



Operation and Maintenance Manual

844H Wheel Dozer

BTW 1-UP (844H)

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.



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

Failure to follow this warning may lead to premature failures, product damage, personal injury or death.

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

Table of Contents

Foreword	4
----------------	---

Safety Section

Safety Messages	6
Additional Messages	11
General Hazard Information	13
Crushing Prevention and Cutting Prevention..	16
Burn Prevention	16
Fire Prevention and Explosion Prevention	17
Fire Extinguisher Location	20
Tire Information	20
Electrical Storm Injury Prevention	21
Before Starting Engine	21
Visibility Information	22
Restricted Visibility	22
Engine Starting	23
Before Operation	23
Operation	23
Engine Stopping	24
Parking	24
Slope Operation	24
Equipment Lowering with Engine Stopped	25
Sound Information and Vibration Information .	25
Operator Station	27

Product Information Section

General Information	28
---------------------------	----

Identification Information	29
----------------------------------	----

Operation Section

Before Operation	33
Machine Operation	35
Engine Starting	58
Parking	60
Transportation Information	62
Towing Information	64
Engine Starting (Alternate Methods)	67

Maintenance Section

Tire Inflation Information	70
Lubricant Viscosities and Refill Capacities	71
Maintenance Support	78
Maintenance Interval Schedule	81

Reference Information Section

Reference Materials	143
---------------------------	-----

Index Section

Index	145
-------------	-----

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:

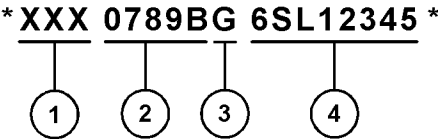


Illustration 1

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

i03917877

Safety Messages

SMCS Code: 7000

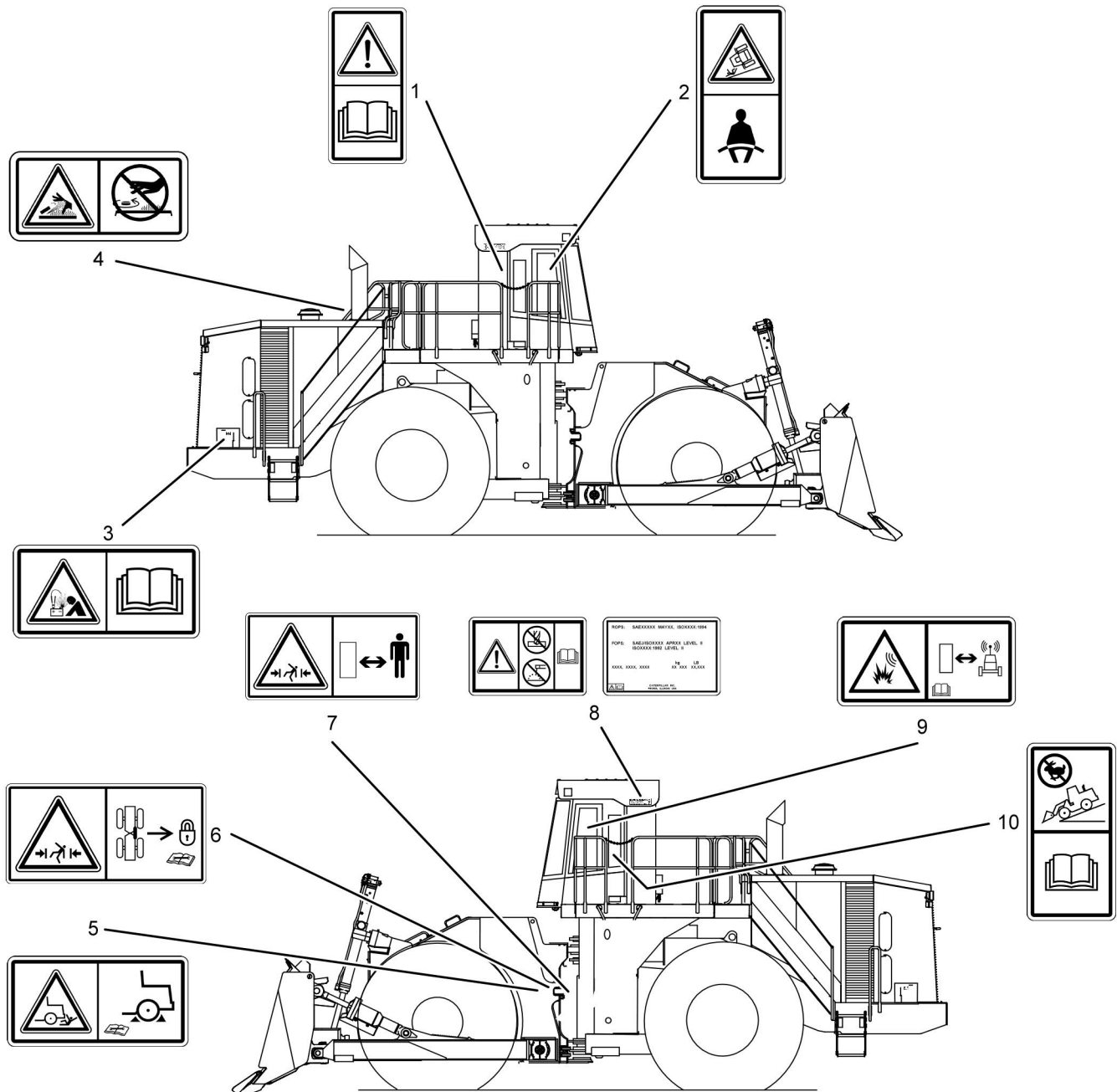


Illustration 2

g02151061

There are several specific safety messages on this machine. The exact location of the hazards and the description of the hazards are reviewed in this

section. Please become familiarized with all safety messages.

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

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

Do Not Operate (1)

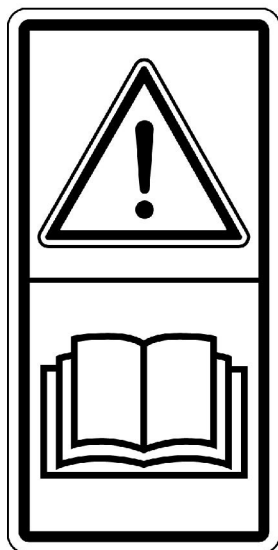


Illustration 3

g01379128

This warning label is located in the cab on the inside of the front door post.

WARNING

DO NOT OPERATE OR WORK ON THIS MACHINE UNLESS YOU HAVE READ AND UNDERSTAND THE INSTRUCTIONS AND WARNINGS IN THE OPERATION AND MAINTENANCE MANUALS. FAILURE TO FOLLOW THE INSTRUCTIONS OR HEED THE WARNINGS COULD RESULT IN INJURY OR DEATH. CONTACT ANY CATERPILLAR DEALER FOR REPLACEMENT MANUALS. PROPER CARE IS YOUR RESPONSIBILITY.

Seat Belt (2)

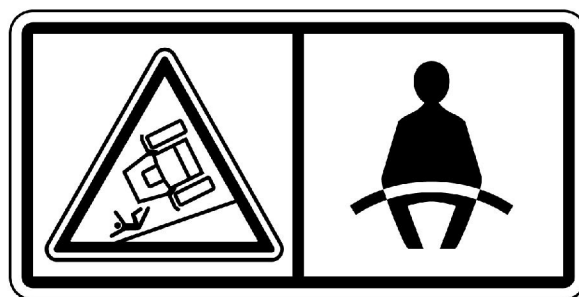


Illustration 4

g01370908

This warning label is located in the cab near the cup holder.

⚠ 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 Connections Of The Jump Start Cable (3)

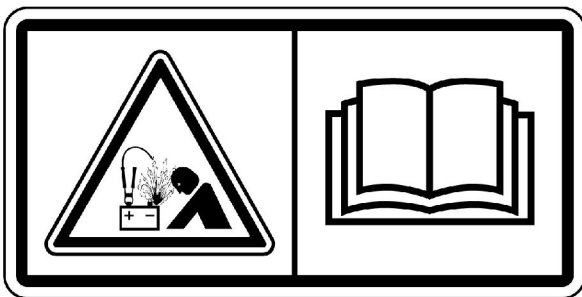


Illustration 5

g01370909

This warning label is located in the battery compartment.

⚠ WARNING

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

Pressurized System (4)



Illustration 6

g01371640

This warning label is located on the back side of the access door for the radiator filler cap.

⚠ 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.

Parking Brake (5)



Illustration 7

g01435623

This warning is located near the articulation joint on the cover for the parking brake.

⚠ WARNING

BEFORE MANUALLY RELEASING PARKING BRAKE-Stop the engine and block wheels to prevent machine movement which could result in personal injury.

BEFORE DISSASSEMBLING BRAKE-Relieve brake oil pressure by repeatedly applying brakes until brake oil pressure gauge indicates zero.

TO MANUALLY RELEASE PARKING BRAKE-Remove three bolts from the storage holes [] in the retainer plate. Install them in the three threaded holes [X] and tighten until solid resistance is felt.

BEFORE OPERATING THE MACHINE-Remove the three bolts and install in the storage holes [].

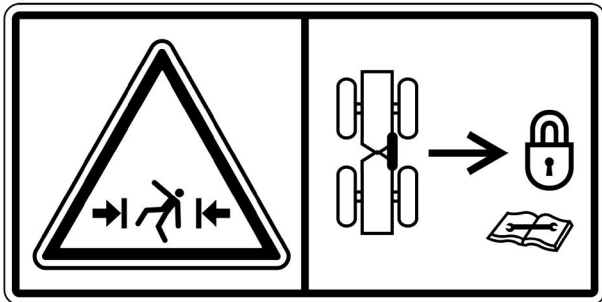
Crushing Hazard (6)

Illustration 8

g01371647

This warning label is located on both sides of the machine at the articulation joint.

⚠ WARNING

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

Disconnect the steering lock and secure before resuming operation.

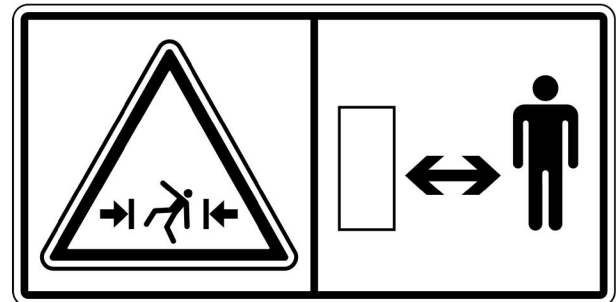
No Clearance (7)

Illustration 9

g01371644

This warning label is located on both sides of the machine at the articulation joint.

⚠ WARNING

Crushing Hazard! Stay back a safe distance. There is no clearance for a person in this area when the machine turns. Failure to follow these instructions could cause serious injury or death.

ROPS/FOPS Structure (2)

This warning label is located on the outside of the cab on the left side below the window.

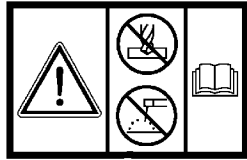


Illustration 10

g01347695

WARNING

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

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

A typical example of the warning film and certification film are shown above.

Product Link (9)

This warning label is located inside the cab.

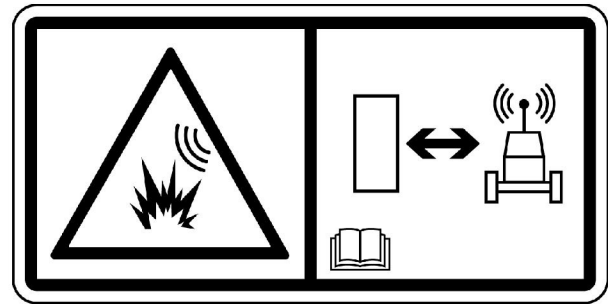


Illustration 11

g01370917

WARNING

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

Down Hill Travel (10)

This warning label is located in the cab on the inside of the front door post.

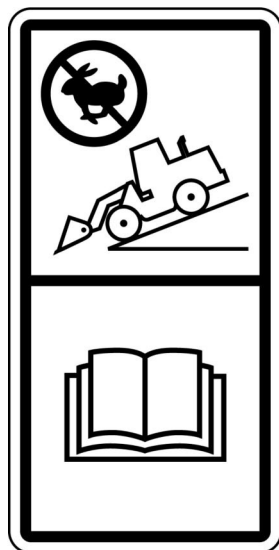


Illustration 12

g02151383

⚠ WARNING

This wheel loader is not equipped with a retarder and should not be used for high speed, down-grade hauling operations. If the service brakes are overused when traveling downhill, the service brakes may overheat and fail which could result in serious injury or death. When traveling downhill, downshift to the proper gear and use engine braking to prevent excessive speed buildup and excessive use of the service brakes. When using the service brakes for downhill travel, always use the right brake pedal.

i02903230

Additional Messages

SMCS Code: 7000

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

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

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

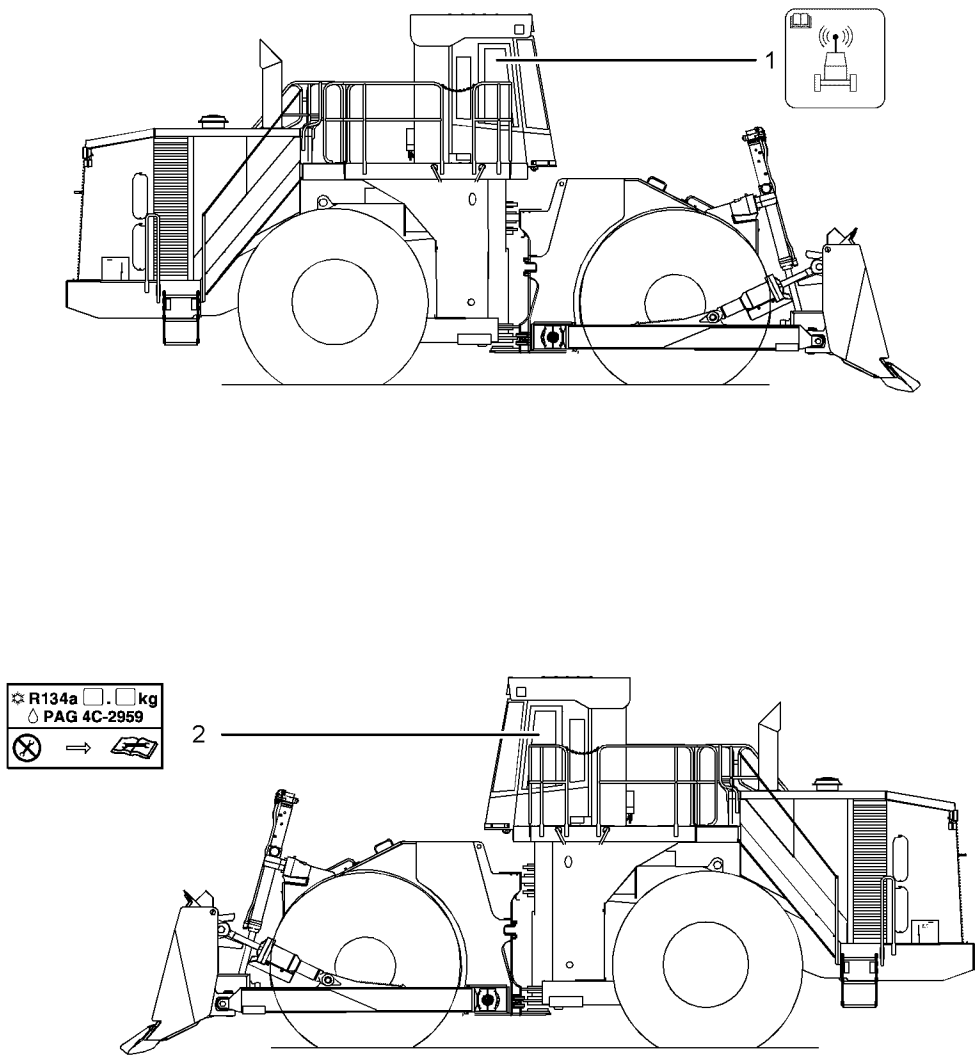


Illustration 13

g01445576

Data Privacy (1)

This message is located in the cab.

i07046904

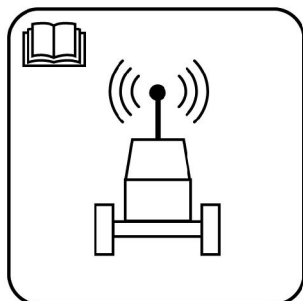


Illustration 14

g01418953

The Product Link is a satellite based communication device that transmits information regarding the machine to Caterpillar, Caterpillar dealers, and Caterpillar customers.

Air Conditioner (2)

This message is located in the cab.

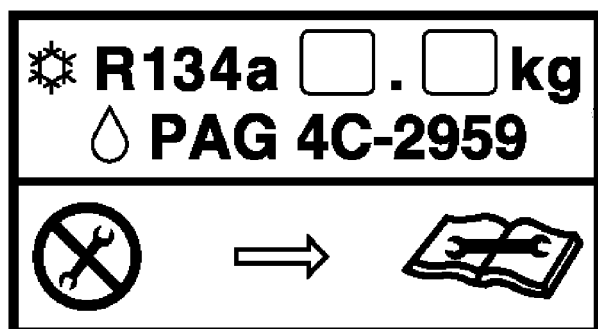


Illustration 15

g00990500

Read the service manual before you perform any maintenance on the air conditioner.

General Hazard Information

SMCS Code: 7000

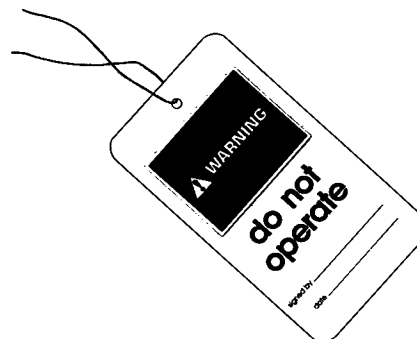


Illustration 16

g00104545

Typical example

Attach a "Do Not Operate" warning tag or a similar warning tag to the start switch or to the controls. Attach the warning tag before you service the equipment or before you repair the equipment. 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 in order to maintain proper clearance when you operate the equipment near fences or near boundary obstacles.

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

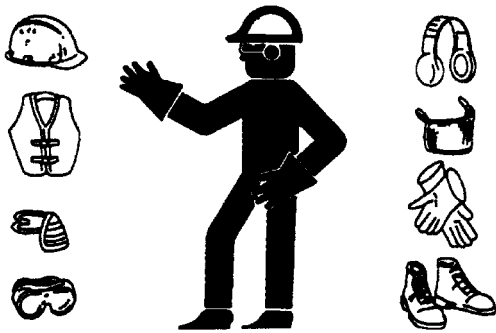


Illustration 17

g00702020

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

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

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

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

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

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

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

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

Obey all local regulations for the disposal of liquids.

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

Do not allow unauthorized personnel on the equipment.

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

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

Pressurized Air and Water

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

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

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

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

Trapped Pressure

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

Fluid Penetration

Pressure can be trapped in the hydraulic circuit long after the 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.

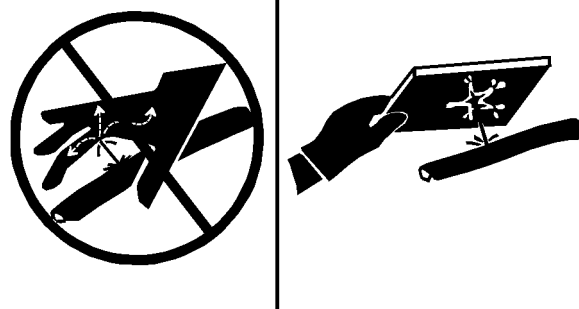


Illustration 18

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

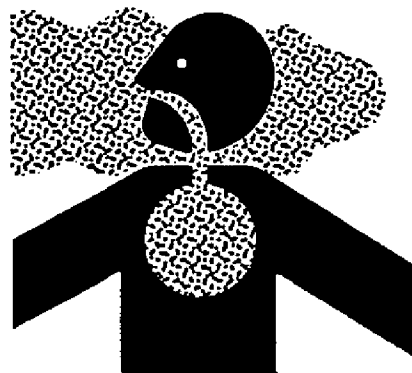


Illustration 19

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.

Safety Section

Crushing Prevention and Cutting Prevention

- Use exhaust ventilation on permanent machining jobs.
- Wear an approved respirator if there is no other way to control the dust.
- Comply with applicable rules and regulations for the work place. In the United States, use Occupational Safety and Health Administration (OSHA) requirements. These OSHA requirements can be found in "29 CFR 1910.1001". In Japan, use the requirements found in the "Ordinance on Prevention of Health Impairment due to Asbestos" in addition to the requirements of the Industrial Safety and Health Act.
- Obey environmental regulations for the disposal of asbestos.
- Stay away from areas that might have asbestos particles in the air.

Dispose of Waste Properly

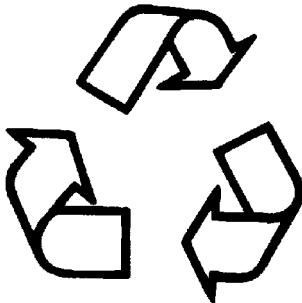


Illustration 20

g00706404

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

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

i01359664

Crushing Prevention and Cutting Prevention

SMCS Code: 7000

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

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

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

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

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

Stay clear of all rotating and moving parts.

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

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

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

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

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

i04760300

Burn Prevention

SMCS Code: 7000

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

Coolant

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

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

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

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

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

Oils

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

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

Batteries

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

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

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

i06180998

Fire Prevention and Explosion Prevention

SMCS Code: 7000



Illustration 21

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.

Safety Section

Fire Prevention and Explosion Prevention

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 22

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 23

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

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

Gases from a battery can explode. Keep any open flames or sparks away from the top of a battery. Do not smoke in battery charging areas. 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 high-pressure lines. Do not install any lines that are bent or damaged. Use the appropriate backup wrenches in order to tighten all connections to the recommended torque.

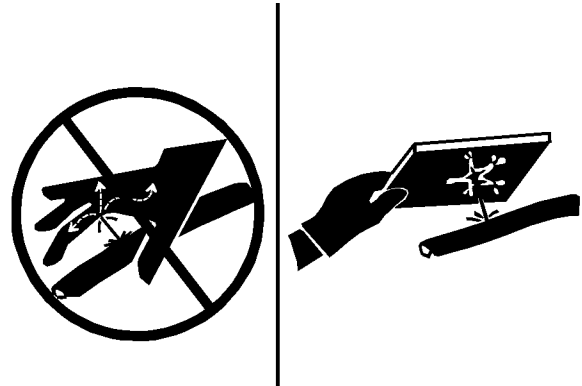


Illustration 24

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.

i00977136

Fire Extinguisher Location

SMCS Code: 7000

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

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

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

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

i06164462

Tire Information

SMCS Code: 7000

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

A tire explosion is much more violent than a blowout. The explosion can propel the tire, the rim components, and the axle components from the machine. Stay out of the trajectory path. Both the force of the explosion and the flying debris can cause property damage, personal injury, or death.

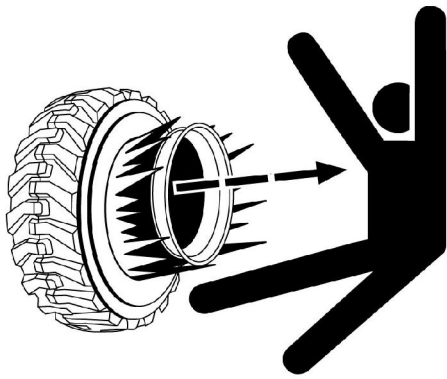


Illustration 25

g02166933

Typical example of tire is shown

Do not approach a hot or an apparently damaged tire.

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

WARNING

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

A tire blowout and/or rim failure can occur if the inflation equipment is not used correctly, due to the fact that a fully charged nitrogen cylinder's pressure is approximately 15000 kPa (2200 psi).

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

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

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

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

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

i01122596

Electrical Storm Injury Prevention

SMCS Code: 7000

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

- Mount the machine.
- Dismount the machine.

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

i00934890

Before Starting Engine

SMCS Code: 1000; 7000

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

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

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

Adjust the seat so that there is full pedal travel while the operator's back is against the back of the seat.

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

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

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i03687975

Visibility Information

SMCS Code: 7000

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

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

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

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

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

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

Restricted Visibility

SMCS Code: 7000

The size and the configuration of this machine may result in areas that can not be seen when the operator is seated. Illustration 26 provides an approximate visual indication of areas of significant restricted visibility. Illustration 26 indicates restricted visibility areas at ground level inside a radius of 12 m (40 ft) from the operator on a machine without the use of optional visual aids. This illustration does not provide areas of restricted visibility for distances outside a radius of 12 m (40 ft).

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

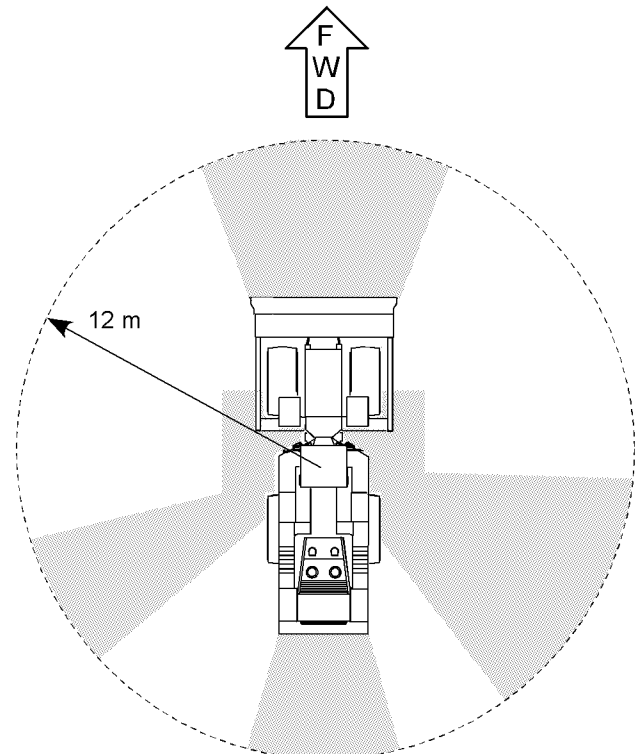


Illustration 26

g01983387

Top view of a typical wheel dozer.

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

i03690423

i02039052

Engine Starting

SMCS Code: 1000; 7000

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

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

Move the transmission control to the NEUTRAL position.

Engage the parking brake.

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

Briefly sound the horn before you start the engine.

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

i07012438

Before Operation

SMCS Code: 7000

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

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

Make sure that all windows are clean. Secure the doors and the windows in the open position or in the shut position.

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

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

Fasten the seat belt securely.

Operation

SMCS Code: 7000

Machine Operating Temperature Range

The standard machine configuration is intended for use within an ambient temperature range of -40 °C (-40 °F) to 50 °C (122 °F). Special configurations for different ambient temperatures may be available. Consult your Caterpillar dealer for additional information on special configurations of your machine.

Operation

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.

Check for proper operation of all controls and protective devices while you operate the machine slowly in an open area.

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

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

- additional seat
- additional seat belt
- Rollover Protective Structure (ROPS)

Report any needed repairs that were noted during operation.

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

If the machine begins to sideslip, perform the following procedure:

- Discard the load.
- Turn the machine downhill.

Be careful to avoid any condition which could lead to tipping. Tipping can occur when you work on hills, banks and slopes. Also, tipping can occur when you cross ditches, ridges or other unexpected obstructions.

Whenever it is possible, operate the machine up the slopes and down the slopes. Avoid operating the machine across the slope, when possible.

Keep the machine under control. Do not overload the machine beyond capacity.

Be sure that the towing devices are adequate.

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

Know the maximum dimensions of your machine.

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

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.

i03907830

Parking

SMCS Code: 7000

Park the machine on a level surface. If you must park the machine on a downgrade, block the tires.

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

Engage the parking brake.

Lower all work tools to the ground. Activate any control locks.

Stop the engine.

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

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

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

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.

i01329161

Equipment Lowering with Engine Stopped

SMCS Code: 7000

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

i03306267

Sound Information and Vibration Information

SMCS Code: 7000

Sound Level Information

The operator Equivalent Sound Pressure Level (Leq) is 75 dB(A) when "ANSI/SAE J1166 OCT 98" is used to measure the value for an enclosed cab. This is a work cycle sound exposure level. The cab was properly installed and maintained. The test was conducted with the cab doors and the cab windows closed.

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

The average exterior sound pressure level is 82 dB (A) when the "SAE J88Apr95 - Constant Speed Moving Test" procedure is used to measure the value for the standard machine. The measurement was conducted under the following conditions: distance of 15 m (49.2 ft) and "the machine moving forward in an intermediate gear ratio".

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

The dynamic operator sound pressure level is 74 dB (A) when "ISO 6396:1992" is used to measure the value for an enclosed cab. The cab was properly installed and maintained. The test was conducted with the cab doors and the cab windows closed.

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

Vibration Data for Wheel Loaders

Information Concerning Hand/Arm Vibration Level

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

Information Concerning Whole Body Vibration Level

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

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

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

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

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

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

Table 1

"ISO Reference Table A - Equivalent vibration levels of whole body vibration emission for earthmoving equipment."							
Machine Type	Typical Operating Activity	Vibration Levels			Scenario Factors		
		X axis	Y axis	Z axis	X axis	Y axis	Z axis
Wheel Loader	load and carry motion	0,84	0,81	0,52	0,23	0,20	0,14
	mining application ⁽¹⁾	1,27	0,97	0,81	0,47	0,31	0,47
	transfer ⁽²⁾	0,76	0,91	0,49	0,33	0,35	0,17
	V-shape motion ⁽³⁾	0,99	0,84	0,54	0,29	0,32	0,14

⁽¹⁾ Loading at the face

⁽²⁾ Travel at high speed on the job site or on public roads

⁽³⁾ Loading a truck in short cycles

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

The Caterpillar suspension seat meets the criteria of "ISO 7096". This represents vertical vibration level under severe operating conditions. This seat is tested with the input "spectral class EM5". The seat has a transmissibility factor of "SEAT<0.7".

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

Guidelines for Reducing Vibration Levels on Earthmoving Equipment

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

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

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

- a. Tire pressures
- b. Brake and steering systems
- c. Controls, hydraulic system and linkages

3. Keep the terrain in good condition.

- a. Remove any large rocks or obstacles.
- b. Fill any ditches and holes.
- c. Provide machines and schedule time in order to maintain the conditions of the terrain.

4. Use a seat that meets "ISO 7096". Keep the seat maintained and adjusted.

- a. Adjust the seat and suspension for the weight and the size of the operator.
- b. Inspect and maintain the seat suspension and adjustment mechanisms.

5. Perform the following operations smoothly.

- a. Steer
- b. Brake
- c. Accelerate.

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

Sources

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

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

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

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

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

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

Caterpillar, Inc.
www.cat.com

i07199012

Operator Station

SMCS Code: 7000

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

Product Information Section

General Information

i03652829

Specifications

SMCS Code: 7000

Intended Use

This machine is classified as a Wheel Dozer as described in “ISO 6165:2001”. This machine normally has a front attachment for dozing or another work tool for the principal intended functions of cutting, grading, and moving material such as earth, crushed rock or gravel.

Application/Configuration Restrictions

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

The maximum fore and aft slope for proper lubrication is 25 degrees continuous and 35 degrees intermittent.

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

Machine Data

This machine is equipped with a 3516B Engine.

Table 2

844H Wheel Dozer	
Approximate Weight	74079 kg (163316 lb)
Maximum Length	11941 mm (470 inch)
Width Across Tires	4152 mm (164 inch)
Height to Top of ROPS	5067 mm (200 inch)

Identification Information

i03652793

Plate Locations and Film Locations

SMCS Code: 1000; 7000

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

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

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

Product Identification Number (PIN) and CE Plate

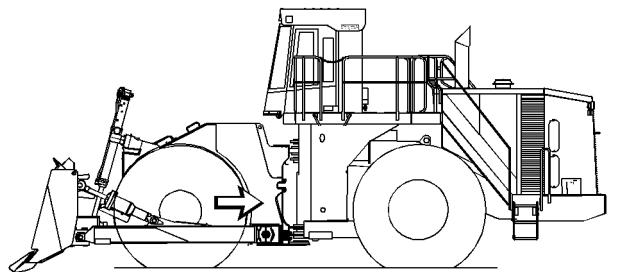


Illustration 27 g01055829

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

Machine PIN _____

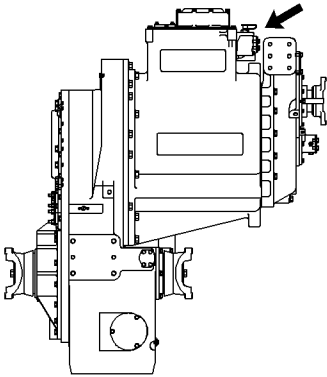


Illustration 28 g00940370

This plate is located on the transfer gear case.

Transmission Serial Number _____

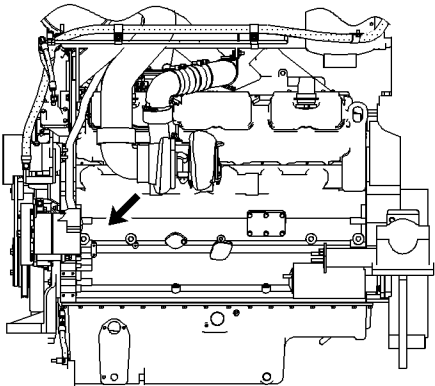


Illustration 29 g00941911

This plate is located on the top of the engine.

Engine Serial Number _____

European Union

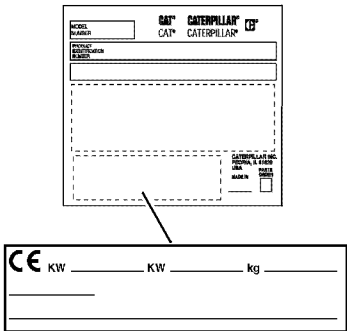


Illustration 30 g01880193

This plate is positioned on the bottom left side of the plate for the PIN.

Note: The CE plate is on machines that are certified to the European Union requirements that were effective at that time.

For machines compliant to 2006/42/EC, the following information is stamped onto the CE 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 for European Market (kg)_____
- Year of Construction_____
- Machine Type _____

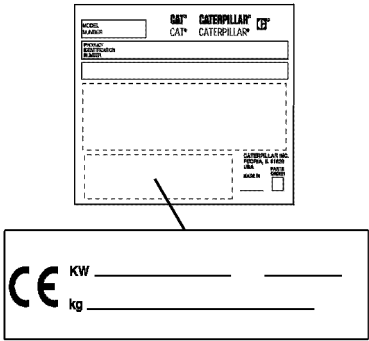


Illustration 31 g01120192

This plate is positioned on the bottom left side of the plate for the PIN.

Note: The CE plate is on machines that are certified to the European Union requirements that were effective at that time.

For machines compliant to 1998/37/EC and 1989/392/EEC, the following information is stamped onto the CE plate. For quick reference, record this information in the spaces that are provided below.

- Engine Power Primary Engine (kW)_____
- Typical Machine Operating Weight for European Market (kg)_____
- Year_____

For the name and address of the manufacturer, and the country of origin of the machine, refer to the PIN plate.

Certification

Sound

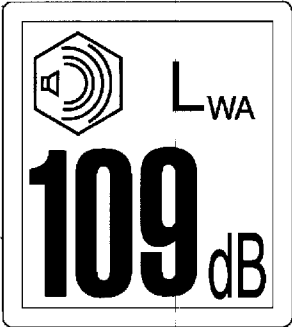


Illustration 32 g00933634

Typical example

If equipped, the film is used to verify the environmental sound certification of the machine. The value that is listed on the film indicates the guaranteed sound level. The guaranteed sound level is measured at the time of manufacture. Refer to Operation and Maintenance Manual, “Sound Information and Vibration Information” for the guaranteed sound level for your machine.

ROPS/FOPS Film

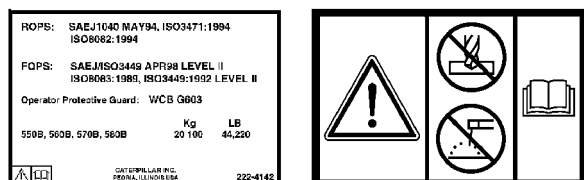


Illustration 33

g00944234

This film is located on the outside of the cab on the left side on the ROPS. This machine has been certified to the standards that are listed on the certification label. The maximum mass of the machine, which includes the operator and the attachments without a payload, should not exceed the mass on the certification label.

i04687649

Emissions Certification Film

SMCS Code: 1000; 7000; 7405

Certification Label for Emissions

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

Consult your Cat dealer for an Emission Control Warranty Statement.

This label is located on the engine valve cover.

Declaration of Conformity

SMCS Code: 1000; 7000

Table 3

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

EC DECLARATION OF CONFORMITY OF MACHINERY

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

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

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

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

Description:	Generic Denomination:	Earth moving Equipment
	Function:	Wheeled Dozer
	Model/Type:	844H Wheel Dozer
	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)		
2004/108/EC	N/A	

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

Done at:

Signature

Date:

Name/Position

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

Operation Section

Before Operation

i04021647

Mounting and Dismounting

SMCS Code: 7000

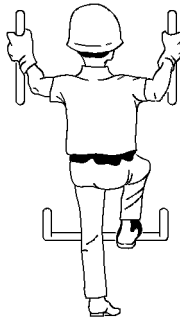


Illustration 34

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".

i01830479

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, 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.

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.

Perform the daily procedures that are applicable to your machine:

- Operation and Maintenance Manual, "Backup Alarm - Test"
- Operation and Maintenance Manual, "Bucket Control and Linkage - Lubricate"

Operation Section

Steering Frame Lock

- Operation and Maintenance Manual, "Bucket Cutting Edges - Inspect/Replace"
- Operation and Maintenance Manual, "Bucket Lower Pivot Bearings- Lubricate"
- Operation and Maintenance Manual, "Bucket Tips - Inspect/Replace"
- Operation and Maintenance Manual, "Cooling System Level - Check"
- Operation and Maintenance Manual, "Engine Air Filter Service Indicator - Check"
- Operation and Maintenance Manual, "Engine Oil Level - Check"
- Operation and Maintenance Manual, "Hydraulic System Oil Level (Implement and Braking) - Check"
- Operation and Maintenance Manual, "Hydraulic System Oil Level (Steering and Hydraulic Fan) - Check"
- Operation and Maintenance Manual, "Seat Belt - Inspect"
- Operation and Maintenance Manual, "Transmission Oil Level - Check"
- Operation and Maintenance Manual, "Windows - Clean"

i01851244

Steering Frame Lock

SMCS Code: 7506

WARNING

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

Note: The machine must be in the straight ahead position in order to connect the steering frame lock.

The steering frame lock is located at the articulation joint on the right side of the machine.

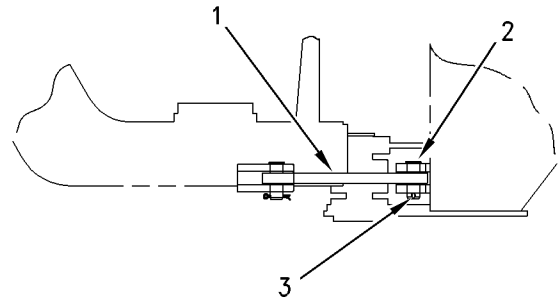


Illustration 35

g00943056

Connect steering frame lock (1) when the machine is being lifted and when the machine is being transported. Also connect the steering frame lock if you are performing service work near the articulation joint. Install pin (2) and secure the pin with locking pin (3).

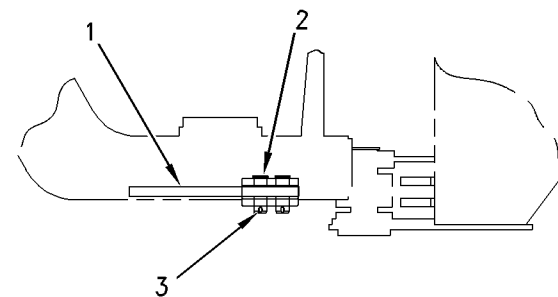


Illustration 36

g00943061

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

Move the steering frame lock to the front frame and install pin (2). Secure the pin with locking pin (3).

Machine Operation

i02060850

Alternate Exit

SMCS Code: 7310

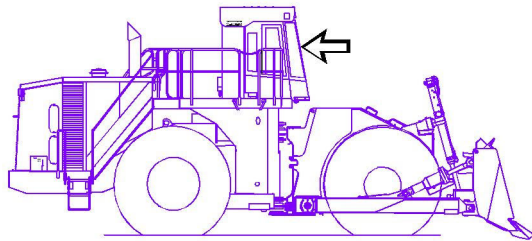


Illustration 37

g01056320

The right cab window can be used as an alternate exit. The window can be opened from the inside of the cab. Release the latch in order to open the window.

