpillar filters is essential to protect the fuel system.
- Do not service the fuel filters prior to the suggested maintenance interval. This may increase the risk of contamination in the fuel system.

Note: To reduce the risk of contamination in the system, do not remove the primary fuel filter and the secondary fuel filter simultaneously. Perform these operations separately.

Note: After the engine has stopped, wait for 60 seconds to allow the fuel pressure to be purged from the high-pressure fuel lines before any service or repair is performed on the engine fuel lines.

1. Open the engine compartment. The secondary fuel filter is on the right side of the machine.

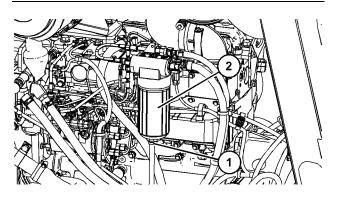


Illustration 151

- Open drain (1) on the secondary fuel filter. Allow the fuel, water, and sediment to drain into a suitable container.
- **3.** Clean the outside of the filter housing (2). Use a Caterpillar strap wrench to remove the filter housing (2).
- 4. Remove the filter from the filter housing (2).
- 5. Install a new filter element into filter housing (2).
- 6. Install filter housing (2).
- 7. Close drain (1).
- **8.** Prime the fuel system. Refer to the Operation and Maintenance Manual, "Fuel System Prime" for more information.
- 9. Start the engine. Check for leaks.
- 10. Close the engine compartment.

i07194513

q06333250

Fuel System Water Separator - Drain

SMCS Code: 1263-543; 1263

- Shut off engine, and turn off battery disconnect switch.
- 2. Open the engine compartment.

The water separator element is located in the engine compartment next to the fuel tank filler cap.

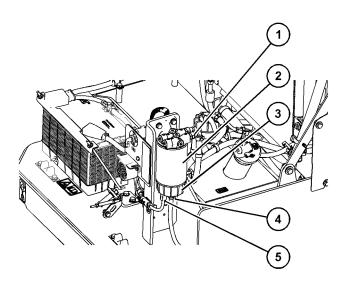


Illustration 152 g06248956

- (1) Supply fuel from tank
- (2) Filter
- (3) Drain bowl
- (4) Drain
- (5) Sensor
- **3.** Place a suitable container under the water separator. Clean the outside of the water separator.
- **4.** Open drain (4). Allow the fluid to drain into the container.
- 5. Close drain (4). Hand tighten only.
- 6. Prime the fuel system.
- 7. Start the engine.
- 8. Check for leaks.
- 9. Close the engine compartment.

i07194533

Fuel Tank Cap Filter and Strainer - Replace/Clean

SMCS Code: 1273-070-STR; 1273-510-FI; 1273-070-Z2

1. The fuel tank is on the rear of the machine under the enclosure. Open the engine enclosure to access the fuel tank.

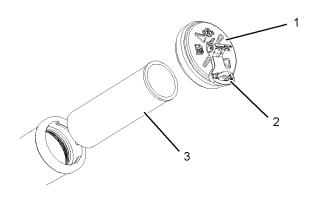


Illustration 153 g02458361

- **2.** Lift lever (2) and turn the lever counterclockwise until the lever stops. Remove fuel cap (1).
- 3. Remove fuel strainer (3).
- 4. Seal the tank to prevent contamination.

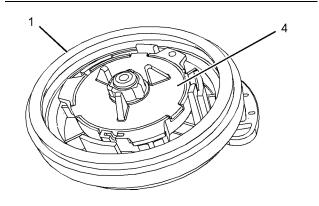


Illustration 154 g02460326

Turn over fuel cap (1).

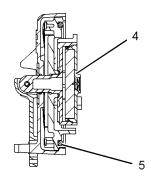


Illustration 155 g02460331

- **6.** Inspect seal (5) for damage. Replace the seal if damaged or worn.
- 7. Put a light coat of fuel on the fuel cap seal.
- Wash the fuel strainer (3) in a clean, nonflammable solvent.
- 9. Install fuel strainer (3).
- **10.** Install fuel cap (1). Turn lever (2) clockwise until the lever stops. Fold lever (2) down.

i07194812

Fuel Tank Water and Sediment - Drain

SMCS Code: 1273-543-M&S

1. Remove the access plate.

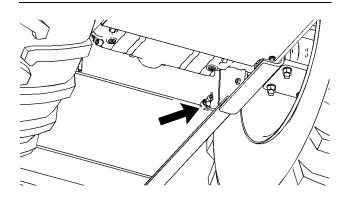


Illustration 156 g06249172

- 2. The drain valve is on the bottom of the fuel tank. Drain the water and the sediment into a suitable container. Refer to the Operation and Maintenance Manual, "General Hazard Information" for information that pertains to containing fluid spillage.
- **3.** Close the drain valve. Install the access plate.