If you use the alternate exit, maintain three points of contact with the machine at all times. Three-point contact can be two feet and one hand. Three-point contact can also be one foot and two hands.

i01851303

Seat

SMCS Code: 7312

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

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

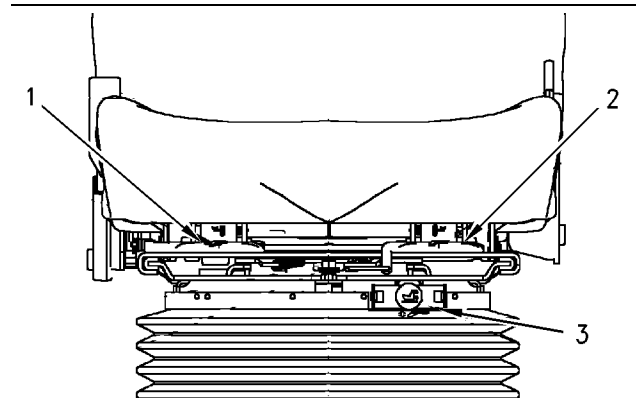


Illustration 38

g00943089



Backrest Cushion Angle (1) – Pull the lever upward. Hold the lever upward and adjust the backrest cushion to the desired angle. Release the lever in order to lock the backrest cushion into position.



Fore and Aft Position (2) – Pull the lever upward. Hold the lever upward and slide the seat forward or backward to the desired position. Release the lever in order to lock the seat into position.



Seat Height (3) – Pull the lever upward. Hold the lever upward and move the seat to the desired height. Release the lever in order to lock the seat into position.

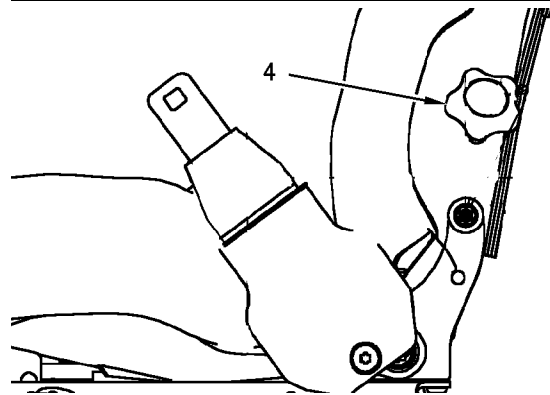


Illustration 39

g00943092



Lumbar Support (4) – Push the lever backward in order to increase support to the lower back. Pull the lever forward in order to decrease support to the lower back. Release the lever in order to lock the seat into position.

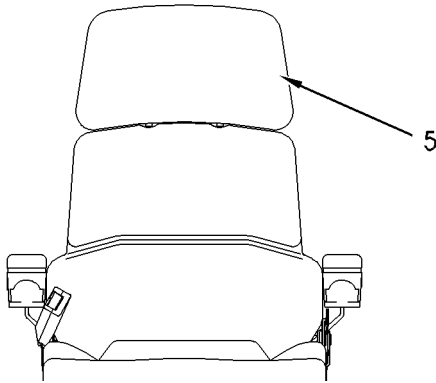


Illustration 40

g00847660

Pull up on the backrest in order to remove extension (5).

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

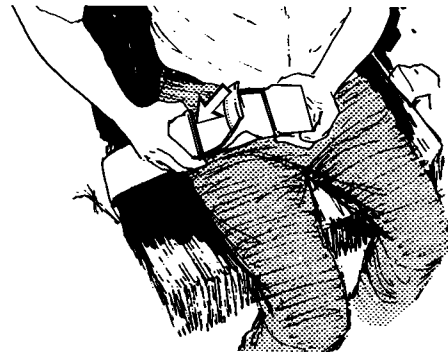


Illustration 41

g00100709

1. Unfasten the seat belt.

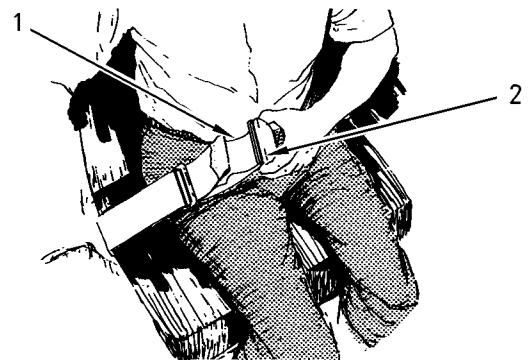


Illustration 42

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

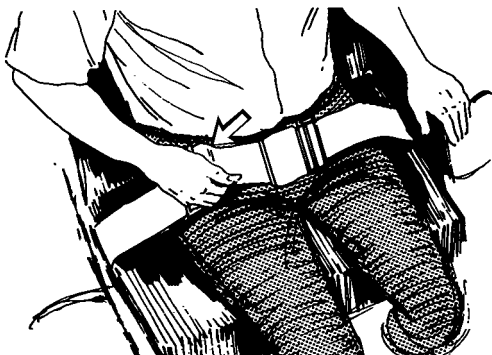


Illustration 43

g00100713

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

Fastening The Seat Belt

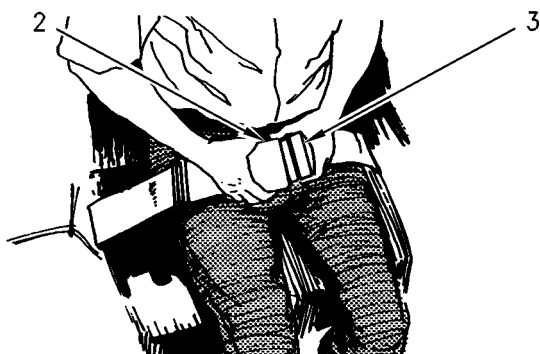


Illustration 44

g00932818

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

Releasing The Seat Belt

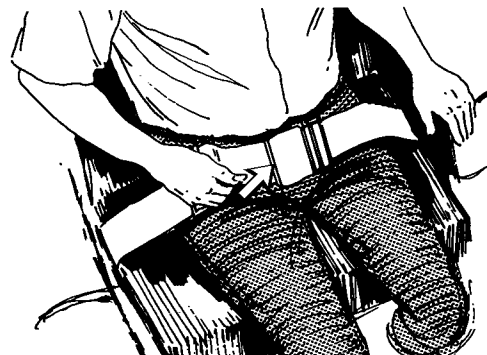


Illustration 45

g00100717

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

Seat Belt Adjustment for Retractable Seat Belts

Fastening The Seat Belt

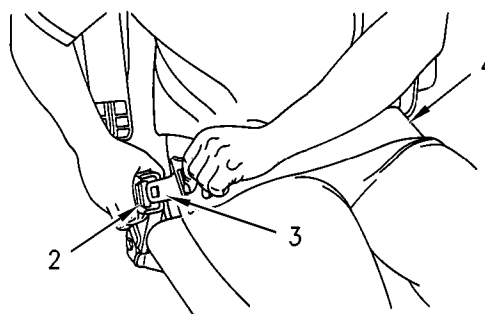


Illustration 46

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

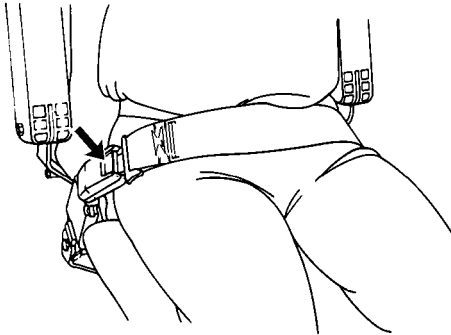


Illustration 47

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.

i04460905

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 of the mirrors that are described in this topic.

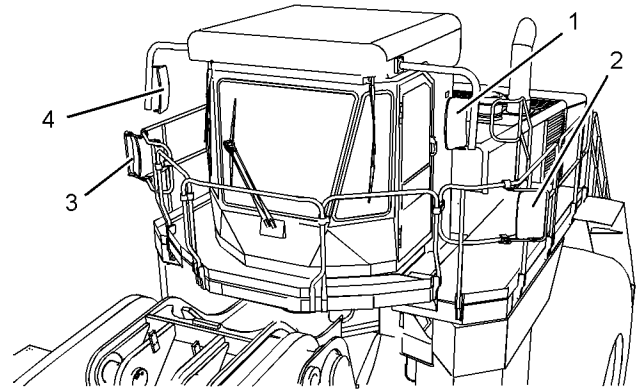


Illustration 48

g01586417

- (1) Upper left side rear view mirror
- (2) Lower left side rear view mirror
- (3) Lower right side rear view mirror
- (4) Upper right side rear view mirror

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

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.

Hand tools will be needed in order to adjust the mirrors. Refer to Specifications, SENR3130, "Torque Specifications" for the recommended torque.

Left Side Rear View Mirrors

Upper Left Side Rear View Mirror

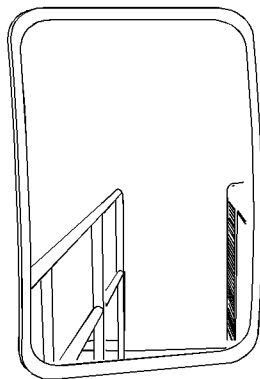


Illustration 49

g01603374

Adjust the mirror (1) so that the engine enclosure is visible from the operator seat. Additionally, adjust the mirror so that the stairs are visible in the center of the mirror. Additionally, provide as much visibility to the rear as possible.

Lower Left Side Rear View Mirror

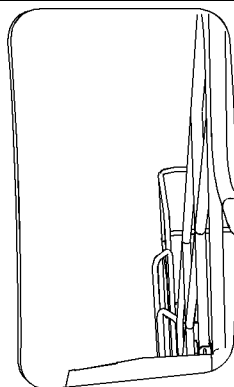


Illustration 50

g01592392

If equipped, adjust the mirror (2) so that the handrails of the platform are visible from the operator seat. Additionally, provide as much visibility to the rear as possible.

Note: Ensure that the mirror is mounted at the outermost end of the handrail.

Right Side Rear View Mirrors

Upper Right Side Rear View Mirror

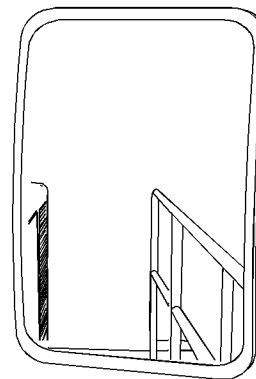


Illustration 51

g01603377

Adjust the mirror (4) so that the engine enclosure is visible from the operator seat. Additionally, adjust the mirror so that the stairs are visible in the center of the mirror. Additionally, provide as much visibility to the rear as possible.

Lower Right Side Rear View Mirror

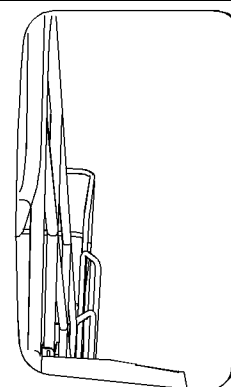


Illustration 52

g01603375

If equipped, adjust the mirror (3) so that the handrails of the platform are visible from the operator seat. Additionally, provide as much visibility to the rear as possible.

Note: Ensure that the mirror is mounted at the outermost end of the handrail.

i03711665

Operator Controls

SMCS Code: 7300; 7301; 7451

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

Operation Section Operator Controls

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

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

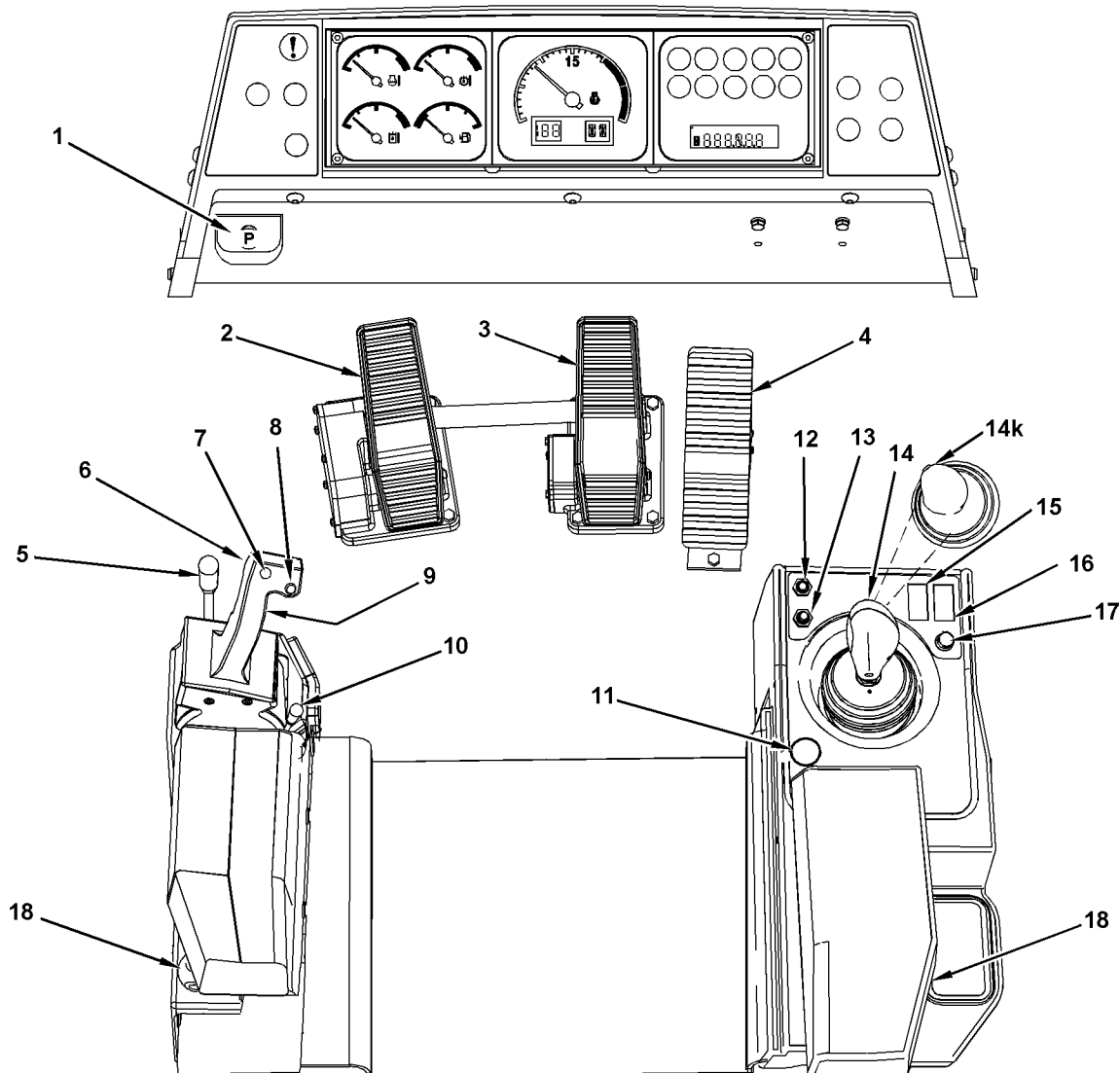


Illustration 53

g01675113

- (1) Parking brake knob
- (2) Left brake pedal and impeller clutch
- (3) Right brake pedal
- (4) Throttle control
- (5) STIC control lock
- (6) STIC steering control
- (7) Upshift switch

- (8) Downshift switch
- (9) Direction control switch
- (10) Steering console adjustment
- (11) Adjustment for implement console
- (12) Set/Decel switch
- (13) Resume/Accel switch
- (14) Blade control lever

- (14k) Blade tip control (button)
- (15) Implement lockout switch
- (16) Dual tilt control
- (17) Horn
- (18) Armrest adjustment knobs

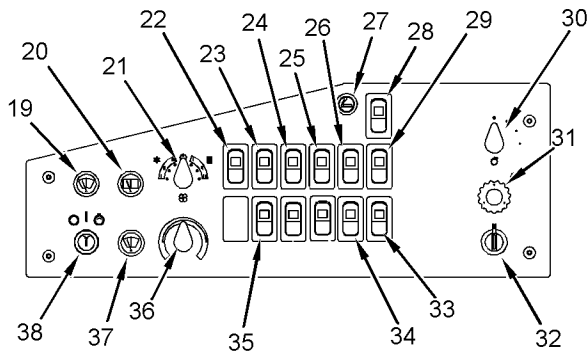


Illustration 54

g01215430

Right side instrument panel

- (19) Front window wiper switch
- (20) Rear window wiper switch
- (21) Heating and air conditioning switch
- (22) Mode switch for Engine Monitoring System (EMS)
- (23) Torque converter lockup switch
- (24) Quickshift switch
- (25) HID light switch
- (26) Front floodlight switch
- (27) 12 Volt cigar lighter
- (28) Rotating beacon
- (29) Rear floodlight switch
- (30) Reduced rimpull select switch
- (31) Diagnostic connector
- (32) 12 Volt power supply
- (33) Stairway access light switch
- (34) Running light switch
- (35) Throttle lock switch
- (36) Temperature control
- (37) Window wiper switch for the quarter panel
- (38) Engine start switch

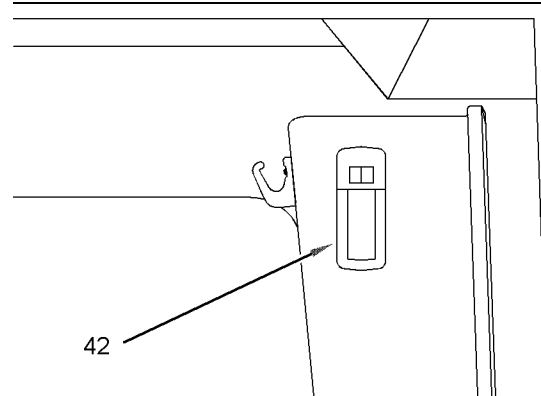


Illustration 56

g01057455

(42) Interior dome light

The following information briefly identifies the components of the cab.

Parking Brake (1)

Parking Brake – Engage the parking brake after the machine has been stopped. Use the parking brake if the service brakes fail to stop the machine.

Pull the knob outward in order to apply the parking brake. Push the knob inward in order to release the parking brake.

Left Brake Pedal and Impeller Clutch (2)

The left brake pedal controls both the brake pressure and the impeller clutch pressure. Partially depress the left brake pedal in order to reduce the impeller clutch pressure. The brake pressure is increased as the operator pushes down the pedal farther. This feature allows the operator to control the maximum drive train torque. Lowering the maximum drive train torque supplies more engine power to the implements and to the steering.

When the operator is digging, the left brake pedal can be used to stop any excessive tire slip.

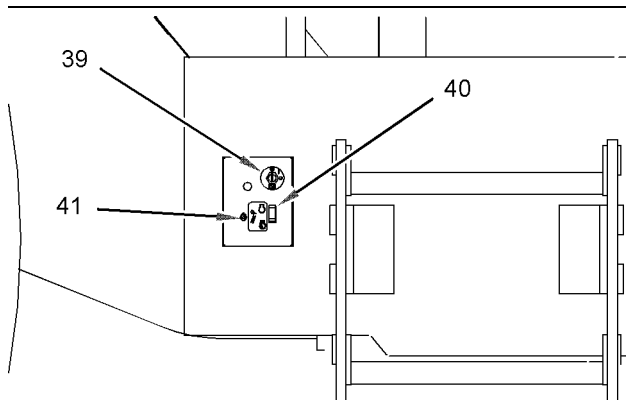


Illustration 55

g01057452

Left side bumper

- (39) Battery disconnect switch
- (40) Engine shutdown control
- (41) Stairway access light switch

Note: Calibration of the left brake pedal is necessary in order to compensate for normal mechanical wear. Refer to Systems Operation/Testing and Adjusting, SENR1372, "Transmission Electronic Control System" for information about calibrating the left brake pedal.

Right Brake Pedal (3)

The right brake pedal decelerates the machine. Depress the brake pedal for normal braking of the machine. Release the pedal in order to release the brake.

Throttle Control (4)

The throttle control is mounted on the floor of the operator's compartment. Depress the throttle control in order to increase the engine speed. Release the throttle control in order to decrease the engine speed.

STIC Control Lock (5)

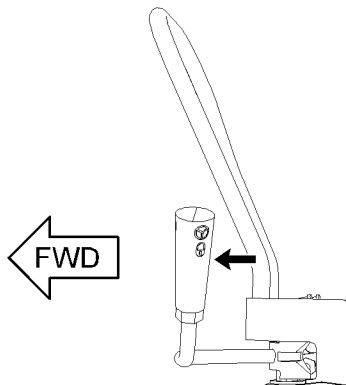


Illustration 57

g01318569



Steering



Lock

Move the lock lever to the left and to the rear in order to lock the STIC steering and transmission controls. Return the lock lever to the original position in order to unlock the STIC steering and transmission controls.

STIC Steering Control (6)

Note: The steering frame lock must be in the unlocked position in order to steer the machine.

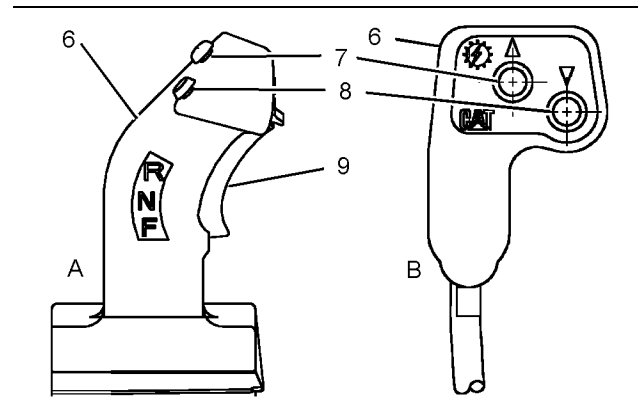


Illustration 58

g01318874

View from operator's seat

(A) Left view

(B) Front view



Left Turn – Move the STIC steering control to the left in order to steer the machine to the left. Moving the STIC steering control farther to the left will cause the machine to turn more quickly to the left.



Right Turn – Move the STIC steering control to the right in order to steer the machine to the right. Moving the STIC steering control farther to the right will cause the machine to turn more quickly to the right.

Note: When you release the STIC steering control, the control will return to the center position. However, the machine will maintain the current travel direction.

Upshift Switch (7)



Electronic Transmission Control

Push the upshift switch in order to shift the machine into the next highest speed. The active speed range will be shown on the speedometer.

- "1" indicates First Speed.
- "2" indicates Second Speed.
- "3" indicates Third Speed.

Downshift Switch (8)

Push the downshift switch in order to shift the machine into the next lowest speed. The active speed range will be shown on the speedometer.

Note: When the parking brake is engaged, the machine can only be shifted into second speed or into third speed.

Direction Control Switch (9)

The direction control switch for the STIC system is located on the steering control lever.

FORWARD – Move the bottom of trigger switch (9) to “F”. This will enable the machine to move in a forward direction. “F” will be displayed on the speedometer.

NEUTRAL – Move the trigger switch to the MIDDLE position that is indicated by “N”. This will disengage the transmission. “N” will be displayed on the speedometer.

REVERSE – Move the top of the trigger switch to “R”. This will enable the machine to move in a reverse direction. “R” will be displayed on the speedometer.

Steering Console Adjustment (10)

Push the lever downward in order to slide the console forward or backward. Release the lever in order to lock the console into position.

Adjustment for Implement Console (11)

Push the implement console adjustment lever downward in order to slide the console forward or backward. Release the lever in order to lock the console into position.

Set/Decel Switch (12)



Set/Decel – See this article, “Throttle Lock Switch (35)” for instructions on using the Set/Decel switch.

Resume/Accel Switch (13)



Resume/Accel – See this article, “Throttle Lock Switch (35)” for instructions on using the Resume/Accel switch.

Blade Control Lever (14)

Lift Control

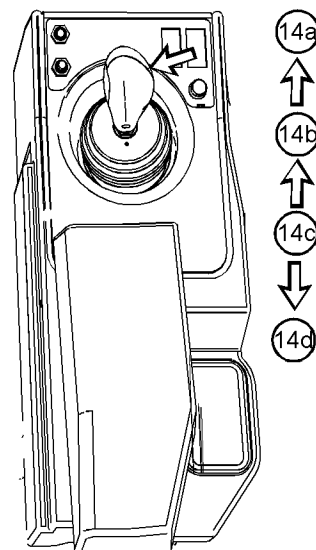


Illustration 59

g01448531



FLOAT (14a) – Push the control lever forward into the detent. The blade will lower to the ground. The blade will

follow along the contour of the ground. The control lever will remain in the detent until the control lever is manually moved out of the detent.



LOWER (14b) – Push the control lever forward in order to lower the blade. The control lever will return to the HOLD position when the control lever is released.



HOLD (14c) – The control lever will return to the HOLD position when the control lever is released from the RAISE position or from the LOWER position. The blade will remain in the selected position.



RAISE (14d) – Pull back on the control lever in order to raise the blade. The control lever will return to the HOLD position when the control lever is released.

Tilt Control

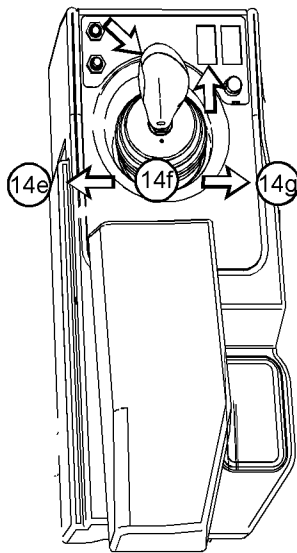


Illustration 60

g01448535

A switch is located on the right armrest. Pressing the top of the switch enables dual tilt operation of the blade.

Pressing the bottom of the switch enables single tilt operation for the blade. Blade movement is slower in single tilt operation and there is less movement and less downward force. Pressing the top of the switch enables the dual tilt function. Blade movement is faster in dual tilt operation and there is more movement and more downward force.



TILT LEFT (14e) – Move the control lever to the left in order to lower the blade to the left.



HOLD (14f) – The control lever will return to the HOLD position when the control lever is released. The blade will remain in the selected position.



TILT RIGHT (14g) – Move the control lever to the right in order to lower the blade to the right.

Blade Tip Control (14k)

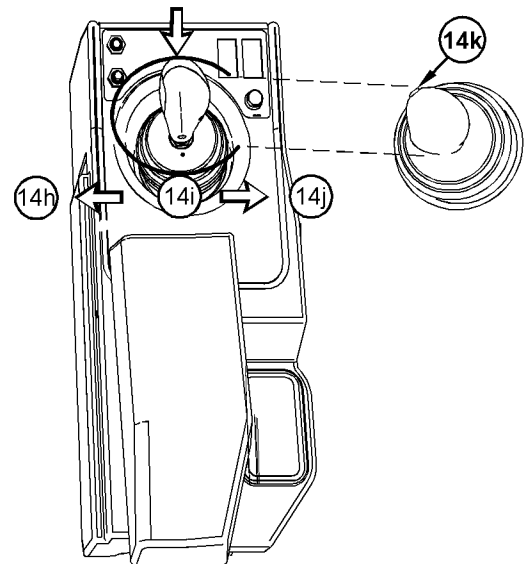


Illustration 61

g01686874

Momentary switch (14k) on the blade control lever allows the blade tip to tilt forward and backward. To tilt the blade tip, press the top of momentary switch (14k) when the control lever is moved to the left or to the right.



TIP BACK (14h) – Press the top of the rocker switch and move the control lever to the left in order to tip the blade rearward. Tipping the blade rearward improves the ability to carry a load.



HOLD(14i) – The control lever will return to the HOLD position when the control lever is released. The blade will remain in the selected position.



TIP FORWARD (14j) – Press the top of the momentary switch and move the control lever to the right in order to tip the blade forward. Tipping the blade forward improves the blade's ability to penetrate and the blade's ability to dump the load.

Implement Lockout Switch (15)



LOCKED – Push the front of the switch in order to electronically lock the hydraulic control lever.



UNLOCKED – Push the rear of the switch in order to electronically unlock the hydraulic control lever.

Dual Tilt Control (16)

Pressing the bottom of the switch enables single tilt operation for the blade. Blade movement is slower in single tilt operation and there is less movement and less downward force. Pressing the top of the switch enables the dual tilt function. Blade movement is faster in dual tilt operation and there is more movement and more downward force.

Horn (17)



Horn – Press the horn button in order to activate the horn.

Armrest Adjustment Knobs (18)

Turn the knobs counterclockwise in order to loosen the armrest. Pull up on the armrest in order to adjust to the desired height. Turn the knobs counterclockwise in order to tighten the armrest at the desired height.

Front Window Wiper Switch (19)



Front Window Wiper and Window Washer – Turn the knob clockwise in order to turn on the intermittent wiper.

Two speeds are available. Push the knob in order to activate the window washer. Spring force will return the knob when the knob is released.

Rear Window Wiper Switch (20)



Rear Window Wiper and Window Washer – Turn the knob clockwise in order to turn on the window wiper. Push the knob in order to activate the window washer. Spring force will return the knob when the knob is released.

Heating and Air Conditioning Switch (21)

Fan Control



Heating and Air Conditioning Switch – This switch controls the three-speed heater/air conditioner fan.



OFF – Move the switch to this position in order to stop the blower fan.

Move the switch clockwise in order to operate the heating system. Move the switch counterclockwise in order to operate the air conditioning system.



Low Speed – Move the switch to this symbol for the lowest fan speed.



Medium Speed – Move the switch to this symbol for a medium fan speed.



High Speed – Move the switch to this symbol for the highest fan speed.

Mode Switch for Engine Monitoring System (EMS) (22)



EMS mode switch – The EMS mode switch is used to scroll between display modes.

Torque Converter Lockup Switch (23)



Torque Converter Lockup Clutch – This feature allows the operator to engage the lockup clutch, which prevents the torque converter from operating. This makes the power train direct drive. Push the top of the switch in order to enable the torque converter lockup clutch. When the lockup clutch is enabled, the transmission electronic control module (ECM) causes the engagement of the lockup clutch.

This feature provides more efficient operation for high speeds and for carrying loads. The feature is available in all speeds and directions.

Quickshift Switch (24)



Transmission Quickshift – This will enable the transmission to automatically shift from first speed into second speed when the operator moves the transmission control from the FORWARD position to the REVERSE position.

When the direction is shifted from the REVERSE position to the FORWARD position, the transmission will remain in SECOND SPEED.

Note: A quickshift can only occur when the transmission is in FIRST SPEED and the operator is moving the transmission control from the FORWARD position to the REVERSE position.

1. Press the top of the quickshift switch in order to activate the quickshift function.

2. An indicator on the front dash panel comes on when the transmission quickshift is activated. Move the transmission control from the FORWARD position to the REVERSE position.

3. Press the bottom of the quickshift switch in order to deactivate the quickshift function.

HID Light Switch (25)



Front HID Lights

Press the top of the switch (if equipped) in order to turn on the lights. Press the bottom of the switch (if equipped) in order to turn off the lights.

Front Floodlight Switch (26)



Floodlights – Push the top of the switch in order to turn on the front floodlights.

Cigar Lighter (27)



Lighter – Push the lighter inward and release the lighter. The lighter will move outward slightly when the lighter is ready for use.

NOTICE

The lighter outlet is part of a 24 volt circuit. Do not use this outlet to operate 12 volt electrical components. Use of the lighter outlet to operate 12 volt electrical components may result in damage to the component and/or to the machine electrical system.

Rotating Beacon (28)



Rotating Beacon Light (If Equipped) – Press the top of the switch in order to turn on the rotating beacon light. Press the bottom of the switch in order to turn off the rotating beacon light. The rotating beacon light is used to alert other vehicles when the machine is being roaded from one job to another job.

Rear Floodlight Switch (29)



Floodlights – Push the top of the switch in order to turn on the rear floodlights.

Reduced Rimpull Select Switch (30)

The reduced rimpull select switch reduces the potential for wheel slippage without reducing the hydraulic efficiency. The reduced rimpull select switch is a four-position switch. Each setting corresponds to a maximum allowable percentage of maximum rimpull.

Reduced Rimpull Selection Control Settings	Estimated % Rimpull
	100
	100
	100
	100

Illustration 62
(C) Position of reduced rimpull select switch
(D) Estimated rimpull (percentage)

Operating With Reduced Rimpull



Reduced rimpull – In order to select a reduced rimpull setting, move the reduced rimpull switch to the desired setting.

If the machine is in FIRST SPEED FORWARD, the reduced rimpull select switch will limit the engine speed. The reduced engine speed will limit the rimpull to the desired level when the pedal is fully released.

Depressing the brake pedal will further reduce rimpull from the selected percentage. The rimpull that is commanded by the fully released pedal will equal the reduced rimpull that is selected on the reduced rimpull select switch.

When a lower rimpull is selected, pedal travel will result in a more gradual decrease in rimpull.

If the machine is not in FIRST SPEED FORWARD, the engine speed will not be limited until the transmission is placed into a forward speed.

Returning to Maximum Rimpull

The reduced rimpull select switch will continue to limit rimpull until the transmission is shifted out of FIRST SPEED or until the dial is placed in the MAXIMUM position.

Diagnostic Connector (31)

The diagnostic connector is for the connection of service tools.

12 Volt Power Supply (32)

Power Receptacle (12 Volt) – This machine has a 12 volt electrical outlet receptacle. This outlet supplies power for auxiliary uses. Remove the cap before you use the outlet.

Stairway Access Light Switch (33)



Stairway Access Lights – Press the top of the switch in order to turn on the stairway access lights. Press the bottom of the switch in order to turn off the stairway access lights.

Note: An external switch for the stairway access lights (41) is located in the bumper on the left side of the machine.

Running Light Switch (34)



Running Lights – Push the top of the switch in order to turn on the running lights. Move the switch to the center position in order to turn on the panel lights. The center position also turns on the rocker switches that are equipped with indicator lights. Push the bottom of the switch in order to turn off the running lights.

Throttle Lock Switch (35)



Throttle Lock Switch – The throttle lock switch is located on the right side of the cab. Engage the switch in order to keep the engine at the current rpm. When the throttle lock is active, an indicator light will illuminate on the front dash. Use the throttle lock control on long hauls in order to avoid driver fatigue. Fatigue may result from depressing the throttle control for an extended period of time.

On – Push the top of the switch in order to engage the throttle lock control.

Off – To release the throttle lock control, push the bottom of the switch or slightly depress the right brake pedal.

Setting the Throttle Lock

The throttle lock can be set for a desired rpm.

1. Push the top of the on/off switch in order to turn on the throttle lock.
2. The indicator light for the throttle lock will illuminate when the on/off switch is in the ON position. Refer to this Operation and Maintenance Manual, "Monitoring System" for the location of the indicator light.
3. Depress the throttle control in order to achieve the desired engine rpm.
4. Depress "Set/Decel" switch (12) in order to set the throttle.

Cancelling the Throttle Setting

The throttle setting may be cancelled by depressing the right brake pedal or by moving the on/off switch to the OFF position.

When the right brake pedal is used to cancel a throttle setting, press "Resume/Accel" switch (13) in order to resume the throttle setting.

Accelerate or Decelerate

In order to accelerate to a higher rpm, continue pressing the Resume/Accel switch. Once the switch is released the previous setting will resume.

In order to decelerate to a lower rpm, continue pressing the Set/Decel switch. Once the switch is released the previous setting will resume.

Temperature Control (36)



Setting the temperature – Turn the knob clockwise for warmer air. Turn the knob counterclockwise for cooler air.

The heating and air conditioning system can be used for four functions:



Heating – Turn fan control switch (21) clockwise to the desired speed. Adjust the temperature control for the desired temperature.



Cooling – Turn fan control switch (21) counterclockwise to the desired speed. Adjust the temperature control for the desired temperature.

Pressurizing – Pressure inside the cab will help keep out dust. Close the door and the windows in order to keep pressure in the cab.

Defogging – Turn fan control switch (21) counterclockwise in order to turn on the air conditioner. This will prevent moisture from forming on the windows. The volume of air that is needed to remove moisture from the cab varies according to the speed of the fan. Adjust the temperature control so that the windows remain free of moisture.

Quarter Panel Window Wiper and Window Washer Switch (37)



Quarter Panel Window Wiper and Washer – Turn the knob clockwise in order to turn on the window wiper. Push the knob in order to activate the window washer. Spring force will return the knob when the knob is released.

Engine Start Switch (38)



OFF – When you insert the key and when you remove the key, the engine start switch must be in the OFF position. Turn the engine start switch to the OFF position in order to stop the engine. Also, turn the engine start switch to the OFF position in order to disconnect the power to the electrical circuits in the cab.



ON – To activate the electrical circuits in the cab, turn the engine start switch clockwise to the ON position.



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

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

Battery Disconnect Switch (39)

The battery disconnect switch and the engine start switch (38) perform different functions. The entire electrical system is disabled when the battery disconnect switch is turned to the OFF position. The battery remains connected to the electrical system when the engine start switch is turned to the OFF position.



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



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

Turn the battery disconnect switch to the OFF position and remove the key when you service the electrical system or any other machine components. Turn the battery disconnect switch to the OFF position and remove the key when the machine will not be used for an extended period of a month or more. This will help to prevent drainage of the battery.

NOTICE

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

Engine Shutdown Control (40)

Note: The engine shutdown control does not shut off the electrical system of the machine.



Stop – Lift up the switch cover and move the switch upward in order to stop the engine.



Run – Push down the switch cover and the switch in order to allow the engine to be started.

Stairway Access Light Switch (41)



Stairway Access Lights – Press the top of the switch in order to turn on the stairway access lights. Press the bottom of the switch in order to turn off the stairway access lights.

Note: An internal switch for the stairway access lights (33) is located on the right side instrument panel in the cab of the machine.

Interior Dome Light (42)



Interior Light

Push the switch in order to turn the dome light on and off.

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Battery Disconnect Switch

SMCS Code: 1411



Illustration 63

g00750509

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



Illustration 64

g00750527



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



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

The battery disconnect switch and the engine start switch perform different functions. The entire electrical system is disabled when the battery disconnect switch is turned to the OFF position. The battery remains connected to the electrical system when the engine start switch is turned to the OFF position.

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

NOTICE

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

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

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

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

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Backup Alarm

SMCS Code: 7406



Backup Alarm – The backup alarm will sound when the transmission is placed in reverse. The backup alarm alerts people when the machine is backing up.

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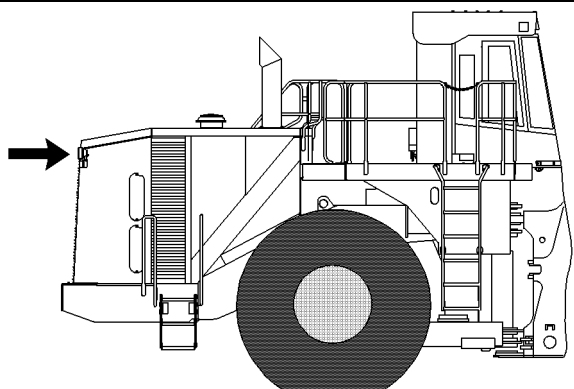


Illustration 65

g00847524

The backup alarm is behind the fan guard on the rear of the machine.

Monitoring System

SMCS Code: 7451; 7490

Display Modules

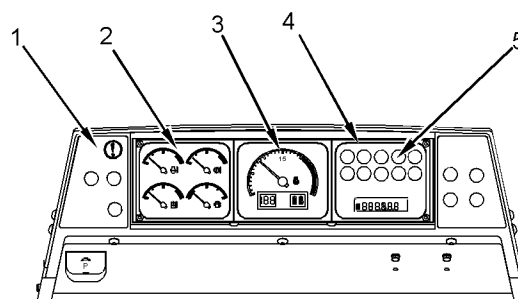


Illustration 66

g01051636

The Caterpillar Monitoring System is an electronic monitoring system that continuously monitors machine systems. The monitoring system has three display panels. The monitoring system includes the action lamp (1), gauge display (2), speedometer/tachometer display (3), and monitoring system display (4). The monitoring system display has alert indicators (5).

Functional Test

The Caterpillar Monitoring System performs an automatic internal test when the engine start switch is moved from the OFF position to the ON position. The test verifies proper operation of the outputs (displays, alert indicators, and the action alarm) and the internal circuits. The operator must observe the displays in order to determine whether the monitoring system is operating properly. The length of time for the test is approximately three seconds.

1. During this test, the action light is on continuously and the action alarm sounds once.
2. All of the alert indicators flash. Also, the "X10" indicator, the indicator for the hour meter, and all units of measurement come on in the display window. The digital readout shows "8.8.8.X.8.8."
3. On the speedometer/tachometer display, the gear/direction readout shows an asterisk and the digital speedometer shows 188 mph and km/h.
4. All of the gauge needles ramp straight up. Then, the gauge needles go to the right and to the left. The gauge needles then show the actual current readings.

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

Warning Categories

The Caterpillar Monitoring System notifies the operator of an immediate problem with a machine system or an impending problem with a machine system. The Caterpillar Monitoring System provides four warning categories. The categories are based on the severity of the problem. The categories dictate the required response of the operator.

Table 4

WARNING OPERATION					
Warning Category	Warning Indications ⁽¹⁾			Required Action	Possible Result ⁽²⁾
	Flashing Indicator	Flashing Action Lamp	Sounding of the Action Alarm		
1	X			No immediate action is required. The system needs attention soon.	No harm or damage
2	X	X		Change machine operation or perform maintenance to the system.	Severe damage to components
2-S	X	X	X ⁽³⁾	Immediately change the machine operation.	Severe damage to components
3	X	X	X ⁽⁴⁾	Immediately perform a safe engine shutdown.	Injury to the operator or severe damage to components

⁽¹⁾ The warning indicators that are active are marked with an "X" .

⁽²⁾ This is the possible result if no action is taken.

⁽³⁾ The alarm is on continuously.

⁽⁴⁾ The alarm is on intermittently.

Alert Indicators

Note: Not all of the following indicators are present on every machine.



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



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



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



Fuel Level – The fuel tank is at 10 percent capacity. Refuel as soon as possible.



Parking Brake – This light indicates that the parking brake is engaged. If the machine is in neutral, only the indicator lights. However, if the machine is in a forward gear or a reverse gear, the action lamp and the action alarm also activates.



Charging System – This light indicates that the battery voltage is outside the battery charge range. While the engine is running, the light also turns on when the alternator frequency is low.



Engine Overspeed – This light indicates that the engine speed is too high.



Engine Oil Pressure – This light indicates that the engine oil pressure is low.



Transmission Oil Filter – This light indicates that the transmission oil filter is restricted.

NOTICE

If the transmission oil filter is plugged, the bypass valve will open. Unfiltered transmission oil will flow through the system and damage to other system components may occur.



Inlet Air Temperature – This light indicates that the air inlet temperature is high.



Fuel Pressure – This light indicates that the fuel filter is restricted.



Primary Steering – This light indicates that the primary steering pressure is low.



Steering Oil Temperature – This light indicates excessive steering oil temperature.



Brake Oil Pressure – This light indicates that the brake oil pressure is low.



Axle Oil Temperature – The light indicates that the axle oil temperature is high.

NOTICE

If the hydraulic oil filter is plugged, the bypass valve will open. Unfiltered hydraulic oil will flow through the system and damage to other system components may occur.

Reference: For the location of the electrical components, refer to the Electrical System Schematic in the Service Manual for your machine.

Indicators

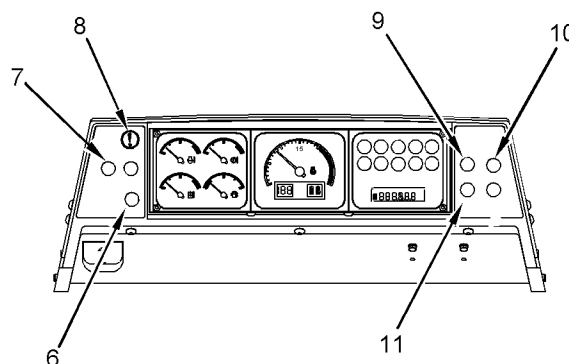


Illustration 67

g01059611



Quickshift function (6) – This light indicates when the quickshift switch is activated.



Secondary Steering Pressure (7) – This light indicates that the secondary steering system is activated.



Action Indicator (8) – This light indicates that the monitoring system has detected a fault.



rimpull.

Reduced Rimpull (9) – This light indicates that the rimpull selection switch has been moved to reduced



Lockup Clutch (10) – This light indicates that the torque converter lockup control is activated.



Throttle Lock (11) – This light indicates that the throttle lock is activated.

i07233032

Product Link

SMCS Code: 7490; 7606

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

The Cat Product Link communication device utilizes cellular and/or satellite technology to communicate equipment information. This information is communicated to Caterpillar, Cat dealers, and Caterpillar customers. The Cat Product Link communication device uses Global Positioning System (GPS) satellite receivers.

The capability of two-way communication between the equipment and a remote user is available with the Cat Product Link communication device. The remote user can be a dealer or a customer.

Data Broadcasts

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

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

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

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

Operation in a Blast Site for Product Link Radios

WARNING

This equipment is equipped with a Cat® Product Link communication device. When electric detonators are being used for blasting operations, radio frequency devices can cause interference with electric detonators for blasting operations which can result in serious injury or death. The Product Link communication device should be deactivated within the distance mandated under all applicable national or local regulatory requirements. In the absence of any regulatory requirements Caterpillar recommends the end user perform their own risk assessment to determine safe operating distance.

Refer to your products Operation and Maintenance Manual Supplement, "Regulatory Compliance Information" for more information.

For information regarding the methods to disable the Cat Product Link communication device, please refer to your specific Cat Product Link manual listed below:

- Operation and Maintenance Manual, SEBU8142, "Product Link - 121SR/321SR/420/421/522/523"
- Operation and Maintenance Manual, SEBU8832, "Product Link PLE601, PL641, PL631, PL542, PL240, PL241, PL141, PL131, PL161, and G0100 Systems"

Note: If no radio disable switch is installed and the equipment will be operating near a blast zone, a Product Link radio disable switch may be installed on the equipment. The switch will allow the Cat Product Link communication device to be shut off by the operator from the equipment control panel. For more details and installation procedures, refer to the following:

- Special Instruction, "Installation Procedure for Product Link PLE640 Systems" REHS7339
- Special Instruction, "Installation Procedure for the Elite Product Link PLE601, PLE641, and PLE631 Systems" REHS8850
- Special Instruction, "Installation Procedure for the Product Link PL131, PL141, and PL161 Systems" SEHS0377

- Special Instruction, "Installation Procedure for the Pro Product Link PL641 and PL631 Systems" REHS9111

i03638511

Camera (If Equipped)

SMCS Code: 7347; 7348

The Work Area Vision System (WAVS) is a closed circuit television system that is designed to supplement the view for the operator during machine operation. The system may include one, two, or three cameras, depending on the type of machine and the application.

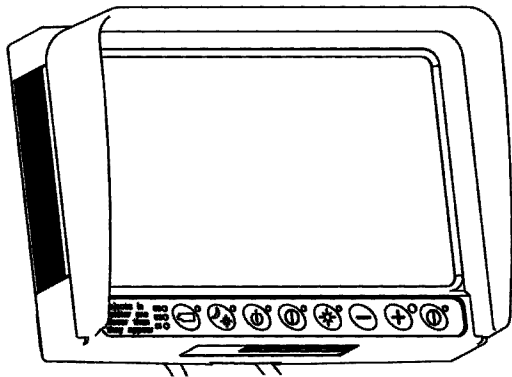


Illustration 68

g01223034

Display for WAVS

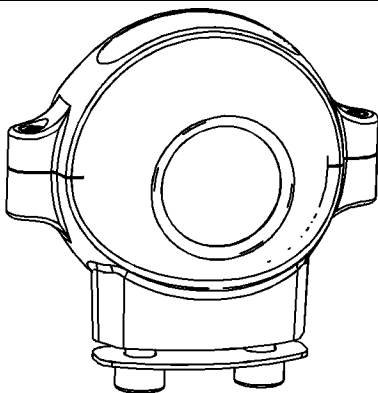


Illustration 69

g01223051

Camera for WAVS

Prior to operating the machine, ensure proper orientation of images by the camera(s). The camera(s) has been set up by the factory or by a Caterpillar dealer in order to provide views which comply with the guidelines that have been documented. Consult your Caterpillar dealer before any adjustments are made to the camera(s).

Prior to operating the machine, ensure that the features of the display are properly adjusted. Ensure that the brightness and the contrast are adjusted prior to operating the machine. Ensure that the brightness and the contrast are adjusted after changes in the conditions for ambient light.

Prior to operating the machine, ensure that the display is positioned in order to provide clear visibility of the display from the operator seat. Do not position the display in a way that will cause the following conditions:

- Cover any safety messages or other important information.
- Impede the entry to the cab or impede the exit from the cab.
- Obstruct the visibility of the operator.
- Obstruct the view of any indicators, gauges, or monitoring system.
- Impair access to any operator controls or impair movement of any operator controls.

Prior to operating the machine, ensure that the camera lens and the display are clean.

Refer to Operation and Maintenance Manual, SEBU8157, "Work Area Vision System" for additional information about WAVS.

i03917671

Operation Information

SMCS Code: 7000

Follow these basic instructions whenever you are operating the machine:

- To prevent injury, make sure that no one is working on the machine or near the machine. Always maintain control of the machine.
- Raise the bucket or the work tool enough to negotiate any obstacles.
- Before you release the parking brake, depress the service brake pedal in order to keep the machine from moving.
- Drive the machine forward for best visibility and for best control.
- Reduce the engine speed when you maneuver in tight quarters and when you are going over a hill.

Downhill Operation

Before you start down a hill or grade, select the proper gear to maintain a proper ground speed. Select a speed that is slow enough for the grade and conditions. In most situations, the proper gear will be the same gear that is required to drive up the grade. The proper gear should allow the machine to maintain the appropriate speed without continuous use of the brakes. Use the right service brake pedal or the engine brake (if equipped) in order to slow the machine until a lower gear can be selected. The engine speed should be in the mid range to maintain proper cooling and lubrication of the machine systems and not over speed the engine.

If the machine builds up excessive speed, the engine can over speed. Engine over speed can result in damage to the engine, the hydraulic pump and /or the power train.

Using the right service brake pedal continuously to control travel speed of the machine on a grade can cause the brake discs and axle oil to overheat. This use of the service brake can result in significant wear and /or damage to the service brakes and final drives.

Note: The left impeller clutch/brake pedal should not be used for downhill braking. Using the left impeller clutch/brake pedal will disengage the engine from the power train. This action will increase the load on the service brakes, increasing the risk of significant wear and/or damage to the service brakes and final drives.

i03084784

Parking Brake

SMCS Code: 7000

WARNING

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

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

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

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

Note: The action alarm intermittently sounds if the service brake loses oil pressure on early machines.

Driving Through the Parking Brake

NOTICE

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

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

You have the ability to drive through the parking brake in order to move the machine to a safe location. In order to drive the machine through the parking brake, follow these steps:

1. Move the transmission control to the NEUTRAL position.
2. Push the parking brake knob inward.
3. Continue to push the parking brake knob inward and shift the transmission control into the FORWARD position or the REVERSE position.

Note: "1F" and "1R" are the only gears that are available to drive through the parking brake. Although Other gears are selectable, the other gears will not provide the drive through capabilities.

4. Continue to push the parking brake knob inward. Increase the engine speed and move the machine to a safe location.

Note: Machine movement will be jerky since the power train is fighting the parking brake.

Note: A Warning Category 3 will activate during machine movement. The event will be logged, but the alarm should deactivate once the transmission is returned to the NEUTRAL position.

5. Shift the transmission control into the NEUTRAL position in order to stop the machine.
6. Before you return the machine to operation, inspect the brake system and make any necessary repairs.

i04147152

Secondary Steering (If Equipped)

SMCS Code: 7000

Secondary steering enables steering in the event machine loses power while traveling. The system uses a ground driven pump to provide hydraulic pressure and flow to the steering system.

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

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

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

Engine Starting

i05448891

Engine Starting

SMCS Code: 1000; 7000

WARNING

Do not allow a companion to ride on the machine unless the companion is seated within the Roll-over Protective Structure (ROPS) or Falling Object Protection Structure (FOPS) with the seat belt fastened. The companion must have the seat belt fastened while the machine is in operation. The operator of the machine is responsible for the safety of the companion. Personal injury or death may occur if the companion is not restrained and protected.

WARNING

Diesel engine exhaust contains products of combustion which may be harmful to your health

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

1. Adjust the operator seat and fasten the seat belt.
2. Engage the parking brake.
3. Engage the steering and transmission integrated control (STIC) lock.
4. Deactivate the implement controls with the implement/hydraulic lockout switch.
5. Before the engine is started, check for the presence of bystanders or maintenance personnel. Ensure that all personnel are clear of the machine. Briefly sound the forward horn before you start the engine.
6. Turn the engine start switch key to the ON position. The monitoring system starts. Allow the monitoring system to complete the automatic self-diagnostic test

Note: For more information on the monitoring system, refer to Operation and Maintenance Manual, "Monitoring System".

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

Note: Ether will be automatically injected if the ambient conditions call for the use of a starting aid.

NOTICE

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

Note: This machines engine with standard specifications can start in areas that have temperatures as low as -18°C (0°F). For areas that are cooler, the use of cold weather starting aids is recommended.

Note: For temperatures below -23°C (-10°F), consult your Cat dealer for additional information or refer to Special Publication, SEBU5898, "Cold Weather Recommendations".

i02044115

Engine and Machine Warm-Up

SMCS Code: 1000; 7000

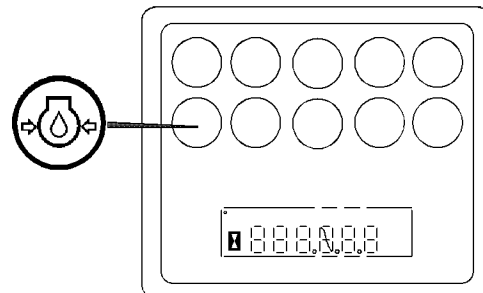


Illustration 70

g01049774

NOTICE

Keep the engine speed low for 10 seconds to allow the engine oil pressure to build.

If the message center displays low oil pressure, stop the engine and investigate the cause before starting again. Failure to do so can cause engine damage.

Turbocharger damage can result, if the engine speed is not kept low until the engine oil pressure is sufficient.

1. When the engine is cold, operate the engine at low idle for several minutes. Cycle all the hydraulic controls. This will aid the warm-up of the hydraulic components.
2. During operation, look at the indicators and the gauges frequently.

To speed the warming of the hydraulic oil, hold the blade in the RAISE position for short periods. Do not hold the blade in the RAISE position for more than ten seconds.

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

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

While you idle the engine for warm-up, observe the following recommendations:

- In temperatures above 0°C (32°F), the suggested warm-up period is 15 minutes.
- In temperatures below 0°C (32°F), the warm-up will require a period of 30 minutes or more.
- If the temperatures are below -18°C (0°F) or if the hydraulic functions are sluggish, the warm-up may require a longer period.

Parking

i03314406

Stopping the Machine

i06851283

SMCS Code: 7000

NOTICE

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

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

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

1. Apply the service brakes to stop the machine.
2. Move the transmission control to the NEUTRAL position.
3. Engage the parking brake.
4. Lower the work tool to the ground and apply slight downward pressure.

i00982184

Stopping the Engine

SMCS Code: 1000; 7000

NOTICE

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

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

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

Stopping the Engine if an Electrical Malfunction Occurs

SMCS Code: 1000; 7000

If the engine start switch is in the OFF position but the engine does not stop, use the engine shutdown control (switch) to stop the engine.

Reference: Refer to Operation and Maintenance Manual, "Operator Controls" for more information.

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

i02068544

Equipment Lowering with Engine Stopped

SMCS Code: 7000

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

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

 WARNING

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

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

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

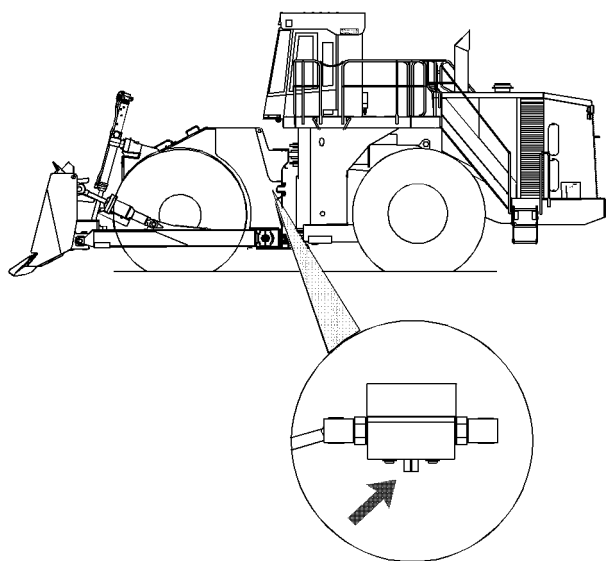


Illustration 71

g01059740

6. A ball valve is located near the left rear of the main control valve. This ball valve is used for manually lowering the work tool. **Slowly turn the square stem in the clockwise direction.** The square stem should be rotated 90 degrees. After the work tool is resting on the ground, rotate the square stem counterclockwise.

i03907860

Leaving the Machine

SMCS Code: 7000

1. Use the steps and the handholds when you get off the machine. Face the machine and use both hands. Make sure that the steps are clear of debris before you dismount.
2. Inspect the engine compartment for debris. Clean out any debris and paper in order to avoid a fire.
3. Remove all flammable debris in order to reduce a fire hazard. Dispose of all debris properly.
4. Always turn the battery disconnect switch to the OFF position before leaving the machine.
5. If the machine will not be operated for a month or more, remove the battery disconnect switch key.
6. Install all covers and all vandalism protection locks.

Transportation Information

i01671778

Shipping the Machine

SMCS Code: 7000; 7500

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

Remove ice, snow, or other slippery material from the loading dock and from the transport machine before you load the machine. This will help to prevent slippage of the machine. This will also help to prevent a shift while the machine is moving in transit.

Obey the appropriate laws that govern the parameters of the load (weight, width, and length).

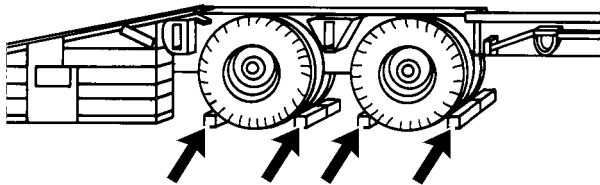


Illustration 72

g00863991

Properly chocked trailer wheels

1. Chock the trailer wheels or the rail car wheels before you load the machine.
2. After the machine is positioned, connect the steering frame lock in order to hold the front frame and the rear frame in place.
3. Lower the bucket or the work tool to the floor of the transport vehicle. Move the transmission control to the NEUTRAL position.
4. Engage the parking brake.
5. Turn the engine start switch to the OFF position. Remove the engine start switch key.
6. Move all of the control levers in order to relieve any trapped pressure.
7. Turn the battery disconnect switch to the OFF position. Remove the battery disconnect switch key.
8. Lock the door and the access covers. Attach any vandalism protection.
9. Secure the machine, any equipment, and any tools with adequate tie-downs in order to prevent movement during shipping.
10. Cover the exhaust opening. The turbocharger (if equipped) should not rotate when the engine is not operating. Damage to the turbocharger can result.

i01998604

Roading the Machine

SMCS Code: 7000

Check with the proper officials in order to obtain the required licenses and other similar items before roading the machine.

Complete a thorough daily inspection before you mount the machine and before you start the engine.

Reference: For more information, refer to Operation and Maintenance Manual, "Daily Inspection".

Carry the work tool as low to the ground as possible. Disable the controls for the work tool when the machine is roaded.

Limitations for TON-kilometer per hour (TON-mile per hour) must be obeyed. Before roading, consult your tire dealer for recommended tire pressures and for speed limitations of the tires.

Inflate the tires to the correct pressure. Use a self-attaching inflation chuck in order to inflate the tire. Stand behind the tire tread while you inflate the tires.

Reference: For more information, refer to the Operation and Maintenance Manual, "Tire Inflation Information".

When you road for long distances, schedule stops in order to allow the tires and the components to cool. Stop for 30 minutes after every 40 km (25 miles) or after every hour.

i03304404

Lifting and Tying Down the Machine

SMCS Code: 7000; 7500

WARNING

Improper lifting and improper tie-downs can allow the load to shift or fail and cause injury or damage. Use only properly rated cables and slings with lift and tie down points provided.

Follow the instructions in Operation and Maintenance Manual, "Lifting and Tying Down the Machine" for the proper technique for securing the machine. Refer to Operation and Maintenance Manual, "Specifications" for specific weight information.

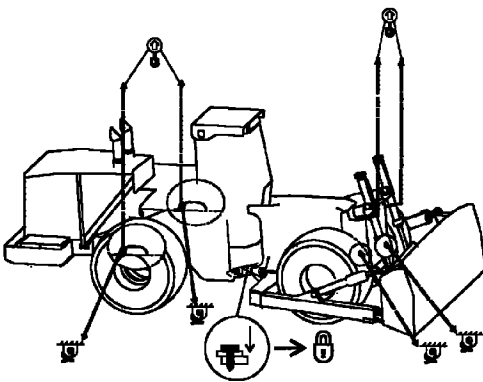


Illustration 73

g01687614

NOTICE

Improper lifting or tie-downs can allow the load to shift and cause injury or damage. Install the steering frame lock link before lifting.

Note: Do not use handles or steps in order to lift or tie down the machine.

Note: The machine shipping weight that is listed is the weight of the most common configuration of the machine. If attachments have been installed on your machine, the weight of your machine and the center of gravity of your machine may vary.

Reference: Refer to Operation and Maintenance Manual, "Specifications" for the dimensions and weight of the machine.



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



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

Use properly rated cables and properly rated slings to lift the machine.

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

The width of the spreader bar must be sufficient to prevent the lifting cables or the lifting straps from contacting the machine.

1. Engage the parking brake before you sling the machine and before you secure the machine with tie-downs.
2. Install the frame lock pin prior to lifting the machine.
3. Attach two lifting cables to the rear of the machine. There is one lifting eye on each side of the rear of the machine. The lifting eyes are identified by a label that shows a hook.
4. Attach two lifting cables to the front of the machine. There is one eye on each side of the front of the machine. The lifting eyes are identified by a label that shows a hook.
5. Connect the four lifting cables to the spreader bars. The spreader bars must be centered over the machine.
6. If equipped, secure any attachments.
7. Lift the machine. Move the machine to the desired position.
8. When the machine is positioned, place the blocks behind the tires.
9. Secure the machine at the tie-down positions. The positions are identified on the machine by a label.

Check all of the laws that govern the load characteristics (height, weight, width, and length).

Reference: For shipping instructions, refer to Operation and Maintenance Manual, "Shipping the Machine".

Towing Information

i02959311

Machine Retrieval

SMCS Code: 7000

WARNING

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

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

In order to properly perform the towing procedure, use the following recommendations.

Your machine is equipped with spring-applied parking brakes. The parking brakes are released by oil pressure. If the engine is inoperable or if the brake oil system is inoperable, the parking brakes are applied. The machine cannot be moved.

Use these towing instructions for moving a disabled machine over a short distance. Do not move the machine faster than 2 km/h (1.2 mph). Move the machine to a convenient location for repair. Use these instructions for emergency situations only. Always haul the machine if long distance moving is required.

Shielding must be provided on the towing machine in order to protect the operator in case the tow line breaks or the tow bar breaks.

Do not allow riders on the machine which is being towed.

Before you tow the machine, inspect the condition of the tow line or of the tow bar. Make sure that the tow line or the tow bar is sturdy enough to tow the disabled machine. The tow line or the tow bar must have a strength that is equal to 1.5 times the gross weight of the machine that is being towed. Use a tow bar with this strength or a tow line with this strength to tow a disabled machine that is stuck in the mud. Also, use a tow bar with this strength or a tow line with this strength to tow a disabled machine up a grade.

The towing force must not exceed 1100 kN (247291 lb).

Do not use a chain for pulling. A chain link may break. This can cause personal injury. Use a wire cable with cable loops or end rings. Position an observer at a safe location. The observer should stop the pulling procedure if the cable starts to break or the cable starts to unravel. If the towing machine moves without the pulled machine, stop the pulling procedure.

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

Quick machine movement could overload the tow line or the tow bar. This could cause the tow line or the tow bar to break. Gradual, smooth machine movement is recommended.

Normally, the towing machine should be as large as the disabled machine. The towing machine must have enough brake capacity, enough weight, and enough power for the grade that is involved and for the distance that is involved.

It may be necessary to connect a larger machine or additional machines to the machine that is disabled. This will provide sufficient control for moving a disabled machine downhill and sufficient braking for moving a disabled machine downhill.

The requirements for different situations cannot be specified. Minimal towing machine capacity is required on smooth, level surfaces. Maximum towing machine capacity is required on inclines or on poor surface conditions.

Any towed machine with a load must be equipped with a brake system that can be operated from the operator's compartment.

Consult your Caterpillar dealer for more information about towing a disabled machine.

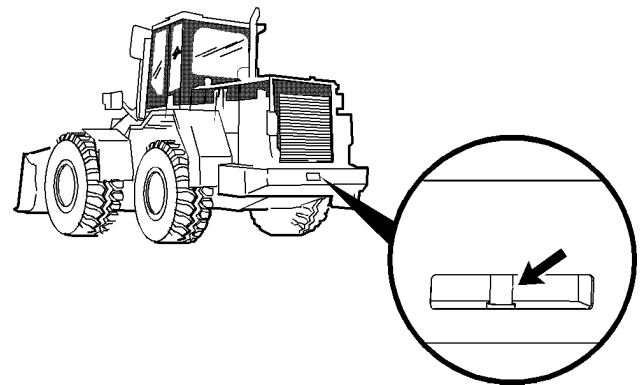


Illustration 74

g01478145

Location of the retrieval and towing pin

Towing with the Engine Idle

If the engine is running, the machine can be towed for a short distance under certain conditions. The power train and the steering system must be operable. **Tow the machine for a short distance only.** For example, pull the machine out of mud or pull the machine to the side of the road.

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

Carefully obey all of the instructions that are outlined in this topic.

Towing with the Engine Stopped

Perform the following steps before you tow the machine.

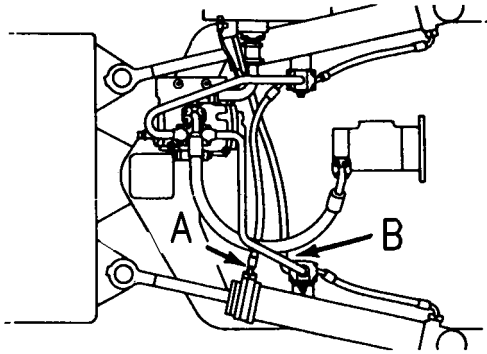


Illustration 75

g00286064

Typical example

(A) Rod end
(B) Head end

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

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

1. Reverse the hydraulic steering hose connections on one cylinder only. This will allow the steering cylinders to move freely.

WARNING

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

Block the wheels securely so that the machine cannot move.

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

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

Reference: For more information on the axle shaft, refer to the Service Manual for your machine or consult your Caterpillar dealer.

NOTICE

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

3. Release the parking brake.

Reference: For information about the manual release of the parking brake, refer to Operation and Maintenance Manual, "Parking Brake Manual Release".

4. Inspect the machine for power train damage. If damage is suspected, remove the axle shafts.
5. Fasten the tow bar.

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.

6. Remove the wheel blocks. Tow the machine slowly. Do not exceed 2 km/h (1.2 mph).

i01851383

Parking Brake Manual Release

SMCS Code: 4267; 7000

WARNING

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

Correct any problem before attempting to operate the machine.

1. Chock the wheels in order to prevent the machine from rolling when the parking brake is released.
 2. Connect the steering frame lock.
-

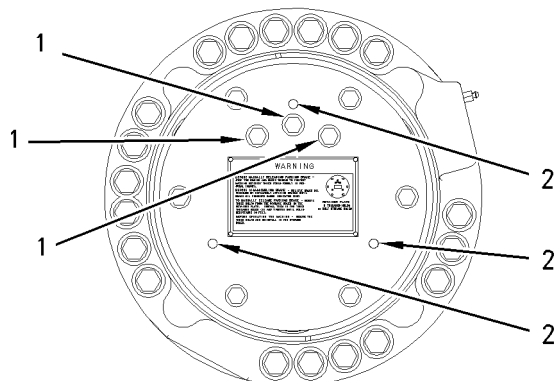


Illustration 76

g00943164

3. Remove three bolts (1) from the storage holes in the cover.
4. Install the bolts in forcing holes (2). Tighten these bolts until an opposing force is felt.
5. Before the machine is operated again, remove the bolts from the forcing holes and install bolts in the storage holes.

Engine Starting (Alternate Methods)

i02407539

Engine Starting with Jump Start Cables

SMCS Code: 1000; 7000

WARNING

Failure to properly service the batteries may cause personal injury.

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

Do not smoke when checking battery electrolyte levels.

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

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

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

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

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

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

WARNING

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

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

Always let the ice melt before attempting to charge.

NOTICE

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

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

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

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

Use of Jump Start Cables

1. Place the transmission control on the stalled machine in the NEUTRAL position. Engage the parking brake. Lower all attachments to the ground. Move all controls to the HOLD position.
2. On the stalled machine, turn the engine start switch to the OFF position. Turn off the accessories.
3. On the stalled machine, turn the battery disconnect switch to the ON position.
4. Move the machine or the auxiliary power source close to the stalled machine so that the cables can reach. **DO NOT ALLOW THE MACHINE OR THE AUXILIARY POWER SOURCE TO CONTACT THE STALLED MACHINE.**
5. Stop the engine on the machine that is the electrical source. (If you are using an auxiliary power source, turn off the charging system.)
6. Check the battery caps for correct placement and for correct tightness. Make these checks on both machines. Make sure that the batteries in the stalled machine are not frozen. Check the batteries for low electrolyte.
7. Connect the positive jump start cable to the positive cable terminal of the discharged battery.

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

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

Operation Section
Engine Starting with Auxiliary Start Receptacle

8. Connect the positive jump start cable to the positive terminal of the electrical source. Use the procedure from Step 7 in order to determine the correct terminal.
9. Connect one end of the negative jump start cable to the negative terminal of the electrical source.
10. Make the final connection. Connect the negative cable to the frame of the stalled machine. Make this connection away from the battery, away from the fuel, away from the hydraulic lines, and away from all moving parts.
11. Start the engine of the machine that is the electrical source. (If you are using an auxiliary power source, energize the charging system on the auxiliary power source.)
12. Allow the electrical source to charge the batteries for two minutes.
13. Attempt to start the stalled engine.

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

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

i01851496

Engine Starting with Auxiliary Start Receptacle (If Equipped)

SMCS Code: 1463

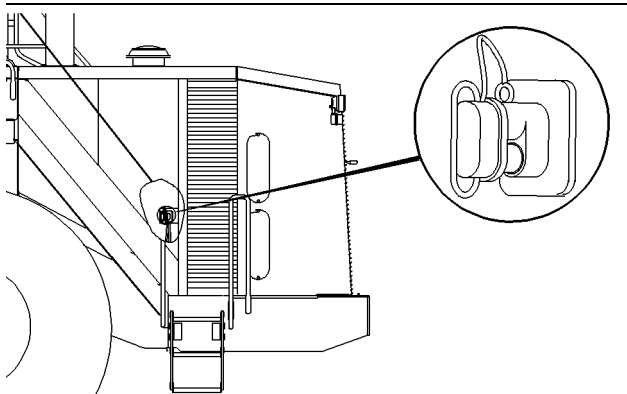


Illustration 77

g00943217

The Auxiliary Starting Receptacle is behind the access door on the left side of the machine.

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

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

1. Determine the reason that the engine will not start. See Special Instruction, SEHS7768 for information about the use of 6V - 2150 Starting/Charging Analyzer. Use this procedure even if the machine does not have a diagnostic connector.
2. Move the transmission control lever on the stalled machine to the NEUTRAL position. Engage the parking brake. Lower all attachments to the ground. Move all controls to the HOLD position.
3. Turn the start switch key on the stalled machine to the OFF position. Turn off all accessories.
4. Turn on the battery disconnect switch that is located on the stalled machine .
5. Move the machine that is being used as a power source close to the stalled machine so that the jump start cables reach the batteries on both machines. **DO NOT ALLOW THE MACHINES TO CONTACT EACH OTHER.**
6. Stop the engine on the machine that is being used as a power source. If you use an auxiliary power source, turn off the charging system.
7. Connect the appropriate jump start cable to the auxiliary starting receptacle on the stalled machine.
8. Connect the other end of the jump start cable to the auxiliary starting receptacle of the machine that is being used as a power source.
9. Start the engine on the machine that is being used as a power source or energize the charging system on the auxiliary power source.
10. Allow the machine that is being used as a power source to charge the batteries for two minutes.
11. Attempt to start the stalled engine.
12. Immediately after the stalled engine starts, disconnect the jump start cable from the machine that is being used as a power source.
13. Disconnect the other end of the jump start cable from the stalled machine.

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

Maintenance Section

Tire Inflation Information

i02096880

Tire Inflation with Nitrogen

SMCS Code: 4203

Caterpillar recommends the use of dry nitrogen gas for tire inflation and for tire pressure adjustments. This includes all machines with rubber tires. Nitrogen is an inert gas that will not aid combustion inside the tire.

WARNING

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

A tire blowout and/or rim failure can occur if the inflation equipment is not used correctly, due to the fact that a fully charged nitrogen cylinder's pressure is approximately 15000 kPa (2200 psi).

There are other benefits to using nitrogen in addition to reducing the risk of an explosion. The use of nitrogen for tire inflation lessens the slow oxidation of the rubber. Use of nitrogen also slows gradual tire deterioration. This is especially important for tires that are expected to have a long service life of at least four years. Nitrogen reduces the corrosion of rim components. Nitrogen also reduces problems that result from disassembly.

WARNING

A tire blowout or a rim failure can cause personal injury.

Use a self-attaching inflation chuck and stand behind the tread when inflating a tire, to prevent personal injury.

Note: Do not set the tire inflation equipment regulator higher than 140 kPa (20 psi) over the recommended tire pressure.

Use 6V-4040 Inflation Group or an equivalent inflation group to inflate tires with a nitrogen gas cylinder.

Reference: For tire inflation instructions, refer to Special Instruction, SMHS7867, "Nitrogen Tire Inflation Group".

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

i02284174

Tire Inflation Pressure

SMCS Code: 4203; 7500

The tire inflation pressure for machines that are shipped from the factory is suitable for shipping only. Always obtain the proper tire inflation pressures for your machine from the tire supplier before placing the machine into operation. The recommended tire inflation pressures for the front tires and for the rear tires will vary for each application.

Proper tire inflation pressure and maintenance of the tire inflation pressure is critical for optimum tire life. The tire inflation pressure should always be obtained from the tire supplier due to changes in the technology of tires, equipment, and job applications.

Reference: Refer to the latest edition of Special Publication, "Caterpillar Performance Handbook" for general information on tire inflation pressure.

i02610518

Tire Inflation Pressure Adjustment

SMCS Code: 4203

Always obtain the proper tire inflation pressures and maintenance recommendations for the tires on your machine from your tire supplier. The tire pressure in a warm shop area 18° to 21°C (65° to 70°F) will significantly change when you move the machine into freezing temperatures. If you inflate the tire to the correct pressure in a warm shop, the tire will be underinflated in freezing temperatures. Low pressure shortens the life of a tire.

Reference: When you operate the machine in freezing temperatures, refer to Special Publication, SEBU5898, "Cold Weather Recommendations for All Caterpillar Machines" in order to adjust tire inflation pressures.

Lubricant Viscosities and Refill Capacities

i05562829

Lubricant Viscosities

SMCS Code: 7581

General Information for Lubricants

When you are operating the machine in temperatures below -20°C (-4°F), refer to Special Publication, SEBU5898, "Cold Weather Recommendations". This publication is available from your Cat dealer.

For cold-weather applications where transmission oil SAE 0W-20 is recommended, Cat TDTO Cold Weather is recommended.

Refer to the "Lubricant Information" section in the latest revision of the Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for a list of Cat engine oils and for detailed information. This manual may be found on the Web at Safety.Cat.com.

The footnotes are a key part of the tables. Read ALL footnotes that pertain to the machine compartment in question.

Selecting the Viscosity

In order to select the proper oil for each machine compartment, refer to the "Lubricant Viscosity for Ambient Temperature" table. Use the oil type AND oil viscosity for the specific compartment at the proper ambient temperature.

The proper lubricant viscosity grade is determined by the minimum outside temperature when the machine is started. The proper lubricant viscosity grade is also determined by the maximum outside temperature while the machine is operated. Use the column on the table that is designated "Min" in order to determine the lubricant viscosity grade that is required when you start a cold machine and when you operate a cold machine. Use the column on the table that is designated "Max" to select the lubricant viscosity grade when you operate the machine at the highest temperature that is anticipated. When you start the machine, use the oil with the highest lubricant viscosity that is allowed for the temperature.

Machines that are continuously operated should use the oils with a higher viscosity in the final drives and differentials in order to maintain the highest possible oil film thickness. Refer to "General Information for Lubricants" article, "Lubricant Viscosities" tables, and any associated footnotes. Consult your Cat dealer if additional information is needed.

NOTICE

Not following the recommendations found in this manual can lead to reduced performance and compartment failure.

Engine Oil

Cat oils have been developed and tested in order to provide the full performance and life that has been designed and built into Cat engines.

Cat DEO-ULS multigrade and Cat DEO multigrade oils are formulated with the correct amounts of detergents, dispersants, and alkalinity in order to provide superior performance in Cat diesel engines where recommended for use.

Table 5

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

When fuels of sulfur level of 0.1 percent (1000 ppm) or higher are used, Cat DEO-ULS may be used if S·O·S oil analysis program is followed. Base the oil change interval on the oil analysis.

Note: Failure to follow oil analysis recommended oil change interval may result in reduced engine component life.

- Cat TDTO-TMS
- Cat DEO-ULS SYN
- Cat DEO-ULS Cold Weather

Hydraulic Systems

Refer to the “Lubricant Information” section in the latest revision of the Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for detailed information. This manual may be found on the Web at Safety.Cat.com.

The following are the preferred oils for use in most Cat machine hydraulic systems:

- Cat HYDO Advanced 10 SAE 10W
- Cat HYDO Advanced 30 SAE 30W
- Cat BIO HYDO Advanced

Cat HYDO Advanced fluids have a 50% increase in the standard oil drain interval for machine hydraulic systems 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

Table 6

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Hydraulic System	Cat HYDO Advanced 10 ⁽¹⁾ Cat TDTO	SAE 10W	-20	40	-4	104
	Cat HYDO Advanced 30 Cat TDTO	SAE 30	0	50	32	122
	Cat BIO HYDO Advanced	"ISO 46" Multi-Grade	-30	45	-22	113
	Cat MTO Cat DEO-ULS Cat DEO	SAE10W-30	-20	40	-4	104
	Cat DEO-ULS Cat DEO	SAE15W-40	-15	50	5	122
	Cat TDTO-TMS	Multi-Grade	-15	50	5	122
	Cat DEO-ULS 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

(1) -20° C (-4° F) to 50° C (122° F) if equipped with the High Ambient Cooling Attachment

Other Oil Applications

Refer to the "Lubricant Information" section in the latest revision of the Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for detailed information. This manual may be found on the Web at Safety.Cat.com.

Cat HYDO Advanced fluids are the preferred oils for use in Cat machines hydraulic systems.

When you are operating the machine in temperatures below -20°C (-4°F), refer to Special Publication, SEBU5898, "Cold Weather Recommendations". This publication is available from your Cat dealer.

Table 7

Wheel Loaders, Integrated Toolcarriers, Wheeled Dozers, and Compactors Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Power Shift Transmission	Cat TDTO Cat TDTO-TMS Cat Cold Weather TDTO Cat TO-4, Cat TO-4M	SAE 0W-20	-40	10	-40	50
		SAE 10W	-20	10	-4	50
		SAE 30	0	35	32	95
		SAE 50	10	50	50	122
		TDTO-TMS	-20	43	4	110

(continued)

(Table 7, contd)

Wheel Loaders, Integrated Toolcarriers, Wheeled Dozers, and Compactors Lubricant Viscosities for Ambient Temperatures						
Compartment or System	Oil Type and Performance Requirements	Oil Viscosities	°C		°F	
			Min	Max	Min	Max
Drive Axles for Large Wheel Loaders (988-993), Large Wheel Dozers (834-854), and Large Compactors (836)	Cat TDTO Cat TDTO-TMS Cat Cold Weather TDTO Cat TO-4, Cat TO-4M	SAE 0W-20	-40	-10	-40	14
		SAE 10W	-25	0	-13	32
		SAE 30	-20	20	-4	68
		SAE 50	-10	50	14	122
		Cat TDTO-TMS	-25	22	-13	72
Drive Axles for 994 Wheel Loader	Cat TDTO Cat TDTO-TMS Cat TO-4, Cat TO-4M	SAE 10W	-25	0	-13	32
		SAE 30	-20	20	-4	68
		SAE 50	-10	43	14	110
		SAE 60	-5	50	23	122
		Cat TDTO-TMS	-25	22	-13	72
Powered Stairway (If equipped)	Cat TDTO Cat TO-4	SAE 10W	0	50	32	122
	Cat Cold Weather TDTO	SAE 0W-20	0	50	32	122
	MIL-H-5606A	MIL-H-5606A	-40	40	-40	104

Grease Applications

In order to use a non-Cat grease, the supplier must certify that the lubricant is compatible with Cat grease.

Each pin joint should be flushed with the new grease. Ensure that all old grease is removed. Failure to meet this requirement may lead to failure of a pin joint.

Table 8

Type of Cat Grease								
Application Point	Typical Load and Speed	Load Factor	Ambient Temperature Range				NLGI Grade	Grease Type
			° C		° F			
			Min	Max	Min	Max		
Articulation Bearings, Articulation Pins, Blade Lift Cylinder Socket, Centershift Cylinder Socket, Fan Drive Bearings, Fan Drive Belt Tightener, Pump Drive Shaft Slip Spline	High	Ditching, fill spreading, spreading base material, ripping, heavy road maintenance, snow plowing.	-35	40	-31	104	1	Cat Ultra 5Moly Grease
			-30	50	-22	122	2	
	Medium	Average road maintenance, road mix work, scarifying, snow plowing.	-20	40	-4	104	2	Cat Advanced 3Moly Grease
	Low	Finish grading, light maintenance, road travel.	-30	40	-22	104	2	Cat Multipurpose Grease
Drive Shaft Spline (Center)			-30	50	-22	122	2	Cat Ultra 5Moly Grease
Drive Shaft Support Bearing, Drive Shaft Universal Joints			-30	40	-22	104	2	Cat Multipurpose Grease

Table 9

Recommended Grease for the Autolube System				
Compartment or System	GreaseType	NLGI Grade	°C	°F
			Min	Min
Cat Autolube System	Cat 3Moly Grease	NLGI Grade 2	-18	0
	Cat Ultra 5Moly	NLGI Grade 2	-7	20
		NLGI Grade 1	-18	0
		NLGI Grade 0	-29	-20
	Cat Arctic Platinum	NLGI Grade 0	-43	-45
	Cat Desert Gold	NLGI Grade 2	2	35

The grease used with the automatic lubrication system must not contain any graphite or PTFE.