Note: Dispose of all fluids according to local regulations.

i07477624

Fuses - Replace

SMCS Code: 1417-510



Fuse – The fuses protect the electrical system from damage that is caused by overloaded circuits. Change the fuse if

the element separates. If the element of the new fuse separates, check the circuit. Repair the problem before you operate the machine.

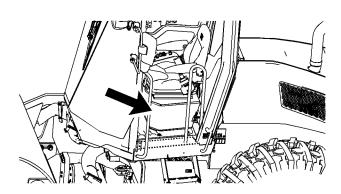


Illustration 157 g06256

The compartment for the fuses is located under the seat. The access door is secured with a padlock.

To access the compartment for the fuses, remove the padlock. Remove the large cover.

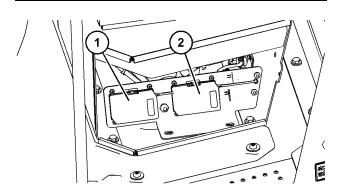


Illustration 158

g06333553

- (1) Fuse Block 1
- (2) Fuse Block 2

After the large panel has been removed, remove the two smaller plastic covers to access the fuses.

Fuse Block 1

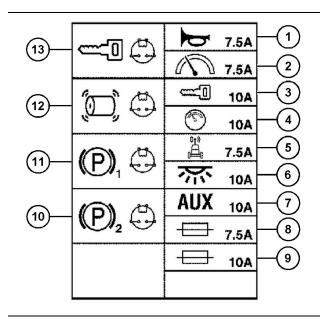


Illustration 159

g06333563

Fuses

Horn (1) - 7.5 Amps

Display (2) – 7.5 Amps

Keyswitch (3) - 10 Amps

Compaction Control (4) – 10 Amps

Product Link (5) – 7.5 Amps

Dome (6) – 10 Amps

Aux (7) - 10 Amps

Spare (8) – 7.5 Amps

Spare (9) – 7.5 Amps

Relays

Parking (10) - Relay

Parking (11) - Relay

Vibratory System (12) - Relay

Keyswitch (13) - Relay

Fuse Block 2

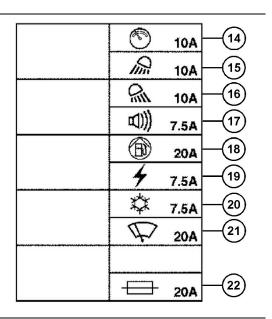


Illustration 160

g06333566

Fuses

Compaction Control (14) - 10 Amps

Front Work Lights (15) - 10 Amps

Rear Work Lights (16) - 10 Amps

Backup Alarm (17) – 7.5 Amps

Lift Pump (18) – 20 Amps

Power Port (19) – 7.5 Amps

Cab AC (20) - 7.5 Amps

Window Wipers (21) - 20 Amps

Spare (22) - 20 Amps

Hydraulic System Oil - Change

SMCS Code: 5050-044; 5095-044

NOTICE

Take extreme care to insure the cleanliness of the hydraulic oil. Keep the hydraulic oil clean in order to extend the component life and assure the maximum performance.

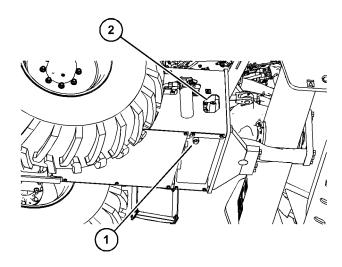


Illustration 161 g06249215

- (1) Hydraulic tank drain plug
- (2) Hydraulic tank filler tube
- Place drain pan under hydraulic oil tank. Remove hydraulic tank drain plug (1) to drain oil. The drain plug is located on the bottom of the hydraulic oil tank. Drain the fluid into a suitable container.

Note: Dispose of the used oil in a proper manner. Refer to the Operation and Maintenance Manual, "General Hazard Information" for information that pertains to containing fluid spillage.

- 2. Reinstall the hydraulic tank drain plug (1).
- 3. Refill the hydraulic tank with clean, filtered hydraulic oil. Refer to the Operation and Maintenance Manual, "Capacities (Refill) and Lubricant Viscosities".
- **4.** Add the oil through the filler tube (2).