Note: Pumpability is based on “US Steel Mobility and Lincoln Ventmeter Tests”. Performance may vary depending on lubrication equipment and the length of the lines.

Reference: Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for additional information about grease. This manual may be found on the Web at Safety.Cat.com.

Diesel Fuel Recommendations

Diesel fuel must meet Caterpillar Specification for Distillate Fuel and the latest revisions of “ASTM D975-09a” and “EN 590” in order to ensure optimum engine performance. Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for the latest fuel information and for Caterpillar fuel specification. This manual may be found on the Web at Safety.Cat.com.

The preferred fuels are distillate fuels. These fuels are commonly called diesel fuels, furnace oil, gas oil, or kerosene. These fuels must meet the Caterpillar Specification for Distillate Fuel For Off-Highway Diesel Engines. Diesel fuels that meet the Caterpillar specification will help provide maximum engine service life and performance. This manual may be found on the Web at Safety.Cat.com.

Misfueling with fuels of high sulfur level can have the following negative effects:

- Reduce engine efficiency and durability.
- Increase the wear.
- Increase the corrosion.
- Increase the deposits.
- Lower fuel economy
- Shorten the time period between oil drain intervals (more frequent oil drain intervals).

- Increase overall operating costs.
- Negatively impact engine emissions

Failures that result from the use of improper fuels are not 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 non-road and machine applications that are not Tier 4/ Stage IIIB/ Stage IV certified engines and are not equipped with aftertreatment devices. Follow operating instructions and fuel tank inlet labels, if available in order to ensure that the correct fuels are used.

Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” for more details about fuels, lubricants. This manual may be found on the Web at Safety.Cat.com.

Fuel Additives

Cat Diesel Fuel Conditioner and Cat Fuel System Cleaner are available for use when needed. These products are applicable to diesel and biodiesel fuels. Consult your Cat dealer for availability.

Biodiesel

Biodiesel is a fuel that can be made from various renewable resources that include vegetable oils, animal fat, and waste cooking oil. Soybean oil and rapeseed oil are the primary vegetable oil sources. In order to use any of these oils or fats as fuel, the oils or fats are chemically processed (esterified). The water and contaminants are removed.

U.S. distillate diesel fuel specification “ASTM D975-09a” includes up to B5 (5 percent) biodiesel. Currently, any diesel fuel in the U.S. may contain up to B5 biodiesel fuel.

European distillate diesel fuel specification “EN 590” includes up to B5 (5 percent) and in some regions up to B7 (7 percent) biodiesel. Any diesel fuel in Europe may contain up to B5 or in some regions up to B7 biodiesel fuel.

Note: Up to B20 biodiesel blend level is acceptable for use in this machine.

When biodiesel fuel is used, certain guidelines must be followed. Biodiesel fuel can influence the engine oil, aftertreatment devices, non-metallic, fuel system components, and others. Biodiesel fuel has limited storage life and has limited oxidation stability. Follow the guidelines and requirements for engines that are seasonally operated and for standby power generation engines.

In order to reduce the risks associated with the use of biodiesel, the final biodiesel blend and the biodiesel fuel used must meet specific blending requirements.

All the guidelines and requirements are provided in the latest revision of Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations". This manual may be found on the Web at Safety.Cat.com.

Coolant Information

The information provided in this "Coolant Recommendation" section should be used with the "Lubricants Information" provided in the latest revision of Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations". This manual may be found on the Web at Safety.Cat.com.

The following two types of coolants may be used in Cat diesel engines:

Preferred – Cat ELC (Extended Life Coolant)

Acceptable – Cat DEAC (Diesel Engine Antifreeze/Coolant)

NOTICE

Never use water alone as a coolant. Water alone is corrosive at engine operating temperatures. In addition, water alone does not provide adequate protection against boiling or freezing.

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Capacities (Refill)

SMCS Code: 7560

Table 10

Approximate Refill Capacities			
Component or System	Liters	US gal	Recommended Type
Engine Crankcase	95	25	Diesel Engine Oil (DEO) API CG-4 or CF-4
Transmission	110	30	Caterpillar TDTO

(continued)

(Table 10, contd)

Approximate Refill Capacities			
Component or System	Liters	US gal	Recommended Type
Hydraulic Tank (Implement and Brakes)	197	52	Caterpillar HYDO or Caterpillar HEES
Hydraulic Tank (Steering and Fan Drive Motor)	132	35	Caterpillar HYDO or Caterpillar HEES
Cooling System	150	40	Caterpillar ELC
Fuel Tank	1016	260	No. 1 Diesel Fuel or No. 2 Diesel Fuel
Front Differential and Final Drive ⁽¹⁾	271	72	Caterpillar TDTO
Rear Differential and Final Drive ⁽¹⁾	261	69	Caterpillar TDTO

⁽¹⁾ Allow 4 L (1 US gal) for the addition of 1U-9891 Hydraulic Oil Additive.

Table 11

Caterpillar Extender for ELC	
Cooling System Capacity	Recommended Amount of Extender
22 to 30 L (6 to 8 US gal)	0.57 L (20 fl oz)
31 to 38 L (8 to 10 US gal)	0.71 L (24 fl oz)
39 to 49 L (10 to 13 US gal)	0.95 L (32 fl oz)
50 to 64 L (13 to 17 US gal)	1.18 L (40 fl oz)
65 to 83 L (17 to 22 US gal)	1.60 L (54 fl oz)
84 to 114 L (22 to 30 US gal)	2.15 L (72 fl oz)
115 to 163 L (30 to 43 US gal)	3.00 L (100 fl oz)
164 to 242 L (43 to 64 US gal)	4.40 L (148 fl oz)

For the refill capacities for the air conditioning system, refer to Service Manual, SENR5664, "Air Conditioning and Heating R-134a For All Caterpillar Machines".

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S·O·S Information

SMCS Code: 1348; 1395; 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.

Refer to the Operation and Maintenance Manual, "Maintenance Interval Schedule" for a specific sampling location and a service hour maintenance interval.

Consult your Cat dealer for complete information and assistance in establishing an S·O·S program for your equipment.

Maintenance Support

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System Pressure Release

SMCS Code: 1250-553-PX; 1300-553-PX; 1350-553-PX; 3000-553-PX; 4250-553-PX; 4300-553-PX; 5050-553-PX; 6700-553-PX; 7540-553-PX

General Precautions

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.

Perform this procedure in order to release compressed air pressure or hydraulic oil pressure.

Put blocks in front of the wheels and behind the wheels.

Perform this procedure before performing any of the following service procedures:

- Disconnecting any hydraulic connections for the implement system
- Removing any sensors or switches from the implement system
- Working on the bucket or linkage

Brake Pressure

To release any brake oil pressure, depress the brake pedal repeatedly.

Cooling System Pressure

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.

Wait until the radiator is cool.

Slowly loosen cooling system pressure cap in order to relieve any system pressure.

Hydraulic Pressure

WARNING

Hydraulic oil pressure can remain in the hydraulic system on this machine after the engine and pump have been stopped. Serious injury can result if this pressure is not released before any service is done on the hydraulic systems. In order to prevent possible injury, release the hydraulic system pressure before working on any fitting, hose, or hydraulic component.

Lower all attachments to the ground before service is started. If the hydraulic system must be serviced, tested, or adjusted with the attachment in the raised position, the attachments and lift cylinders must be supported properly.

Always move the machine to a location away from the travel of other machines. Be sure that other personnel are not near the machine when the engine is running and tests or adjustments are being made.

Note: The pressure in the hydraulic system must be released before hose assemblies or components can be removed or disconnected.

Note: Hydraulic lockout control must be in the UNLOCKED position.

1. Ensure that the machine is on a smooth, horizontal surface. Ensure that the machine is away from working machines and personnel. Lower all implements to the ground. Install the articulation lock pin.

Note: Permit only one operator on the machine. Keep all other personnel away from the machine or in the view of the operator.

2. Activate the parking brake. Place all implements on the ground.
3. If equipped, move all joysticks into all positions repeatedly.
4. Place the lift cylinders in the FLOAT position. The oil will return to the hydraulic tank. This will relieve pressure in the circuit.
5. Stop the engine.

NOTICE

Never remove the fill/vent plug from the hydraulic tank if the oil is hot.

Air can enter the system and cause pump damage.

6. In order to release all remaining pressure in the hydraulic oil tank, hold down the plunger on the breaker relief valve. The breaker relief valve is located on the hydraulic oil tank.

Note: The pressure in the hydraulic oil tank may also be released by slowly loosening the filler cap. Make sure that the filler cap is cool enough to touch with your bare hand.

7. Ensure that all pressure is relieved in the secondary hydraulic system. Ensure that all pressure is relieved in the auxiliary hydraulic system.
8. Make sure that all of the hydraulic pressure is relieved before any work is performed on the hydraulic system or any hydraulic component.
9. Tighten the cap on the hydraulic tank.

Lock Valve Pressure

The procedures in this section may be used in the following operations:

- Maintenance on lock valves
- Maintenance on hydraulic cylinders

1. Fully slacken the locknut.
2. Use an appropriate allen wrench in order to adjust the screw as far as possible in a counterclockwise direction. Record the number of turns in order to reset the lock valve later. The pressure in the lock valve will now be relieved.

3. Reset the lock valve after all the pressure has been relieved.

Steering Pressure

To release any steering oil pressure, move the steering control through all travel positions several times in both directions. Move the steering wheel several times in both directions in order to relieve the pilot pressure in the steering system. If you are servicing the steering cylinders, the steering valve, or the steering hoses, slowly crack the lines in order to purge any trapped oil that may be in the steering system.

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

1. Turn off the engine. Place the engine start switch in the OFF position.
2. If equipped, turn the battery disconnect switch to the OFF position. If there is no battery disconnect switch, remove the negative battery cable at the battery.

NOTICE

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

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

- Bearings of the drive train

Maintenance Section

Welding on Machines and Engines with Electronic Controls

- Hydraulic components
 - Electrical components
 - Other components of the machine
4. Protect any wiring harnesses and components from the debris and the spatter which is created from welding.
 5. Use standard welding procedures in order to weld the materials together.

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Maintenance Interval Schedule

SMCS Code: 7000

Ensure that all safety information, warnings, and instructions are read and understood before any operation or any maintenance procedures are performed.

The user is responsible for the performance of maintenance. All adjustments, the use of proper lubricants, fluids, filters, and the replacement of components due to normal wear and aging are included. Failure to adhere to proper maintenance intervals and procedures may result in diminished performance of the product and/or accelerated wear of components.

Use mileage, fuel consumption, service hours, or calendar time, **WHICH EVER OCCURS FIRST**, in order to determine the maintenance intervals. Products that operate in severe operating conditions may require more frequent maintenance. Refer to the maintenance procedure for any other exceptions that may change the maintenance intervals.

Note: The aftertreatment system can be expected to function properly for the useful life of the engine (emissions durability period), as defined by regulation. All prescribed maintenance requirements must be followed.

Note: Before each consecutive interval is performed, all maintenance from the previous interval must be performed.

Note: If Cat HYDO Advanced hydraulic oils are used, the hydraulic oil change interval may be extended substantially. S·O·S services may extend the oil change even longer. Consult your Cat dealer for details.

When Required

" Alternator - Inspect"	84
" Articulation Bearings - Lubricate"	84
" Automatic Lubrication Grease Tank - Fill"	84
" Automatic Lubrication System Components - Check"	85
" Battery - Recycle"	89
" Battery or Battery Cable - Inspect/Replace".	89
" Camera - Clean"	93
" Circuit Breakers - Reset"	94
" Cutting Edges and End Bits - Inspect/Replace"	100

" Engine Air Filter Primary Element - Clean/Replace"	104
" Engine Air Filter Secondary Element - Replace"	107
" Engine Air Precleaner - Clean"	108
" Ether Starting Aid Cylinder - Replace"	116
" Fuel System - Prime"	118
" Fuses - Replace"	122
" High Intensity Discharge Lamp (HID) - Replace"	123
" Oil Filter - Inspect"	132
" Radiator Core - Clean"	132
" Seat Side Rails - Adjust"	135
" Secondary Steering - Test"	135
" Transmission Magnetic Screen - Clean"	138
" Window Washer Reservoir - Fill"	141
" Window Wiper - Inspect/Replace"	141

Every 10 Service Hours or Daily

" Backup Alarm - Test"	89
" Cooling System Coolant Level - Check"	97
" Engine Air Filter Service Indicator - Inspect"	107
" Engine Oil Level - Check"	112
" Hydraulic System Oil Level (Implement) (Braking) - Check"	130
" Hydraulic System Oil Level (Steering) (Hydraulic Fan) - Check"	130
" Seat Belt - Inspect"	133
" Transmission Oil Level - Check"	140
" Windows - Clean"	141

Every 50 Service Hours or Weekly

" Cab Air Filter - Clean/Replace"	92
" Fuel System Primary Filter (Water Separator) - Drain"	119
" Fuel Tank Water and Sediment - Drain"	121

“ Tire Inflation - Check” 137

Every 100 Service Hours or 2 Weeks

“ Axle Oscillation Bearings - Lubricate” 88

“ Steering Cylinder Bearings - Lubricate” 136

“ Tilt Cylinder Bearings - Lubricate” 137

Every 250 Service Hours

“ Engine Oil Sample - Obtain” 112

Every 250 Service Hours or Monthly

“ Battery - Clean” 89

“ Belts - Inspect/Adjust/Replace” 90

“ Brake Accumulator - Check” 91

“ Braking System - Test” 91

“ Differential and Final Drive Oil Level - Check” .. 101

“ Drive Shaft Spline (Center) - Lubricate” 103

“ Engine Air Filter Service Indicator - Inspect/Replace” 108

“ Engine Oil (High Speed) and Oil Filter - Change” 110

“ Engine Oil and Filter - Change” 113

Initial 500 Service Hours

“Cooling System Coolant Sample (Level 2) - Obtain” 98

“ Electronic Unit Injector - Inspect/Adjust” 104

“ Engine Valve Lash - Check” 115

“ Engine Valve Rotators - Inspect” 115

“ Seat Side Rails - Adjust” 135

Every 500 Service Hours

“ Differential and Final Drive Oil Sample - Obtain” 102

“ Hydraulic System Oil Sample (Implement) (Braking) - Obtain” 131

“ Hydraulic System Oil Sample (Steering) (Hydraulic Fan) - Obtain” 131

“ Transmission Oil Sample - Obtain” 140

Every 500 Service Hours or 3 Months

“Cooling System Coolant Sample (Level 1) - Obtain” 97

“ Engine Oil (High Speed) and Oil Filter - Change” 110

“ Engine Oil and Filter - Change” 113

“ Fuel System Primary Filter (Water Separator) Element - Replace” 119

“ Fuel System Secondary Filter - Replace” 120

“ Fuel Tank Cap and Strainer - Clean” 121

“ Hoses and Clamps - Inspect/Replace” 124

“ Hydraulic System Oil Filter (Implement) (Braking) - Replace” 129

“ Hydraulic System Oil Filter (Steering) (Hydraulic Fan) - Replace” 129

“ Transmission Oil Filter - Replace” 139

Every 1000 Service Hours or 6 Months

“ Articulation Bearings - Lubricate” 84

“ Battery Hold-Down - Tighten” 89

“ Case Drain Oil Filters - Replace” 93

“ Drive Shaft Support Bearing - Lubricate” 104

“ Drive Shaft Universal Joints - Lubricate” 104

“ Lift Cylinder Yoke Bearings - Lubricate” 131

“ Rollover Protective Structure (ROPS) - Inspect” 133

“ Transmission Oil - Change” 138

Every 2000 Service Hours or 1 Year

“ Crankshaft Vibration Damper - Inspect” 99

“ Differential and Final Drive Oil - Change” 100

“ Engine Crankcase Breather - Clean” 108

“ Hydraulic System Oil (Implement) (Braking) - Change” 127

“ Hydraulic System Oil (Steering) (Hydraulic Fan) - Change” 128

“ Hydraulic Tank Breaker Relief Valve - Clean” .. 131

“ Receiver Dryer (Refrigerant) - Replace” 133

“ Service Brake Wear Indicator - Check” 135

Every Year

“Cooling System Coolant Sample (Level 2) -
Obtain” 98

Every 3000 Service Hours

“ Electronic Unit Injector - Inspect/Adjust” 104

“ Engine Valve Lash - Check” 115

“ Engine Valve Rotators - Inspect” 115

Every 3000 Service Hours or 2 Years

“ Cooling System Coolant Extender (ELC) -
Add” 96

“ Engine Mounts - Inspect” 109

Every 3 Years

“ Seat Belt - Replace” 134

Every 5000 Service Hours or 3 Years

“ Alternator - Inspect” 84

“ Starting Motor - Inspect” 136

“ Turbocharger - Inspect” 141

Every 6000 Service Hours or 4 Years

“ Cooling System Coolant (ELC) - Change” 95

“ Cooling System Water Temperature Regulator -
Replace” 98

“ Engine Water Pump - Inspect” 115

Every 12 000 Service Hours or 6 Years

“ Fuel Lines - Replace” 116

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Alternator - Inspect

SMCS Code: 1405-040

Caterpillar recommends a scheduled inspection of the alternator.

1. Open the engine access door on the right side of the machine.

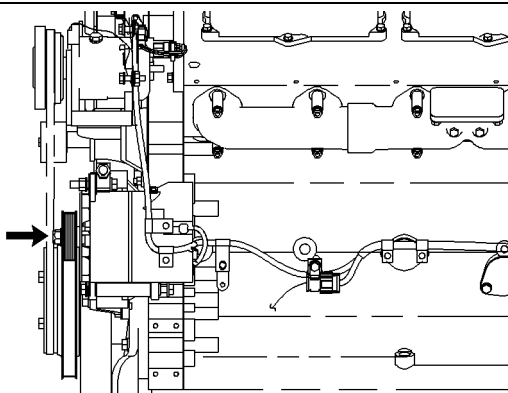


Illustration 78

g00946039

2. Inspect the alternator for loose connections.
3. Check the ammeter during engine operation in order to ensure that the electrical system is functioning properly. Make the necessary repairs.
4. Check the alternator and the battery charger for proper operation. Keep the batteries fully charged.

Note: Air temperature affects the cranking power of the batteries. Keep the batteries warm. The engine will not crank if the batteries are too cold. Even when the engine is warm, cold batteries will not crank the engine.

Note: When the engine is operated for short periods of time, the batteries may not fully recharge. Make sure that the alternator is functioning properly. The alternator will charge the battery.

i01855622

Articulation Bearings - Lubricate

SMCS Code: 7057-086-BD; 7065-086-BD; 7066-086-BD

Wipe the fittings before you apply any lubricant.

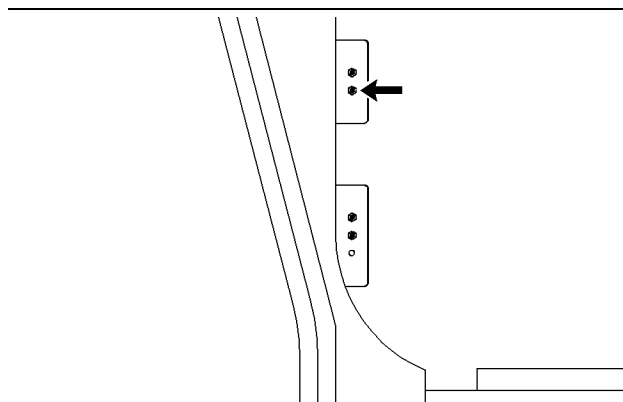


Illustration 79

g00949655

Apply lubricant through the remote fitting for the upper hitch.

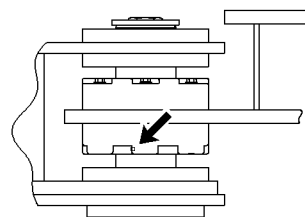


Illustration 80

g00946295

Apply lubricant through one fitting on the lower hitch.

i02216552

Automatic Lubrication Grease Tank - Fill (If Equipped)

SMCS Code: 7540-544-TNK



WARNING

A pressure hazard is present. Severe personal injury or death can result from removing hoses or fittings that are under pressure. Relieve the pressure in the system before you remove hoses or fittings.

The Centro-Matic Lubrication System

Reference: Before any service work is performed on the lubrication system, refer to Special Instructions, REHS1394 or consult your Caterpillar dealer.

Bulk Fill

1. In order to fill the reservoir, remove the lower and upper plugs from the side of the reservoir.
2. Attach the appropriate pump to the lower inlet.
3. Fill the reservoir until visual indicator on the lid of the tank indicates FULL or until the grease appears at the top vent port.

Reference: For the correct type of grease, refer to Operation and Maintenance Manual, "Lubricant Viscosities".

4. Remove the pump and replace both plugs.

The Quicklub Lubrication System

Reference: Before any service work is performed on the lubrication system, refer to Special Instructions, REHS1396 or consult your Caterpillar dealer.

Filling the Reservoir

1. Fill the reservoir through the grease fitting. The grease fitting is located at the base of the reservoir.

Reference: For the correct type of grease, refer to Operation and Maintenance Manual, "Lubricant Viscosities".

2. Refill the reservoir when the grease reaches the "MIN" mark on the reservoir.
3. Fill the reservoir to the "MAX" mark on the reservoir.

Priming the System

After the reservoir has been filled with the recommended lubricant, loosen the fitting to the supply line. Operate the pump until lubricant flows from the outlet. Then, tighten fitting.

i04164902

Automatic Lubrication System Components - Check (If Equipped)

SMCS Code: 7540-535

WARNING

A pressure hazard is present. Severe personal injury or death can result from removing hoses or fittings that are under pressure. Relieve the pressure in the system before you remove hoses or fittings.

Reference: Before any service work is performed on the lubrication system, refer to Special Instructions, REHS1394 or consult your Cat dealer. Autolube systems need to be adjusted before being put into use to ensure each joint gets the appropriate amount of grease. Different applications require frequency, volume, and proportioning adjustments from the recommended or factory settings.

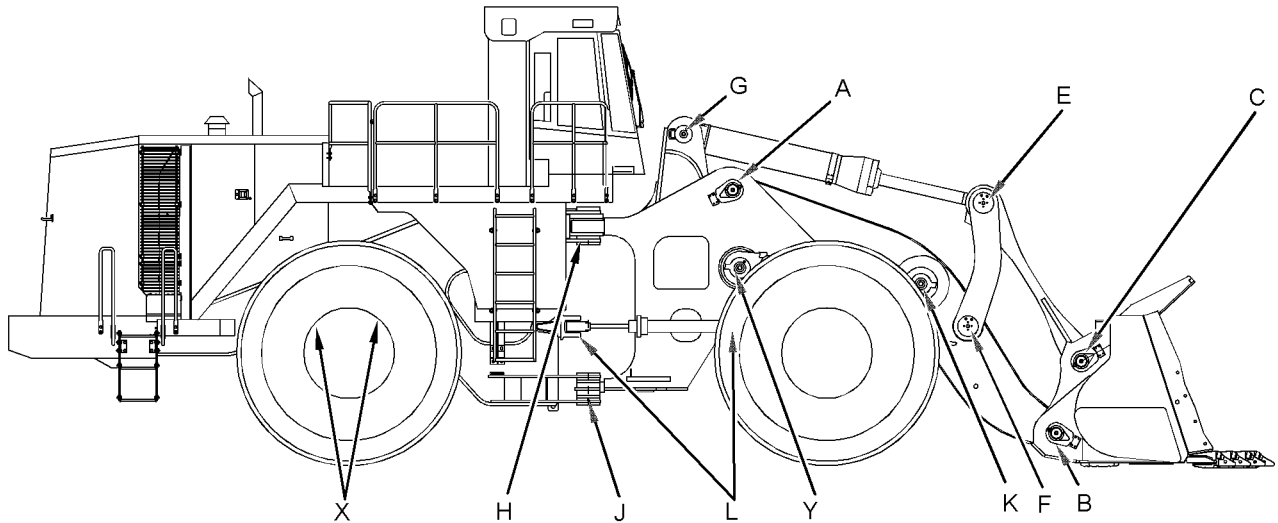


Illustration 81

g01032039

- (A) A-Pin
(B) B-Pin
(C) C-Pin
(E) E-Pin
- (F) F-Pin
(G) G-Pin
(H) Pin for Upper Articulation Joint
(J) Pin for Lower Articulation Joint
- (K) K-Pin
(L) Steering Cylinder Pins
(X) Trunnions
(Y) Y-Pin

1. Remove any buildup of grease. Check that each pin joint is receiving a fresh supply of grease.

Reference: If a fresh supply of grease is not present, refer to Special Instructions, REHS1394 for system troubleshooting procedures.

2. Check the grease level at the top vent port of the reservoir.

Reference: For filling procedures, refer to Operation and Maintenance Manual, “Automatic Lubrication Grease Tank - Fill”.

Settings of the Injectors for the Autolube System

The controller of the autolube system is preset from the factory. The lubrication is dispensed at 15 minute intervals, and all of the injectors are preset at the full flow setting. There may be an excessive buildup of grease around some of the joints. As a result, the grease reservoir may need filling more frequently. The injectors for selected joints can be adjusted in order to reduce the flow of grease without adversely affecting the life of the pin. The injectors are set by the factory at the full flow setting. This setting is equivalent to 8 turns open. When the injectors are adjusted, the injectors should first be closed. Then, the injectors should be opened by the number of specified turns. The recommended settings for the injectors at each pin location are listed in Table 12 .

Table 12

Pins	Qty (Injectors)	Settings (Turns)
A	0	8
B	2	
C	2	
E	3	5
F	2	2
G	1	8
H	1	2
J	1	
K	0	8
L	4	2
X	2	8
Y	0	8

Note: By using the above settings, the buildup of grease will be reduced. The interval between refills of the reservoir will be extended to approximately 250 hours. Grease levels in the reservoir must be checked in order to ensure an uninterrupted flow.

Timer Operation

Autolube systems must be adjusted before being put into use to ensure each joint gets the appropriate amount of grease. Different applications require frequency, volume, and proportioning adjustments from the recommended or factory settings.

Autolube settings must be monitored and adjusted as needed to account for changes in application, temperature, grease type, and NLGI grade.

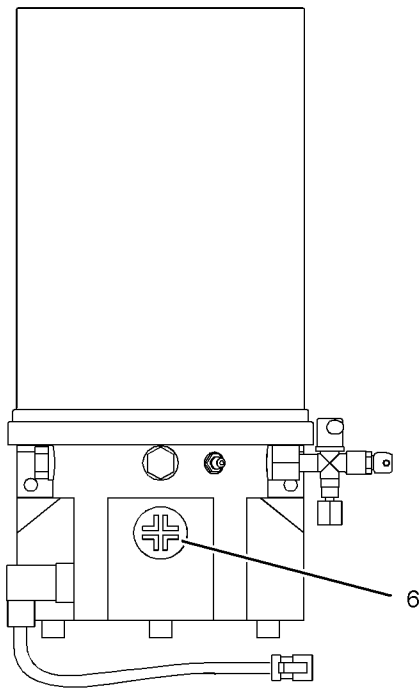


Illustration 82

g01239276

(6) Access plug

Remove access plug (6) on the front of the pump in order to access the timer control. The timer control group consists of the following:

- Manual lubrication switch
- OFF timer rotary switch
- ON timer rotary switch
- Power ON LED
- Pump ON LED

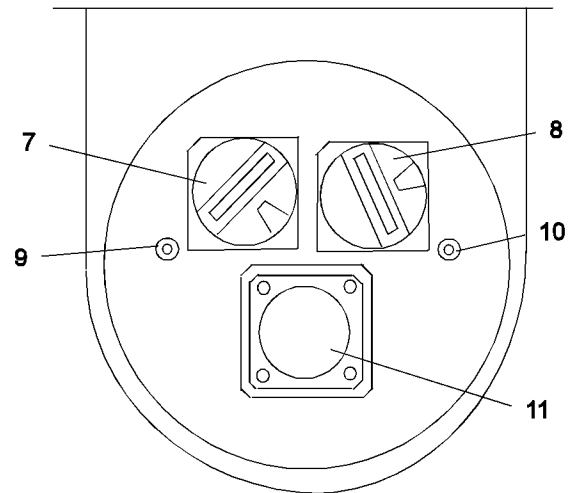


Illustration 83

g01238978

Timer control

- (7) OFF timer switch
- (8) ON timer switch
- (9) Power ON LED.
- (10) Pump motor ON LED
- (11) Push button for manual lubrication

OFF timer switch (7) can be adjusted to 15 values. See Table 1 for the time interval for each value.

ON timer switch (8) can be adjusted to 15 values. See Table 1 for the time interval for each value.

LED (9) is marked "battery". This LED will illuminate when power is sent to the pump control.

LED (10) is marked "motor". This LED will illuminate when the pump is pumping lubricant.

Press push button (11) for 2 seconds. This process will initiate a manual lubrication cycle.

The OFF position of the timer begins accumulating time when the ignition switch closes. When the OFF position of the timer reaches the preset value, the pump will turn ON. The pump remains activated for the time period that is preset on the ON timer.

When the ignition is turned OFF, the used time is saved for an unlimited duration.

Turn the ignition to the ON position. The automatic lubrication operation will finish the cycle time.

Note: Do not use the zero setting that is located on the timer switches.

Note: The factory setting for the OFF position is "4" (16 minutes). The factory setting for the ON position is "2" (4 minutes).

Maintenance Section
Axle Oscillation Bearings - Lubricate

Table 13

OFF TIME Rotary Switch Setting	Interval Be- tween Cycles	ON TIME Rotary Switch Setting	Cycle Time of the Pump
0	0 minutes	0	0 minutes
1	4 minutes	1	2 minutes
2	8 minutes	2	4 minutes
3	12 minutes	3	6 minutes
4	16 minutes	4	8 minutes
5	20 minutes	5	10 minutes
6	24 minutes	6	12 minutes
7	28 minutes	7	14 minutes
8	32 minutes	8	16 minutes
9	36 minutes	9	18 minutes
A	40 minutes	A	20 minutes
B	44 minutes	B	22 minutes
C	48 minutes	C	24 minutes
D	52 minutes	D	26 minutes
E	56 minutes	E	28 minutes
F	60 minutes	F	30 minutes

Note: If the Lincoln 94824 Pump or the printed circuit board are replaced in the field, contact Lincoln Technical Service Department at 314-679-4200 ext. 4782 for instructions on special jumper pin setting for timer operation prior to installation and start up.

i02044747

Axle Oscillation Bearings - Lubricate

SMCS Code: 3268-086-BD; 3278-086-BD

Wipe the fittings before you apply any lubricant.

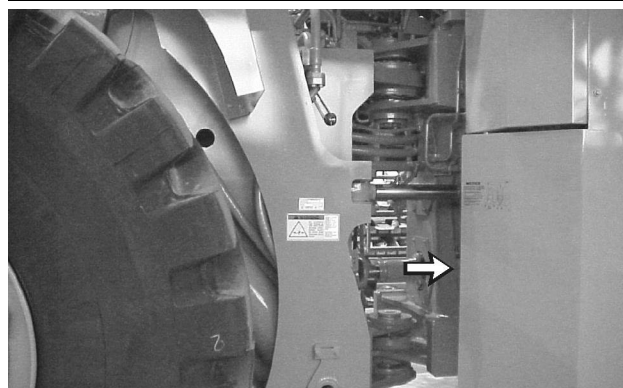


Illustration 84

g00761327

The two remote fittings are located near the articulation joint on the left side of the machine.

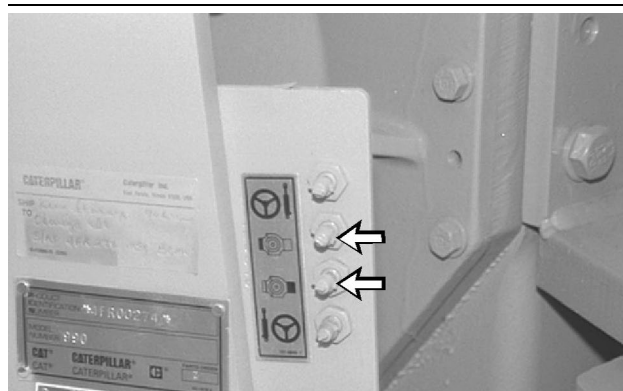


Illustration 85

g01050142

Apply lubricant through the two remote fittings.

i02044811

Backup Alarm - Test

SMCS Code: 7406-081

i01861362

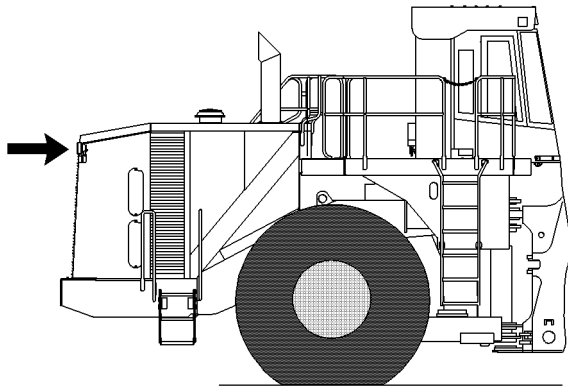


Illustration 86

g00847524

The backup alarm is behind the fan guard on the rear of the machine.

1. Turn the engine start switch to the ON position in order to perform the test.
2. Apply the service brake.
3. Move the transmission direction control switch to the REVERSE position. The backup alarm should immediately sound. The backup alarm will continue to sound until the transmission direction control switch is moved to the NEUTRAL position or to the FORWARD position.

i01861358

Battery - Clean

SMCS Code: 1401-070

Open the battery compartments on the left and right sides of the rear bumper.

Clean the battery terminals and the surfaces of the batteries with a clean cloth. Coat the battery terminals with petroleum jelly. Make sure that the battery cables are installed securely.

i06543763

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

Battery Hold-Down - Tighten

SMCS Code: 7257-527

Open the battery compartments on the left and right sides of the rear bumper.

Over time, the vibration of an operating machine can cause the battery hold-downs to loosen. To help to prevent loose batteries and the possibility of loose cable connections, tighten the four locknuts (two per battery) to a torque of 14 ± 2 N·m (10 ± 1.5 lb ft).

i01835250

Battery or Battery Cable - Inspect/Replace

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

1. Turn the engine start switch key to the OFF position. Turn all of the switches to the OFF position.
2. Turn the battery disconnect switch to the OFF position. Remove the key.
3. Disconnect the positive battery cable at the battery disconnect switch. The battery disconnect switch is connected to the machine frame.

Note: Do not allow the disconnected battery cable to contact the disconnect switch.

4. Disconnect the negative battery cable at the battery that is connected to the battery disconnect switch. If the machine has four 12 volt batteries, disconnect the negative battery cables of two of the batteries.
5. Make any necessary repairs or replace the battery.
6. Reconnect the negative battery cable at the battery that is connected to the battery disconnect switch.
7. Reconnect the positive battery cable at the battery disconnect switch.
8. Install the key and turn the battery disconnect switch to the ON position.

i01861375

Belts - Inspect/Adjust/Replace

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

Alternator Belt

1. Stop the engine. Open the right side engine access door.

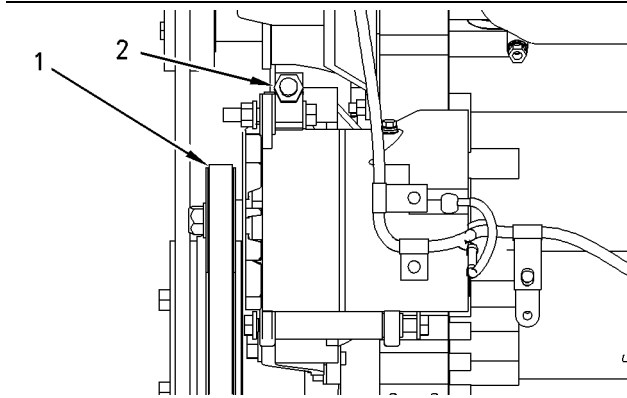


Illustration 87

g00949309

2. Inspect the condition of alternator belt (1). If the belt is cracked or frayed, replace the belt.
3. Use a Kent Moore Company BT-33-97 gauge to check the tension of the alternator belt.

The tension of a used alternator belt with more than 30 minutes of operation at rated speed should be 400 ± 44 N (90 ± 10 lb). The tension of a new alternator belt with 30 minutes of operation or less at rated speed should be 534 ± 22 N (120 ± 5 lb).

Adjusting the Tension of the Alternator Belt

1. Loosen mounting bolt (2) and the adjusting locknut.
2. Move the alternator until the correct tension is reached.
3. Tighten the adjusting locknut and mounting bolt (2).
4. Recheck the belt tension. If the belt tension is incorrect, repeat the adjustment procedure.

Air Conditioner Belt

1. Stop the engine. Open the right side engine access door.

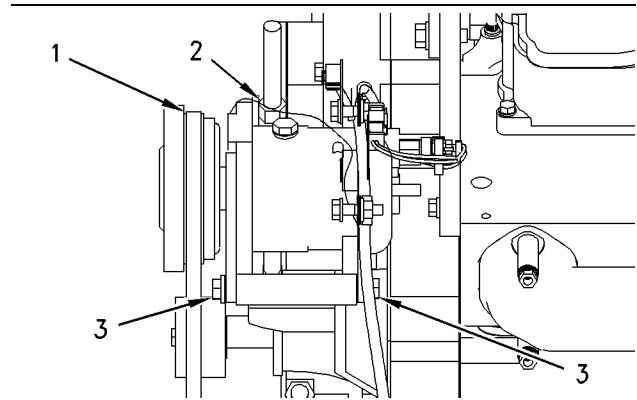


Illustration 88

g00949214

2. Inspect the condition of air conditioner belt (1). If the belt is cracked or frayed, replace the belt.
3. Use a Kent Moore Company BT-33-97 gauge to check the tension of the air conditioner belt.

The tension of a used air conditioner belt with more than 30 minutes of operation at rated speed should be 400 ± 44 N (90 ± 10 lb). The tension of a new air conditioner belt with 30 minutes of operation or less at rated speed should be 534 ± 22 N (120 ± 5 lb).

Adjusting the Tension of the Air Conditioner Belt

1. Loosen two pivot bolts (3).
2. Loosen two adjusting nuts (2).
3. Move the adjusting nuts until the correct belt tension is reached.
4. Tighten the two adjusting nuts. The torque for the nuts is 150 ± 20 N·m (110 ± 15 lb ft).
5. Tighten two pivot bolts (3).

- Recheck the belt tension. If the belt tension is incorrect, repeat the adjustment procedure.

i01445933

Brake Accumulator - Check

SMCS Code: 4263-535

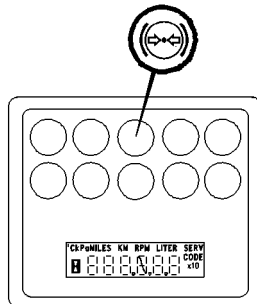


Illustration 89

g00757073

- Turn the engine start switch to the ON position. The alert indicator for the brake oil pressure should come on if the braking system is not at the normal operating pressure.
- Start the engine and run the engine for one minute in order to increase the accumulator pressure. The alert indicator for the brake oil pressure should go off. Stop the engine.
- Apply the service brake pedal for a minimum of five applications until the alert indicator for the brake oil pressure comes on.
- If the alert indicator for the brake oil pressure comes on with less than five applications of the service brake pedal, measure the nitrogen precharge pressure of the accumulator.

Your Caterpillar dealer has the appropriate tools for measuring the precharge pressure of the brake accumulator. Only use dry nitrogen gas to recharge the brake accumulator.

i01249292

Braking System - Test

SMCS Code: 4251-081; 4267-081

- Park the machine on a hard, dry, level surface.
- Check the area around the machine. Make sure that the machine is clear of personnel and clear of obstacles.

- Make sure that the steering frame lock is in the unlocked position.
- Fasten the seat belt before you test the brakes.

The following tests are used to determine whether the braking system is functional. These tests are not intended to measure the maximum brake holding effort. The required brake holding effort for sustaining a machine at a specific engine rpm varies from one machine to another machine. The variations include differences in the engine setting, the power train efficiency, the brake holding ability, etc.

Service Brake Holding Ability Test

⚠ WARNING

Personal injury can result if the machine moves while testing.

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

This test is performed when the service brakes are engaged. If the machine begins to move, compare the engine rpm to the engine rpm of a prior test. This will indicate the amount of system deterioration.

- Start the engine. Raise the implement slightly. Apply the service brake. Release the parking brake.
- Place the transmission in THIRD SPEED FORWARD while the service brakes are applied.
- Gradually increase the engine speed to high idle. The machine should not move.
- Reduce the engine speed to low idle. Place the transmission in neutral. Engage the parking brake. Lower the implement to the ground. Stop the engine.

If the machine moved during the test, consult your Caterpillar dealer for a brake inspection. Make any necessary repairs before the machine is returned to operation.

Parking Brake Holding Ability Test

⚠ WARNING

Personal injury can result if the machine moves while testing.

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

This test is performed when the parking brake is engaged. If the machine begins to move, compare the engine rpm to the engine rpm of a prior test. This will indicate the amount of system deterioration.

1. Start the engine. Raise the implement slightly. Engage the parking brake.
2. Place the transmission in THIRD SPEED FORWARD.
The parking brake indicator light should come on.
3. Gradually increase the engine speed to high idle. The machine should not move.
4. Reduce the engine speed. Place the transmission in neutral. Lower the implement to the ground. Stop the engine.

If the machine moved during the test, consult your Caterpillar dealer for a brake inspection. Make any necessary repairs before the machine is returned to operation.

i02053319

Cab Air Filter - Clean/Replace

SMCS Code: 7342-510; 7342-070

Note: The filters must be cleaned more often if the machine is being operated in dusty conditions.

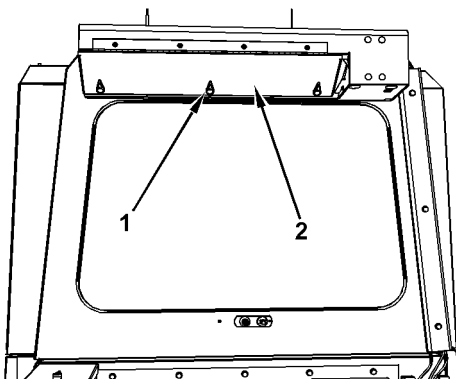


Illustration 90

g01052909

1. Open latches (1) on cover (2) and lift the cover.

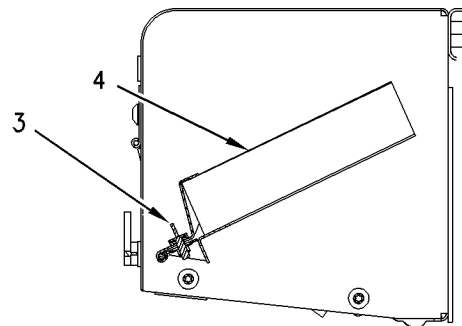


Illustration 91

g00949852

2. Remove retainers (3) from the cover. Remove fresh air filter (4).

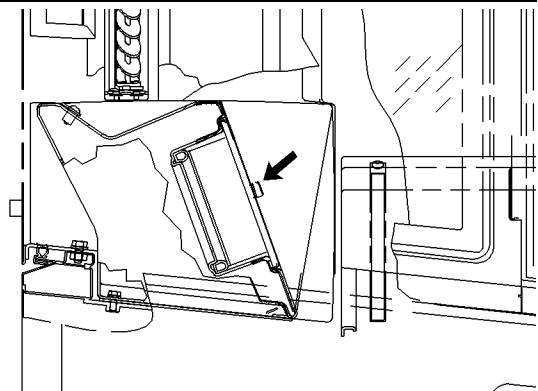


Illustration 92

g00949812

3. Remove the filter cover behind the seat. Remove the recirculation filter.
4. Clean the filter elements with pressure air or wash the filter elements in warm water with a nonsudsing household detergent.
5. If water was used to wash the filter elements, rinse the filter element in clean water and allow the filter element to air dry thoroughly.
6. Install the recirculation filter and the filter cover behind the seat.
7. Install fresh air filter (4) and retainers (3). Close the cover on the outside rear of the cab and close the latches.

i02816405

Camera - Clean (If Equipped)

SMCS Code: 7348-070

In order to maintain sufficient vision, keep the Work Area Vision System (WAVS) camera lens and the display clean.

Display

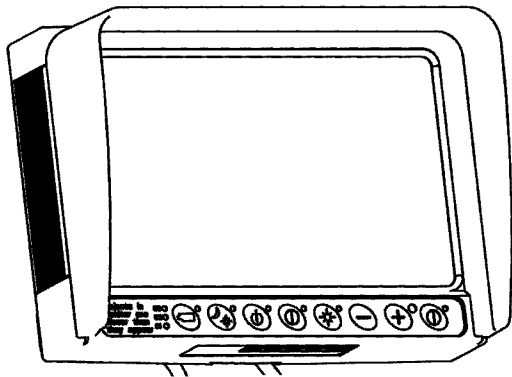


Illustration 93

g01223034

WAVS display

Use a soft, damp cloth in order to clean the display. The display has a soft plastic surface that can be easily damaged by an abrasive material. **The display is not sealed. Do not immerse the display with liquid.**

Camera

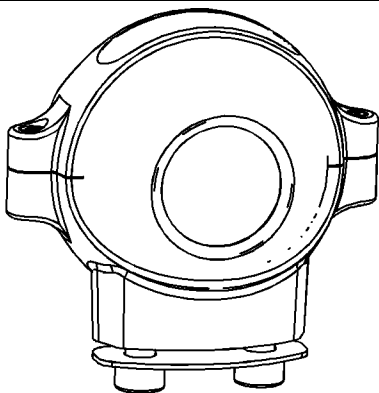


Illustration 94

g01223051

The WAVS camera is located on the rear of the machine in the center of the fan guard.

Use a damp cloth or water spray in order to clean the camera lens. The camera is a sealed unit. The camera is not affected by high pressure spray.

The camera is equipped with an internal heater to help counteract the effects of condensation, snow, or ice.

Note: For more information on WAVS, refer to Operation and Maintenance Manual, SEBU8157, "Work Area Vision System".

i05984657

Case Drain Oil Filters - Replace (If Equipped)

SMCS Code: 5091-510

NOTICE

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

Refer to Special Publication, NENG2500, "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.

Hydraulic Pump Filters

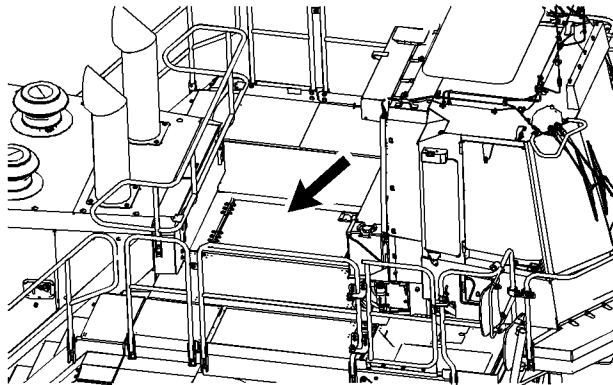


Illustration 95

g02146855

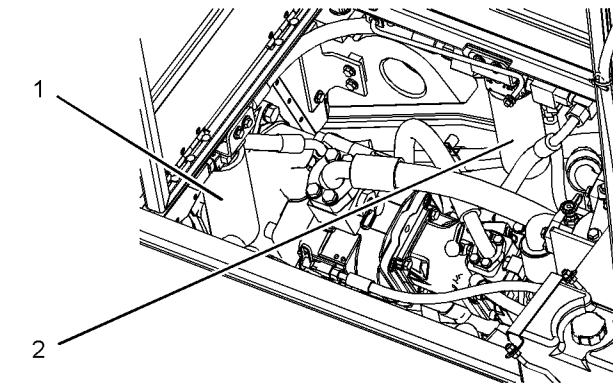


Illustration 96

g02146901

1. Stop the engine
2. Remove the steering pump filter (1) and remove the fan pump filter (2).
3. Clean the filter mounting base.
4. Lubricate the gasket of the new filter with clean hydraulic oil.
5. Discard the filter elements.
6. Install the new filter elements.
7. Check the hydraulic oil level. Refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check" for more details about the hydraulic oil level.
8. Start the engine and run the engine at low idle. Operate the steering, the brakes, and the implements

9. Stop the engine. Inspect the filters for leaks. Make any necessary repairs. Close all access doors.

Hydraulic Fan Motor Filter

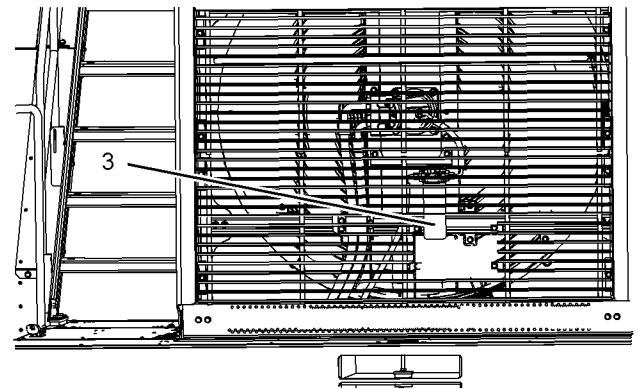


Illustration 97

g02146859

1. Remove the fan motor filter (3).
2. Clean the filter mounting base.
3. Lubricate the gasket of the new filter with clean hydraulic oil.
4. Discard the filter element.
5. Install the new filter element.
6. Check the hydraulic oil level. Refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check" for more details about the hydraulic oil level.
7. Start the engine and run the engine at low idle. Operate the steering, the brakes, and the implements
8. Stop the engine. Inspect the filters for leaks. Make any necessary repairs. Close all access doors.

i02068764

Circuit Breakers - Reset

SMCS Code: 1420-529



Circuit Breaker/Reset – Push in the button in order to reset the circuit breaker. If the system is functioning properly, the button will remain depressed. If the button does not remain depressed, check the appropriate electrical circuit.

The circuit breakers are located under the rear access door on the right side of the cab platform.

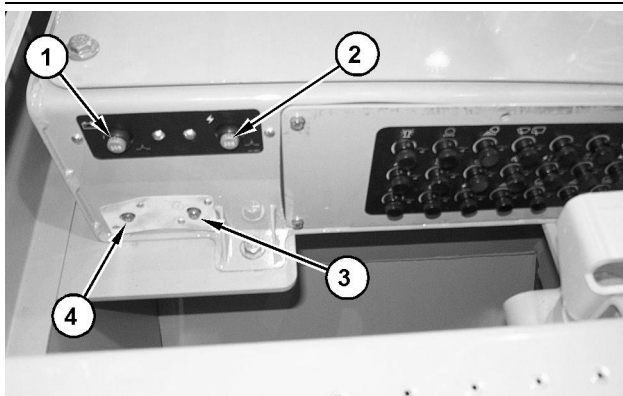


Illustration 98

g01050339

Main Circuit (1) – 105 amp**Alternator (2)** – 105 amp**Engine ECM (3)** – 15 amp**Engine Start Switch (4)** – 10 amp

i01862955

Cooling System Coolant (ELC) - Change

SMCS Code: 1350-044-NL

WARNING

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

NOTICE

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

Use only Caterpillar products or commercial products that have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants. Use only Extender with Cat ELC.

Failure to follow these recommendations can result in shortened cooling system component life.

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

Reference: For information about adding Extender to your cooling system, refer to Operation and Maintenance Manual, "Cooling System Coolant Extender (ELC) - Add" or consult your Caterpillar dealer.

If an Extended Life Coolant was previously used, flush the cooling system with clean water. No other cleaning agents are required. Use the following procedure to change the Extended Life Coolant.

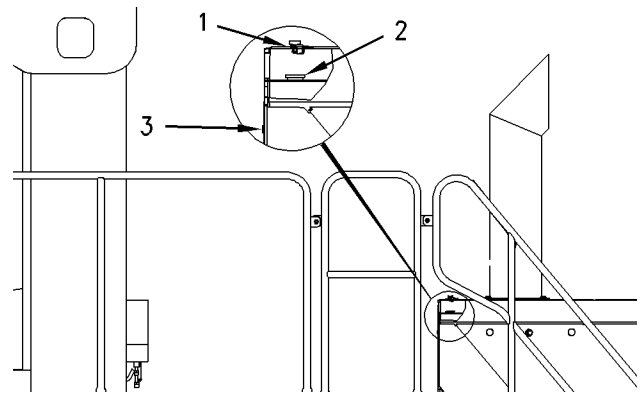


Illustration 99

g00964090

Left side view

1. Open access door (1) on the top of the engine compartment. Slowly remove cooling system pressure cap (2) in order to relieve system pressure.

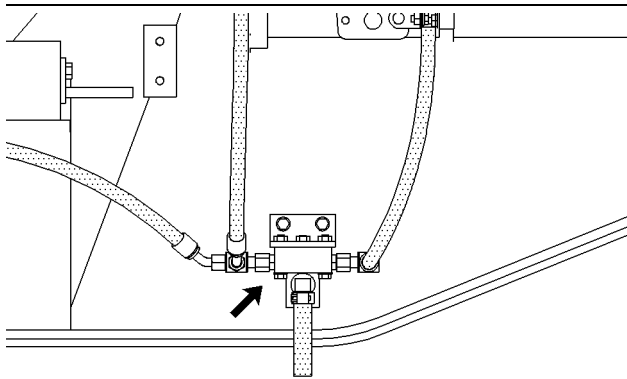


Illustration 100

g00949689

2. The coolant drain valve is located under the right rear of the machine. Open the drain valve. Allow the coolant to drain into a suitable container.
3. Flush the cooling system with clean water until the draining water is clean. Close the drain valve.
4. Replace the water temperature regulator.

Reference: Refer to Operation and Maintenance Manual, "Cooling System Water Temperature Regulator - Replace" for the correct procedure.

5. Add the Extended Life Coolant (ELC).

Reference: Refer to Operation and Maintenance Manual, "Capacities (Refill)" for the correct amount.

6. Start the engine. Run the engine without the cooling system pressure cap until the thermostat opens and the coolant level stabilizes.
7. Maintain the coolant level in sight gauge (3).
8. Install the cooling system pressure cap. Close the access door.

i01863590

Cooling System Coolant Extender (ELC) - Add

SMCS Code: 1352-544-NL

WARNING

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

NOTICE

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

Use only Caterpillar products or commercial products that have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants. Use only Extender with Cat ELC.

Failure to follow these recommendations can result in shortened cooling system component life.

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

When a Caterpillar Extended Life Coolant (ELC) is used, an Extender must be added to the cooling system.

Use a 8T-5296 Coolant Test Kit to check the concentration of the coolant.

Reference: For additional information about the addition of Extender, refer to Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

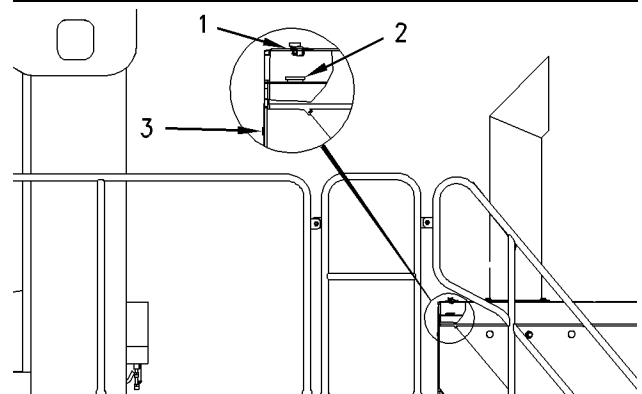


Illustration 101

g00964090

1. Open the small access door (1) on the top of the engine compartment. Slowly remove cooling system pressure cap (2) in order to relieve system pressure.

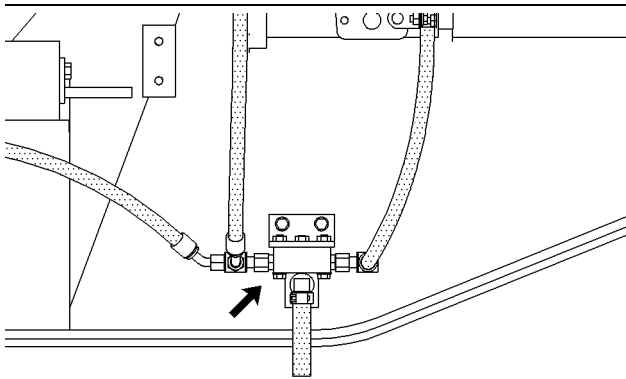


Illustration 102

g00949689

2. If necessary, drain enough coolant from the radiator in order to allow the addition of the Extender to the cooling system. The coolant drain valve is located under the rear of the machine.
3. Add the Extender to the cooling system.

Reference: Refer to Operation and Maintenance Manual, "Capacities (Refill)" for the correct amount.

4. Maintain the coolant level in sight gauge (3).
5. Install the cooling system pressure cap. Close the access door.

i01889708

Cooling System Coolant Level - Check

SMCS Code: 1350-535-FLV

WARNING

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

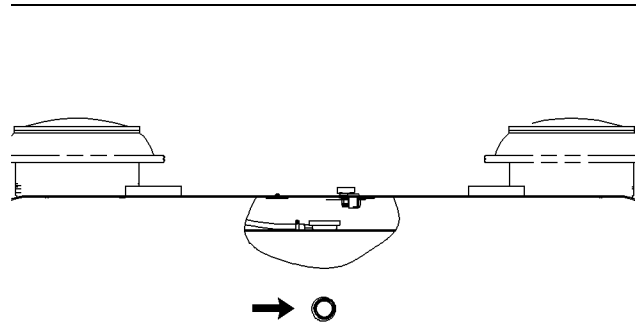


Illustration 103

g00949993

Maintain the coolant level in the sight gauge. If it is necessary to add coolant daily, check for leaks.

i02279524

Cooling System Coolant Sample (Level 1) - Obtain

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

Note: It is not necessary to obtain a Coolant Sample (Level 1) if the cooling system is filled with Cat ELC (Extended Life Coolant). Cooling systems that are filled with Cat ELC should have a Coolant Sample (Level 2) that is obtained at the recommended interval that is stated in the Maintenance Interval Schedule.

Note: Obtain a Coolant Sample (Level 1) if the cooling system is filled with any other coolant instead of Cat ELC. This includes the following types of coolants.

- Commercial long life coolants that meet the Caterpillar Engine Coolant Specification -1 (Caterpillar EC-1)
- Cat Diesel Engine Antifreeze/Coolant (DEAC)
- Commercial heavy-duty coolant/antifreeze

NOTICE

Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contaminate may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

Note: Level 1 results may indicate a need for Level 2 Analysis.

Maintenance Section

Cooling System Coolant Sample (Level 2) - Obtain

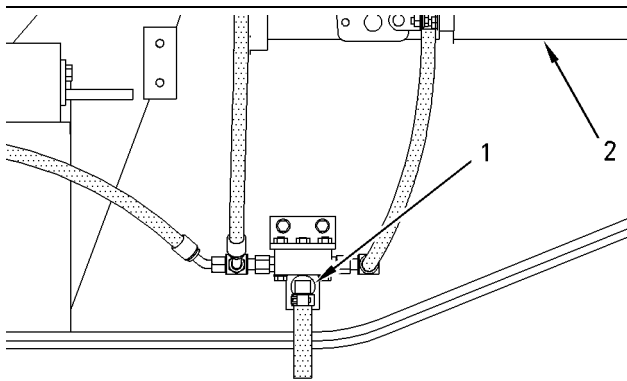


Illustration 104

g00936889

- (1) Coolant drain valve
(2) Engine oil pan

The cooling system is not equipped with a sampling valve. To obtain a sample of the coolant, use the drain valve under the engine compartment on the right rear side of the machine.

Submit the sample for level 1 analysis.

i02053404

Cooling System Coolant Sample (Level 2) - Obtain

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

NOTICE

Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contaminate may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.

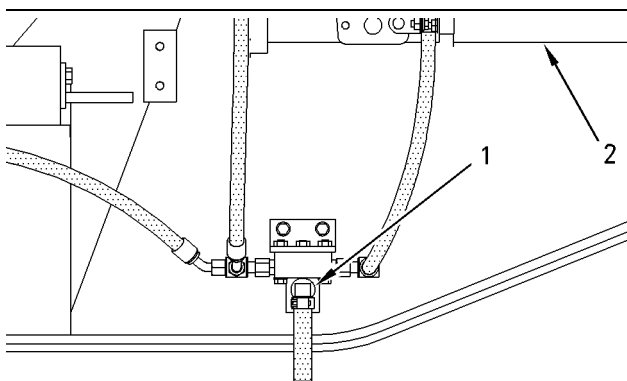


Illustration 105

g00936889

- (1) Coolant drain valve
(2) Engine oil pan

The cooling system is not equipped with a sampling valve. To obtain a sample of the coolant, use the drain valve under the engine compartment on the right rear side of the machine.

Submit the sample for level 2 analysis.

i02046056

Cooling System Water Temperature Regulator - Replace

SMCS Code: 1355-510; 1393-010

WARNING

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

NOTICE

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

NOTICE

Caterpillar engines incorporate a shunt design cooling system and require operating the engine with a thermostat installed.

If the thermostat is installed wrong, it will cause the engine to overheat. Inspect gaskets before assembly and replace if worn or damaged.

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

Replace the water temperature regulator (thermostat) on a regular basis in order to reduce the chance of unscheduled downtime and the chance of problems with the cooling system.

The thermostat should be replaced after the cooling system has been cleaned. Replace the thermostat and the seals while the cooling system is completely drained or while the cooling system coolant is drained to a level that is below the thermostat housing.

Note: If you are only replacing the thermostat, drain the cooling system coolant to a level that is below the thermostat housing. There are two water temperature regulators on this engine. One water temperature regulator is located on each side of the engine.

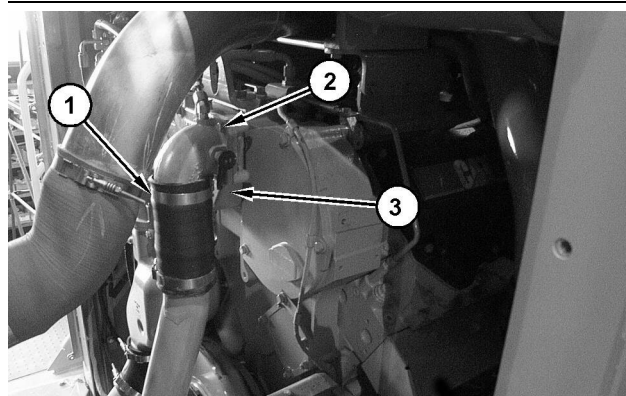


Illustration 106

g01050345

1. Loosen hose clamps (1). Remove hose from housing (3).
2. Remove bolts (2), housing (3), and the gasket.
3. Remove the water temperature regulator. Install a new water temperature regulator.
4. Inspect the gaskets. Replace the gaskets if wear or damage is evident.
5. Install housing (3) and bolts (2).
6. Install hose on housing (3). Tighten hose clamps (1).
7. Repeat Steps 1 through 6 for the remaining water temperature regulator.

i01863697

Crankshaft Vibration Damper - Inspect

SMCS Code: 1205-040

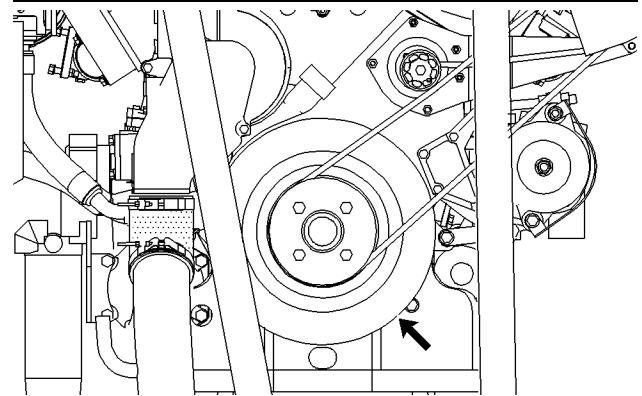


Illustration 107

g00950089

The crankshaft vibration damper is located at the rear end of the engine compartment.

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

Caterpillar recommends replacing the vibration damper for any of the following reasons:

- The engine has had a failure because of a broken crankshaft.
- The S·O·S oil analysis detected a worn crankshaft front bearing.
- The S·O·S oil analysis detected a large amount of gear train wear that is not caused by a lack of oil.
- The alignment marks on the hub and on the outer ring are not in alignment because the rubber seal has separated.

The vibration damper can be used again if none of the above conditions are found and the damper is not damaged.

Note: Some wobble on the outer ring of the vibration damper is normal.

Reference: Refer to Disassembly and Assembly, SENR1013, "3408E & 3412E Engines For Caterpillar Built Machines" for more information.

i03314441

Cutting Edges and End Bits - Inspect/Replace

SMCS Code: 6801-510; 6801-040; 6804-510; 6804-040

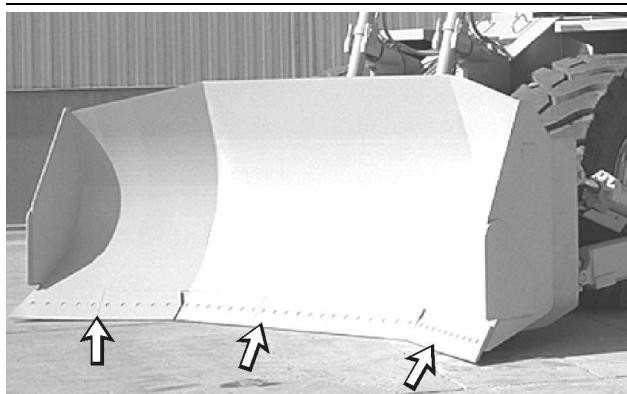


Illustration 108

g00312104

1. Raise the bulldozer blade and block up the bulldozer blade. When you remove the cutting edges and the end bits, maintain the bulldozer blade at a minimum height.
2. Remove the bolts. Then, remove the cutting edge and the end bits.
3. Thoroughly clean all contact surfaces.
4. Inspect the opposite side of the cutting edge. If the opposite side of the cutting edge is not worn, turn the opposite side of the cutting edge outward and install the cutting edge.

If both sides of the cutting edge are worn, install a new cutting edge section.
5. Repeat Step 4 for the end bits.
6. Install all bolts and tighten the bolts to the specified torque. Refer to Specifications, Torque Specifications, "Ground Engaging Tool (G.E.T.) Fasteners".
7. Strike the bolt heads with a 1.4 kg (3 lb) hammer. Tighten the bolts to the specified torque again.
8. Raise the bulldozer blade and remove the blocking. Lower the bulldozer blade to the ground.

i06761495

Differential and Final Drive Oil - Change

SMCS Code: 3278-044; 4050-044

WARNING

Pressurized system: Hot oil can cause serious burns. To open plug, stop engine, wait until axle is cool. The loosen plug slowly to relieve the pressure.

NOTICE

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

Refer to Special Publication, NENG2500, "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.

Note: Perform this procedure on one axle at a time.

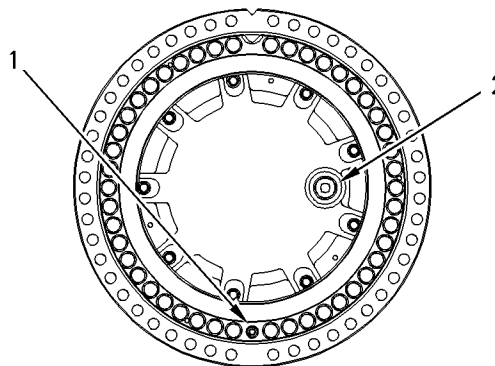


Illustration 109

g00950121

1. Position the wheels so that final drive drain plugs (1) are facing downward. Remove the drain plugs and allow the oil to drain into a suitable container. Clean the drain plugs and install the drain plugs.

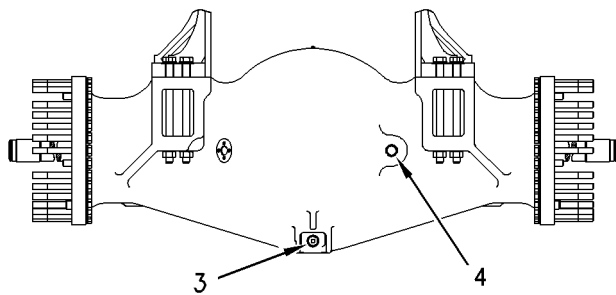


Illustration 110

g00950123

Front axle

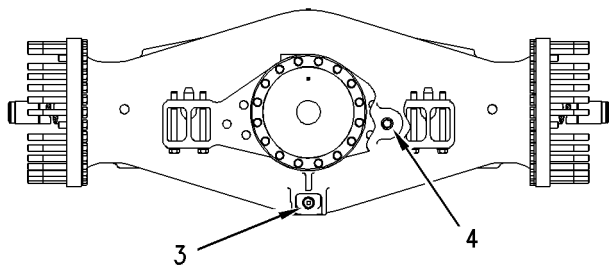


Illustration 111

g00950125

Rear axle

2. Remove differential drain plug (3) and allow the oil to drain into a suitable container. Clean the drain plug and install the drain plug.
3. Remove differential filler plug (4). Fill the differential to the bottom of the filler plug opening.

Reference: Refer to Operation and Maintenance Manual, "Lubricant Viscosities and Refill Capacities" for the correct type of oil and for the correct amount of oil.

4. Clean the filler plug and install the filler plug.
5. Position both wheels so that filler plugs (2) for the final drives are flush with the centerline of each wheel. Remove the filler plugs.
6. Fill the final drives to the bottom of the filler plug openings.

Reference: Refer to Operation and Maintenance Manual, "Lubricant Viscosities and Refill Capacities" for the correct type of oil and for the correct amount of oil.

7. Clean the filler plugs and install the filler plugs.
8. If the specified amount of oil will not fit in the final drives, install the final drive filler plugs. Operate the machine on level ground for a few minutes in order to equalize the oil level in the axles. Remove the final drive filler plugs and add the remaining oil.
9. Operate the machine for a few minutes and recheck the oil level. The oil level should reach the bottom of the filler plug opening.

If the oil level is higher than the filler plug opening, do not allow the oil to drain to the proper level. Install the filler plug.
10. Repeat this procedure for the other differential and final drives.

i06761497

Differential and Final Drive Oil Level - Check

SMCS Code: 3278-535-FLV; 4050-535-FLV

WARNING

Pressurized system: Hot oil can cause serious burns. To open plug, stop engine, wait until axle is cool. The loosen plug slowly to relieve the pressure.

Note: Perform this procedure on one axle at a time.

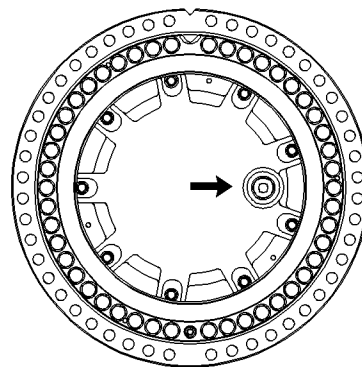


Illustration 112

g00950152

1. Position the wheels so that the filler plugs for the final drives are flush with the centerline of the wheels.
2. Remove the filler plugs. The oil level should be at the bottom of the filler plug openings. Add oil, if necessary.

Maintenance Section
Differential and Final Drive Oil Sample - Obtain

Reference: Refer to Operation and Maintenance Manual, "Lubricant Viscosities" for the correct type of oil.

If the oil level is higher than the filler plug openings, do not allow the oil to drain to the proper level. Install the filler plugs.

i06761499

Differential and Final Drive Oil Sample - Obtain

SMCS Code: 3278-008; 4050-008; 4070-008; 7542

WARNING

Pressurized system: Hot oil can cause serious burns. To open plug, stop engine, wait until axle is cool. The loosen plug slowly to relieve the pressure.

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.

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

1. Operate the machine for a few minutes before obtaining the oil sample. This will thoroughly mix the oil for a more accurate sample.

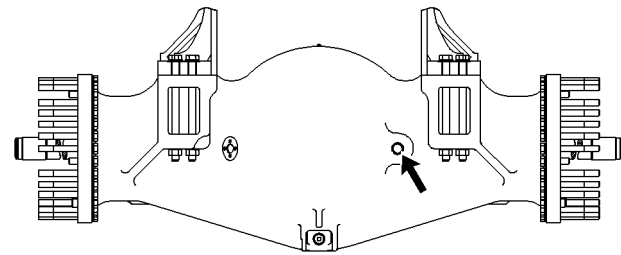


Illustration 113

g00935893

Front axle

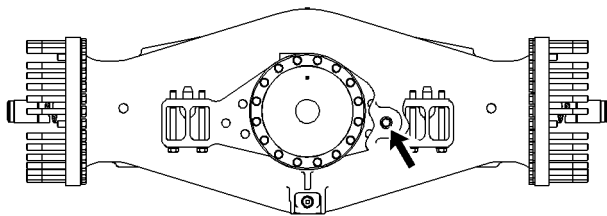


Illustration 114

g00935898

Rear axle

3. Remove the differential filler plug. The oil level should be at the bottom of the filler plug opening. Add oil, if necessary.

Reference: Refer to Operation and Maintenance Manual, "Lubricant Viscosities" for the correct type of oil.

If the oil level is higher than the filler plug opening, do not allow the oil to drain to the proper level. Install the filler plug.

4. Repeat the procedure for the other differential and final drives.

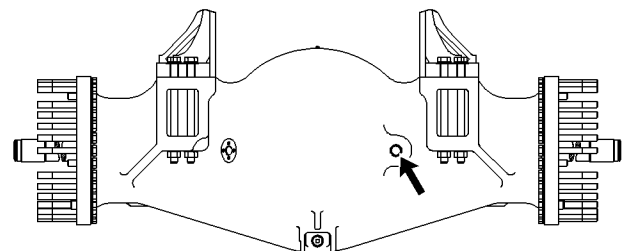


Illustration 115

g00935893

Front Differential Filler Plug

i01863955

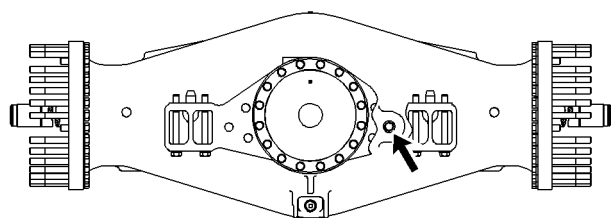


Illustration 116

g00935898

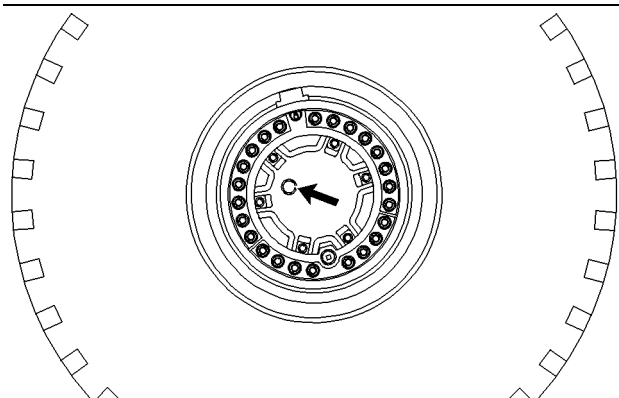
Rear Differential Filler Plug

Illustration 117

g00760182

Final Drive Filler Plug

2. The differential and final drives are not equipped with sampling valves. Obtaining an oil sample will require the use of a vacuum pump or equivalent in order to extract the oil from the component. Extract the oil through the filler openings on the differential and final drives.

Note: This procedure requires a sample for each final drive and each differential. There will be a total of three samples per axle and six samples for this procedure in total. Make sure that you properly record the location of each oil sample.

Reference: For more information, refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" and Special Publication, PEHP6001, "How To Take A Good Oil Sample".

Drive Shaft Spline (Center) - Lubricate

SMCS Code: 3253-086-SN

NOTICE

To prevent damage to the seal, articulate the machine full right or left, before lubricating the splines.

1. Start the engine. Raise the bucket. Release the parking brake. Articulate the machine to the right or to the left.
2. Lower the bucket to the ground. Engage the parking brake. Stop the engine.

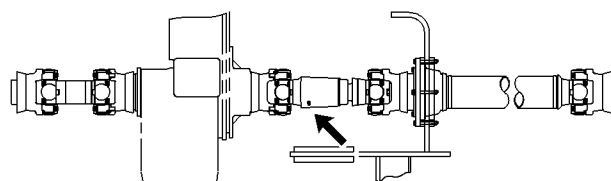


Illustration 118

g00950288

3. Wipe the fitting before you apply any lubricant. Apply lubricant through the fitting on the center drive shaft spline.
4. Start the engine. Raise the bucket. Release the parking brake. Reposition the machine in a straight direction.
5. Lower the bucket to the ground. Apply a slight down pressure. Engage the parking brake. Stop the engine.

i01863808

Drive Shaft Support Bearing - Lubricate

SMCS Code: 3267-086-BD

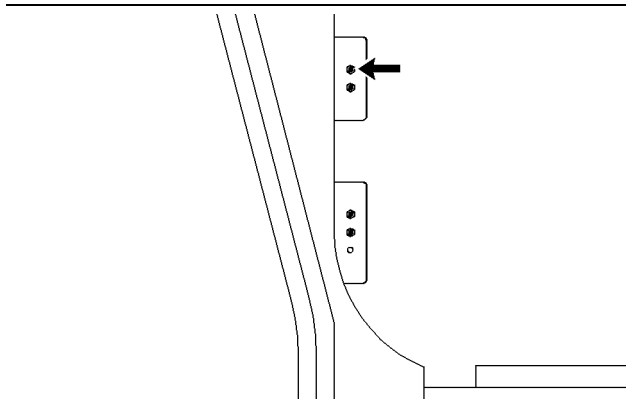


Illustration 119

g00950169

Apply lubricant through the remote fitting that is located on the left side of the machine. Wipe the fitting before you apply any lubricant.

i01863805

Drive Shaft Universal Joints - Lubricate

SMCS Code: 3251-086

Wipe the fittings before you apply any lubricant.

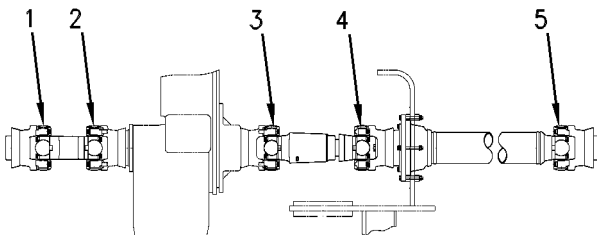


Illustration 120

g00310828

1. Apply lubricant through fittings (1) and (2) on the rear drive shaft universal joints. There is a total of two fittings.
2. Apply lubricant through fitting (3) on the rear end of the center drive shaft universal joint.

3. Apply lubricant through fitting (4) on the front end of the center drive shaft universal joint.
4. Apply lubricant through fitting (5) on the front drive shaft universal joint.

i02549084

Electronic Unit Injector - Inspect/Adjust

SMCS Code: 1251-025; 1251-040; 1290-040; 1290-025

WARNING

Be sure the engine cannot be started while this maintenance is being performed. To prevent possible injury, do not use the starting motor to turn the flywheel.

Hot engine components can cause burns. Allow additional time for the engine to cool before measuring/adjusting the unit injectors.

The electronic unit injectors use high voltage. Disconnect the unit injector enable circuit connector in order to prevent personal injury. Do not come in contact with the injector terminals while the engine is running.

This procedure is recommended by Caterpillar as part of a lubrication and preventive maintenance schedule in order to help provide maximum engine life. Only qualified personnel should perform this procedure.

For information on adjusting the electronic unit injector, refer to Systems Operation, Testing And Adjusting, SENR9937, "C27 and C32 Engines for Caterpillar Built Machines" or consult your Caterpillar dealer.

i01879349

Engine Air Filter Primary Element - Clean/Replace

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

WARNING

To avoid personal injury, always wear eye and face protection when using pressurized air.

NOTICE

Caterpillar recommends certified air filter cleaning services that are available at 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.

NOTICE

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

Clean the engine air filter primary element when the clogged air filter indicator is displayed on the Caterpillar controller. Clean the engine air filter primary element as soon as convenient.

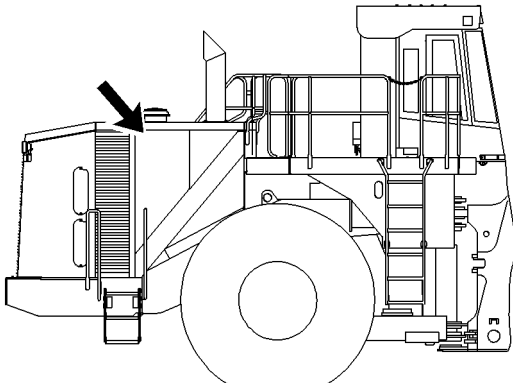


Illustration 121

g00964171

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

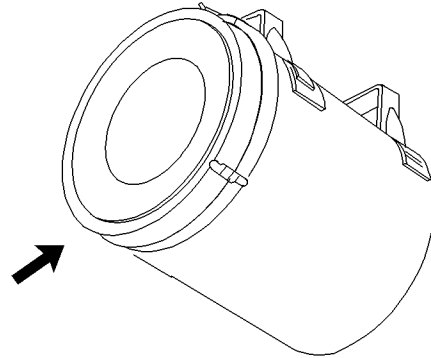


Illustration 122

g00845360

2. Loosen the four cover latches and remove the air cleaner cover.

Note: The latches for the air cleaner housing may snap open when you release the latches.

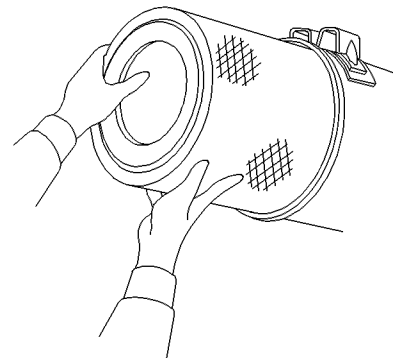


Illustration 123

g00101415

3. Remove the primary filter element from the air cleaner housing. In order to remove the engine air filter primary element, pull the element outward. While you pull the element outward, rock the element.