5. Maintain the oil level between the sight gauges. Fill to the mid height level on the sight guage to allow for warm oil expansion without over filling the tank.

i07476047

Hydraulic System Oil Filter - Replace

SMCS Code: 5068-510

NOTICE

Take extreme care to insure the cleanliness of the hydraulic oil. Keep the hydraulic oil clean in order to extend the component life and assure the maximum performance.

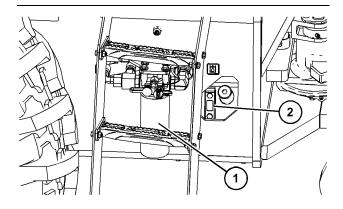


Illustration 162 g06333259

- (1) Hydraulic oil filter
- (2) Hydraulic oil level sight glass
- **1.** The filter is on the right side of the machine. in front of the rear tire.
- 2. To catch any oil that spills, place a suitable container under the filter.
- 3. Remove the filter. Clean the filter base. Discard the filter in a proper manner. Refer to the Operation and Maintenance Manual, "General Hazard Information" for information that pertains to fluid spillage.
- 4. Coat the gaskets of the new filter with clean oil.
- 5. Install the new filter. Hand tighten the filter. When the gasket contacts the filter base, tighten the filter element for an extra 3/4 turn. This will tighten the filter sufficiently. The filters have index marks that are spaced at 90 degree intervals.
- Start the engine. Allow the hydraulic oil to warm. Maintain the oil between the sight gauges. If necessary, add oil.

Refer to the Operation and Maintenance Manual, "Capacities (Refill)". Refer to the Operation and Maintenance Manual, "Lubricant Viscosities".

i07195347

Hydraulic System Oil Level - Check

SMCS Code: 5056-535-FLV; 5095-535-FLV

Note: Always check the hydraulic oil level when the machine is parked on a level surface.

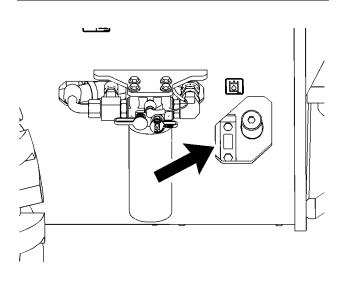


Illustration 163 g06249286

- 1. Observe the level of the hydraulic oil in the sight gauge on the right side of the machine. The sight gauge should be approximately half way to the top with cool oil, or to the bottom of the fill neck. This allows for oil expansion as the oil warms to operating temperature.
- 2. If necessary, add oil.

Refer to the Operation Manual, "Daily Inspection" for the recommended types of hydraulic oil.

3. To add the oil, remove the filler plug. Add the oil through the filler tube. Clean the oil filler plug and install the filler plug.

i07195341

Hydraulic System Oil Sample - Obtain

SMCS Code: 5050-008; 5056-008; 5095-008

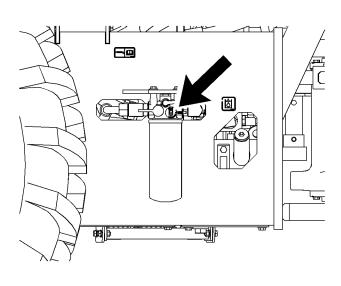


Illustration 164 g06249267

The sampling port for the hydraulic oil is on the inlet line for the hydraulic oil filter.

Refer to the Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining an oil sample.

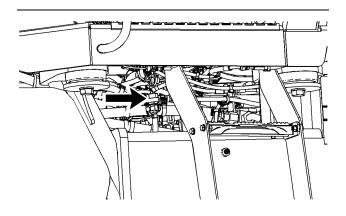
g06333260

i07476061

Hydraulic Tank Breather - Replace

SMCS Code: 5050-510-BRE; 5056-510-BRE; 5118-

510



The hydraulic tank breather is located under the operators platform.

- 1. Loosen band clamp that holds breather.
- 2. Remove the breather.

Illustration 165

- 3. Install new breather assembly.
- 4. Tighten band clamp around new breather.