Use Steps 4 through 6 in order to clean the primary element:

4. Inspect the primary element. If the pleats, the gaskets, or the seals are damaged, discard the element. Replace a damaged primary element with a clean primary element.

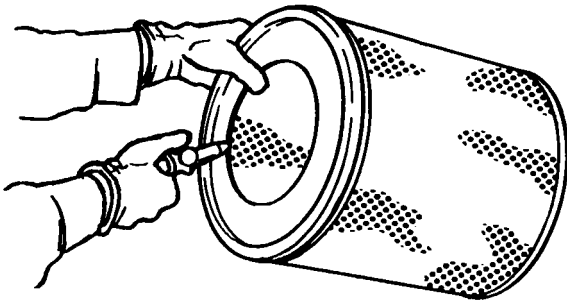


Illustration 124

g00328468

5. If the primary element is not damaged, clean the primary element.

Pressurized air can be used to clean a primary element that has not been cleaned more than two times. Use filtered, dry air at a maximum pressure of 207 kPa (30 psi).

Note: Pressurized air will not remove deposits of carbon and oil.

6. When you clean the primary element, always begin in the inside of the element (clean side). This will force dirt particles toward the outside of the element (dirty side).

Direct the air along the length (inside) of the filter. This will help prevent damage to the paper pleats.

Note: Do not aim the stream of air directly at the primary element. Dirt could be forced further into the pleats.

Use Steps 7 through 10 in order to inspect the primary element:

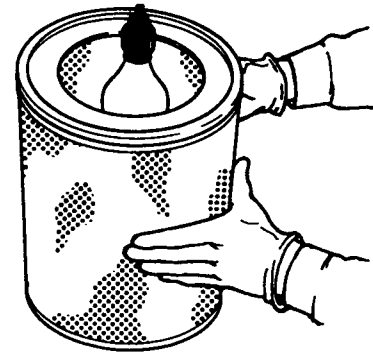


Illustration 125

g00328470

7. Place a light bulb inside the filter element. Use a 60 watt blue light in a dark room or in a similar facility. Inspect the primary element for light that may show through the filter material.
8. Inspect the primary element while you rotate the element. Inspect the primary element for tears and/or holes. Do not use a primary element that has any tears and/or holes in the filter material. Do not use a primary element with damaged pleats, gaskets, or seals.
9. If it is necessary, compare the primary element to a new primary element. Use a new primary element that has the same part number. This may be necessary in order to confirm the results of the inspection.
10. Discard a damaged primary element.

Use Steps 11 through 13 to install a clean primary element:

NOTICE

Do not use a filter if the pleats, the gaskets or the seals are damaged.

11. Install a clean primary filter element over the engine air filter secondary element. Apply firm pressure to the end of the primary element as you gently rock the filter element. This seats the primary element.
12. Clean the cover for the air cleaner housing. Align the slot on the cover with the pin on the air cleaner housing. Install the cover.
13. Close the access door.

Repeat the procedure for the air cleaner on the left side of the machine.

i01632178

Engine Air Filter Secondary Element - Replace

SMCS Code: 1054-510-SE

NOTICE

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

NOTICE

Always replace the secondary element. Do not attempt to reuse it by cleaning. Engine damage could result.

Note: Replace the secondary element when you service the primary element for the third time. If a clean primary element has been installed and a warning for the air filter still occurs, replace the secondary element. Also if the exhaust smoke remains black and a clean primary element has been installed, replace the secondary element.

1. Remove the primary element.

Reference: Refer to Operation and Maintenance Manual, "Engine Air Filter Primary Element - Clean/Replace" for the correct procedure.

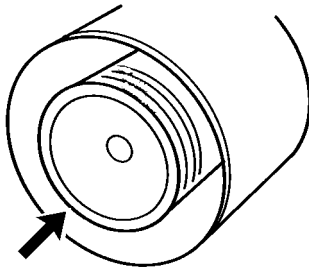


Illustration 126

g00845406

2. Remove the secondary element.
3. Cover the air inlet opening. Clean the inside of the air cleaner housing.
4. Inspect the gasket between the air inlet pipe and the air cleaner housing. Replace the gasket if the gasket is damaged.
5. Uncover the air inlet opening. Install a new secondary element.

6. Install a clean primary element and the cover for the air cleaner housing.
7. Close the access door.
8. Repeat the procedure for the air cleaner on the other side of the machine.

i01549255

Engine Air Filter Service Indicator - Inspect

SMCS Code: 7452-040

NOTICE

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

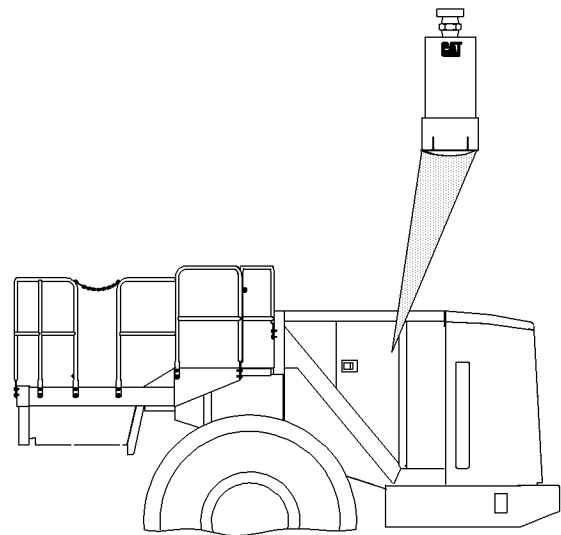


Illustration 127

g00804672

Open the engine access door on the left side of the machine.

The air filter service indicator is located on the air inlet line.

If the yellow piston in the filter service indicator is in the red zone, service the air cleaner.

i01548088

Engine Air Filter Service Indicator - Inspect/Replace

SMCS Code: 7452-040; 7452-510

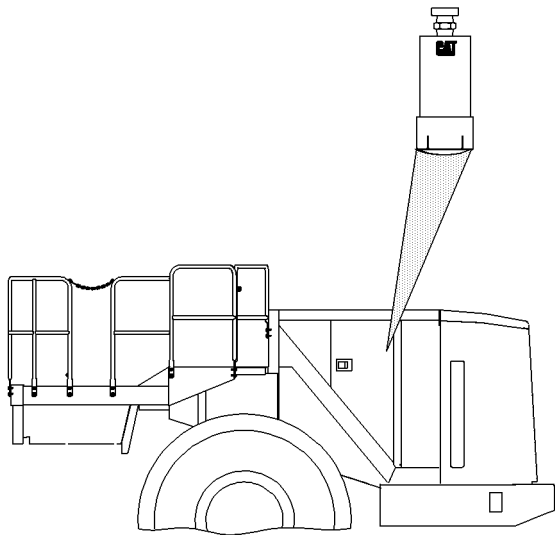


Illustration 128

g00804672

Open the access door on the left side of the machine.

To check the condition of the service indicator, try resetting the service indicator. This should require less than three pushes of the reset button.

Next, check the movement of the yellow piston in the service indicator. Start the engine and accelerate the engine to high idle for a few seconds. After the governor control pedal is released, the yellow piston should remain at the highest position that was achieved during acceleration.

If either of these conditions are not met, replace the service indicator.

i01863898

Engine Air Precleaner - Clean

SMCS Code: 1055-070

NOTICE

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

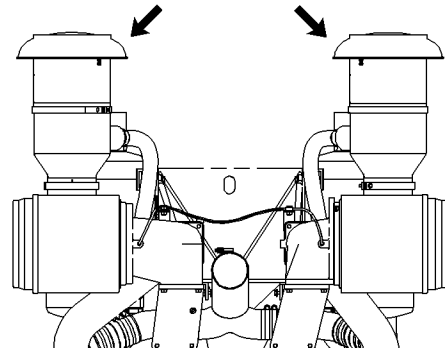


Illustration 129

g00950249

1. Remove the precleaners.
2. Inspect the air inlet screens for dirt and debris. Remove the screens and clean the screens, if necessary.
3. Inspect the precleaner tube openings. Remove any dirt and debris.
4. Clean the precleaners with compressed air or wash the precleaners in warm water. Dry all of the parts.
5. Install the precleaners.

i03304734

Engine Crankcase Breather - Clean

SMCS Code: 1317-070

There are a total of two engine crankcase breathers on the right side of the engine. Perform this procedure for each breather.

1. Park the machine on level ground. Lower the dozer blade to the ground. Move the transmission control switch to the NEUTRAL position and engage the parking brake. Shut off the engine.
2. Open the engine access door on the platform behind the cab on the left side of the machine.

i00689133

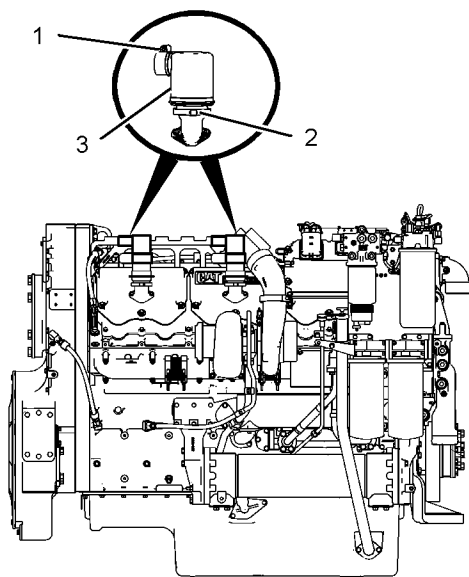


Illustration 130

g01687705

3. Loosen outlet hose clamp (1). Remove the hose from the breather cover.
4. Loosen clamp (2) on the inlet hose and remove the breather element cover assembly (3).
5. Check the condition of the cover seal. If the used seal is damaged, replace the seal with a new seal.
6. Wash the element and the cover assembly in clean, nonflammable solvent.
7. To dry the element, shake the element or use pressure air.
8. Inspect the hose for damage. If necessary, replace the hose.
9. Install the breather element in the cover.
10. Install breather element cover assembly (3). Tighten clamp (2) over the inlet hose.
11. Install the outlet hose and tighten outlet hose clamp (1).
12. Repeat steps 3 through 11 for the other breather.
13. Close the engine access door.

Engine Mounts - Inspect

SMCS Code: 1152-040

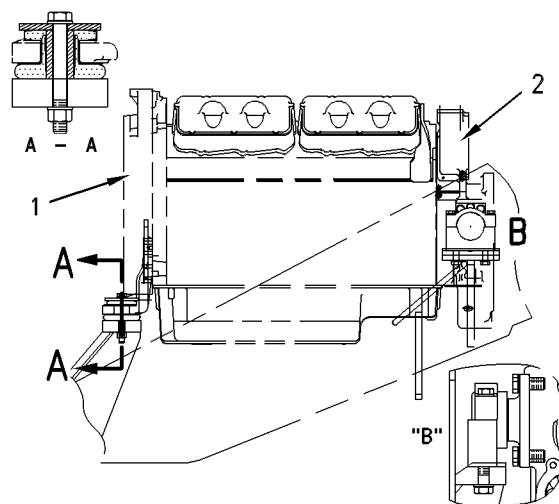


Illustration 131

g00297415

The front housing (1). The flywheel housing (2).

Caterpillar recommends checking the engine mounts for deterioration. Checking the engine mounts will ensure that the bolts have the proper torque. This will prevent excessive engine vibration that is caused from improper mounting.

Refer to Service Manual Module, SENR1017, "Engine Specifications" for the proper bolt torques on the engine mounts.

i02433175

Engine Oil (High Speed) and Oil Filter - Change

SMCS Code: 1318-510-HZ

Selection of the Oil Change Interval

NOTICE

This machine is equipped with an engine that meets EPA Tier 2, Euro Stage II, or MOC Step 2 emission regulations. A 500 hour engine oil change interval is available, provided that operating conditions and recommended multigrade oil types are met. When these requirements are not met, shorten the oil change interval to 250 hours, or use an S·O·S oil sampling and analysis program to determine an acceptable oil change interval.

If you select an interval for oil and filter change that is too long, you may damage the engine.

Caterpillar oil filters are recommended.

Recommended multigrade oil types are listed in Table 14 . Do not use single grade oils.

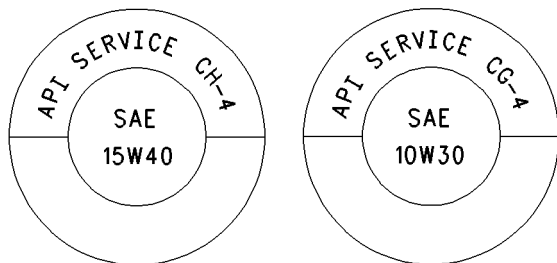


Illustration 132

g00753767

API Trademark

Commercial oils that are licensed by the American Petroleum Institute (API) bear this trademark. Commercial oils that do not bear this trademark are not licensed and these oils are not recommended. Oils that are not listed in Table 14 are not recommended.

Abnormally harsh operating cycles or harsh environments can shorten the service life of the engine oil. Arctic temperatures, corrosive environments, or extremely dusty conditions may require a reduction in engine oil change intervals from the recommendations in Table 14 . Also refer to Manual, SEBU5898, "Cold Weather Recommendations". Poor maintenance of air filters or of fuel filters requires reduced oil change intervals. See your Caterpillar dealer for more information if this product will experience abnormally harsh operating cycles or harsh environments.

Table 14

990H Wheel Loader 844H Wheel Tractor Engine Oil Change Interval ⁽¹⁾				
Multigrade Oil Type	Operating Conditions			
	Normal ⁽²⁾	High Load Factor ⁽³⁾ above 91 L (24 US gal) per hr of fuel	Severe	
			Fuel Sulfur from 0.3% to 0.5% ⁽⁴⁾	Altitude above 1830 m (6000 ft)
Cat DEO Preferred	500 hr	500 hr	500 hr	250 hr ⁽⁶⁾
API CH-4 11.0 minimum TBN ⁽⁴⁾ Preferred	500 hr	500 hr	500 hr	250 hr ⁽⁶⁾
API CH-4 TBN ⁽⁴⁾ below 11.0	500 hr	500 hr	250 hr ⁽⁵⁾	250 hr ⁽⁶⁾
API CG-4	500 hr	250 hr ⁽⁵⁾	250 hr ⁽⁵⁾	250 hr ⁽⁶⁾
API CF-4	250 hr ⁽⁵⁾	250 hr ⁽⁶⁾	250 hr ⁽⁶⁾	250 hr ⁽⁶⁾

⁽¹⁾ The traditional oil change interval for engines is 250 hours. The standard oil change interval in this machine is 500 hours, if the operating conditions and recommended oil types that are listed in this table are met. Improvements in the engine allow this engine oil change interval. This new standard interval is not permitted for other machines. Refer to the applicable Operation and Maintenance Manuals for the other machines.

⁽²⁾ Normal conditions include these factors: Fuel sulfur below 0.3%, altitude below 1830 m (6000 ft) and good air filter and fuel filter maintenance. Normal conditions do not include high load factor, harsh operating cycles, or harsh environments.

⁽³⁾ High load factors can shorten the service life of your engine oil. Continuous heavy load cycles and very little idle time result in increased fuel consumption and oil contamination. These factors deplete the oil additives more rapidly. If the average fuel consumption of your 990 Series II Wheel Loader or 844 Wheel Tractor exceeds 91 L (24 US gal) per hour, follow the "High Load Factor" recommendations in Table 14 . To determine average fuel consumption, measure average fuel consumption for a period of 50 to 100 hours. If the application of the machine is changed, the average fuel consumption may change.

⁽⁴⁾ For sulfur content above 0.5%, refer to Operation and Maintenance Manual, SEBU6250, "Total Base Number (TBN) and Fuel Sulfur Levels for Direct Injection (DI) Diesel Engines".

⁽⁵⁾ In order to verify an oil change interval of 500 hours, refer to "Program A" below.

⁽⁶⁾ Use "Program B" below to determine an appropriate interval.

Adjustment of the Oil Change Interval

Note: Your Caterpillar dealer has additional information on these programs.

Program A

Verification for an Oil Change Interval of 500 Hours

This program consists of three oil change intervals of 500 hours. Oil sampling and analysis is done at 250 hours and 500 hours for each of the three intervals for a total of six oil samples. The analysis includes oil viscosity and infrared (IR) analysis of the oil. If all of the results are satisfactory, the 500 hour oil change interval is acceptable for the machine in that application. Repeat Program A if you change the application of the machine.

If a sample does not pass the oil analysis, take one of these actions:

- Shorten the oil change interval to 250 hours.
- Proceed to Program B.
- Change to a preferred oil type in Table 14 .

Program B

Optimizing Oil Change Intervals

Begin with a 250 hour oil change interval. The oil change intervals are adjusted by increments. Each increment is an additional 50 hours. Periodic oil sampling and analysis is done during each interval. The analysis includes oil viscosity and infrared (IR) analysis of the oil. Repeat Program B if you change the application of the machine.

If an oil sample does not pass the analysis, shorten the oil change interval, or change to a preferred multigrade oil type in the listing above.

References

Reference: Form, PEDP7035, "Optimizing Oil Change Intervals"

Reference: Form, PEDP7036, "S·O·S Fluid Analysis"

Reference: Form, PEDP7076, "Understanding the S·O·S Oil Analysis Tests"

Procedure for Changing the Engine Oil and Filter

Your machine may be equipped with a high speed arrangement for changing the engine oil. The high speed arrangement allows the engine oil to be changed faster than the conventional method.

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

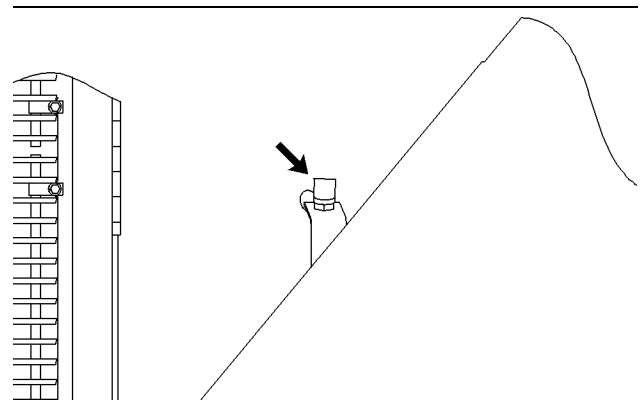


Illustration 133

g00950306

2. Remove the cap that protects the male coupler. Connect an oil pump to the fitting.
3. Turn on the oil pump and withdraw the engine oil from the engine crankcase.
4. Close the access door. Open the engine access door on the left side of the machine in order to access the engine oil filters.

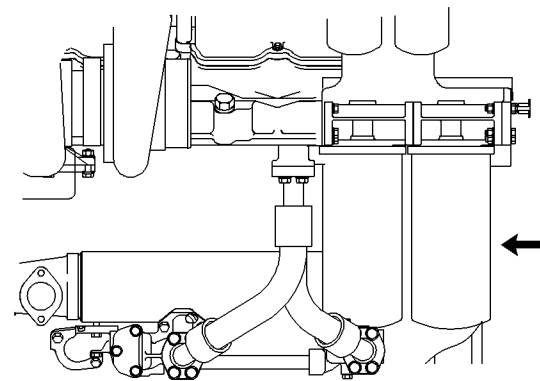


Illustration 134

g00950381

5. Use a strap type wrench to remove the used oil filter elements.
6. Clean the filter mounting base with a clean cloth.

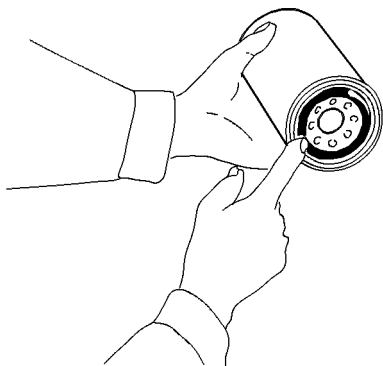


Illustration 135

g00101318

7. Apply a thin film of clean engine oil to the sealing surface of both new filter elements.
8. Install the new filter elements hand tight. When the gasket contacts the filter base, tighten the filter by an additional 3/4 turn.
9. Clean the end of the male coupler for the high speed arrangement. Connect an oil pump to the male coupler. Fill the crankcase with new oil.

Reference: Refer to Operation and Maintenance Manual, "Lubricant Viscosities and Refill Capacities" for the type of lubricant and for the refill capacity.

10. Clean the end of the male coupler and the cap that covers the male coupler. Install the cap.
11. Start the engine and allow the oil to warm. Check the machine for oil leaks.
12. Close the access door.
13. Check the engine oil level.

Reference: Refer to Operation and Maintenance Manual, "Engine Oil Level - Check" for the correct procedure.

i01864246

Engine Oil Level - Check

SMCS Code: 1000-535-FLV

NOTICE

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

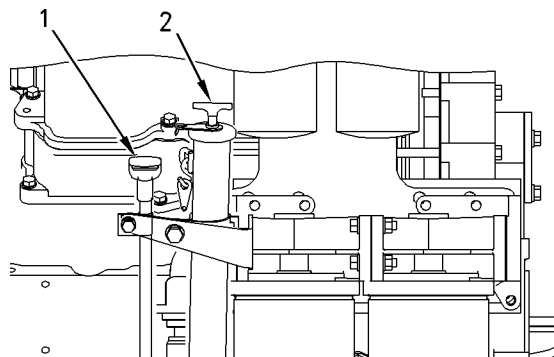


Illustration 136

g00950425

1. Open the access door that is located on the left side of the machine. The oil level dipstick (1) and filler cap (2) are located on the left side of the machine.
2. When the engine is not running, maintain the engine oil within the "Safe Starting Range" on the dipstick.
3. Remove the filler cap (2). If necessary, add oil.
4. Clean the filler cap and install the filler cap.
5. Close the access door.

i01832371

Engine Oil Sample - Obtain

SMCS Code: 1348-008; 7542

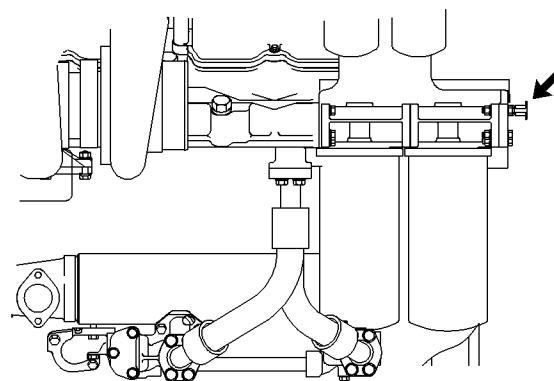


Illustration 137

g00936118

The sampling valve for the engine oil is located on the engine oil filter base on the right side of the machine.

Reference: Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information about obtaining an fluid sample.

i02433180

Engine Oil and Filter - Change

SMCS Code: 1318-510

Selection of the Oil Change Interval

NOTICE

This machine is equipped with an engine that meets EPA Tier 2, Euro Stage II, or MOC Step 2 emission regulations. A 500 hour engine oil change interval is available, provided that operating conditions and recommended multigrade oil types are met. When these requirements are not met, shorten the oil change interval to 250 hours, or use an S·O·S oil sampling and analysis program to determine an acceptable oil change interval.

If you select an interval for oil and filter change that is too long, you may damage the engine.

Caterpillar oil filters are recommended.

Recommended multigrade oil types are listed in Table 15 . Do not use single grade oils.

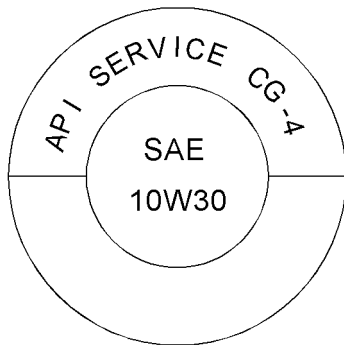


Illustration 138

g01126916

API Trademark

Commercial oils that are licensed by the American Petroleum Institute (API) bear this trademark. Commercial oils that do not bear this trademark are not licensed and these oils are not recommended. Oils that are not listed in Table 15 are not recommended.

Abnormally harsh operating cycles or harsh environments can shorten the service life of the engine oil. Arctic temperatures, corrosive environments, or extremely dusty conditions may require a reduction in engine oil change intervals from the recommendations in Table 15 . Also refer to Manual, SEBU5898, "Cold Weather Recommendations". Poor maintenance of air filters or of fuel filters requires reduced oil change intervals. See your Caterpillar dealer for more information if this product will experience abnormally harsh operating cycles or harsh environments.

Table 15

990H Wheel Loader 844H Wheel Tractor Engine Oil Change Interval ⁽¹⁾				
Multigrade Oil Type	Operating Conditions			
	Normal ⁽²⁾	High Load Factor ⁽³⁾ above 91 L (24 US gal) per hr of fuel	Severe	
			Fuel Sulfur from 0.3% to 0.5% (4)	Altitude above 1830 m (6000 ft)
Cat DEO Preferred	500 hr	500 hr	500 hr	250 hr ⁽⁶⁾
ECF-1 11.0 minimum TBN ⁽⁴⁾ Preferred	500 hr	500 hr	500 hr	250 hr ⁽⁶⁾
ECF-1 TBN ⁽⁴⁾ below 11.0	500 hr	500 hr	250 hr ⁽⁵⁾	250 hr ⁽⁶⁾
API CG-4	500 hr	250 hr ⁽⁵⁾	250 hr ⁽⁵⁾	250 hr ⁽⁶⁾

(1) The traditional oil change interval for engines is 250 hours. The standard oil change interval in this machine is 500 hours, if the operating conditions and recommended oil types that are listed in this table are met. Improvements in the engine allow this engine oil change interval. This new standard interval is not permitted for other machines. Refer to the applicable Operation and Maintenance Manuals for the other machines.

(2) Normal conditions include these factors: Fuel sulfur below 0.3%, altitude below 1830 m (6000 ft) and good air filter and fuel filter maintenance. Normal conditions do not include high load factor, harsh operating cycles, or harsh environments.

(3) High load factors can shorten the service life of your engine oil. Continuous heavy load cycles and very little idle time result in increased fuel consumption and oil contamination. These factors deplete the oil additives more rapidly. If the average fuel consumption of your 990 Series II Wheel Loader or 844 Wheel Tractor exceeds 91 L (24 US gal) per hour, follow the "High Load Factor" recommendations in Table 15 . To determine average fuel consumption, measure average fuel consumption for a period of 50 to 100 hours. If the application of the machine is changed, the average fuel consumption may change.

(4) For sulfur content above 0.5%, refer to Operation and Maintenance Manual, SEBU6250, "Total Base Number (TBN) and Fuel Sulfur Levels for Direct Injection (DI) Diesel Engines".

(5) In order to verify an oil change interval of 500 hours, refer to "Program A" below.

(6) Use "Program B" below to determine an appropriate interval.

Adjustment of the Oil Change Interval

Note: Your Caterpillar dealer has additional information on these programs.

Program A

Verification for an Oil Change Interval of 500 Hours

Maintenance Section
Engine Oil and Filter - Change

This program consists of three oil change intervals of 500 hours. Oil sampling and analysis is done at 250 hours and 500 hours for each of the three intervals for a total of six oil samples. The analysis includes oil viscosity and infrared (IR) analysis of the oil. If all of the results are satisfactory, the 500 hour oil change interval is acceptable for the machine in that application. Repeat Program A if you change the application of the machine.

If a sample does not pass the oil analysis, take one of these actions:

- Shorten the oil change interval to 250 hours.
- Proceed to Program B.
- Change to a preferred oil type in Table 15 .

Program B

Optimizing Oil Change Intervals

Begin with a 250 hour oil change interval. The oil change intervals are adjusted by increments. Each increment is an additional 50 hours. Periodic oil sampling and analysis is done during each interval. The analysis includes oil viscosity and infrared (IR) analysis of the oil. Repeat Program B if you change the application of the machine.

If an oil sample does not pass the analysis, shorten the oil change interval, or change to a preferred multigrade oil type in the listing above.

References

Reference: Form, PEDP7035, "Optimizing Oil Change Intervals"

Reference: Form, PEDP7036, "S·O·S Fluid Analysis"

Reference: Form, PEDP7076, "Understanding the S·O·S Oil Analysis Tests"

Procedure for Changing the Engine Oil and Filter

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

1. Open the engine access door on the right side of the machine.

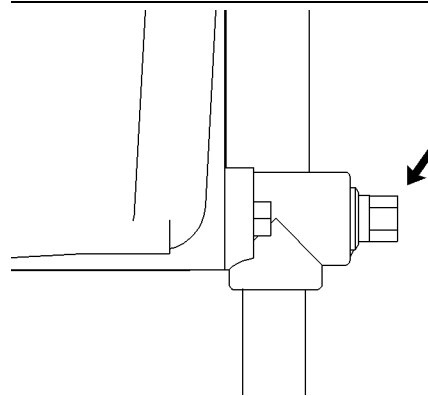


Illustration 139

g00950436

2. The crankcase drain valve is on the oil pan. Open the crankcase drain valve. Allow the oil to drain into a suitable container. Close the drain valve.
3. Open the engine access door on the left side of the machine.

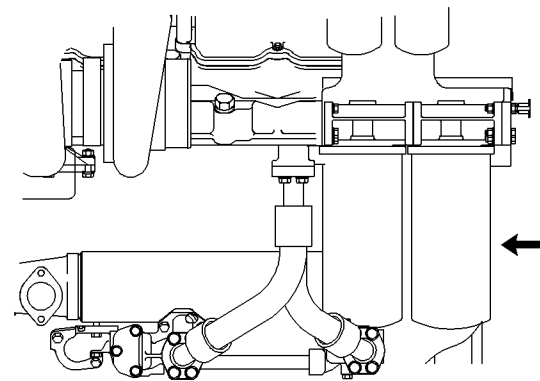


Illustration 140

g00950381

4. Remove the filter elements with a strap type wrench.

Reference: Refer to Operation and Maintenance Manual, "Oil Filter - Inspect" for information about inspecting used filter elements for metal and for other debris.

5. Clean the filter housing base. Make sure that the used filter gasket is completely removed.

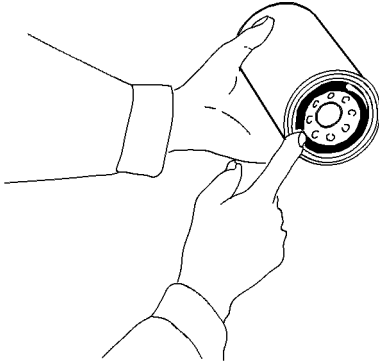


Illustration 141

g00101318

6. Apply a thin coat of oil to the seal on the new filters. Install each new engine oil filter hand tight until the seal of each engine oil filter contacts each base. Note the position of the index marks on each filter in relation to a fixed point on each filter base.

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

7. Tighten the filters according to the instructions that are printed on the filters. Use the index marks as a guide. For non-Caterpillar filters, use the instructions that are provided with the filter.

Note: You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

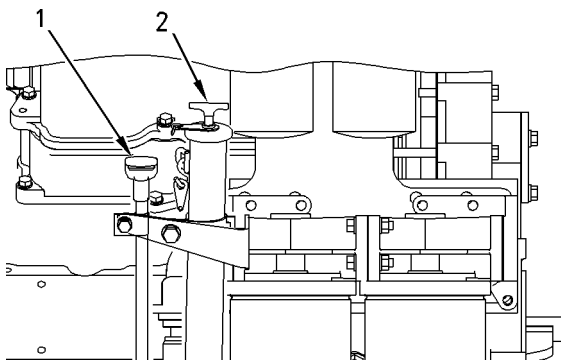


Illustration 142

g00950425

Note: The oil filler plug (2) and dipstick (1) are on the left side of the machine.

8. Remove the oil filler plug. Fill the crankcase with new oil. Clean the filler plug and install the filler plug.

Reference: Refer to Operation and Maintenance Manual, "Capacities (Refill)" in order to determine the correct amount of oil.

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

10. Turn off the engine and check the oil level on the dipstick. Maintain the oil between the "ADD" mark and the "FULL" mark. If necessary, add oil.

11. Close the engine access doors and stop the engine.

i04538255

Engine Valve Lash - Check

SMCS Code: 1105-535

In order to perform the valve lash adjustment, refer to Systems Operation, Testing and Adjusting, "Engine Valve Lash - Inspect/Adjust".

Note: A qualified mechanic should adjust the engine valve lash because special tools and training are required.

i01448018

Engine Valve Rotators - Inspect

SMCS Code: 1109-040

Reference: Refer to Systems Operation/Testing and Adjusting, SENR6577, "3412C Engine For Caterpillar Built Machines" for the complete inspection procedure for the engine valve rotators. Consult your Caterpillar dealer for a proper inspection of the engine valve rotators.

i01394313

Engine Water Pump - Inspect

SMCS Code: 1361-040

Failure of the engine water pump may cause severe engine overheating problems such as cracks in the cylinder head or piston seizure.

Visually inspect the water pump for leaks. If you find leaks, all of the seals on the water pump must be replaced.

Note: For more information, refer to the appropriate Disassembly and Assembly manual for your machine's engine.

i01632017

Ether Starting Aid Cylinder - Replace (If Equipped)

SMCS Code: 1456-510-CD

WARNING

Ether is poisonous and flammable.

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

Use ether only in well ventilated areas.

Do not smoke while changing ether cylinders.

Use ether with care to avoid fires.

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

Do not store ether cylinders in direct sunlight or at temperatures above 49 °C (120 °F).

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

Keep ether cylinders out of the reach of unauthorized personnel.

To avoid possible injury, be sure the brakes are applied and all controls are in **HOLD** or **NEUTRAL** when starting the engine.

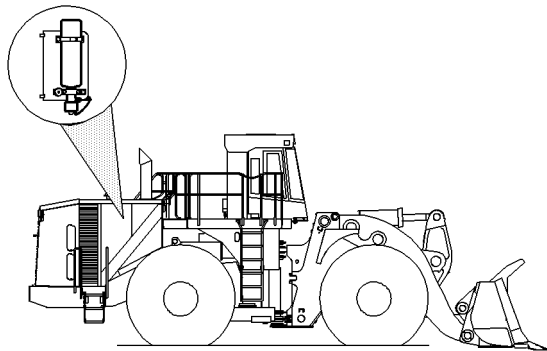


Illustration 143

g00845578

1. Open the engine access door on the right side of the machine. The ether starting aid cylinder is located in front of the air cleaner.
2. Loosen the cylinder retaining clamp. Unscrew the empty ether starting aid cylinder and remove the empty ether starting aid cylinder.

3. Remove the used gasket. Install the new gasket that is provided with each new ether starting aid cylinder.
4. Install the new ether starting aid cylinder. Tighten the ether starting aid cylinder and the cylinder retaining clamp hand tight.
5. Close the engine access door.

i03898359

Fuel Lines - Replace (Low Pressure)

SMCS Code: 1274

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

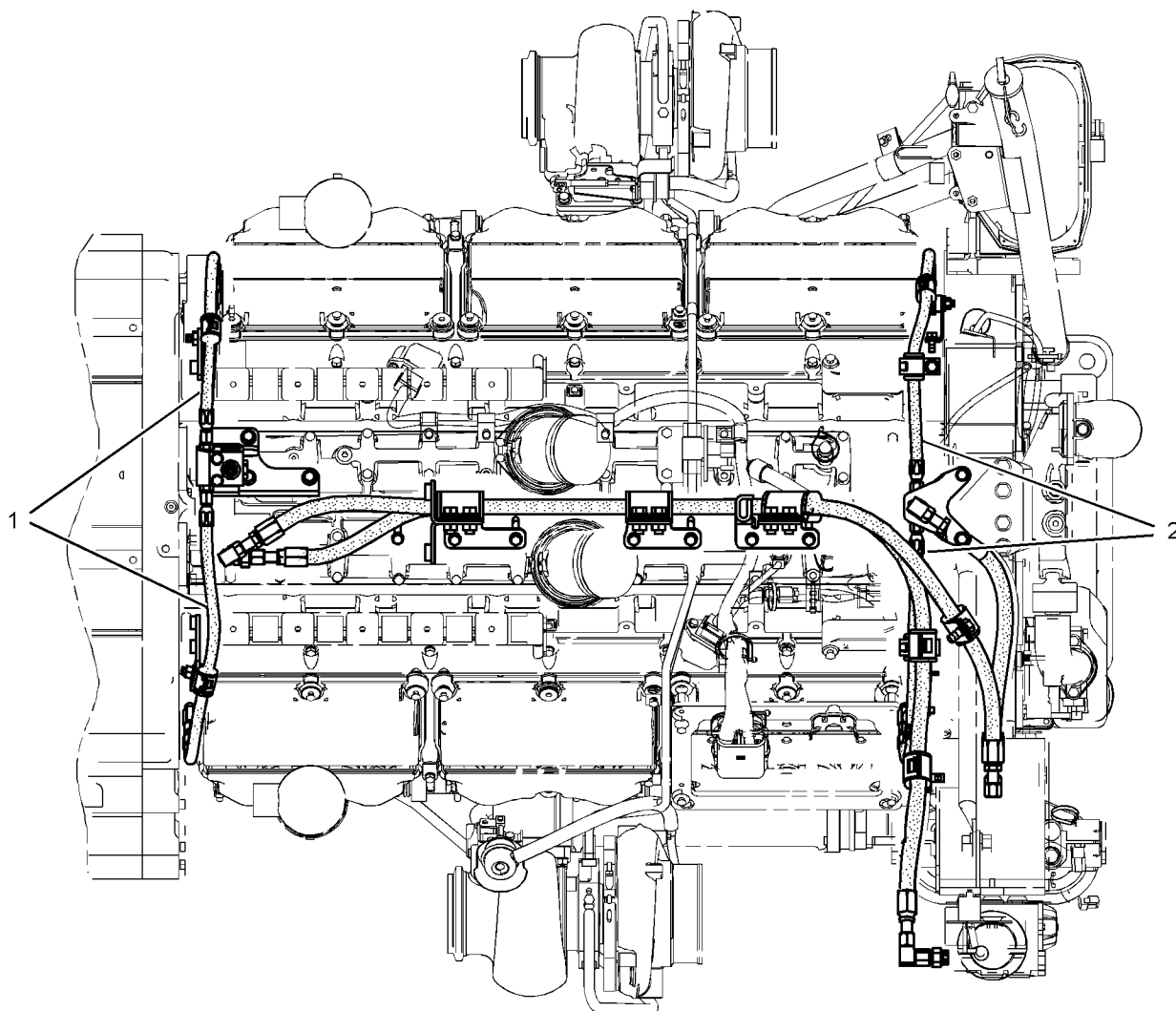
Dispose of all fluids according to local regulations and mandates.

NOTICE

Cleanliness is an important factor. The exterior of the engine should be thoroughly cleaned before the removal procedure. Ensure the area around the Fuel Manifold and the Fuel Lines are thoroughly cleaned. This will prevent contaminants from entering the internal mechanism. Before replacing any Fuel Lines, follow the instructions that are listed below. Replace the Fuel Lines with the correct Fuel Lines Group.

Replace Nonmetallic Fuel Lines

Make sure that the nonmetallic fuel lines are replaced at the engine overhaul.



TOP VIEW OF ENGINE

Illustration 144

g02141035

Top view of engine

Note: The following procedures were written for only specific fuel lines that need replacing. Only remove the fuel lines and clamps that need replacement.

Removal Procedure

1. Turn the fuel supply to the OFF position.
2. Turn the battery disconnect switch to the OFF position.

3. Remove the rear two low-pressure fuel lines (1).

4. Remove the front two low-pressure fuel lines (2).

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Install hose clamps which have been inspected or install new hose clamps. Refer to Specifications, SENR3130, "Torque Specifications" "Hose Clamps" for information about selecting and installing the proper hose clamps.

1. Install the rear two low-pressure fuel lines (1) with new hoses.
2. Install the front two low-pressure fuel lines (2) with new hoses.

Note: Make sure that the hoses do not contact nearby components. Excessive contact with other surfaces will produce chafing that could lead to a leak.

3. Carefully inspect the engine for any spilled fuel. Make sure that no fuel remains on or close to the engine.
4. Turn the battery disconnect switch to the ON position.
5. Turn the fuel supply to the ON position.

Note: Fuel must be added to the fuel system ahead of the fuel filter.

6. Refill the fuel system. Refer to this Operation and Maintenance Manual, "Fuel System - Prime" for information about priming the engine with fuel.

7. Start the engine. Inspect the fuel system for leaks.

i02046075

Fuel System - Prime

SMCS Code: 1250-548

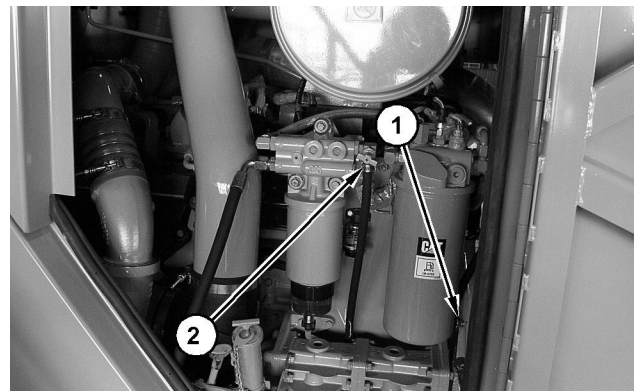


Illustration 145

g01050347

1. Open the engine access door on the left side of the machine.
2. Your machine is equipped with an electric fuel pump. The toggle switch (1) for the electric fuel pump is located above the primary fuel filter on the left side of the machine.
3. A plug (2) is located on the fuel manifold. The plug is used in order to purge air from the fuel lines.
4. Use the toggle switch in order to operate the electric fuel pump. Open the plug. Operate the fuel priming pump until no air bubbles are present from the plug.
5. Tighten the plug when air bubbles are no longer present. Turn off the fuel priming pump.