Indicators and Gauges - Test

SMCS Code: 7450-081

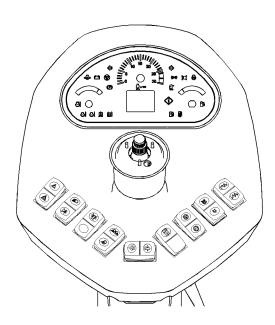


Illustration 166 g06256775

Note: Display will boot up with all lights on

- **1.** Look for broken lenses on the gauges, broken indicator lights, broken switches, and other broken components in the cab.
- 2. Start the engine.
- 3. Look for inoperative gauges.
- **4.** Turn on all machine lights. Check for proper operation.
- **5.** Stop the engine.

Note: When the engine is stopped and the engine start switch key is turned to the ON position, all the indicator lights should illuminate. If the indicator lights do not illuminate, replace the display.

6. Make any repairs that are required before operating the machine.

Isolation Mounts - Inspect

SMCS Code: 5654-040

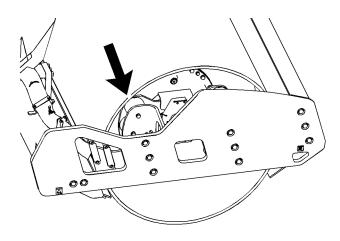


Illustration 167 g06249353

- Check the mounts for cracks which exceed 25 mm (1.0 inch). If two or more mounts on a side have cracks which exceed 25 mm (1.0 inch), replace all the mounts on that side of the machine.
- 2. Check for broken mounts. If any mounts are completely broken through, replace all the mounts on that side of the machine.
- **3.** Check for a split in the middle of the mount. If any mounts are split in the middle, replace all the mounts on that side of the machine.

Refer to the Disassembly and Assembly for further information on removing and installing the isolation mounts.

i07476067

Neutral Start Switch - Test

SMCS Code: 1424-081; 1424-025; 1424-535

WARNING

The machine may lurch forward if the neutral start switch is out of adjustment. Be sure the area is clear of all personnel and equipment before performing this test.

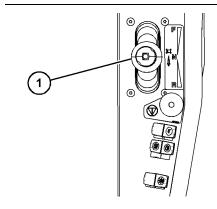


Illustration 168 g06333266

1. Place the propel lever (1) in the FORWARD position.

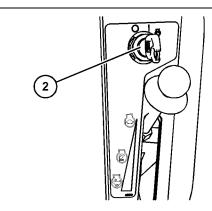


Illustration 169 g06333267

- **2.** Hold the engine start switch (2) in the START position. Slowly move the propel lever toward the STOP position.
- 3. If the machine moves when the engine starts, the neutral start switch and/or propel cable possibly require adjustment. Do not operate the machine until the repairs have been made. Refer to the service manual for instructions on adjusting the neutral start switch and the propel cable.

Oil Filter - Inspect

SMCS Code: 1308-507; 3004-507; 3067-507; 5068-

Inspect a Used Filter for Debris

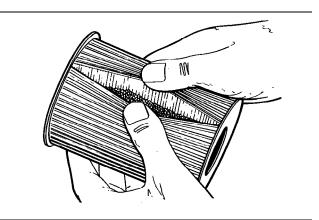


Illustration 170

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.

i07476076

Parking Brake - Check

SMCS Code: 4267-535

Note: If the machine configuration changes, the parking brakes need to be tested.

Check the area around the machine. Make sure that the machine is clear of personnel and clear of obstacles.

Put the steering frame lock in the UNLOCKED position.

Fasten the seat belt before checking the parking brake.

The following tests are used to determine if the parking brake is functional on a specified grade or a specified slope. These tests are not intended to measure the maximum brake holding effort. Read all the steps before you perform the following procedure.

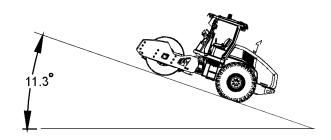


Illustration 171

g06333270

Position the machine on the incline of the slope, but near the base of the slope to check the parking brake. The test position should be 20 percent or a 11.3 degree slope.

- Start the engine. Refer to the Operation and Maintenance Manual, "Engine Starting" for information on starting the engine.
- 2. Move the machine into the test position.
- Place the throttle control into the LOW IDLE position.
- 4. Engage the parking brake.

The machine should not move under the following conditions.

- · The engine is at low idle.
- The propel lever is in the NEUTRAL position.
- The parking brake is engaged.
- The machine is positioned on the specified slope.

⚠ WARNING

Personal injury can result if the machine moves while testing.

If the machine begins to move, release the parking brake and use the propel lever in order to move the machine to a level surface.

- 5. Park the machine on a level surface.
- 6. Stop the engine.