If the engine does not start or the engine misfires, further priming is necessary.

i02046487

Fuel System Primary Filter (Water Separator) - Drain

SMCS Code: 1263-543

NOTICE

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

Refer to Special Publication, NENG2500, "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

Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts. Fuel system should be primed prior to starting the engine.

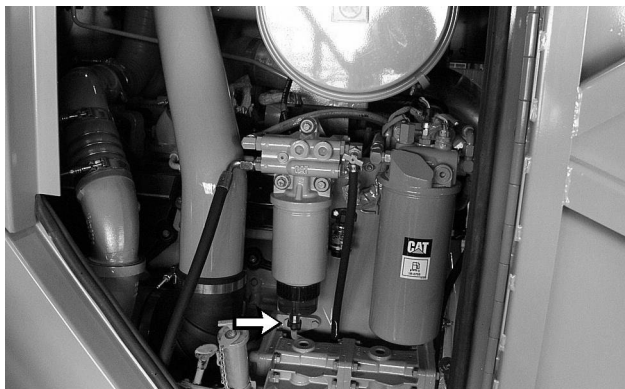


Illustration 146

g01050601

1. Open the engine access door on the left side of the machine. The water separator is located on the bottom of the primary fuel filter.
2. Attach a rubber tube to the bottom of the drain valve on the bottom of the water separator bowl. Open the drain valve. Allow the water and the fuel to drain into a suitable container.
3. Close the drain valve.

Note: The water separator is under suction during normal engine operation. Tighten the drain valve securely in order to prevent air leakage into the fuel system.

4. Close the access door.

i02046731

Fuel System Primary Filter (Water Separator) Element - Replace

SMCS Code: 1260-510; 1263-510-FQ

NOTICE

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



Illustration 147

g01050623

1. Open the engine access door on the left side of the machine.
 2. Open the drain valve on the bottom of the water separator bowl. Allow the water and the fuel to drain into a suitable container.
 3. Remove the primary fuel filter from the mounting base.
 4. Remove the water separator bowl from the filter element. Clean the water separator bowl and the O-ring groove.
- Note:** The water separator bowl is reusable. Do not discard the water separator bowl.
5. Inspect the O-ring seal on the water separator bowl. Replace the O-ring seal, if necessary.
 6. Lubricate the O-ring seal with clean diesel fuel or with engine oil. Place the O-ring seal in the water separator bowl.
 7. Install the water separator bowl onto the new filter element by hand. Do not use tools to tighten the water separator bowl to the filter element.

8. Install the primary fuel filter.
9. Close the drain valve on the bottom of the water separator bowl.

Note: The water separator bowl is under suction during normal engine operation. Tighten the drain valve securely in order to prevent air leakage into the fuel system.

10. Prime the fuel system.

Reference: Refer to Operation and Maintenance Manual, "Fuel System - Prime" for the correct procedure.

11. Close the engine access door.

i01630296

Fuel System Secondary Filter - Replace

SMCS Code: 1261-510-SE

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts. Fuel system should be primed prior to starting the engine.

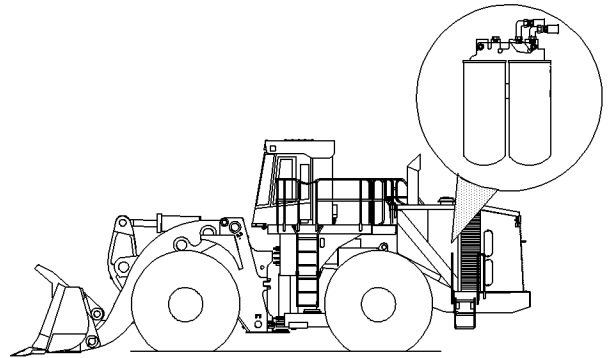


Illustration 148

g00845696

1. Open the engine access door on the left side of the machine.
 2. Use a strap type wrench to remove both filter elements. Dispose of the used filter elements properly.
 3. Clean the filter mounting base. Make sure that all of the used seal is completely removed.
-

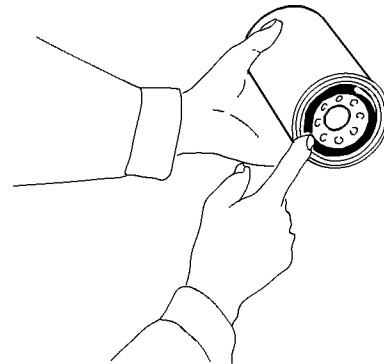


Illustration 149

g00101318

4. Lubricate the seal of the new filter elements with clean diesel fuel.
5. Install the new filter elements by hand. After the gasket contacts the filter mounting base, tighten the filter elements by an additional 3/4 turn.
6. Prime the fuel system.

Reference: Refer to Operation and Maintenance Manual, "Fuel System - Prime" for the correct procedure.

7. Close the engine access door.

i01864344

Fuel Tank Cap and Strainer - Clean

SMCS Code: 1273-070-ZZ; 1273-070-STR

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

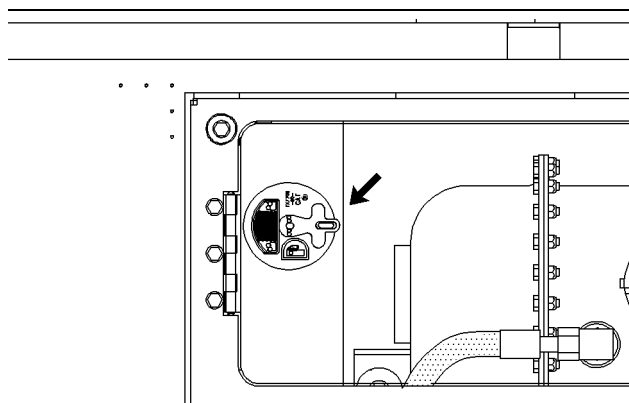


Illustration 150

g00950505

The fuel filler cap is located on the left side of the platform.

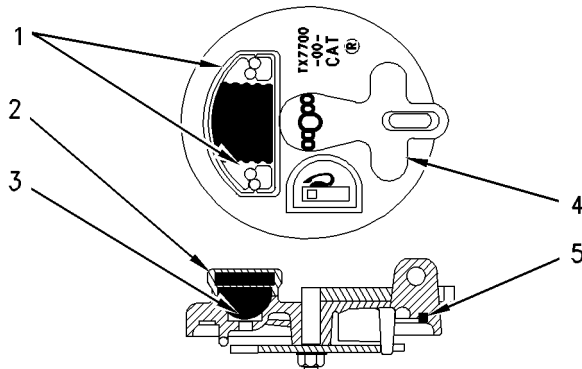


Illustration 151

g00848308

1. Lift lever (4) and turn the lever counterclockwise until the lever stops. Remove the fuel tank cap.

2. Inspect seal (5) for damage. If necessary, replace the seal.
3. Remove screws (1), filter assembly (2), valve (3) and the gaskets.
4. Remove the strainer from the filler opening.
5. Wash the fuel tank cap and the strainer in a clean, nonflammable solvent.
6. Install a new cap filter kit. Install the other components in reverse order.
7. Install the strainer and the fuel tank cap.

i01866057

Fuel Tank Water and Sediment - Drain

SMCS Code: 1273-543-M&S

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

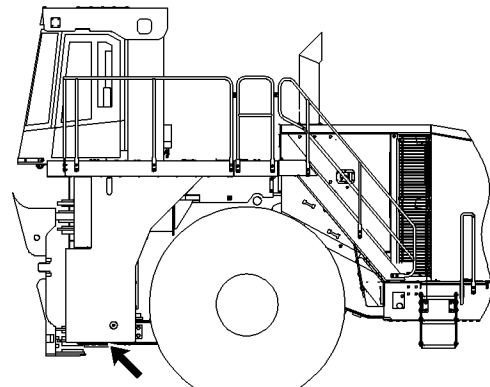


Illustration 152

g00951148

The drain valve is under the fuel tank on the left side of the machine.

1. Open the drain valve. Allow the water and the sediment to drain into a suitable container.
2. Close the drain valve.

i04819237

Fuses - Replace

SMCS Code: 1417-510

NOTICE

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

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

Type 1

The fuse panel is under the rear access door on the right side of the cab platform.



Transmission Control – 10 Amp



Air Filter Restriction Indicator – 10 amp



Product Link and Voltage Converter – 15 amp



Electronic Gauges – 10 amp



Rotating Beacon – 10 amp



Implement Electronic Control – 10 amp



Voltage Converter and Floodlight – 10 Amp



Blower Fan Motor – 20 Amp



Seat Heater and Air Compressor – 15 Amp



Side Window Wipers – 10 Amp



Front and Rear Window Wipers – 10 Amp



Horn – 10 Amp



Rear Floodlights – 10 Amp



Front Floodlights – 10 Amp



Tower Floodlights – 10 Amp

Type 2

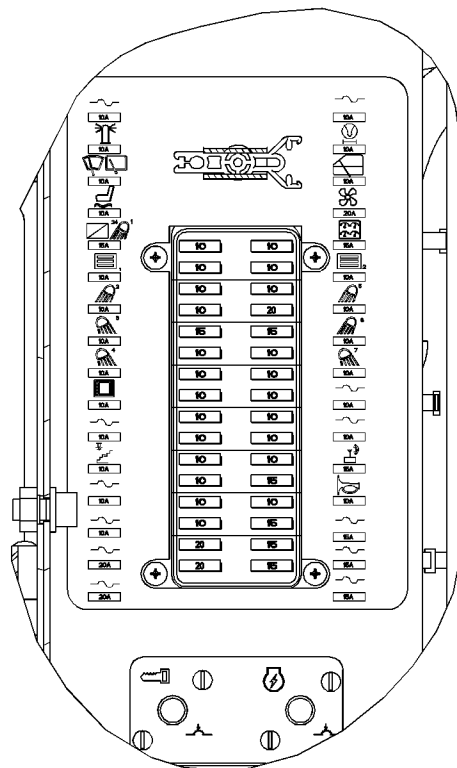


Illustration 153

g01317665



Spare (1) – 10 Amp



Spare (2) – 10 Amp



Beacon (3) – 10 Amp



Air Filter Restriction Indicator (4) – 10 amp



Front and Rear Window Wipers (5) – 10 Amp

**Side Window Wipers (6) – 10 Amp****Seat Heater and Air Compressor (7) – 10 Amp****Blower Fan Motor (8) – 20 Amp****Voltage Converter and Floodlights (Bucket) (9) – 15 Amp****“VIMS” Monitor (ECM) (10) – 15 Amp****Implement Control (11) – 10 Amp****Power Train Control (12) – 10 Amp****Front ROPS floodlights (13) – 10 Amp****Front fender floodlights (14) – 10 Amp****Rear Floodlights (Radiator) (15) – 10 Amp****Front ROPS (HID) (16) – 10 Amp****Rear ROPS Floodlights (17) – 10 Amp****Rear ROPS (HID) (18) – 10 Amp****Rear Monitor (19) (Vision) – 10 Amp****Spare (20) – 10 Amp****Spare (21) – 10 Amp****Spare (22) – 10 Amp****Stairway Access Light (23) – 10 Amp****Product Link (24) – 15 Amp****Spare (25) – 10 Amp****Forward Horn (26) – 10 Amp****Spare (27) – 10 Amp****Spare (28) – 15 Amp****Spare (29) – 20 Amp****Spare (30) – 15 Amp****Spare (31) – 20 Amp****Spare (32) – 15 Amp**

i07349182

High Intensity Discharge Lamp (HID) - Replace (If Equipped)

SMCS Code: 1434-510

WARNING

HID lamps operate at very high voltages. To avoid electrical shock and personal injury, disconnect power before servicing HID lamps.

WARNING

HID bulbs become very hot during operation. Before servicing, remove power from lamp for at least five minutes to ensure lamp is cool.

NOTICE

Although HID bulb materials may change over time, HID bulbs produced at the time of the printing of this manual contain mercury. When disposing of this component, or any waste that contains mercury, please use caution and comply with any applicable laws.

Note: Always use a board or cardboard when the engine components are checked for leaks. Leaking fluid that is under pressure can cause serious injury or possible death, including leaks that are the size of a pin hole. Refer to Operation and Maintenance Manual, "General Hazard Information" for more information.

1. Remove the electrical power from the high intensity discharge lamp (HID). The electrical power must be removed from the HID lamp for at least five minutes, in order to ensure that the bulb is cool.
2. Disassemble the housing for the HID lamp in order to have access to the bulb.

Note: On some HID lamps, the bulb is an integral part of the lens assembly. The bulb is not removed separately from the lens assembly. Replace the entire lens assembly on these HID lamps.

3. Remove the bulb from the HID lamp.
4. Install the replacement bulb in the HID lamp.

If the bulb is an integral part of the lens assembly, install the replacement lens assembly in the HID lamp.

Note: In order to avoid failure to the bulb that is premature, avoid touching the bulb's surface with your bare hands. Clean any fingerprints from the bulb with alcohol prior to operation.

5. Reassemble the housing for the HID lamp. Ensure that any printing on the lens is oriented correctly with respect to the HID lamp's mounting position on the machine.
6. Reattach the electrical power to the HID lamp.
7. Check the HID lamp for proper operation.

Note: Consult your Cat dealer for additional information on HID lamps.

i03898378

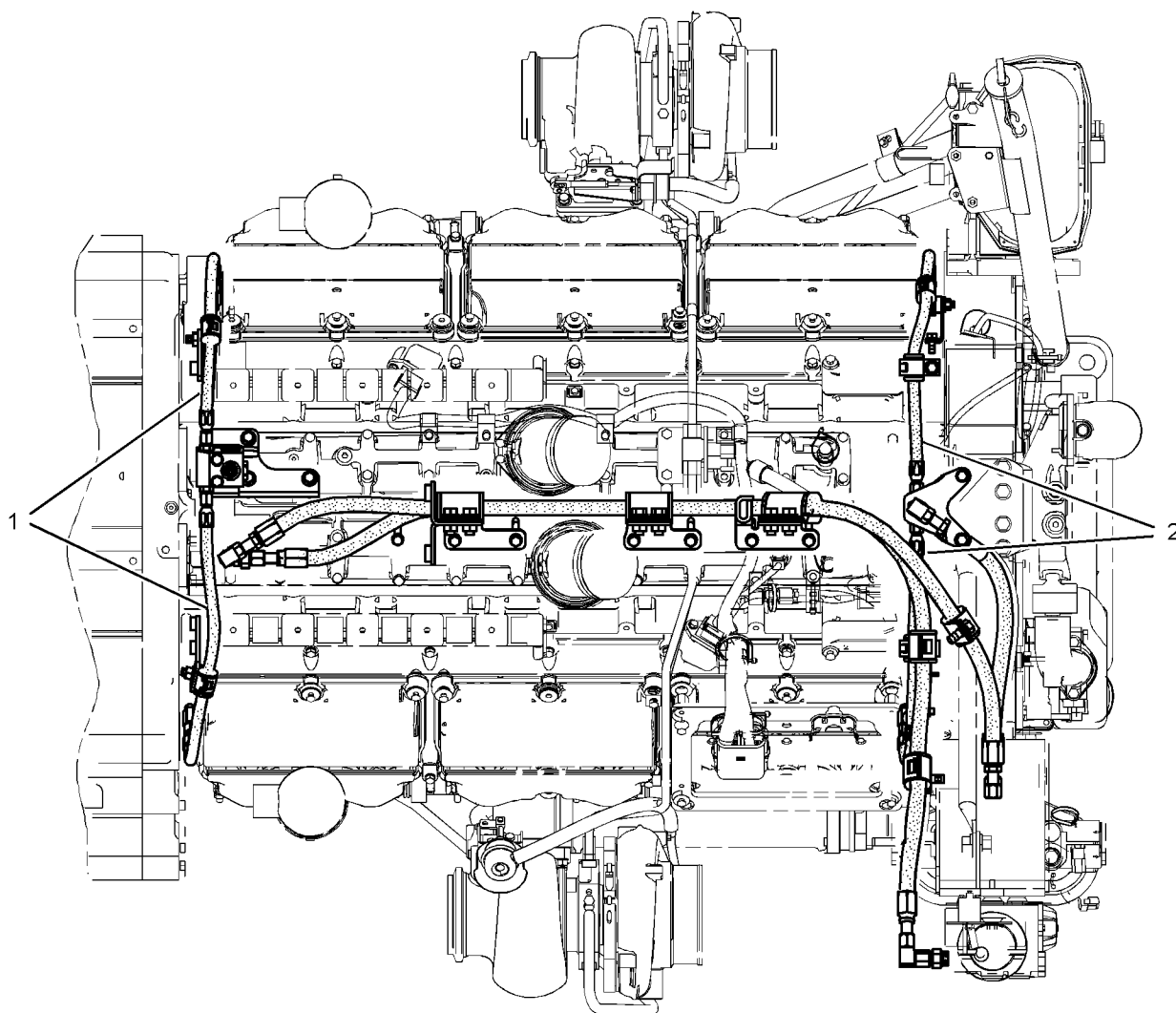
Hoses and Clamps - Inspect/Replace

SMCS Code: 1000; 7554-510; 7554-040

Inspect the Hoses and the Clamps

The nonmetallic hoses and the clamps must be inspected periodically in order to ensure safe operation and continuous operation of the engine fuel system. Take proper safety precautions before inspecting or replacing hoses and clamps.

Nonmetallic Fuel Lines



TOP VIEW OF ENGINE

Illustration 154

g02141367

(1) Rear low-pressure fuel lines

(2) Front low-pressure fuel lines

Inspect hoses (1) and (2) of the engine fuel system for leaks that are caused by the following conditions.

Replace any non-metallic fuel line (hose) which exhibits any of the following conditions.

- Hoses which are cracked
- Hoses which are soft
- Outer covering that is chafed or cut
- Outer covering that is ballooning locally
- Flexible part of the hose that is kinked or crushed

- Hoses which exhibit signs of leakage which are not the result of loose couplings or clamps

Failure to replace a non-metallic fuel line (hose) which exhibits any of the above conditions may result in a hazardous situation.

Inspect all clamps for the following conditions. Replace any clamp which exhibits signs of any of the following conditions.

- Cracking
- Looseness
- Damage

Inspect all couplings for leaks. Replace any coupling which exhibits signs of leaks.

Each installation application can be different. The differences depend on the following factors:

- Type of hose
- Type of fitting material
- Anticipated expansion and contraction of the hose
- Anticipated expansion and contraction of the fittings

Due to extreme temperature changes, the hose will heat set. Heat setting causes hose clamps to loosen. The loose clamp can result in leaks. A constant torque hose clamp will help to prevent loose hose clamps.

Replace hoses that are cracked or soft. Replace hoses that show signs of leakage. Replace hoses that show signs of damage. Replace hose clamps that are cracked or damaged. Tighten or replace hose clamps which are loose.

Replace the Hoses and the Clamps

NOTICE

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

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" or refer to Special Publication, PECJ0003, "Caterpillar Shop Supplies and Tools Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Nonmetallic Fuel Lines

WARNING

Personal injury can result from removing hoses or fittings in a pressure system.

Failure to relieve pressure can cause personal injury.

Do not disconnect or remove hoses or fittings until all pressure in the system has been relieved.

NOTICE

Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over any disconnected fuel system components.

Replace the non-metallic fuel lines in a set.

1. Stop the engine and turn off the fuel supply.
2. Turn the battery disconnect switch to the OFF position.
3. Drain the fuel from the fuel system to a level that is below the hose that is being replaced.
4. Remove the hose clamps.
5. Disconnect the old hose. Refer to Illustration 154 .
6. Replace the old hose with a new hose.
7. Install hose clamps which have been inspected or install new hose clamps. Refer to Specifications, SENR3130, "Torque Specifications" "Hose Clamps" for information about selecting and installing the proper hose clamps.
8. Carefully inspect the engine for any spilled fuel. Make sure that no fuel remains on or close to the engine.

Note: Fuel must be added to the fuel system ahead of the fuel filter.

9. Refill the fuel system. Refer to this Operation and Maintenance Manual, "Fuel System - Prime" for information about priming the engine with fuel.

10. Start the engine. Inspect the fuel system for leaks.

i03650177

Hydraulic System Oil (Implement) (Braking) - Change

SMCS Code: 5056-044

NOTICE

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

Refer to Special Publication, NENG2500, "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.

1. Operate the machine in order to warm the oil.
2. Park the machine on level ground. Lower the implement to the ground with a slight downward pressure. Engage the parking brake and stop the engine.

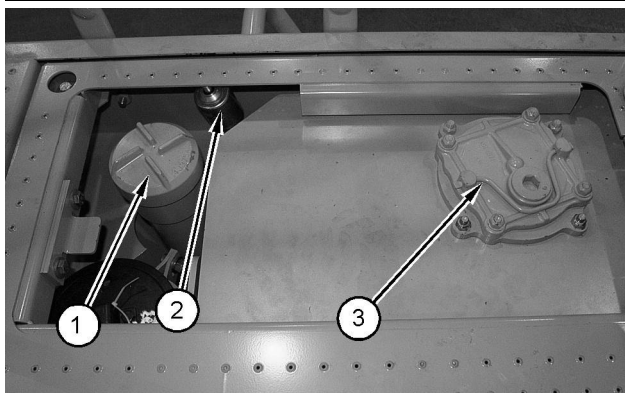


Illustration 155

g01050654

3. Open the access door on the right side of the platform.
4. Push the button on the top of breaker relief valve (2) in order to relieve any tank pressure.
5. Remove hydraulic tank filler cap (1). Remove the strainer from the tube.
6. Wash the strainer and the filler cap in a clean, nonflammable solvent.

7. Remove the oil drain plug from the bottom of the hydraulic tank.
8. Attach a hose to a suitable drain adapter. Install the adapter into the drain plug opening in order to open the internal drain valve. Allow the oil to drain into a suitable container.

NOTICE

Never start the engine while the hydraulic oil tank is being drained or while the hydraulic oil tank is empty. Excessive wear and damage to the hydraulic components can occur.

9. Remove the adapter in order to close the internal drain valve. Clean the drain plug and install the drain plug.
10. Remove filter cover (3) and replace the hydraulic oil filter.

Reference: Refer to Operation and Maintenance Manual, "Hydraulic System Oil Filter (Implement and Braking) - Replace" for the correct procedure.

11. Install the filler strainer.
12. Fill the hydraulic oil tank with clean oil. Make sure that the oil level is at the "FULL" mark on the sight gauge.

Reference: Refer to Operation and Maintenance Manual, "Lubricant Viscosities and Refill Capacities" for the correct type of oil and for the correct amount of oil.

13. Start the engine and run the engine for at least ten seconds. Then, stop the engine and add hydraulic oil to the tank until the oil level is at the "FULL" mark on the sight gauge.
14. Start the engine and run the engine at low idle. Cycle the implements so that all hydraulic systems are filled with oil.

Note: Make sure that the oil level is never below the suction ports in the hydraulic tank while the engine is running.

15. Stop the engine and top off the hydraulic tank so that the oil level is at the "FULL" mark on the sight gauge.

Note: The oil must be free of air bubbles. If air bubbles are present in the hydraulic oil, air is entering the hydraulic system. Inspect the hydraulic suction line and the hose clamps.

16. If necessary, tighten any loose clamps or any loose connections. Replace any damaged hoses.

17. Inspect the gasket on the hydraulic tank filler cap for damage. Replace the gasket, if necessary. Install the filler cap.
18. Stop the engine. Close the access door.

i03650242

Hydraulic System Oil (Steering) (Hydraulic Fan) - Change

SMCS Code: 5056-044

NOTICE

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

Refer to Special Publication, NENG2500, "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.

1. Operate the machine in order to warm the oil.
2. Park the machine on level ground. Lower the blade to the ground with a slight downward pressure. Engage the parking brake and stop the engine.

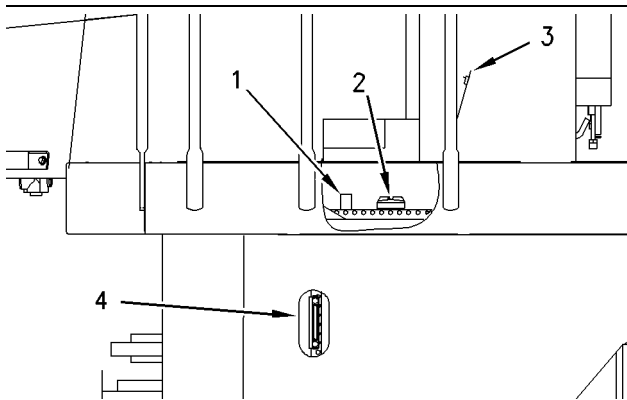


Illustration 156

g00951477

3. Open access panel (3) on the left side of the machine.
4. Push the button on the top of breaker relief valve (1) in order to relieve any tank pressure.
5. Remove hydraulic tank filler cap (2). Remove the strainer from the tube.

6. Wash the strainer and the filler cap in a clean, nonflammable solvent.
7. Remove the oil drain plug from the bottom of the hydraulic tank.
8. Attach a hose to a 126 - 7914 Oil Drain Coupling. Install the oil drain coupling into the drain plug opening in order to open the internal drain valve. Allow the oil to drain into a suitable container.
9. Remove the oil drain coupling in order to close the internal drain valve. Clean the drain plug and install the drain plug.
10. Replace the hydraulic oil filter.
- Reference:** Refer to Operation and Maintenance Manual, "Hydraulic System Oil Filter (Steering and Hydraulic Fan) - Replace" for the correct procedure.
11. Install the filler strainer.
12. Fill the hydraulic oil tank with clean oil. Make sure that the oil level is above the "ADD COLD" mark on sight gauge (4).

Reference: Refer to Operation and Maintenance Manual, "Lubricant Viscosities and Refill Capacities" for the correct type of oil and for the correct amount of oil.

13. Start the engine and run the engine for at least ten seconds. Then, stop the engine and add hydraulic oil to the tank until the oil level is above the "ADD COLD" mark on the sight gauge.
14. Start the engine and run the engine at low idle. Cycle the STIC control so that the steering hydraulic oil lines are filled with oil.

Note: Make sure that the oil level is never below the suction ports in the hydraulic tank while the engine is running.

15. Stop the engine and top off the hydraulic tank so that the oil level is above the "ADD COLD" mark on the sight gauge.

Note: The oil must be free of air bubbles. If air bubbles are present in the hydraulic oil, air is entering the hydraulic system. Inspect the hydraulic suction line and the hose clamps.

16. If necessary, tighten any loose clamps or any loose connections. Replace any damaged hoses.
17. Inspect the gasket on the hydraulic tank filler cap for damage. Replace the gasket, if necessary. Install the filler cap.
18. Stop the engine. Close the access door.

i03650298

Hydraulic System Oil Filter (Implement) (Braking) - Replace

SMCS Code: 5068-510

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

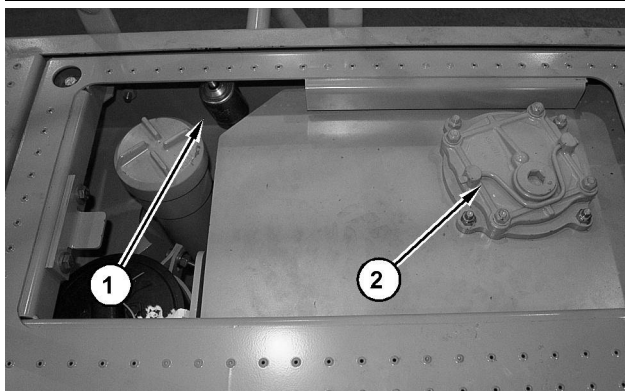


Illustration 157

g01050742

1. Open the access door on the right side of the cab platform.
2. Press the breaker relief valve (1) in order to relieve any tank pressure.
3. Remove the four bolts that hold filter cover (2) in place. Use the handle to pull the cover and the filter from the hydraulic tank.
4. Inspect the filter gasket and inspect the cover seal. Replace the gasket and replace the seal, if necessary.
5. Remove the filter element. Properly dispose of the filter element.
6. Remove the filter screen. Wash the screen in a clean nonflammable solvent.
7. Install the filter screen and install a new filter element.

8. Install the filter cover. Close the access door.
9. Start the engine. Run the engine at low idle and check for leaks in the hydraulic system.
10. Check the hydraulic oil level.

Reference: Refer to Operation and Maintenance Manual, "Hydraulic System Oil (Implement and Braking) - Check" for the correct procedure.

11. Stop the engine.

i03650327

Hydraulic System Oil Filter (Steering) (Hydraulic Fan) - Replace

SMCS Code: 5068-510

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

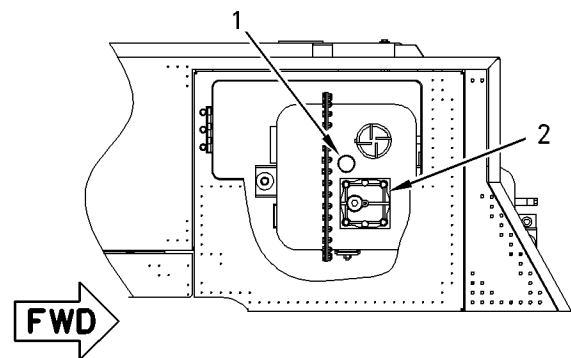


Illustration 158

g00951566

1. Open the access door on the left side of the cab platform.
2. Push the top of breaker relief valve (1) in order to relieve any tank pressure.
3. Remove the four bolts that hold filter cover (2) in place. Use the handle to pull the cover and the two filters from the hydraulic tank.

Maintenance Section

Hydraulic System Oil Level (Implement) (Braking) - Check

4. Inspect the filter gasket and inspect the cover seal.
Replace the gasket and replace the seal, if necessary.
5. Install the new oil filters and install the filter cover.
Install the four bolts.
6. Close the access door.
7. Check the hydraulic oil level.

Reference: Refer to Operation and Maintenance Manual, "Hydraulic System Oil Level (Steering and Hydraulic Fan) - Check" for the correct procedure.

i03650376

Hydraulic System Oil Level (Implement) (Braking) - Check

SMCS Code: 5056-535-FLV

The hydraulic tank for the implement and braking systems is located on the right side of the machine. Maintain the oil level above the "ADD COLD" mark in sight gauge (1) while the engine is running.

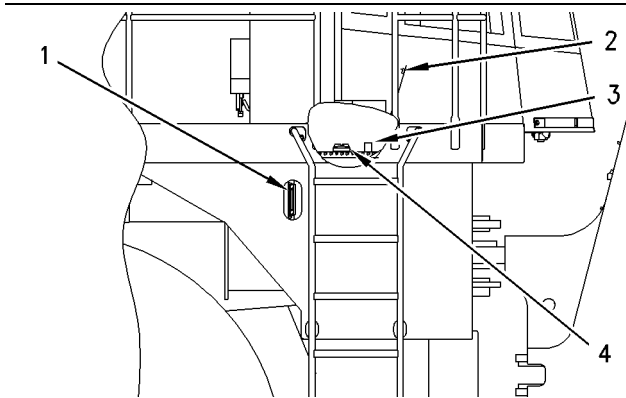


Illustration 159

g00946588

If necessary, add oil to the hydraulic tank.

1. Shut off the engine.
2. Open access door (2) on the right side of the cab platform.
3. Push the button on the top of breaker relief valve (3) in order to relieve any tank pressure.
4. Remove filler cap (4) and add the oil.
5. Install the filler cap and close the access door.

i03650410

Hydraulic System Oil Level (Steering) (Hydraulic Fan) - Check

SMCS Code: 5056-535-FLV

The hydraulic tank for the steering and hydraulic fan systems is located on the left side of the machine. Maintain the oil level above the "ADD COLD" mark in sight gauge (4) while the engine is running.

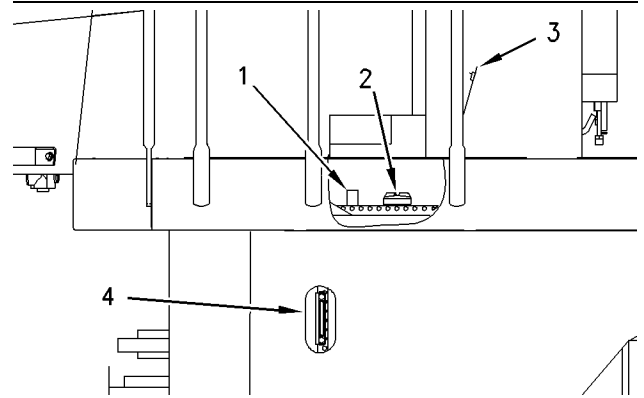


Illustration 160

g00951477

If necessary, add oil to the hydraulic tank.

1. Shut off the engine.
2. Open access door (3) on the left side of the cab platform.
3. Push the button on the top of breaker relief valve (1) in order to relieve any tank pressure.
4. Remove filler cap (2) and add the oil.
5. Install the filler cap and close the access door.

i03650431

Hydraulic System Oil Sample (Implement) (Braking) - Obtain

SMCS Code: 4250-008; 5050-008; 5056-008; 7542

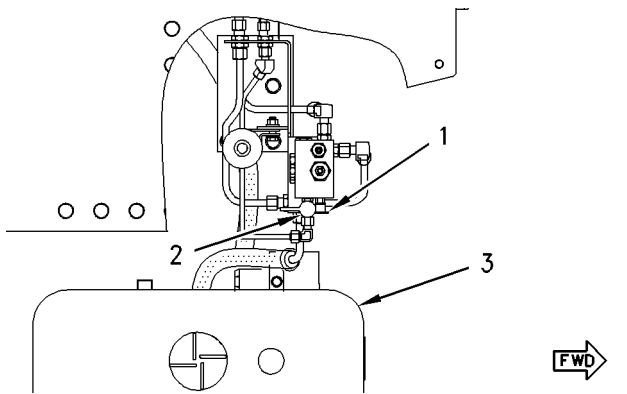


Illustration 161

g00936855

The sampling valve (1) for the hydraulic oil (implement and brakes) is located near hydraulic tank (3) under the right side cab platform (2). Do not use pressure tap (2).

Reference: Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information about obtaining an fluid sample.

i04291169

Hydraulic System Oil Sample (Steering) (Hydraulic Fan) - Obtain

SMCS Code: 4300-008; 5050-008; 5056-008; 7542

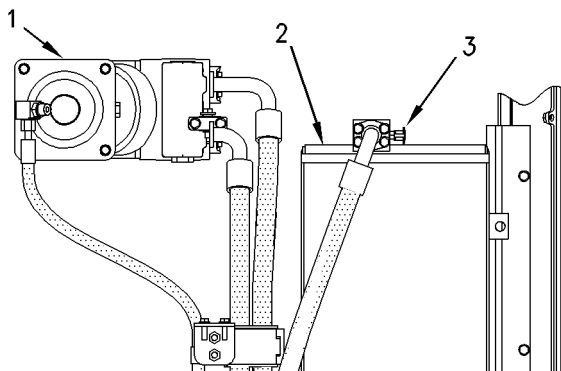


Illustration 162

g00936442

- (1) Fan motor
- (2) Cooler for the hydraulic fan
- (3) Sampling valve

The sampling valve (3) for the hydraulic oil (steering and hydraulic fan motor) is located on the left side of the engine compartment behind the air inlet.

Reference: Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information about obtaining a fluid sample.

i01866105

Hydraulic Tank Breaker Relief Valve - Clean

SMCS Code: 5118-070

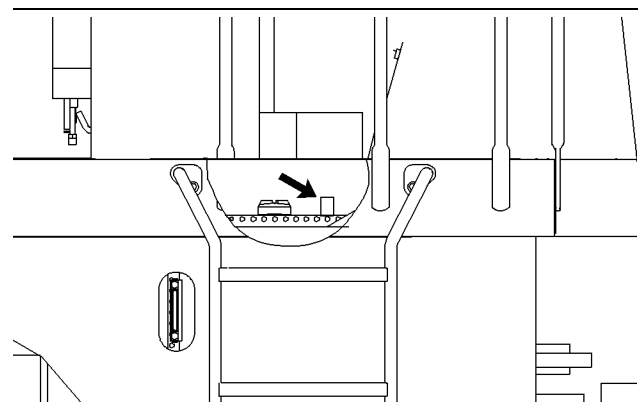


Illustration 163

g00951177

1. Open the access cover on the right side of the cab platform.
2. Remove the hydraulic tank breaker relief valve.
3. Clean the breaker relief valve in a clean nonflammable solvent. Dry the breaker relief valve thoroughly by shaking or by using compressed air.
4. Install the hydraulic tank breaker relief valve.
5. Close the access cover.
6. Repeat the procedure for the other hydraulic tank breaker relief valve on the left side of the machine.

i02068777

Lift Cylinder Yoke Bearings - Lubricate

SMCS Code: 5102-086-BD

Wipe off the fittings before any lubricant is applied.

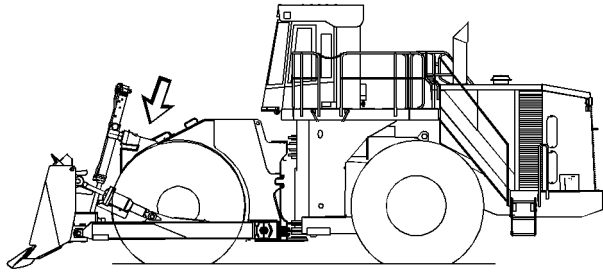


Illustration 164

g01059969

Apply lubricant through one fitting on the yoke for each lift cylinder.

There is a total of two fittings.

i02106227

Oil Filter - Inspect

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

Inspect a Used Filter for Debris

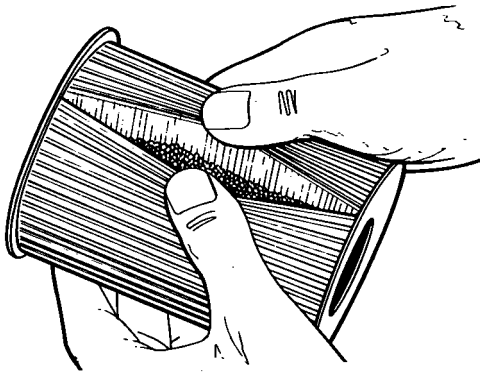


Illustration 165

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.

i00057294

Radiator Core - Clean

SMCS Code: 1353-070-KO

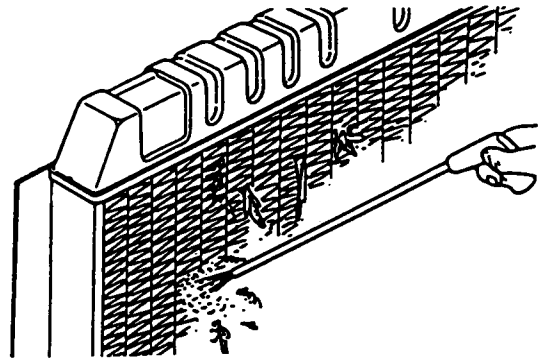


Illustration 166

g00100062

You can use compressed air, high pressure water, or steam to remove dust and other debris from the radiator core. However, the use of compressed air is preferred.

See Special Publication, SEBD0518, "Know Your Cooling System" for the complete procedure for cleaning the radiator core.

i05805860

i01869155

Receiver Dryer (Refrigerant) - Replace

SMCS Code: 7322-510

WARNING

Personal injury can result from contact with refrigerant.

Contact with refrigerant can cause frost bite. Keep face and hands away to help prevent injury.

Protective goggles must always be worn when refrigerant lines are opened, even if the gauges indicate the system is empty of refrigerant.

Always use precaution when a fitting is removed. Slowly loosen the fitting. If the system is still under pressure, release it slowly in a well ventilated area.

Personal injury or death can result from inhaling refrigerant through a lit cigarette.

Inhaling air conditioner refrigerant gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting air conditioner refrigerant gas, can cause bodily harm or death.

Do not smoke when servicing air conditioners or wherever refrigerant gas may be present.

Use a certified recovery and recycling cart to properly remove the refrigerant from the air conditioning system.

NOTICE

If the refrigerant system has been open to the outside air (without being plugged) for more than 30 minutes, the receiver-dryer must be replaced. Moisture will enter an open refrigerant system and cause corrosion which will lead to component failure.

Refer to Service Manual, "Air Conditioning and Heating R-134a for All Caterpillar Machines" for the proper procedure to change the receiver-dryer assembly and for the procedure to reclaim the refrigerant gas.

Rollover Protective Structure (ROPS) - Inspect

SMCS Code: 7325-040

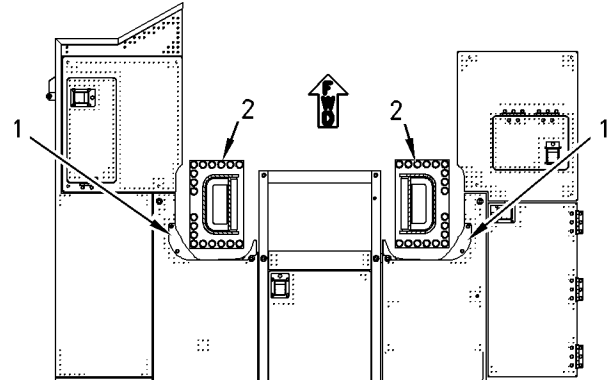


Illustration 167

g00952022

Typical example

1. Remove access covers (1) from both sides of the Rollover Protective Structure (ROPS).
2. Inspect the ROPS for bolts (2) that are loose or damaged. Replace the damaged bolts and missing bolts with original equipment parts only. Torque the bolts to $1600 \pm 200 \text{ N}\cdot\text{m}$ ($1200 \pm 150 \text{ lb}\cdot\text{ft}$).