NOTICE

If the machine moved during the brake test, consult your Caterpillar dealer.

The dealer must inspect the brake system and make any necessary repairs before the machine is returned to operation.

i01829953

Radiator Core - Clean

SMCS Code: 1353-070-KO

Open the engine compartment. The radiator core is located at the rear of the machine.

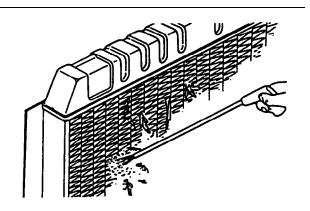


Illustration 172 g00101939

Inspect the radiator core for debris. If necessary, clean the radiator.

Compressed air is preferred, but high pressure water or steam can be used to remove dust and general debris from a radiator. Clean the radiator according to the condition of the radiator.

Note: High pressure water can bend the oil cooler and the radiator fins.

See Special Publication, SEBD0518, "Know Your Cooling System" for more information about cleaning radiator fins.

Close the engine compartment.

i02977292

Refrigerant Dryer - Replace

SMCS Code: 7322-710; 7322-510; 7322-535

Reference: For the correct procedure, refer to Air Conditioning and Heating Service Manual, SENR5664 or the Disassembly and Assembly Manual for your machine.

Note: A qualified mechanic should replace the components of the refrigerant system since special tooling and training are required.

i08155554

Rollover Protective Structure (ROPS) - Inspect

SMCS Code: 7323-040

Refer to "Prepare the Machine for Maintenance".



Illustration 173 g06621263

Inspect the rollover protective structure (ROPS) for cracks. Inspect the ROPS for any loose bolts or damaged bolts. Replace the damaged bolts with original equipment parts only.

Note: Apply oil to all ROPS bolt threads before you install the bolts. Failure to apply the oil to the threads can result in an improper bolt torque.

Replace the ROPS mounting support if the ROPS rattles.

Do not straighten the ROPS or repair the ROPS by welding reinforcement plates to the ROPS.

Consult your Cat ® dealer for the repair 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.

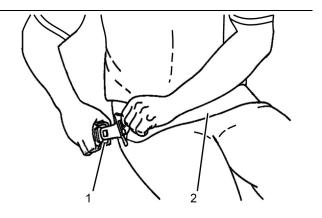


Illustration 174

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).

i06891605

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).



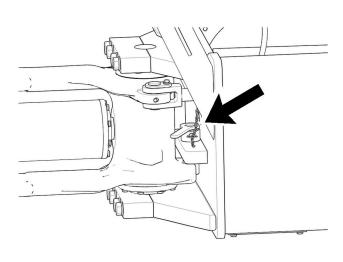


Illustration 176 g06250118

Lower the steering frame lock pin into the LOCKED position.

Note: Wipe all the fittings before you lubricate the fittings.

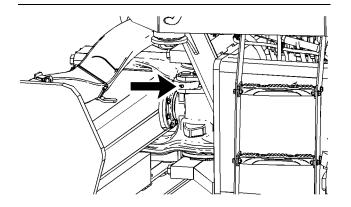


Illustration 177 g06333273

 There are two steering cylinders. One steering cylinder is on the right side of the machine and one steering cylinder is on the left side of the machine. Lubricate the front lube fitting on each side of the machine.

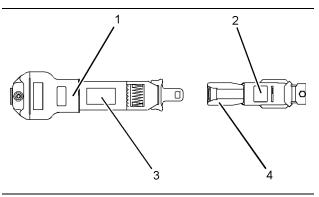


Illustration 175

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.

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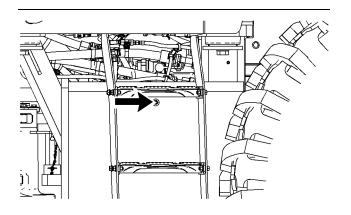


Illustration 178 g06333276

Left side

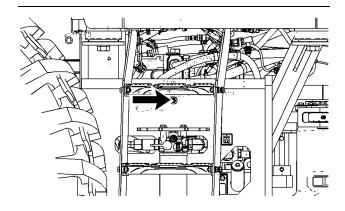


Illustration 179
Right side

aht side

- 2. Lubricate the rear ends of the steer cylinders underneath of the cab.
- Raise the steering frame lock pin into the UNLOCKED position.

i07476101

g06333280

Tire Inflation - Check

SMCS Code: 4203-535-PX

The tire pressure in a warm shop area (18° to 21°C (65° to 70°F) average temperature) 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.