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

3. Drive the machine on a rough surface. If the ROPS mounting supports rattle, replace the ROPS mounting supports.
4. Install the access covers.

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

Consult your Caterpillar dealer for repair of cracks in the weld, in the castings, or in any metal section of the ROPS.

i04423622

Seat Belt - Inspect

SMCS Code: 7327-040

Always inspect the condition of the seat belt and the condition of the seat belt mounting hardware before you operate the machine. Replace any parts that are damaged or worn before you operate the machine.

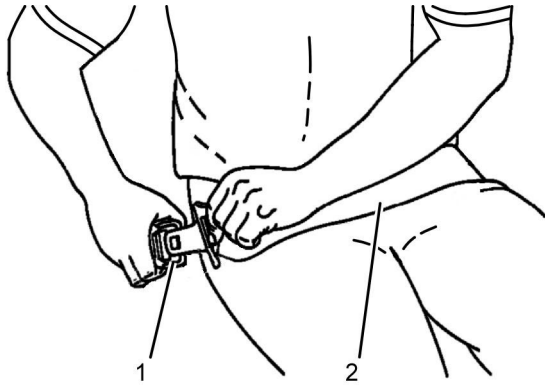


Illustration 168

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).

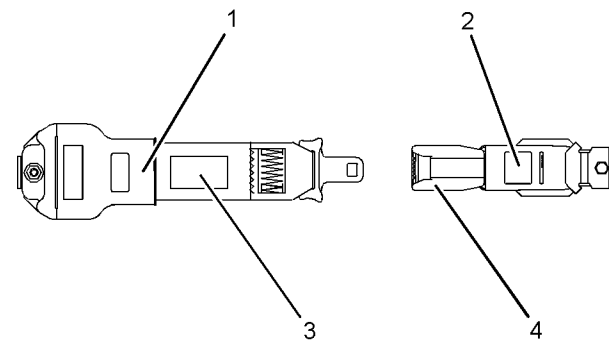


Illustration 169

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.

i01547608

Seat Side Rails - Adjust

SMCS Code: 7312-025

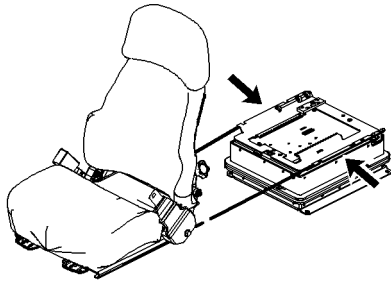


Illustration 170

g00804394

Caterpillar recommends adjusting the side rails after the initial 500 hours of machine operation. After the initial 500 service hours, perform this procedure when it is necessary.

Reference: Refer to Service Manual, SENR6615, "Contour Series Seat" for the adjustment procedure.

i03694709

Secondary Steering - Test

SMCS Code: 4300-081-SE; 4300-081-SST; 4324-081; 4324

WARNING

The service brake must be checked in order to ensure proper operation before you test the supplemental steering system.

Personal injury, death, or property damage could occur if the supplemental steering system is tested and the service brake is not operational.

Test the service brake before you test the supplemental steering system.

Perform the following procedure if your machine is equipped with a ground driven supplemental steering and if the procedure is required by local regulations.

Ensure that there are no hazards in the test area. The test area must be unobstructed and level. Operate the machine in second gear.

Ensure that all air tanks and accumulators are properly charged. Ensure that there is no load in the work tool. Position the machine with the bucket or the work tool in the CARRY position with the machine in neutral. Release the parking brake. Apply the service brakes and put the engine at low idle. Ensure that The area around the machine is clear of personnel. Shift the transmission to second gear forward and slowly release the service brakes. Moderately increase the engine speed to high idle. Shift the transmission to neutral. Turn the ignition to the OFF position. Allow the machine to coast.

While the machine is in motion, turn the machine to the left and to the right. If the machine responds to the steering input, the supplemental steering system is operating. Stop the machine with the service brakes. Apply the parking brake. The machine can then be returned to normal operation.

If there is no response to the steering input, the supplemental steering system is not operating. Stop the machine immediately. Repair the supplemental steering system before returning the machine to service.

i03689109

Service Brake Wear Indicator - Check

SMCS Code: 4255-535-IND

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

This procedure requires two people. One person must engage the service brakes and the other person must measure the disc wear. Care must be taken when you perform this procedure. Oil leakage from the brake system will occur. Keep all other personnel away from the machine or in sight of the operator.

1. Park the machine on a level surface away from other equipment and other personnel and lower the implement to the ground. Place the transmission in NEUTRAL. Engage the parking brake and turn off the engine.
2. Install the steering lock and chock the wheels.
3. Start the engine in order to build brake system pressure.

4. Stop the engine. Allow the axle oil to settle before proceeding to the next step.

Note: Keep the engine off when the brake wear is measured.

5. Place a suitable container below the plug in order to collect oil leakage from the brake system.
6. Press and hold the service brake pedal.

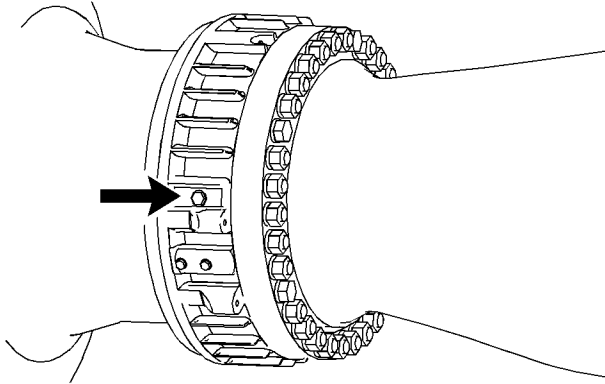


Illustration 171

g01446483

7. Remove the plug.

NOTICE

Do not allow the brake piston to retract while the pin is installed in the plug hole. This could cause the pin to break off when the brake piston retracts. It is possible for broken pieces of the tool to fall into the brake housing and cause damage.

8. Insert a FT3105 brake wear gauge into the inspection hole.

If the brake wear gauge does not drop all the way into the inspection hole, the brake wear is less than 50%. Proceed to step 11.

If the brake wear gauge drops all the way into the inspection hole, the brake wear is greater than 50%. Proceed to step 9.

9. Insert a FT3104 brake wear gauge into the inspection hole.

If the brake wear gauge does not drop all the way into the inspection hole, the brake wear is between 50% and 75%. Proceed to step 11.

If the brake wear gauge drops all the way into the inspection hole, the brake wear is greater than 75%. Proceed to step 10.

10. Insert a FT3103 brake wear gauge into the inspection hole.

If the brake wear gauge does not drop all the way into the inspection hole, the brake wear is between 75% and 100%. Brake service should be scheduled soon.

If the brake wear gauge drops all the way into the inspection hole, the brake wear is greater than 100%. Brake service should be scheduled immediately.

11. Remove the brake wear gauge.
12. Release the service brake pedal.
13. Install the plug.
14. Clean up spilled oil.
15. Repeat steps 1 through 14 for each service brake.

i00689198

Starting Motor - Inspect

SMCS Code: 1453-040

Caterpillar recommends a scheduled inspection of the starter. Inspect the starter for connections that are loose.

Check the starter for proper operation and check the battery charger for proper operation.

Keep the batteries fully charged.

Air temperature affects the cranking power of the batteries. Keep the batteries warm. The engine will not crank if the batteries are too cold. A warm engine will not crank if the batteries are too cold.

Refer to the Service Manual Module, SENR1018, "Engine Systems Operation Testing and Adjusting" for the procedure to inspect the starting motor.

i01448338

Steering Cylinder Bearings - Lubricate

SMCS Code: 4303-086-BD

Wipe the fittings before you apply any lubricant.

i02069257



Illustration 172

g00761327

Two remote fittings are located near the articulation joint on the left side of the machine.

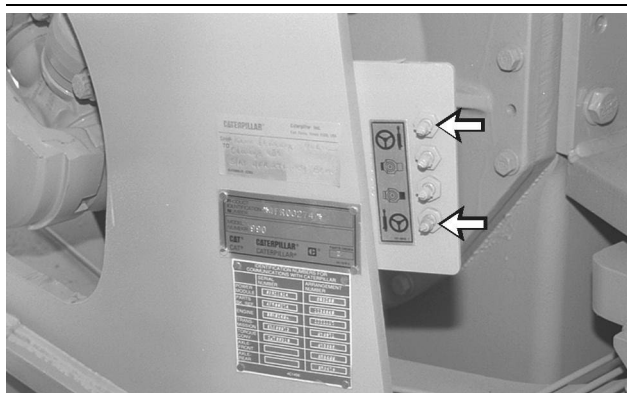


Illustration 173

g00304165

Typical Example

Apply lubricant through the two remote fittings for the head ends of the steering cylinders.

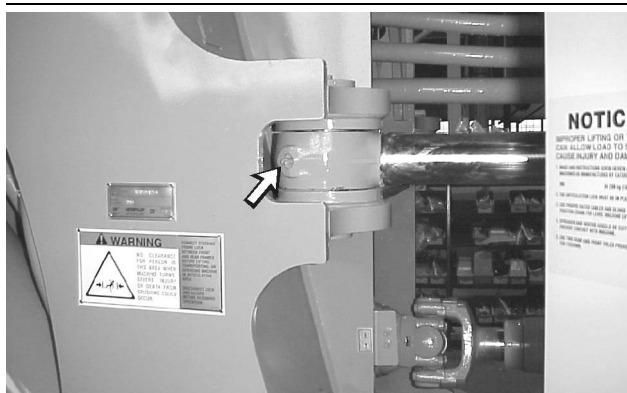


Illustration 174

g00761938

Apply lubricant through the fitting in the rod end of the left steering cylinder.

Apply lubricant through the fitting in the rod end of the right steering cylinder.

Tilt Cylinder Bearings - Lubricate

SMCS Code: 5104-086-BD

Wipe off the fittings before any lubricant is applied.

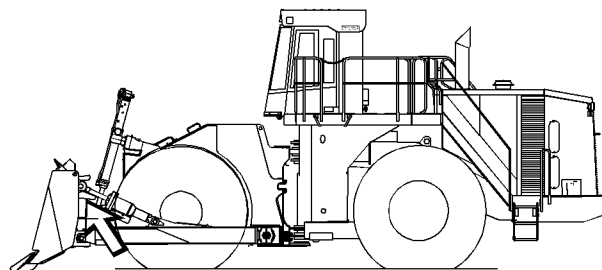


Illustration 175

g01060050

Apply lubricant through one fitting on each tilt cylinder.

There is a total of two fittings.

i02305841

Tire Inflation - Check

SMCS Code: 4203-535-AI

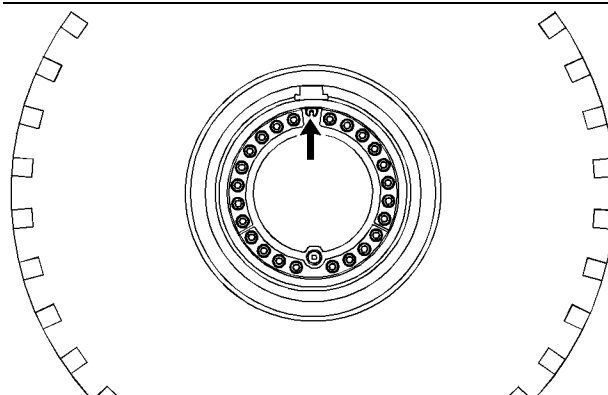


Illustration 176

g01160201

Always obtain proper tire inflation pressures and maintenance recommendations for the tires on your machine from your tire supplier. Measure the tire pressure on each tire.

Inflate the tires with nitrogen, if necessary.

Reference: Refer to the "Tire Inflation Information" section of the Operation and Maintenance Manual for more information.

i01868211

Transmission Magnetic Screen - Clean

SMCS Code: 3030-070-MGS

Clean the transmission magnetic screen if the transmission oil pump fails or the transmission is disassembled.

Drain the transmission oil before you remove the transmission magnetic screen. Refer to Operation and Maintenance Manual, "Transmission Oil - Change" for the procedure to drain the transmission oil.

1. Park the machine on level ground. Lower the blade to the ground and apply slight downward pressure. Engage the parking brake and stop the engine.

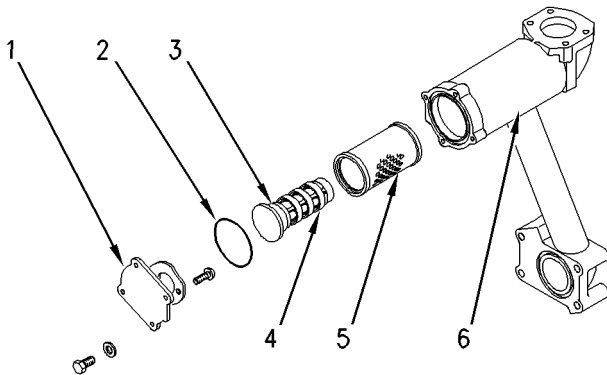


Illustration 177

g00849759

2. The transmission magnetic screen is located on the right side of the transmission. Remove cover (1) from transmission magnetic screen (5).
3. Remove magnets (4), screen (5) and tube (3) from housing (6).
4. Wash screen (5) and tube (3) in clean nonflammable solvent.
5. Clean magnets (4) with a cloth, with a stiff bristle brush or with pressure air.
6. Clean cover (1) and inspect seal (2). Replace the seal, if necessary.
7. Insert magnets (4) in screen (5). Then, insert screen (5), magnets (4) and tube (3) in housing (6).
8. Install cover (1) and tighten the cover bolts.

i02046957

Transmission Oil - Change

SMCS Code: 3030-044

NOTICE

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

Refer to Special Publication, NENG2500, "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.

1. Operate the machine in order to warm the oil.
2. Park the machine on level ground. Lower the implement to the ground and apply slight downward pressure. Engage the parking brake. Stop the engine.

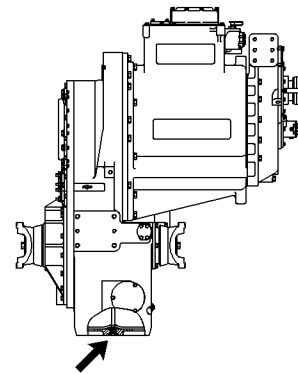


Illustration 178

g00951887

3. The transmission drain plug is located on the bottom of the transmission case at the center of the machine. Remove the transmission drain plug. Allow the oil to drain into a suitable container.
4. Change the transmission oil filter.

Reference: Refer to Operation and Maintenance Manual, "Transmission Oil Filter - Replace" for the correct procedure.

5. Clean the transmission magnetic screen.

Reference: Refer to Operation and Maintenance Manual, "Transmission Magnetic Screen - Clean" for the correct procedure.

6. Clean the transmission drain plug and install the transmission drain plug.

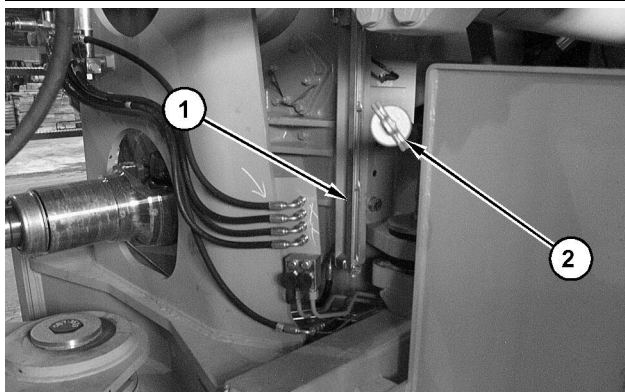


Illustration 179

g01050754

7. Remove transmission oil filler cap (2). Fill the transmission with oil.

Reference: Refer to Operation and Maintenance Manual, "Lubricant Viscosities and Refill Capacities" for the proper type of oil and for the proper amount of oil.

8. Clean the transmission oil filler cap and install the transmission oil filler cap.

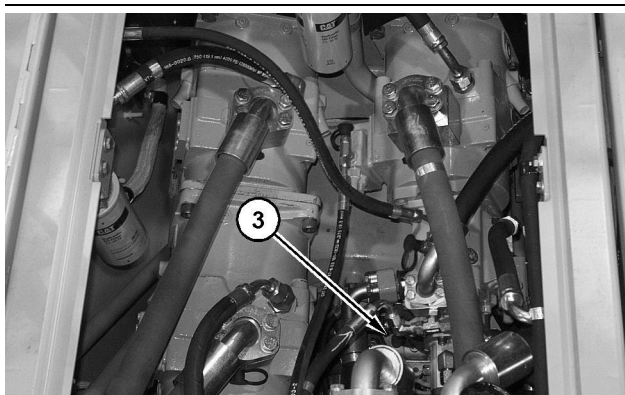


Illustration 180

g01050755

9. Open the access door in the platform behind the cab and remove transmission breather (3). Wash the breather in a clean nonflammable solvent. Allow the breather to dry or use air pressure to dry the breather. Install the transmission breather.
10. Remove the transfer gear housing breather. Wash the breather in a clean, nonflammable solvent. Allow the breather to dry or use air pressure to dry the breather. Install the transfer gear housing breather.

11. Start the engine and run the engine at low idle. Inspect the transmission for leaks.
12. Slowly operate the STIC steering control in order to circulate the oil.
13. Move the STIC transmission direction control switch to the NEUTRAL position. Engage the parking brake. Inspect the entire transmission system for leaks.
14. Check the oil level on the sight gauge (1).

Reference: Refer to Operation and Maintenance Manual, "Transmission Oil Level - Check" for the correct procedure.

15. Stop the engine.

i02047141

Transmission Oil Filter - Replace

SMCS Code: 3004-510; 3067-510

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.

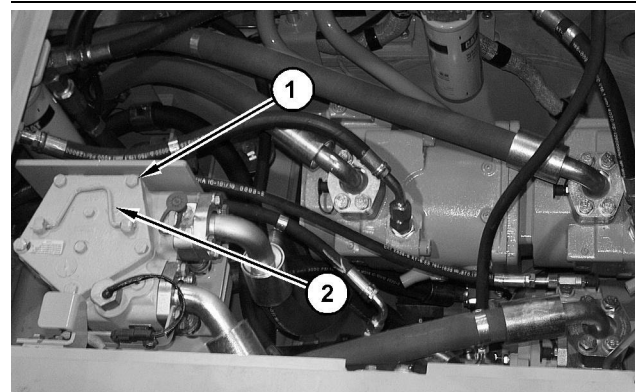


Illustration 181

g01050890

1. Open the access door in the center of the cab platform.

Maintenance Section
Transmission Oil Level - Check

2. Remove mounting bolts (1) and pull up on handle (2) in order to remove the oil filter.
3. Remove the used filter element from the filter housing. Dispose of the used filter element properly.
4. Clean the filter housing and the filter housing base with a clean, nonflammable solvent.
5. Inspect the filter housing seal. Replace the seal if the seal is damaged.
6. Insert a new filter element into the filter housing.
7. Install the oil filter and the mounting bolts.
8. Start the engine and apply the right brake pedal only.
9. Slowly operate the transmission direction switch in order to circulate the oil.
10. Move the transmission direction switch to NEUTRAL. Engage the parking brake. Inspect the entire power train system for leaks.
11. Check the transmission oil level.

Reference: Refer to Operation and Maintenance Manual, "Transmission Oil Level - Check" for the correct procedure.

i02641020

Transmission Oil Level - Check

SMCS Code: 3030-535-FLV

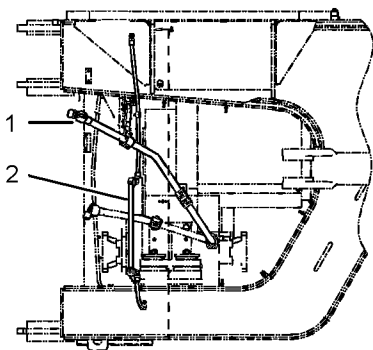


Illustration 182

g01325050

Transmission oil level gauge (2) and transmission oil filler cap (1) are located on the left side of the machine near the articulation joint.

1. Operate the machine for a few minutes in order to warm the oil.

2. Park the machine on firm, level ground. Put the transmission control into the NEUTRAL position. Lower the bucket to the ground with a slight downward pressure. Engage the parking brake.

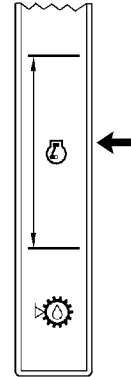


Illustration 183

g01326398

3. Check the oil level in sight gauge (2) while the engine is running at low idle. Maintain the oil level within the operating range while the engine is running.

Note: The oil level varies significantly when the engine is stopped. The oil level will be considerably higher than the operating range. The oil level should be above the middle of the gauge before the engine is started.

4. If necessary, remove filler cap (1) and add oil. Clean the filler cap and install the filler cap.

i02047417

Transmission Oil Sample - Obtain

SMCS Code: 3080-008; 7542

NOTICE

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

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat® products.

Dispose of all fluids according to local regulations and mandates.



Illustration 184

g01051036

The sampling valve for the transmission is located in the center compartment on the cab platform right behind the cab.

Reference: Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information about obtaining an fluid sample.

i01394768

Turbocharger - Inspect

SMCS Code: 1052-040

If the turbocharger fails during engine operation, severe damage to the turbocharger compressor wheel and to the entire engine can result.

Turbocharger bearing failures can cause large quantities of oil to enter the intake system and the exhaust system. Loss of engine oil can result in serious engine damage.

Do not continue to operate the engine when a turbocharger bearing failure is accompanied by a significant loss of engine performance. Engine smoke and speeding up of the engine with no load are characteristics of a loss of engine performance.

Reference: For more information about inspecting the turbocharger, refer to the appropriate Service Manual for your machine's engine.

i01869115

Window Washer Reservoir - Fill

SMCS Code: 7306-544

NOTICE

When operating in freezing temperatures, use Caterpillar nonfreezing window washer solvent or equivalent. System damage can result from freezing.

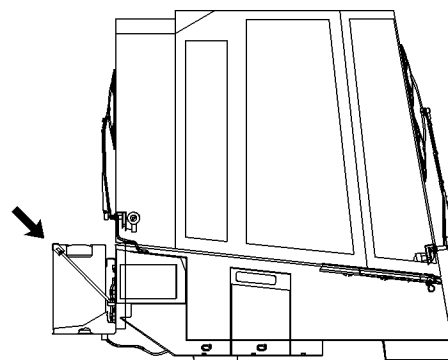


Illustration 185

g00952003

The window washer reservoir is located behind the cab.

As needed, fill the reservoir with window washer solvent.

i01869069

Window Wiper - Inspect/Replace

SMCS Code: 7305-510; 7305-040

Inspect the condition of all of the wiper blades. Replace the wiper blades if the wiper blades are worn or damaged or if streaking occurs.

i04412316

Windows - Clean

SMCS Code: 7310-070

Clean the outside of the windows from the ground, unless handholds are available.

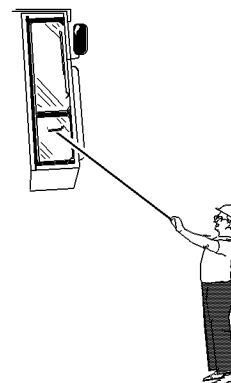


Illustration 186

g00566124

Typical example

Cleaning Methods

Commercial Window Cleaner

Apply the cleaner with a soft cloth. Rub the window with moderate pressure until all the dirt is removed. Allow the cleaner to dry. Wipe off the cleaner with a clean soft cloth.

Soap and Water

Use a clean sponge or a soft cloth. Wash the windows with a mild soap or with a mild detergent. Also use plenty of lukewarm water. Rinse the windows thoroughly. Dry the windows with a moist chamois or with a moist cellulose sponge.

Stubborn Dirt and Grease

Wash the windows with a good grade of naphtha, of isopropyl alcohol, or of Butyl Cellosolve. Then, wash the windows with soap and with water.

Polycarbonate Windows (If equipped)

Wash polycarbonate windows with a mild soap or detergent. Never use a cleaning solvent on polycarbonate windows.

Wash polycarbonate windows with warm water and a soft sponge, or damp cloth. Never use a dry cloth or paper towels on polycarbonate windows.

Rinse the windows with a sufficient amount of clean water.

Reference Information Section

Reference Materials

i02818556

Reference Material

SMCS Code: 1000; 7000

The following literature can be obtained from any Caterpillar dealer:

Caterpillar Reference Material

- Special Publication, PEHP6046, "Product Data Sheet for Caterpillar Diesel Engine Oils (DEO)", CG-4 engine oil
- Special Publication, PEHP1021, "Product Data Sheet for Caterpillar Biodegradable Hydraulic Oil (BIO HYDO)"
- Special Publication, PEHP7508, "Product Data Sheet for Caterpillar Gear Oil (GO)"
- Special Publication, PEHP3050, "Product Data Sheet for Caterpillar Multipurpose Tractor Oil (MTO)"
- Special Publication, PEHP7506, "Product Data Sheet for Caterpillar Transmission/Drive Train Oil (TDTO)"
- Special Publication, NEHP5621, "How To Select The Right Grease For Any Job"
- Special Publication, PEHP0002, "Product Data Sheet for Multipurpose Lithium Complex Grease with Molybdenum (MPGM)"
- Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog"
- Special Publication, SEBD0640, "Oil and Your Engine"
- Special Publication, SEBD0717, "Diesel Fuels and Your Engine"
- Operation and Maintenance Manual, SEBU5898, "Cold Weather Recommendations for All Caterpillar Machines"
- Special Publication, SEBD1587, "What ROPS/FOPS Certification Means"
- Special Publication, TEBJ1015, "Understanding the S·O·S Report"
- Special Publication, PEHP6001, "How to Take a Good Oil Sample"
- Special Publication, PEHP4036, "Product Data Sheet for Caterpillar ELC"
- Special Publication, PEHP5033, "S·O·S Coolant Analysis"
- Special Publication, SEBD0518, "Know Your Cooling System"
- Special Publication, SEBD0970, "Coolant and Your Engine"
- Special Publication, PMEP5027, "Label"
- Special Instruction, SEHS9031, "Storage Procedure for Caterpillar Products"
- Special Instruction, REHS0034, "Guideline for Repair of Non-metallic Fenders and Hoods"
- Special Instruction, SEHS6929, "Inspection, Maintenance and Repair of ROPS and Attachment Installation Guidelines"
- Special Instruction, REHS1642, "Operation of the Product Link System"
- Operation and Maintenance Manual, SEBU6310, "EMA Lubricating Oils Data Book For Engines"
- Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations"
- Operation and Maintenance Manual, SEBU6981, "Emissions Control Warranty Information for US, Canada, and California"
- Operation and Maintenance Manual (Supplement), SEBU8257, "The European Union Physical Agents (Vibration) Directive 2002/44/EC"
- Service Manual, SENR5664, "Air Conditioning and Heating R-134a for All Caterpillar Machines"
- Service Manual, RENR6245
- Service Manual, RENR6245
- Parts Manual, SEBP3340

Additional Reference Material

ASTM D2896, "TBN Measurements" This can normally be obtained from your local technological society, from your local library, or from your local college.

SAE J313, "Diesel Fuels" This can be found in the SAE handbook. Also, this publication can be obtained from your local technological society, from your local library, or from your local college.

SAE J754, "Nomenclature" This can normally be found in the SAE handbook.

SAE J183, "Classification" This can normally be found in the SAE handbook.

Engine Manufacturers Association Lubricating Oils
Data Book

Engine Manufacturers Association
401 North Michigan Avenue
Chicago, Illinois, USA 60611
(312) 644-6610

i03989612

Decommissioning and Disposal

SMCS Code: 1000; 7000

When the product is removed from service, local regulations for the product decommissioning will vary. Disposal of the product will vary with local regulations. Consult the nearest Cat dealer for additional information.

Index

A

Additional Messages	11
Alternate Exit	35
Alternator - Inspect	84
Articulation Bearings - Lubricate	84
Automatic Lubrication Grease Tank - Fill (If Equipped)	84
The Centro-Matic Lubrication System	85
The Quicklub Lubrication System	85
Automatic Lubrication System Components - Check (If Equipped)	85
Settings of the Injectors for the Autolube System	86
Timer Operation	87
Axle Oscillation Bearings - Lubricate	88

B

Backup Alarm	50
Backup Alarm - Test	89
Battery - Clean	89
Battery - Recycle	89
Battery Disconnect Switch	50
Battery Hold-Down - Tighten	89
Battery or Battery Cable - Inspect/Replace	89
Before Operation	23, 33
Before Starting Engine	21
Belts - Inspect/Adjust/Replace	90
Air Conditioner Belt	90
Alternator Belt	90
Brake Accumulator - Check	91
Braking System - Test	91
Parking Brake Holding Ability Test	91
Service Brake Holding Ability Test	91
Burn Prevention	16
Batteries	17
Coolant	16
Oils	17

C

Cab Air Filter - Clean/Replace	92
Camera - Clean (If Equipped)	93
Camera	93
Display	93
Camera (If Equipped)	55
Capacities (Refill)	76
Case Drain Oil Filters - Replace (If Equipped)	93

Hydraulic Fan Motor Filter	94
Hydraulic Pump Filters	94
Circuit Breakers - Reset	94
Cooling System Coolant (ELC) - Change	95
Cooling System Coolant Extender (ELC) - Add	96
Cooling System Coolant Level - Check	97
Cooling System Coolant Sample (Level 1) - Obtain	97
Cooling System Coolant Sample (Level 2) - Obtain	98
Cooling System Water Temperature Regulator - Replace	98
Crankshaft Vibration Damper - Inspect	99
Crushing Prevention and Cutting Prevention ..	16
Cutting Edges and End Bits - Inspect/Replace	100

D

Daily Inspection	33
Declaration of Conformity	32
Decommissioning and Disposal	144
Differential and Final Drive Oil - Change	100
Differential and Final Drive Oil Level - Check	101
Differential and Final Drive Oil Sample - Obtain	102
Drive Shaft Spline (Center) - Lubricate	103
Drive Shaft Support Bearing - Lubricate	104
Drive Shaft Universal Joints - Lubricate	104

E

Electrical Storm Injury Prevention	21
Electronic Unit Injector - Inspect/Adjust	104
Emissions Certification Film	31
Certification Label for Emissions	31
Engine Air Filter Primary Element - Clean/Replace	104
Engine Air Filter Secondary Element - Replace	107
Engine Air Filter Service Indicator - Inspect ..	107
Engine Air Filter Service Indicator - Inspect/Replace	108
Engine Air Precleaner - Clean	108
Engine and Machine Warm-Up	58
Engine Crankcase Breather - Clean	108
Engine Mounts - Inspect	109

Engine Oil (High Speed) and Oil Filter - Change	110
Procedure for Changing the Engine Oil and Filter	111
Selection of the Oil Change Interval	110
Engine Oil and Filter - Change	113
Procedure for Changing the Engine Oil and Filter	114
Selection of the Oil Change Interval	113
Engine Oil Level - Check	112
Engine Oil Sample - Obtain	112
Engine Starting	23, 58
Engine Starting (Alternate Methods)	67
Engine Starting with Auxiliary Start Receptacle (If Equipped)	68
Engine Starting with Jump Start Cables	67
Use of Jump Start Cables	67
Engine Stopping	24
Engine Valve Lash - Check	115
Engine Valve Rotators - Inspect	115
Engine Water Pump - Inspect	115
Equipment Lowering with Engine Stopped	25, 60
Ether Starting Aid Cylinder - Replace (If Equipped)	116
F	
Fire Extinguisher Location	20
Fire Prevention and Explosion Prevention	17
Battery and Battery Cables	18
Ether	20
Fire Extinguisher	20
General	17
Lines, Tubes, and Hoses	19
Wiring	19
Foreword	4
California Proposition 65 Warning	4
Certified Engine Maintenance	5
Literature Information	4
Machine Capacity	5
Maintenance	4
Operation	4
Product Identification Number	5
Safety	4
Fuel Lines - Replace (Low Pressure)	116
Replace Nonmetallic Fuel Lines	116
Fuel System - Prime	118
Fuel System Primary Filter (Water Separator) - Drain	119

Fuel System Primary Filter (Water Separator) Element - Replace	119
Fuel System Secondary Filter - Replace	120
Fuel Tank Cap and Strainer - Clean	121
Fuel Tank Water and Sediment - Drain	121
Fuses - Replace	122
Type 1	122
Type 2	122

G

General Hazard Information	13
Containing Fluid Spillage	15
Dispose of Waste Properly	16
Fluid Penetration	14
Inhalation	15
Pressurized Air and Water	14
Trapped Pressure	14
General Information	28

H

High Intensity Discharge Lamp (HID) - Replace (If Equipped)	123
Hoses and Clamps - Inspect/Replace	124
Inspect the Hoses and the Clamps	124
Replace the Hoses and the Clamps	126
Hydraulic System Oil (Implement) (Braking) - Change	127
Hydraulic System Oil (Steering) (Hydraulic Fan) - Change	128
Hydraulic System Oil Filter (Implement) (Braking) - Replace	129
Hydraulic System Oil Filter (Steering) (Hydraulic Fan) - Replace	129
Hydraulic System Oil Level (Implement) (Braking) - Check	130
Hydraulic System Oil Level (Steering) (Hydraulic Fan) - Check	130
Hydraulic System Oil Sample (Implement) (Braking) - Obtain	131
Hydraulic System Oil Sample (Steering) (Hydraulic Fan) - Obtain	131
Hydraulic Tank Breaker Relief Valve - Clean	131

I

Identification Information	29
Important Safety Information	2

L		Warning Categories	52
Leaving the Machine	61	Mounting and Dismounting	33
Lift Cylinder Yoke Bearings - Lubricate	131	Alternate Exit	33
Lifting and Tying Down the Machine	63	Machine Access System Specifications	33
Lubricant Viscosities	71	O	
Biodiesel	75	Oil Filter - Inspect	132
Coolant Information	76	Inspect a Used Filter for Debris	132
Diesel Fuel Recommendations	75	Operation	23
Engine Oil	71	Machine Operating Temperature Range	23
Fuel Additives	75	Operation	23
General Information for Lubricants	71	Operation Information	55
Grease Applications	74	Downhill Operation	56
Hydraulic Systems	72	Operation Section	33
Other Oil Applications	73	Operator Controls	39
Selecting the Viscosity	71	12 Volt Power Supply (32)	47
Lubricant Viscosities and Refill Capacities	71	Adjustment for Implement Console (11)	43
M		Armrest Adjustment Knobs (18)	45
Machine Operation	35	Battery Disconnect Switch (39)	49
Machine Retrieval	64	Blade Control Lever (14)	43
Towing with the Engine Idle	64	Cigar Lighter (27)	46
Towing with the Engine Stopped	65	Diagnostic Connector (31)	47
Maintenance Interval Schedule	81	Direction Control Switch (9)	43
Every 10 Service Hours or Daily	81	Downshift Switch (8)	42
Every 100 Service Hours or 2 Weeks	82	Dual Tilt Control (16)	45
Every 1000 Service Hours or 6 Months	82	Engine Shutdown Control (40)	49
Every 12 000 Service Hours or 6 Years	83	Engine Start Switch (38)	49
Every 2000 Service Hours or 1 Year	82	Front Floodlight Switch (26)	46
Every 250 Service Hours	82	Front Window Wiper Switch (19)	45
Every 250 Service Hours or Monthly	82	Heating and Air Conditioning Switch (21)	45
Every 3 Years	83	HID Light Switch (25)	46
Every 3000 Service Hours	83	Horn (17)	45
Every 3000 Service Hours or 2 Years	83	Implement Lockout Switch (15)	45
Every 50 Service Hours or Weekly	81	Interior Dome Light (42)	49
Every 500 Service Hours	82	Left Brake Pedal and Impeller Clutch (2)	41
Every 500 Service Hours or 3 Months	82	Mode Switch for Engine Monitoring System	
Every 5000 Service Hours or 3 Years	83	(EMS) (22)	46
Every 6000 Service Hours or 4 Years	83	Parking Brake (1)	41
Every Year	83	Quarter Panel Window Wiper and Window	
Initial 500 Service Hours	82	Washer Switch (37)	49
When Required	81	Quickshift Switch (24)	46
Maintenance Section	70	Rear Floodlight Switch (29)	47
Maintenance Support	78	Rear Window Wiper Switch (20)	45
Mirror	38	Reduced Rimpull Select Switch (30)	47
Mirror Adjustment	38	Resume/Accel Switch (13)	43
Monitoring System	51	Right Brake Pedal (3)	42
Alert Indicators	52	Rotating Beacon (28)	47
Display Modules	51	Running Light Switch (34)	48
Functional Test	51	Set/Decel Switch (12)	43
Indicators	53	Stairway Access Light Switch (33)	47

Stairway Access Light Switch (41)	49
Steering Console Adjustment (10)	43
STIC Control Lock (5)	42
STIC Steering Control (6)	42
Temperature Control (36)	48
Throttle Control (4)	42
Throttle Lock Switch (35)	48
Torque Converter Lockup Switch (23)	46
Upshift Switch (7)	42
Operator Station	27

P

Parking	24, 60
Parking Brake	56
Driving Through the Parking Brake	56
Parking Brake Manual Release	66
Plate Locations and Film Locations	29
Certification	30
Product Identification Number (PIN) and CE Plate	29
Product Information Section	28
Product Link	53
Data Broadcasts	54
Operation in a Blast Site for Product Link Radios	54

R

Radiator Core - Clean	132
Receiver Dryer (Refrigerant) - Replace	133
Reference Information Section	143
Reference Material	143
Additional Reference Material	143
Caterpillar Reference Material	143
Reference Materials	143
Restricted Visibility	22
Roading the Machine	62
Rollover Protective Structure (ROPS) - Inspect	133

S

S·O·S Information	76
Safety Messages	6
Crushing Hazard (6)	9
Do Not Operate (1)	7
Down Hill Travel (10)	10
Improper Connections Of The Jump Start Cable (3)	8
No Clearance (7)	9
Parking Brake (5)	8

Pressurized System (4)	8
Product Link (9)	10
ROPS/FOPS Structure (2)	9
Seat Belt (2)	7
Safety Section	6
Seat	35
Seat Belt	36
Extension of the Seat Belt	38
Seat Belt Adjustment for Non-Retractable Seat Belts	36
Seat Belt Adjustment for Retractable Seat Belts	37
Seat Belt - Inspect	133
Seat Belt - Replace	134
Seat Side Rails - Adjust	135
Secondary Steering - Test	135
Secondary Steering (If Equipped)	56
Service Brake Wear Indicator - Check	135
Shipping the Machine	62
Slope Operation	24
Sound Information and Vibration Information	25
Sound Level Information	25
Sound Level Information for Machines in European Union Countries and in Countries that Adopt the "EU Directives"	25
Sources	27
"The European Union Physical Agents (Vibration) Directive 2002/44/EC"	25
Specifications	28
Application/Configuration Restrictions	28
Intended Use	28
Machine Data	28
Starting Motor - Inspect	136
Steering Cylinder Bearings - Lubricate	136
Steering Frame Lock	34
Stopping the Engine	60
Stopping the Engine if an Electrical Malfunction Occurs	60
Stopping the Machine	60
System Pressure Release	78
Brake Pressure	78
Cooling System Pressure	78
General Precautions	78
Hydraulic Pressure	78
Lock Valve Pressure	79
Steering Pressure	79

T

Table of Contents	3
-------------------------	---

Tilt Cylinder Bearings - Lubricate	137
Tire Inflation - Check	137
Tire Inflation Information.....	70
Tire Inflation Pressure	70
Tire Inflation Pressure Adjustment.....	70
Tire Inflation with Nitrogen.....	70
Tire Information	20
Towing Information	64
Transmission Magnetic Screen - Clean	138
Transmission Oil - Change.....	138
Transmission Oil Filter - Replace	139
Transmission Oil Level - Check.....	140
Transmission Oil Sample - Obtain	140
Transportation Information	62
Turbocharger - Inspect.....	141

V

Visibility Information	22
------------------------------	----

W

Welding on Machines and Engines with Electronic Controls	79
Window Washer Reservoir - Fill	141
Window Wiper - Inspect/Replace	141
Windows - Clean	141
Cleaning Methods.....	142
Polycarbonate Windows (If equipped)	142

Product and Dealer Information

Note: For product identification plate locations, see the section “Product Identification Information” in the Operation and Maintenance Manual.

Delivery Date: _____

Product Information

Model: _____

Product Identification Number: _____

Engine Serial Number: _____

Transmission Serial Number: _____

Generator Serial Number: _____

Attachment Serial Numbers: _____

Attachment Information: _____

Customer Equipment Number: _____

Dealer Equipment Number: _____

Dealer Information

Name: _____ Branch: _____

Address: _____

	<u>Dealer Contact</u>	<u>Phone Number</u>	<u>Hours</u>
Sales:	_____	_____	_____
Parts:	_____	_____	_____
Service:	_____	_____	_____