When you operate the machine in freezing temperatures, see Operation and Maintenance Manual, SEBU5898, "Cold-Weather Recommendations".

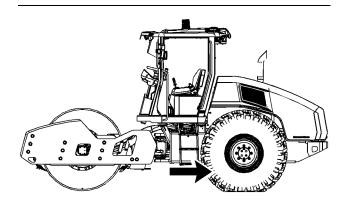


Illustration 180 g06333290

Tire Inflation Pressure

WARNING

The liquid ballast in tires is an irritant. Protect the eyes and face from the spray that comes out of the valve stem when checking the ballast level in the tires or when checking the tires air pressure. Failure to protect the eyes and face could result in personal injury.

The tires are filled with liquid ballast from the factory. When you check the tire pressure, move the machine so that the valve stem for the tire is in the twelve o'clock position to prevent the liquid ballast from spraying out of the valve stem. Use 1P-0545 Pressure Gauge for tires that are equipped with a liquid ballast.

Note: There will be a slight amount of liquid ballast in the valve stem after moving the machine into position. Depress the valve stem to allow the liquid ballast to be blown out of the valve stem before attaching the pressure gauge.

Tire Operating Pressures

Since operating conditions can vary, inflate the tires to the following pressures:

Low-Pressure Limit – Adjust the tire pressure to the low-pressure limit to improve traction. Lowering the tire pressure will also provide a smoother ride.

Normal Operating Pressure – Adjust the tire pressure to the normal operating pressure when special conditions do not exist.

High-Pressure Limit – Adjust the tire pressure to the high-pressure limit to improve stability. Raising the tire pressure will also reduce the flex in the sidewall.

Maximum Shipping Pressure – Adjust the tire pressure to the maximum shipping pressure when you ship the machine.

Note: After shipping the machine, return the tire pressure to the correct operating pressure before operating the machine.

Table 20

Ply Rating	Low-Pres- sure Limit	Normal Op- erating Pressure	High-Pres- sure Limit	Maximum Shipping Pressure
8	12	16	16	30
10	12	16	20	30
12	12	16	24	30
14	12	16	28	30

Liquid Ballast

The liquid ballast for tires is a solution of water and calcium chloride powder CaCl₂. Calcium chloride powder CaCl₂ is an additive which will provide an antifreeze protection and more weight. If a tire is repaired or replaced, the tire must be filled with the correct amount of liquid ballast before the machine returns to operation. The correct mixture for the liquid ballast is 300 grams of calcium chloride powder CaCl₂ per 1 Liter of water. Fill each tire with 430 L (114 US gal) of thirty percent calcium chloride and seventy percent water.

- **1.** Move the machine to a flat surface and park the machine with the valve stem in the 9 o'clock position.
- 2. Remove the cap for the valve stem.
- Check for fluid by depressing the stem in the valve stem. The liquid ballast should spray from the stem.
- **4.** Move the machine so that the valve stem is in the 11 o'clock position.

5. Depress the stem in the valve stem. A light mist should spray from the valve stem.

i07476107

Vibratory Support Oil - Change

SMCS Code: 5656-044-OC

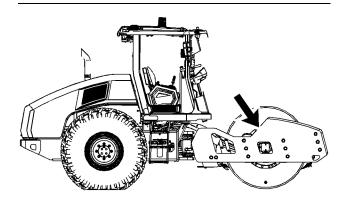


Illustration 181

g06333294

The vibratory support is on the right side of the drum.

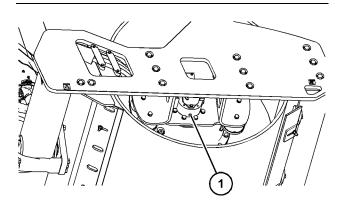


Illustration 182

g06250100

 Remove drain plug (1). Drain plug (1) is on the bottom. Drain the oil into a suitable container. Dispose of the oil in an acceptable manner.

Note: Refer to Operation and Maintenance Manual, "General Hazard Information" for information that pertains to containing fluid spillage.

2. After the oil is drained, clean the drain plug. Install drain plug (1).

136

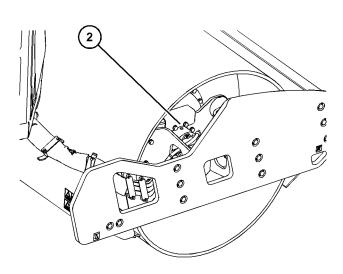


Illustration 183 g06250113

Some parts removed to show fill plug (2).

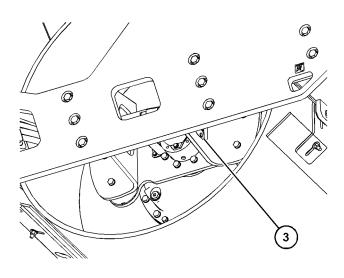


Illustration 184 q06250114

3. Filler plug (2) is at the top of the support. Remove filler plug(2).

Note: When a machine is equipped with a sensor for the VPM gauge, there is a guard over the fill port hole. The level check plug can be used as a filler plug in this case.

4. Level check plug (3) is on the side of the support. Remove level check plug (3).

- 5. Fill the support until the oil is at the bottom of the level check plug opening (3). Refer to the Operation and Maintenance Manual, "Lubricant Viscosities and Capacities (Refill)".
- 6. Clean plugs (2) and (3). Install plugs (2) and (3).

i07476108

g06333294

Vibratory Support Oil Level - Check

SMCS Code: 5656-535-FLV

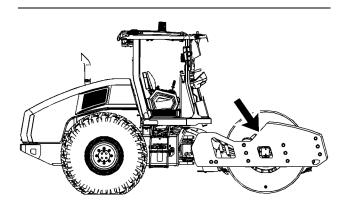


Illustration 185

The vibratory support is on the right side of the drum.

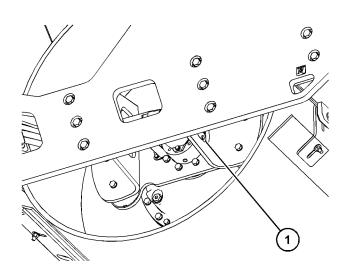


Illustration 186 g06257814

1. The level check plug (1) is at the three o'clock position.

Remove level check plug (1). Check the level of the oil. Maintain the level of the oil at the bottom of the level check plug opening.

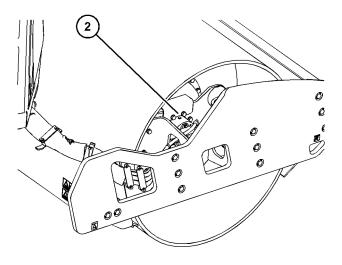


Illustration 187 g06250113

Note: When a machine is equipped with a sensor for the VPM gauge, there is a guard over the fill port hole. The level check plug can be used as a filler plug in this case.

- 3. If the oil level is low, remove filler plug (2).
- 4. To maintain the proper oil level, add oil.
- **5.** Refer to the Operation and Maintenance Manual, "Lubricant Viscosities and Capacities (Refill)".
- 6. Clean the plugs and install the plugs.

i07476109

Vibratory Support Oil Sample - Obtain

SMCS Code: 5656-008

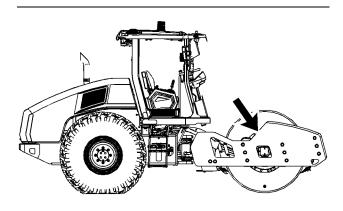


Illustration 188 g06333294

Refer to the Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information. Refer to Special Publication, PEGJ0047, "How To Take A Good Oil Sample" for more information about obtaining an oil sample.

Note: After you obtain an oil sample, add oil to maintain the proper level.

i07476128

Wheel Nuts - Tighten

SMCS Code: 4201-527-NT: 4210-527

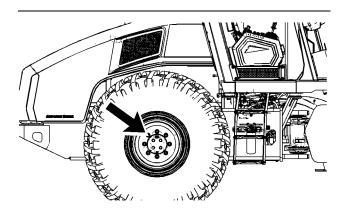


Illustration 189 g06333300

Tighten the wheel nuts to a torque of $460 \pm 60 \text{ N} \cdot \text{m}$ (340 ± 45 lb ft).

i08155129

Window Washer Reservoir - Fill

SMCS Code: 7306-544; 7306-544-KE; 7306

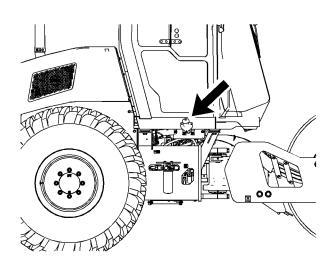


Illustration 190 g06250145

The window washer reservoir is on the right side of the cab.

If the level of the cleaning solution is low, refill the reservoir.

Window Wiper - Inspect/ Replace

SMCS Code: 7305-040; 7305-510

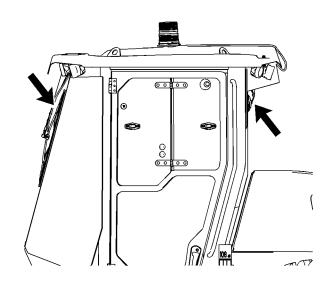


Illustration 191 g06567893

Inspect the front window wiper blade and the rear window wiper blade. If necessary, replace the window wiper blades.

i00851568

Windows - Clean

SMCS Code: 7310-070; 7340-070

Use commercially available window cleaning solutions in order to clean the windows. Clean the outside of the cab windows from the ground unless handholds are available.

Warranty Section

Warranty Information

i08769122

Emissions Warranty Information

SMCS Code: 1000

The certifying engine manufacturer warrants to the ultimate purchaser and each subsequent purchaser that:

- 1. New non-road diesel engines and stationary diesel engines less than 10 L per cylinder (including Tier 1 and Tier 2 marine engines < 37 kW, but excluding locomotive and other marine engines) operated and serviced in the United States and Canada, including all parts of their emission control systems ("emission related components"), are:
 - Designed, built, and equipped so as to conform, at the time of sale, with applicable emission standards prescribed by the United States Environmental Protection Agency (EPA) by way of regulation.
 - b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.
- 2. New non-road diesel engines (including Tier 1 and Tier 2 marine propulsion engines < 37 kW and Tier 1 through Tier 4 marine auxiliary engines < 37 kW, but excluding locomotive and other marine engines) operated and serviced in the state of California, including all parts of their emission control systems ("emission related components"), are:
 - Designed, built, and equipped so as to conform, at the time of sale, to all applicable regulations adopted by the California Air Resources Board (ARB).
 - b. Free from defects in materials and workmanship which cause the failure of an emission-related component to be identical in all material respects to the component as described in the engine manufacturer's application for certification for the warranty period.

- 3. New non-road diesel engines installed in construction machines conforming to the South Korean regulations for construction machines manufactured after January 1, 2015, and operated and serviced in South Korea, including all parts of their emission control systems ("emission related components"), are:
 - a. Designed, built, and equipped so as to conform, at the time of sale, with applicable emission standards prescribed in the Enforcement Rule of the Clean Air Conservation Act promulgated by South Korea MOE.
 - b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.
- 4. New China non-road 4 mobile diesel engines operated and serviced in China, including all parts of their emission control systems ("emission related components"), are:
 - a. Designed, built, and equipped so as to conform, at the time of manufacture, sale, and import with applicable emission standards in the promulgated by Enforcement Rule of the Clean Air Conservation Act Ministry of Ecology and Environment (MEE).
 - b. Free from defects in materials and workmanship in emission-related components that can cause the engine to fail to conform to applicable emission standards for the warranty period.

A detailed explanation of the Emission Control Warranty that is applicable to new non-road and stationary diesel engines, including the components covered and the warranty period, is found in the Emission Control Warranty statement available at the Cat Warranty website. Consult your authorized Cat dealer to determine if your engine is subject to an Emission Control Warranty, and to obtain a copy of the applicable warranty publication.

Reference Information Section

Reference Materials

i08292374

Reference Material

SMCS Code: 1000; 7000

Additional literature regarding your product may be purchased from your local Cat dealer or by visiting publications.cat.com. Use the product name, sales model, and serial number to obtain the correct information for your product.

publications.cat.com

i08292382

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.

Improperly disposing of waste can threaten the environment. Obey all local regulations for the decommissioning and disposal of materials.

Utilize appropriate personal protective equipment when decommissioning and disposing product.

Consult the nearest Cat dealer for additional information. Including information for component remanufacturing and recycling options.

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Product and Dealer Information

Delivery Date: _____

Note: For product identification plate locations, see the section "Product Identification Information" in the Operation and Maintenance Manual.

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Produc	et Information		
Model:			
Product Ide	ntification Number:		
Engine Seri	al Number:		
Transmissio	on Serial Number:		
Generator S	Serial Number:		
Attachment	Serial Numbers:		
Attachment	Information:		
Customer E	quipment Number:		
Dealer Equ	pment Number:		
Dealer	Information		
Name:		Branch:	
Address:			
	Dealer Contact	Phone Number	<u>Hours</u>
Sales: -			
Parts: -			
Service: -			

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